MUNICIPAL INFRASTRUCTURE

AN INDUSTRY GUIDE TO INFRASTRUCTURE SERVICE DELIVERY LEVELS AND UNIT COSTS

JUNE 2010

cooperative governance & traditional affairs

THE FOLLOWING STAKEHOLDERS / ROLE PLAYERS ARE ACKNOWLEDGED FOR CONTRIBUTIONS

ACRONYMS

BER	Bureau for Economic Research
BSRP	Building For Sport And Recreation Programme
CAPEX	Capital Expenditure
CFLC	Cold Formed Lipped Channel
COGTA	Department of Cooperative Governance and Traditional Affairs
CHC	Community Health Center
CIDB	Construction Industry Development Board
CIP	Capital Investment Plan
CPAF	Contract Price Adjustment Formula
CPI	Consumer Price Index
CSIR	Council for Science and Industrial Research
DBSA	Development Bank of Southern Africa
DEAT	Department of Environmental Affairs And Tourism
DHS	Department of Human Settlement
DMC	Disaster Management Center
DME	Department of Minerals And Energy
DMIS	Disaster Management Information System
DoH	Department of Health
DSR	Department of Sports and Recreation
DoT	Department of Transport
DRDLR	Department of Rural Development and Land Reform
DTI	Department of Trade and Industry
DWA	Department of Water Affairs
EC	Eastern Cape
ECSA	Engineering Council of South Africa
EPWP	Expanded Public Works Programme
FBW	Free Basic Water
FS	Free State
GDP	Gross Domestic Product
GSC	General Service Counter
GT	Gauteng
IDC	Infrastructure Delivery System
IDIP	Infrastructure Delivery Improvement Programme
IDP	Infrastructure Development Plan
IIBCI	Industry Insight Building Cost Index
IPIP	Infrastructure Programme Implementation Plan
IPMP	Infrastructure Programme Management Plan
KZN	KwaZulu Natal
LED	Local Economic Development
LIC	Labour Intensive Construction
LP	Limpopo
LOFLOS	Low-Flow On-Site
LOS	Level Of Service (also known as Service Option)
MDMC	Municipal Disaster Management Center
MIG	Municipal Infrastructure Grant
MIIF	Municipal Infrastructure Investment Framework
MIS	Municipal Information System

MP	Mpumalanga
MPCC	Multi-Purpose Community Center
MPCF	Multi-Purpose Community Facility
MTEF	Medium Term Expenditure Framework
NBR	National Building Regulations
NC	Northern Cape
NDMC	National Disaster Management Center
NHBRC	National Home Building Regulations Certificate
NMMU	National MIG Management Unit
NT	National Treasury
NW	North West
O&M	Operation and Maintenance
OHS	Occupational Health And Safety
OPEX	Operational Expenditure
P&G's	Preliminary and General
PDA	Pre-Determined Attendance
PDMC	Provincial Disaster Management Center
PMU	Project Management Unit
PPI	Production Price Index
PPP	Public Private Partnership
PRF	Project Registration Forms
PW	Department Of Public Works
RDP	Rural Development Programme
SABS	South African Bureau of Standards
SAFCEC	South African Federation Of Civil And Electrical Contractors
SALGA	South African Local Government Association
SANS	South African National Standards (also known as SABS)
SDA	Service Delivery Agreement
SMME	Small, Micro and Medium Enterprise
SRSA	Sports And Recreation South Africa
STATSA	Statistics South Africa
TMA	Trade Metrology Act
UDS	Urine Diversion System
UPS	Uninterrupted Power Supply
VIP	Ventilated Improved Pit
WBASA	Water Borehole Association Of South Africa
WC	Western Cape
WSA	Water Services Authority
WSDP	Water Service Development Plan
WTW	Water Treatment Works

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1. PREFACE

This revised report *"**An Industry Guide to Infrastructure Service Delivery Levels and Unit Costs – 2009/2010"*** provides an updated and revised version of the 2007 *"An Industry Guide: Infrastructure Service Levels and Unit Costs"*

The Industry Guide document addresses regional, sectoral and industry related cost values, taking into account the national impacts such as variance in labour, fuel, material and transport and acknowledges the changed market conditions in the building and construction industry since the peak in 2007 and early 2008 to the recessionary levels in the latter half of 2009.

A practical and current (August 2009) nation-wide system of guidelines is provided for **high level infrastructure planning** for municipalities, service providers and local/provincial/national government in terms of the provision of weighted infrastructure development and service provision cost values.

Infrastructure review extends beyond the focus of "basic service options" and includes aspects of integrated infrastructure planning and management and the value and role of infrastructure in local and national growth and development objectives.

The Industry Guide is limited in terms of its review of infrastructure operations and maintenance and life cycle costing, but lays down the basis for inclusion in the next revision of the document.

2. EXECUTIVE SUMMARY

This update of the ***Industry Guide to Infrastructure Service Delivery Levels and Unit Costs 2009/2010*** was commissioned by the Department of Cooperative Governance and Traditional Affairs (COGTA) to update services standards and reflect the change in the economic climate and service delivery unit costs in South Africa since the last update of the Industry Guide in 2007. Whilst much of the 2007 Industry Guide has been retained, this update clarified the role of the document in improving services planning, provision and management beyond the MIG Programme. **The Industry Guide is not to be confused as a services design guide (which is contained in separate technical design standard documents), but aims to present levels of services options, standards and services unit costs , within a regional/provincial context, escalated to August 2009**.

In 2007, a "zero-based" unit costing methodology to calculate services unit costs factored in regional / provincial variances in labour rates, fuel and transport cost, materials, and other related factors (urban and rural). It was assumed that the standards, bill of quantities and unit costs presented in 2007 were widely endorsed by the sector (save for the sanitation unit costs).

After extensive stakeholder engagement (contained in a separate detailed report titled "*Industry Guide 2009/2010 - Stakeholder Consultation*") this Industry Guide 2009/2010 document was updated to incorporate the development of standards, inputs and comments by sector departments involved in municipal infrastructure. Collaboration with DWA Sanitation Unit provided consensus on the approach for the determination of sanitation standards, bills of quantities for various service levels and respective unit costs. The Industry Guide 2009/2010 document adopted an approach to escalate services unit costs based on the most recent SAFCEC indices (August 2009) for labour, plant, materials, fuel/transport per region/province.

To verify the escalation cost methodology, an exercise was conducted to test the individual escalated component costs (e.g. building sand, cement, bricks etc) to the current supplier rates. The variance in materials supplier costs of between 3,7% to 13% gives confidence in the escalated rate methodology.

The services unit costs included all construction costs, including a construction margin and preliminary and general charges, but excluded professional fees and value added tax. To reflect the current recessionary economic climate, a 15% construction margin was adopted (to cover the contractor installed cost overheads and profit) for all services unit costs. A detail tariff of fees for engineering professionals, in accordance with the Gazetted Board Notice 1 of 2009 ECSA *Scope of Services and Tariff of Fees*, forms the basis for the determination of professional fees. Additional fee guidelines were provided for other professionals i.e. quantity surveyors, land surveyors, environmentalists, geohydrologists etc, and this revised Industry Guide 2009/2010/2010 presents, for discussion, approximate fee percentages for service types.

Often omitted from project budgets is the cost of engagement of professional service providers to undertake project feasibility studies. As a guide this fee is estimated at 1% of the total project capital value, but is project specific.

Section 7.1 of this document discusses water supply construction costs for residential water supply reticulation, connector services and bulk water supply, which increased on average between 20%-22% between February 2007 and August 2009, reflective of the construction industry boom in 2007 and the gradual slowdown towards the latter half of 2008.

Sanitation unit costs (section 7.2) involved a more complicated process of updating, as the bill of quantities was revised to include the outcomes of the sanitation task team meetings. As time constraints prevented the zero-based cost approach to this new Bill of Quantities, individual component rates used in 2007 were escalated using the SAFCEC indices and a "location" factor used to account for the regional variances compared to Gauteng.

Aligned with the DWA Sanitation Unit, a community development budget was allocated to provide for a health and hygiene education budget component. On average a budget estimate of R445/household was allocated for this activity.

The unit standards, level of service options and associated unit costs of roads are discussed in detail in sections 7.3. Regional cost variances were highlighted. As an example the cost of a un-graveled rural road in the Northern Cape is 23,7% higher than in Gauteng. Significantly the unit cost comparison of a high level paved bitumen road in the Western Cape is 28,9% higher than in Gauteng.

Stormwater unit standards and costs are contained in sections 7.4 of this document. Included herein is a section on unit costs for embankment and erosion protection using gabions and reno mattresses.

Section 7.5 describes unit standards and costs for electricity. Regional variation

Sports and Recreation South Africa engaged in a similar exercise in March 2008, and established a set of unit costs for sport facilities (such as athletics tracks, cricket pitches, multi-purpose halls etc). To ensure consistency of unit cost data, these figures were adjusted to the August 2009 baseline, by firstly assuming that the SRSA unit costs were derived for Gauteng and multiplying all elements by the SAFCEC indices and escalation factor, as well as providing an allowance for geographic/regional variances to Gauteng.

Notwithstanding the approach to the document, it does not take into account:

- the impact of contractor workload – the less construction work available, the lower and more competitive are the unit rates and vice-versa; and
- Site specific conditions i.e. hydrology, topography, geology etc but applies an average cost rate estimate.

The conclusion of this document outlines future enhancement and improvements to the Industry Guide 2009/2010 document. Interim updates of service unit costs escalated to any point in time, can be calculated by practitioners applying the methodology contained in Appendix 1b. A further enhancement is to develop a web-based application that will enable users to accurate estimate project costs and facilitate improved planning at a high level.

A summary of the various services unit standards, level of service options and unit cost per region/province is contained in Appendix 2.

The Industry Guide unit costs should be used for first order project planning and budgeting only. Actual project costs must be determined through detail project feasibility studies, designs and contractor tender prices.

3. INTRODUCTION

3.1 CONTEXT

The former Department of Provincial and Local Government published (December 2005): "*Basic Level of Services and Unit Costs: A Guide for Municipalities*" as a working document to guide users within the context and conditions of the Municipal Infrastructure Grant (MIG) programme. The purpose of the 2005 document was to provide a framework for municipalities to consider, deliberate and plan in terms of the various infrastructure options and associated costs, related to the selection of appropriate service levels for basic service provision. The guideline provided an outline of the issues concerned, but the responsibility and mandate rested with municipalities to consider and decide upon the (basic and other) Levels of Service, which they decided to be most appropriate, sustainable and affordable within their local circumstances. The document also acted as the base comparison document for the National MIG Management Unit's (NMMU) assessment of the Project Registration Forms (PRF).

However, concern was expressed by stakeholders that the 2005 Guideline document and the unit cost values reflected therein, were too static and did not reflect regional variances, local economic trends or national market factors and costs indices which impact on the civil infrastructure sector/s. In 2007, the former Department of Provincial and Local Government (DPLG), embarked on an exercise to determine the unit cost of infrastructure for various levels of service at a provincial scale. This culminated in the drafting of the document in 2007 known as *"An Industry Guide – Infrastructure Service Delivery Levels and Unit Costs".* Although broadly accepted by stakeholders, the unit cost for sanitation levels of service was contested by the Department of Water Affairs and Forestry – Sanitation Unit, and the *Industry Guide 2007* document remained a draft.

In 2009, the Department of Cooperative a Governance and Traditional Affairs (COGTA) undertook to revise and update the *Industry Guide 2007*. This document "*An Industry Guide – Infrastructure Service Delivery Levels and Unit Costs 2009"* document aims to:

- ensure broad stakeholder participation and adoption of infrastructure unit standards and costs;
- address regional / provincial and sectoral/industry related cost values, as well as to allow for national impacts such as variance in labour rates, fuel and transport cost, materials, and other related factors;
- to align/revise the associated infrastructure construction costs within the changed market conditions to reflect the escalation since the 2007; and
- Ensure that infrastructure types such as sport facilities are incorporated into the revised Guide document.

The overall objective was therefore to develop a practical, current and relevant nation-wide system of guidance for municipalities, their service providers and ultimately national and provincial government in terms of the provision of *basic infrastructure service provision cost values* that reflect national and regional impacts, and provide comparative value for high level planning estimates and value for money assessment guidelines.

The *Industry Guide 2009/2010*, aims to provide a high level first order infrastructure planning cost estimate. The Industry Guide could be used in conjunction with tools such as the Municipal Services Financial Model (MSFM) or the Municipal Infrastructure Investment Model MIIF) to corroborate planning cost estimates.

An aspect relating to the capital costing for rehabilitation of infrastructure, which is becoming a major part of MIG expenditure within municipalities, is not dealt with by the Industry Guide.

3.2 BACKGROUND

Municipalities are responsible for ensuring that the people in their localities receive at least the *basic level of services*. There are a range of service options and levels of service that can be provided, of which the most immediate needs in terms of related national targets and universal access include:

- water supply;
- sanitation;
- health centers;

- electricity or alternative energy sources;
- roads and stormwater drainage;
- solid waste disposal; and
- sports facilities.

When providing services that require infrastructure, municipalities may choose one of several options to meet the service needs of communities in their areas as quickly and effectively as possible, without compromising the quality or sustainability related to the service. However, there are a number of factors to be considered before this can be done. The overall aim is improved quality of life for all people in South Africa, *particularly the poorest,* without compromising the ability to operate and maintain existing services.

Probably the most important factor, is the level at which the service is provided. The term *"service level"* relates to the way in which the user experiences the service. The choice of an appropriate service level is dictated by affordability (both for customer and service provider) and by community needs and acceptance. Convenience may be as important to a particular community as health, environmental and economic factors.

However, it is the responsibility of municipalities to make final decisions about the level of service to be provided. Such decisions have a critical impact on the long-term viability of the particular service and the financial sustainability of local government as a whole.

Viability relates largely to the affordability of the service. Municipalities depend largely on the income received from customers and this must be sufficient to cover the cost of providing the service. Higher levels of service are generally associated with higher costs, for which customers must pay more. If higher levels of service are not affordable, the ability of a municipality to recover its costs is negatively affected, threatening the revenue base and the financial sustainability of the municipality.

It should be noted that historically, the MIG provides funding only up to a "basic level of service", with specific conditions as specified under the MIG conditions. However, experience has shown the need to reconsider the concept of a higher "basic level", as substantiated by adequate technology assessment and motivation, and achievable in terms of the viability of the chosen service level.

The focus has shifted from the provision of basic services to the provision of sustainable services, which ensures growth and development of communities, both in terms of economical- and quality of living parameters. Funding and financing of infrastructure relate to the entire life cycle of infrastructure development and to the life expectancy of infrastructure durability. For this reason, the Industry Guide considers and addresses all major types of municipal infrastructure, beyond the ambit of the conventional "basic levels" of infrastructure. *MIG (which is one form of the infrastructure funding), in its current maturity, can be viewed* as *the 'stepping stone' from basic infrastructure planning, funding and financing to comprehensive integrated capital investment and infrastructure planning, development and management.*

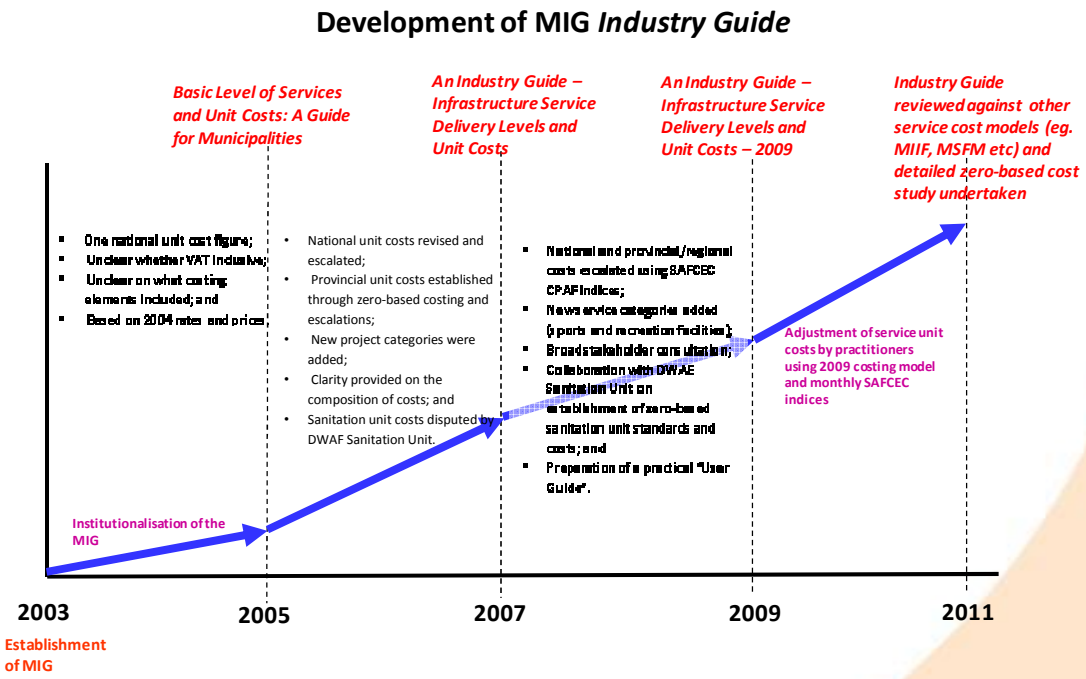
Through various infrastructure programmes, the use of labour intensive methods for certain types of infrastructure had been made mandatory. This is in line with the Expanded Public Works Programme (EPWP), which aims to maximize job creation through government expenditure. The use of labour intensive methods does not affect the level of service choices of services delivered. The Department of Public Works has issued "Guidelines on the implementation of labour intensive infrastructure projects under the EPWP" and municipalities are required to adhere to these guidelines for projects funded through the MIG.

4. REVISED GUIDELINE

4.1 OBJECTIVE

The objective of the report *"An Industry Guide: Infrastructure Service Levels and Unit Costs"* is to provide an updated and revised version of the 2007 "Basic Levels of Services and Unit Costs: A Guide to Municipalities".

Figure 1: Development of MIG Industry Guide



This 2009/2010 version of the *Industry Guide* has the following objectives:

- To define and describe the various types of municipal infrastructure, funded by all infrastructure programmes (including MIG);
- To provide (updated) options of Levels of Services (LOS) as associated with each infrastructure type;
- To provide an average unit cost for each of the defined LOS, with due consideration of the predetermined national policy and parameters;
- To provide actual and current unit costs for the individual infrastructure components;
- To provide such unit costs for bulk, connector and reticulation infrastructure, separately;
- To compare unit costs for the respective Provinces / Regions within South Africa by providing:
    - National: average unit cost considering national characteristics and needs;
    - Provincial: typical unit costs reflecting the characteristics of the province;
    - Scheme level: typical unit costs for different scheme types; and
    - Component level: typical unit costs of individual infrastructure components;
- To provide a practical "User Guide" that will allow stakeholders to escalate services unit costs, based on the most current SAFCEC CPAF indices; and
- To provide a comprehensive reference base for further and more detailed data and information, regarding infrastructure and its related industry, norms and specifications, costs, escalation figures,

trends and projections.

The report targets the following users:

Public Sector:
- Local Government - Municipal Project Management Unit (PMU) Managers.
- Local Government - Municipal Technical Managers.
- Local Government - Municipal Political Infrastructure Portfolio Leaders.
- Provincial Government: Executives and Managers in MIG and Infrastructure Planning and Implementation.
- National Government: Executives and Managers and MIG and Infrastructure Policy and Regulation.

Private Sector:
- Professional Engineers, Consultants and Project Managers.
- Service Providers in the construction and building industry.

Civil Society:
- Stakeholders in Infrastructure and Implementing Agents in Infrastructure Development.

The public sector, as related with the MIG programme include, the national departments and their provincial counterparts, who directly contribute and add value to the municipal infrastructure programmes. The public sector supports, guide and/or regulate at any given interface of the project life cycle, which may include early inception or conceptualization, planning, design, implementation, operation and maintenance, monitoring, evaluation and reporting phases of infrastructure projects - as implemented by municipalities nationally. The Public Sector Departments include (with its respective provincial counterparts):

- Department of Cooperative Governance and Traditional Affairs (COGTA);
- South African Local Government Association (SALGA);
- National Treasury (NT);
- Department of Water Affairs and Environment (DWA);
- Department of Public Works (DPW);
- Sports and Recreation South Africa (SRSA);
- Department of Minerals and Energy (DME);
- Department of Transport (DoT);
- Department of Human Settlements (DHS);
- Department of Health (DoH);
- Department of Social Development; and
- Department of Rural Development and Land Reform.

4.2 PURPOSE

The purpose of the revised Industry Guide 2009/2010/2010 is to provide a *relevant, current and practical nation-wide system of guidance for municipalities in terms of the provision of weighted basic infrastructure service provision cost values* that reflect national and regional/provincial trends of current development and economies in South Africa.

This document aims to provide user-friendly guide to high level planning for the most appropriate infrastructure Levels of Service, and to cost accordingly within the MIG (or other capital investment) programme/s, within the IDP and MTEF frameworks.

This document does not aim to be a services design manual and should be used in conjunction with the Red Book and other design standard documents.

4.3 METHODOLOGY

The terms of reference of this study, which dictates the approach, does not allow for the review of the 2007 services design or detail bill of quantities– these were assumed as correct, as it had been endorsed by the vast majority of industry stakeholders. However where gaps and errors in calculation were identified, these were corrected.

The updated revised services unit cost was determined by using three different approaches as follow:

i. **The Contract Price Adjustment Factor (CPAF) and SAFCEC indices**:
This was applied to the Civil Engineering components of the unit costing. The price increase varied between 20 and 22 % depending on the category of work.

ii. **The JBCC Calculation and Indices:**
This was applied to the Building components of the unit costing. The lump sum contract approach was used that resulted in a price increase of 21.47%

iii. **The SEIFSA indices combined with SAFCEC indices:**
This was applied to the Electrical Engineering components for the Street lights and Highmast lights. The SEIFSA does not incorporate the fuel price increase hence the practice is to combine it with SAFCEC fuel indices. The price increase was calculated at 19.84%

It must be noted that the transport cost, rural or urban location and provincial differences were already taken into account in the exercise completed in 2007.

The revised costs that include the Provincial Prices were amended with the percentage price increase calculated as applicable.

As the unit costs for sanitation services were contested by the DWA –Sanitation Unit, a concerted effort was placed into reviewing the level of service designs, bill of quantities and rates that make up the unit cost. For this purpose the DWA Sanitation Unit established a task team to determine the unit costs, using a *zero-based (tender-type 'bill of quantities") approach* to determine the sub-cost elements, and costs that contribute, which amount to the final unit cost per Level of Service.

To verify and check the final unit cost as derived from the above approach, a number of Sectoral, Specialist, Institutional and Industry Stakeholders were identified and consulted to form part of the Task Team to review and comment on the updated Industry Guide (refer to the Acknowledgement Page):

- Professional engineers;
- Project management- or development consultants;
- Civil and building contractors;
- MIG and national MIS;
- National, Provincial and Local Government:
- Manufacturers / suppliers of material; and
- Financial / academic / research institutions.

Technical Specifications:

The revised report allowed for the inclusion of services and options which were not specifically dealt with in the 2007 Guideline:

- Agreement with DWA on sanitation unit standards and unit costs.
- Sanitation services included a component for social costing of health and hygiene education and community participation;
- Bulk infrastructure is separated from the connector and internal reticulation services to allow for separate costing and/or planning;
- Sports and recreation facilities were added to the services categories, Escalated unit costs for each facility type added;
- Guideline for EPWP employment creation for the various infrastructure types;
- The breakdown of each infrastructure type was done by considering the respective phases associated with the entire lifecycle of MIG or infrastructure development which makes up the total project cost, to include feasibility studies, P&G, materials, labour, plant, fuel, professional services and retention.
- A Summary User Guide document has been developed to assist users to make optimal use of the Guide; and
- Each level of service reflects the status of costs per region / province.

Note: The document does not deal with operations and maintenance costing or related aspects.

Assumptions in development of infrastructure costs:

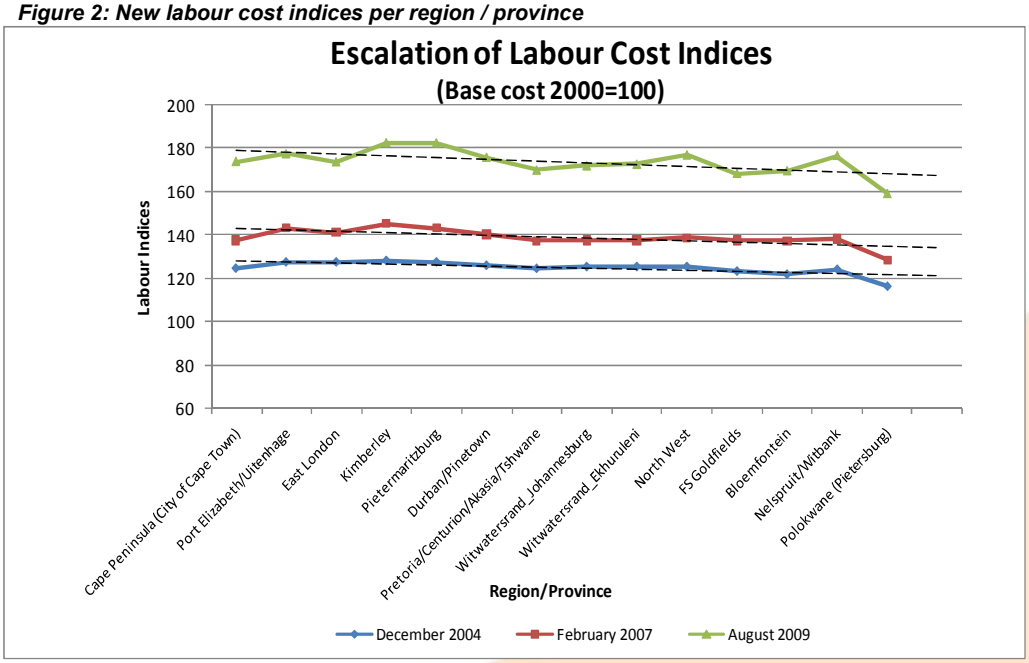
- The level of services designs, measured bill of quantities and derived service unit costs presented in the 2007 Industry Guide is assumed to be correct as these were endorsed by sector stakeholders (save for internal household sanitation costs contested by DWA- Sanitation Unit);
- The 2009 Industry Guide services unit costs is based on the labour, plant, materials and fuel indices (August 2009) as published by SAFCEC for the purposes of calculating contract escalation; and
- The data sheets that contain and reflect current costs, are based on the 2007 unit cost values escalated to August 2009 per region/province.

Labour Rates

Labour rates are determined per region/province. The rate of increase in labour cost between August 2007 and July 2008 is significant (approximately 12,75% year on year). This rate of increase slowed in the latter half of 2008 and in 2009.

Compared to the weighted average labour index (174,11) in August 2009, cost of labour in Limpopo is significantly less than the average (159,1). On the opposite end of the spectrum, labour is relatively more costly in Pietermaritzburg (182,4) and Kimberley (182,5) . Labour costs impacts significantly on unit costs 2007/08 when compared to 2005.

Figure 2: New labour cost indices per region / province



Source: Data obtained from SAFCEC website – www.safcec.org.za, September 2009

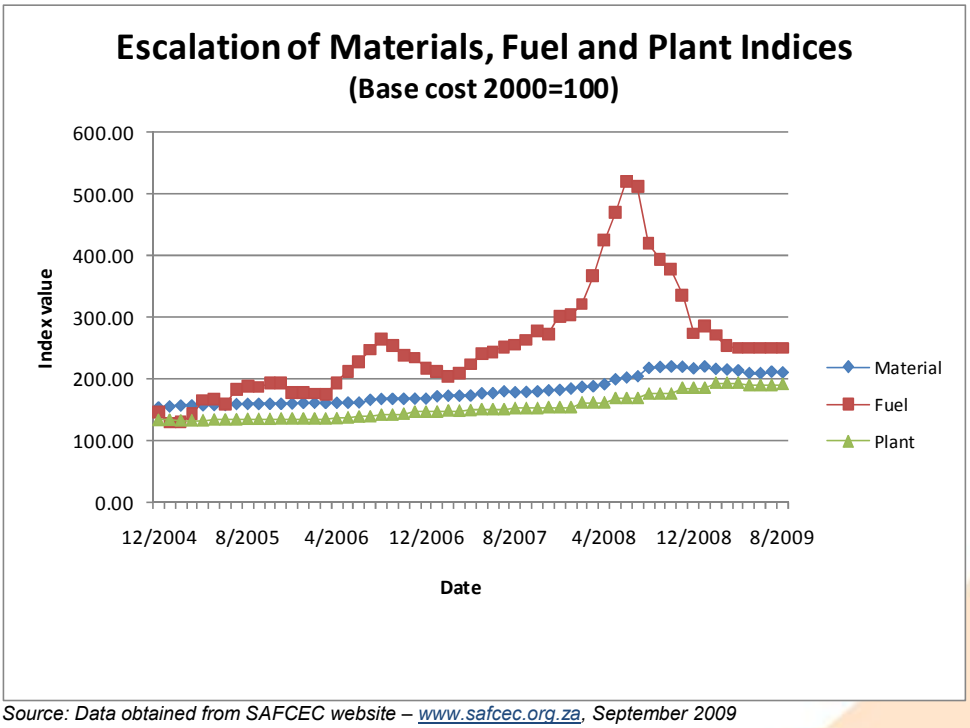
Plant and material rates:

The general approach and guideline design followed was:

- Gauteng is used as base province and factors incorporated to reflect regional costs based on Gauteng value of 1.0.
- All rates and prices exclude VAT at 14% and professional fees at ESCA rates.
- All rates and prices obtained from suppliers are 'bin' rates and transport costs were calculated and incorporated as regional averages.

- Most rates and prices were obtained for one major center in each province only - as can be seen from the schedules (Appendixes), where the city/town has been indicated.
- From the averages calculated, it is noted that there is a prominent trend and need for provincial adjustment and premiums.
- The rate of increase of materials and plant increased between 2007 and 2009.
- However due to the strengthening of the rand, the rate of increase of the fuel price increase has been fairly steady between 2004 and 2009 – refer to Figure 3 below.
- A more detailed breakdown of the escalation factors and indexes are provided in Appendix 1.

Figure 3: New materials, fuel and plant indices per region / province



Source: Data obtained from SAFCEC website – www.safcec.org.za, September 2009

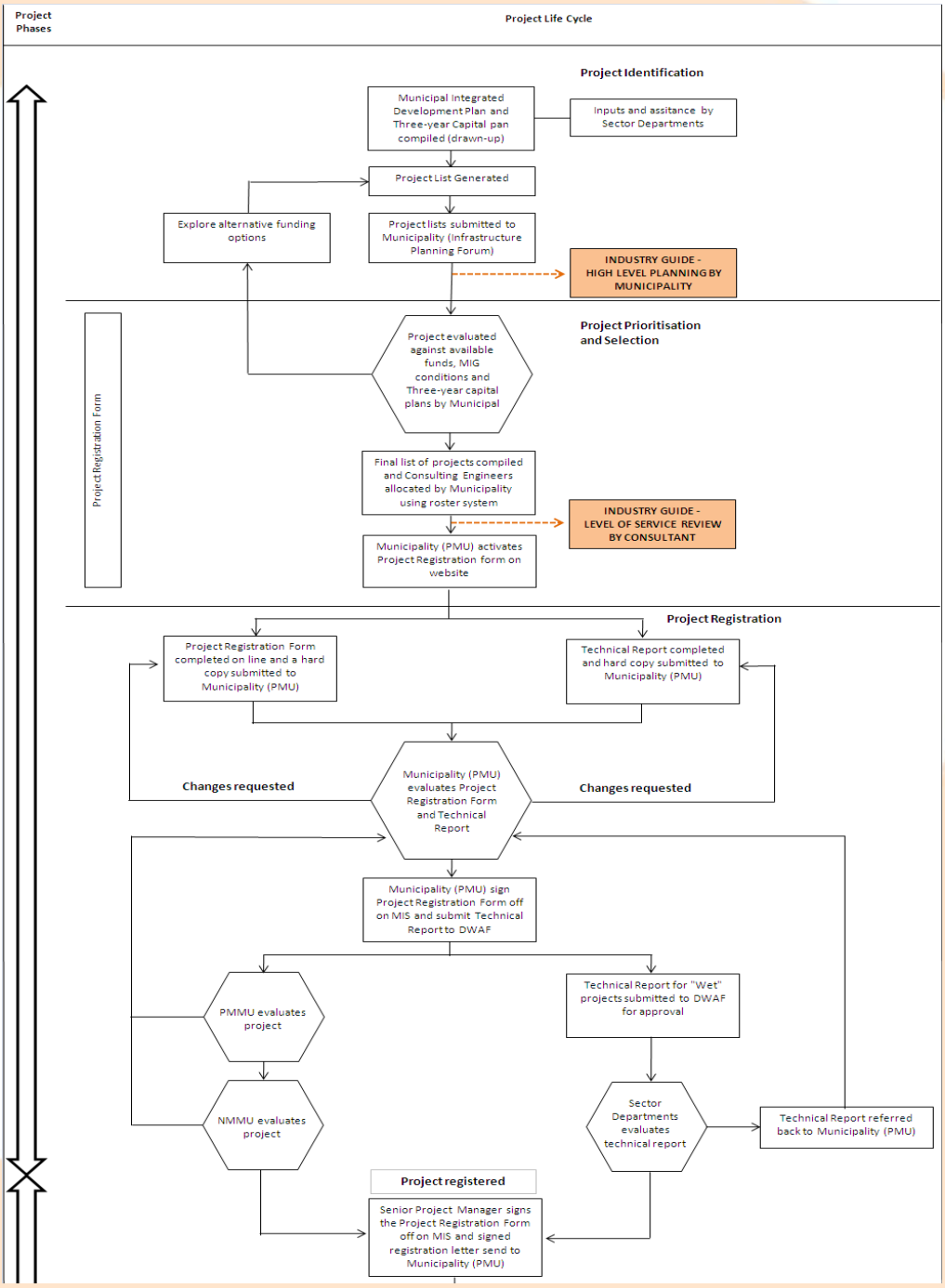
4.4 REFERENCE DATE AND FUTURE REVISION

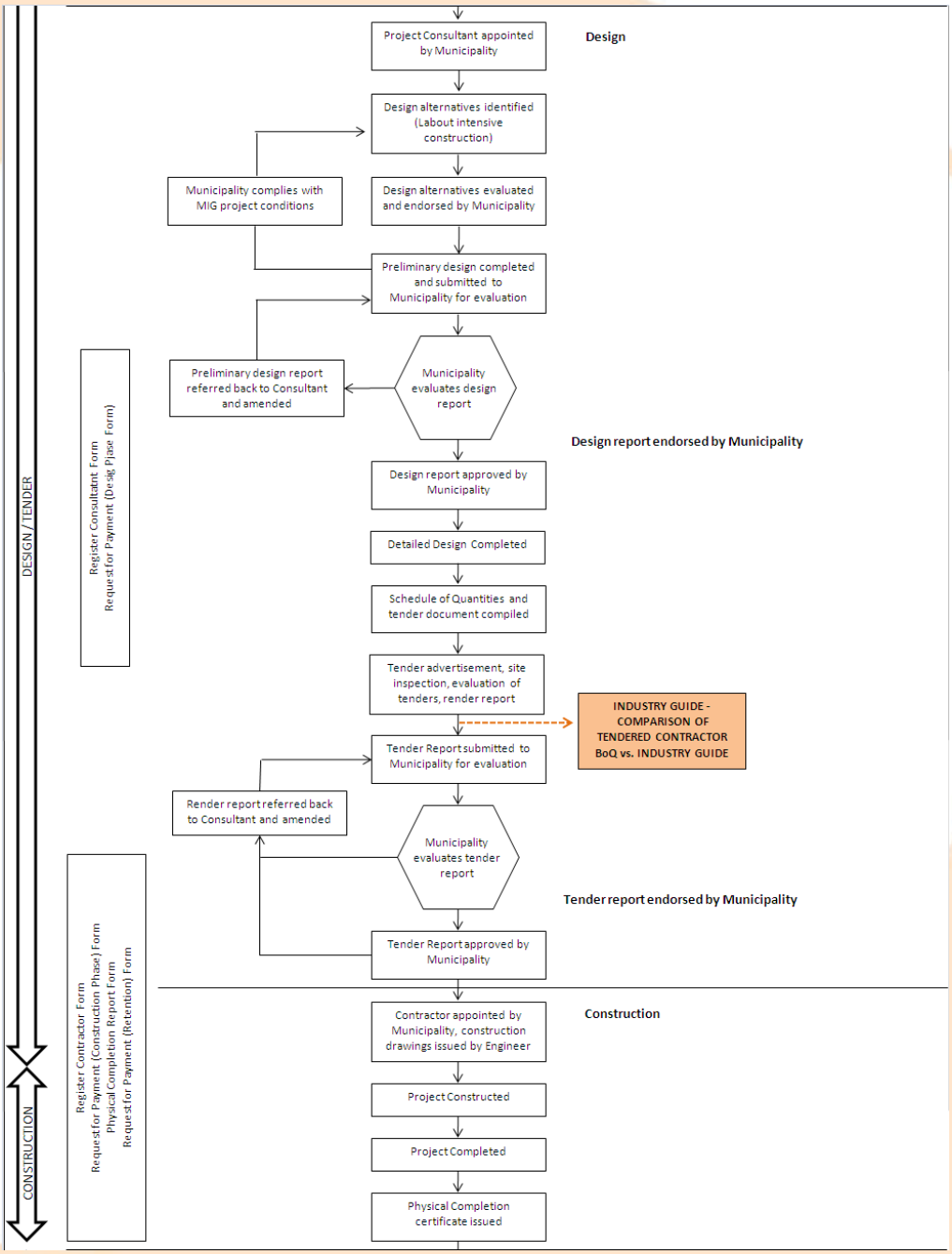
Costs in this publication reflect industry prices escalated by the latest SAFCEC indices as at August 2009.

Should this publication not be updated in the near future, users may escalate the costs by the published Production Price Index (PPI) for civil engineering. This can be obtained from Statistics South Africa, Tel: (012) 310-8600, Fax: (012) 310-8500, Email: info@statssa.gov.za or Statistics South Africa - Home. The Industry Insight Building Cost Index (IIBCI) is also another convenient resource of market developments and price adjustments and can be found at www.industryinsight.co.za or Tel: (011) 431 3691.

(REFER TO APPENDIX 1B)

4.5 USE OF THE INDUSTRY GUIDE – PROJECT LIFE CYCLE




DESIGN / TENDER
CONSTRUCTION
Register Consultant Form
Request for Payment (Design Phase Form)
Register Contractor Form
Request for Payment (Construction Phase) Form
Physical Completion Report Form
Request for Payment (Retention) Form
Project Consultant appointed by Municipality
Design
Design alternatives identified (Labout intensive construction)
Municipality complies with MIG project conditions
Design alternatives evaluated and endorsed by Municipality
Preliminary design completed and submitted to Municipality for evaluation
Preliminary design report referred back to Consultant and amended
Municipality evaluates design report
Design report endorsed by Municipality
Design report approved by Municipality
Detailed Design Completed
Schedule of Quantities and tender document compiled
Tender advertisement, site inspection, evaluation of tenders, render report
INDUSTRY GUIDE - COMPARISON OF TENDERED CONTRACTOR BoQ vs. INDUSTRY GUIDE
Tender Report submitted to Municipality for evaluation
Render report referred back to Consultant and amended
Municipality evaluates tender report
Tender report endorsed by Municipality
Tender Report approved by Municipality
Construction
Contractor appointed by Municipality, construction drawings issued by Engineer
Project Constructed
Project Completed
Physical Completion certificate issued

5. GENERAL CONSIDERATIONS IN INFRASTRUCTURE PLANNING

5.1 INTEGRATED ASSET MANAGEMENT AND MIG

The year 2007 observed a shift in focus towards more comprehensive integrated capital investment and infrastructure planning, development and management. The rational for this is that historically the Infrastructure Delivery Cycle covers the same timeframes as that of the Budget Cycle (MTEF – 3 yrs) and includes the various phases of planning, implementation and commissioning. However, the planning of such infrastructure, as well as the number of role-players involved in the delivery of infrastructure, often requires that the planning, design and tendering phases of delivery normally take place in excess of one year, depending on the nature and type of project. The status quo situation indicates that insufficient time is allocated for the full "MIG cycle", which is also the root cause of the fourth quarter expenditure spike in the national financial year span. With such approach, it means that there is often less than one year remaining for implementation of the projects. Such unrealistic planning and timeframes invariably leads to under-expenditure, projects not completed within the planned timeframes, and funds being rolled over to new financial years. This is often coupled with confusion between the client departments and their implementing agents as to the detailed clarity of what needs to be delivered and when it should be delivered, by whom and at what cost it should be delivered as well as by when it should be delivered.

The Infrastructure Delivery Improvement Programme (IDIP) under the jurisdiction of National Treasury introduced the following changes to the Infrastructure Delivery Cycle:

- That the Infrastructure Delivery Cycle be amended to include the Infrastructure Programme Management Plan (IPMP), the Infrastructure Programme Implementation Plan (IPIP), and the Service Delivery Agreement (SDA - in which all parties agree to exactly what needs to be done, where, by whom, when, and at what cost), and that these plans be made mandatory for all departments.
- That the timeframes of the Infrastructure Delivery Cycle be amended to allow for the alignment of the Infrastructure Delivery Cycle with the Budget Cycle so that departmental budgets are informed by actual projects.
- That best practice budgeting processes be adopted so that budgets for large projects are appropriately committed across the duration of the project.

This would imply that municipalities should undertake infrastructure asset management planning and infrastructure investment planning processes in order to determine the long-term consequences of capital investment including operations and maintenance and the implications to the beneficiaries. This process should link a number of variables such as the service profile of a community, household profiles, socio-economic profile, infrastructure backlogs and growth, reticulation, bulk and connector costs, capital costs, capital budget and operational budgets and household bills.

The consequences of capital investment and the implications to the beneficiaries should also be aligned with the tariff structure of municipalities. All municipalities should develop the CIP's as outputs of the asset management and infrastructure investment planning processes. (Ref: ii: Department of Provincial and Local Government: *Guidelines: Multi-dimensional targeted approach to support municipalities on infrastructure services delivery,* Applicable from 1 April 2007.)

5.2 MARKET FACTORS IMPACTING ON CIVIL AND BUILDING SERVICES:

The State of the Civil Industry 2nd Quarter 2009 report published by SAFCEC, explains the impact of the global credit crisis on the South African economy:

"Quarterly economic growth contracted from the 3rd quarter to 4th quarter of 2008 as economic growth dropped by 1.8%. Economic growth quarter on quarter (QoQ) for the 1st quarter 2009 contracted by 6.4% and 1.3% on an annual basis. This contraction was mainly due to the credit crunch, uncertainty within the market and a decline in demand for goods and services since the outbreak of the financial crisis in September 2008. Not only did the demand for goods and services decline, but commodities such as gold and platinum were also affected during the final months of 2008. Platinum lost as much as 60% in value during the last 3 months of 2008 but has regained some losses since the beginning of 2009. Forecasts for 2009 indicate that the South African economy may only grow by 0.4% or even contract on an annual basis.

On a more positive side, CPI and PPI have reached their respective peaks in the last quarter of 2008 due to the decline in commodity prices, specifically oil. Producer Price Inflation (PPI) decreased substantially since December 2008 from 11% to 5.3% at the end of March 2009. The Consumer Price Index (CPI) also saw a decline but remains sticky downwards as some prices are still increasing on a monthly basis.

Construction works were the main driver in Gross Fixed Capital Formation (GFCF), increasing by 24.88% on an annual basis. Non – residential also increased during the same time, growing at 13 .41%. Residential buildings on the other hand contracted by 5.66% during the 4th quarter of 2008. This contraction in development of residential buildings is not surprising given the ongoing decline in Private Sector Credit Extension (PSCE).

The confidence levels remained low at 51 out of a potential hundred during the 1st quarter of 2009. This is due to large companies becoming cautious of the future beyond current order book. Their current order books however are still healthy as a result of contract awards that grew substantially (37.28%) during the 1st quarter of 2009. Annual turnover is expected to grow by 14.9% on average in 2009 and by 2.93% during 2010. There is a possibility that 2010 could be a tipping year (contraction in activity) depending on the impact of the financial crisis on new macro projects."

As part of Government's Programme of Action 2009, it has identified 10 priority areas, to be addressed between now and 2014. These are to:

- speed up economic growth and transform the economy to create decent work and sustainable livelihoods;
- introduce a massive programme to build economic and social infrastructure;
- develop and implement a comprehensive rural development strategy linked to land and agrarian reform and food security;
- strengthen the skills and human resource base;
- improve the health profile of all South Africans;
- intensify the fight against crime and corruption;
- build cohesive, caring and sustainable communities
- pursue African advancement and enhanced international cooperation;
- ensure sustainable resource management and use; and
- build a developmental state, improve public services and strengthen democratic institutions.

5.3 LABOUR INTENSIVE CONSTRUCTION METHODS AND THE EPWP

EPWP is a national government initiative aimed at drawing a significant number of employed people into productive work. Its conceptualization gained recognition after the programme started on the 1st April 2004, following the cabinet agreements in November 2003. EPWP has been incorporated by four sectors - environmental, economic, infrastructural and social sectors. A total of 1,4million work opportunities were created by the end of the first five years of the EPWP.

It is possible to use labour intensive methods in the construction of all the categories of infrastructure included in this document. However, it is advised that a project is divided into phases and all phases may not be suitable for LIC methods. The potential for the inclusion of labour intensive methods is greatest in the construction of:

- Roads: rural roads and local municipal roads;
- Water and sewer pipelines, specifically the trenching activities involved in the provision of water and sanitation services;
- Stormwater drainage; and
- Sidewalks.

It is therefore mandatory that these types of infrastructure and activities are executed with an intense labour component in accordance with the EPWP Guidelines issued by the Department of Public Works, when funded through the MIG.

The scaling up of the EPWP initiative in the roads sector aims to direct additional funds to such programmes and is structured to also act as an incentive for provinces to increase their contribution to the EPWP by allocating additional funds to those who are performing well.

Because the EPWP cross cuts sectors and departments, there is no set EPWP rate. For the Infrastructure sector, there is no single set rate of pay. Municipalities and provinces must be guided by the prevailing minimum wage in the area and on-going poverty-relief projects. The aim is not to displace workers from existing employment to new EPWP projects. Allowance is made for EPWP projects to pay below the minimum wage as Gazetted in the Code of Good Practice for Employment under the Special Public Works Programme.

As part of Phase Two of the Expanded Public Works Programme (EPWP), the Community Work Programme will be fast-tracked. It will offer a minimum level of regular work to those who need it, while improving the quality of life in communities. This year, the Department of Public Works has allocated R5,2 billion to the EPWP. Government's target is to create four million job opportunities through this programme by 2014 with 500 000 work opportunities by December 2009.

5.3.1 EPWP Employment Guidelines

While many projects and programmes of government create employment, not all of them are classified as EPWP projects or programmes. Given the wide variation of projects implemented by government, it is not always straightforward to distinguish between EPWP projects and non-EPWP projects. The key characteristics of EPWP projects are listed below:

- They employ large numbers of local, low skilled, unemployed persons who are willing to work, defined as the EPWP target group;
- They are highly labour intensive: a large percentage of the overall project costs are paid out in wages to the EPWP target group; and
- They provide a service to or develop an asset for the community.

Government has proposed in a document titled *EPWP Infrastructure Sector: Incentive Grant Manual (October 2009),* guidelines for qualification of for grant incentives by ensuring projects exceed the minimum employment requirement. The table below defines minimum employment levels per infrastructure type.

Table 1: Minimum Number of Full Time Equivalents (FTEs) to be created per Million Rand of Expenditure on different Infrastructure Portfolios

Type of Infrastructure Portfolio	Minimum number of Full Time Equivalent (FTEs) to be created per million rand of expenditure	Minimum number of person days of work to be created per million rand of expenditure
Education infrastructure (provinces)	5.78	1329.4
Health infrastructure (provinces)	5.78	1329.4
Roads/ Transport (provinces)	4.53	1041.9
Public Works (provinces)	19.06	4383.8
Roads, Transport & Public Works infrastructure (combined in provinces)	4.28	984.4
Urban Municipal Infrastructure	6.00	1380
Non-urban (rural) Municipal infrastructure	None	

Source: EPWP incentive manual, October 2009, National Department of Public Works

Note: 1 Full Time Equivalent = 230 person days of work.

5.4 FINANCIAL ARRANGEMENTS FOR INFRASTRUCTURE

5.4.1 Services Unit Costs

The starting point in dealing with financial arrangements is cost, both capital and on-going operating and maintenance costs. As mentioned, these costs need to be calculated for particular circumstances and may differ from area to area within a municipality.

Infrastructure cost can vary significantly and for this reason this report has the functionality as a **Guideline** (as opposed to a Specification or Standard). The main factors that impacts on unit costs are:

- **Topography:**
  Physical features such as: Terrain (slope) – ranging from flat to mountainous and/or combinations thereof and existing physical features, e.g. natural, infrastructure.
- **Geology and Geotechnical considerations:**
  Soil characteristics such as soil types – cohesive & non-cohesive, soil conditions – soft to hard, rock, and where applicable borrow pit/s & spoil/dump/disposal site/s and local/ in-situ materials.
- **Hydrology:**
  Drainage characteristics, i.e. sub-surface & surface in terms of drainage and stormwater requirements and where applicable water sources and access.
- **Context/ Locality of the project:**
  Aspects such as accessibility to site – rural (remoteness) or urban (built environment); working space; security; availability and accessibility of local resources; climate - rain, dust (dry, wind), season (hot, cold).
- **Environment:**
  Environmental considerations: erosion control and rehabilitation measures; borrow pit/s & spoil/dump/disposal site/s; ecologically sensitive areas/s, traditional site/s, historical zones; protection of water, soils and vegetation.
- **Labour:**
  Availability of local people (unskilled to skilled), local sub-contractors, and small emerging contractors.
- **Other aspects:**
  Aspects such as distance to travel to site, transportation requirements, accredited or non-accredited training requirements (including for EPWP); task/ production rates for LIC work items and published wage schedules; wage rate (unskilled/semi-skilled) varies anywhere between government gazettes and the Industry's minimum wage rates respectively – also varies per Province and whether in rural or urban context.

It therefore needs to be recognized and accepted that, in the case of both capital costs and monthly charges, there exist great variation in amounts at a National level, between different provinces and municipalities, and even within municipal boundaries - terrain changes (flat vs undulating), geotechnical variances (soft material vs rock excavations), and hydrology.

Case example to illustrate the above: The impact of such factors such as topography, location, climate, etc can be illustrated in the example of a community road (14m width, including sidewalk) in eThekwini Metro (KZN). The extremely undulating terrain, requiring extensive cut and fill in addition to a lengthy low water bridge river crossing had as an average cost/km an amount of R 19,179,408.85, compared to the national average for a chip & spray (width 4.5-6m = R1,128,155.00 / km) which if extrapolated to a 14m width indicates a cost of R 2,632,362.00. This would indicate an increase differential of around 7 times that of the average cost.

Cost benchmarks are often required for different purposes and at different levels of detail. They serve primarily as a reference or check for evaluation of conceptual project plans and project proposals. They can also be useful references for regional and national budgeting and strategic planning. However, **such figures should not be used for detailed cost calculations in feasibility studies or business plans. For such purposes, site specific design information and material costs should be gathered and prepared**.

Figures provided in this document are intended only to give an *indication of current costs and charges and possible deviations* and would include Preliminary and General (P&G's) and a "Construction Margin", but

exclude professional fees and value added tax (VAT at 14%).
Where possible the following summary levels have been included in the document:

- National: average unit cost considering national characteristics and needs
- Provincial: typical unit costs reflecting the characteristics of the province
- Scheme level: typical unit costs for different scheme types
- Component level: typical unit costs of individual infrastructure components.

Most of the services listed within the document resort from a legislative authority aspect under different structures or government departments. In many cases, each of these legislative authorities have developed detailed norms, standards and design conditions for these services. Where possible, these standards and or links to existing specifications have been included in this document, for readers who may need greater detail.

5.4.1.1 P & G's for Contractors Establishment:

Preliminary and General (P & G) cost items are based on a percentage of the total capital cost of the project excluding VAT, contingencies, disbursements, professional fees, relocations and land acquisition.

The purpose of preliminaries is to describe the works as a whole, and to specify general conditions and requirements for their execution, including such things as sub-contracting, approvals, testing and completion. Preliminaries relate to the cost-significant items required by the method and particular circumstances under which the work is to be carried out, and those costs concerned with the whole of the works rather than just Work Sections. These costs may either be 'once-off' fixed costs, such as the cost of bringing to site and erecting site accommodation (and subsequent removal) or time-related, such as the heating, lighting and maintenance cost for that accommodation.

Experience has shown that, in general, higher P&G's are expected in rural areas as opposed to urban or home-based contracts. Contractors who are home-based, or are already established (project phase 2 or 3) or projects expanded - also have the benefit of offering low P&G's as a distinct advantage over contractors who need to establish site from zero or from another area/region.

Below is an 'indication' of the typical P&G's as related to various infrastructure schemes and project value:

Table 2: Typical Preliminary and General Charges per Infrastructure Type

COMPONENT	P & G (%) FOR PROJECT SIZE RANGE				
	CAPITAL COST RANGE IN RANDS X 1 000				
	0 -200	200 - 600	600 - 1 500	1 500 - 5 000	>5 000
Reticulation	30	25	22	20	18
Reservoirs	30	25	22	20	18
Bulk pipelines	25	22	20	18	15
Pump stations	25	22	20	20	18
Treatment works	30	25	22	20	18
Dams and weirs	30	25	22	20	18
Boreholes	10	5	3	2	2
Power supply	25	18	15	10	5

Source: Industry Guide 2007

5.4.1.2 Construction Margin:

There is a clear distinction between supply cost (i.e. the cost of obtaining materials from supplier) and service installed cost. A construction margin (previously termed "profit" in the Industry Guide 2007 document), which accounts for contractor overheads, material wastage, cost of moving materials around on site and contractor profit is therefore added to the supplier cost to provide the service installed unit cost. The construction margin is a function of various factors, including amongst others:

- The nature and complexity of the project;
- The project location;
- Number of contractors bidding for work; and
- The prevailing economic climate (i.e. in recessionary economic conditions, competition for available work is high, which forces margins lower).

In view of the above factors the construction margin was reduced from 30% (in the 2007 Industry Guide) to 15% across all service unit costs in the Industry Guide 2009/2010.

5.4.2 Management Cost Factors

Often the estimated capital costs of the works reflect the costs of the materials and the costs of constructing the various components of the particular infrastructure scheme. This would imply that various cost escalating factors such as topography, soil conditions, remoteness, availability of contractors and security have been accounted for.

However, the actual final cost of a project, (eg. water supply scheme) may be almost double the estimated capital cost in view of additional expenses incurred in terms of:

- Institutional & Social Development;
- Professional fees in terms of feasibility studies (example: ground water studies, environmental impact assessments), design and construction supervision;
- Contingencies for unforeseen expenses; and
- VAT at 14%

5.4.2.1 Institutional and Social Development:

Historically little provision has been made for the social project costs that are incurred and bitter experience has shown that if this component is neglected, the sustainability of the project is in jeopardy. Institutional and social development cost need to be recognized as an intrinsic part of the project cost, specifically water and sanitation related projects, and includes such aspects as:

- **Pre-Project Implementation:**
  - Community consultation and mobilization.
  - Social surveys (including skills, income, willingness to pay & perception / expectations).

- **Post-Project Implementation:**
  The post-implementation cost factors can be seen to be part of the on-going operational cost and as such should be included in setting of the water and sanitation tariff, trade-effluent charges and bulk services contributions or levies. The municipal bylaws should reflect these and be updated to stay current with new infrastructure or policy development. This includes:
  - health education (including sanitation health awareness, water conservation and demand management).
  - operations training (including infrastructure operation, cost recovery and administration).
  - monitoring & evaluation (including customer satisfaction, leakage detection, fault reporting, etc).
  - running cost of customer services.

- **Sanitation – Community Development**
  The DWA Sanitation Unit has made significant progress in attempting to quantify these management and community development costs. These costs typically include:
  - Builder and quality assessor training and record keeping;
  - Health, hygiene and user education materials;
  - Health, hygiene and user education training; and
  - Peer education house to house visits (x 3)

  The estimated cost is approximately R445 per household.

5.4.2.2 Professional Fees

(a) Engineering
The focus of this section is mainly in terms of Professional Fees as these relate to feasibility studies, design, tender preparation, construction supervision and project management.

The Engineering Council of South Africa (ECSA) issued a guideline in Board Notice 2 of 2009: "*Guideline Scope of Services and Tariff of Fees for Persons Registered in terms of the Engineering Profession Act, 2000, (Act No.46 of 2000)"* (Ref xxv). The commencement date of these Rules shall be 1 January 2009

and any amount mentioned in or fee calculated in terms of this Schedule is exclusive of VAT.

The following insight is provided as to the determining of professional fees:

Fees for Normal Services: 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 which shall be reimbursed on a time basis.

Cost of the Works		Basis of Fee Calculation	
For projects up to R 440 000		A Lump Sum or on a Time Basis	
Where the cost of the works:		Primary Fee	Secondary Fee
Exceeds	But does not exceed		
R 440,000	R 1,110,000	R 55,000	12,5% on the balance over R 440,000
R 1,110,000	R 5,500,000	R 137,500	10,0% on the balance over R 1,110,000
R 5,500,000	R 11,000,000	R 577,500	9,0% on the balance over R 5,500,000
R 11,000,000	R 27,500,000	R 1,072,500	8,0% on the balance over R 11,000,000
R 27,500,000	R 55,000,000	R 2,392,500	6,0% on the balance over R 27,500,000
R 55,000,000	R 330,000,000	R 4,042,500	5,5% on the balance over R 55,000,000
R 330,000,000		R 19,167,000	5,0% on the balance over R 330,000,000

(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. Where structures of identical design are repeated on the same project, the combined costs shall be cumulated for the determination of the cost of the reinforced concrete and structural steel works. In cases where structures require individual design, a separate additional fee shall be calculated for each structure based on the cost of the reinforced concrete and/or structural steel work for that particular structure. The additional 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.

(3) To calculate the fee for railway track work in terms of this item, 50 percent of the cost of the permanent way materials is excluded from the cost of the works, but the full cost of ballast and equipment specially designed by the consultant is included in the cost of the works.

Cost of the Works		Basis of Fee Calculation	
For projects up to R 440 000		A Lump Sum or on a Time Basis	
Where the cost of the works:		Primary Fee	Secondary fee
Exceeds	But does not exceed		
R 440,000	R 1,110,000	R 22,000	5,0% on the balance over R 440,000
R 1,110,000	R 5,500,000	R 55,000	4,5% on the balance over R 1,110,000
R 5,500,000	R 11,000,000	R 253,000	4,0% on the balance over R 5,500,000
R 11,000,000	R 27,500,000	R 473,000	3,0% on the balance over R 11,000,000
R 27,500,000	R 55,000,000	R 968,000	2,0% on the balance over R 27,500,000
R 55,000,000	R 330,000,000	R 1,518,000	1,5% on the balance over R 55,000,000
R 330,000,000		R 5,643,000	1,0% on the balance over R 330,000,000

(4) 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 (as calculated in terms of clause 3.2.1(1) and 3.2.1(2) of the guidelines) is multiplied by the category factor mentioned against that description in the second column of the table. In case more than one of the descriptions below applies, the effective factor will be the product of the factors involved, except for the fee for targeted procurement.

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

(6) In the case of road works, where the road traverses both rural and urban areas, an adjustment pro-rata to the length of road in rural and urban area should be made.

(7) In the case of road rehabilitation a combination of factors applies depending on the situation of the road (rural or urban) and the category factor for alterations to existing works.

Description of the Works	Factor by which basic fee is multiplied
Rural roads (single carriageways), excluding bridges.	0,85
Rural freeways and dual carriageways, excluding bridges.	0,95
Freeways and dual carriageways through existing peri-urban areas, excluding bridges.	1,00
Single Carriageways through existing urban areas.	1.00
Freeways and dual carriageways through existing urban areas.	1,25
Gravel roads: Primary roads Secondary roads Informal roads	1,25 to 1,50 1,00 to 1,25 0,75 to 1,00
Water and wastewater 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

(b) Other Professional Service Fees

A holistic approach to project funding must take into account other required professional technical services such as geotechnical experts, land surveyors, and/or environmental specialists, amongst others. The scale of fees for each professional is governed by the respective statutory body:

- The South African Council for the Quantity Surveying Profession;
- The South African Council for the Architectural Profession;
- South African Council for Professional and Technical Surveyors; and
- Engineering Council of South Africa.

Although the composition of the professional team of service providers is project specific, a guide to this cost is based on project experience and can be summarized as follows:

Infrastructure project type	Allowable Professional Service Fee (as percentage of total project construction value)					Groundwater Protocol *
	Geotechnical Engineer	Quantity Surveyor	Land Surveyor	Architect	Environment alist	
Water						
• Internal residential supply	1%				0,5%	
• Bulk water supply	1%	0,5%	0,5%		1%	
Sanitation						
• Household sanitation	1%				0,5%	
• Bulk sanitation (including WWTW)	1%	0,5%	0,5%		1%	
Roads	0,5%		1%		0,5%	
Stormwater					0,5%	
Building projects (multi-purpose halls/sports facilities)	0,5%	1%		2%	0,5%	
Expert Inputs						R40,000*

* 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 projects *("Guideline for costing basic household sanitation, April 2007")*

5.4.3 Grants and Subsidies

To assist households and municipalities in covering the capital cost of providing services, grants are made available by national and provincial government, the most important being the Equitable Share subsidy and the Municipal Infrastructure Grant (MIG). The emphasis of these grants is on assisting poorer households to gain access to at least a basic level of service.

In addition, some municipalities receive inter-governmental grants that subsidize operating costs for certain services. These need to be taken into account. Subsidies also need to be built into the system at local level through tariffs, with wealthier residents paying more for certain services. There is a responsible limit to how much local cross-subsidies can be applied before wealthier residents and businesses move out of an area.

5.4.4 Loans

For those capital costs not covered by grants, municipalities generally need to take out loans from private financial institutions, which have to be repaid over a specified period of time with interest and loan redemption costs covered by the income raised by the municipality.

5.4.5 Raising Income

The on-going viability of the municipality mentioned previously means that sufficient income must be raised every month to cover the cost of operating the services and repaying the loans. This, in turn, means that customers must be charged appropriate tariffs for the services and that these tariffs should be paid timeously.

6. INFRASTRUCTURE CONSIDERATIONS

6.1 RURAL VERSUS URBAN

These service option guidelines apply to both urban and rural conditions. Nevertheless, urban and rural situations differ and affect unit costs and applicability of service options directly. It is therefore not generally possible to provide the same level of service in all areas, primarily because the cost of services increases in rural areas, while incomes are usually lower. Basic and intermediate service levels therefore tend to be more appropriate in rural areas.

The Municipal Infrastructure Investment Framework (MIIF), which is part of this publication series, covers service backlogs, the assessment of capital costs to address the backlogs, recurrent costs for operating and maintaining services, the financing framework, methods of enhancing the institutional ability of municipalities to ensure delivery of services, and suggestions concerning investments, and the management of municipal services to promote the development objectives specified in the RDP across the urban and rural spectrum.

The MIIF (2005) indicates that the capital costs incurred by a municipality are typically separated into internal, connector and bulk infrastructure costs:

- Internal infrastructure costs include the costs of reticulation within the boundaries of townships;
- Connector costs relate to items such as the main pipelines, reservoirs, sewers and distribution roads which connect the internal service to the bulk service; and
- The bulk infrastructure costs are those associated with the major roads, treated water supply, outfall sewers and wastewater treatment works.

Of note though is the impact that rural situation could have on the unit cost of a project, in the sense that provision of basic materials to site, often is substantially higher for the deep rural areas than the more accessible areas and as such can skew the cost substantially. When this situation applies it is recommended that a clear concise description of the circumstance be provided as motivation.

6.2 THE MEANING OF A “BASIC” LEVEL OF SERVICE

When describing levels of service, the term "basic level" refers to the level considered adequate to ensure the health and safety of its household users. It therefore provides cost-effective economic benefits in terms of the improved health of workers and families. A lower level often brings unacceptable health risks, if not appropriately used or maintained.

Levels higher than the basic level represent increased convenience for service users. Health and safety benefits to the users may also increase, but this is not necessarily the case. Higher levels of services result in- and equal higher cost and user charges to the customer.

6.3 MAKING UP A SERVICES "PACKAGE"

Each of the services is dealt with separately in this document. However, the internal residential infrastructure associated with these services is generally delivered as part of a "package", including housing. The services therefore need to be matched and the total cost tailored to suit the requirements of the households that will receive the services, taking into consideration their ability to afford the "package".

Municipalities generally strive to select a range of service packages which are suited to their local conditions and which suit the customers they serve. Over time, arrangements may be made for upgrading as the area develops and residents can afford to pay higher user charges.

6.4 SELECTION OF APPROPRIATE SERVICE OPTIONS

The selection of an appropriate service option (service package) takes place through a consultative process of between the customer (end-user who will receive the services) and the service provider (municipality that will provide them). The emphasis is on giving both the customer and service provider a choice in identifying the most appropriate service option.

Such deliberation in selecting of an appropriate service package should reflect:

- The specifics of an area, as particular conditions and associated costs vary from area to area;
- Customer requirements, each group of customers has different requirements;
- Broader community needs and benefits (economic and public health);
- Information about the capital costs of the service packages under consideration;
- The operating costs of these services. (Some Departments have developed or are in the process of developing costing models);
- Clarity by the municipality about available subsidies, both local and from other spheres of government;
- Clarity by the customer for the costs for which they are accountable, both capital and on-going monthly payments. These costs should also be suited to customers' household incomes to ensure affordability and sustainability; and
- Consideration of the natural resource constraints and the potential environmental impact.

6.5 SERVICE DELIVERY: THE IMPLEMENTATION ARRANGEMENTS

Service delivery will differ for new infrastructure, upgrading of service options, and bulk and connector infrastructure.

Of note is that historical programmes and projects would have focused on assisting as many people as quickly as possible. For this rationale, the beneficiary communities were often selected on ease of access and easiness in providing services. However, as more people are being serviced, the more far-reached or difficult-accessible communities' needs are being addressed, resulting in more difficult and costly service provision. The 'per capita' cost of servicing the remainder communities is therefore likely to be increasing over the next few years.

6.6 NEW INFRASTRUCTURE IN URBAN AREAS: RELATIONSHIP TO HOUSING

With regard to new infrastructure in urban areas, internal services in the neighbourhood are generally provided together with housing. Funding arrangements for such internal infrastructure are also associated with the provision of housing, with capital costs typically included in the selling price of a housing package.

Individual households generally face only the capital cost of the internal services, whether they pay these themselves or use part of the housing subsidy for finance. However, each level of service may have different requirements for bulk and connector services supplied by the municipality.

6.7 NEW INFRASTRUCTURE IN RURAL AREAS

In rural areas less emphasis is placed on housing and new infrastructure is often provided independently for each service rather than as a "package". Arrangements for each service are often established by national departments, non-governmental organizations or parastatal bodies (e.g. Water Boards, Eskom).

6.8 UPGRADING

Particular services may be upgraded, refurbished or retrofitted separately or together with a number of services for a particular area.

6.9 BULK AND CONNECTOR INFRASTRUCTURE

Historically, the focus was on internal infrastructure development, with less emphasis given to the important impact that the various service level decisions have on bulk and connector infrastructure requirements. For example, lack of spare capacity in water or wastewater treatment works, or a main electrical sub-station could be a major cost factor, but is essential to balance the demand-supply scenario associated with new housing development with full level internal services, etc.

For more information on the overall implications of infrastructure financing, the Municipal Infrastructure Investment Framework (MIIF) should be consulted.

6.10 COMMUNITY SERVICE INFRASTRUCTURE

It is also important for municipalities to provide ancillary facilities and services, such as solid waste disposal, cemeteries, community and sports facilities. These ancillary facilities and services ensure the necessary supporting infrastructure, which is essential to community life and contributes substantially to ensuring a well-balanced, stable society and an enhanced quality of life.

6.11 UNDERSTANDING OPERATION AND MAINTENANCE FACTORS

The selection of service levels and packages involves not only the initial provision of these services, but also operation and maintenance for many decades after their installation. In selecting service levels, the on-going management implications and costs must therefore be carefully considered.

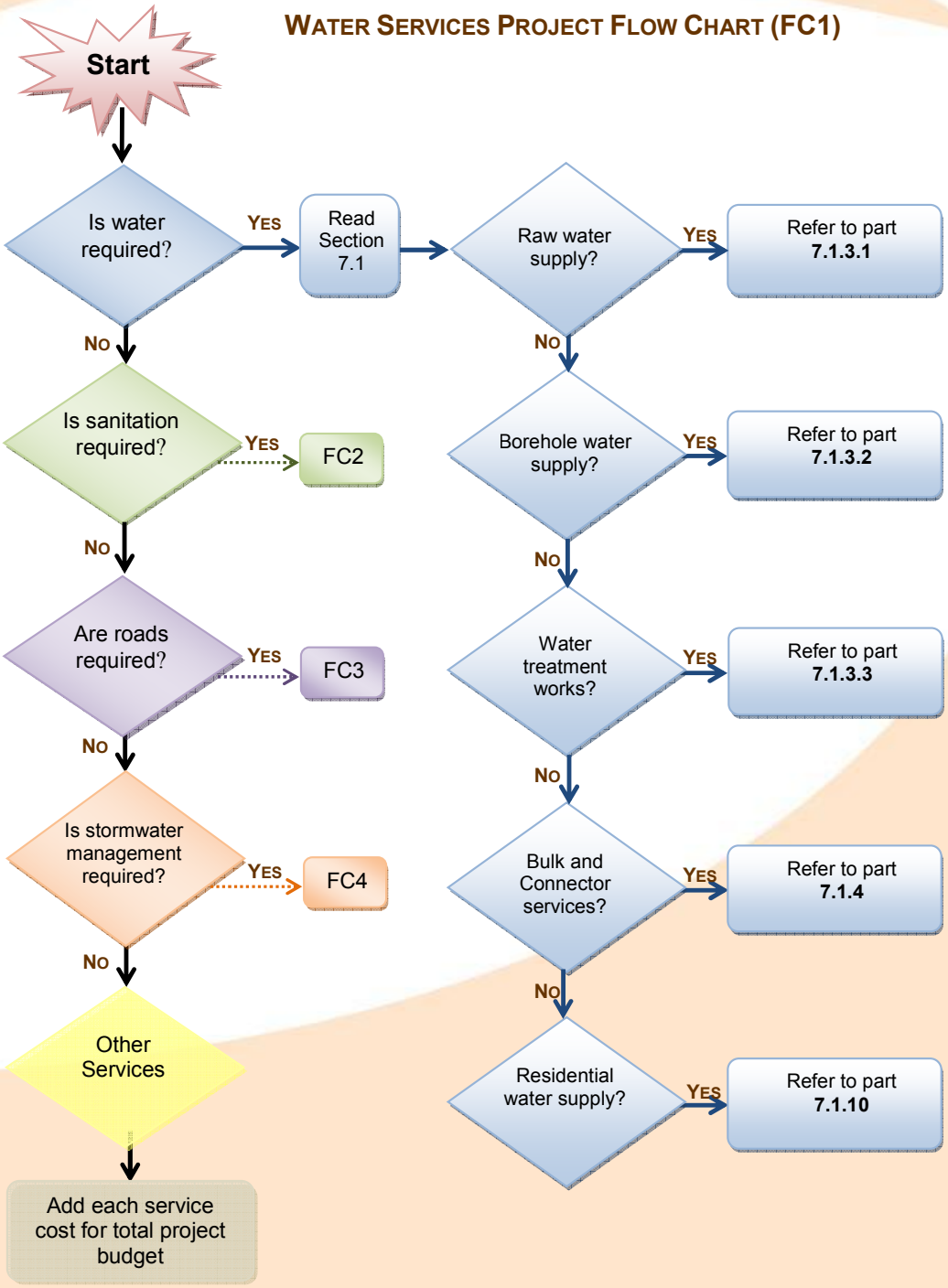
It is important that the operating and maintenance requirements should suit the capacity of the municipality responsible for the necessary work. If services are provided that are difficult to operate, the on-going viability of the service will be at risk owing to down time, leaving people without a service or causing damage to the environment.

An example of the impact of O&M in such decision-making can be demonstrated in the context of the road standards in dense urban areas. Considering the extent of the road network required in a major metropolis, such as eThekwini, the cost of O&M and rehabilitation, due to constant use, terrain and climate, means that the use of gravel roads is unfeasible and as such all their municipal roads has as minimum standard that it needs to be an asphalt road. The initial additional capital cost is in whole offset against the saving in terms of long term O&M costs.

7. BASIC RESIDENTIAL INFRASTRUCTURE (B)

7.1 WATER SUPPLY

WATER SERVICES PROJECT FLOW CHART (FC1)



7.1.1 Definition

Water Supply Services is defined as the abstraction from a water resource, conveyance, treatment, storage and distribution of potable water, water intended to be converted to potable water and water for industrial or other use, to consumers or other water services providers. This includes all the organizational arrangements necessary to ensure the provision of water supply services including, amongst others, appropriate health, hygiene and water-related awareness, the measurement of consumption and the associated billing, collection of revenue and consumer care.

The definition of water supply services is no longer restricted to the supply of potable water but includes all water supplied by- or on behalf of a water services authority. Potable water is water used for drinking or domestic purposes of a quality consistent with SABS 241 (Specifications for Drinking Water - as may be amended).

Water infrastructure is divided into bulk, connector and distribution infrastructure. The infrastructure required varies depending on the complexity of the situation and whether a surface water or groundwater source is used with a typical surface water system shown below.

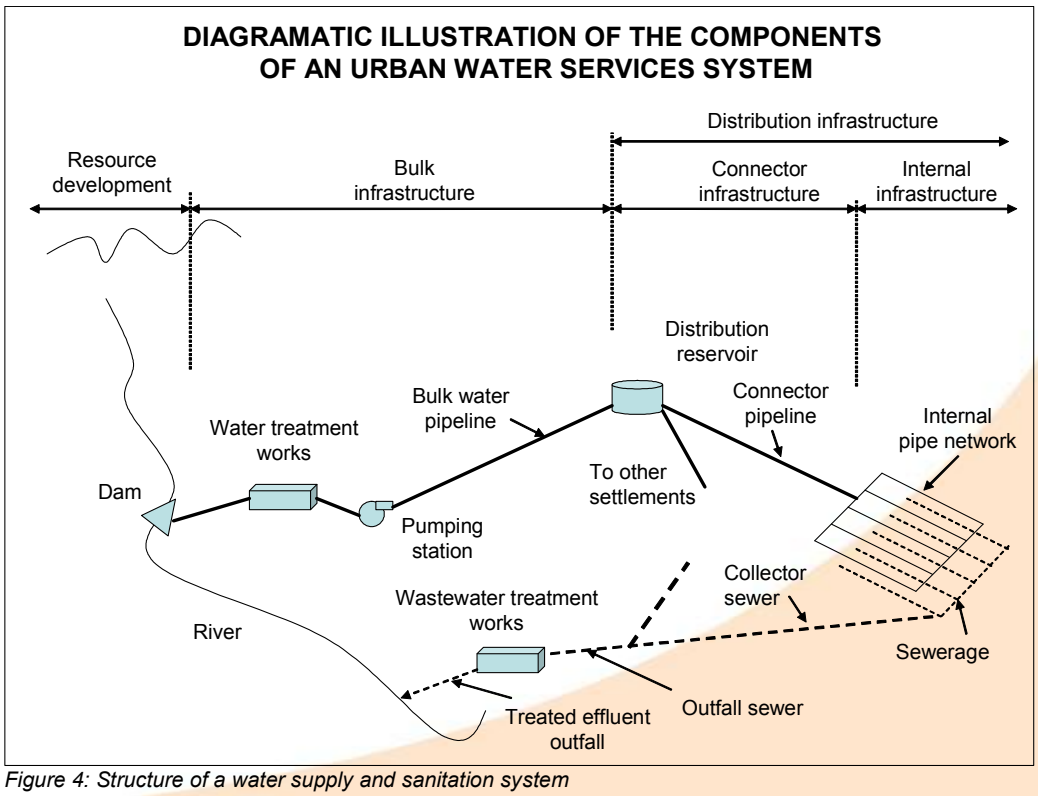


Figure 4: Structure of a water supply and sanitation system

7.1.2 Water Resources Planning

In terms of water resource planning it is DWA's role to respond to expected growth initiatives, to advise on water sources and supply, and to ensure, where economically viable, that the necessary water is available when it is required. The planning for water resources must be undertaken long before the need realises.

District and Local Municipalities are responsible for their Integrated Development Plans (IDPs). An important part of every IDP is the Water Services Development Plan (WSDP), and the DWA Regional Offices provide support for developing both the IDPs and WSDPs. Giving attention to the water resources required has, however, often proved to be an unfortunate gap in IDP planning and it is one of the objectives of the DWA to put information and strategies in place that can be assimilated into IDPs to address this gap.

The water resource reconciliation strategies for the large metropolitan areas of Cape Town, East London, Gauteng and the Rustenburg/Brits area are complete. eThekwini is nearing completion while Port Elizabeth commenced in May 2008 and Mangaung Municipality in February 2009. The Richards Bay area is planned for an early start in 2010. Similar water resource strategies for all towns falling outside these large consumption areas commenced in June 2008 and these strategies include the small towns, villages, or cluster of villages where they are being assessed in terms of water resource availability.

By 2012, these strategies should give clear direction to municipal managers on the best sources of water supply, and for the development of implementation strategies which need to be incorporated into the IDPs. At present the work is in various stages of completions. However, the Regional Offices of DWA are involved in the process and should be approached for inputs into the drafting of the current water resource infrastructure development needs in the IDPs.

7.1.3 Bulk Services: Water Supply Infrastructure

7.1.3.1 Raw Water Storage Dams

The Industry Guide deal with primarily with water services, not water resources. However, of importance is to note the impact and importance of integrated water resource management on water services. Catchment Management Agencies (CMAs) and the respective Water Users Associations (WUAs) are the institutions responsible for water resources management on an operational level, under the auspices of DWA as regulator and sector leader.

Dams are usually constructed on rivers in cases where the flow during the dry months of the year, or during periods of drought, is insufficient to meet the water requirements. Additional storage thus needs to be provided. The volume of storage required is a function of the flow characteristics of the river, local climate and pattern of abstraction. Dams are usually constructed in narrow valleys with wide deep basins, flat river reaches and sound foundation conditions. The choice of the type and location of the dam depends on a number of factors, including the type of project for which the facility is being constructed, local geology, available materials and local topography.

The factors that influence the cost of the dam are the storage required, topography, valley shape, dam length, foundation conditions and spillway requirements. The cost of the dam is a function of the volume of construction material in the dam. The volume of the dam, be it mass concrete, rock fill or earth fill, is related to the cross-section of the dam and the valley cross-section. The cross-section of the dam is related to the type and height of the dam.

The table below shows the Capital Cost (excluding fees, P&G + VAT) for various Bulk Services, Surface Water Dam Wall Types (ref vii) unit cost in rand

Table 3: Average of Capital Cost – Bulk Services and Surface Water Dam Wall Types

Material and Element		Scheme Size			
		Very Small (1000 people)	Small (5000 people)	Medium (20000 people)	Large (50000 people)
		30 000 m^3	120 000 m^3	500 000 m^3	1 200 000 m^3
Earth-fill	Dam-Wall	R 1,042,934	R 2,423,586	R 7,169,023	R 14,728,222
	Spillway	R 211,898	R 541,000	R 1,501,695	R 2,900,441
Earth-fill Sum		**R 1,254,832**	**R 2,964,586**	**R 8,670,718**	**R 17,628,663**
Rock-fill	Dam-Wall	R 997,828	R 2,640,475	R 7,294,415	R 15,303,098
	Spillway	R 242,471	R 532,081	R 1,891,472	R 3,254,570
Rock-fill Sum		**R 1,240,299**	**R 3,172,556**	**R 9,185,887**	**R 18,557,668**
Roll-crete	Dam-Wall	R 1,354,367	R 3,840,996	R 11,200,567	R 24,289,806
	Spillway	R 8,648	R 11,761	R 19,371	R 22,831
Roll-crete Sum		**R 1,363,015**	**R 3,852,757**	**R 11,219,938**	**R 24,312,637**

Source: DWA Cost Benchmark 2009 (basic LoS)

7.1.3.2 Boreholes Development

Groundwater is exploited mainly by means of boreholes, but can also be exploited by means of springs, hard dug wells and infiltration galleries.

7.1.3.2.1 Definition/Description

A borehole is a hole that is normally drilled into the ground to reach selected subsurface geological formations containing groundwater.

7.1.3.2.2 Purpose of a Borehole

The purpose of a borehole is to enable the lowering of water abstraction equipment e.g. pump, motor and pipes into the hole to facilitate the abstraction of groundwater and pump it to the surface.

7.1.3.2.3 Geographical context

Boreholes are typical of rural areas where human settlement development has not progressed to the extent where bulk storage and supply of water has occurred for the consumption by the people. The lack of significant run-offs in streams and rivers in inland towns historically resulted in many smaller inland towns being entirely dependent on boreholes for their water supply.

7.1.3.2.4 Basic Level of Service

A borehole is considered as a basic level of bulk water supply in rural and inland areas where no alternative exists for adequate water supply to communities. Boreholes can be utilized on their own or in conjunction with alternative low water supply sources e.g. springs and minor streams to augment the supply required for the specific community.

7.1.3.2.5 Levels of Service Options

Boreholes do not have alternatives of different levels of service options. The equipment of abstracting water may vary between submersible pumps driven by electricity or solar power to the old wind pump arrangement. These do not constitute different options for the level of services but is determined by the availability of e.g. electricity on site and/or the cost to have it available.

7.1.3.2.6 Advantages/Disadvantages

The advantages and disadvantages of boreholes are summarized in the table below:

Table 4: Boreholes – Advantages and Disadvantages

Advantages	Disadvantages
▪ Water supply to rural and remote areas ▪ Can be utilized where Power supply is not available e.g. solar power or engine ▪ Mostly good quality water	▪ High unit cost for small number of people ▪ Water supply dependant on consistency of ESKOM power supply ▪ Supply (yield) not known until borehole is complete ▪ Groundwater can be over exploited resulting in failure of the borehole

7.1.3.2.7 Standards of Construction

The drilling of boreholes is regulated by DWA. Permission and approval from DWA is required before a new borehole can be drilled. It is a recommendation that the drilling contractor be a member of the Water Borehole Association of SA to ensure that reputable and experienced contractors are appointed.

The design of the pump and motor installation should be that the maximum pumping rate should be between 70 and 80% of the tested borehole yield. This is in order to protect the ground water source and prevent over exploitation. The pumping rate should further be sized to deliver the total water demand per day over a 24 hour daily period. The low water demand at night can be utilized in conjunction with the storage reservoir to provide buffer storage during the day.

7.1.3.2.8 Unit Costs

In borehole development the initial capital costs are related to the hydro-geological consulting fees. These fees include costs to conduct the following activities:

- Desk study and reconnaissance survey groundwater development and use in the area;
- Borehole sitting: This activity includes all the procedures methods used to identify positions for the drilling of boreholes. These can include, remote sensing, field mapping and geophysical surveys.
- Contract, administration and supervision of drilling: This is required to ensure that boreholes are drilled and constructed according to required standards and to evaluate if the borehole has intersected the target identified during the sitting exercise.
- Contract, administration and supervision and analysis of pumping tests: Analysis of water quality test results to insure that water is fit for the proposed use
- Management recommendations and reporting: Information obtained during the abovementioned activities is evaluated to recommended abstraction rates for boreholes, pump settings and monitoring and management requirements.

However, the cost of a borehole and resultant water supply is determined by three factors:

- The actual drilling cost of the borehole which is finally determined by the final depth of the hole
- The depth at which the water is found - this determines the head against which the pump must work and hence the cost of the pump and motor required.
- The yield or supply of the borehole - this determines the rate at which pumping of water will occur and hence again the cost of the pump and motor required

The table following gives an indication of the variances in cost with the depth and yield of the borehole. The table represents the indicative pump and motor costs, with typical cost variances dependant on total head and yield for boreholes:

From the information above, note that that the costs can vary considerably from borehole to borehole. The unit costs can therefore fluctuate equally as this will be entirely dependant on the number of households that will benefit from the water supply.

The following table depicts the capital cost, excluding fees, P&G's and VAT, of the various **borehole types for a range of scheme sizes.**

Table 5: Average of Capital Cost of Borehole types

Material	Scheme Size			
	Very Small (1000_people)	Small (5000_people)	Medium (20000_people)	Large (50000_people)
Diesel	R 855	R 513	R 427	R 427
Electricity	R 1,045	R 627	R 522	R 522
Hand Pump	R 290	R 174	R 145	R 145
Solar	R 1,330	R 798	R 665	R 665
Wind	R 772	R 463	R 386	R 386

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 6 and Table 7: Shows the range of unit costs in Rand per meter (R/m) for the most common options of borehole diameters relevant to settlement location, as developed from zero-based approach, following breakdown as depicted in Appendix 2:

Table 6: Bulk Water Supply – Boreholes

Bulk Water Supply: Boreholes (165 mm ID Hole)					
Province		Shallow 50 m - Semi Rural (100 km radius)	Shallow 50 m – Deep Rural (250 km radius)	Deep 200 m - Semi Rural (100 km radius)	Deep 200 m – Deep Rural (250 km radius)
		R / metre	R / metre	R / metre	R / metre
Limpopo	Min	1,313	1,425	638	675
	Max	1,459	1,583	709	750
	Avg	1,386	1,504	673	713
Gauteng	Min	1,316	1,428	639	677
	Max	1,462	1,586	710	752
	Avg	1,389	1,507	675	714
North West	Min	1,320	1,432	641	679
	Max	1,466	1,591	713	754
	Avg	1,393	1,512	677	717
Free State	Min	1,312	1,424	638	675
	Max	1,458	1,582	709	750
	Avg	1,385	1,503	673	713
Kwazulu Natal	Min	1,316	1,428	640	677
	Max	1,462	1,587	711	752
	Avg	1,389	1,507	675	715
Mpumalanga	Min	1,320	1,433	642	679
	Max	1,467	1,592	713	755
	Avg	1,394	1,513	677	717
Northern Cape	Min	1,317	1,429	640	677
	Max	1,463	1,588	711	753
	Avg	1,390	1,508	675	715
Western Cape	Min	1,318	1,430	641	678
	Max	1,464	1,589	712	753
	Avg	913	913	545	545
Eastern Cape	Min	1,313	1,425	638	675
	Max	1,459	1,583	709	750
	Avg	913	913	545	545
National	**Avg**	**1283**	**1376**	**646**	**677**

Source: Industry Guide 2007 service unit costs escalated to August 2009.

NOTE: The unit cost does not include pump testing and only makes allowance for the site establishment and drilling of one borehole.

Table 7: Bulk Water Supply - Boreholes

Bulk Water Supply: Boreholes (208 mm ID Hole)					
Province		Shallow 50 m - Semi Rural (100 km radius)	Shallow 50 m – Deep Rural (250 km radius)	Deep 200 m - Semi Rural (100 km radius)	Deep 200 m – Deep Rural (250 km radius)
		R / metre	R / metre	R / metre	R / metre
Limpopo	Min	1,375	1,487	700	737
	Max	1,528	1,652	778	819
	Avg	1,451	1,569	739	778
Gauteng	Min	1,378	1,490	702	739
	Max	1,531	1,655	780	821
	Avg	1,454	1,573	741	780
North West	Min	1,382	1,495	704	741
	Max	1,536	1,661	782	824
	Avg	1,459	1,578	743	783
Free State	Min	1,374	1,486	700	737
	Max	1,527	1,651	778	819
	Avg	1,451	1,569	739	778
Kwazulu Natal	Min	1,378	1,490	702	739
	Max	1,531	1,656	780	821
	Avg	1,455	1,573	741	780
Mpumalanga	Min	1,383	1,495	704	742
	Max	1,537	1,662	782	824
	Avg	1,460	1,579	743	783
Northern Cape	Min	1,379	1,491	702	740
	Max	1,532	1,657	780	822
	Avg	1,456	1,574	741	781
Western Cape	Min	1,380	1,493	703	740
	Max	1,534	1,659	781	823
	Avg	913	913	545	545
Eastern Cape	Min	1,313	1,425	638	738
	Max	1,459	1,583	709	819
	Avg	913	913	545	545
National	Avg	1,335	1,427	697	728

Source: Industry Guide 2007 service unit costs escalated to August 2009.

NOTE: The unit cost does not include pump testing and only makes allowance for the site establishment and drilling of one borehole.

7.1.3.3 Water Treatment Works

7.1.3.3.1 Conventional Water Treatment Works

Water sources, be they groundwater (boreholes), surface water (rivers), rainwater and oceans, influence potable water quality. To supply potable water of acceptable quality, or of a certain fitness for use, the water has to be rid off undesirable amounts of dissolved or suspended constituents, which may threaten the health of the users, both in the long and short term. Depending on the fitness for use, the choice water treatment may range from simple home treatment to advanced treatments like reverse osmosis and ion exchange.

It has been found that biological constituents have little influence on treatment as they can be removed easily by boiling, house bleaching, chlorination etc with little cost for chemicals only. However, the removal of physical constituents (turbidity, dissolved salts and pH) were found to incur significant treatment costs.

Water-soluble chemicals can be grouped into those suited for conventional treatment and those requiring advanced treatment. Conventional treated constituents include arsenic, calcium, iron, magnesium, manganese and zinc, which can be removed from the water by adding specific flocculation agents which react with the chemical to form solids that can be precipitated and removed using physical methods and filtration. Calcium (causes scaling in metal, but no serious health risk) and iron (high concentration cause chronic health effects) being the most common.

Advanced treatment is needed to remove calcium, chloride, fluoride, nitrate, potassium, sodium and sulfates. Generally it is very expensive to treat these impurities as it requires advanced technology such as iron exchange or reverse osmosis. The most common constituents requiring advanced treatment include fluoride, nitrates and chloride.

Some cost influencing factors include:

- *Project size:* A reduction in the cost is anticipated for larger projects in view of the economy of scale.
- *Location*: Extensive distances from economic center's and expertise can have a significant cost implication, especially if operation and maintenance of advanced treatment processes are involved.
- *Topography*: This mainly influences the cost of access roads, but may in particular affect the cost of delivering package treatment plants
- *Specialist Contractors:* As treatment works require specialized expertise, the availability of such contractors is critical.

7.1.3.3.2 Unit Costs

The following table depicts the capital cost, excluding fees, P&G's and VAT, of the various **smaller types of water treatment works.**

Table 8: Average of Capital Cost of Smaller Types of WTW

Element	Scheme Size			
	Very Small	Small	Medium	Large
	(1000 people)	(5000 people)	(20000 people)	(50000 people)
	30 kl/day	160 kl/day	600 kl/day	1600 kl/day
Package Plant	R 409,239	R1,498,566	R 2,550,330	R 6,306,630
Conventional	R 587,309	R2,006,756	R 3,137,562	R 6,634,487
Advanced Treatment	R 1,403,670	R 3,835,380	R 3,657,450	R 7,611,450

Source: DWA Cost Benchmark 2009 (basic LoS)

7.1.4 Connector Services: Water Supply Infrastructure

7.1.4.1 Reservoirs

Reservoirs are used to store treated bulk water from purification/treatment plants (bulk storage) or as distribution reservoirs to gravity feed water reticulation pipe networks in communities (e.g. reticulation reservoirs).

In some instances, reservoirs may be used for hydraulic purposes to reduce pipeline costs or pipe pressure (pipe class). They can also be used to optimize level of supply, pipe sizes and pumpstation operating rules (schedules).

Reticulation reservoirs are normally placed on the highest available / accessible sites to allow effective gravity feed and adequate line pressure in the water reticulation. The exact location of the reservoirs will depend on the hydraulic pressures required. Construction can be at, above or below ground level. Various materials including polyethylene, bricks, steel, concrete and reinforcing mesh with supporting (tarpaulin) can be used in construction.

Depending on the population size and water requirements, reservoir sizes may vary from small (10 kl) to large (>10 000 kl). Reservoirs will be designed based on the accepted design criteria of the industry, the scheme requirements and of those specifications as determined by the individual municipality.

The expected lifespan and the availability of funds may play a role in selection of affordable construction materials. Concrete structures for instance are very costly to construct but last longer (have a longer life expectancy). Polyethylene and steel structures may on the other hand be preferred due to ease of construction, practicality and project economy. Various materials are used in construction, as shown in the table below:

Table 9: Reservoirs – Cost Effective Usage

Material	Cost effective usage based on capacity of Reservoir
Polyethylene reservoirs	▪ Sizes less than 50 kl ▪ Lifespan 10-15 yrs
Steel reservoirs	▪ Sizes between 50 to 500 kl ▪ Lifespan 20-25 yrs
Brick reservoirs	▪ Sizes between 50 to 500 kl ▪ Lifespan 20-30 yrs
Concrete reservoir	▪ Sizes exceeding 500 kl ▪ Lifespan exceeding 50 yrs

The following key variables have been identified as impacting on the choice and cost of reservoir:

- location and elevation (ground reservoir vs. elevated reservoir)
- capacity / size
- type of material & construction method
- excavation & founding condition.

Table 10: Shows the range of costs in Rand for the various material options for **ground reservoirs** per scheme size:

Table 10: Ground Reservoir per Scheme Size

Ground Reservoir per Scheme Size				
Material	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
	60kl	**300kl**	**1300kl**	**3200kl**
Brick	R 162,213	R 626,930	R 2,148,572	R 4,578,924
Concrete	R 172,609	R 595,075	R 1,837,758	R 3,673,890
Steel	R 151,549	R 645,100	R 2,414,164	R 5,430,661
PE	R 107,165	R 467,525	R 1,969,025	R 4,821,875

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 11: Shows the range of maintenance costs in Rand for the various material options for **ground reservoirs** per annum per household:

Table 11: Maintenance Cost – Ground Reservoir

Maintenance Cost per annum per household				
Material	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
	60kl	**300kl**	**1300kl**	**3200kl**
Brick	R 32.44	R 25.08	R 21.49	R 18.32
Concrete	R 17.26	R 11.90	R 9.19	R 7.35
Steel	R 45.46	R 38.71	R 36.21	R 32.58
PE	R 21.43	R 18.70	R 19.69	R 19.29

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 12: Shows the range of operation costs in Rand for the various material options for **ground reservoirs** per annum per household, as developed from zero-based approach:

Table 12: Operation Cost – Ground reservoir

Operation Cost per annum per household				
Material	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
	60kl	**300kl**	**1300kl**	**3200kl**
Brick	R 15.00	R 3.00	R 0.75	R 0.30
Concrete	R 15.00	R 3.00	R 0.75	R 0.30
Steel	R 15.00	R 3.00	R 0.75	R 0.30
PE	R 15.00	R 3.00	R 0.75	R 0.30

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 13: Shows the range of costs in Rand for the various material options for **elevated reservoirs** per scheme size:

Table 13: Elevated Reservoir per Scheme Size

Elevated Reservoir per Scheme Size				
Material	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
	32kl	**159kl**	**635kl**	**1588kl**
Steel	R 194,024	R 341,491	R 894,494	R 2,000,499
Concrete	R 485,055	R 853,723	R 2,236,229	R 5,001,241
PE	R 124,961	R 464,644	R 1,738,457	R 4,286,082

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 14: Shows the range of maintenance costs in Rand for the various material options for **elevated reservoirs** per annum per household, as developed from zero-based approach:

Table 14: Maintenance Cost – Elevated Reservoir

Maintenance Cost per annum per household				
Material	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
	32kl	**159kl**	**635kl**	**1588kl**
Concrete	R 72.76	R 25.61	R 16.77	R 15.00
Steel	R 58.21	R 20.49	R 13.42	R 12.00
PE	R 124.96	R 92.93	R 86.92	R 85.72

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 15: Shows the range of operation costs in Rand for the various material options for **elevated reservoirs** per annum per household:

Table 15: Operation Cost – Elevated reservoir

Operation Cost per annum per household				
Material	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
	32kl	**159kl**	**635kl**	**1588kl**
Steel	R 15.00	R 3.00	R 0.75	R 0.30
PE	R 30.00	R 6.00	R 1.50	R 0.60

Source: DWA Cost Benchmark 2009 (basic LoS)

7.1.4.2 Pumpstations

Pumpstations form an integral part of most water supply schemes and are used mainly for two reasons:

- to add elevation(potential energy) to water conveyed.
- to increase the rate of supply / volume (kinetic energy) to existing or inadequate systems.

Pumpstations may comprise of components that warrant a wide range of expertise from different fields of engineering. Depending on the size and complexity of the pumpstation, it may include:

- Civil engineering expertise for sump design, hydraulic flow patterns, flow separation, manifold arrangement, cavitation prevention, pump protection, pump duty points, and the civil super structure.
- Mechanical engineering expertise may be required for pump-set installation and alignment, transmission and mechanical drives, motorization and ventilation, as well as handling facilities such as cranes.
- Electrical engineering expertise may be required for motors, switch gear, pump relaying, safety precaution and motor protection, as well as remote sensing (telemetry) if needed.

Ebenezer Pumpstation

Each pumpstation is designed based on the accepted design criteria of the industry, the scheme requirements and of those specifications as determined by the individual municipality. The following aspects are however general to most schemes and the choice of which, will impact on the cost:

- **Power Supply:**
  - *Diesel:*
    Usually operate 8 hrs per day, more cumbersome and substantially more costly in terms of capital and operational cost. Consists of mechanical pump, energy source & pump pipe-work. The optimum pump and pipeline should be governed by the option with the lowest recurrent diesel fuel consumption.
  - *Electrical:*
    Usually operate 24 hrs per day, easy and cost effective, but only of electricity power is available. Consists of mechanical pump, pump switchgear, energy source & pump pipe-work. Supply costs for new power supply line is around R48 000 per km.

- **Capacity**
  - The pump capacity is mainly influenced by its ability to provide sufficient water supply ranging from 25 to 180 l/c/d for individual schemes or for a combination of the above, at pumping rate ranges of 15 - 25 l/s, 25 - 40 l/s, 40 - 65 l/s, 65 - 130 l/s, 130 - 200 l/s.
  - Sizes of pumpstations are given in terms of their kW requirement (some institutions use kVA) and the cost of relating switch gear is also best represented per kW.
  - Ensure that adequate standby facilities are available.
- **Other typical cost factors:**
  - Pump duty: Required speed of motor and required pumping head.
  - Pump house building (prefabricated/ zinc, brick or concrete).

Pump Stations – Diesel Driven (Low Speed: 1450rpm, Low Head: <90m):

Table 16: Shows the capital cost per household for a diesel pump station per scheme size, as developed by DWA Water Services unit:

Table 16: Diesel Pump Station – Average capital cost per household

Diesel pump per scheme size				
Element	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
	2kW	**8kW**	**33kW**	**82kW**
Mechanical pump	R 34.80	R 23.12	R 16.26	R 12.88
Energy Source	R 98.68	R 29.20	R 16.17	R 13.56
Pump pipework	R 31.68	R 21.53	R 15.43	R 12.39
TOTAL cost per household	**R 165.16**	**R 73.85**	**R 47.87**	**R 38.84**

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 17: Shows the capital cost per household for a diesel pumphouse building per scheme size, as developed from zero-based approach:

Table 17: Diesel pumphouse building – capital cost per household

Diesel pumphouse building- Capital cost per household					
Material	**Scheme Size**				
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**	
	1NoPS	**1NoPS**	**1NoPS**	**1NoPS**	**2NoPS**
Prefabricated /Zinc	R 483.75	R 96.75	R 24.19	R 9.68	R 19.35
Brick	R 903.00	R 180.60	R 45.15	R 18.06	R 36.12
Concrete	R 1,097.25	R 219.45	R 54.86	R 21.95	R 43.89
Average Pumphouse building cost per household	**R 828.00**	**R 165.60**	**R 41.40**	**R 16.56**	**R 33.12**

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 18: Shows the maintenance cost per household for a diesel pump station per scheme size, as developed from zero-based approach:

Table 18: Diesel pump station – Maintenance cost per household

Diesel pump station – Maintenance Cost per scheme size				
Element	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
Energy Source	R 15.79	R 4.67	R 2.59	R 2.17
Mechanical pump	R 3.48	R 2.31	R 1.63	R 1.29
Pump pipework	R 0.32	R 0.22	R 0.15	R 0.12
TOTAL	**R 19.59**	**R 7.20**	**R 4.37**	**R 3.58**

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 19: Shows the operation cost per household for a diesel pump station per scheme size, as developed from zero-based approach:

Table 19: Diesel pump station – Operation cost per household

Diesel pump station – Maintenance Cost per scheme size				
Material	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
Diesel	R 131	R 112	R 109	R 108

Source: DWA Cost Benchmark 2009 (basic LoS)

Pumpstations – Electrical Driven (Low Speed: 1450rpm, Low Head: <90m):

Table 20: Shows the capital cost per household for an electrical driven pump station per scheme size, as developed from zero-based approach:

Table 20: Electrical Driven Pump Station – Average capital cost per household

Diesel pump per scheme size				
Element	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
	1kW	**4kW**	**17kW**	**42kW**
Mechanical pump	R 21.65	R 12.40	R 7.68	R 5.59
Pump switchgear	R 53.06	R 13.89	R 6.54	R 5.07
Energy Source	R 67.53	R 17.07	R 7.52	R 5.83
Pump pipework	R 19.23	R 13.07	R 9.37	R 7.52
TOTAL	**R 161.47**	**R 56.43**	**R 31.11**	**R 24.02**

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 21: Shows the capital cost per household for an electrical driven pumphouse building per scheme size, as developed from zero-based approach:

Table 21: Electrical driven pumphouse building – capital cost per household

Diesel pumphouse building- Capital cost per household					
Material	**Scheme Size**				
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**	
	1NoPS	**1NoPS**	**1NoPS**	**1NoPS**	**2NoPS**
Prefabricated /Zinc	R 483.75	R 96.75	R 24.19	R 9.68	R 19.35
Brick	R 903.00	R 180.60	R 45.15	R 18.06	R 36.12
Concrete	R 1,097.25	R 219.45	R 54.86	R 21.95	R 43.89
Average Total	**R 828.00**	**R 165.60**	**R 41.40**	**R 16.56**	**R 33.12**

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 22: Shows the maintenance cost per household for an electrical driven pump station per scheme size, as developed from zero-based approach:

Table 22: Electrical driven pump station – Maintenance cost per household

Electrical driven pump station – Maintenance Cost per scheme size				
Element	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
Energy Source	R 10.81	R 2.73	R 1.20	R 0.93
Pump switchgear	R 8.49	R 2.22	R 1.05	R 0.81
Mechanical pump	R 2.16	R 1.24	R 0.77	R 0.56
Pump pipework	R 0.19	R 0.13	R 0.09	R 0.08
TOTAL	**R 21.65**	**R 6.33**	**R 3.11**	**R 2.38**

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 23: Shows the operation cost per household for an electrical driven pump station per scheme size, as developed from zero-based approach:

Table 23: Electrical driven pump station – Operation cost per household

Electrical driven pump station – Maintenance Cost per scheme size				
Material	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
Diesel	R 90	R 27	R 16	R 13

Source: DWA Cost Benchmark 2009 (basic LoS)

Pumpstations – Diesel Driven (High Speed: 2900rpm, High Head: >90m):

Table 24: Shows the capital cost per household for a diesel pump station per scheme size, as developed from zero-based approach:

Table 24: Diesel Pump Station – Average capital cost per household

Diesel pump per scheme size				
Element	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
	3kW	**14kW**	**54kW**	**136kW**
Mechanical pump	R 50.94	R 33.85	R 23.80	R 18.86
Energy Source	R 106.56	R 37.08	R 24.05	R 21.45
Pump pipework	R 46.70	R 31.74	R 22.76	R 18.26
TOTAL	**R 204.21**	**R 102.67**	**R 70.61**	**R 58.57**

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 25: Shows the capital cost per household for a diesel pumphouse building per scheme size, as developed from zero-based approach:

Table 25: Diesel pumphouse building – capital cost per household

Diesel pumphouse building- Capital cost per household					
Material	**Scheme Size**				
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**	
	1NoPS	**1NoPS**	**1NoPS**	**1NoPS**	**2NoPS**
Prefabricated /Zinc	R 483.75	R 96.75	R 24.19	R 9.68	R 19.35
Brick	R 903.00	R 180.60	R 45.15	R 18.06	R 36.12
Concrete	R 1,097.25	R 219.45	R 54.86	R 21.95	R 43.89
Average Total	**R 828.00**	**R 165.60**	**R 41.40**	**R 16.56**	**R 33.12**

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 26: Shows the maintenance cost per household for a diesel pump station per scheme size, as developed from zero-based approach:

Table 26: Diesel pump station – Maintenance cost per household

Diesel pump station – Maintenance Cost per scheme size				
Element	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
Energy Source	R 17.05	R 5.93	R 3.85	R 3.43
Mechanical pump	R 5.09	R 3.38	R 2.38	R 1.89
Pump pipework	R 0.47	R 0.32	R 0.23	R 0.18
TOTAL	**R 22.61**	**R 9.64**	**R 6.46**	**R 5.50**

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 27: Shows the operation cost per household for a diesel pump station per scheme size, as developed from zero-based approach:

Table 27: Diesel pump station – Operation cost per household

Diesel pump station – Maintenance Cost per scheme size				
Material	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
Diesel	R 203	R 184	R 180	R 179

Source: DWA Cost Benchmark 2009 (basic LoS)

Pumpstations – Electrical Driven (High Speed: 2900rpm, High Head: >90m):

Table 28: Shows the capital cost per household for an electrical driven pump station per scheme size, as developed from zero-based approach:

Table 28: Electrical Driven Pump Station – Average capital cost per household

Diesel pump per scheme size				
Element	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
	1kW	**7kW**	**28kW**	**130kW**
Mechanical pump	R 98.02	R 50.26	R 28.27	R 27.62
Pump switchgear	R 55.79	R 16.62	R 9.27	R 13.54
Energy Source	R 70.51	R 20.05	R 10.66	R 19.97
Pump pipework	R 28.35	R 19.27	R 13.81	R 17.63
TOTAL	**R 252.67**	**R 106.19**	**R 62.02**	**R 78.77**

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 29: Shows the capital cost per household for an electrical driven pumphouse building per scheme size, as developed from zero-based approach:

Table 29: Electrical driven pumphouse building – capital cost per household

Diesel pumphouse building- Capital cost per household					
Material	**Scheme Size**				
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**	
	1NoPS	**1NoPS**	**1NoPS**	**1NoPS**	**2NoPS**
Prefabricated /Zinc	R 483.75	R 96.75	R 24.19	R 9.68	R 19.35
Brick	R 903.00	R 180.60	R 45.15	R 18.06	R 36.12
Concrete	R 1,097.25	R 219.45	R 54.86	R 21.95	R 43.89
Average Total	**R 828.00**	**R 165.60**	**R 41.40**	**R 16.56**	**R 33.12**

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 30: Shows the maintenance cost per household for an electrical driven pump station per scheme size, as developed from zero-based approach:

Table 30: Electrical driven pump station – Maintenance cost per household

Electrical driven pump station – Maintenance Cost per Household				
Element	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
Energy Source	R 11.28	R 3.21	R 1.71	R 3.20
Pump switchgear	R 8.93	R 2.66	R 1.48	R 2.17
Mechanical pump	R 9.80	R 5.03	R 2.83	R 2.76
Pump pipework	R 0.28	R 0.19	R 0.14	R 0.18
TOTAL	**R 30.29**	**R 11.09**	**R 6.16**	**R 8.30**

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 31: Shows the operation cost per household for an electrical driven pump station per scheme size, as developed from zero-based approach:

Table 31: Electrical driven pump station – Operation cost per household

Electrical driven pump station – Maintenance Cost per Household				
Material	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
Diesel	R 98	R 35	R 24	R 38

Source: DWA Cost Benchmark 2009 (basic LoS)

7.1.4.3 Supply Pipelines

Pipelines are required to convey bulk water from the water source or pumpstation to the service reservoir. Bulk water pipelines are also sometimes required to convey bulk water from the service reservoir over considerable distance to the edge of the village.

Pipelines are made of various materials which include polyethylene, uPVC, mPVC, HDPE, steel and fiber cement. Each type of material has specific strength and hydraulic characteristics thus making it suitable for specific site conditions, water quality, pressure ranges and sizes of flow.

Pipelines are usually buried for protection and may be tens of kilometers in length. The different pipe materials require specific bedding material and handling procedures during the laying and coupling of pipe sections. Pipelines are made of different thicknesses to handle the operating pressures applicable to the various reaches of the pipeline. The specified class pipeline to be used also often differs from municipality to municipality and is based on their design and maintenance criteria.

In essence the cost of pipe lines is determined by:

- Pipe size
- Pipe class (water pressure) (based on SANS and municipal design criteria)
- Pipe material
- Soil / excavation conditions(soft, intermediate and hard rock excavations)
- Other escalating factors (access, topography /slope, availability of labour, etc.).

Typically uPVC tends to be used in soft to intermediate soils and steel pipes for hard rock. Most commonly used diameter pipelines are:

- 110 mm Ø
- 160 mm Ø
- 200 mm Ø
- 250 mm Ø
- 315 mm Ø

It is necessary, particularly in the case of major pipelines, to optimize the diameter selected. With larger pipe diameters, friction losses are lower and this would imply that the total pumping head would be lower. The result is that the cost of the pipeline would be higher, but the cost of the pumpstation and the cost of operation, particularly in terms of electricity charges would be lower. With small diameters, the reverse is true. The length of the pipeline is an important controlling factor as it influences the total operating head.

Costs are incurred along the route of the pipeline and include bush clearing, markers and servitudes. It is estimated that the cost of these items only contribute about 1% to the cost of the pipeline.

However, exceptional costs may be incurred when roads, railways and rivers need to the crossed. The cost of the river crossings may be considerable when difficult situations arise and these need to be determined separately for the specific site.

Pipeline trench excavation in hard rock material is a major cost parameter. This is site specific and it is imperative that the geology of the pipeline route is understood to provide the necessary contingency against such unforeseen costs.

Table 32: Shows the capital cost per scheme size for a FC/Concrete Pipeline, as developed from zero-based approach:

Table 32: FC/Concrete Pipeline – Capital cost per scheme

FC/Concrete Pipeline – Capital cost per scheme				
Material	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
	5km	**8km**	**17km**	**32km**
Soft soil excavation	R 198,868	R 436,342	R 2,511,737	R 6,958,624
Moderate soil hardness (10% ripping)	R 258,529	R 567,245	R 3,265,258	R 9,046,212
Hard soil excavation (15% ripping; 5% blasting)	R 318,189	R 698,148	R 4,018,779	R 11,133,799
AVG OF CAPITAL COST	**R 258,529**	**R 567,245**	**R 3,265,258**	**R 9,046,212**
AVG CAPITAL COST PER KM	**R 51,705**	**R 70,905**	**R 192,074**	**R 282,694**

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 33: Shows the maintenance cost per household for a FC/Concrete Pipeline per scheme size:

Table 33: FC/Concrete Pipeline – Maintenance cost per Household

FC/Concrete Pipeline – Maintenance cost per Household				
Material	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
Soft soil excavation	R 9.94	R 4.36	R 6.28	R 6.96
Moderate soil hardness (10% ripping)	R 12.93	R 5.67	R 8.16	R 9.05
Hard soil excavation (15% ripping; 5% blasting)	R 15.91	R 6.98	R 10.05	R 11.13
AVG OF MAINTENANCE COST	**R 12.93**	**R 5.67**	**R 8.16**	**R 9.05**

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 34: Shows the operation cost per household for a FC/Concrete Pipeline per scheme size:

Table 34: FC/Concrete Pipeline – Operation cost per Household

FC/Concrete Pipeline – Maintenance cost per Household				
Material	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
Soft soil excavation	R 15.00	R 4.80	R 2.55	R 1.92
Moderate soil hardness (10% ripping)	R 15.00	R 4.80	R 2.55	R 1.92
Hard soil excavation (15% ripping; 5% blasting)	R 15.00	R 4.80	R 2.55	R 1.92
AVG OF OPERATION COST	**R 15.00**	**R 4.80**	**R 2.55**	**R 1.92**

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 35: Shows the capital cost per scheme size for a uPVC/HDPE Pipeline:

Table 35: uPVC/HDPE Pipeline - Capital cost per scheme

uPVC/HDPE Pipeline – Capital cost per scheme				
Material	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
	5km	**8km**	**17km**	**32km**
Soft soil excavation	R 377,779	R 670,359	R 2,309,034	R 5,727,916
Moderate soil hardness (10% ripping)	R 491,113	R 871,466	R 3,001,744	R 7,446,291
Hard soil excavation (15% ripping; 5% blasting)	R 604,446	R 1,072,574	R 3,694,454	R 9,164,665
AVG OF CAPITAL COST	**R 491,113**	**R 871,466**	**R 3,001,744**	**R 7,446,291**
AVG CAPITAL COST PER KM	**R 98,223**	**R 108,933**	**R 176,573**	**R 232,697**

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 36: Shows the range of unit costs in Rand for the various options of bulk water connector supply, as developed from zero-based approach, following breakdown as depicted in Appendix 2:

Table 36: Pipelines Diameter Bulk Water Supply (uPVC)

Pipelines Diameter Bulk Water Supply					
Province		**110 mm**	**160 mm**	**250 mm**	**315 mm**
		R / meter	**R / meter**	**R / meter**	**R / meter**
Limpopo	**Min**	325	418	677	938
	Max	361	464	752	1,042
	Avg	343	441	715	990
Gauteng	**Min**	283	350	565	780
	Max	315	389	627	867
	Avg	299	370	596	823
North West	**Min**	314	406	660	912
	Max	349	452	733	1,013
	Avg	331	429	697	963
Free State	**Min**	289	366	590	816
	Max	321	406	656	907
	Avg	305	386	623	862
Kwazulu Natal	**Min**	267	339	548	758
	Max	297	377	609	842
	Avg	282	358	578	800

Pipelines Diameter Bulk Water Supply					
Province		110 mm	160 mm	250 mm	315 mm
		R / meter	R / meter	R / meter	R / meter
Mpumalanga	Min	326	404	655	906
	Max	362	449	728	1,007
	Avg	344	427	691	956
Northern Cape	Min	355	441	715	991
	Max	394	490	794	1,101
	Avg	374	465	755	1,046
Western Cape	Min	323	403	654	904
	Max	358	448	726	1,005
	Avg	341	426	690	955
Eastern Cape	Min	286	354	570	788
	Max	318	393	633	876
	Avg	302	373	602	832
National	Avg	325	408	661	914

Source: Industry Guide 2007 unit costs escalated costs to August 2009.

Table 37: Shows the maintenance cost per household for a uPVC/HDPE Pipeline per scheme size, as developed from zero-based approach:

Table 37: uPVC/HDPE Pipeline – Maintenance cost per Household

uPVC/HDPE Pipeline – Maintenance cost per Household				
Material	Scheme Size			
	Very Small (1000 people)	Small (5000 people)	Medium (20000 people)	Large (50000 people)
Soft soil excavation	R 18.89	R 6.70	R 5.77	R 5.73
Moderate soil hardness (10% ripping)	R 24.56	R 8.71	R 7.50	R 7.45
Hard soil excavation (15% ripping; 5% blasting)	R 30.22	R 10.73	R 9.24	R 9.16
AVG OF MAINTENANCE COST	**R 24.56**	**R 8.71**	**R 7.50**	**R 7.45**

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 38: Shows the operation cost per household for a uPVC/HDPE Pipeline per scheme size, as developed from zero-based approach:

Table 38: uPVC/HDPE Pipeline – Operation cost per Household

uPVC/HDPE Pipeline – Maintenance cost per Household				
Material	Scheme Size			
	Very Small (1000 people)	Small (5000 people)	Medium (20000 people)	Large (50000 people)
Soft soil excavation	R 15.00	R 4.80	R 2.55	R 1.92
Moderate soil hardness (10% ripping)	R 15.00	R 4.80	R 2.55	R 1.92
Hard soil excavation (15% ripping; 5% blasting)	R 15.00	R 4.80	R 2.55	R 1.92
AVG OF OPERATION COST	**R 15.00**	**R 4.80**	**R 2.55**	**R 1.92**

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 39: Shows the capital cost per scheme size for a Steele Pipeline, as developed from zero-based approach:

Table 39: Steel Pipeline - Capital cost per scheme

Steel Pipeline – Capital cost per scheme				
Material	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
	5km	**8km**	**17km**	**32km**
Soft soil excavation	R 768,891	R 1,468,084	R 5,449,618	R 12,735,657
Moderate soil hardness (10% ripping)	R 999,558	R 1,908,509	R 7,084,503	R 16,556,354
Hard soil excavation (15% ripping; 5% blasting)	R 1,230,225	R 2,348,934	R 8,719,388	R 20,377,051
AVG OF CAPITAL COST	**R 999,558**	**R 1,908,509**	**R 7,084,503**	**R 16,556,354**
AVG CAPITAL COST PER KM	**R 199,912**	**R 238,564**	**R 416,735**	**R 517,386**

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 40: Shows the maintenance cost per household for a Steel Pipeline per scheme size, as developed from zero-based approach:

Table 40: Steel Pipeline – Maintenance cost per Household

Steel Pipeline – Maintenance cost per Household				
Material	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
Soft soil excavation	R 38.44	R 14.68	R 13.62	R 12.74
Moderate soil hardness (10% ripping)	R 49.98	R 19.09	R 17.71	R 16.56
Hard soil excavation (15% ripping; 5% blasting)	R 61.51	R 23.49	R 21.80	R 20.38
AVG OF MAINTENANCE COST	**R 49.98**	**R 19.09**	**R 17.71**	**R 16.56**

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 41: Shows the operation cost per household for a Steel Pipeline per scheme size, as developed from zero-based approach:

Table 41: Steel Pipeline – Operation cost per Household

Steel Pipeline – Maintenance cost per Household				
Material	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
Soft soil excavation	R 15.00	R 4.80	R 2.55	R 1.92
Moderate soil hardness (10% ripping)	R 15.00	R 4.80	R 2.55	R 1.92
Hard soil excavation (15% ripping; 5% blasting)	R 15.00	R 4.80	R 2.55	R 1.92
AVG OF OPERATION COST	**R 15.00**	**R 4.80**	**R 2.55**	**R 1.92**

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 42: Shows the capital cost per scheme size for a GRP Pipeline, as developed from zero-based approach:

Table 42: GRP Pipeline - Capital cost per scheme

GRP Pipeline – Capital cost per scheme				
Material	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
	5km	**8km**	**17km**	**32km**
Soft soil excavation	R 615,113	R 1,174,467	R 4,359,694	R 10,188,526
Moderate soil hardness (10% ripping)	R 799,646	R 1,526,807	R 5,667,602	R 13,245,083
Hard soil excavation (15% ripping; 5% blasting)	R 984,180	R 1,879,147	R 6,975,511	R 16,301,641
AVG OF CAPITAL COST	**R 799,646**	**R 1,526,807**	**R 5,667,602**	**R 13,245,083**
AVG CAPITAL COST PER KM	**R 159,929**	**R 190,851**	**R 333,388**	**R 413,909**

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 43: Shows the maintenance cost per household for a GRP Pipeline per scheme size, as developed from zero-based approach:

Table 43: GRP Pipeline – Maintenance cost per Household

GRP Pipeline – Maintenance cost per Household				
Material	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
Soft soil excavation	R 30.76	R 11.74	R 10.90	R 10.19
Moderate soil hardness (10% ripping)	R 39.98	R 15.27	R 14.17	R 13.25
Hard soil excavation (15% ripping; 5% blasting)	R 49.21	R 18.79	R 17.44	R 16.30
AVG OF MAINTENANCE COST	**R 39.98**	**R 15.27**	**R 14.17**	**R 13.25**

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 44: Shows the operation cost per household for a GRP Pipeline per scheme size, as developed from zero-based approach:

Table 44: GRP Pipeline – Operation cost per Household

GRP Pipeline – Maintenance cost per Household				
Material	**Scheme Size**			
	Very Small (1000 people)	**Small (5000 people)**	**Medium (20000 people)**	**Large (50000 people)**
Soft soil excavation	R 15.00	R 4.80	R 2.55	R 1.92
Moderate soil hardness (10% ripping)	R 15.00	R 4.80	R 2.55	R 1.92
Hard soil excavation (15% ripping; 5% blasting)	R 15.00	R 4.80	R 2.55	R 1.92
AVG OF OPERATION COST	**R 15.00**	**R 4.80**	**R 2.55**	**R 1.92**

Source: DWA Cost Benchmark 2009 (basic LoS)

7.1.5 Purpose of Water Supply Infrastructure

The Strategic Framework for Water Services of the former Department of Water Affairs and Forestry (September 2003), defines a basic water supply facility as “the infrastructure necessary to supply 25 liters of potable water per person per day within 200 meters of a household and with a minimum flow of 10 liters per minute (in case of communal water points) or 6 000 liters of potable water supplied per formal connection per month (in case of yard or house connections).”

This would include the infrastructure necessary for the abstraction, conveyance, treatment and distribution of potable water, water intended to be converted to potable water or water for commercial use, but not water for industrial use.

7.1.6 Geographical Context

The selection of the type of water supply service and infrastructure utilized is impacted upon by the geographical context. Geographical context impacts on a number of layers, such as physical location, site access, population settlement pattern and density, the economic and technical capacity of the available service providers and economic situation of the beneficiary community. Some of this had been described in section 5: Infrastructural Considerations, and will also be discussed in the sections following, specifically under the levels of service options.

7.1.7 Basic Level of Service

A basic water supply service is defined as “the provision of a basic water supply facility, the sustainable operation of the facility (available for at least 350 days per year and not interrupted for more than 48 consecutive hours per incident) and the communication of good water-use, hygiene and related practices.”

The definitions of basic water supply facility and service are quite flexible, for example in the case of a water supply facility to provide for both a communal standpipe in the street within 200m or other innovations such as yard tank. Flexibility is there to promote development and use of alternative solutions to cost effective water and sanitation solutions

The level of service for water must be cognisant of the impact on other related services eg. sanitation service options. In the case of dense urban settlements where waterborne sanitation is provided, the implication is that at least a yard connection, but in most cases a house connection must be provided.

7.1.8 Level of Service Options

There is a range of water supply service options that generally fall below the minimum "RDP level". This includes unimproved traditional sources, tanker systems, and some forms of private water cartage and vending. These options are not discussed in this document. Only those levels that are at or above the minimum level are described, including:

- communal standpipes - Basic level of service (within 200 metres from the dwelling i.e. RDP standard).
- yard tanks - Basic level of service (where a supply is provided to a tank on the ground, typically 250 litres) at the individual dwelling or group of dwellings in a yard. The tank is filled daily)
- roof tanks - Intermediate level of service (where the tank is located on the roof in order to provide a semi-pressure supply)
- yard taps - Basic level of service (where the supply is to a single tap in the yard, possibly with a connection to an external toilet of flush sanitation is used)
- house connections - Full level of service (supply connected to a pipework system which runs to bathrooms and kitchen in the house).

It is recognized that the cost of water supply services infrastructure can vary significantly, with changing site conditions and the economic climate. Furthermore, it would appear that cost estimate factors for water services development projects seldom use the same costing factors, planning norms and design criteria.

Different municipalities have different standards and O&M norms, but this often leads to more expensive cost per capita, i.e. some Metropolitans demand that a Class 12 uPVC is used, versus other municipalities who accept Class 9, similarly with steel pipes and painting thicknesses, etc. All of these standards are

based on the respective SANS specifications. However, in terms of whether it qualifies as a basic level option or how to account for this differentiation is open to interpretation and remains a debatable issue.

The historic and current approach is to deal with those communities with dense populations, thereby providing services to as many as possible, but we are reaching a point where more far-flung communities must be served, sparse population requiring further reticulation and thus at a greater cost per capita than before. Cost differentiation needs to account for this.

DWA have developed a fairly extensive reference document for local authorities detailing typical unit costs: "***Cost Benchmarks: Typical Unit Cost For Water Services Development Projects: A Guide for Local Authorities" (updated August 2009*).** Some of the summarized and adjusted information have been included in the sections following.

The ultimate cost of a scheme is not just linked to the selected level of service option. The extent of the existing infrastructure or need for upgrading/expanding such infrastructure also has a significant effect on the cost of the service. Furthermore, most municipalities' development is undertaken through water master plans that form part of their Water Services Development Plan (WSDP), which in itself form one of the cornerstones of the IDP.

In line with this, DWA therefore demand that municipalities undertake water services projects in a holistic manner. This would thus imply that a water services project is undertaken in phases, which often firstly include detailed feasibility studies, then the development of the bulk infrastructure to service the reticulation and finally the choice of level of service in terms of reticulation, which can vary within a scheme based on the community's situation. Recognition is given for such a graduated project development in that the cost breakdown will be provided in components such as reticulation, connector services and bulk services, in the following manner:

- Basic General Water Supply Reticulation (residential):
    - Standpipes and communal taps
    - Yard taps (on site sanitation)
    - Yard taps (water borne sanitation)
    - Yard tanks
    - Roof tanks
    - House connection (low income)
    - House connection (high income)
- Connector Services: Water Supply Infrastructure:
    - Reservoirs
    - Pumpstations
    - Supply Pipelines:
        - 110 mm Ø
        - 160 mm Ø
        - 250 mm Ø
- Bulk Services: Water Supply Infrastructure:
    - Water Treatment Works
    - Raw Water Storage Dams
    - Boreholes Development

a) Communal standpipes

With this option, a single standpipe (often with a single tap) is shared by a number of households. The number of households per standpipe will depend on the density of dwellings in the settlement. A ratio of 25 households per tap is typical in an urban dense settlement; however it should be noted that that a sparse rural settlement pattern of the community (i.e. rural KZN) would imply that this would often substantially exceed the 200 m walking distance. In these cases a median ratio of 7 to 12 families per standpipe is more realistic. It is recommended that the decided upon ratio needs to be motivated in terms of the settlement pattern. Where the ratio is higher, the possibility of customers having to queue must be considered and several taps per standpipe may be better.

Payment for access to water from public standpipes is critical and is associated with the level of service.

The options for payment are:

- Water provided free of charge (where the municipality can afford this and have incorporated it into their Free Basic Water policy).
- Fixed monthly charges per household using the public standpipes.
- A "concession" system whereby the standpipe is located in the yard of a selected individual, who then sells the water to others at an agreed rate, generating an income for the service provided by operating the system.
- A coupon system whereby customer buy coupons for a fixed volume of water. These are purchased and handed to a person appointed to supervise the public standpipe.
- Electronic pre-payment meters allowing water to be dispensed from public standpipes using an electronically encoded token.
- With regard to payment arrangements, systems where people pay for the quantity of water used (the last three options described before) are considered to be better.

b) Yard taps

For this option, a single tap is provided on each plot, either as part of a private standpipe or mounted on the wall of a toilet, if a water-borne sanitation system is used. Although this has not always been done in the past, it is essential that a meter be provided. Yard taps can be used with dry sanitation systems, LOFLOS or water-borne systems (see sanitation section). If a water-borne system is not used, drainage of wastewater at the yard tap needs to be considered. This could be a connection to the roadside drain, or the installation of a soak-away. If customers are paying for water, this becomes less of a problem as there is less wastewater.

c) Yard tank

For this option a tank is installed in the household yard. This can be filled every day from a central point by a tanker truck or by a trickle feed arrangement controlled, for example, by an orifice (restriction in the pipe to reduce the flow rate). In most cases the volume of the yard tank is limited to 200 liters, although the yard tank capacity can range from around 170 liters to 5000 liters.

It is possible for more than one tank to be provided per customer. It may also be feasible for tanks to be mounted above ground to allow water to be piped into the house.

d) Roof tanks

This is an upgrade option for yard tanks and taps. The tank is provided in the roof of the house and is supplied via a "trickle feed" arrangement controlled, for example, by an orifice. Payment can be made on a flat rate basis or the supply can be metered. The key advantage is to the service provider, who saves on reticulation and distribution storage costs compared with a normal house connection system. The consumer can control consumption and monthly bills and variations in water pressure and periods during the day when water is not available can be compensated for (as in some developing areas).

e) House connections

This option provides a metered supply to the plot, with a connection to the house and several taps in the house. It requires a wastewater system, such as a septic tank or sewerage.

7.1.9 Advantages and Disadvantages

The table below shows the range of service level options and some of their advantages and disadvantages:

Table 45: Service Level Options – Advantages and Disadvantages

Service Level	Service Option	General comment	Advantages	Disadvantages
Level 1	Standpipe & communal taps	• Average 25 households per tap, linked to settlement pattern. • Standpipe can have more than one tap.	• Generally least expensive • Low consumption & delivery rate (10l/min)	• Customer inconvenience. • Water stored open in buckets – health risk. • Poor designs create – messy water pooling create an environment & health risk. • Reduced cost recovery options. • Water wastage
Level 2	Yard taps	• Metered. • Not connected to any private plumbing fixtures.	• Water available "on-site". • Accurate meter reading and billing possible. • Greater sanitation options. • Less wastage.	• Potentially open stored water (buckets) – health risk • Poor designs create – messy water pooling create an environment & health risk
Level 3	Yard tank	• Filled by trickle flow or tanker daily, • Max 200 l/day	• FBW policy easy to implement • Up-front payment ensures cost recovery • Customers know water usage • "on-site" storage reduces required capacity of connector & reticulation infrastructure • Low capital cost • Good upgrade potential	• Consumption constrained, potential to run-dry • Tanks need regular cleaning
	Roof Tank	• Upgraded yard tank, • trickle feed	• Service provider saves on cost of reticulation and distribution storage compared to full connection • Customer convenience and usage control	• Consumption still constrained • Tanks need regular cleaning
Level 4	House Connection	• fully metered • pressurized connection • no limitation on usage • requires proven ability to bear full cost by consumer	• Highest level of convenience for both customer and service provider • Accurate meter reading and billing	• High cost to Municipality • High levels of water usage – greater bulk infrastructure required • Difficulty to control water usage • Needs complementary wastewater system

Source: Industry Guide 2007

7.1.10 Residential Water Supply: Basic Unit Cost

Table 46: Shows the range of unit costs in Rand for the various options of residential water supply, as developed from zero-based approach, following breakdown as depicted in Appendix 2:

Table 46 : Residential Water Supply: Basic Unit Cost

Residential: Water Supply						
Province		Communal standpipes	Yard taps	5000 l yard tanks	Roof tanks - intermediate level of service	House connections - full level of service
		R / standpipe	R / yard tap	R / yard tank	R / roof tank	R / household
LIMPOPO	Min	1,856	1,261	16,329	1,572	2,761
	Max	2,063	1,401	18,144	1,746	3,068
	Avg	1,960	1,331	17,236	1,659	2,914
GAUTENG	Min	1,629	1,071	14,153	1,371	2,332
	Max	1,810	1,190	15,726	1,522	2,591
	Avg	1,720	1,131	14,939	1,447	2,461
NORTH WEST	Min	1,731	1,150	15,277	1,471	2,691
	Max	1,924	1,278	16,974	1,634	2,990
	Avg	1,828	1,214	16,126	1,553	2,840
FREE STATE	Min	1,655	1,128	14,762	1,427	2,412
	Max	1,839	1,254	16,403	1,586	2,680
	Avg	1,747	1,191	15,583	1,507	2,546
KWAZULU NATAL	Min	1,519	1,031	13,487	1,460	2,242
	Max	1,688	1,145	14,986	1,623	2,491
	Avg	1,603	1,088	14,236	1,542	2,366
MPUMALANGA	Min	1,782	1,206	15,752	1,554	2,665
	Max	1,980	1,340	17,502	1,727	2,961
	Avg	1,881	1,273	16,627	1,641	2,813
NORTHERN CAPE	Min	1,946	1,325	17,068	1,645	2,896
	Max	2,162	1,472	18,964	1,828	3,218
	Avg	2,054	1,399	18,016	1,737	3,057
WESTERN CAPE	Min	1,779	1,204	15,723	1,170	2,436
	Max	1,977	1,338	17,469	1,567	2,707
	Avg	1,878	1,271	16,596	1,235	2,571
EASTERN CAPE	Min	1,623	1,110	14,514	1,262	2,337
	Max	1,803	1,234	16,127	1,684	2,597
	Avg	1,713	1,172	15,321	1,332	2,467
National	Avg	1,820	1,230	16,076	1,517	2,671

Source: Service unit costs from Industry Guide 2007, escalated to August 2009.

Table 47: Shows the range of maintenance unit costs in Rand for the various options of residential water supply per household density:

Table 47: Water Reticulation – Maintenance cost per household

Maintenance Cost per annum per household				
Element	**Material**	**Household Density (houses per hectare)**		
		5	**15**	**40**
House connection	Hard soil excavation (15% ripping; 5% blasting)	R 2,241.18	R 1,239.87	R 787.03
	Moderate soil hardness (10% ripping)	R 1,820.96	R 1,007.40	R 639.46
	Soft soil excavation	R 1,400.74	R 774.92	R 491.89
Yard connection	Hard soil excavation (15% ripping; 5% blasting)	R 1,470.85	R 803.31	R 501.41
	Moderate soil hardness (10% ripping)	R 1,195.07	R 652.69	R 407.40
	Soft soil excavation	R 919.28	R 502.07	R 313.38
Street tap	Hard soil excavation (15% ripping; 5% blasting)	R 490.48	R 240.16	R 126.95
	Moderate soil hardness (10% ripping)	R 398.52	R 195.13	R 103.14
	Soft soil excavation	R 306.55	R 150.10	R 79.34

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 48: Shows the range of operation unit costs in Rand for the various options of residential water supply per household density:

Table 48: Water Reticulation – Operation cost per household

Operation Cost per annum per household			
Element	**Household Density (houses per hectare)**		
	5	**15**	**40**
House connection	R 3,744.00	R 3,744.00	R 3,744.00
Yard connection	R 1,440.00	R 1,440.00	R 1,440.00
Street tap	R 864.00	R 864.00	R 864.00
TOTAL:	**R 6,048.00**	**R 6,048.00**	**R 6,048.00**

Source: DWA Cost Benchmark 2009 (basic LoS)

7.1.11 Management Cost Factors

As mentioned, the actual final cost of the water supply scheme may be almost double the estimated capital cost in view of additional expenses incurred in terms of:

- Institutional & Social Development (see section 5.4.2.1)
- Professional fees in terms of feasibility studies, design and construction supervision (see section 5.4.2.2)
- P&G's for contractors establishment
- Contingencies for unforeseen expenses
- VAT at 14%

7.1.12 Standards of Construction

There are numerous construction standards and codes of design practice that apply to the various components of water supply, not only at a national level, but often at a local government level. Many municipalities, using the National Design Standards as base, refine their own building codes and design regulations to suite their individual requirements. When costing and designing a water supply project it is advisable to first check with the local municipality as to their specific design criteria.

Following is a list of applicable design and construction standards / codes which are to be used as base guidelines:

Standards for Drinking Water

- South African National Standard Specification Drinking Water 241, Edition 6, 2005; Standards South Africa.
- Quality of Domestic Water Supplies – Volume 1: Assessment Guide, 2nd Edition, 1998, Department of Water Affairs and Forestry, Water Research Commission and Department of Health.
- The South African Compulsory National Standards Regulations, under Section 9 of the Water Services Act, 1997 (Act no 108 of 1997), directs Water Services Authorities for the quality of potable water to SANS 241 for guidance.
- Sample taking is in accordance with Quality of Domestic Water Supplies, Volume 2 – Sampling Guide, 1st Edition, 2000; Department of Water Affairs & Forestry, Water Research Commission and Department of Health.

Standards for Construction

- National Building Regulations.
- Red Book.
- SANS 1200 – All sections.
- NHBRC Home Building Manual – Part 1 – 3.
- ISO 1900 – All sections.
- CSIR Standards (will also make reference to SANS 1200).

7.1.13 Capital Cost for Water Supply per Household

The table below is a summary of the Provincial Capital Costs per household for Water Supply:

Table 49: Capital Costs per Household for Water Supply

Sum of Provincial-Cap Cost Per HH		Scheme Size			
Costs Including Fees P&G and VAT					
Water Supply	Province	Very Small (1000 people)	Medium (5000 people)	Large (20000 people)	Large (50000 people)
	EC	38,295	24,699	22,264	21,428
	FS	38,815	23,894	21,248	20,315
	KN	39,987	25,997	23,564	22,718
	LP	37,112	23,099	21,053	20,393
	MP	37,618	23,571	21,131	20,316
	NC	37,694	23,376	21,509	20,989
	NW	36,495	22,790	20,653	19,953
	WC	37,524	23,334	21,039	20,313

Source: DWA Cost Benchmark 2009 (basic LoS)

7.1.14 Metering of all Services in Terms of the Water Services Act

Regulations in terms of the Water Services Act require, inter alia, that:

(1) The quantity of water supplied to every water user connection must be metered;

(2) Water meter must be supplied to every user connection, including:

- Every individual dwelling in a new sectional title development or apartment building;
- Every individual building, having a maximum designed flow rate exceeding 60 (sixty) liters per minute, in any domestic, commercial or public utility complex; and
- Every irrigation system with a maximum designed flow rate exceeding 30 (thirty) liters per minute using water supplied by a water services authority.

(3) Water meter sizes should comply with the Trade Metrology Act (Act 77 of 1973);

(4) A meter greater in size than that specified by the Trade Metrology Act shall be deemed to be defective if it is found to have a percentage error in over-registration or under- registration greater than 5 % at any one of the rates of flow when tested at the following percentages of its design maximum rate of flow:

- 75 % or more of the design maximum flow11
- Between 50 and 55% of the design maximum flow
- Between 15 and 20% of the design maximum flow

Typical capital cost: R350/meter
Typical pre-paid meters: R1 300/meter (excl installation and VAT)

Of note is that this cost can increase by as much as 40% in the event of including training, meter management system and tokens. Capital and monthly cost for the municipality is the same as for yard taps plus the cost of the water meter. (These costs are considered to be part of the house costs and not included in internal distribution capital).

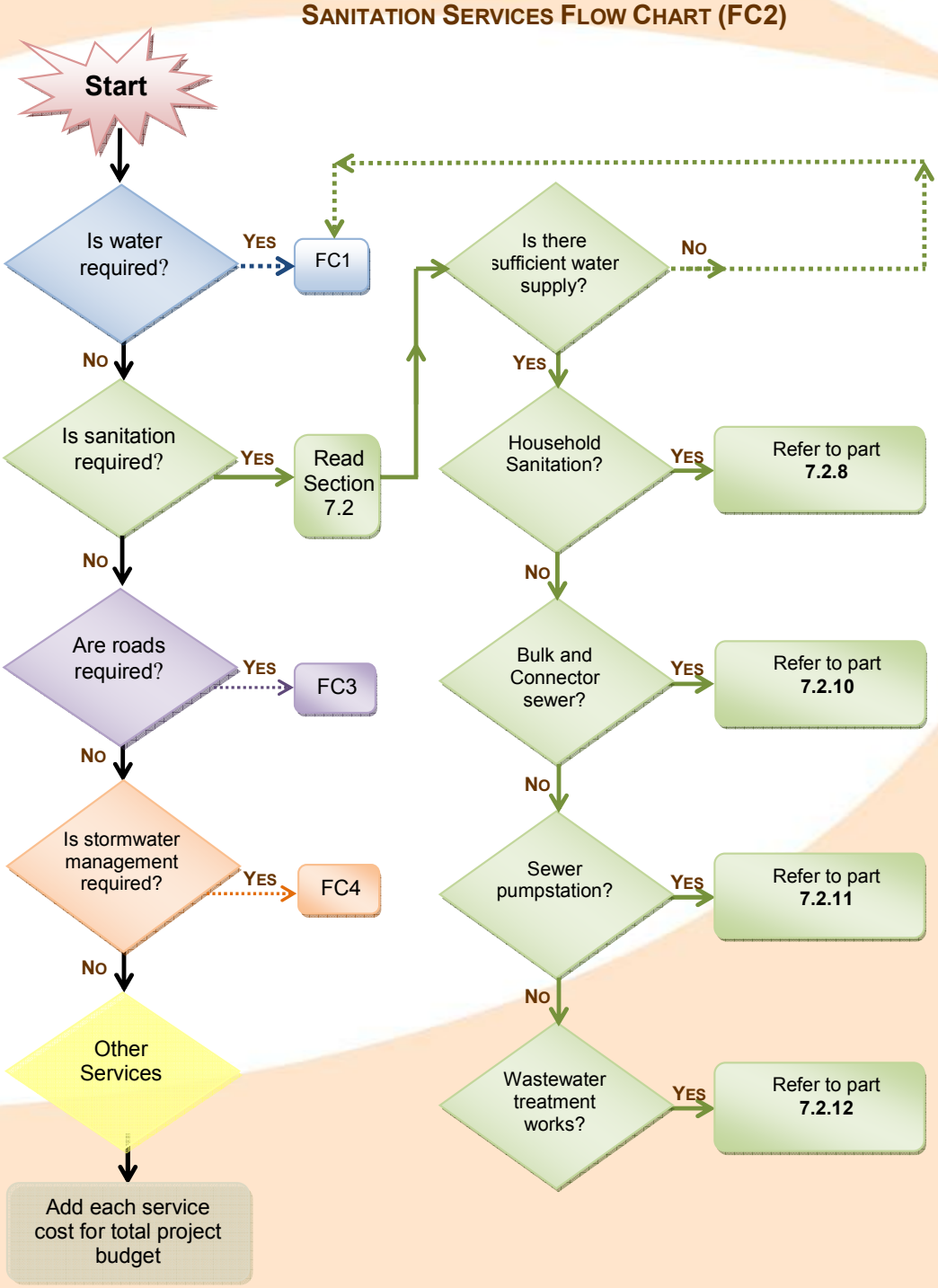
Table 50: Shows the range of unit costs in Rand for the various options of Residential: Domestic Water Supply: Water Meters Unit Cost in Rand, as developed from zero-based approach, following breakdown as depicted in Appendix 2:

Table 50: Domestic Water Supply - Water Meters

Domestic Water Meters				
Province		Domestic meters (15 mm)	Domestic meters (25 mm)	Domestic meters pre paid (15 mm)
		R / meter	R / meter	R / meter
Limpopo	Min	2,349	2,739	2,944
	Max	2,610	3,043	3,271
	Avg	2,480	2,891	3,108
Gauteng	Min	1,972	2,293	2,479
	Max	2,191	2,548	2,754
	Avg	2,081	2,421	2,617
North West	Min	2,301	2,682	2,885
	Max	2,556	2,979	3,205
	Avg	2,429	2,830	3,045
Free State	Min	2,056	2,394	2,583
	Max	2,285	2,660	2,871
	Avg	2,171	2,527	2,727
Kwazulu Natal	Min	1,907	2,221	2,394
	Max	2,119	2,467	2,660
	Avg	2,013	2,344	2,527
Mpumalanga	Min	2,277	2,653	2,855
	Max	2,530	2,948	3,172
	Avg	2,403	2,800	3,014
Northern Cape	Min	2,477	2,889	3,102
	Max	2,752	3,210	3,446
	Avg	2,615	3,050	3,274
Western Cape	Min	2,272	2,648	2,850
	Max	2,525	2,942	3,166
	Avg	2,399	2,795	3,008
Eastern Cape	Min	1,986	2,136	2,232
	Max	2,206	2,373	2,480
	Avg	2,096	2,255	2,356
National	Avg	2,298	2,657	2,853

Source: Industry Guide 2007 service unit costs escalated to August 2009.

SANITATION SERVICES FLOW CHART (FC2)



7.2.1 Definition

Sanitation Services can be described as the collection, removal, treatment and/or disposal of human excreta and domestic wastewater, and the collection, treatment and disposal of industrial wastewater. This includes all the organizational arrangements necessary to ensure the provision of sanitation services including, amongst others, appropriate health, hygiene and sanitation related awareness, the ongoing operation and maintenance of the systems, the measurement of the quantity and quality of discharges where appropriate, and the associated billing, collection of revenue and consumer care. This in general falls under the responsibilities of municipalities that have been authorized as Water Services Authorities. Water services authorities have a right but not an obligation to accept industrial wastewater from industries within their area of jurisdiction.

7.2.2 Purpose of Sanitation Infrastructure

The infrastructure must provide a sanitation service at household level or on other occupied land which is safe, reliable, private, protected from the weather, ventilated, keeps smells to the minimum, is easy to keep clean, minimizes the risk of the spread of sanitation-related diseases by facilitating the appropriate control of disease carrying flies and pests, and at municipal level that enables safe and appropriate treatment and/or removal of human waste and wastewater in an environmentally sound manner.

7.2.3 Geographic Context

As with water the selection of the type of sanitation service and infrastructure utilized is substantially impacted upon by the geographical context. Geographical context impacts on a number of layers, such as physical location, topography, site access, population settlement pattern and density, availability of water resources and supply, the economic and technical capacity of the appointed service providers and the economic situation of the municipality and the beneficiary community.

In general the impact of the settlement pattern in terms of technology choice is as follows:

- 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."

The key geographical aspects that may impact on this relate to the availability of sufficient water resources, the risk of contamination of important aquifers, the additional costs of implementation arising from hard rock, flat terrain, very steep terrain, and sensitive environmental locations.

7.2.4 Basic Level of Service

The Cabinet approved the Strategic Framework for Water Services (2003), which defines a basic sanitation facility as: "The infrastructure necessary to provide a sanitation service which is safe, reliable, private, protected from the weather, ventilated, keeps smells to the minimum, is easy to keep clean, minimizes the risk of the spread of sanitation- related diseases by facilitating the 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 is defined in the Strategic Framework for Water Services as:

> *"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."*

The final choice of the type of service rests with the Water Services Authority (WSA). In order for the WSA to take such a decision they must ensure that it is practical as well as financially viable and sustainable according to the considerations stated below.

7.2.4.1 Considerations for deciding on the most appropriate sanitation system

DWA has developed several guideline documents which are specifically focused in assisting WSAs in the decision making of the choice of a sanitation system.
The use of MIG funds for alternative higher level sanitation systems including waterborne sanitation is permissible provided that the sanitation scheme can be defined as providing a basic sanitation facility that is appropriate (and sustainable) for the selected community.

The definition of a basic sanitation service does not define the technology to be used in providing such a service. The decision on the selected sanitation technology, 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 local settlement conditions.

CoGTA in collaboration with its sector parterns, through the MIG funding instrument, has the mandate to provide a basic sanitation facility to the poor under its capital programme, including health, hygiene and end-user education of the beneficiaries. Recognition must also be given to the following aspects when deciding on the most appropriate sanitation level of service option:

- The target of 2010 for the eradication of the total national sanitation backlogs has been extended to be incorporated into the housing target of 2014. A WSA must choose the most effective way to use the funding available through the MIG, to provide basic sanitation to everyone in their area of jurisdiction by 2014. A strategy in this regard must be developed and applied in the WSA's Water Services Development Plan (WSDP) and reflected in their Comprehensive Infrastructure Plan (CIP) and other service delivery planning instruments.
- The WSA's capacity, (financial and institutional) to operate and maintain complex sewage systems if opting for higher service levels and in particular waterborne sanitation.
- The environmental impact and associated groundwater and surface water implications, in line with the Environment Conservation Act 73 of 1989 as well as the National Water Act.
- Water resource and supply implications, (availability, affordability and management of water required).

The principles on which the DWA sector leader 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.
  - Pits should be at least partially lined, i.e. have at least a constructed collar on which further building (slab, superstructure) will take place.
  - Sewers, pump stations and sewage treatment plants must be designed, implemented and managed by suitably qualified engineering consultants, contractors and managers.
  - All projects should include a component of quality assurance.

- The sanitation infrastructure must be socially acceptable and serve the needs of the community i.e.:
  - There must be consultation with the communities at the beginning of each project, and their representatives should be included in all decisions regarding the planning and design, and preferably also with aspects of implementation involving local community participation.
  - 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 DWA guidelines for compiling a groundwater protocol and feasibility report, and the DEA guidelines for Environmental Impact Studies (where required).

- 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 (acceptable tariffs and daily servicing costs) and the municipality (income from tariffs and grants greater than costs).
  - Operations and maintenance 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 operations and maintenance.

- The project implementation budget allocation should cover the cost of:
  - Construction (basic materials, the wages of the builders, labour for digging pits and trenches, contractors' costs and fees),
  - Social facilitation (including training, health and hygiene education, community liaison, and functioning of the committee).
  - Project management.
  - Other expert inputs as required (e.g. geo-hydrologist).

- Budget allocations must be in line with the achievement of full sanitation coverage by 2010. In some cases this may mean more than trebling the current allocation within municipalities.

- 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 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 from both local suppliers and from centralized 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. 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 one type of basic sanitation facility. However cognizance 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 operations and maintenance budget requirements. "

7.2.4.2 MIG funding for basic level of service

Based on the existing availability of MIG funds and the objective laid out in the MIG policy, MIG focuses on funding a basic level of service to the poor. The following is thus recommended:

- In rural or low density areas as well as unserved dense areas, funding from MIG is restricted to the basic allocation.
- Each province has a unit cost associated with the particular service options, with a variance to allow for costs differences across the particular region. These unit costs exclude VAT and professional fees. These unit costs should be escalated and revised annually.
- Where WSA's implement waterborne sanitation in dense urban settlements as a basic level of service, this may be fully funded by the MIG if, the considerations given under 7.2.4.1 have been met and the municipality has demonstrated in its IDP, WSDP and capital plan that the total backlogs in its wider area are being addressed.
- MIG funds may further be allocated for the upgrading or extension or construction of a wastewater treatment plant in such cases where the basic level of services impacts/contributes on the hydraulic or organic load of the treatment plant.

7.2.5 Level of Service Options

Several sanitation systems are widely applied in South Africa, but do not meet the basic level of service requirements. Bucket toilets and unimproved pit toilets are the most obvious, but problems have also been experienced with the operation and maintenance of other systems. Chemical toilets are prohibitively expensive for continuous use and should only be considered as a short-term and temporary measure (3-5 months).

Adequate service level options for sanitation include:

- VIP toilets and other approved dry, on-site sanitation systems.
- Low-flow on-site (LOFLOS) systems (seldom used owing to bad experiences with certain manufacturers proprietary models, but has potential for more extensive use).

- Septic tanks (usually used in areas not serviced with sewers but where full flush systems are installed, may also be an upgradeable option or as an option where the household takes some of the treatment responsibility from the municipal authority). Suitable for less densely populated areas with soil conditions that have good drainage properties.
- Septic tanks with solids-free sewers also referred to as septic tank effluent drainage (STED) systems (appropriate for areas with flush toilets but not serviced with conventional sewers and where the soils are poorly drained or areas with flush toilets that have become densely populated where the potential of pollution from the effluent exists). The household also takes on some of the responsibility for sewage treatment and disposal.
- Full water-borne sanitation (the household takes minimal responsibility for treatment and disposal).

Sanitation service levels need to be planned in conjunction with the availability of water resources and supply. Where flush systems are required, there must be sufficient water available and the viability of the system must take the cost of supplying water into account.

Table 51: Level of Service Options

LOS OPTION	WATER		SANITATION	
Level 1 Basic	Standpipe & communal taps	• Average 25 households per tap • standpipe can have more than one tap	• Single & double pit fixed & movable top structure VIP • UDS • Other dry sanitation systems	• 1 per household • Free of monthly consumer charge
Level 2 Intermediate	Yard taps	• Metered • not connected to any private plumbing fixtures	• Pour-flush toilet • LOFLOS	• Manually operated cistern • Lined pit or closed digester & soakaway
Level 3 Full	Yard tank	• filled by trickle flow or other controlled flow daily, • max 200 l/day	• Ecological sanitation • Pour flush toilet • LOFLOS	• Manually operated cistern • Lined pit or closed digester & soakaway
	Roof Tank	• Upgraded yard tank, • trickle feed or metered	• Flush toilet with Septic Tank	• On-site flush • Soak away or solids free sewer
	Yard tap with toilet connection	• Metered • Full plumbing to toilet structure and wash basin	• Full flush toilet in outside structure	• Shallow sewer or conventional sewers • All wastewater drained to sewer
Level 4 Full	House Connection	• fully metered • pressurized connection • no limitation on usage • require proven ability to bear full cost by consumer	• Water borne connection inside house • Full flush	• All wastewater drained to sewer • require proven ability to bear full cost by consumer

7.2.6 Advantages/Disadvantages

Table 52: Level of Sanitation Service – Advantages and Disadvantages

Level of service	Advantages	Disadvantages
VIP toilets or equivalent (basic level of service – level 1)	▪ Low capital and operating costs. ▪ System is robust with little day-to-day attention required other than cleaning. ▪ Easy to build locally with commonly available materials.	▪ The toilet must be outside. ▪ There can be problems where there is rocky ground or a high water table. ▪ A de-sludging system is required or arrangements to move the top structure when the pit is full. ▪ Not suitable for higher density developments due to technical requirements.
Ecological Sanitation including UDS (Composting and Desiccating toilets) (basic level of service – level 1)	▪ Low capital and minimal operating costs. ▪ No impact on the environment (ecologically friendly). ▪ System is robust and can be maintained by the household. ▪ Can be incorporated into a home. ▪ Shallow or no pit means it can be installed in all ground conditions.	▪ May be some initial resistance to handling dry wastes from toilet collection chambers. ▪ Proprietary models do not promote use of local labour and hence job creation. ▪ Typically more expensive than pit-type systems ▪ More sensitive to operational problems and require more user-education
Wet on-site digesters (LOFLOS Aqua-privies or Pour Flush – level 2)	▪ Fairly low capital and operating costs. ▪ Easy to install. ▪ Low flush feature	▪ Water has to be carried to the flushing tank. ▪ Where small digesters are used, they need to be de-sludged often. ▪ There has been a problem with some proprietary models in the past, with mechanical failure of the flushing mechanisms. ▪ Areas with very poor draining soils require modifications to soak-away. ▪ Some responsibility is placed on the local authority in respect of operation and maintenance of the system.
Full flush toilets with septic tank and soak-away – level 3	▪ Intermediate capital and operating costs ▪ Provides full flush system ▪ All wastewater can be drained and disposed through the system ▪ Does not require sewerage infrastructure ▪ Sludge management and treatment is a relatively low cost operation ▪ Households take on responsibility for a large portion of the operation and maintenance	▪ Only suitable for low density settlement ▪ Not suitable in areas with poorly draining soils ▪ Some responsibility is placed on the local authority in respect of operation and maintenance of the desludging service and sludge treatment facility

Level of service	Advantages	Disadvantages
▪ **Septic tank effluent drainage systems** (level 3) **–** ▪ Flush Toilets with Septic Tanks & solids free sewer & Pond Treatment	▪ No soak away required on the plot. ▪ Sometimes suits sloped or very flat areas, as sewer gradients are not critical. ▪ Suitable where poor drainage soils exist for on-site sanitation schemes, or where risk of contamination of an underground aquifer in unacceptable. ▪ A possible upgrading option for a neighbourhood previously served by LOFLOS or septic tanks. ▪ Less risk of failure where desludging of tanks is not done regularly.	▪ Requires both sewers and digesters. ▪ Fairly expensive. ▪ Tanks require de-sludging. ▪ Municipality responsible for managing wastewater treatment facility and sludge treatment facility.
Full water-borne sanitation (full level of service)	▪ The most convenient sanitation system from a user's point of view. ▪ Minimal risk of pollution on-site from poor maintenance by household. ▪ Other wastewater from the household can be transported in the same system. ▪ Provides the municipality with a source of water for watering parks and gardens.	▪ The most expensive system in terms of capital and operating costs. ▪ Uses the most water. ▪ Everyone in the neighbourhood needs to be connected, even those who may not be able to afford the service. ▪ Municipality responsible for managing wastewater treatment facility and sludge treatment facility. ▪ Leaks or blockages in the distribution system may cause serious contamination of the environment including ground and surface water. ▪ The Free Basic Services policy of 25 liters per person per day does not allow for this option to be provided free of monthly tariffs.

7.2.7 Standards of Construction

Most municipalities have their own individual guidelines for the design and construction of sanitation services. However, most of these guidelines are read in conjunction with the Code of Practice for the Application of National Building Regulations (NBR), SANS 0400-1990 and Building Standards Act No.103 of 1977 or latest revisions thereof.

In addition to these Guidelines, DWA as the custodian sector department for the management of water and wastewater have developed a number of Guidelines (available from the DWA web site www.dwa.gov.za), or from the National Sanitation Programme Unit.

With regard to the management of sludge / biosolids, the new *"South African Sludge Guideline Series" (2007)* is the most advanced and recent South African publication to guide the planning and permissible or beneficial utilization of sewage sludge handling and disposal.

7.2.8 Unit Costs of Basic Sanitation

The Minister of Water Affairs 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 any higher than maximum costs should only be approved under special motivated circumstances. Under normal circumstances costs are expected to be less than the maximum costs. Municipalities should strive to maintain costs within the "maximum cost" envelope. For on-site 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 guide provides cost guidelines

for the different levels of on-site and off-site facilities. This simplifies cost comparisons and budgeting, and enables authorities to evaluate cost differences of tenders in terms of the individual components of the different sanitation systems and specifications.

The table below provides for the unit costs for domestic sanitation which includes the material costs, labour costs, a construction margin of 15%, and P&G's of 10%. The Community Development costs totaling R445.00 is not included.

The **Groundwater Protocol** cost is also not included in the table below – for further information on expert inputs refer to section 5.4.2.2.Professional Fees.

Table 53: Unit Costs for Domestic Sanitation

Domestic Sanitation								
Province		VIP toilets/ equivalent (single pit fixed top structure)	VIP toilets/ equivalent (double pit fixed top structure)	VIP toilets/ equivalent (single pit movable top structure)	VIP toilets/ equivalent (double pit movable top structure)	Onsite UDS	Septic tanks (full level of service)	Full water-borne sanitation (full level of service)
		R / household	R / household	R / household	R / household	R / household	R / household	R / household
Limpopo	Min	6,247	6,518	6,587	6,858	6,125	9,388	7,247
	Max	6,941	7,242	7,319	7,620	6,806	10,431	8,052
	Avg	6,594	6,880	6,953	7,239	6,466	9,910	7,650
Gauteng	Min	5,614	5,860	6,216	6,462	5,515	8,476	6,611
	Max	6,238	6,511	6,907	7,180	6,127	9,418	7,346
	Avg	5,926	6,186	6,562	6,821	5,821	8,947	6,979
North West	Min	6,326	6,604	6,916	7,194	6,185	9,229	7,179
	Max	7,028	7,337	7,684	7,993	6,872	10,254	7,977
	Avg	6,677	6,970	7,300	7,593	6,528	9,741	7,578
Free State	Min	5,608	5,863	6,300	6,555	5,487	9,075	6,933
	Max	6,231	6,514	7,000	7,283	6,096	10,084	7,703
	Avg	5,919	6,188	6,650	6,919	5,792	9,580	7,318
Kwazulu Natal	Min	5,302	5,536	6,140	6,374	5,086	8,274	6,464
	Max	5,891	6,152	6,822	7,082	5,651	9,194	7,183
	Avg	5,597	5,844	6,481	6,728	5,369	8,734	6,823
Mpumalanga	Min	6,234	6,503	6,697	6,966	6,115	9,160	7,087
	Max	6,926	7,225	7,441	7,740	6,794	10,178	7,875
	Avg	6,580	6,864	7,069	7,353	6,454	9,669	7,481
Northern Cape	Min	6,502	6,791	6,925	7,213	6,406	9,885	7,448
	Max	7,225	7,545	7,694	8,014	7,118	10,983	8,276
	Avg	6,864	7,168	7,309	7,614	6,762	10,434	7,862
Western Cape	Min	6,107	6,374	6,684	6,950	5,971	9,300	7,245
	Max	6,786	7,082	7,426	7,723	6,635	10,333	8,050
	Avg	6,447	6,728	7,055	7,337	6,303	9,817	7,648
Eastern Cape	Min	6,231	6,531	6,776	7,077	6,014	9,477	7,389
	Max	6,923	7,257	7,529	7,863	6,682	10,530	8,210
	Avg	6,577	6,894	7,153	7,470	6,348	10,003	7,800
National	Avg	6,353	6,636	6,948	7,230	6,205	9,648	7,460

Source: DWA: Costing Framework for Household Sanitation Projects; November 2009

7.2.9 Sanitation Community Development Costs (Training, Health, Hygiene and User-Education)

The budget is comprised of four main components: material, labour, community development and project feasibility, assessment and management. The costing for community development (including technical and social training, producing training materials and conducting household awareness) per household is often not fully appreciated or budgeted, and hence is set out below as an individual cost item.

Training, health, hygiene and User-education are budgeted as follows:

Table 54: Training, Health, Hygiene and User-education (Community Development)

ACTIVITIES PER HOUSEHOLD	UNIT	QTY	RATE	TOTAL
Community liaison, builder and quality assessor training and record keeping	person days	1	R 150.00	R 150.00
Health, hygiene and user education materials	user material pack	1	R 100.00	R 100.00
Health, hygiene and user education training	person days	0.5	R 150.00	R 75.00
Peer education house to house visits (x 3)	visit	3	R 40.00	R 120.00
TOTAL COMMUNITY DEVELOPMENT PER HOUSEHOLD				**R 445.00**

Source: DWA: Costing Framework for Household Sanitation Projects; November 2009

On average the community development unit cost for liaison, training, health, hygiene and user-education is R445/household.

7.2.10 Connector Services: Sewage Infrastructure

Connector infrastructure, often referred to as trunk sewers, are the main sewer pipelines used to convey sewage to the wastewater treatment works.

Similar to water supply, the sewer pipelines are usually buried for protection and may be many kilometers in length. The different pipe materials require specific bedding material and handling procedures during the laying and coupling of pipe sections. Pipelines are made of different thicknesses to handle the overburden since they generally operate as gravity flow pipelines at atmospheric pressure.. The specified class pipeline to be used also often differs from municipality to municipality and is based on their design and maintenance criteria.

In essence, the cost of sewer pipelines is determined by:

- Pipe size
- Pipe class (overburden pressure) (based on SANS and municipal design criteria)
- Pipe material
- Soil / excavation conditions(soft, intermediate and hard rock excavations)
- Other escalating factors (access, topography (slope), availability of labour, etc.)

Some of the standard factors affecting the cost of sewerage connector infrastructure are as follows:

- Clearing of bush
- Remove topsoil
- Trench excavation (machine)
- Bedding & backfill
- Type and size of sewer pipe
- Materials and construction of the manhole base, benching, access rings, manhole cover and manhole lid
- Testing
- Labour man days
- Supervision

As in the case of water supply connector infrastructure, costs are incurred along the route of the pipeline and include bush clearing, markers and servitudes. It is estimated that the cost of these items only contribute about 1% to the cost of the pipeline. However, exceptional costs may be incurred when roads, railways and rivers need to the crossed. The cost of the river crossings may be considerable when difficult situations arise and these need to be determined separately for the specific site.

Table 55: Unit Costs for Sewer Pipelines (Reticulation)

Pipelines Diameter: Bulk Sewer									
Province		75 mm	90 mm	110 mm	160 mm	250 mm	315 mm	400 mm	500 mm
		R/meter	R/meter	R/meter	R/meter	R/meter	R/meter	R/meter	R/meter
Limpopo	Min	329	334	343	389	583	628	731	833
	Max	365	371	381	432	647	698	812	926
	Avg	347	353	362	410	615	663	771	879
Gauteng	Min	289	297	297	334	494	585	688	792
	Max	321	329	329	371	549	650	764	881
	Avg	305	313	313	352	522	618	726	837
North West	Min	307	312	321	365	555	600	703	805
	Max	341	347	357	406	616	667	781	895
	Avg	324	329	339	386	586	634	742	850
Free State	Min	279	287	290	329	497	577	679	782
	Max	309	318	322	366	552	641	755	868
	Avg	294	302	306	347	525	609	717	825
Kwazulu Natal	Min	297	303	309	349	524	593	695	798
	Max	330	337	343	388	583	658	772	886
	Avg	314	320	326	369	553	626	734	842
Mpumalanga	Min	301	306	316	361	556	591	693	796
	Max	335	340	351	401	618	657	770	885
	Avg	318	323	333	381	587	624	731	840
Northern Cape	Min	330	337	349	396	602	630	738	857
	Max	367	375	387	440	669	701	820	952
	Avg	349	356	368	418	635	666	779	904
Western Cape	Min	303	310	319	362	549	595	697	800
	Max	336	344	354	403	611	661	775	889
	Avg	320	327	336	382	580	628	736	844
Eastern Cape	Min	278	283	287	324	486	577	680	793
	Max	308	315	319	360	540	641	755	882
	Avg	293	299	303	342	513	609	717	837
National	Avg	318	325	332	377	568	631	739	851

Source: DWA: Costing Framework for Household Sanitation Projects; November 2009

Table 56: below provides cost for bulk wastewater reticulation, measured in Capital Cost/Stand, reflected as follows based on actual tendered prices (August 2009):

Table 56: Cost for Bulk Wastewater Reticulation

	Low Cost	Small	Medium	Large	Cluster
Sewage Outflow	0.6 kl/erf	0.7 kl/erf	0,5 kl/erf	0,8 kl/erf	0,6 kl/erf
Stands / 1Ml/day Flow	1,667 Stands	1,429 Stands	1,250 Stands	1,250 Stands	1,667 Stands
Cost / Ml/day	4,5 million /Ml/day	4,5 million /Ml/day	4,5 million /Ml/day	4,5 million /Ml/day	R 4,5 million /Ml/day
Cost / Stand (excluding cost of top structure)	R 2,700	R 3,150	R 3,600	R 3,600	R 2,700

Source:

Note that the unit costs can be expected to increase for small systems, and decrease for larger systems.

7.2.11 Bulk Services: Sewerage Infrastructure

Bulk services include:

- Sewage pump stations
- Treatment works,

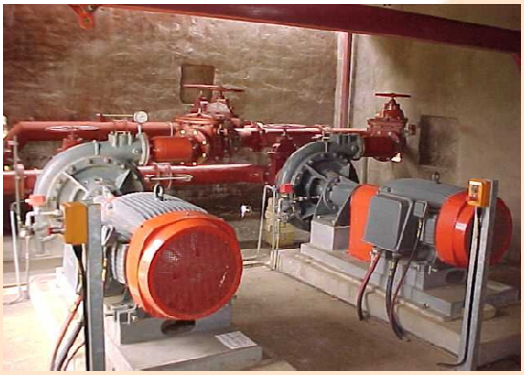
7.2.11.1 Sewage Pump Stations

Some general considerations regarding pump stations:

- Sewage pump stations should be avoided as far as possible and should only be considered where absolutely necessary where a gravity connection to the existing municipal sewer system is not feasible.
- Pump stations must be functional, as simple as possible, and located as far as practically possible from any present or proposed residential areas to minimize community impact resulting from noise, odours and spillages when the pumps fail.
- All reasonable and practical measures must be considered and used in the planning and design of sewage pump stations to minimize the incidence and effect of any pollution as a result of wastewater overflows into the environment and/or stormwater systems, except under the most extreme circumstances, inter alia through specification of quality components and good design.

Thus in locating or siting the pump station the following should be borne in mind:

- Minimum negative impact on the environment.
- Minimum user inconvenience in terms of operating and maintaining it.
- Minimum event impact, should something go wrong.
- Must be located above the 1:50 year flood line and preferably the 1:100 year flood line of any water courses.



Pump stations shall be designed to accommodate peak wet weather flow, with at least one reserve pump and standby generator. It is recommended that a minimum of two pumps be permanently installed, each capable of pumping at a flow rate in excess of the peak wet weather flow. Excessive standby capacity should however also be avoided.

Where three or more pumps are indicated, it is recommended that they are designed to fit actual flow conditions and must be so designed so that with any one pump out of service, the remaining pumps will have capacity to pump peak design flows.

Pumps shall be so sized that one pump can empty the sump plus handle the average inflow in less than 30 minutes.

Wastewater pumpstations are usually up to 18% more expensive than water pumpstations, depending on the conditions and design parameters. Table 57 below provides the unit costs for waster water pump station. These prices include the mechanical and electrical aspects (includes for one duty and one stand by pump set), electrical control panel, level control, installation, pipe work and valves.

Table 57: Pump Station Cost – Average cost per household (excluding cost of top structure)

Pump Station Type	Cost Type	Element	Scheme Size			
			Very Small (1000 people)	Small (5000 people)	Medium (20000 people)	Large (50000 people)
Diesel Driven (Low Speed: 1450rpm, Low Head: <90m):	Capital Cost	Mechanical pump	**2kW**	**8kW**	**33kW**	**82kW**
			41.06	27.28	19.19	15.20
		Energy Source	116.44	34.46	19.08	16.00
		Pump pipework	37.38	25.41	18.21	14.62
		TOTAL Capital cost per household	194.89	87.14	56.47	45.82
	Building Cost depending on type of Structure	Prefabricated /Zinc	570.83	114.17	28.54	11.42
		Brick	1,065.54	213.11	53.28	21.31
		Concrete	1,294.76	258.95	64.73	25.90
	Maintenance Cost	Energy Source	18.63	5.51	3.06	2.56
		Mechanical pump	4.11	2.73	1.92	1.52
		Pump pipework	0.38	0.26	0.18	0.14
		TOTAL maintenance cost per Household	23.12	8.50	5.16	4.22
	Operating Cost	Diesel	154.58	132.16	128.62	127.44
Electrical Driven (Low Speed: 1450rpm, Low Head: <90m):	**Capital Cost**					
		Mechanical pump	25.55	14.63	9.06	6.60
		Pump switchgear	62.61	16.39	7.72	5.98
		Energy Source	79.69	20.14	8.87	6.88
		Pump pipework	22.69	15.42	11.06	8.87
		TOTAL Capital cost per household	190.53	66.59	36.71	28.33
	Building Cost depending on type of Structure	Prefabricated /Zinc	570.83	114.17	28.54	11.42
		Brick	1,065.54	213.11	53.28	21.31
		Concrete	1,294.76	258.95	64.73	25.90
	Maintenance Cost	Energy Source	12.76	3.22	1.42	1.10
		Pump switchgear	10.02	2.62	1.24	0.96
		Mechanical pump	2.55	1.46	0.91	0.66
		Pump pipework	0.22	0.15	0.11	0.09
		TOTAL maintenance cost per Household	25.55	7.46	3.67	2.81
	Operating Cost	Electricity	106.20	31.86	18.88	15.34

Source: Calculated from DWA Cost Benchmark 2009 (basic LoS)

7.2.12 Wastewater Treatment Plants

Similar to the situation of the water supply, it appear necessary to split the sanitation section into the various components to ensure that municipalities undertake a sanitation services projects in a holistic manner.

Wastewater, which comprises domestic sewage and / or industrial effluents, contains certain quantities of solid particles in addition to the biological and chemical constituents. On arrival at a treatment works, the wastewater is screened to remove intractable / inorganic solids such as stones, plastic bags and the like and is then passed through de-gritters to remove sand and grit. The quantity of screenings and sand / grit removed is relatively small and those solids are usually buried on site or transported to and disposed of at regional solid waste (refuse) sites.

The screened wastewater enters the primary and secondary treatment sections of the works and various processes are used to biologically treat the organic solids and the resultant biological cells are then separated from the liquid. The liquid is treated to prescribed standards and discharged to the nearby river / watercourse or through a sea outfall. The separated solids (which are collectively referred to as sludge) are treated and disposed of in a number of different ways.

The sludge treatment processes can include gravity settlement and thickening, anaerobic digestion (whereby sludge is stored for extended periods of time and stabilized by means of natural biological processes without oxygen), followed by conditioning and dewatering by means of drying beds, belt and plate presses and centrifuges.

The basic options for the ultimate disposal of the treated sludge are:

- Agricultural use including horticulture and forestry
- Landfill and land reclamation
- Marine disposal
- Incineration and disposal of residue by landfill

The table below indicates the total wastewater treatment plant costs per household for various scheme sizes. The costs below exclude P&G's, professional fees and VAT.

Table 58: Conventional Sewerage Treatment Plants - Civil, Electrical and Mechanical Costs per Household (depending on Scheme Size)

Element	Scheme Size			
	Very Small	Small	Medium	Large
	(1000 people)	(5000 people)	(20000 people)	(50000 people)
	Capacity 300 kl/day	1000 kl/day	6000 kl/day	10 000 kl/day
Civil Works	R 6,197	R 4,131	R 5,311	R 3,541
Electrical Equipment	R 1,239	R 826	R 1,062	R 708
Mechanical Equipment	R 1,859	R 1,239	R 1,593	R 1,062
Pipework	R 1,033	R 689	R 885	R 590
Total	**R 10,328**	**R 6,885**	**R 8,852**	**R 5,902**

Source: DWA Cost Benchmark 2009 (basic LoS)

The following table depicts the associated maintenance cost of a Conventional Sewerage Treatment Works per Household:

Table 59: Conventional Sewage Treatment Works – Maintenance Costs per Household

Element	Scheme Size			
	Very Small	Small	Medium	Large
	(1000 people)	(5000 people)	(20000 people)	(50000 people)
	300 kl/day	1000 kl/day	6000 kl/day	10 000 kl/day
Civil Works	R 18.59	R 12.39	R 15.93	R 10.62
Electrical Equipment	R 14.87	R 9.91	R 12.75	R 8.50
Mechanical Equipment	R 26.77	R 17.85	R 22.95	R 15.30
Pipework	R 1.03	R 0.69	R 0.89	R 0.59
Total	**R 61.26**	**R 40.84**	**R 52.51**	**R 35.01**

Source: DWA Cost Benchmark 2009 (basic LoS)

The following table depicts the operation cost of a Conventional Sewage Treatment Works per Household:

Table 60: Conventional Sewage Treatment Works – Operation Costs per Household

Element	Scheme Size			
	Very Small	Small	Medium	Large
	(1000 people)	(5000 people)	(20000 people)	(50000 people)
	300 kl/day	1000 kl/day	6000 kl/day	10 000 kl/day
Civil Works	R 0	R 0	R 0	R 0
Electrical Equipment	R 192	R 128	R 192	R 128
Mechanical Equipment	R 115	R 77	R 115	R 77
Pipework	R 77	R 51	R 77	R 51
Total	**R 383**	**R 256**	**R 383**	**R 256**

Source: DWA Cost Benchmark 2009 (basic LoS)

Table 61: Shows the range of unit costs in Rand/Ml for the various options of wastewater treatment plants, calculated by escalating the Industry Guide 2007 data to August 2009:

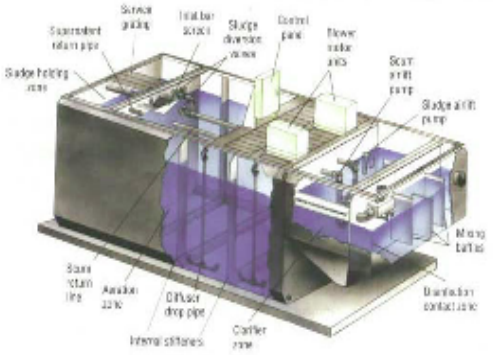
Table 61: Unit Costs for Various Options of Wastewater Treatment

Wastewater Treatment Plant				
Province		Primary and Secondary treatment	Primary, secondary and tertiary treatment with nutrient - removal	Primary, secondary, tertiary and advance treatment - removal of SS
		R / Ml	R / Ml	R / Ml
Limpopo	Min	6,754,208	9,287,036	10,131,312
	Max	7,504,675	10,318,929	11,257,013
	Avg	7,129,442	9,802,982	10,694,162
Gauteng	Min	5,580,121	7,672,666	8,370,181
	Max	6,200,134	8,525,185	9,300,202
	Avg	5,890,128	8,098,926	8,835,191
North West	Min	6,600,579	9,075,796	9,900,868
	Max	7,333,976	10,084,217	11,000,964
	Avg	6,967,277	9,580,006	10,450,916
Free State	Min	5,845,097	8,037,008	8,767,645
	Max	6,494,552	8,930,009	9,741,828
	Avg	6,169,825	8,483,509	9,254,737
Kwazulu Natal	Min	5,437,509	7,476,574	8,156,263
	Max	6,041,676	8,307,305	9,062,514
	Avg	5,739,592	7,891,940	8,609,389
Mpumalanga	Min	6,525,303	8,972,292	9,787,954
	Max	7,250,337	9,969,213	10,875,505
	Avg	6,887,820	9,470,752	10,331,730
Northern Cape	Min	7,148,825	9,829,634	10,723,237
	Max	7,943,139	10,921,816	11,914,708
	Avg	7,545,982	10,375,725	11,318,972
Western Cape	Min	6,513,049	8,955,443	9,769,574
	Max	7,236,722	9,950,492	10,855,082
	Avg	6,874,885	9,452,968	10,312,328
Eastern Cape	Min	5,625,109	7,734,524	8,437,663
	Max	6,250,121	8,593,916	9,375,181
	Avg	5,937,615	8,164,220	8,906,422
National	Avg	6,571,396	9,035,670	9,857,094

Source: The Industry Guide 2007 service unit cost escalated to August 2009

7.2.12.1 Package Plants

The following section provides more detail of on-site sanitation systems of 'package plant' costing and options. Unlike larger activated sludge works where a full complement of components is a given, the scope of supply for 'package plants' can vary for many reasons, some of which would include: retro-fitting where some basic infrastructure is already in place, topographical implications, process requirements, discharge methodology (irrigation or to receiving water body), etc.



Delivery, installation and commissioning and prerequisite site works (site preparation) has been included in the costing, in order to allow for the comparing of costs with large activated sludge works, ponds etc. As a rule of thumb, delivery, installation and commissioning amount to about 10% and prerequisite site works amount to about 5% of the plant stand alone price.

In the tables a selection of hydraulic levels of entry i.e. from the small group of houses at twenty (20) kilolitres per day up to one (1) mega-liter per day is provided. Combinations can be calculated by interpolation for hydraulic requirements from the table, following.

Note: laboratory costs for reporting purposes only realistically becomes applicable at the 24 kl/day duty level, as DWA does not require analytical reporting under 10 kl/day duty and the 12 kl/day duty would generally not be attained due to conservative engineering.

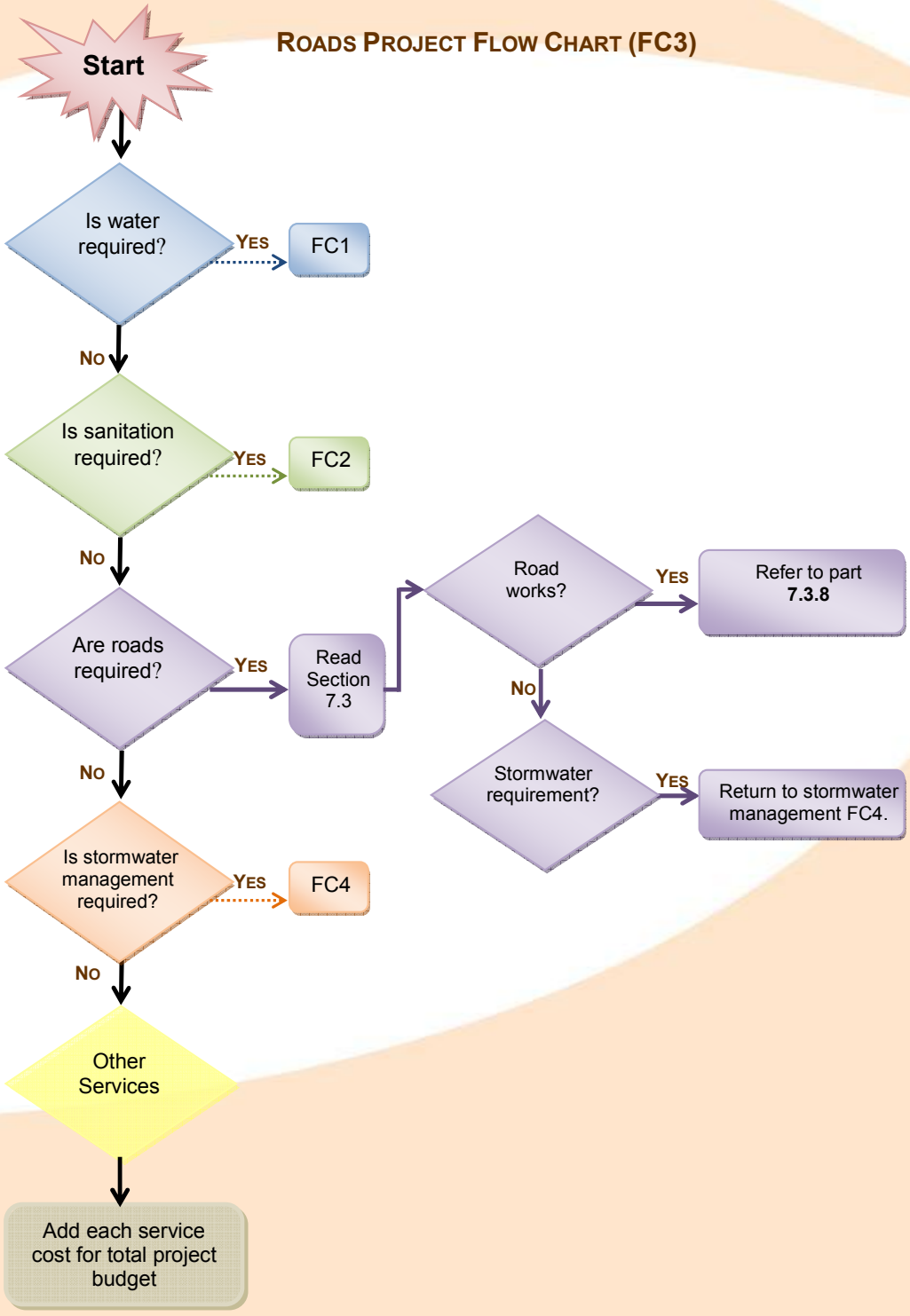
Table 62: Shows the range of unit costs in Rand for the various options of package wastewater treatment works, calculated by escalating the Industry Guide 2007 data to August 2009:

Table 62: Unit Costs for Various Options of Package Wastewater Treatment Works

Package Plants				
Province		20 kl - 50 kl	50 kl - 100 kl	500 kl - 1Ml
		Rand / kl	Rand / kl	Rand / kl
Limpopo	Min	4,822	4,201	3,654
	Max	17,202	9,078	7,373
	Avg	11,012	6,640	5,513
Gauteng	Min	3,332	3,479	3,026
	Max	14,247	7,519	6,106
	Avg	8,790	5,499	4,566
North West	Min	3,918	3,409	2,965
	Max	16,853	8,894	7,223
	Avg	8,253	5,771	4,101
Free State	Min	4,189	3,645	3,171
	Max	14,923	7,877	6,397
	Avg	9,556	5,761	4,784
Kwazulu Natal	Min	4,365	3,798	3,303
	Max	15,549	8,207	6,665
	Avg	9,957	6,002	4,984
Mpumalanga	Min	4,851	4,226	3,676
	Max	17,303	9,132	7,416
	Avg	11,077	6,679	5,546
Northern Cape	Min	5,123	4,458	3,877
	Max	18,252	9,633	7,823
	Avg	11,688	7,045	5,850
Western Cape	Min	4,668	4,061	3,533
	Max	16,628	8,777	7,127
	Avg	10,648	6,419	5,330
Eastern Cape	Min	4,071	3,542	3,081
	Max	14,504	7,654	6,216
	Avg	9,288	5,598	4,649
National	Avg	10,030	6,157	5,036

Source: Industry Guide 2007 service unit costs escalated to August 2009

ROADS PROJECT FLOW CHART (FC3)



7.3.1 Definition/Description

Roads are divided into the RIFSA Functional Road Classification System, with only Classes 3 to 5 being relevant to municipal roads. As the RIFSA classification does not deal with design standards, assumptions have been made regarding road width and pavement structure to generate high level road costs. Costs are differentiated between paved, gravel and graded roads in each category (except no graded Class 3 roads) and access roads have been divided into urban and rural access roads.

Stormwater drainage is included in the road costs, but it is assumed this takes the form of minimal transverse culverts and open drains alongside the road. If piped stormwater is to be provided alongside the road, then an 'extra-over' cost is applied to the basic road cost.

7.3.2 Geographical Context

Road infrastructure can be classified as being either rural, urban or within a Metropolis. The significance of these different classifications will be appreciated with later reference to basic levels of services and unit costing.

TYPICAL RURAL ROAD

TYPICAL METRO ROAD

TYPICAL URBAN/ SUBURB ROAD

7.3.4 Basic Level of Service

Currently, there is not a national policy that defines a basic level of service for roads serving households in residential areas. However, the Municipal Infrastructure Investment Framework refers to "all-weather access to within 500 m of the dwelling". This could be interpreted as a 'basic level of service'. In urban areas, it is generally possible to improve upon this specification and to provide for access by a vehicle to each erf. In some rural areas, where there are very small, scattered settlements, it may not be feasible to provide all-weather access to within 500 m of every dwelling.

The basic level of service to be provided in the rural context is a minimum of an access to the center point in a village or an area. This basic service can be extended to include some of the main accesses, spurs or lanes linked to the main thoroughfare in the village. With time as all villages have been provided with this basic service the basic level of service can then be upgraded to the next level that may then include all other roads and tracks in the village. In all instances, the surface of the road will be gravel.

In the urban context, a gravel road is not acceptable as a basic service. This is due to the impact of O & M costs and other urban road users applications (e.g. emergency services refuse removal, street sweeping by mechanical means), the type of vehicles (e.g. taxis, buses), as well as the vehicle count per day.

In the metropolis areas, the basic level of road service is a durable, all weather surfaces that results in a minimum of O & M costs to be incurred.

Considering these issues, it is understood that the basic level of service will vary according to the geographical context of rural, urban and metro areas. The basic level of service provided should be based on the above approaches, but must also be a service option agreed to by the community (meeting their needs) and the Local Authority (minimizing their O & M costs).

This will require that the purpose of any road to be funded from MIG be clearly defined, supported and motivated. The vehicle count and an analysis of the vehicle type currently using the road must also be presented to support the motivation. Value Engineering and Life Cycle Costing are valuable exercises to inform and lead to responsible decision-making, regarding the most appropriate level of service for the specific circumstances over a longer term.

7.3.5 Level of Service Options

Starting at a basic level, the level of service options include:

- All-weather access to within 500 m of the dwelling;
- Paved width (intermediate or full level of service);
- Access to each erf with graded or gravel-paved road (basic);
- Access to each erf with a narrow paved road or a wider road with a narrow paved width (intermediate or full level of service); and

- Paved streets with kerbs (full level of service).

Urban and Rural Kerb-side

Gravel roads are not recommended in areas where there is high rainfall and high volumes of traffic. Paved roads are preferable options when considering job creation, by employing labour intensive construction methods.

The level of basic road infrastructure options is determined by the following factors:

- The needs of the community;
- The number of vehicles per day;
- The type of vehicle that must be accommodated;
- The funds available to provide the basic service;
- The expected O & M costs and the availability of funds to absorb this level of O & M costs to maintain the road at the required level;
- The adaptability and suitability of the proposed road surface to the stormwater drainage to be used - these must be considered due to the strong linkages that exist between roads and stormwater service options (in a similar manner that water and sanitation services are linked).

In general, the various levels of services options include:

Rural – Gravel road service (Low Level)
Urban – Chip and spray surface treatment with gravel only in the exceptional cases e.g. alleyways and lanes (Intermediate Level)
Metro – Hot premix or concrete surfaced roads (High Level)

7.3.5.1 Access to each plot with a graded or gravel-paved road

In areas where car ownership is low, it may be appropriate to have simple earth or gravel roads. Where local soils are of good quality, it may be possible to grade the existing material into a road formation. In other circumstances, a graveled layer may be needed. An earth/graded road is not acceptable as a minimum level of service.

Table 63: Gravel-paved Road – Advantages and Disadvantages:

Advantages	Disadvantages
• Low cost.	• Dusty. • Can be impassable during very rainy periods. • Not suited to heavy traffic. • Requires frequent maintenance (this maintenance can be labour-intensive and locally managed).

:

7.3.5.2 Narrow paved road or road with narrow paving

For this option the road would be sealed, but would be built with a narrow width or have only a narrow width paved (about three meters) to save costs. The paving could be single- layer bituminous "chip and spray", pre-cast blocks or other types. Paved roads require several layers of material below the paving for support and to give the road sufficient strength.

Table 64: Narrow paved Road – Advantages and Disadvantages

Advantages	Disadvantages
• All-weather driving surface. • Reasonably low maintenance intervals.	• Passing vehicles need to pull on to gravel shoulder. • Fairly expensive.

7.3.5.3 Paved streets with kerbs

For this option the road would be of sufficient width for two lanes and would have the full width paved. Paving durability would typically be greater than for the previous option. The road would typically be provided with kerbs or edging of some sort. While maintenance intervals are longer than with other options, the cost of maintenance, when it is needed, is high and specialists are generally needed to do the maintenance work.

Table 65: Paved Streets with Kerbs – Advantages and Disadvantages

Advantages	Disadvantages
• All-weather driving surface. • Low maintenance intervals.	• High Cost

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The estimates of unit costs for provision of different types of roads are provided in the table below.

7.3.6 Advantages/Disadvantages

The advantages and disadvantages of the different service level options are summarized in the table below:

Table 66: Road Options – Advantages and Disadvantages

	Advantages	Disadvantages
Rural – Low Level	Low cost Easy construction	▪ Dusty surface ▪ May be impassable after prolonged and heavy rain. ▪ Road surface subject to damage by high rainfall. ▪ Not suited for high traffic counts ▪ Not suited for heavy traffic ▪ Frequent maintenance required ▪ High O & M costs
Urban – Intermediate	Low maintenance cycle Damage to vehicles limited All weather driving surface	▪ Expensive construction ▪ Specialized construction ▪ High replacement cost
Metro – High Level	All weather driving surface Maintenance not highly specialized	▪ Expensive construction ▪ Surface can be subject ▪ to damage during high ▪ rainfall

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7.3.7 Standards of Construction

The construction of road infrastructure must be implemented in accordance with SANS 1200: Standard Specification for Civil Engineering Construction. This includes the relevant sub specification related to the specific activity being undertaken e.g. Earthworks (SANS 1200 D), Gabions and Pitching (SANS 1200 DK), Concrete Work (SANS 1200 G), etc.

The Consulting Engineer employed must be registered as a Professional Engineer with adequate Professional Indemnity insurance. A proven track record of relevant experience for the type of road project being undertaken is essential. Proof of the expertise in the firm relating to the type of project must also be obtained.

For EPWP projects Labour Intensive Construction Qualifications is compulsory e.g. NQF 7 and NQF 5.

7.3.8 Unit Costs

The topography of the road and the geographical location/area implies variances in the rainfall and stormwater run-off expected. Therefore, the unit costs associated with a road project can vary considerably over a spread of different projects, depending on the extent of stormwater being provided for. Where extensive stormwater (e.g. culverts, pipe drains) is required as part of the road the appropriate section on stormwater must be consulted and applied to determine the unit cost for those elements. This can then be added to give a total unit cost for the road.

The unit costs applicable to roads as stated below include the construction of layer works only. The unit costs do not include any stormwater or stormwater structures, which is being dealt with separately under section 6.4. (e.g. drains, culverts, etc).

The table below shows the range of unit costs in Rand/km for the various levels of roads, with open channels, as developed from the escalation approach.

Table 67: Unit Costs – Various Levels of Roads

With stormwater	National Average Cost price per kilometer of road
• Graveled roads (width 4,5 – 6 meters)	R420,000 – Basic Level of Service
• Chip and Spray (width 4,5 – 6 meters)	R3,720,000 – Intermediate Level of Service
• Paved/Sealed (6 meters wide)	R5,220,000 and more – Full Level of Service

Source: Industry Guide 2007 roads unit costs escalated to August 2009

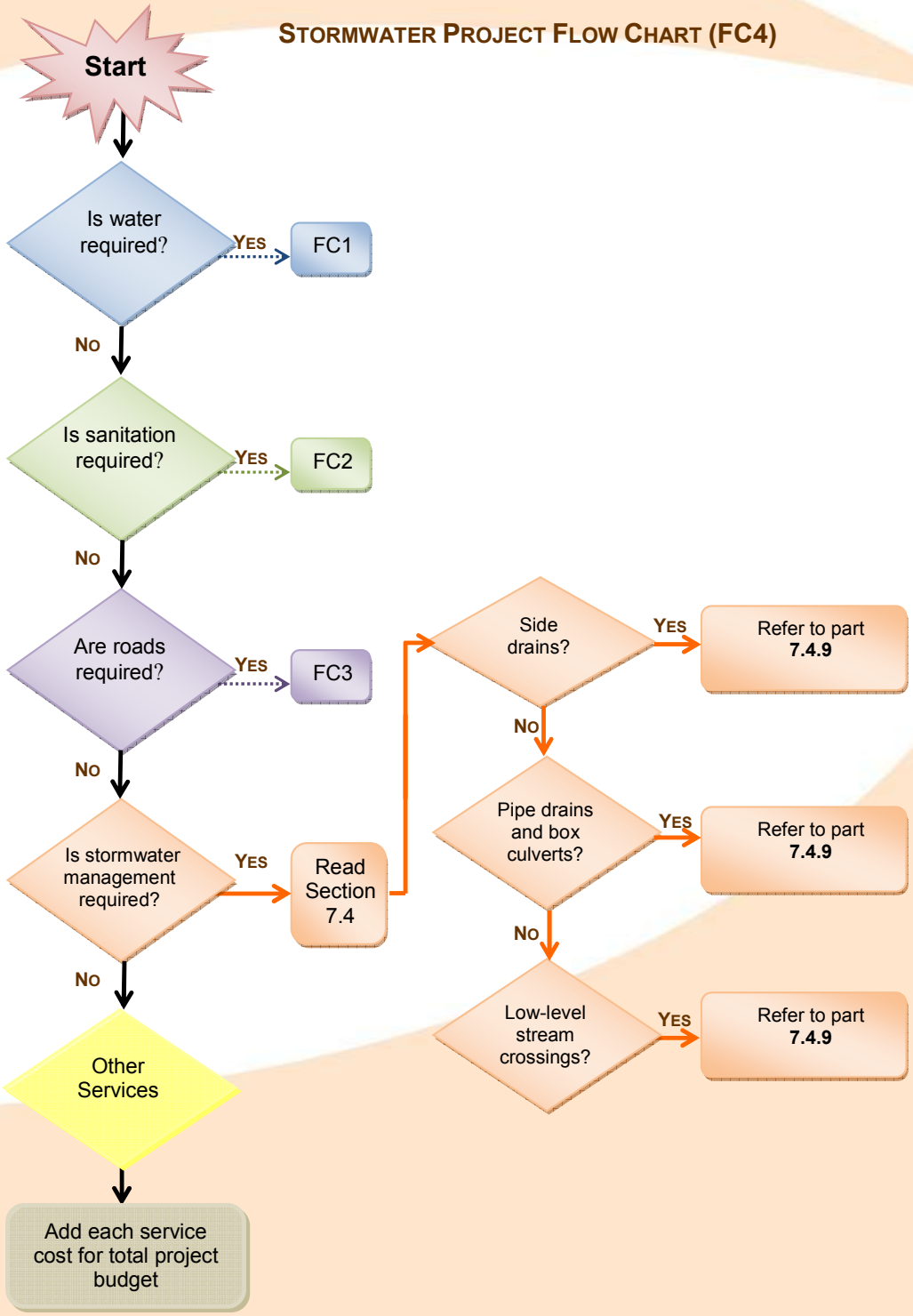
Table 67: Shows the range of unit costs in (Rand/km) for the various options of Roads, as calculated by escalating the Industry Guide 2007 cost to the August 2009 equivalent. A detail breakdown of the component costs is contained in Appendix 2:

Table 68: Unit Costs – Infrastructure Roads

Infrastructure: Roads						
Province		Class 5b (Unpaved gravel - rural)	Class 5a (Unpaved gravel - urban)	Class 5a (Paving Blocks urban)	Class 4 (Low level paved chip and spray)	Class 3 (High level paved bitumen)
		R / km	R / km	R / km	R / km	R / km
Limpopo	Min	439,447	343,760	3,579,974	4,169,844	5,228,768
	Max	472,406	369,542	3,848,472	4,482,583	5,620,925
	Avg	455,927	356,651	3,714,223	4,326,213	5,424,847
Gauteng	Min	396,952	310,517	3,579,974	3,764,675	4,720,706
	Max	426,723	333,806	3,848,472	4,047,025	5,074,759
	Avg	411,837	322,162	3,714,223	3,905,850	4,897,732
North West	Min	410,560	322,916	3,579,974	3,933,154	4,931,971
	Max	441,352	347,135	3,848,472	4,228,141	5,301,869
	Avg	425,956	335,026	3,714,223	4,080,648	5,116,920
Free State	Min	418,248	334,562	3,579,974	4,148,185	5,201,608
	Max	449,617	359,654	3,848,472	4,459,299	5,591,729
	Avg	433,933	347,108	3,714,223	4,303,742	5,396,669
Kwazulu Natal	Min	416,974	329,009	3,579,974	4,022,845	5,044,438
	Max	448,247	353,685	3,848,472	4,324,558	5,422,771
	Avg	432,610	341,347	3,714,223	4,173,701	5,233,604
Mpumalanga	Min	410,869	326,348	3,579,974	4,012,879	5,031,942
	Max	441,684	350,824	3,848,472	4,313,845	5,409,337
	Avg	426,277	338,586	3,714,223	4,163,362	5,220,640
Northern Cape	Min	416,070	323,002	3,579,974	3,885,262	4,871,916
	Max	447,275	347,227	3,848,472	4,176,657	5,237,310
	Avg	431,673	335,114	3,714,223	4,030,959	5,054,613
Western Cape	Min	432,251	342,290	3,579,974	4,216,739	5,287,572
	Max	464,670	367,961	3,848,472	4,532,995	5,684,140
	Avg	448,460	355,126	3,714,223	4,374,867	5,485,856
Eastern Cape	Min	491,025	446,323	3,579,974	3,946,073	4,948,170
	Max	527,852	479,798	3,848,472	4,242,028	5,319,283
	Avg	509,438	463,061	3,714,223	4,094,051	5,133,727
National	Avg	441,790	354,909	3,714,223	4,161,488	5,218,290

Source: Industry Guide 2007 roads unit costs escalated to August 2009

STORMWATER PROJECT FLOW CHART (FC4)



7.4.1 Definition/Description

Stormwater is the accumulation of rain and other forms of precipitation after it has fallen and the consequential flow/runoff from higher to lower lying ground in the process of reaching streams and rivers.

7.4.2 Purpose of Stormwater Infrastructure

The purpose of providing stormwater infrastructure is to manage the volume, flow velocity and direction of flow of the accumulated stormwater. These run-off water must be controlled to acceptable levels in order to minimize the damaging effect that the stormwater may have on the environment, property and other forms of existing infrastructure.

The volume of stormwater encountered is dependent on the rainfall. Due to the variances experienced in South African rainfall events, the stormwater is expressed in terms of the re-occurrence or return period. To manage and control the extreme cases becomes an expensive exercise and therefore good engineering judgment must be applied in selecting what the particular return period will be.

Uncontrolled stormwater impacts severely on access enjoyed by communities and for this reason, stormwater is closely linked (and planned) with road construction.

7.4.3 Geographical Context

Stormwater is encountered in both rural and urban areas. Therefore the management and control must be applied in both areas.

TYPICAL URBAN/METRO STORMWATER

7.4.4 Basic Level of Service

The basic level of service for stormwater in rural areas comprise of open channels along the road or through open areas. These channels may be lined (with concrete or other materials) or unlined.

In the urban context, however, the stormwater system is a combination of open channels and underground pipes. The stormwater can be channeled to underground pipes by kerbs and catch-pits.

7.4.5 Level of Service Options

The level of service selected will be determined by the geographic context. In rural areas, stormwater will mostly comprise of open channels.

In the urban context, it will be a combination of channels and pipes that will be determined by the volume and flow of the stormwater. Consideration of the possible damage to the environment, property and other infrastructure could result in more piped stormwater in the urban context.

7.4.6 Advantages/Disadvantages

The advantages and disadvantages of the different service level options and possible failure of the service are summarized in the table below:

Table 69: Stormwater – Advantages and Disadvantages

	Advantages	Disadvantages
Rural – Low Level	▪ Less run-off due to natural vegetation ▪ Limited damage to property and assets ▪ Low cost	▪ Severe consequences of ▪ road access failure
Urban – High Level	▪ Less consequences of road access failure due to alternative routes available for use.	▪ High cost ▪ Severe damage to assets and property ▪ More run-off due to paved areas

7.4.7 Standards of Construction

The construction of stormwater infrastructure must be implemented in accordance with SANS 1200: Standard Specification for Civil Engineering Construction. This includes the relevant sub specification related to the specific activity being undertaken e.g. Kerbing and Channeling (SANS 1200 MK), Gabions and Pitching (SANS 1200 DK), Pipe Trenches (SANS 1200 DB), etc.

The Consulting Engineer employed must be registered as a Professional Engineer with adequate Professional Indemnity insurance. A proven track record of relevant experience for the type of road project being undertaken is essential. Proof of the expertise in the engineering firm relating to the type of project must also be obtained.

For EPWP projects Labour Intensive Construction Qualifications is compulsory e.g. NQF 7 and NQF 5.

The suggested design parameters for stormwater are as follow:

- Rural Stormwater - Minimum Return period of 1 in 5 years
- Urban Stormwater - Minimum Return period of 1 in 5 years

It should be noted that the guidelines of the applicable authority i.e. Local Authority or Provincial Department must be consulted. Of critical importance is applying good engineering judgment when doing a sensitivity and “what if” analysis to determine the consequences of failure. This could result in the design parameters being adjusted to 1 in 7 or even 1 in 10 years. These cases will have to be well motivated. Feasibility studies are of utmost importance to consider these aspects, before design and construction of the road and stormwater.

7.4.8 Gabions

Gabion boxes and reno mattresses are modular and flexible stormwater and erosion protection structures, suitable for most site conditions. The unit costs are determined by the quantity of rock material used in the gabions and mattresses.

7.4.9 Unit Costs

The unit costs for stormwater infrastructure will be largely determined by the return period of the run-off. The consequences of failure must be considered and evaluated against the cost of providing adequate stormwater. The unit costs applicable to the different levels of service are listed in Table 70 below.

Table 70: Shows the range of unit costs in Rand for the various options of Stormwater, as developed from zero-based approach, following breakdown as depicted in Appendix 2:

Table 70: Unit Costs – Stormwater

Stormwater									
Province		Un lined	Lined	Pipe culverts (600mm; Class 100D)	Box culverts (1500 x 1500mm)	Low level stream crossings	Dewatering (Subsoil)	Gabions	Reno Mattresses
		R / m	R / m	R / m	R / m	R / m	R / m	per m^3	per m^3
Limpopo	Min	259	860	4,025	18,982	64,489	5,650	1,483	1,753
	Max	278	924	4,326	20,405	69,326	6,074	1,595	1,884
	Avg	269	892	4,175	19,694	66,908	5,862	1,539	1,819
Gauteng	Min	234	776	3,643	17,183	58,379	5,115	1,339	1,582
	Max	251	834	3,916	18,472	62,758	5,499	1,439	1,700
	Avg	243	805	3,780	17,828	60,568	5,307	1,389	1,641
North West	Min	239	815	3,842	18,123	61,572	5,366	1,402	1,657
	Max	257	876	4,131	19,482	66,190	5,768	1,507	1,781
	Avg	248	846	3,987	18,803	63,881	5,567	1,455	1,719
Free State	Min	235	874	4,089	19,285	65,520	5,741	1,508	1,782
	Max	253	939	4,395	20,731	70,434	6,171	1,621	1,915
	Avg	244	906	4,242	20,008	67,977	5,956	1,564	1,848
Kwazulu Natal	Min	241	836	3,928	18,526	62,941	5,515	1,441	1,703
	Max	259	899	4,222	19,915	67,662	5,928	1,549	1,831
	Avg	250	868	4,075	19,221	65,301	5,722	1,495	1,767
Mpumalanga	Min	234	839	3,960	18,676	63,452	5,560	1,443	1,705
	Max	252	902	4,257	20,077	68,211	5,977	1,551	1,833
	Avg	243	871	4,108	19,377	65,832	5,768	1,497	1,769
Northern Cape	Min	249	795	3,735	17,616	59,850	5,244	1,370	1,618
	Max	267	854	4,015	18,937	64,338	5,637	1,472	1,740
	Avg	258	824	3,875	18,277	62,094	5,441	1,421	1,679
Western Cape	Min	247	881	4,148	19,564	66,468	5,824	1,516	1,792
	Max	266	948	4,459	21,032	71,453	6,261	1,630	1,926
	Avg	256	915	4,304	20,298	68,961	6,042	1,573	1,859
Eastern Cape	Min	231	825	3,865	18,228	61,930	5,426	1,500	1,767
	Max	248	887	4,155	19,595	66,574	5,833	1,612	1,899
	Avg	240	856	4,010	18,912	64,252	5,630	1,556	1,833
National	Avg	250	865	4,062	19,157	65,086	5,699	1,499	1,770

Source: Industry Guide 2007 stormwater unit costs escalated to August 2009

Poor maintenance of open drains leads to soil erosion, or erosion of the road, thus requiring expensive repairs. A piped system without maintenance can lead to blockages, demanding complete reconstruction.

7.5 Solid Waste Disposal (Municipal Collection)

7.5.1 Basic Level of Service

Government requires that "a refuse removal service" be provided at least once a week. This can be interpreted as some arrangement to remove the solid waste from an area at least once a week.

7.5.2 Level of Service Options (Collection)

The range of options includes:

- Household transfer to communal skips; waste in skips transported to proper landfill sites (basic).
- Organized transfer to communal skips; waste in skips transported to proper landfill sites (intermediate).
- Kerb-side collection; to landfill sites (full).

7.5.2.1 Household transfer to communal skips (basic level of service)

For this option, individual households must carry their own solid waste to a communal point in their neighborhood, where skips are provided. The skips are then removed and emptied at a landfill site by the municipality or a contractor appointed by the municipality. **Typical cost: R 10 – R 18 /household /month.**

Table 71: Solid Waste Disposal – Household Transfer to Communal Skips

Advantages	Disadvantages
• Simple system. • Low operating cost.	• If the distances are too great, people dump their rubbish in the street. • The collection point may become untidy and unhygienic.

7.5.2.2 Organized transfer to communal skips (basic level of service)

For this option local contractors are appointed to collect the waste door-to-door. They transport it to a local collection point, perhaps using hand or bicycle-carts. The municipality, or another contractor, then transports the waste in skips to landfill sites. **Typical cost: R 16 – R 21 /household /month.**

Table 72: Solid Waste Disposal – Organised transfer to Communal Skip

Advantages	Disadvantages
• Convenient for households. • Creates jobs. • Contractor can also clean streets.	▪ Contractor may be inexperienced or unreliable, requiring extra supervision. ▪ The collection point may become untidy and unhygienic

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7.5.2.3 Kerb-side collection (full level of service)

Households put their rubbish out for collection once or twice a week. The municipality or appointed contractors collect the waste in trucks, or with tractors and trailers, and transport it to the landfill. **Typical cost: R 66 – R 80 / household / month, bin rental at R 7 – 11 / month.**

Table 73: Solid Waste Disposal – Kerb side Collection

Advantages	Disadvantages
▪ Convenient for households. ▪ No storage of waste at collection points	• Fairly expensive option. • Requires substantial investment in specialized vehicles/equipment.

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7.6 Street/Community Lighting

7.6.1 Definition/Description

Electricity distribution (defined as electricity reticulation in the constitution) is a municipal function and supplied by many municipalities, with Eskom's distribution arm being a large scale service provider serving a large proportion of South Africa's municipalities. The bulk service is not a municipal function with bulk supply being virtually the exclusive domain of Eskom. Costs for the total reticulation have been aggregated by service level and divided by the users served by a particular system

7.6.2 Purpose of Street Lighting/Community Lighting Infrastructure

The purpose of street lighting is to ensure safe and easy movement of the community at night. It further serves as security measure to protect property of the people and of the Local Authority.

7.6.3 Geographical Context

Street lighting is mainly a feature of the urban environment. It can only be provided where development has taken place that includes electrical reticulation as this is required to facilitate the connecting of street lighting.

7.6.4 Basic Level of Service

Although street lighting is high on the needs list of communities it is not regarded as a basic service in the same sense as water or sanitation.

7.6.5 Level of Service Options

Two types of street lighting are possible. The final choice of service to be provided must made after consideration of the advantages and disadvantages listed below. The options of street lighting available are briefly outlined below

7.6.5.1 Streetlights

Streetlights are provided for in areas that have previously been reticulated. The choice between midblock and streetlights is for the preference of the municipality and community. Note that midblock lighting is not favoured, as result of the high possibility of vandalism, illegal connections and theft. **One streetlight is provided per four (4) stands (i.e. serving 2 stands either side of the road) at a cost of R 8 200 per streetlight**.

7.6.5.2 High Mast Lights

High mast lights can be provided in dense settlements. One high mast light, 30 meters high covers the radius of 150 m^2 and diameter of 300 m^2 serves approximately 30 households at the **national average cost of R 222 100 per high mast light**. Anything outside this range will require a strong motivation from the municipalities concerned.

7.6.6 Advantages/Disadvantages

The advantages and disadvantages of the two types of street lighting that can be provided are summarized in the table below:

Table 74: Street Lighting – Advantages and Disadvantages

	Advantages	Disadvantages
Street lighting	▪ Low technology construction ▪ More labour intensive for Construction ▪ Easy access for maintenance and repair ▪ Low technology required for maintenance	▪ Easy object for vandalism ▪ Illegal connections can easily be made
High Mast Lights	▪ Access difficult and hence vandalism	▪ Relatively high technology not subject to construction ▪ Less labour intensive construction ▪ High technology required for maintenance ▪ Access difficult for maintenance ▪ Illegal connections difficult

7.6.7 Standards of Construction

The construction of street lighting infrastructure must be implemented in accordance with SANS 0142. This includes the relevant sub-specifications related to the specific activities being undertaken.

The Consulting Engineer employed must be registered as a Professional Engineer with adequate Professional Indemnity insurance. A proven track record of relevant experience for the type of electrification project being undertaken is essential. Proof of the expertise in the firm relating to the type of project must also be obtained. For EPWP projects Labour Intensive Construction Qualifications is compulsory e.g. NQF 7 and NQF 5.

7.6.8 Unit Costs

The unit costs to provide the two options of street lighting are as follow:

Table 74: Shows the range of unit costs in Rand for the various options of Street / Community Lighting, as calculated by escalating the Industry Guide 2007 unit costs to August 2009 equivalent – detail breakdown of component costs is as depicted in Appendix 2:

Table 75: Unit Costs – Street / Community Lighting

Street / Community Lighting			
Province		Streetlights	High Mast Lights
		R / street light	R / high mast
Limpopo	Min	8,148	221,197
	Max	8,759	237,786
	Avg	8,454	229,492
Gauteng	Min	7,399	200,871
	Max	7,954	215,936
	Avg	7,677	208,403
North West	Min	7,762	210,717
	Max	8,344	226,521
	Avg	8,053	218,619
Free State	Min	8,129	220,671
	Max	8,738	237,222
	Avg	8,434	228,947
Kwazulu Natal	Min	7,910	214,738
	Max	8,503	230,843
	Avg	8,207	222,791
Mpumalanga	Min	7,924	215,116
	Max	8,518	231,250
	Avg	8,221	223,183
Northern Cape	Min	7,645	207,532
	Max	8,218	223,097
	Avg	7,931	215,314
Western Cape	Min	8,307	225,518
	Max	8,930	242,432
	Avg	8,619	233,975
Eastern Cape	Min	7,737	210,045
	Max	8,318	225,798
	Avg	8,027	217,922
National	Avg	8,180	222,072

Source: Industry Guide 2007 street lighting unit costs escalated to August 2009

8. PUBLIC MUNICIPAL SERVICE INFRASTRUCTURE (P)

MIG is aimed at assisting the poor to gain access to infrastructure. Basic public municipal service infrastructure including public transport, emergency services and community services may be newly constructed or existing infrastructure may be rehabilitated with MIG funds.

Unlike the so-called 'big 5' services in South Africa (water supply, sanitation, electricity, solid waste and roads), public municipal services encompass a wide range of highly variable services that can be accessed by the public at large. While this variability complicates an analysis of the 'sector', a lack of clear national guidelines for the classification of these services also clouds the topic. This is not made any easier by the fact that the original definitions of these services as local government functions in the Constitution (Schedules 4b and 5b) are not clear.

In order to structure the municipal public services functions for the purpose of this report, which deals with costs, the decision has been taken to follow the categorisation applied by National Treasury which requires municipalities to use a Government Finance Statistics (GFS) reporting format that includes municipal public services under the category labelled 'Community and public safety'. This category includes the following functional groups: Community and social services, Sport and recreation, Public safety, Housing and Health, with the associated sub-functions.

8.1 PUBLIC TRANSPORT

The funds intended to be used from the MIG allocation for Public Municipal Infrastructure type of projects may not exceed the proportional allocation calculated in the MIG formula i.e. P component.

8.1.1 Definition

Busses and taxis are two of the most common means of public transportation used by the majority of South African. Bus shelters and taxi ranks therefore provide major holding areas and boarding points for accessing public transport services within urban areas and to and from urban to rural areas.

8.1.2 Purpose of Infrastructure

The purpose of this infrastructure is to provide:

- An effective and safe boarding points
- Shelter for the commuter from the elements
- Relative health and welfare comforts such as access to ablution facilities and market stalls.

8.1.3 Geographical Context

Both forms of transport play a major role, both within the rural as well as urban context. Access to these transport modes is usually achieved via a bus or taxi shelters. The impact of the geographical context on the infrastructure is mainly in terms of size, and access to commuter routes and or rail and other public transport services.

8.1.4 Basic Service Level

Bus shelters can be combined with taxi ranks where practical and where conflict between the different operators is not likely to occur. In such instances, it will normally be located close to an area where large gatherings of commuters occur such as at train stations or shopping complexes. The most common facilities for which provision is made for ablution blocks, hawker stalls, shelter for commuters, administration office, high mast lights, waste disposal, washing bay and a repair area. (The latter two aspects are mainly in relation to the taxi industry). The extent of the facilities will range based on size of population using it and will include variations of the above facilities, with the most minimal being adequate lighting, commuter shelter. These smaller shelters are normally built along streets on bus routes in towns and in the rural areas.

8.1.5 Level of Service Options

8.1.5.1 Bus shelters

Two types of bus shelters shall be discussed to address the various applications for bus shelters.

8.1.5.1.1 Bus shelters for bus ranks

Such shelters shall be of sufficient height to allow a bus to travel freely under the roof and of sufficient size to cover both the bus and waiting passengers on the center island. Normal practice allows for busses to line up in single file with a minimum of one bus that will park under the shelter itself during the loading of passengers. Several of these lanes can be provided alongside each other with each lane serving a different destination. The bus lanes will typically be 3,5m wide and the length to be covered by the shelter shall be 15m long. The center island between the different bus lanes shall be 3m wide where waiting passengers can queue before embarking on busses. This implies that a total width of not less than 6,5m is required for each destination being catered for in the bus rank. The length of the lanes shall be a minimum of 30m to allow for one bus under the shelter and one bus waiting in the queue to load passengers.

Sufficient maneuvering space shall be provided at the entrance and exit sides of the lanes to allow busses to enter and exit the lanes. The turning circles of buses must be taken into account in this regard. The suggested width/length of the maneuvering areas is 15m before and after the bus lanes. The above geometry results in a total length of 60m for the bus rank. Therefore, the minimum area required for each destination catered for is 60m by 6,5m or about 390 square m. The total width will depend on the number of lanes that are provided and shall preferably have a minimum width of approximately 30m.

The bus rank surface shall be paved with either interlocking concrete blocks or a bituminous layer. The islands between the bus lanes shall be created with figure 3 concrete vertical kerbs and the raised surfaces shall be interlocking concrete blocks. The total bus rank shall also have figure 3 concrete kerbs around the outside circumference to act as barrier for the surfacing.

The estimated unit cost for the layer works and interlocking block paving including the kerbs is approximately R220 per m^2. Stormwater drainage shall be on surface as far as possible with kerbs inlets or grid inlets at the low portions of the area with pipes leading to nearby municipal stormwater lines or channels.

The bus shelter shall be manufactured from cold formed lipped channel (CFLC) profiles with metal sheeting

as roof cover. Square or round hollow sections shall be used for columns. Column footings shall be reinforced concrete and will be placed in the islands. The estimated unit cost for the **total bus shelter including the roof sheeting and concrete footings is R2,500-00 per m^2**.

8.1.5.1.2 Bus shelters for streets

These bus shelters will typically be erected along bus routes in ordinary streets and shall cater for 10 to 15 passengers. The structure shall be manufactured from CFLC profiles with metal sheeting for the roof cover and side cladding. The seating can also be manufactured from CFLC profiles as part of the shelter structure. The estimated unit cost for a street bus shelters is R2500-00 per m^2.

8.1.5.2 Taxi ranks

The size of the taxi rank will depend on the number of taxis that will serve a particular town or municipality. The taxi rank can be combined with a bus rank as mentioned before but will depend on the particular needs of a specific town or municipality.

8.1.5.2.1 Layout of taxi rank

The taxi rank shall have 2,5m wide lanes where the taxis will line up to pick up passengers. Islands shall be provided between the lanes and the typical width shall be 1,5m. This implies that a total width of not less than 4,0m is required for each destination being catered for in the Taxi rank. The length of a lane shall typically be 25m to allow for 4 taxis to queue per lane. A covered shelter shall be provided as a minimum over the last 11m to provide cover for waiting passengers. Several of these lanes can be provided alongside to allow for the different destinations that shall be served by the taxis. An open parking area for waiting taxis can also be constructed in the same taxi rank to cater for waiting taxis during off-peak periods.

Sufficient maneuvering space shall be allowed at the entrance and exit sections of the lanes and shall typically be 10,0m at both ends. The turning circles of the taxis must be taken into account in this regard. The open parking area shall allow the normal 2,5m wide by 5m long parking bays and shall be arranged to one side of the taxi rank to prevent interference with taxis moving into the passenger lanes. This geometry will results in the minimum length of the taxi rank being 45m and the width dependant on the number of lanes provided. It is suggested that a minimum number of 4 lanes are provided. An open parking area of 7,5m wide along the one long side of the taxi rank and a 7,5 m wide “road lane” between the parking area and the passenger lanes must also be allowed for. This will result in a total width of the taxi rank being approximately 30m. Therefore the minimum area required for each destination catered for is 45m by 30m or about 1 350 square m.

The taxi rank surface shall be paved with either interlocking concrete blocks or a bituminous layer. The

islands between the taxi lanes shall be created with figure 3 concrete vertical kerbs and the raised surfaces shall be interlocking concrete blocks. The total taxi rank shall also have figure 3 concrete kerbs around the outside circumference to act as barrier for the surfacing.

The estimated unit cost for the layer works and interlocking block paving including the kerbs is approximately R225-00 per m^2. Stormwater drainage shall be on surface as far as possible with kerb inlets or grid inlets at the low portions of the area with pipes leading to nearby municipal stormwater lines or channels.

The taxi shelter shall be manufactured from cold formed lipped channel (CFLC) profiles with metal sheeting as roof cover. Square or round hollow sections shall be used for columns.

Column footings shall be reinforced concrete and will be placed in the islands. The estimated unit cost for the steel structure including the roof sheeting and concrete footings is R160-00 per m^2.

8.1.5.3 Sidewalks

Sidewalks are normally provided alongside roads in densely populated areas for the safety of pedestrians.

Sidewalks shall either be finished with a gravel wearing course, with concrete paving blocks or with a bitumen surface depending on the location of the sidewalks. Sidewalks shall typically be 1,5m wide and shall start on the road edge or behind the kerb.

8.1.5.3.1 Gravel sidewalk

The sidewalk route shall be leveled and all plant material and other debris shall be removed. The top of the re-worked surface shall be 150mm lower than the top of the kerb or the road level. The in-situ material shall be compacted to provide an even surface before the imported gravel is placed. The imported gravel shall be at least of G7 quality and shall be compacted to 93% modified AASHTO density.

The surface shall be graded 1:100 towards the road in the case where no side channels are present in the streets. Where side channels are provided the surface shall be graded at 1:100 towards the side channels. The estimated unit cost for sidewalks with a gravel wearing course is R40-00 per m^2 and include for the removal of topsoil and other unsuitable material.

GRAVELLED SIDEWALK

8.1.5.3.2 Paved sidewalk

The sidewalk route shall be leveled and all plant material and other debris shall be removed. The top of the reworked surface shall be approximately 180mm lower than the top of the kerb or the road surface. The in-situ material shall be compacted to provide an even surface before a 100mm thick layer of imported gravel is placed. The imported gravel shall be at least G5 quality and shall be compacted to 93% modified AASHTO density. The bedding sand layer of approximately 25 to 30mm shall be placed and 50mm thick paving blocks shall then be packed in a suitable pattern to form the sidewalk.

The outer edge (away from the road) shall be restrained with either concrete garden kerbs (75mm wide by 225mm deep) or a concrete edge strip. The surface shall be graded at 1:100 towards the road in the case where no side drains are present. Where side drains are present the surface shall be graded at 1:100 towards the side drain. The estimated unit cost for sidewalks with concrete pavers is R105-00 per m^2 and include for the removal of unsuitable material and topsoil. I would prefer to have the unit cost set out in a table – will see when it has been finalized.

8.1.6 Standards of Construction

All civil work should be done in accordance with SANS 1200: Standardized Specification for Civil Engineering Construction. All other structures should be designed and constructed in accordance with the requirements of the National Building Regulations and all applicable SANS standards.

8.1.7 Unit Cost

The cost estimates exclude VAT and is based on basic structures and services. The provision of toilets and water points at bus or taxi ranks are not considered in the proposals below.

Table 76: Shows the range of unit costs in Rand for the various options of Public Municipal Services, as calculated by escalating the Industry Guide 2007 costs to the August 2009 equivalent – detail breakdown is depicted in Appendix 2:

Table 76: Unit Costs – Public Municipal Services

Bus Shelters			
Province		Bus shelters for bus ranks	Bus shelters for streets
		R / per m²	R / per m²
Limpopo	Min	2,477	2,477
	Max	2,752	2,752
	Avg	2,615	2,615
Gauteng	Min	2,042	2,042
	Max	2,269	2,269
	Avg	2,156	2,156
North West	Min	2,408	2,408
	Max	2,675	2,675
	Avg	2,542	2,542
Free State	Min	2,144	2,144
	Max	2,383	2,383
	Avg	2,263	2,263
Kwazulu Natal	Min	1,989	1,989
	Max	2,210	2,210
	Avg	2,100	2,100
Mpumalanga	Min	2,379	2,379
	Max	2,644	2,644
	Avg	2,511	2,511
Northern Cape	Min	2,614	2,614
	Max	2,904	2,904
	Avg	2,759	2,759
Western Cape	Min	2,379	2,379
	Max	2,644	2,644
	Avg	2,511	2,511
Eastern Cape	Min	2,063	2,063
	Max	2,292	2,292
	Avg	2,177	2,177
National	Avg	2,404	2,404

Sidewalks	
Paved sidewalk	Gravel sidewalk
R / per m²	R / per m²
205	94
227	104
216	99
185	85
206	94
196	90
194	89
215	99
205	94
203	93
226	104
215	99
198	91
220	101
209	96
198	91
220	101
209	96
191	88
213	97
202	92
208	95
231	106
219	100
194	89
216	99
205	94
208	90

Source: Industry Guide 2007 service unit costs escalated to August 2009

8.2 EMERGENCY SERVICES

There are to aspect which is discussed under this section, being Fire Fighting Services and Disaster Management Services

8.2.1 Definition

Public Safety involves the protection of the general population from all manner of significant danger, injury, damage or harm, such as may occur in a natural disaster, and the prevention of the same. This protection is typically provided by emergency services organizations such as police, fire and emergency medical services.

The term “disaster management” refers to a continuous and integrated multi-sectoral, multidisciplinary process of planning, and implementation of measures, aimed at:

- preventing or reducing the risk of disasters;
- mitigating the severity or consequences of disasters;
- emergency preparedness;
- a rapid and effective response to disasters; and
- post-disaster recovery and rehabilitation.

8.2.2 Purpose of Service and Infrastructure

Emergency services are organizations / structures that deal with varying types of emergency, in order to ensure public safety. The organization may exist for the sole purpose of dealing with emergencies, or may deal with ad hoc emergencies as they arise as part of their normal duties. Many of these organizations will also be involved with community work to help avoid or detect the emergencies which they are engaged to deal with.

Sections 29, and 43 of the Disaster Management Act, Act 57 of 2002, require that the three spheres of government (National (NDMC), Provincial and Metropolitan / District Municipalities) establish Disaster Management Center’s (DMC’s). It is envisaged that the DMC’s will provide the physical environment where various emergency and disaster management role players can meet and co-ordinate an integrated and coordinated disaster management approach that focuses on:

- Preventing or reducing the risk of disasters, mitigating the severity of disasters, emergency preparedness, rapid and effective response to disasters and post-disaster recovery;
- The establishment of a disaster management repository of, and conduit for, information concerning disasters, impending disasters and disaster management in the Province or District (Section 30(1)c).

8.2.3 Geographical Context

The emergency service available is dependent on the area in terms of settlement pattern, physical and economic activities, the extent of development. In terms of this guideline focus is place on two aspects being basic fire fighting and disaster management centers / facilities.

8.2.4 Basic Service Level

8.2.4.1 Basic fire fighting services

Fire fighting is a local government function, but will only be funded if adequate provision for it has been made within their IDP. The main functions of a fire service are to prevent fires and to protect life and property should a fire occur. Two essentials for protection against fire are an efficient fire service and an adequate water supply. Local authorities should endeavour to achieve and maintain a category 1 service.

Fire Brigades are classified according to the type and quantity of equipment held, and they fall into one of the following categories:

Category 5 a): A brigade with adequate arrangements and provisions in place, in relation to risk, as measured in the assessments section of Annexure's A and C of the Standard (SANS 10090: 2002, Edition 3) for :

- Risk profile of area of jurisdiction;
- Weight and speed of response;
- Call receipt and processing requirements;
- Vehicle/equipment availability and maintenance;
- Incident management procedures;
- Pre-fire planning and risk visits;
- Training/personnel;
- Water supplies; and
- Fire safety functions;

Category 5 b): A brigade that is able to meet performance criteria for staff availability per appliance availability, pre-determined attendance (PDA), manning levels and attendance times, 35 % to 45 % of the time, measured annually.

Category 4: A brigade as given in category 5 a) as monitored by relevant performance indicators or statistics, or both, and which is able to meet the performance criteria given for category 5 b) 46 % to 55 % of the time, measured annually.

Category 3: A brigade as given for category 5 a) as monitored by relevant performance indicators or statistics, or both, and which is able to meet performance criteria as given for category 5 b) 56 % to 65 % of the time, measured annually.

Category 2: A brigade as given for category 5 a) as monitored by relevant performance indicators or statistics, or both, and which is able to meet performance criteria as given for category 5 b) 66 % to 75 % of the time, measured annually.

Category 1: A brigade as given for category 5 a) as monitored by relevant performance indicators or statistics, or both, and which is able to meet performance criteria as given for category 5 b) more than 75 % of the time, measured annually.

Basic Fire Fighting Services consist of different components and is determined by the risk where the services are to be rendered. In motivating for funding a local authority will have to define the extent of their activities and the rationale for the fund utilization.

Similarly the fire fighting services could be developed as parts of Disaster Management Center's (DMC's), which are discussed below.

Any "urban" services consist of an operational section responsible for physical fire fighting, rescue and in-house training services and a fire safety section responsible for law enforcement and structural fire safety, as well as legislation on dangerous and hazardous goods.

Remote and rural areas are serviced adequately by an operational service only. Basic services in remote and rural areas could consist of only an all terrain water tanker truck and/or veldt fire units on l.d.v.'s available to respond on short notice stationed at central points as rapid response holds the key to all operational activity where life and property are at stake. Such a service should be well equipped with means of communication suitable for the area and be manned 24 hours by at least one preferably two persons to coordinate activities. A shed for the vehicle(s) and equipment and an office/communication room as well as an ablution, kitchen and sleeping facility should be provided.

Moderate risks call for more permanent personnel including a chief officer/station commander, more specialized equipment and vehicles and a building that can accommodate a full-time fire safety officer, recreation lectures and basic equipment repair facility (fire hoses and breathing apparatus). Fixed installations should make provision for an emergency generator and water tank in the event of power failures and where constant water supplies are not available. High and extra high risks (large urban areas including the industrial areas) require professional full time fire and rescue services incorporating an advanced communication system and center, offices, training facility, maintenance facility, engine room, emergency generator, large capacity, breathing apparatus compressor, specialized equipment and vehicles and highly trained and skilled personnel.

8.2.4.2 Disaster Management Facilities

The council of each metropolitan and district municipality must establish institutional capacity for disaster risk management in its area. Such arrangements must be consistent with national and provincial arrangements and must provide the appropriate mechanisms to allow for the application of co-operative governance to facilitate both intergovernmental and municipal interdepartmental relations as well as community participation for the purpose of disaster risk management.

The Municipal Disaster Management Center (MDMC) is the primary functional unit for disaster risk management in metropolitan and district municipalities. It must provide direction for the implementation of disaster risk management policy and legislation and the integration and co-ordination of municipal disaster risk management activities and priorities in order to ensure that national and provincial objectives are achieved. In addition, a key function of the MDMC is to provide support to the NDMC and the relevant PDMC.

In the event of a disaster occurring or threatening to occur, the MDMC must provide support and guidance to the relevant sub-administrative units in the case of metropolitan municipalities and to local municipalities in the case of district municipalities. Furthermore, it must mobilize municipal infrastructure and all other available resources to support local disaster risk management resources. Institutional arrangements for disaster risk management in metropolitan and district municipalities must be consistent with the national disaster management framework and the applicable provincial disaster management framework.

Basic level of service options

The minimum infrastructural requirements necessary to enable the provincial, district and the municipal disaster management center's to operate optimally are:

- a disaster operations center for the facilitation of disaster risk management planning and operations and multidisciplinary strategic management of disaster operations;
- an integrated information management and communication system (*see Enabler 1 under Disaster Management Framework document ref xx*);
- a central communications center, including the establishment and maintenance of a central 24-hour communications facility for reporting purposes as well as for managing the dissemination of early warnings and coordinating activation and response to significant events and disasters;
- a media and public information service that makes provision for two-way communication within communities and among individuals by providing information on disaster risk reduction strategies, preparedness, response, recovery and all other aspects of disaster risk management, as well as providing communities with the mechanisms for obtaining access to assistance in the event of an emergency and for reporting important local information to the relevant disaster management center;
- an education, training and research facility; and
- adequate office accommodation and facilities for operational personnel.

Infrastructure must be established in accordance with national guidelines developed by the NDMC.
Additional detail as to functions and structure of a Disaster Management Center is provided in Appendix 3.

8.2.5 Standards of Construction

To carry out effective fire fighting functions the service must be well organized. To this effect the Standard South Africa, with the assistance of the Fire Protection Association of Southern Africa, have issued a standard - SANS 10090: 2002, Edition 3.

The purpose of this standard is to provide advice on the measures that should be taken to ensure that fire services are efficient. It includes a schedule against which the performance potential of each aspect, as well as of the whole, of a fire service can be judged. A fire-risk rating based on this schedule will indicate the extent to which loss of life and property can be avoided in any particular given area.

The standards that are applicable for the building code aspects and similarly those for Disaster Management Center's are those standards used for construction, being:

- National Building Regulations
- Red Book
- SANS 1200 – All
- NHBRRC Home Building Manual – Part 1 – 3
- ISO 1900 – All
- CSIR Standards (will refer to SANS 1200).

8.2.6 Unit Cost

Table 76: Shows the range of unit costs in Rand/m^2 for the various options of Disaster Management Facility, as calculated by escalating the Industry Guide 2007 unit costs to the August 2009 equivalent – detail breakdown is depicted in Appendix 2:

Table 77: Unit Costs – Disaster Management Facility

Disaster Management Facilities (Provincial DMC - 750-1000sq)					
Province		Offices for staff	Small conference room	Ablution facilities, as per the Building Regulations	Small kitchen
		R / per m²	R / per m²	R / per m²	R / per m²
Limpopo	Min	4,613	4,527	6,020	5,382
	Max	5,125	5,030	6,688	5,979
	Avg	4,869	4,779	6,354	5,681
Gauteng	Min	3,803	3,732	4,963	4,437
	Max	4,225	4,147	5,514	4,929
	Avg	4,014	3,940	5,238	4,683
North West	Min	4,483	4,400	5,851	5,231
	Max	4,982	4,889	6,501	5,812
	Avg	4,733	4,645	6,176	5,521
Free State	Min	3,993	3,919	5,211	4,658
	Max	4,437	4,354	5,790	5,176
	Avg	4,215	4,137	5,500	4,917
Kwazulu Natal	Min	3,704	3,636	4,834	4,322
	Max	4,116	4,040	5,371	4,802
	Avg	3,910	3,838	5,103	4,562
Mpumalanga	Min	4,430	4,348	5,781	5,169
	Max	4,922	4,831	6,424	5,743
	Avg	4,676	4,590	6,103	5,456
Northern Cape	Min	4,868	4,777	6,352	5,679
	Max	5,408	5,308	7,058	6,310
	Avg	5,138	5,043	6,705	5,994
Western Cape	Min	4,430	4,348	5,781	5,169
	Max	4,922	4,831	6,424	5,743
	Avg	4,676	4,590	6,103	5,456
Eastern Cape	Min	3,841	3,770	5,012	4,481
	Max	4,268	4,189	5,569	4,979
	Avg	4,054	3,979	5,291	4,730
National	Avg	4,476	4,393	5,841	5,222

Source: Industry Guide 2007 service unit costs escalated to August 2009

8.3 COMMUNITY SERVICES

8.3.1 Health Services

Health is a mainly provincial and national competence. There is a limited level of involvement of municipalities in delivering health services and this is essentially in the form of Community Health Clinics under municipal jurisdiction.

8.3.1.1 Definition & Purpose of Infrastructure

A Community Health Center (CHC) is the second step in the provision of health care but can also be used for first contact care. A CHC offers similar services to a Provincial Clinic with the addition of a 24 hours maternity service, emergency care and casualty and a short stay ward. The CHC will refer a patient to a District hospital when necessary.

8.3.1.2 Geographical context

It should be sited with due regard to that section of the population most "at risk" – determined by the number of general medical practitioners who can be attracted to work in a building.

8.3.1.3 Basic Service Level and Options

Health center's include the following services:

- Maternity
- Ophthalmic
- Child guidance
- Speech therapy
- Physiotherapy
- Community nursing services
- Health Education
- Accommodation of General Practitioners (GPs)

Relationship to Hospital:

In some circumstances, a health center can be conveniently sited with a hospital – such an arrangement may encourage the joint use of facilities by GP's and hospital staff.

Structure of Healthcare:

Plan is to be consolidated with the different groups or teams, (e.g. GP's, nurses, etc.) which have an identity of their own, but which can share central services such as reception, records, etc.

Size:

At present the average health center accommodates 6 GP's and serving a population of 15 000 (ratio of 1 GP to 2500). This average conceals wide variances between 1 -30GP's, although no general rule can be applied. A more detailed suggested guideline of space allocation and sizes is included in Appendix 4a.

8.3.2 Standards of Construction

Due to the specialist nature of this type of infrastructure, the Department of Health have specific design criteria and guidelines that also need to be met.

The other standards that are applicable are those for construction, being:

- National Building Regulations
- Red Book
- SANS 1200 – All

- NHBRC Home Building Manual – Part 1 – 3
- ISO 1900 – All
- CSIR Standards (will refer to SANS 1200).

8.3.3 Unit Cost

Department of Health is in the final stages of approving a new Integrated Health Planning Framework, which will include planning and budgeting guidelines and details. However, in the absence of a detailed guideline at present, the following guideline (based on actual 2007 costs, escalated to the August 2009 equivalent) has been provided by the KZN DoH on their building cost budgeting.

Table 78: Shows the range of unit costs in Rand/m^2 for the various options of Health Services:

Table 78: Unit Costs – Health Services

Health Services									
Province		Car parking	Main entrance	Reception	Record storage	Administration	Waiting areas	Consulting rooms	Treatment rooms
		R / per m²	R / per m²	R / per m²	R / per m²	R / per m²	R / per m²	R / per m²	R / per m²
Limpopo	Min	8,713	7,688	7,688	7,688	7,688	7,688	7,688	7,688
	Max	9,681	8,542	8,542	8,542	8,542	8,542	8,542	8,542
	Avg	9,197	8,115	8,115	8,115	8,115	8,115	8,115	8,115
Gauteng	Min	7,183	6,338	6,338	6,338	6,338	6,338	6,338	6,338
	Max	7,981	7,042	7,042	7,042	7,042	7,042	7,042	7,042
	Avg	7,582	6,690	6,690	6,690	6,690	6,690	6,690	6,690
North West	Min	8,469	7,472	7,472	7,472	7,472	7,472	7,472	7,472
	Max	9,410	8,303	8,303	8,303	8,303	8,303	8,303	8,303
	Avg	8,939	7,888	7,888	7,888	7,888	7,888	7,888	7,888
Free State	Min	7,542	6,655	6,655	6,655	6,655	6,655	6,655	6,655
	Max	8,380	7,394	7,394	7,394	7,394	7,394	7,394	7,394
	Avg	7,961	7,025	7,025	7,025	7,025	7,025	7,025	7,025
Kwazulu Natal	Min	6,997	6,174	6,174	6,174	6,174	6,174	6,174	6,174
	Max	7,774	6,860	6,860	6,860	6,860	6,860	6,860	6,860
	Avg	7,386	6,517	6,517	6,517	6,517	6,517	6,517	6,517
Mpumalanga	Min	8,368	7,384	7,384	7,384	7,384	7,384	7,384	7,384
	Max	9,298	8,204	8,204	8,204	8,204	8,204	8,204	8,204
	Avg	8,833	7,794	7,794	7,794	7,794	7,794	7,794	7,794
Northern Cape	Min	9,194	8,113	8,113	8,113	8,113	8,113	8,113	8,113
	Max	10,216	9,014	9,014	9,014	9,014	9,014	9,014	9,014
	Avg	9,705	8,563	8,563	8,563	8,563	8,563	8,563	8,563
Western Cape	Min	8,368	7,384	7,384	7,384	7,384	7,384	7,384	7,384
	Max	9,298	8,204	8,204	8,204	8,204	8,204	8,204	8,204
	Avg	8,833	7,794	7,794	7,794	7,794	7,794	7,794	7,794
Eastern Cape	Min	7,255	6,401	6,401	6,401	6,401	6,401	6,401	6,401
	Max	8,061	7,113	7,113	7,113	7,113	7,113	7,113	7,113
	Avg	7,658	6,757	6,757	6,757	6,757	6,757	6,757	6,757
National	Avg	8,455	7,460	7,460	7,460	7,460	7,460	7,460	7,460

Source: Industry Guide 2007 service unit costs escalated to August 2009

8.3.4 Mortuary

There is no substantiation that mortuaries reside under local government, other than from an OHS aspect. The only concrete documentation indicated that mortuaries have been moved from the jurisdiction of the SAPS to Department of Health. (Ref Department of Health, The Official Transfer of Government Forensic Mortuaries from the SAPS to the Department of Health, Minister of Health communiqué 13 April 2006).

This document states: "*Government reviewed the services provided by medico-legal mortuaries or what was called state mortuaries. The service was fragmented and uncoordinated and Cabinet decided to transfer the medico-legal mortuaries to the Department of Health. This will ensure separation and autonomy of forensic services and ensure that a comprehensive service is rendered*".

As from April 2006, the forensic mortuaries have been vested under the authority of provincial Departments of Health, including personnel, equipment and other logistical services. The transfer process will usher, for the first time, the establishment of the country's first comprehensive Forensic Pathology Service.

A Directorate has been established at the National Department to oversee the service."

8.3.5 Multi-Purpose Community Center (MPCC) (GCIS Version)

8.3.5.1 Definition & Purpose of Infrastructure

An MPCC is a 'one-stop', integrated community development center, where community development is of primary importance and community needs are addressed by providing relevant services and information.

8.3.5.2 Geographical context

The identification of an MPCC site should take into consideration:

- Availability of facilities in the area – in which case services should be clustered around these facilities;
- Accessibility and centrality of the MPCC / facilities in the area, as well as meeting the needs of the physically challenged people;
- Availability of transport to the area as well as road infrastructure;
- How clustered or scattered are the communities or households in the area; and
- Problems in reaching facilities in the area, and adjacent or remote communities.

8.3.5.3 Basic Service Level and Options

An MPCC aims to empower communities through the provision of access to information, services and resources from various structures, which amongst others includes government, NGOs, private sector and other initiatives. The following *six block operational model* defines services that should be accommodated at an MPCC.

- Public services (national, provincial and local government services – e.g. sports complex, clinic, home affairs services, municipal services, etc.)
- Economic development services (financial and non-financial services)
- Private sector and community activities (spaza shops, commercial activities, arts and crafts, food gardens, etc.)
- Information and communication activities (content creation, community media, community radio stations, distribution services, etc.)
- Office services (communications services – fax, copiers, telephone, internet, postal services, etc.)
- Education and skills development services (adult basic education and training, computer training, business development skills, etc).

It is however important to indicate that an MPCC will also make provision for a multi- purpose community hall, depending on the availability of a community hall within the community.

In order to ensure that MPCC's are sustainable, it is recommended that municipalities take full ownership and management of MPCC's, while simultaneously ensuring that there is community participation. It is

equally important for municipalities to budget sufficiently for construction or rehabilitation of the infrastructure and to be innovative in the design to meet the communal needs, and to ensure sufficient resources and budget for operation and maintenance of the center.

The following are some of the issues to be considered to ensure sustainability:

- MPCC's should be prioritized in the IDP's and budgeted for;
- To ensure there is a security in all MPCC's, including alarm, burglar doors and windows, fence, etc;
- There should be a center manager who will coordinate and facilitate the day-to-day operations and monitor services rendered and facilitated value addition at MPCC's;
- ICT infrastructure should be taken into consideration during the construction phase;
- Clustering of services as part of costs sharing mechanism and
- Coordination and sharing resources.

8.3.5.4 Standards of Construction

The basic standards that are applicable are those for construction, being:

- National Building Regulations
- Red Book
- SANS 1200 – All
- NHBRC Home Building Manual – Part 1 – 3
- ISO 1900 – All
- CSIR Standards (will also refer you to SANS 1200)

MPCC's are unique and differ from each other depending on the size of the community (number of people) and their needs. A detailed example of a MPCC has been included in Appendix 4b. The following are some of the features that are recommended in an MPCC structure:

- Offices for all service providers as described above in the 6 block operational model;
- A community hall / sports complex;
- Reception area with general service counter;
- A furnished sheltered waiting room for clients;
- Center manager's office;
- Furnished telecommunication/computer center;
- Boardroom for MPCC stakeholders meetings; and
- Parking area.

8.3.5.5 Unit Cost of an MPCC

The recommended area per MPCC should not be less than 600m^2.

Table 79: Shows the range of unit costs (in Rand/600 m^2) for the various options of Multi-Purpose Community Center, as calculated by escalating the Industry Guide 2007 unit costs to the August 2009 equivalent:

Table 79: Unit Cost of facilities in a 600m^2 Multi-Purpose Community Centre

Multi Purpose Community Center									
Province		Offices for all service provider 6m^2	A community hall / sports complex 429m^2	Reception area with general service counter 25m^2	Furnished sheltered waiting room for clients 25m^2	Center managers office 15m^2	Furnished telecomm unication/ computer center 50m^2	Board-room for MCPC stake-holders meetings 50m^2	Parking area 480m^2
		R / unit	R / unit	R / unit	R / unit	R / unit	R / unit	R / unit	R / unit
Limpopo	Min	7,688	9,225,485	184,510	174,259	192,198	1,281,317	854,212	256,263
	Max	8,542	10,250,539	205,011	193,621	213,553	1,423,686	949,124	284,737
	Avg	8,115	9,738,012	194,760	183,940	202,875	1,352,502	901,668	270,500
Gauteng	Min	6,338	7,605,511	152,110	143,660	158,448	1,056,321	704,214	211,264
	Max	7,042	8,450,568	169,011	159,622	176,054	1,173,690	782,460	234,738
	Avg	6,690	8,028,040	160,561	151,641	167,251	1,115,006	743,337	223,001
North West	Min	7,472	8,966,898	179,338	169,375	186,810	1,245,402	830,268	249,080
	Max	8,303	9,963,220	199,264	188,194	207,567	1,383,781	922,520	276,756
	Avg	7,888	9,465,059	189,301	178,784	197,189	1,314,591	876,394	262,918
Free State	Min	6,655	7,985,787	159,716	150,843	166,371	1,109,137	739,425	221,827
	Max	7,394	8,873,096	177,462	167,603	184,856	1,232,375	821,583	246,475
	Avg	7,025	8,429,442	168,589	159,223	175,613	1,170,756	780,504	234,151
Kwazulu Natal	Min	6,174	7,408,583	148,172	139,940	154,345	1,028,970	685,980	205,794
	Max	6,860	8,231,759	164,635	155,489	171,495	1,143,300	762,200	228,660
	Avg	6,517	7,820,171	156,403	147,714	162,920	1,086,135	724,090	217,227
Mpumalanga	Min	7,384	8,860,421	177,208	167,363	184,592	1,230,614	820,409	246,123
	Max	8,204	9,844,912	196,898	185,959	205,102	1,367,349	911,566	273,470
	Avg	7,794	9,352,666	187,053	176,661	194,847	1,298,981	865,988	259,796
Northern Cape	Min	8,113	9,735,054	194,701	183,884	202,814	1,352,091	901,394	270,418
	Max	9,014	10,816,727	216,335	204,316	225,348	1,502,323	1,001,549	300,465
	Avg	8,563	10,275,891	205,518	194,100	214,081	1,427,207	951,471	285,441
Western Cape	Min	7,384	8,860,421	177,208	167,363	184,592	1,230,614	820,409	246,123
	Max	8,204	9,844,912	196,898	185,959	205,102	1,367,349	911,566	273,470
	Avg	7,794	9,352,666	187,053	176,661	194,847	1,298,981	865,988	259,796
Eastern Cape	Min	6,401	7,681,566	153,631	145,096	160,033	1,066,884	711,256	213,377
	Max	7,113	8,535,074	170,701	161,218	177,814	1,185,427	790,285	237,085
	Avg	6,757	8,108,320	162,166	153,157	168,923	1,126,156	750,770	225,231
National	Avg	7,460	8,952,252	179,045	169,098	186,505	1,243,368	828,912	248,674

Source: Industry Guide 2007 service unit costs escalated to August 2009

8.3.6 Multi-Purpose Center/Facility (SRSA Version)

8.3.6.1 Definition & Purpose of Infrastructure

The Building for Sport and Recreation Programme's (BSRP) main focus was the construction of outdoor and indoor facilities and the rehabilitation and upgrading of existing ones. A key element of this programme was the provision of training in facility management, and the implementation of sustainable maintenance projects. The majority of the projects are located in rural poverty nodes.

From 2005/06, the allocation became part of the MIG programme. The SRSA will continue with its policy, advocating and monitoring roles. In accordance with a contract concluded with the SRSA, local authorities own the facilities once they have been completed and are responsible for their maintenance.

In order to address the backlog of amenities and sport facilities in previously disadvantaged communities and rural areas, basic sport facilities should be provided in such areas. These must be multi-use indoor and outdoor facilities which include fields for sports such as football, rugby, cricket, athletics (track and field), baseball, softball, as well as all-weather surface courts for sports such as tennis, basketball, volleyball, netball, and handball depending on the needs of the community.

The **indoor** facilities:

- must be multi-use, provide reasonable seating, and a play surface that is appropriate for multiple activities and marked accordingly;
- should have a minimum clearance of 2 metres on all sides.
- must have male and female ablutions with at least one disability toilet for males and females; and provide access to people with disabilities.
- Should have adequate storage space for equipment and supplies; and
- should also have a supervisor who should be competent at managing sport and recreation programmes.

The **outdoor** facilities:

- must be fenced and grassed (natural or artificial surface);
- must have male and female ablutions with at least one disability toilet for males and females; and provide access to people with disabilities;
- should be adequate storage for equipment and supplies;
- should as an option have, grassed embankments, or seating platforms made from wood, steel or concrete; and
- must have supervision to prevent vandalism and or undesirable usage.

Both indoor and outdoor facilities should have a ticket office, guard house and adequate parking space. These minimum requirements should be read in conjunction with sport specific minimum requirements as outlined in the technical specifications section.

8.3.6.2 Basic level of service

The RDP states that "sporting and recreational facilities are available to all South African communities" and they "should be accessible and affordable for all South Africans, including those in rural areas, the young and the elderly". This also applies to communities having access to municipal administration, a library, local information, pensioner payment points and a hall for community gatherings.

To stretch limited resources further, municipalities should consider combining facilities in centralized community center's, thus avoiding unnecessary duplication. Such facilities include:

- Multi-purpose halls – to serve as a community hall, sports hall, theatre, exposition center and arts and crafts center;
- Secondary halls – to serve as a rates hall, pension's payment hall, activity rooms and clinics;
- Library and other facilities; and
- Shared facilities, including parking, entrance and security, ablution facilities, reception, manager's office, area lighting and fencing, landscaping and plants.

Justifying the provision of a community center

As far as it is fiscally possible, each community should have some facility where the local authority can provide for the needs of that community. The need for a facility should be governed, inter alia, by:

- Availability of facilities in adjacent communities;
- Accessibility of adjacent facilities;
- Availability of transport to more remote communities; and
- Problems in reaching facilities in adjacent or remote communities.

8.3.6.3 Standards of Construction

The basic standards that are applicable are those for construction, being:

- National Building Regulations
- Red Book
- SANS 1200 – All
- NHBRC Home Building Manual – Part 1 – 3
- ISO 1900 – All
- CSIR Standards (will refer to SANS 1200).

In determining the size of the community center, the following should be considered:

- Size of the community, which determines the largest gathering at the facility;
- The minimum size, irrespective of numbers, determined according to the activities likely to take place at the facility; and
- Availability of facilities in adjacent communities for major events.

It is recommended that the minimum size of the multi-purpose area be determined by the largest size required for the most popular recreational activities generally taking place indoors, probably basketball or volleyball. This would require a hall of 30 m x 15-20 m, plus an area for spectators, bags and clothing, which amount to a minimum area of 450-600 m^2. A hall of this size would seat approximately 1 200 to 2500 spectators and would accommodate a wide variety of sporting, recreational, commercial and entertainment activities.

8.3.6.4 Unit Costs

Table 80: Shows the range of unit costs in Rand/ per 400 – 600 m^2 for the various options of Multi-Purpose Center/Facility, as developed from zero-based approach, following breakdown as depicted in Appendix 2:

Table 80: Unit Costs for a 600m^2 Multi Purpose Center / Facility

Multi-Purpose Center/Facility					
Province		Type of facility (seating 1 200 – 2 500 people)	Outdoor	Hall	Sports and recreational hall
		R / 600m^2	R / 600m^2	R / 600m^2	R / 600m^2
Limpopo	Min	4,954,427	3,416,846	4,271,058	6,150,323
	Max	5,504,919	3,796,496	4,745,620	6,833,693
	Avg	5,229,673	3,606,671	4,508,339	6,492,008
Gauteng	Min	4,084,441	2,816,856	3,521,070	5,070,341
	Max	4,538,268	3,129,840	3,912,300	5,633,712
	Avg	4,311,355	2,973,348	3,716,685	5,352,026
North West	Min	4,815,556	3,321,073	4,151,342	5,977,932
	Max	5,350,618	3,690,081	4,612,602	6,642,146
	Avg	5,083,087	3,505,577	4,381,972	6,310,039
Free State	Min	4,288,663	2,957,699	3,697,124	5,323,858
	Max	4,765,181	3,286,332	4,107,915	5,915,398
	Avg	4,526,922	3,122,015	3,902,519	5,619,628
Kwazulu Natal	Min	3,978,683	2,743,920	3,429,899	4,939,055
	Max	4,420,759	3,048,800	3,810,999	5,487,839
	Avg	4,199,721	2,896,360	3,620,449	5,213,447
Mpumalanga	Min	4,758,374	3,281,637	4,102,047	5,906,947
	Max	5,287,082	3,646,264	4,557,830	6,563,274
	Avg	5,022,728	3,463,950	4,329,938	6,235,111
Northern Cape	Min	5,228,085	3,605,576	4,506,970	6,490,036
	Max	5,808,983	4,006,195	5,007,744	7,211,151
	Avg	5,518,534	3,805,885	4,757,357	6,850,594
Western Cape	Min	4,758,374	3,281,637	4,102,047	5,906,947
	Max	5,287,082	3,646,264	4,557,830	6,563,274
	Avg	5,022,728	3,463,950	4,329,938	6,235,111
Eastern Cape	Min	4,125,286	2,845,025	3,556,281	5,121,044
	Max	4,583,651	3,161,138	3,951,423	5,690,049
	Avg	4,354,468	3,003,081	3,753,852	5,405,547
National	Avg	4,807,691	3,315,649	4,144,561	5,968,168

Source: Derived from the Industry Guide 2007, escalated to August 2009.

8.3.7 Sports Infrastructure

For detailed schematics of sizes, please refer to the "Draft Norms and Standards for Sport and Recreation Infrastructure Provision and Management, 30 June 1998" document from Department of Sport and Recreation South Africa.

8.3.7.1 Archery

8.3.7.1.1 Field Specifications

Since teams of archers consist of four archers and since there are never less than two or more than six archers shoot at each target, the minimum length of the field (without spectator facilities) is thus 120 metres and the minimum width of the field ranges from 35 metres. The maximum width of the field may however vary dependant on the number of shooting lanes that are set up.

8.3.7.1.2 Field surfaces

Fields are grassed and are generally set level with a slight sideways gradient to allow for storm water run-off. In general lower earth platforms are compacted to 93 % Modified AASHTO followed by a 50 mm thick layer of course river sand and a 75 mm thick layer of top soil (not compacted) which is then grassed. On larger fields it may be necessary to insert a herring bone sub-soil storm water drainage system.

8.3.7.1.3 Target buttresses

The buttress can be either square or round and must be not less than 1240 mm in any direction to ensure that any arrow just missing the target remains in the buttress. The buttresses are set at an angle of between 12 and 18 degrees and the centre of the target must be 1300 mm above ground level.

8.3.7.1.4 The target

There are two standard target face sizes; 1220 mm diameter to be used for distances between 90 and 60 metre and 800 mm diameter to be used for distances of 50 and 30 metre. The target faces are divided into 5 concentric circles. The zones created by 2 mm thick concentric lines are 61 mm wide on the 1220 mm diameter targets and 40 mm wide on the 800 mm diameter targets.

8.3.7.2 Athletics

8.3.7.2.1 Outdoor track and field specifications

Any firm, uniform and level surface capable of accepting running shoes or spikes may be used for athletics. Where meetings are held under the auspices of the International Amateur Athletics Federation (IAAF), only surfaces sanctioned and constructed to the standards prescribed by the IAAF may be used.

The field that houses the 400 metre oval athletics track has minimum dimensions of 176.91 metre long x 92.52 metre wide. The lanes are a1220 mm wide. Demarcation lines are 50 mm wide and distances are measured from the edge of the starting line to the edge of the finishing line. (See drawing below). Where races are not run in lanes the starting line must be curved to ensure that all runners start at the same distance from the finishing line. Tracks normally consist of 6 - 10 lanes (up to 12 lanes on the „front" straight) and many include a steeple

chase lane with a water pit on one of the turns. The steeple chase pit can be placed on either the inside or the outside of the track.

8.3.7.2.2 Synthetic surfaces

Synthetic surfaces may be either for outdoor or indoor applications and various trade products are available on the commercial markets. Outdoor synthetic surfaces consist of cast in-situ polyurethane materials that are commercially available in various grades:

- Embedded surfaces have a granular surface that allows for greater traction and are available in a number of different coarseness.
- Encapsulated (Abrasion Resistant) surfaces are smoother and offer a greater resistance to abrasion. Again they are available in a number of different coarseness.

8.3.7.2.3 Concrete Substrates

- The sub-surface earth needs to be leveled and compacted to 93 % Modified ASSHTO with a maximum cross slope of 1%.
- Sub-Surface drainage system to be installed below all track surfaces (in terms with Civil Engineering design).
- The sub-surface drainage system is to be connected to a storm water system to ensure proper drainage.
- A 250 micron damp proof layer is to be installed below a 125 mm thick (20 Mega Pascal design strength) concrete surface bed finished smooth to ensure proper adhesion.
- Sealers and curing agents should not be used since these may affect the adhesion of the polyurethane track surface.
- All concrete surfaces need to be dry and dust free prior to the placement of the track surface.
- Since the track surface is poured in-situ, formwork or a suitable kerb needs to be set into the track edges.

8.3.7.2.4 Asphalt Substrates

- The sub-surface earth needs to be levelled and compacted to 93 % Modified ASSHTO with a maximum cross slope of 1%.
- Sub-Surface drainage system to be installed below all track surfaces (in terms with Civil Engineering design).
- The sub-surface drainage system is to be connected to a storm water system to ensure proper drainage.
- A 250 micron damp proof layer is to be installed below a 25 mm thick asphalt carpet finished smooth to ensure proper adhesion.
- All asphalt surfaces need to be dry and dust free prior to the placement of the track surface.
- Since the track surface is poured in-situ, formwork or a suitable kerb needs to be set into the track edges.

8.3.7.2.5 Existing Substrate Surfaces

It is possible to pour the synthetic surfaces over existing surfaces, they do however, need to be thoroughly cleaned; paint, grease, oils, hydraulic type fluids and all loose particles have to be removed to ensure proper adhesion.

8.3.7.2.6 Indoor track and field

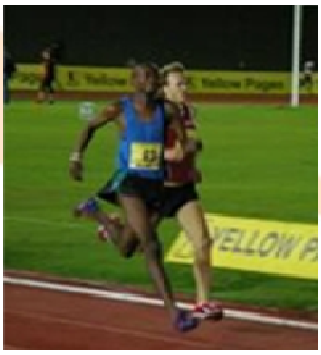
- Most indoor tracks are 200 metres and consist of 1 - 6 lanes. Track lengths may vary however, from 120 metres to lengths of up to 300 metres. The 300 metre lengths are not considered valid for setting indoor records. Often an indoor track will have banked turns to compensate for the tight turns.
- In an indoor track meeting athletes contest the same track events as at the outdoor meetings, with the exception of the 100 metre sprints and 100/110 metre hurdles events that are replaced by the 55 - 60 metre sprints and 55 - 60 metre hurdles. In field events, indoor meetings only feature high jump, long jump, pole vault, triple jump and shot put. Due to space limitations, discus, hammer throw and javelin throw events are not included in indoor events.

8.3.7.2.7 Indoor synthetic surfaces

As with outdoor synthetic surfaces, indoor surfaces are available in various grades and colours:

- Micro-Encapsulated surfaces have a granular surface that allows for greater traction and are available in a number of different coarseness.
- Encapsulated (Abrasion Resistant) surfaces are smoother and offer a greater resistance to abrasion. Again they are available in a number of different coarseness.
- Sharkskin surfaces are smooth and are used for multi-purpose facilities. CONCRETE SUBSTRATES

- The sub-surface earth needs to be levelled and compacted to 93 % Modified ASSHTO with a maximum cross slope of 1%.
- A 250 micron damp proof layer is to be installed below a minimum thickness of 100 mm thick (20 Mega Pascal design strength) concrete surface bed finished smooth to ensure proper adhesion.
- Sealers and curing agents should not be used since these may affect the adhesion of the polyurethane track surface.
- All concrete surfaces need to be dry and dust free prior to the placement of the track surface.
- Since the track surface is poured in-situ, formwork or a suitable kerb needs to be set into the track edges.



8.3.7.3 Baseball

8.3.7.3.1 Construction of playing field

The general specification of the sub-surface may vary dependant on site conditions and should be in terms with a Civil Engineers specifications. The general specification may, however, be described as follows:

- Remove all topsoil. Remove all topsoil and level earth platform to correct site development levels with particular emphasis on natural sub-soil drainage.
- Rip and compact in-situ earth to 93 % modified AASHTO.
- Install sub-surface drainage comprising 110 mm diameter agricultural drains
- placed in 450 x 600 mm deep herring bone drainage system at 6 metre intervals and to entire perimeter of the field.
- Sub-surface drains to be lined with a “Bidum” Hessian layer and filled in with 19 mm crusher run stone. Sub-Surface drains to connect at the lowest point to a storm water catch pit which should be connected to a storm water main.
- The sub-surface drains are then covered with a 100 mm thick layer of crusher
- run to assist in the sub-surface drainage (Optional layer dependant on the
- drainage characteristics of the in-situ soil). The crusher run layer is levelled, lightly compacted and covered with a 25 mm thick layer of course river sand.
- Import, spread and level 100 mm thick layer of weed free top soil and compact lightly.
- Fertilise soil as per chemical soil analysis and grass with either Kikuyu grass or alternatively with “Golfing Green” grass.
- Once the grass is established, top dress.
- Cover grass with thin layer of sieved top soil to a depth of not more than 15 mm over the grass and smooth.
- Water daily or as may be required.
- Regular soil tests should be taken to ensure that the correct fertilisation program is carried out.

- Grass matting should be avoided and always controlled by vertical cutting. Length of grass should never be longer than 15 mm when played on.

8.3.7.3.2 THE MOUND

The mound is constructed out of compacted earth with the following dimensions:

- 5.5 Metre diameter mound of earth no higher than 254 mm above the general playing field.

8.3.7.4 Basketball

8.3.7.4.1 The court

- The court must have a hard surface (not grass) and be 29.0 metres long and 15 metres wide. (See Drawing Below). Although the length may vary by two metres and it"s width by one metre, the proportions must be retained (See Drawing Below). If situated indoors, the ceiling should be at least 7.0 metres high.
- The court is divided into two equal halves with centre dividing line. The centre circle has a radius of 1.80 metre and a free throw line is drawn 5.90 metre from the end line. The

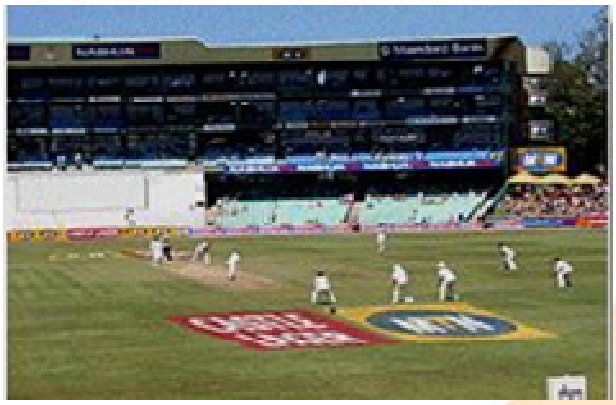
8.3.7.4.2 The backboard

- There must be a 1800 mm wide and 1200 mm high backboard at each end of the court. It must be made of wood or a suitable transparent material. The front of the board is flat and unless it is transparent it is finished in a white colour.

8.3.7.4.3 The rings

- The rings, through which goals are scored, are 450 mm in inner diameter and should be attached horizontally to the backboards at a height of 3.05 metre above the floor. The inside edge of the ring must be 150 mm away from the face of the backboard. The net attached to the ring must be 400 mm long.

8.3.7.5 Cricket



Cricket is a bat-and-ball game played by two teams consisting of eleven players per team each with a twelfth man who is a fielding reserve. A cricket match is played on a grass field in the centre of which is a cricket pitch which has wickets placed at either end.

8.3.7.5.1 The pitch

The pitch is located in the centre of the playing field and its width is 1.52 metre to either side of the centre line joining the wicket"s centre stump. The length between the two sets of wickets at either end of the pitch is 20.12 metre (22 yards) with an additional 1220 mm recommended on either side as part of the Bowler"s run up. There may be more than one pitch placed next to each other and is referred to as "The Square". Pitches may also be constructed out of concrete and covered with either a coir mat or artificial turf (usually played on by junior players).

8.3.7.5.2 The outfield

The boundaries of the field are a minimum of 130.00 metres square of the pitch. The pitch should be a minimum of 55.00 metres from one of the boundaries square of the pitch. When this minimum distance is used the pitch has to be a minimum of 73 metre from the opposite square boundary. The straight boundary at both ends of the pitch shall be a minimum of 55.00 metre from the centre of the pitch.

The boundary should be marked by a white line, a rope laid on the ground or a boundary fence. If only flags or posts are used an imaginary line joining the flags or posts is regarded as the boundary.

8.3.7.5.3 Sight screens

Sight screens are placed on opposite sides of the field behind the bowlers bowling arm to assist the batsmen in seeing the ball. The sight screens may be fixed or moveable and should be high enough so that the ball is visible below the top of the screen, from the batsman' s point of view, at point of the delivery of the ball by the bowler. The sights screens should thus be at least 4.0 metres high and if fixed, must project at least one pitch width beyond either side of the "Square". The sight screens may be constructed out of various materials but should be painted white for day games and covered with a black material for games played under lights during the evening (When a white ball is used for play).

8.3.7.6 Football (Soccer)

Football is a ball game where two teams of eleven players each, kick of a ball in an attempt to score a goal. The game may be played either indoors (See Multi-Purpose Halls) or outdoors on a rectangular playing field that may not be longer than 120 metres and not shorter than 90 metres and it may not be more than 90 metres or less than 45 metres wide.

The field must be clearly marked with lines that are wider than 120 mm. A halfway line is marked across the centre of the field. A suitable mark indicating the centre of the field is surrounded by a circle with a radius of 1500 mm. Penalty areas, in front of the goal posts, are also marked at each end of the field (See Drawing Below).
Flags are placed at each corner on a post not less than 1500 mm high. Similar flags are placed opposite the halfway line on each side of the field of play and not less than 1.00 metre outside the touch line.

8.3.7.6.1 Goal area

- Two lines are drawn at right angles to the goal line, 5.50 metre from each goal post. These lines extend into the field for 5.50 metre and are joined by a line drawn parallel with the goal line. The space enclosed by these lines is referred to as the goal area.

8.3.7.6.2 Penalty area

- Two lines are drawn at right angles to the goal line, 16.50 metre from each goal post and are joined by a line drawn parallel with the goal line. The penalty spot is drawn 11 metre from the centre of the goal line. Using the penalty as a centre, an arc of a circle with a radius of 9.15 metre is drawn outside the penalty area.

8.3.7.6.3 Corner area

- A quadrant with a radius of 900 mm is drawn from each corner post.

8.3.7.6.4 Goal posts

- The goal posts are 7.32 metre apart (internal dimensions) and are joined by a horizontal cross bar situated 2.64 metre (internal dimension) above the playing field level. The posts and the crossbar must be the same width as the goal line. Nets giving the goalkeeper ample room may be fixed to the rear and the sides of the goal posts. The nets are generally manufactured out of 40 mm rectangular nylon netting.

8.3.7.6.5 INDOOR FOOTBALL FACILITIES

For details of indoor football facilities see Multi-Purpose Hall specifications elsewhere in this document.

8.3.7.7 Hockey

Hockey is played on fields that may be grassed, sand-based artificial surfaces or water-based artificial surfaces. The field is rectangular 91.40 metres long and 55 metres wide. The longer lines are called sidelines and the shorter lines are called back lines. The goal-line is part of the back line.

8.3.7.7.1 Flagposts

Flag posts 1200 - 1500 mm high are placed at each corner of the field and at the centre line 910 mm outside the sidelines.

8.3.7.7.2 Shooting circles

A line 3.66 metre long is drawn in front of each goal, parallel to and 14.63 metre from the back line. This line is continued in both directions to meet the back line by quadrants which have the nearest inside corner of the goal-post as their centre.

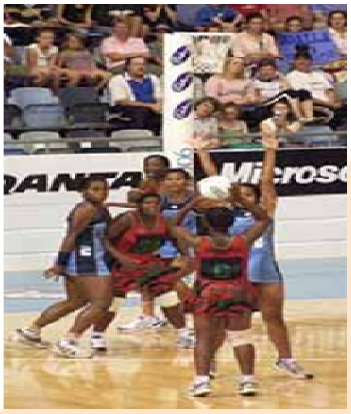
8.3.7.7.3 ARTIFICIAL SURFACES

- Artificial turf is a man-made surface manufactured from synthetic materials, made to look like natural grass.
- There are three different types of artificial grass surfaces used in hockey:
    - Unfilled: Often called water-based where the pile is not filled with sand and the field requires wetting prior to play dependant on climatic conditions. These surfaces are favoured by players as they minimise the abrasive effect created by the sand filling that the other systems require.

- Sand Dressed: The pile of the carpet is filled to within 5 - 8 mm of the top of the fibre with fine sand.
- Sand Filled: The pile of the carpet is filled to the top with sand. The sand makes the field rougher and harder. In comparison to the other two systems, the ball speed is much slower.

- **Concrete substrates**
  - The sub-surface earth needs to be levelled and compacted to 95 % Modified ASSHTO with a maximum cross slope of 1%
  - Sub-Surface drainage system to be installed below all field surfaces (in terms with Civil Engineering design).
  - Install sub-surface drainage comprising 110 mm diameter agricultural drains placed in 450 x 600 mm deep herring bone drainage system at 6 metre intervals and to entire perimeter of the cricket field.
  - Sub-surface drains to be lined with a "Bidum" Hessian layer and filled in with 19 mm crusher run stone.
  - Sub-Surface drains to connect at the lowest point to a storm water catch pit which should be connected to a storm water main.
  - The sub-surface drains are then covered with a 100 mm thick layer of crusher run to assist in the sub-surface drainage.
  - The sub-surface drainage system is to be connected to a storm water system to ensure proper drainage.
  - A 250 micron damp proof layer is to be installed below a 125 mm thick (20 Mega Pascal design strength) concrete surface bed finished smooth to ensure proper adhesion.
  - Sealers and curing agents should not be used since these may affect the adhesion of the artificial grass surface.
  - All concrete surfaces need to be dry and dust free prior to the placement of the track surface.
  - A 25 mm thick cement levelling screed needs to be placed to true and smooth levels.
  - Any level defects are to be filled in to ensure a smooth and even finish. Any projections will damage the artificial grass carpet when subjected to use.

8.3.7.8 Netball



8.3.7.8.1 The court

The court is 30.5 metres long and 15.25 metres wide and is divided into thirds. There is a centre circle with a diameter of 900 mm and two goal circles which are semi-circles measuring 4.9 metres in radius. All lines
are part of the court and measure 50 mm in width.

The goal posts are placed mid point on each goal line and measure 3.05 metre in height. The goal rings have an internal diameter of 380 mm. The goal rings project horizontally from the post on a single attachment measuring 150 mm.

8.3.7.9 Squash

The dimensions for the two types of court are as follows:

- Singles court - The plan dimensions of the singles court, measured 1 metre above finished floor level, shall be:
  - Length: 9,750 mm plus or minus 10 mm
  - Width: 6,400 mm plus or minus 10 mm
  - Diagonals: 11,665 mm plus or minus 25 mm
  - Height above floor to lower edge of Front Wall Line 4570 mm
  - Height above floor to lower edge of Back Wall Line 2130 mm
  - Height above floor to lower edge of Service Line on the Front Wall 1780 mm
  - Height above floor to upper edge of Board 480 mm
  - Distance to nearest edge of Short Line from Back Wall 4260 mm
  - Internal dimensions of Service Box 1600 mm

- Width of all line and the Board 50 mm

- Doubles court - The plan dimensions of the doubles court, measured 1 metre above finished floor level, shall be:

  - Length: 9,750 mm plus or minus 10 mm
  - Width: 7,620 mm plus or minus 10 mm
  - Diagonals: 12,375 mm plus or minus 25 mm
  - Height above floor to lower edge of Front Wall Line
  - Height above floor to lower edge of Back Wall Line Height above floor to lower edge of Service Line on the Front Wall
  - Height above floor to upper edge of Board
  - Distance to nearest edge of Short Line from Back Wall Internal dimensions of Service Box 4570 mm

8.3.7.10 Swimming

For purposes of public swimming pools the pools may be classified into the following categories:

- **Competition pools**
  - Competition pools may be indoor or outdoor 8 lane pools, heated all year round with regulations regarding water temperature, anti-turbulent lane lines, starter blocks and backstroke flags.
  - Olympic standard length is 50 metre and with a width of at least 25 metre. The lanes are numbered 1 - 8, with individual lane widths of 2.50 metres wide and a space of at least 2.0 metre is to be provided on the outside of lanes 1 and 8. The minimum water temperature for competition is 26 degrees.
  - Starting platforms must be used for all races in all styles other than backstroke. The starting platforms are covered with a non-slip material and bear the lane number on all four sides. They must have a surface platform of at least 500 x 500 mm and 500 - 700mm above the water level. The overall depth of an Olympic standard pool is 2.00 metre.

- **Regional swimming pools**
  - These swimming pools are designed to dimensions, which will be in multiples of the Olympic standard length for competitive swimming of 50 metre, for example for the pool length to be one of the following and consist of 8 lanes: (16.66 metre, 25.00 metre, 33.33 metre, or 50 metre).
  - The overall depth of the regional swimming pool is 2.00 metre.
  - These pools will be in a position to accommodate swimming clubs who may then be able to make use of the facilities for water polo, diving, lifesaving events, competitions, etc.

- **Neighbourhood swimming pools**
  - These swimming pools are mainly recreational and are not designed/ used by clubs for championships or competitions but may at times be used for a gala (School or other), if gala equipped. They therefore do not have to conform to any standard of dimensions and do not have to follow the hours of operation set for Competition and Regional swimming pools.
  - The maximum depth of the recreational swimming pool is generally more than 1.50 metre.

- **District swimming pools**
  - District swimming pools are admission free, these pools are of various shapes and sizes as they intended for recreational purposes only and therefore are not governed by any standards or set dimensions.
  - However, the most widely used design for the district swimming pool has been the rectangular shape and the design of the modern district swimming pool is rectangular to half Olympic standard length of 25 metre with a maximum depth of 1.50 metre.

8.3.7.11 Tennis

Tennis is played on a rectangular flat surface, usually on grass, clay, concrete (hard court) or a synthetic suspended court. The court is 23.77m long and its width is 8.23m for singles matches and 10.97m for doubles matches.

Additional clear space around the court is needed in order for players to reach overrun balls for a total of 18.288 m wide and 36.576 m long. A net is stretched across the full width of the court, parallel with the baselines, dividing it into two equal ends. The net is 1.07 metre high at the posts and 914mm high in the center. The court on the right side of each player is called the deuce court, while the left side is called the ad court (short for „advantage court‟)

8.3.7.11.1 Types of tennis courts

There are four main types of courts depending on the materials used for the court surface: *clay courts, hard courts, grass courts and indoor courts (carpet, rubber or wood).* Each playing surface has its own characteristics which affects the playing style of the game.

- ***Hard Courts***
  Hard courts, usually made of cement or asphalt, are considered “medium” to “fast” surfaces, where fast hard-hitting players have a slight advantage. Hard courts can vary in speed, but they are faster than clay and slower than grass courts, which allow the ball to slide.

- ***Grass Courts***
  Grass courts are the fastest type of tennis courts in common use (Astro Turf is faster but is primarily only used for personal courts). They consist of grass grown on very hard-packed soil, similar to golf greens, which adds an additional variable bounce.

- ***Clay Court***
  A clay court is one of the four different types of tennis court. Clay courts are made of crushed shale, stone or brick. The red clay is slower than the green, or Har-Tru “American” clay. The French Open uses clay courts, making it unique among the Grand

8.3.7.11.2 Tennis court dimensions

- **The net**
  The net is suspended from a cord or metal cable held over two posts. The posts must be 1.07 metre high and positioned 914 mm outside the centre of the doubles sidelines. The net must be 914 mm high at the centre, where it must be kept taut by a white strap that may not be wider than 50 mm. A white band at the top of the net covers the cord or cable and must extend between 50 and 63 mm down on each side of the net.
- **Playing lines**
  The outside dimensions of the playing lines should be as follows:
  - Doubles: 23.77 metre x 10.97 metre
  - Singles: 23.77 metre x 8.23 metre

Table 81: Unit Costs – Summary of Sports Infrastructure

SPORT INFRASTUCTURE TYPE	GAUTENG - Witwatersrand	EASTERN CAPE - Port Elizabeth	FREE STATE - Bloemfontein	KWAZULU-NATAL - Durban	LIMPOPO - Polokwane	MPUMALANGA - Nelspruit	NORTHERN CAPE - Kimberley	NORTH WEST	WESTERN CAPE - Cape Peninsula
Athletic Track	5,650,030.93	5,695,346.04	5,929,985.49	6,159,625.14	6,826,695.00	6,849,627.97	7,241,784.29	6,667,673.58	6,589,850.71
Baseball Diamond	2,098,147.39	2,114,975.22	2,202,108.93	2,287,385.96	2,535,103.34	2,543,619.53	2,689,247.37	2,476,050.50	2,447,150.86
Basketball Hard Court	220,856.98	222,628.33	231,800.27	240,776.77	266,852.21	267,748.65	283,077.85	260,636.14	257,594.08
Bowling Green	402,560.06	405,788.72	422,506.59	438,868.23	486,396.41	488,030.36	515,971.18	475,066.26	469,521.45
Elevated Boxing Ring	189,784.73	191,306.87	199,188.42	206,902.02	229,308.92	230,079.24	243,251.78	223,967.39	221,353.31
Cricket Field	4,509,799.83	4,545,969.92	4,733,256.84	4,916,552.99	5,449,001.67	5,467,306.54	5,780,321.91	5,322,072.32	5,259,954.86
Football Field	1,920,680.03	1,936,084.52	2,015,848.20	2,093,912.25	2,320,676.98	2,328,472.85	2,461,783.07	2,266,619.00	2,240,163.78
Grassed Hockey Field	1,159,031.24	1,168,327.06	1,216,460.32	1,263,567.95	1,400,408.76	1,405,113.16	1,485,558.99	1,367,787.56	1,351,823.19
Korfball	266,609.59	268,747.89	279,819.89	290,655.96	322,133.17	323,215.32	341,720.11	314,629.38	310,957.13
Netball Hard Court	208,784.74	210,459.26	219,129.86	227,615.70	252,265.83	253,113.27	267,604.56	246,389.53	243,513.76
Rugby Field	1,847,203.11	1,862,018.29	1,938,730.56	2,013,808.22	2,231,897.91	2,239,395.54	2,367,605.88	2,179,907.95	2,154,464.79
Tennis Hard Court	202,287.49	203,909.91	212,310.68	220,532.44	244,415.48	245,236.55	259,276.88	238,722.05	235,935.77
Softball Diamond	2,098,147.39	2,114,975.22	2,202,108.93	2,287,385.96	2,535,103.34	2,543,619.53	2,689,247.37	2,476,050.50	2,447,150.86
Swimming Pool	2,784,414.50	2,806,746.43	2,922,380.04	3,035,549.68	3,364,291.07	3,375,592.76	3,568,852.89	3,285,923.08	3,247,570.88
Multi-Purpose Sports Hall	7,809,677.57	7,872,313.76	8,196,640.91	8,514,057.16	9,436,105.30	9,467,804.08	10,009,856.77	9,216,300.13	9,108,730.55

Source: Derived unit costs from SRSA, "Norms and Standards for Sport and Recreation Infrastructure Provision and Management (draft published 30 June 2008)", escalated to August 2009.

Note:
1. It was assumed that the original unit costs were determined for Gauteng, and provincial factors were used to provide a regional cost perspective;
2. The above unit costs include P&G's and is escalated to August 2009, but excludes contingency allowances, professional fees and VAT.

8.3.8 Parks and Open Spaces

8.3.8.1 Definition & Purpose of Infrastructure

A park is any piece of land controlled and maintained by a municipal council for public use. The two broad definitions of parks are:

a) Any land, square, camping site, swimming, bath, beach, bathing area, sports fields, public resorts, public open space, recreation site, river, nature reserve, hiking trail, including any portion hereof any facility or apparatus therein or thereon but excluding any public road or street.

b) Any building, structure, hall, room or office including any part thereof and any facility or apparatus therein which is the property of or is possessed, controlled or leased by a municipal council and to which the general public has access, whether on payment of admission fees or not.

8.3.8.2 Basic Service Level and Options

Ablution facilities may be provided at a cost that will be determined by the size of the facility.

8.3.8.3 Standards of Construction

The basic standards that are applicable are those for construction, being:

- National Building Regulations
- Red Book
- SANS 1200 – All
- NHBRC Home Building Manual – Part 1 – 3
- ISO 1900 – All
- CSIR Standards (will refer to SANS 1200)
- GFSH-10 - Design and construction of Engineering Services - Oct 2002 in relation to muni-services.

8.3.8.4 Unit Cost

Table 82: Shows the range of unit costs in Rand for the various options of Parks and Open spaces, escalated to August 2009:

Table 82: Unit Costs – Parks and Open Spaces

Parks and Open spaces						
Province		Earthworks	Grassing	Irrigation	Ablution facility	Fencing 1,8m high concrete palisade fencing
		R / per m²	R / per m²	R / per m²	R / per m²	R / m
Limpopo	Min	6	27	26	7,688	769
	Max	7	30	29	8,542	854
	Avg	6	29	27	8,115	812
Gauteng	Min	5	23	21	6,338	634
	Max	5	25	24	7,042	704
	Avg	5	24	22	6,690	669
North West	Min	6	27	25	7,472	747
	Max	6	30	28	8,303	830
	Avg	6	28	26	7,888	789
Free State	Min	5	24	22	6,655	665
	Max	6	26	25	7,394	739
	Avg	5	25	23	7,025	702
Kwazulu Natal	Min	5	22	21	6,174	617
	Max	5	24	23	6,860	686
	Avg	5	23	22	6,517	652
Mpumalanga	Min	6	26	25	7,384	738
	Max	6	29	28	8,204	820
	Avg	6	28	26	7,794	779
Northern Cape	Min	6	29	27	8,113	811
	Max	7	32	30	9,014	901
	Avg	7	30	29	8,563	856
Western Cape	Min	6	26	25	7,384	738
	Max	6	29	28	8,204	820
	Avg	6	28	26	7,794	779
Eastern Cape	Min	5	23	21	6,401	640
	Max	6	25	24	7,113	711
	Avg	5	24	23	6,757	676
National	Avg	6	27	25	7,460	746

Source: Derived from the Industry Guide 2007, escalated to August 2009.

8.3.9 Beaches and Amusement Facilities

8.3.9.1 Definition & Purpose of Infrastructure

Beaches are defined in section 1 of the Sea Shore Act of 1935 (Act 21 of 1935) and include an area adjoining the high-water mark.

8.3.9.2 Basic Service Level and Options

Where a beach and amusement facilities are in a poor area, access to basic water, sanitation and refuse removal must be provided.

8.3.9.3 Standards of Construction

The basic standards that are applicable are those for construction, being:

- National Building Regulations
- Red Book
- SANS 1200 – All
- NHBRC Home Building Manual – Part 1 – 3
- ISO 1900 – All
- CSIR Standards (will refer to SANS 1200)
- GFSH-10 - Design and construction of Engineering Services - Oct 2002 in relation to muni-services

8.3.10 Cemeteries

8.3.10.1 Definition & Purpose of Infrastructure

A cemetery is defined as a burial-ground, especially a large landscaped park or ground laid out expressly for the deposition or interment of the dead, not being a churchyard attached to a place of worship.

Cemeteries are an emotional issue and are subject to many cultural preferences within communities that should be fully understood before such facilities are designed. Suitable recognition must be given to the health hazard potential of a cemetery and as such and the need for a comprehensive cemetery site investigation should also be recognized.

A comprehensive investigation is essential to ensure that the preferences and attitudes of the beneficiary community are addressed and that a cemetery of the correct size will be established before land is acquired or developed.

8.3.10.2 Geographical context

Cemetery capacity should be available (at a maximum distance of 30 km for urban and 50 km for rural communities) to all communities of sufficient size to warrant such a facility The need for a facility should be governed, inter alia, by:

- Mortality rate of beneficiary and adjacent communities;
- Population growth of beneficiary and adjacent communities;
- Age distribution of beneficiary and adjacent communities;
- Availability of existing cemetery capacity to beneficiary and adjacent communities;
- Accessibility of adjacent facilities;
- Availability of transport or more remote facilities; and
- Problems in reaching facilities in adjacent or more remote communities.

Four different types of cemeteries are applicable, being:

1. Places of burial
2. Local cemetery
3. Regional cemetery
4. Memorial parks

These are discussed below in greater detail.

8.3.10.3 Basic Service Level and Options

8.3.10.3.1 Places of burial: Below basic level of service:

It has been found that there a number of "below basic" places of burial have developed, mainly in rural and outskirts of urban areas. Such facilities are often in contravention of basic safety and health regulations.

These "cemeteries" have no facilities and basically consist of open pieces of land earmarked for burial purposes, with no fencing and no buildings. Road infrastructure, if any, is limited.

Cemeteries of this type are operated below the basic level of service. Graves are often not numbered and sometimes there is no formal burial register. Of note is that MIG is not funding LOS below the defined minimum level of service, but that MIG is funding the upgrading of such "service" to a minimum LOS. It is therefore, recommended that funding be limited to ensuring upgrading of the facilities to an acceptable basic safety and environmental health standard, on condition that no further development is allowed. Alternatively, in the event where it can be shown that the rehabilitated cemetery complies with all codes and can similarly accommodate expansion, should such further expansion be supported. It is envisaged that the rehabilitation will in all probability be substantially more expensive that the building of new facilities to code.

8.3.10.3.2 Local Cemetery: Basic level of service:

A local cemetery provides burial capacity for a suburb, township or town at a basic, medium or high level of service, as required by the community and developed by the municipality concerned.

At a basic level of service, these cemeteries should have access roads and internal distributor roads, parking areas, public toilets, showers for workers (where applicable), security fencing and a security gate.

Operation of local cemeteries should entail the formulation of and adherence to cemetery Bylaws, formulating tariffs, staking out grave plots, providing graves on time, as required, maintaining a map of graves and keeping a burial register.

8.3.10.3.3 Local Cemetery: Higher level of service

At higher service levels, facilities such as administrative buildings, drinking fountains, paved roads, shelters, a wall of remembrance, landscaping, a caretaker's house/shelter, various different sections (e.g. a lawn section, a berm section and a monumental section) should be added.

Maintenance and operation of the cemetery increases and becomes more specialized since more effort is required and service provision is also at a higher level, with staff manning the site during working hours and over the weekends.

8.3.10.4 Regional cemetery: Intermediate level of service:

A regional cemetery can be similar to a local cemetery, as described above, except that it serves more than one community and therefore may need to meet diverse needs of the various communities. Regional cemeteries could be justified by economies of scale, with savings on buildings, access roads, and other facilities and on planning, design, development and operation and maintenance costs.

The provision of a crematorium may even be justified. Agreement should be reached between participating municipalities concerning the development, ownership, management, operation and maintenance of the cemetery.

8.3.10.5 Memorial parks: Highest level of service:

Memorial parks are highly specialized cemeteries that cater for every need and desire of the communities they serve. Memorial parks should have a park-like atmosphere, providing a tranquil ambience. Memorial parks are provided mostly on a public-private partnership basis, or they may be fully privatized.

8.3.10.6 Standards of Construction

There are a number of general principles to be followed when a cemetery is sited. Some municipalities might have their own Bylaws controlling the site allocation for cemeteries and all other applicable regulations shall also be followed in this regard.

In general the location of cemeteries shall be dictated by the following factors:

- Topography,
- Soil and geo-technical conditions,
- Hydrology,
- Religious beliefs,
- Social attitudes,
- Aesthetic considerations,
- Sanitary, and
- Environmental considerations.

A number of these considerations will depend on the specific community that is served by the cemetery and the most important engineering aspects are discussed below:

- Cemeteries should be located in areas that do not fall below the 1:100 year flood line and shall as far as possible should not be subject to the possibility of flooding.
- The soil should be of such nature that it can be excavated by hand or a back-actor without undue difficulty. The soil should be stable to prevent for sidewall collapse after excavation.
- The soil must also have sufficient workability to allow for the easy backfilling of the grave.
- The cemetery should be arranged such that a maximum of two rows of graves are placed between vehicle lanes to allow for easy access to any grave. The suggested size per grave plot is 2,50m length by 1,50m width and 1.8 m depth.
- The cemetery should not be located in an area with a high or perched water table and water table shall preferably be more than 5m below the bottom of the grave. It is also preferable that the soil has a low permeability to prevent the leaching of water from the grave into the groundwater.
- The cemetery must also be fenced to prevent illegal access for vandals to the graves. A 1,2m high stock fence is suggested as a minimum level of fencing, however, a palisade fence will be a more preferable and secure option.

The basic standards that are applicable are those for construction, being:

- National Building Regulations
- Red Book
- SANS 1200 – All
- NHBRC Home Building Manual – Part 1 – 3
- ISO 1900 – All
- CSIR Standards (will refer to SANS 1200)
- GFSH-10 - Design and construction of Engineering Services - Oct 2002 in relation to municipal-services

Determining the minimum required size of cemetery sites
Tumagole (ref x) provides detailed selection criteria and methodology to be followed in selecting a cemetery. It is remarked that "the size of a cemetery is very often limited by the non-availability of suitable conditions, especially in areas characterized by dense drainage networks and where shallow bedrock or shallow water tables are prevalent. However, from an economic point of view, a minimum-sized unit should be defined to justify an engineering geological or geotechnical investigation of this nature.

Considering factors such as the cost and time spent on an investigation as well as the period before implementation, a minimum continuous area of at least two to three hectare (20 000 to 30 000 m^2) is recommended for investigator purposes. However, when considering the intended lifespan of the cemetery, factors such as the total population, mortality rate and projected growth rate of a community should be included before an appropriate size is concluded.

A further point to consider is the question of convenience. A perfectly sited cemetery from a technical point of view may be offset by its distance from the community that it serves. Technical suitability should take precedence, but where possible, compromises are encouraged to ensure that proposed sites are utilized."

The standard recommendation is a plot of 0,15 ha should be provided per 1 000 head of the average population for the life of the cemetery, which should be calculated for a 30-year period and for development in three 10-year phases.

The following facilities are recommended for the full 30-year period, at a basic level of service:

- A 6 m wide paved access road, to a maximum of 100 m in length;
- A 4 m graveled internal distributor;
- An administration block;
- Flush toilets for the public if services are available to the site selected (If services are not available, VIPs should be provided);
- Ablution facilities for workers, including showers, wash-basins and toilets;
- Water for ablution facilities and toilets (other water connections, e.g. for watering lawns, should be provided in the buildings, for supervision and control);
- Storage space for equipment;
- A parking area;
- Shelter; and
- Security fencing (determined by outer boundaries, based on the required size plus a percentage for unusable area).

8.3.10.7 Unit costs

The cost of provision is usually recovered from users by selling graves at a fixed tariff to residents and at a much higher tariff to non-residents. This is because it is often a subsidized service.

Table 83: Shows the range of unit costs in Rand for the various options of cemeteries, as developed from zero-based approach, following breakdown as depicted in Appendix 2:

Table 83: Unit Costs - Cemeteries

Cemeteries					
Province		Basic level of service	Higher level of service	Intermediate level of service: Regional cemetery	Highest level of service: Memorial parks
		R / per m²	R / per m²	R / per m²	R / per m²
Limpopo	Min	1,793,844	4,100,216	3,075,162	8,542,116
	Max	1,993,160	4,555,795	3,416,846	9,491,240
	Avg	1,893,502	4,328,005	3,246,004	9,016,678
Gauteng	Min	1,478,849	3,380,227	2,535,170	7,042,140
	Max	1,643,166	3,755,808	2,816,856	7,824,600
	Avg	1,561,008	3,568,018	2,676,013	7,433,370
North West	Min	1,743,563	3,985,288	2,988,966	8,302,683
	Max	1,937,293	4,428,098	3,321,073	9,225,203
	Avg	1,840,428	4,206,693	3,155,020	8,763,943
Free State	Min	1,552,792	3,549,239	2,661,929	7,394,247
	Max	1,725,324	3,943,598	2,957,699	8,215,830
	Avg	1,639,058	3,746,418	2,809,814	7,805,039
Kwazulu Natal	Min	1,440,558	3,292,703	2,469,528	6,859,799
	Max	1,600,620	3,658,559	2,743,920	7,621,999
	Avg	1,520,589	3,475,631	2,606,724	7,240,899
Mpumalanga	Min	1,722,860	3,937,965	2,953,474	8,204,093
	Max	1,914,288	4,375,516	3,281,637	9,115,659
	Avg	1,818,574	4,156,741	3,117,555	8,659,876
Northern Cape	Min	1,892,927	4,326,691	3,245,018	9,013,939
	Max	2,103,252	4,807,434	3,605,576	10,015,488
	Avg	1,998,090	4,567,063	3,425,297	9,514,714
Western Cape	Min	1,722,860	3,937,965	2,953,474	8,204,093
	Max	1,914,288	4,375,516	3,281,637	9,115,659
	Avg	1,818,574	4,156,741	3,117,555	8,659,876
Eastern Cape	Min	1,493,638	3,414,029	2,560,522	7,112,561
	Max	1,659,598	3,793,366	2,845,025	7,902,846
	Avg	1,576,618	3,603,698	2,702,773	7,507,704
National	Avg	1,740,716	3,978,779	2,984,084	8,289,122

Source: Derived from the Industry Guide 2007, escalated to August 2009.

8.3.11 Crematoriums

8.3.11.1 Definition & Purpose of Infrastructure

A .crematorium' means any building fitted with appliances for cremation, including everything essential, incidental or ancillary thereto and includes any structure which in any special circumstances.

8.3.11.2 Geographical Context

There are a number of general principles to be considered when a crematorium is conceptualized and planned. Some municipalities might have their own Bylaws controlling the site allocation for crematoriums, but all other applicable regulations shall also be followed in this regard. In general, the location of crematoriums shall be dictated by topography, soil and geo-technical conditions, religious beliefs, social attitudes, aesthetic and sanitary considerations.

8.3.11.3 Basic Level of Service & Options

There is no prescription as to a basic level of service. The table below Table 8.2.10.a provides a detail of the standard recommended facilities that should form part of the crematorium.

8.3.11.4 Standards of Construction

The following Standards are applicable:

- National Building Regulations SABS 0400-Design Population Requirements
- National Building Regulations SABS 0400-Design Ratio of Sanitary Fittings to Population

8.3.11.5 Unit Cost

The national average cost for the construction of the crematorium is R 3,533 /m^2. Anything outside this range will require a strong motivation from the municipalities concerned. For a detailed breakdown, consult Appendix 8.

8.3.12 Fencing

Fencing can be utilized for the following:

i) **Security** – Fencing can be erected for security purposes at municipal buildings / infrastructure.

ii) **Public** – Fencing can be erected next to open stormwater channels / drains to prevent the public (children) from falling into these dangerous hazards.

iii) **Motorists/pedestrians** – It is very important to fence off all roadways (especially rural areas) to prevent strayed animals / cattle from entering the road reserve that could create life threatening situations to motorists/pedestrians.

Typical fencing that could be used for the various items listed above:

a) *Security fencing*: concrete palisade 2.4 m high or wire fencing 2.4 m high
b) *Public protection*: concrete palisade 1.8 m high, wire fencing 1.2 m or 1.83 m high
c) *Gates / security fencing*: double leaf 4m or 6m wide and 2.4 m high, single pedestrian 1.0 m wide

Mesh fencing is in a number of locations not desirable because of the constant removal thereof by people. Municipalities increasingly prefer wall fencing or palisade (concrete) fencing because of its durability and low maintenance.

Table 84: Shows the range of unit costs in (Rand/ running meter) for the various options of Fencing, as calculated in the Industry Guide 2007, escalated to August 2009 equivalent.:

Table 84: Unit Costs - Fencing

Fencing Security				Public			Gates/Security		
Province		Concrete Pales Palisade Fencing 2,4m high	Wire Fencing 2,4m high	Concrete Pales Palisade Fencing 1,8m high	Wire Fencing 1,2m high	Wire Fencing 1,83m high	Double leaf 4m wide 2,4m high	Double leaf 6m wide	Single pedestrian 1,0m wide
		R / meter	R / meter	R / meter	R / meter	R / meter	R / per gate	R / per gate	R / per gate
Limpopo	Min	1,005	564	564	273	420	4,100	5,467	1,905
	Max	1,116	626	626	304	467	4,556	6,074	2,117
	Avg	1,060	595	595	289	444	4,328	5,771	2,011
Gauteng	Min	828	465	465	225	346	3,380	4,507	1,570
	Max	920	516	516	250	385	3,756	5,008	1,745
	Avg	874	491	491	238	366	3,568	4,757	1,658
North West	Min	976	548	548	266	408	3,985	5,314	1,851
	Max	1,085	609	609	295	454	4,428	5,904	2,057
	Avg	1,031	578	578	280	431	4,207	5,609	1,954
Free State	Min	870	488	488	237	364	3,549	4,732	1,649
	Max	966	542	542	263	404	3,944	5,258	1,832
	Avg	918	515	515	250	384	3,746	4,995	1,741
Kwazulu Natal	Min	807	453	453	220	338	3,293	4,390	1,530
	Max	896	503	503	244	375	3,659	4,878	1,700
	Avg	852	478	478	232	356	3,476	4,634	1,615
Mpumalanga	Min	965	541	541	263	404	3,938	5,251	1,830
	Max	1,072	602	602	292	448	4,376	5,834	2,033
	Avg	1,018	572	572	277	426	4,157	5,542	1,931
Northern Cape	Min	1,060	595	595	288	443	4,327	5,769	2,010
	Max	1,178	661	661	320	493	4,807	6,410	2,233
	Avg	1,119	628	628	304	468	4,567	6,089	2,122
Western Cape	Min	965	541	541	263	404	3,938	5,251	1,830
	Max	1,072	602	602	292	448	4,376	5,834	2,033
	Avg	1,018	572	572	277	426	4,157	5,542	1,931
Eastern Cape	Min	836	469	469	228	350	3,414	4,552	1,586
	Max	929	522	522	253	389	3,793	5,058	1,762
	Avg	883	496	496	240	369	3,604	4,805	1,674
National	Avg	975	547	547	265	408	3,979	5,305	1,848

Source: Derived from the Industry Guide 2007, escalated to August 2009.

8.3.13 Municipal abattoirs

It is no longer standard practice for municipalities to own and operate abattoirs. Private owners mostly run "municipal abattoirs", as it is not the core business of municipalities even though they provide a service to the community. This might be a job creation venture and a good opportunity for public-private partnerships. Municipalities should however, take cognizance of the high-strength wastewater generated by abattoirs and must monitor and bill the abattoirs for receiving these effluents at the wastewater treatment works (according to flow and quality of effluent).

8.3.14 Libraries

There is significant variation between provinces in respect of the source of funding for different items. Municipalities are normally responsible for building maintenance, furniture and equipment, salaries and books. The municipality may share some responsibility with the Provincial department, with regard to building maintenance, furniture, equipment and books.

"The Funding and Governance of Public Libraries in South Africa" is a research document coordinated by the Center for the Book on behalf of the Print Industries Cluster Council Working Group on Libraries and funded by the National Department of Arts and Culture. This reference document indicates that the provinces are more likely than the municipality to bear responsibility for construction of library buildings.

MIG funds may only be used for the provision of a library building and ablution facilities. The total building costs escalated to August 2009 is reflected in the table below.

Table 85: Libraries – Cost per m2

Libraries		
Province		**Cost per m^2**
Limpopo	Min	10,251
	Max	11,389
	Avg	10,820
Gauteng	Min	8,451
	Max	9,390
	Avg	8,920
North West	Min	9,963
	Max	11,070
	Avg	10,517
Free State	Min	8,873
	Max	9,859
	Avg	9,366
Kwazulu Natal	Min	8,232
	Max	9,146
	Avg	8,689
Mpumalanga	Min	9,845
	Max	10,939
	Avg	10,392
Northern Cape	Min	10,817
	Max	12,019
	Avg	11,418
Western Cape	Min	9,845
	Max	10,939
	Avg	10,392
Eastern Cape	Min	8,535
	Max	9,483
	Avg	9,009
National	Avg	9,947

Source: Derived from the Industry Guide 2007, escalated to August 2009.

Other library requirements such as shelves, furniture and books are provided for from other funding sources. In 2007, a new conditional grant called the Community Library Services grant, was announced. The purpose of the grant is to develop the infrastructure and stock of books in local libraries.

8.3.15 Solid Waste Disposal Site (Landfill)

In order to permit a site for waste disposal by landfilling, a site needs to meet and maintain certain standards. In terms of *The DWAF Minimum Requirements (MR) for Waste Disposal by Landfill (second Edition 1998),* a landfill is classified in terms of waste class, size of operation, and potential for significant leachate generation, all of which influence the risk it poses to the environment.

This can be broken down further:

TYPE OF WASTE (CLASS)		
General (G)	**Hazardous**	
No significant threat to public health or environment if managed properly	H:H	H:h
	Hazard Rating 1-4	Hazard Rating 3 & 4

KEY: Hazard Rating 1= Extreme Hazard; Hazard Rating 2 = High Hazard, Hazard Rating 3 = Moderate Hazard, Hazard Rating 4 = Low Hazard

In Terms of the MR, "certain hazardous wastes may be 'delisted' for disposal at an H:h landfill or an appropriately lined general waste site. This would be because the hazardous substance in the waste is of low mobility or concentration, or because the substance has been successfully treated to make it less hazardous. It must, however, be demonstrated to the satisfaction of the Department that the waste does not pose a risk to man or the environment. This would involve additional investigative testing."

SIZE OF WASTE STREAM			
Communal (C)	Small (S)	Medium (M)	Large (L)
Maximum Rate of Deposition (MRD) in tonnes per day			
<25	>25 <150	>150 <500	>500

NOTE: Assuming a 5-day week and therefore 260 days per year

Landfill size is dependent on the daily rate of deposition which is affected by several factors including the size of the population served. A measure referred to as the 'Maximum Rate of Deposition' or 'MRD' is applied. This is a measure of the projected maximum average annual rate of waste deposition, expressed in tonnes per day, during the expected life of a landfill.

The MRD is calculated by establishing the Initial Rate of Deposition (IRD) which is a measurement of the existing waste stream in tonnes per day. The IRD is then escalated at a rate which is usually governed by population growth projections over the anticipated life of the landfill. The maximum average daily rate of deposition is then the MRD.

In the absence of weighbridge figures or estimates of waste, daily tonnages may be arrived at by assuming a per capita waste generation rate and applying this figure to the population served. In general, these rates are very closely tied in to socio-economic standing of the population, with generation rates of 0,5 kg per capita per day in the poor areas, to as much as 3,5 kg per capita per day in the affluent areas.

POTENTIAL FOR LEACHATE GENERATION	
Sporadic	Significant
Climatic Water Balance: **B = R - E**	
B is positive for less than one year in five for the years for which data is available	B is positive for more than one year in five for the years for which data is available
There should be no significant leachate generation on account of the climate	There should be significant leachate generation.
B^-	**B^+**

KEY: **B** is the Climatic Water Balance in mm of Water; **R** is The Rainfall in mm of Water; **E** is the Evaporation from a Soil Surface in mm of Water. The value of B is calculated for the wet season of the wettest year on record, B is then recalculated for successively drier years, because the wettest year on record may only be so on account of unseasonal rainfall, i.e. the wettest wet season does not always occur in the wettest year. This calculation is repeated until it is established whether: B is positive for less than one year in five or positive for more than one year in five for the years for which data is available.

In all, ten classes of landfill are possible:

G:C:B-, G:C:B+(General, communal)
G:S:B-, G:S:B+ (General, small)
G:M:B-, G:M:B+ (general, medium)
G:L:B-, G:L:B+ (general, large)
H:h and H:H (hazardous)

Table 86: Shows the range of unit costs (in Rand for tonnes per day) – based on the Maximum Rate of Deposition (MRD) per day - as calculated in the Industry Guide 2007 document, escalated to August 2009:

Table 86: Solid Waste – Unit Costs per Tonne

Solid Waste Disposal Site - Landfill Maximum					
Province		Communal <25	Small 25-150	Medium >150-500	Large >500
		R / tons / day	R / tons / day	R / tons / day	R / tons / day
Limpopo	Min	3,426,555	5,139,832	23,985,884	41,118,658
	Max	3,807,283	5,710,925	26,650,982	45,687,397
	Avg	3,616,919	5,425,378	25,318,433	43,403,027
Gauteng	Min	2,829,336	4,244,004	19,805,351	33,952,030
	Max	3,143,706	4,715,560	22,005,945	37,724,478
	Avg	2,986,521	4,479,782	20,905,648	35,838,254
North West	Min	3,343,893	5,015,839	23,407,251	40,126,716
	Max	3,715,437	5,573,155	26,008,056	44,585,240
	Avg	3,529,665	5,294,497	24,707,654	42,355,978
Free State	Min	2,965,541	4,448,312	20,758,790	35,586,497
	Max	3,295,046	4,942,569	23,065,322	39,540,552
	Avg	3,130,294	4,695,441	21,912,056	37,563,524
Kwazulu Natal	Min	2,756,779	4,135,168	19,297,450	33,081,343
	Max	3,063,087	4,594,631	21,441,611	36,757,048
	Avg	2,909,933	4,364,899	20,369,531	34,919,196
Mpumalanga	Min	3,305,350	4,958,024	23,137,447	39,664,194
	Max	3,672,611	5,508,916	25,708,274	44,071,327
	Avg	3,488,980	5,233,470	24,422,860	41,867,761
Northern Cape	Min	3,623,901	5,435,852	25,367,308	43,486,813
	Max	4,026,557	6,039,835	28,185,897	48,318,681
	Avg	3,825,229	5,737,843	26,776,603	45,902,747
Western Cape	Min	3,300,754	4,951,132	23,105,281	39,609,053
	Max	3,667,505	5,501,257	25,672,535	44,010,059
	Avg	3,484,130	5,226,195	24,388,908	41,809,556
Eastern Cape	Min	2,853,574	4,280,361	19,975,019	34,242,889
	Max	3,170,638	4,755,957	22,194,465	38,047,655
	Avg	3,012,106	4,518,159	21,084,742	36,145,272
National	Avg	3,331,531	4,997,296	23,320,715	39,978,368

Source: Derived from the Industry Guide 2007 solid waste unit costs, escalated to August 2009.

Cost per household ranges between R350 and R1 300. The national average unit cost is R973 per household. Anything outside this range will require a strong motivation from the municipalities concerned.

DWA's guideline distinguishes between the works required for the various waste disposal site classifications. The DWA guideline further classifies sites according to areas where leaching may occur, i.e. according to climatic water balance.

As mentioned above, the DWA sets guidelines and standards for the selection, design, commissioning, operation, maintenance, closure and rehabilitation of waste disposal sites. These generally require:

- Site selection
- Site investigation
- Permission
- Assessment and mitigation of environmental impacts
- Design, liner and capping components
- Site preparation and commissioning
- Landfill operation
- Rehabilitation, closure and end-use
- Water quality monitoring
- Adequate fencing of the entire site
- Security arrangements for protection and safety

The following advantages and disadvantages are relevant. However, municipalities are required to have an approved waste disposal site, with a valid permit to operate the site.

Table 87: Waste Disposal Sites – Advantages and Disadvantages

Advantages	Disadvantages
▪ Economies of scale, owing to bigger, better equipped waste disposal sites. ▪ Social integration with respect to the provision of joint services. ▪ Higher levels of service at a lower cost.	• Local authorities will have to counter-fund, in ratio to the waste generated by higher- income communities. • Adequate fencing of the entire site • Security arrangements for protection and safety

8.3.16 Facilities for Animals

Provision must be made for the following facilities for animals:

- Accommodation facilities
- Crematoriums
- Burial facilities
- Dipping tanks

Public-Private Partnerships (PPP's) should be encouraged in addressing the above facilities.
The basic building cost of R3 544 per m^2 serves as a guideline.

9. SOCIAL INSTITUTIONS AND MICRO-ENTERPRISES INFRASTRUCTURE (E)

The MIG Programme and associated funding acknowledges the importance of both Economic and Social activities. Growth and development bring key considerations and principles that need to be incorporated in any infrastructure planning and activities, in contributing to the growth and development of the people involved and affected by the infrastructure developed and services rendered within the communities. This ties in essence with the 2014 national target, whereby it is expected to achieve a 50% reduction in poverty (via job creation and associated initiatives).

Therefore, this particular component has been allowed for in all aspects of MIG. These Economic and Social activities are subject to the same criteria as the Basic Residential Infrastructure (B) and Public Municipal Infrastructure (P) as outlined in the **Guideline Document on MIG Processes and Procedures** as discussed above. Identified projects of this Component must also satisfy the same criteria applicable to the other Components prior to approval. These criteria are:

- Providing a Basic Level of Service Infrastructure
- Targeting the poorest of the population, community and people
- Maximizing the economic benefit to the community
- Equity in the fund allocation for projects.

To ensure proportionate equality between the different project categories, the **MIG Policy Framework** (5 February 2004) specifically identifies the E-Component in the formula calculating the MIG allocation to all Local Authorities. The E-Component is defined as *"The allocation for Infrastructure for Social and Micro Enterprises".* The initial indication in the Policy Document is that 5% of the MIG pot is allocated to the E-Component.

The same management and financial controls applicable to all other projects equally applies to this Component. The funds budgeted and expended on these projects should not exceed the amount calculated and allocated in terms of the formula.

Typical examples of the project types that may be included in the two categories covered by the E-Component are:

Micro Enterprises (LED):

- Street Trading
- Markets
- Local Tourism
- Handcraft Centers
- Food Production Units e.g. Chicken Farming, Communal Gardens, etc.

Social Institutions:

- Old-age homes
- Orphanages
- Churches
- Crèches
- Clinics
- Sports Fields
- Recreational Facilities e.g. Parks and Open Spaces, etc

The project should be a plot package that includes the land and all the basic services and infrastructure required for the project e.g. water, sanitation, road access, stormwater and electricity. Local Authorities can contribute in all of the above types of projects by donating the land or by availing land at reduced price.

9.1 MICRO ENTERPRISES

9.1.1 Definition/Description

Micro Enterprises are economic activities with different purposes that are being conducted on a small

scale. They are also referred to as SMME's. The size relates mostly to the number of people employed within the activity and secondly, to the value of annual turnover that is limited for the business type. These factors determine the category (small, micro or medium) being applicable to the category.

9.1.2 Purpose of Micro Enterprises

The purpose of a Micro Enterprise as an economic activity is to sacrifice a larger scale of operation and the benefits of economies of scale (associated with large enterprises) - as a trade off for the financial gain locked into the process of cutting huge overheads, establishment costs and production cost (associated with smaller enterprises). This ultimately then yields a strong competing power for SMMEs in the market place.

Secondly, it provides opportunity to that section of the community and market that do not have huge resources or access to large amounts of capital that is required to participate and compete in the economic sector.

It further also provides for the opportunities of growth and development, specifically in the rural and smaller town context. It is essential to stimulate and promote these activities as they can grow into a significant percentage of the economic activity of the area or town in which they operate.

The significance, however, is that whilst in the urban context there may be the alternative of bigger business or industry, the Micro Enterprise is often the most viable solution to economic activity in the rural areas. Hence, it becomes a key element in providing services and goods and in many cases becomes the only opportunity of employment to many individuals.

These considerations necessitate that Micro Enterprises should be nurtured and assisted to grow ultimately to fill their deserved place and portion in the South African economy.

9.1.3 Geographical Context

Micro Enterprises are found in both the urban and rural context. There may be a shift in the type of goods and services delivered i.e. the purpose of the Micro Enterprises when moving from urban to rural.

9.1.4 Basic level of service

In most cases only the basic levels of a reliable service is required that includes water, sanitation, road access and electricity.

In urban context, there may be special requirements for a special service, but these mostly will relate to more of bulk supplies e.g. large water or electricity supply, special treatment of sewerage or industrial effluents, particular sludge applications, etc.

New services to be constructed must be carefully considered by the Local Authority. If the Micro Enterprise is not viable and sustainable for a minimum period, costly services could be provided for no actual gain and poor/no return to the municipal investment. Hence, before any project is approved, it will be advisable to conduct a comprehensive feasibility or viability study that includes the following:

- Calculations to confirm the Start-up Capital requirements;
- Calculations to confirm the Working Capital requirements for a period at least 2 years beyond the breakeven point;
- A full operations and maintenance plan for the same period of at least 2 years beyond breakeven;
- Research confirming why the particular entity/project to be funded is needed in the market place;
- The marketing strategies, advertising campaigns and selling approaches planned to ensure success of the project; and
- Identification of competitors and threats in the business environment.

The above will be used to inform a comprehensive and realistic Business Plan.

9.1.5 Level of service options

In order to support SMME activities, the most appropriate level of service may be required, depending on

the circumstances e.g. bitumen paved parking area or blocked paved pavement or sidewalks. A healthy level (or potential) of SMME activities may result in the provision of a higher level of services to sustain the SMME activities and leverage for further economic growth in the specific area.

9.1.6 Advantages/Disadvantages

The accommodation of Micro Enterprises and providing for their needs has certain advantages and disadvantages. The advantages and disadvantages are summarized in the table below:

Table 88: Micro Enterprises – Advantages and Disadvantages

Advantages	Disadvantages
• Enables a bigger section of the community to become economic active and participate in the economy of the area. • Creates employment opportunities that otherwise will not be there. • Increases the spending power and ability of the community that in turn - results in growth and development that may attract further economic activity. • Assists in the development of the community due to the exposure and participation in activity that otherwise would not exist. • Increase the ability of communities to pay for municipal services. • The increase of affordability levels result in social upliftment - parents can afford better and more education opportunities for their children. • Food Production Units can sustain a quality and reliable food supply that result in improvement of health conditions. • Micro Enterprises do not place an exceptional burden on services to be supplied through the Local Authority, as they are the same basic services required for the service the residential areas.	• Micro Enterprises has a poor record in co-existing and growing business as a sustainable rate – this result in a fluctuation of the benefits e.g. employment opportunities, income earned and consumer confidence. • Payment of municipal charges may be erratic as it depends on the financial state of the particular enterprise. • In the urban and town context, Bylaws relating to trading and conducting business may have to be enforced more stringently. • Financial welfare could also result in social and moral decay of elements within the community. • O&M activities may require more input to ensure the reliability of services being provided.

9.1.7 Standards of Construction

The standards of construction of services to Micro Enterprises will be similar to those applied in the provision of other basic residential services. Particular care must be applied to quality to ensure the reliability of services.

9.1.8 Unit Costs

The unit costs applicable to the provision of the services will be exactly the same as for the provision of basic residential services.

It is however, critical that adequate allowance is made for all services required and these are fully budgeted for. Hence, it will require a thorough understanding of the business type and servicing requirements. Failure in preparing comprehensive costing will not assist in providing a plot package. This Industry Guide must be studied carefully to allow for all elements of infrastructure.

Where buildings are involved, the ruling building cost per square meter rate for the area must be used for estimating purposes. The rates in this guide under the appropriate sections can also be used.

The plot package could include land at a reduced cost or even free. This should be used as leverage to attract the particular Micro Enterprise.

Table 89: Infrastructure: LED type projects unit costs/sq as calculated from the Industry Guide 2007 unit costs escalated to the August 2009 equivalent:

Table 89: Unit Costs – Local Economic Development

Local Economic Development			
Province		Street trading	Markets
		R / per 4m²	R / per 6m²
Limpopo	Min	9,823	33,314
	Max	10,915	37,016
	Avg	10,369	35,165
Gauteng	Min	8,098	27,464
	Max	8,998	30,516
	Avg	8,548	28,990
North West	Min	9,548	32,380
	Max	10,609	35,978
	Avg	10,079	34,179
Free State	Min	8,503	28,838
	Max	9,448	32,042
	Avg	8,976	30,440
Kwazulu Natal	Min	7,889	26,753
	Max	8,765	29,726
	Avg	8,327	28,240
Mpumalanga	Min	9,435	31,996
	Max	10,483	35,551
	Avg	9,959	33,774
Northern Cape	Min	10,366	35,154
	Max	11,518	39,060
	Avg	10,942	37,107
Western Cape	Min	9,435	31,996
	Max	10,483	35,551
	Avg	9,959	33,774
Eastern Cape	Min	8,179	27,739
	Max	9,088	30,821
	Avg	8,634	29,280
National	Avg	9,532	32,328

Source: Derived from the Industry Guide 2007 unit costs, escalated to August 2009.

9.2 SOCIAL INSTITUTIONS

9.2.1 Definition/Description

Social Institutions are those facilities that are provided for the social well being of the community.

9.2.2 Purpose of Social Institutions

This type of facility provides for and addresses the social needs of a community. These facilities aims at serving the community with services other than basic, e.g. religious needs, recreational needs and relaxation, toddler care and education, etc.

Such 'services' ultimately contribute to the overall well being of a community, and are considered by many people to be the corner stone of development and personal growth in a community.

9.2.3 Geographical Context

Social Institutions are required in both the urban and rural context. There may be a shift in the type encountered when moving from urban to rural. Certain institutions may not be viable in the smallness of the rural context e.g. orphanages and old age homes only become viable in the urban areas. In the rural context, there is no need for open spaces for relaxation as opposed to the urban environment where areas have been built up and hence it has become a desperate need for the community.

9.2.4 Basic level of service

In most cases only the basic levels of a reliable service is required that includes water, sanitation, road access and electricity as may be relevant to the particular type of institution. For example an open space may require water service throughout whilst electricity may be a lesser requirement.

New services to be constructed must be carefully considered by the Local Authority. Considering the social nature of the facility payment of service charges may become problematic as the financial state of the institution is linked to the social status of the community. Hence consideration should be given to subsidize the service being provided e.g. water, sanitation, electricity etc. This must be emphasized as the Local Authorities contribution to the social needs of their community.

Most of the Social Institutions have a strong linkage with the Department of Social Development or the Department of Health. Hence the Local Authority will benefit by establishing good working relations and partnerships with these Government entities. The benefits are to secure payment for services rendered, on-going sustainability and acceptable levels of services being provided within the Institution.

A growing trend is to create Public Private Partnerships (PPP) for the establishment and operation of these facilities. This is encouraged as it ensures sustainability of the institution.

9.2.5 Level of service options

A higher level of service may be required in certain instances e.g. bitumen paved parking area or blocked paved pavement or sidewalks. These will invariably link to providing easier access to those utilizing the particular Social Institution.
Buildings must accommodate in particular the disabled portion and user in the community. Special attention at these facilities must be given to e.g. handrails at steps, ramps for wheelchairs, etc.

9.2.6 Advantages/Disadvantages

The advantages and disadvantages of Social Institutions are summarized in the table below:

Table 90: Social Institutions – Advantages and Disadvantages

Advantages	Disadvantages
• Is essential in providing for the full spectrum of the needs of the community. • Contributes to the overall well being and mental health of the community. • Prevents moral decay of the community.	• Could become a financial burden on the Local Authority due to non payment of service charges. • O&M activities may require more input to ensure the reliability of services being provided e.g. to Old Age Homes etc.

9.2.7 Standards of Construction

The standards of construction of services to Social Institutions will be similar to those applied in the provision of other basic residential services. Once again particular care must be applied to the quality to ensure the reliability of services.

9.2.8 Unit Costs

The unit costs applicable to the provision of the services will be exactly the same as for the provision of basic residential services.

It is critical that adequate allowance is made for all services required and that these are fully budgeted for. Failure in preparing comprehensive costing will not assist in providing a plot package to the end user. This Industry guide must be studied carefully to allow for all elements of infrastructure.

Where buildings are involved the ruling building cost per square meter rate for the area must be used for estimating purposes. The rates in this guide under the appropriate sections can also be used.

The plot package could include land at a reduced cost or even free. This can be seen as the contribution to the social welfare of the Local Authority.

MIG has made provision for the following to be provided with the plot package at a cost that will be determined by the size of the facility.

Table 91: Shows the range of unit costs in Rand for the various options of Social Institutions, as developed from zero-based approach, following breakdown as depicted in Appendix 2:

Table 91: Unit Costs – Social Institutions

Social Institutions					
Province		Old-age homes	Orphanages	Churches	Crèches
		R / inhabitant	R / orphan	R / per m²	R / per m²
Limpopo	Min	153,758	153,758	10,251	7,688
	Max	170,842	170,842	11,389	8,542
	Avg	162,300	162,300	10,820	8,115
Gauteng	Min	126,759	126,759	8,451	6,338
	Max	140,843	140,843	9,390	7,042
	Avg	133,801	133,801	8,920	6,690
North West	Min	149,448	149,448	9,963	7,472
	Max	166,054	166,054	11,070	8,303
	Avg	157,751	157,751	10,517	7,888
Free State	Min	133,096	133,096	8,873	6,655
	Max	147,885	147,885	9,859	7,394
	Avg	140,491	140,491	9,366	7,025
Kwazulu Natal	Min	123,476	123,476	8,232	6,174
	Max	137,196	137,196	9,146	6,860
	Avg	130,336	130,336	8,689	6,517
Mpumalanga	Min	147,674	147,674	9,845	7,384
	Max	164,082	164,082	10,939	8,204
	Avg	155,878	155,878	10,392	7,794
Northern Cape	Min	162,251	162,251	10,817	8,113
	Max	180,279	180,279	12,019	9,014
	Avg	171,265	171,265	11,418	8,563
Western Cape	Min	147,674	147,674	9,845	7,384
	Max	164,082	164,082	10,939	8,204
	Avg	155,878	155,878	10,392	7,794
Eastern Cape	Min	128,026	128,026	8,535	6,401
	Max	142,251	142,251	9,483	7,113
	Avg	135,139	135,139	9,009	6,757
National	Avg	149,204	149,204	9,947	7,460

Source: Derived from the Industry Guide 2007 unit costs, escalated to August 2009.

10. CONCLUSION

This Industry Guide 2009/2010 document provides a comprehensive description of infrastructure standards, levels of services options and unit costs, taking into account geographic context, but is by no means complete. Compilation of this document is made in conjunction with inputs from various stakeholder and task team meetings.

The document serves as a **high level planning guide** and is NOT intended to substitute for a design manual. Whilst the document enables a high level assessment of services options and guide to total project costs (i.e. construction costs + professional fees + social facilitation), it is to be used as a GUIDELINE document only, and where the actual on-site project specific conditions must be motivated for variations to the cost estimates.

In the majority, application of SAFCEC August 2009 indices were used to adjust the unit costs from the zero-based costs determined in 2007, maintaining a regional/provincial context. The construction margin (previously termed "profit"), which accounts for installed cost overheads and profit was reduced from 30% in 2007 to 15% in 2009, reflecting the lower margins in a competitive construction industry during a recessionary economic climate.

Sanitation unit costs were derived after broad consultation with the sanitation task team in establishing a common Bill of Quantities, and reaching agreement on the component unit rates. Health and hygiene education budget formed part of the social facilitation costs, separate from the project construction value and the unit cost.

Water services standards and unit costs were obtained largely from the *DWA: Typical Unit Costs for Water Services Development Projects (August 2009)*, complemented with the Industry Guide 2007 escalated costs.

SRSA provided guidance in establishing sports infrastructure unit standards and unit costs. The SRSA March 2008 costs were escalated to August 2009 using the SAFCEC indices, and a geographic context extrapolated to ensure consistency within the Industry Guide 2009/2010 document.

Notwithstanding the approach to the document, it does not take into account the impact of contractor workload i.e. the less construction work available, the lower and more competitive are the unit rates and vice-versa. It is therefore recommended that the document next be updated in 2011 to take into account the volatile economic climate.

In the interim, a User Manual is being prepared to assist practitioners to fully apply the Industry Guide 2009/2010 document, as well as perform interim self updates (refer to methodology contained in Appendix 1b), using the SAFCEC CPAF indices. A future enhancement would be the development of a web-based application that enables users to accurately estimate project costs and facilitate improved planning at a high level.

11. MIG OFFICES

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Limpopo	Department of Local Government and Housing	Tel: (015) 295 6851 Fax: (015) 295 4700
Mpumalanga	Department of Local Government	Tel: (013) 766 6605 Fax: (013) 766 8449
Northern Cape	Department of Housing and Local Government	Tel: (053) 830 9462 Fax: (053) 830 9562
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Western Cape	Department of Local Government	Tel: (021) 483 4191 Fax: (021) 483 3244

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Disclaimer:

All care has been taken in the preparation of this document and the information contained herein has been directed from sources believed to be accurate and reliable. The document is the collective effort of the various public Sector Departments responsible for infrastructure policy, funding, development and service delivery.

However, these sectors will not assume responsibility for the use of the document outside the framework of its intention, which is primarily serving a purpose of guideline to the end users to assist in the planning and costing of municipal infrastructure.

13. APPENDICES

Appendix 1a: Labour, Plant and Material Indices and Rate and Escalation factors

Contract Price Adjustment Factor

In accordance with Clause 49(2), the value of each certificate issued in terms of Clause 52(1) shall be increased
or decreased by the amount obtained by multiplying "Ac", defined in Clause 2 of this Schedule,
by the Contract Price Adjustment Factor, rounded off to the fourth decimal place,determined according to the formula:

$$(1 - x)\left[\frac{a\,Lt}{Lo} + \frac{b\,Pt}{Po} + \frac{c\,Mt}{Mo} + \frac{d\,Ft}{Fo} - 1\right]$$

in which the symbols have the following meanings:

"x" is the proportion of "Ac" which is not subject to adjustment. Unless otherwise stated in the Appendix this proportion shall be 0,15.

"a", "b", "c" and "d" are the co-efficients determined by the Engineer and specified in the Appendix, which are deemed, irrespective of the actual constituents of the work, to represent the proportionate value of labour, plant, materials (other than "special materials" specified, in terms of Clause 49(3), in the Appendix) and fuel respectively. The arithmetical sum of "a", "b", "c" and "d" shall be unity.

"L" is the "Labour Index" and shall be the actual Wage Rate index for all workers in the civil engineering industry (weighted average for all areas) as published in the Statistical News Release (P0142.2) of the Central Statistical Service.

"P" is the "Plant Index" and shall be the "Civil Engineering Plant Index" as published in the Statistical News Release (PO 142.2) of the Central Statistical Service.

"M" is the "Materials Index" and shall be the "Price Index of Civil Engineering Materials", as published in the Statistical News Release (PO 142.2) of the Central Statistical Service.

"F" is the "Fuel Index" and shall be the weighted average of the fuel indices for "Diesel, before deduction of refund" and "Diesel, after deduction of refund" as published in the Statistical News Release (PO 142.2) of the Central Statistical Service for the "Coast" or "Witwatersrand". The weighting ratio and the use of the "Coast" and "Witwatersrand" indices shall be as specified by the Engineer in the Appendix. Unless otherwise specified by the Engineer in the Appendix, the weighting ratio shall be 1 to 1.

The suffix "o" denotes the basic indices applicable to the base month, which shall be the month prior to the month in which the closing date for the tender falls.

The suffix "t" denotes the current indices applicable to the month in which the last day of the period falls to which the relevant payment certificate relates.

If any index relevant to any particular certificate is not known at the time when the certificate is prepared, the Engineer shall estimate the value of such index. Any correction which may be necessary when the correct indices become known shall be made by the Engineer in subsequent payment certificates.

MIG GUIDELINES UNIT COSTING - ESCALATION FACTORS FOR LABOUR, PLANT, MATERIAL AND FUEL (August 2009):

	LABOUR RATES INDICES PER PROVINCE										OTHER INDICES		
CONTRACT TYPES	CALC's DETAIL	EASTERN CAPE - Port Elizabeth	FREE STATE - Bloemfontein	GAUTENG - Witwatersrand	KWAZULU-NATAL - Durban	LIMPOPO - Polokwane	MPUMALANGA - Nelspruit	NORTHERN CAPE - Kimberley	NORTH WEST	WESTERN CAPE - Cape Peninsula	PLANT INDEX	MATERIAL INDEX	FUEL INDEX
-	Base Costs Feb 2007	143.1	137.1	137.4	140.0	128.5	137.9	144.9	138.5	137.3	148.3	172.5	203.9
	Current Costs Aug 2009	177.4	169.5	172.2	175.8	159.1	176.5	182.5	176.8	173.9	190.9	210.1	250.2
	Index Ratio	1.2397	1.2363	1.2533	1.2557	1.2381	1.2799	1.2595	1.2765	1.2666	1.2873	1.2180	1.2271

CONTRACT TYPES	CALC's DETAIL	LABOUR INDEX									PLANT INDEX	MATERIAL INDEX	FUEL INDEX
		EC	FS	GT	KZN	LM	MP	NC	NW	WC			
1. Earthworks (with Culverts and Drainage)	Coefficient	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.50	0.20	0.15
	Coef X Ratio	0.1860	0.1854	0.1880	0.1884	0.1857	0.1920	0.1889	0.1915	0.1900	0.6436	0.2436	0.1841
	Esc Factor	**0.2187**	**0.2182**	**0.2204**	**0.2207**	**0.2185**	**0.2238**	**0.2212**	**0.2233**	**0.2221**			
2. General Civil Engineering Work - 2/3 Earthworks; 1/3 Concrete	Coefficient	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.55	0.05
	Coef X Ratio	0.2479	0.2473	0.2507	0.2511	0.2476	0.2560	0.2519	0.2553	0.2533	0.2575	0.6699	0.0614
	Esc Factor	**0.2011**	**0.2006**	**0.2034**	**0.2039**	**0.2009**	**0.2080**	**0.2045**	**0.2074**	**0.2057**			
3. Concrete Work	Coefficient	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.10	0.45	0.05
	Coef X Ratio	0.4959	0.4945	0.5013	0.5023	0.4953	0.5120	0.5038	0.5106	0.5066	0.1287	0.5481	0.0614
	Esc Factor	**0.1989**	**0.1978**	**0.2036**	**0.2044**	**0.1984**	**0.2126**	**0.2057**	**0.2115**	**0.2081**			
4. Road-works													
4.1 Roadwork	Coefficient	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.35	0.35	0.10
	Coef X Ratio	0.2479	0.2473	0.2507	0.2511	0.2476	0.2560	0.2519	0.2553	0.2533	0.4505	0.4263	0.1227
	Esc Factor	**0.2104**	**0.2098**	**0.2127**	**0.2131**	**0.2101**	**0.2172**	**0.2137**	**0.2166**	**0.2149**			
4.2 Concrete Structures	Coefficient	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.10	0.45	0.05
	Coef X Ratio	0.4959	0.4945	0.5013	0.5023	0.4953	0.5120	0.5038	0.5106	0.5066	0.1287	0.5481	0.0614
	Esc Factor	**0.1989**	**0.1978**	**0.2036**	**0.2044**	**0.1984**	**0.2126**	**0.2057**	**0.2115**	**0.2081**			

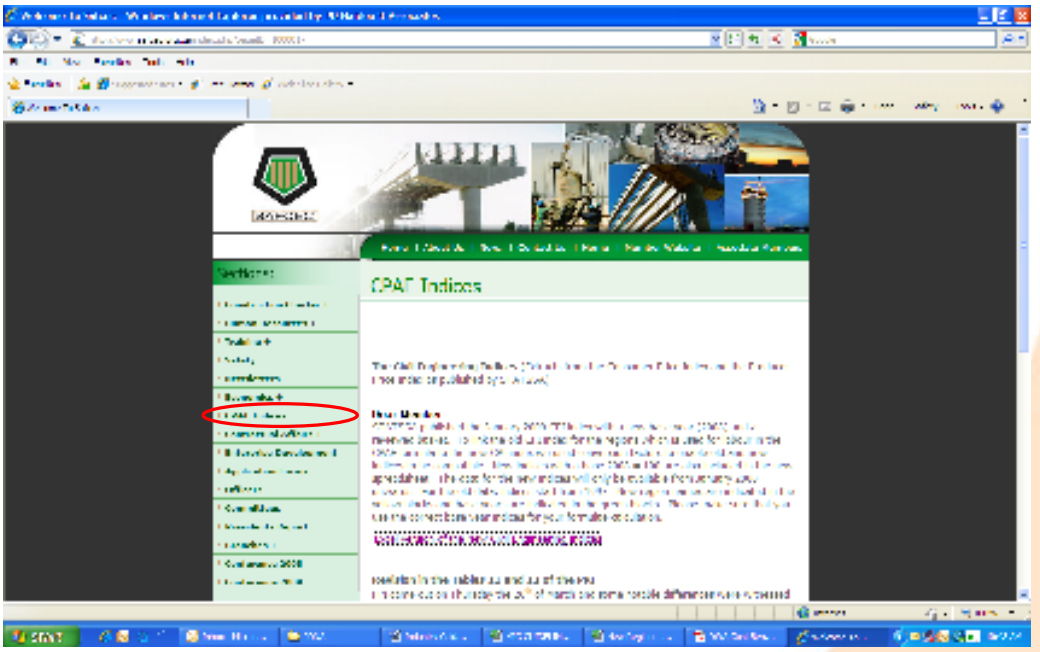
CONTRACT TYPES	CALC's DETAIL	LABOUR INDEX									PLANT INDEX	MATERIAL INDEX	FUEL INDEX
		EC	FS	GT	KZN	LM	MP	NC	NW	WC			
4.3 Township Roads and Services	Coefficient	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.25	0.45	0.10
	Coef X Ratio	0.2479	0.2473	0.2507	0.2511	0.2476	0.2560	0.2519	0.2553	0.2533	0.3218	0.5481	0.1227
	Esc Factor	**0.2222**	**0.2225**	**0.2177**	**0.2203**	**0.2188**	**0.2202**	**0.2237**	**0.2192**	**0.2186**			
4.4 Premix Surfacing and Rehabilitation	Coefficient	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.60	0.10
	Coef X Ratio	0.1860	0.1854	0.1880	0.1884	0.1857	0.1920	0.1889	0.1915	0.1900	0.1931	0.7308	0.1227
	Esc Factor	**0.1977**	**0.1972**	**0.1994**	**0.1997**	**0.1975**	**0.2028**	**0.2002**	**0.2023**	**0.2011**			
5. Water and Sewerage Reticulation, Reservoirs and Engineering Work	Coefficient	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.55	0.05
	Coef X Ratio	0.2479	0.2473	0.2507	0.2511	0.2476	0.2560	0.2519	0.2553	0.2533	0.2575	0.6699	0.0614
	Esc Factor	**0.2011**	**0.2006**	**0.2034**	**0.2039**	**0.2009**	**0.2080**	**0.2045**	**0.2074**	**0.2057**			

Appendix 1b: Methodology for Calculation of Future Unit Costs using SAFCEC Indices

Future Cost Calculations:

The updating of cost to amend the unit cost figures to accommodate price increase can be done for any interim month. It is suggested that this be done by using Table 1b that has been set up for the base month of August 2009 which is the month for which the unit cost have last been updated. The steps to be followed are as detailed below:

Step 1: Go to the SAFCEC Website for the CPAF Indices (Old Index) and select the month for which the price increase is to be determined [http://safcec.org.za]



Step 2: Select the Labour index for the appropriate area and capture this in the yellow block marked (i).

Step 3: Select the other Indices for Plant (ii), Material (iii) and Fuel (iv) and capture the figures in the blocks marked green (ii), blue (iii) and red (iv), respectively.

Step 4: The escalation factor is calculated using the SAFCEC CPAF. Read the percentage escalation for the particular contract type in the respective block in Table 1b.

Step 5: The escalation amount is calculated by multiplying the escalation factor by the service unit cost in the Industry Guideline 2009 document (which was calculated for August 2009).

Step 6: Add the escalation amount (in step 5) to the Industry Guide 2009/2010 unit cost to derive the new unit cost.

The unit cost now established can be used to evaluate the cost on the MIG 1 and the cost contained in the Technical Report.

Refer to the EXAMPLE after the indices table 1b.

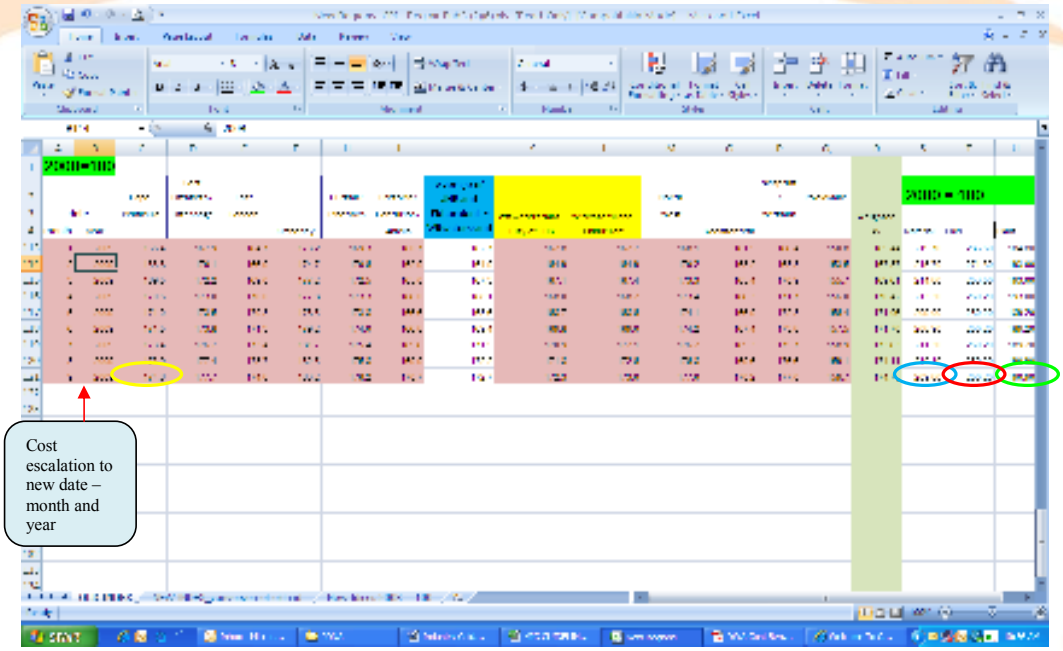
TABLE 1b: UNIT COSTING GUIDELINES - CALCULATION OF ESCALATION FOR CURRENT MONTH

		LABOUR RATES INDICES PER PROVINCE									OTHER INDICES		
CONTRACT TYPES	**CALC's DETAIL**	**EASTERN CAPE - Port Elizabeth**	**FREE STATE - Bloemfontein**	**GAUTENG – Witwatersrand**	**KWAZULU-NATAL - Durban**	**LIMPOPO - Polokwane**	**MPUMALANGA - Nelspruit**	**NORTHERN CAPE - Kimberley**	**NORTH WEST**	**WESTERN CAPE - Cape Peninsula**	**PLANT INDEX**	**MATERIAL INDEX**	**FUEL INDEX**
-	Base Aug 2009	177.4	169.5	172.2	175.8	159.1	176.5	182.5	176.8	173.9	190.9	210.1	250.2
	Current Month	(i)	(i)	(i)	(i)	(i)	(i)	(i)	(i)	(i)	(ii)	(iii)	(iv)
	Index Ratio	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
1. Earthworks (with Culverts and Drainage)	Coefficient	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.50	0.20	0.15
	Coef X Ratio	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
	Esc Factor	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**			
2. General Civil Engineering Work - 2/3 Earthworks; 1/3 Concrete	Coefficient	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.55	0.05
	Coef X Ratio	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
	Esc Factor	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**			
3. Concrete Work	Coefficient	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.10	0.45	0.05
	Coef X Ratio	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
	Esc Factor	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**			
4. Roadworks 4.1 Roadwork	Coefficient	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.35	0.35	0.10
	Coef X Ratio	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
	Esc Factor	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**			

	LABOUR RATES INDICES PER PROVINCE										OTHER INDICES		
CONTRACT TYPES	**CALC's DETAIL**	**EASTERN CAPE - Port Elizabeth**	**FREE STATE - Bloemfontein**	**GAUTENG - Witwatersrand**	**KWAZULU-NATAL - Durban**	**LIMPOPO - Polokwane**	**MPUMALANGA - Nelspruit**	**NORTHERN CAPE - Kimberley**	**NORTH WEST**	**WESTERN CAPE - Cape Peninsula**	**PLANT INDEX**	**MATERIAL INDEX**	**FUEL INDEX**
4.2 Concrete Structures	Coefficient	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.10	0.45	0.05
	Coef X Ratio	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
	Esc Factor	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**			
4.3 Township Roads and Services	Coefficient	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.25	0.45	0.10
	Coef X Ratio	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
	Esc Factor	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**			
4.4 Premix Surfacing and Rehabilitation	Coefficient	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.60	0.10
	Coef X Ratio	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
	Esc Factor	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**			
5. Water and Sewerage Reticulation, Reservoirs and Engineering Work	Coefficient	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.55	0.05
	Coef X Ratio	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
	Esc Factor	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**			

EXAMPLE: ESCALATION OF COMMUNAL STANDPIPE UNIT COST IN THE WESTERN CAPE TO SEPTEMBER 2009 VALUES

Step 1 *– Identify the labour, material, plant and fuel indices for September 2009 for Western Cape.*



Step 2 and 3 *– Input indices into spreadsheet, which then calculates the index ratios for labour (1.0052), plant (1.00), material (0.9986) and fuel (1.00).*

	LABOUR RATES INDICES PER PROVINCE		OTHER INDICES		
CONTRACT TYPES	**CALC's DETAIL**	**Western Cape (Cape Peninsula)**	**PLANT INDEX**	**MATERIAL INDEX**	**FUEL INDEX**
	Base Aug 2009	173.9	190.9	210.1	250.2
	Current Month (September 2009)	174.8	190.9	209.8	250.2
	Index Ratio	1.0052	1.000	0.9986	1.000
5. Water and Sewerage Reticulation, Reservoirs and Engineering Work	Coefficient	0.20	0.20	0.55	0.05
	Coef X Ratio	0.2010	0.2000	0.5492	0.0500
	Esc Factor	**0.0002**			

Step 4 – Escalation factor from August 2009 to September 2009 for water projects in the Western Cape is 0.0002;

Step 5 – The escalation amount is calculated by multiplying the escalation factor to the August 2009 standpipe unit cost in the Western Cape i.e. 0.0002 x R1,977/standpipe = R0.3954;

Step 6 – New September 2009 standpipe unit cost in Western Cape is: R1,977 + R0.3954 = **R1,977.40**

Appendix 2: Summary of Level of Service Unit Costs per Region/Province

The following tables provides a summary of the **August 2009 services unit costs**, derived from the escalation of the February 2007 costs, using the SAFCEC CPAF indices of plant, labour, material and fuel. Professional fees and VAT @14% are excluded.

INFRASTRUCTURE UNIT COST AS REFLECTED ON A PROVINCIAL BASIS AND AS A NATIONAL AVERAGE

INFRASTRUCTURE TYPE	LEVEL OF SERVICE	UNIT	LIMPOPO			GAUTENG			NORTH WEST			FREE STATE			KWA-ZULU NATAL			MPUMALANGA			NORTHERN CAPE			WESTERN CAPE			EASTERN CAPE			NAT.
			Min	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	**AVG**
Basic Residential																													
Water Supply	Communal standpipes	per standpipe	1,856	2,063	1,960	1,629	1,810	1,720	1,731	1,924	1,828	1,655	1,839	1,747	1,519	1,688	1,603	1,782	1,980	1,881	1,946	2,162	2,054	1,779	1,977	1,878	1,623	1,803	1,713	1,820
	Yard taps	per yard tap	1,261	1,401	1,331	1,071	1,190	1,131	1,150	1,278	1,214	1,128	1,254	1,191	1,031	1,145	1,088	1,206	1,340	1,273	1,325	1,472	1,399	1,204	1,338	1,271	1,110	1,234	1,172	1,230
	5000 l yard tanks	per yard tank	16,329	18,144	17,236	14,153	15,726	14,939	15,277	16,974	16,126	14,762	16,403	15,583	13,487	14,986	14,236	15,752	17,502	16,627	17,068	18,964	18,016	15,723	17,469	16,596	14,514	16,127	15,321	16,076
	Roof tanks - intermediate level of service	per roof tank	1,572	1,746	1,659	1,371	1,522	1,447	1,471	1,634	1,553	1,427	1,586	1,507	1,460	1,623	1,542	1,554	1,727	1,641	1,645	1,828	1,737	1,170	1,567	1,235	1,262	1,684	1,332	1,517
	House connections - full level of service	per household	2,761	3,068	2,914	2,332	2,591	2,461	2,691	2,990	2,840	2,412	2,680	2,546	2,242	2,491	2,366	2,665	2,961	2,813	2,896	3,218	3,057	2,436	2,707	2,571	2,337	2,597	2,467	2,671
Domestic Water Meters	Domestic meters (15 mm)	per meter	2,349	2,610	2,480	1,972	2,191	2,081	2,301	2,556	2,429	2,056	2,285	2,171	1,907	2,119	2,013	2,277	2,530	2,403	2,477	2,752	2,615	2,272	2,525	2,399	1,986	2,206	2,096	2,298
	Domestic meters (25 mm)	per meter	2,739	3,043	2,891	2,293	2,548	2,421	2,682	2,979	2,830	2,394	2,660	2,527	2,221	2,467	2,344	2,653	2,948	2,800	2,889	3,210	3,050	2,648	2,942	2,795	2,136	2,373	2,255	2,657
	Domestic meters pre paid (15 mm)	per meter	2,944	3,271	3,108	2,479	2,754	2,617	2,885	3,205	3,045	2,583	2,871	2,727	2,394	2,660	2,527	2,855	3,172	3,014	3,102	3,446	3,274	2,850	3,166	3,008	2,232	2,480	2,356	2,853
Bulk Water Supply	110 mm	per meter	325	361	343	283	315	299	314	349	331	289	321	305	267	297	282	326	362	344	355	394	374	323	358	341	286	318	302	325
	160 mm	per meter	418	464	441	350	389	370	406	452	429	366	406	386	339	377	358	404	449	427	441	490	465	403	448	426	354	393	373	408
	250 mm	per meter	677	752	715	565	627	596	660	733	697	590	656	623	548	609	578	655	728	691	715	794	755	654	726	690	570	633	602	661
	315 mm	per meter	938	1,042	990	780	867	823	912	1,013	963	816	907	862	758	842	800	906	1,007	956	991	1,101	1,046	904	1,005	955	788	876	832	914
Borehole - 165 mm ID Hole	Boreholes - shallow 50 m - semi rural	per meter	1,313	1,459	1,386	1,316	1,462	1,389	1,320	1,466	1,393	1,312	1,458	1,385	1,316	1,462	1,389	1,320	1,467	1,394	1,317	1,463	1,390	1,318	1,464	913	1,313	1,459	913	1,283
	Boreholes - shallow 50 m – deep rural	per meter	1,425	1,583	1,504	1,428	1,586	1,507	1,432	1,591	1,512	1,424	1,582	1,503	1,428	1,587	1,507	1,433	1,592	1,513	1,429	1,588	1,508	1,430	1,589	913	1,425	1,583	913	1,376
	Boreholes - deep 200 m - semi rural	per meter	638	709	673	639	710	675	641	713	677	638	709	673	640	711	675	642	713	677	640	711	675	641	712	545	638	709	545	646
	Boreholes - deep 200 m - deep rural	per meter	675	750	713	677	752	714	679	754	717	675	750	713	677	752	715	679	755	717	677	753	715	678	753	545	675	750	545	677
Borehole - 208 mm ID Hole	Boreholes - shallow 50 m - semi rural	per meter	1,375	1,528	1,451	1,378	1,531	1,454	1,382	1,536	1,459	1,374	1,527	1,451	1,378	1,531	1,455	1,383	1,537	1,460	1,379	1,532	1,456	1,380	1,534	913	1,313	1,459	913	1,335
	Boreholes - shallow 50 m – deep rural	per meter	1,487	1,652	1,569	1,490	1,655	1,573	1,495	1,661	1,578	1,486	1,651	1,569	1,490	1,656	1,573	1,495	1,662	1,579	1,491	1,657	1,574	1,493	1,659	913	1,425	1,583	913	1,427
	Boreholes - deep 200 m - semi rural	per meter	700	778	739	702	780	741	704	782	743	700	778	739	702	780	741	704	782	743	702	780	741	703	781	545	638	709	545	697
	Boreholes - deep 200 m - deep rural	per meter	737	819	778	739	821	780	741	824	783	737	819	778	739	821	780	742	824	783	740	822	781	740	823	545	738	819	545	728
Sanitation	VIP toilets (single pit fixed top structure)	per toilet	6,247	6,941	6,594	5,614	6,238	5,926	6,326	7,028	6,677	5,608	6,231	5,919	5,302	5,891	5,597	6,234	6,926	6,580	6,502	7,225	6,864	6,107	6,786	6,447	6,231	6,923	6,577	6,353
	VIP toilets (double pit fixed top structure)	per toilet	6,518	7,242	6,880	5,860	6,511	6,186	6,604	7,337	6,970	5,863	6,514	6,188	5,536	6,152	5,844	6,503	7,225	6,864	6,791	7,545	7,168	6,374	7,082	6,728	6,531	7,257	6,894	6,636
	VIP toilets (single pit movable top structure)	per toilet	6,587	7,319	6,953	6,216	6,907	6,562	6,916	7,684	7,300	6,300	7,000	6,650	6,140	6,822	6,481	6,697	7,441	7,069	6,925	7,694	7,309	6,684	7,426	7,055	6,776	7,529	7,153	6,948
	VIP toilets (double pit movable top structure)	per toilet	6,858	7,620	7,239	6,462	7,180	6,821	7,194	7,993	7,593	6,555	7,283	6,919	6,374	7,082	6,728	6,966	7,740	7,353	7,213	8,014	7,614	6,950	7,723	7,337	7,077	7,863	7,470	7,230
	Onsite UDS	per toilet	6,125	6,806	6,466	5,515	6,127	5,821	6,185	6,872	6,528	5,487	6,096	5,792	5,086	5,651	5,369	6,115	6,794	6,454	6,406	7,118	6,762	5,971	6,635	6,303	6,014	6,682	6,348	6,205
	Septic tanks (full level of	per septic	9,388	10,431	9,910	8,476	9,418	8,947	9,229	10,254	9,741	9,075	10,084	9,580	8,274	9,194	8,734	9,160	10,178	9,669	9,885	10,983	10,434	9,300	10,333	9,817	9,477	10,530	10,003	9,648

INFRASTRUCTURE TYPE	LEVEL OF SERVICE	UNIT	LIMPOPO			GAUTENG			NORTH WEST			FREE STATE			KWA-ZULU NATAL			MPUMALANGA			NORTHERN CAPE			WESTERN CAPE			EASTERN CAPE			NAT.
			Min	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	**AVG**
	service)	tank																											
	Full water-borne sanitation (full level of service)	per household	7,247	8,052	7,650	6,611	7,346	6,979	7,179	7,977	7,578	6,933	7,703	7,318	6,464	7,183	6,823	7,087	7,875	7,481	7,448	8,276	7,862	7,245	8,050	7,648	7,389	8,210	7,800	7,460
Bulk Wastewater / Sewer	75 mm	per meter	329	365	347	289	321	305	307	341	324	279	309	294	297	330	314	301	335	318	330	367	349	303	336	320	278	308	293	318
	90 mm	per meter	334	371	353	297	329	313	312	347	329	287	318	302	303	337	320	306	340	323	337	375	356	310	344	327	283	315	299	325
	110 mm	per meter	343	381	362	297	329	313	321	357	339	290	322	306	309	343	326	316	351	333	349	387	368	319	354	336	287	319	303	332
	160 mm	per meter	389	432	410	334	371	352	365	406	386	329	366	347	349	388	369	361	401	381	396	440	418	362	403	382	324	360	342	377
	250 mm	per meter	583	647	615	494	549	522	555	616	586	497	552	525	524	583	553	556	618	587	602	669	635	549	611	580	486	540	513	568
	300 mm	per meter	628	698	663	585	650	618	600	667	634	577	641	609	593	658	626	591	657	624	630	701	666	595	661	628	577	641	609	631
	400 mm	per meter	731	812	771	688	764	726	703	781	742	679	755	717	695	772	734	693	770	731	738	820	779	697	775	736	680	755	717	739
	500 mm	per meter	833	926	879	792	881	837	805	895	850	782	868	825	798	886	842	796	885	840	857	952	904	800	889	844	793	882	837	851
Wastewater Treatment Plant /ML	Preliminary, primary and advanced - primary treatment	per Ml	6,754,208	7,504,675	7,129,442	5,580,121	6,200,134	5,890,128	6,600,579	7,333,976	6,967,277	5,845,097	6,494,552	6,169,825	5,437,509	6,041,676	5,739,592	6,525,303	7,250,337	6,887,820	7,148,825	7,943,139	7,545,982	6,513,049	7,236,722	6,874,885	5,625,109	6,250,121	5,937,615	6,571,396
	Secondary and Secondary with nutrient - Removal Treatment	per Ml	9,287,036	10,318,929	9,802,982	7,672,666	8,525,185	8,098,926	9,075,796	10,084,217	9,580,006	8,037,008	8,930,009	8,483,509	7,476,574	8,307,305	7,891,940	8,972,292	9,969,213	9,470,752	9,829,634	10,921,816	10,375,725	8,955,443	9,950,492	9,452,968	7,734,524	8,593,916	8,164,220	9,035,670
	Tertiary and advance treatment - removal of ss	per Ml	10,131,312	11,257,013	10,694,162	8,370,181	9,300,202	8,835,191	9,900,868	11,000,964	10,450,916	8,767,645	9,741,828	9,254,737	8,156,263	9,062,514	8,609,389	9,787,954	10,875,505	10,331,730	10,723,237	11,914,708	11,318,972	9,769,574	10,855,082	10,312,328	8,437,663	9,375,181	8,906,422	9,857,094
Package Plants (Wastewater Treatment Works)	20 kl - 50 kl	per kl	4,822	17,202	11,012	3,332	14,247	8,790	3,918	16,853	8,253	4,189	14,923	9,556	4,365	15,549	9,957	4,851	17,303	11,077	5,123	18,252	11,688	4,668	16,628	10,648	4,071	14,504	9,288	10,030
	50 kl - 100 kl	per kl	4,201	9,078	6,640	3,479	7,519	5,499	3,409	8,894	5,771	3,645	7,877	5,761	3,798	8,207	6,002	4,226	9,132	6,679	4,458	9,633	7,045	4,061	8,777	6,419	3,542	7,654	5,598	6,157
	500 kl - 1Ml	per Kl	3,654	7,373	5,513	3,026	6,106	4,566	2,965	7,223	4,101	3,171	6,397	4,784	3,303	6,665	4,984	3,676	7,416	5,546	3,877	7,823	5,850	3,533	7,127	5,330	3,081	6,216	4,649	5,036
Roads	Class 5b (Unpaved gravel - rural)	per km	439,447	472,406	455,927	396,952	426,723	411,837	410,560	441,352	425,956	418,248	449,617	433,933	416,974	448,247	432,610	410,869	441,684	426,277	416,070	447,275	431,673	432,251	464,670	448,460	491,025	527,852	509,438	441,790
	Class 5a (Unpaved gravel - urban)	per km	343,760	369,542	356,651	310,517	333,806	322,162	322,916	347,135	335,026	334,562	359,654	347,108	329,009	353,685	341,347	326,348	350,824	338,586	323,002	347,227	335,114	342,290	367,961	355,126	446,323	479,798	463,061	354,909
	Class 5a (Paving blocks-urban)	per km	4,653,966	5,003,014	4,828,490	4,653,966	5,003,014	4,828,490	4,653,966	5,003,014	4,828,490	4,653,966	5,003,014	4,828,490	4,653,966	5,003,014	4,828,490	4,653,966	5,003,014	4,828,490	4,653,966	5,003,014	4,828,490	4,653,966	5,003,014	4,828,490	4,653,966	5,003,014	4,828,490	4,828,490
	Class 4 (Low level paved chip and spray)	per km	5,003,813	5,379,099	5,191,456	4,517,609	4,856,430	4,687,020	4,719,785	5,073,769	4,896,777	4,977,822	5,351,159	5,164,490	4,827,414	5,189,470	5,008,442	4,815,455	5,176,614	4,996,035	4,662,314	5,011,988	4,837,151	5,060,087	5,439,594	5,249,841	4,735,287	5,090,434	4,912,861	4,993,786
	Class 3 (High level paved bitumen)	per km	5,409,070	5,814,750	5,611,910	4,883,489	5,249,751	5,066,620	5,102,039	5,484,692	5,293,365	5,380,974	5,784,547	5,582,761	5,218,384	5,609,763	5,414,073	5,205,457	5,595,866	5,400,662	5,039,914	5,417,907	5,228,910	5,469,902	5,880,145	5,675,023	5,118,797	5,502,706	5,310,752	5,398,231
Storm Water	Un lined	per meter	259	278	269	234	251	243	239	257	248	235	253	244	241	259	250	234	252	243	249	267	258	247	266	256	231	248	240	250
	Lined	per meter	860	924	892	776	834	805	815	876	846	874	939	906	836	899	868	839	902	871	795	854	824	881	948	915	825	887	856	865
	Pipe culverts (600mm dia; Class 100D)	per meter	4,025	4,326	4,175	3,643	3,916	3,780	3,842	4,131	3,987	4,089	4,395	4,242	3,928	4,222	4,075	3,960	4,257	4,108	3,735	4,015	3,875	4,148	4,459	4,304	3,865	4,155	4,010	4,062
	Box culverts (1500mm x 1500mm)	per meter	18,982	20,405	19,694	17,183	18,472	17,828	18,123	19,482	18,803	19,285	20,731	20,008	18,526	19,915	19,221	18,676	20,077	19,377	17,616	18,937	18,277	19,564	21,032	20,298	18,228	19,595	18,912	19,157
	Low level stream crossings	per meter	64,489	69,326	66,908	58,379	62,758	60,568	61,572	66,190	63,881	65,520	70,434	67,977	62,941	67,662	65,301	63,452	68,211	65,832	59,850	64,338	62,094	66,468	71,453	68,961	61,930	66,574	64,252	65,086
	Dewatering (subsoil)	per meter	5650	6,074	5,862	5115	5,499	5,307	5366	5,768	5,567	5741	6,171	5,956	5515	5,928	5,722	5560	5,977	5,768	5244	5,637	5,441	5824	6,261	6,042	5426	5,833	5,630	5,699
	Gabions	per m^3	1483	1,595	1,539	1339	1,439	1,389	1402	1,507	1,455	1508	1,621	1,564	1441	1,549	1,495	1443	1,551	1,497	1370	1,472	1,421	1516	1,630	1,573	1500	1,612	1,556	1,499
	Reno Mattresses	per m^3	1753	1,884	1,819	1582	1,700	1,641	1657	1,781	1,719	1782	1,915	1,848	1703	1,831	1,767	1705	1,833	1,769	1618	1,740	1,679	1792	1,926	1,859	1767	1,899	1,833	1,770
Street / community lighting	Streetlights	per street light	8,148	8,759	8,454	7,399	7,954	7677	7,762	8,344	8053	8,129	8,738	8434	7,910	8,503	8207	7,924	8,518	8221	7,645	8,218	7931	8,307	8,930	8619	7,737	8,318	8027	8,180
	High mast lights	per high mast	221,197	237,786	229,492	200,871	215,936	208403	210,717	226,521	218619	220,671	237,222	228947	214,738	230,843	222791	215,116	231,250	223183	207,532	223,097	215314	225,518	242,432	233975	210,045	225,798	217922	222,072
Public Municipal Services																														
Bus Shelters	Bus shelters for bus ranks	per m^2	2,477	2,752	2,615	2,042	2,269	2,156	2,408	2,675	2,542	2,144	2,383	2,263	1,989	2,210	2,100	2,379	2,644	2,511	2,614	2,904	2,759	2,379	2,644	2,511	2,063	2,292	2,177	2,404

INFRASTRUCTURE TYPE	LEVEL OF SERVICE	UNIT	LIMPOPO			GAUTENG			NORTH WEST			FREE STATE			KWA-ZULU NATAL			MPUMALANGA			NORTHERN CAPE			WESTERN CAPE			EASTERN CAPE			NAT.
			Min	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	AVG
	Bus shelters for streets	per m²	2,477	2,752	2,615	2,042	2,269	2,156	2,408	2,675	2,542	2,144	2,383	2,263	1,989	2,210	2,100	2,379	2,644	2,511	2,614	2,904	2,759	2,379	2,644	2,511	2,063	2,292	2,177	2,404
Sidewalks	Paved sidewalk	per m²	205	227	216	185	206	196	194	215	205	203	226	215	198	220	209	198	220	209	191	213	202	208	231	219	194	216	205	208
	Gravel sidewalk	per m²	94	104	99	85	94	90	89	99	94	93	104	99	91	101	96	91	101	96	88	97	92	95	106	100	89	99	94	90
Disaster Mngment Facilities (Provincial DMC) (750-1000sq)	Offices for staff	per m²	4,613	5,125	4,869	3,803	4,225	4,014	4,483	4,982	4,733	3,993	4,437	4,215	3,704	4,116	3,910	4,430	4,922	4,676	4,868	5,408	5,138	4,430	4,922	4,676	3,841	4,268	4,054	4,476
	Small conference room's)	per m²	4,527	5,030	4,779	3,732	4,147	3,940	4,400	4,889	4,645	3,919	4,354	4,137	3,636	4,040	3,838	4,348	4,831	4,590	4,777	5,308	5,043	4,348	4,831	4,590	3,770	4,189	3,979	4,393
	Ablution facilities, as per the Building Regulations	per m²	6,020	6,688	6,354	4,963	5,514	5,238	5,851	6,501	6,176	5,211	5,790	5,500	4,834	5,371	5,103	5,781	6,424	6,103	6,352	7,058	6,705	5,781	6,424	6,103	5,012	5,569	5,291	5,841
	Small kitchen	per m²	5,382	5,979	5,681	4,437	4,929	4,683	5,231	5,812	5,521	4,658	5,176	4,917	4,322	4,802	4,562	5,169	5,743	5,456	5,679	6,310	5,994	5,169	5,743	5,456	4,481	4,979	4,730	5,222
Community Services																														
Health Services	Car parking	per m²	8,713	9,681	9,197	7,183	7,981	7,582	8,469	9,410	8,939	7,542	8,380	7,961	6,997	7,774	7,386	8,368	9,298	8,833	9,194	10,216	9,705	8,368	9,298	8,833	7,255	8,061	7,658	8,455
	Main entrance	per m²	7,688	8,542	8,115	6,338	7,042	6,690	7,472	8,303	7,888	6,655	7,394	7,025	6,174	6,860	6,517	7,384	8,204	7,794	8,113	9,014	8,563	7,384	8,204	7,794	6,401	7,113	6,757	7,460
	Reception	per m²	7,688	8,542	8,115	6,338	7,042	6,690	7,472	8,303	7,888	6,655	7,394	7,025	6,174	6,860	6,517	7,384	8,204	7,794	8,113	9,014	8,563	7,384	8,204	7,794	6,401	7,113	6,757	7,460
	Record storage	per m²	7,688	8,542	8,115	6,338	7,042	6,690	7,472	8,303	7,888	6,655	7,394	7,025	6,174	6,860	6,517	7,384	8,204	7,794	8,113	9,014	8,563	7,384	8,204	7,794	6,401	7,113	6,757	7,460
	Administration	per m²	7,688	8,542	8,115	6,338	7,042	6,690	7,472	8,303	7,888	6,655	7,394	7,025	6,174	6,860	6,517	7,384	8,204	7,794	8,113	9,014	8,563	7,384	8,204	7,794	6,401	7,113	6,757	7,460
	Waiting areas	per m²	7,688	8,542	8,115	6,338	7,042	6,690	7,472	8,303	7,888	6,655	7,394	7,025	6,174	6,860	6,517	7,384	8,204	7,794	8,113	9,014	8,563	7,384	8,204	7,794	6,401	7,113	6,757	7,460
	Consulting rooms	per m²	7,688	8,542	8,115	6,338	7,042	6,690	7,472	8,303	7,888	6,655	7,394	7,025	6,174	6,860	6,517	7,384	8,204	7,794	8,113	9,014	8,563	7,384	8,204	7,794	6,401	7,113	6,757	7,460
	Treatment rooms	per m²	7,688	8,542	8,115	6,338	7,042	6,690	7,472	8,303	7,888	6,655	7,394	7,025	6,174	6,860	6,517	7,384	8,204	7,794	8,113	9,014	8,563	7,384	8,204	7,794	6,401	7,113	6,757	7,460
Multi Purpose Centre / Facilities (400-600m²)	Type of facility (400 – 600 m2) seating 1 200 – 2 500 people)	per unit	4,954,427	5,504,919	5,229,673	4,084,441	4,538,268	4,311,355	4,815,556	5,350,618	5,083,087	4,288,663	4,765,181	4,526,922	3,978,683	4,420,759	4,199,721	4,758,374	5,287,082	5,022,728	5,228,085	5,808,983	5,518,534	4,758,374	5,287,082	5,022,728	4,125,286	4,583,651	4,354,468	4,807,691
	Outdoor	Per unit	3,416,846	3,796,496	3,606,671	2,816,856	3,129,840	2,973,348	3,321,073	3,690,081	3,505,577	2,957,699	3,286,332	3,122,015	2,743,920	3,048,800	2,896,360	3,281,637	3,646,264	3,463,950	3,605,576	4,006,195	3,805,885	3,281,637	3,646,264	3,463,950	2,845,025	3,161,138	3,003,081	3,315,649
	Hall	per unit	4,271,058	4,745,620	4,508,339	3,521,070	3,912,300	3,716,685	4,151,342	4,612,602	4,381,972	3,697,124	4,107,915	3,902,519	3,429,899	3,810,999	3,620,449	4,102,047	4,557,830	4,329,938	4,506,970	5,007,744	4,757,357	4,102,047	4,557,830	4,329,938	3,556,281	3,951,423	3,753,852	4,144,561
	Sports and recreational hall	Per unit	6,150,323	6,833,693	6,492,008	5,070,341	5,633,712	5,352,026	5,977,932	6,642,146	6,310,039	5,323,858	5,915,398	5,619,628	4,939,055	5,487,839	5,213,447	5,906,947	6,563,274	6,235,111	6,490,036	7,211,151	6,850,594	5,906,947	6,563,274	6,235,111	5,121,044	5,690,049	5,405,547	5,968,168
Sports Facilities	Athletic Track	No.	6,144,025	6,826,695	6,485,360	5,085,028	5,650,031	5,367,529	6,000,906	6,667,674	6,334,290	5,336,987	5,929,985	5,633,486	5,543,663	6,159,625	5,851,644	6,164,665	6,849,628	6,507,147	6,517,606	7,241,784	6,879,695	5,930,866	6,589,851	6,260,358	5,125,811	5,695,346	5,410,579	6,081,121
	Baseball Diamond	No.	2,281,593	2,535,103	2,408,348	1,888,333	2,098,147	1,993,240	2,228,445	2,476,050	2,352,248	1,981,898	2,202,109	2,092,003	2,058,647	2,287,386	2,173,017	2,289,258	2,543,620	2,416,439	2,420,323	2,689,247	2,554,785	2,202,436	2,447,151	2,324,793	1,903,478	2,114,975	2,009,226	2,258,233
	Basketball Hard Court	No.	240,167	266,852	253,510	198,771	220,857	209,814	234,573	260,636	247,604	208,620	231,800	220,210	216,699	240,777	228,738	240,974	267,749	254,361	254,770	283,078	268,924	231,835	257,594	244,714	200,365	222,628	211,497	237,708
	Bowling Green	No.	437,757	486,396	462,077	362,304	402,560	382,432	427,560	475,066	451,313	380,256	422,507	401,381	394,981	438,868	416,925	439,227	488,030	463,629	464,374	515,971	490,173	422,569	469,521	446,045	365,210	405,789	385,499	433,275
	Elevated Boxing Ring	No.	206,378	229,309	217,843	170,806	189,785	180,295	201,571	223,967	212,769	179,270	199,188	189,229	186,212	206,902	196,557	207,071	230,079	218,575	218,927	243,252	231,089	199,218	221,353	210,286	172,176	191,307	181,742	204,265
	Cricket Field	No.	4,904,101	5,449,002	5,176,552	4,058,820	4,509,800	4,284,310	4,789,865	5,322,072	5,055,969	4,259,931	4,733,257	4,496,594	4,424,898	4,916,553	4,670,725	4,920,576	5,467,307	5,193,941	5,202,290	5,780,322	5,491,306	4,733,959	5,259,955	4,996,957	4,091,373	4,545,970	4,318,671	4,853,892
	Football Field	No.	2,088,609	2,320,677	2,204,643	1,728,612	1,920,680	1,824,646	2,039,957	2,266,619	2,153,288	1,814,263	2,015,848	1,915,056	1,884,521	2,093,912	1,989,217	2,095,626	2,328,473	2,212,049	2,215,605	2,461,783	2,338,694	2,016,147	2,240,164	2,128,156	1,742,476	1,936,085	1,839,280	2,067,225
	Grassed Hockey Field	No.	1,260,368	1,400,409	1,330,388	1,043,128	1,159,031	1,101,080	1,231,009	1,367,788	1,299,398	1,094,814	1,216,460	1,155,637	1,137,211	1,263,568	1,200,390	1,264,602	1,405,113	1,334,858	1,337,003	1,485,559	1,411,281	1,216,641	1,351,823	1,284,232	1,051,494	1,168,327	1,109,911	1,247,464
	Korfball	No.	289,920	322,133	306,027	239,949	266,610	253,279	283,166	314,629	298,898	251,838	279,820	265,829	261,590	290,656	276,123	290,894	323,215	307,055	307,548	341,720	324,634	279,861	310,957	295,409	241,873	268,748	255,310	286,952
	Netball Hard Court	No.	227,039	252,266	239,653	187,906	208,785	198,346	221,751	246,390	234,070	197,217	219,130	208,173	204,854	227,616	216,235	227,802	253,113	240,458	240,844	267,605	254,224	219,162	243,514	231,338	189,413	210,459	199,936	224,715
	Rugby Field	No.	2,008,708	2,231,898	2,120,303	1,662,483	1,847,203	1,754,843	1,961,917	2,179,908	2,070,913	1,744,858	1,938,731	1,841,794	1,812,427	2,013,808	1,913,118	2,015,456	2,239,396	2,127,426	2,130,845	2,367,606	2,249,226	1,939,018	2,154,465	2,046,742	1,675,816	1,862,018	1,768,917	1,988,142
	Tennis Hard Court	No.	219,974	244,415	232,195	182,059	202,287	192,173	214,850	238,722	226,786	191,080	212,311	201,695	198,479	220,532	209,506	220,713	245,237	232,975	233,349	259,277	246,313	212,342	235,936	224,139	183,519	203,910	193,714	217,722
	Softball Diamond	No.	2,281,593	2,535,103	2,408,348	1,888,333	2,098,147	1,993,240	2,228,445	2,476,050	2,352,248	1,981,898	2,202,109	2,092,003	2,058,647	2,287,386	2,173,017	2,289,258	2,543,620	2,416,439	2,420,323	2,689,247	2,554,785	2,202,436	2,447,151	2,324,793	1,903,478	2,114,975	2,009,226	2,258,233
	Swimming Pool	No.	3,027,862	3,364,291	3,196,077	2,505,973	2,784,415	2,645,194	2,957,331	3,285,923	3,121,627	2,630,142	2,922,380	2,776,261	2,731,995	3,035,550	2,883,772	3,038,033	3,375,593	3,206,813	3,211,968	3,568,853	3,390,410	2,922,814	3,247,571	3,085,192	2,526,072	2,806,746	2,666,409	2,996,862
	Multi-Purpose Sports Hall	No.	8,492,495	9,436,105	8,964,300	7,028,710	7,809,678	7,419,194	8,294,670	9,216,300	8,755,485	7,376,977	8,196,641	7,786,809	7,662,651	8,514,057	8,088,354	8,521,024	9,467,804	8,994,414	9,008,871	10,009,857	9,509,364	8,197,857	9,108,731	8,653,294	7,085,082	7,872,314	7,478,698	8,405,546
Multi Purpose Community Centre (not less than 600sq)	Offices for all service providers 6m²	per unit	7,688	8,542	8,115	6,338	7,042	6,690	7,472	8,303	7,888	6,655	7,394	7,025	6,174	6,860	6,517	7,384	8,204	7,794	8,113	9,014	8,563	7,384	8,204	7,794	6,401	7,113	6,757	7,460
	A community hall / sports complex 429m²	Per unit	9,225,485	10,250,539	9,738,012	7,605,511	8,450,568	8,028,040	8,966,898	9,963,220	9,465,059	7,985,787	8,873,096	8,429,442	7,408,583	8,231,759	7,820,171	8,860,421	9,844,912	9,352,666	9,735,054	10,816,727	10,275,891	8,860,421	9,844,912	9,352,666	7,681,566	8,535,074	8,108,320	8,952,252
	Reception area with general service counter 25m²	per unit	184,510	205,011	194,760	152,110	169,011	160,561	179,338	199,264	189,301	159,716	177,462	168,589	148,172	164,635	156,403	177,208	196,898	187,053	194,701	216,335	205,518	177,208	196,898	187,053	153,631	170,701	162,166	179,045
	A furnished sheltered waiting room for clients	per unit	174,259	193,621	183,940	143,660	159,622	151,641	169,375	188,194	178,784	150,843	167,603	159,223	139,940	155,489	147,714	167,363	185,959	176,661	183,884	204,316	194,100	167,363	185,959	176,661	145,096	161,218	153,157	169,098

INFRASTRUCTURE TYPE	LEVEL OF SERVICE	UNIT	LIMPOPO			GAUTENG			NORTH WEST			FREE STATE			KWA-ZULU NATAL			MPUMALANGA			NORTHERN CAPE			WESTERN CAPE			EASTERN CAPE			NAT.
			Min	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	*Min*	*Max*	*Avg*	**AVG**
	Centre managers office 25m²	Per unit	192,198	213,553	202,875	158,448	176,054	167,251	186,810	207,567	197,189	166,371	184,856	175,613	154,345	171,495	162,920	184,592	205,102	194,847	202,814	225,348	214,081	184,592	205,102	194,847	160,033	177,814	168,923	186,505
	Furnished telecommunication/computer centre 50m²	per unit	1,281,317	1,423,686	1,352,502	1,056,321	1,173,690	1,115,006	1,245,402	1,383,781	1,314,591	1,109,137	1,232,375	1,170,756	1,028,970	1,143,300	1,086,135	1,230,614	1,367,349	1,298,981	1,352,091	1,502,323	1,427,207	1,230,614	1,367,349	1,298,981	1,066,884	1,185,427	1,126,156	1,243,368
	Boardroom for MCPC stakeholders meetings50m²	per unit	854,212	949,124	901,668	704,214	782,460	743,337	830,268	922,520	876,394	739,425	821,583	780,504	685,980	762,200	724,090	820,409	911,566	865,988	901,394	1,001,549	951,471	820,409	911,566	865,988	711,256	790,285	750,770	828,912
	Parking area 480m²	per unit	256,263	284,737	270,500	211,264	234,738	223,001	249,080	276,756	262,918	221,827	246,475	234,151	205,794	228,660	217,227	246,123	273,470	259,796	270,418	300,465	285,441	246,123	273,470	259,796	213,377	237,085	225,231	248,674
Parks and Open Spaces	Earthworks	per m²	6	7	6	5	5	5	6	6	6	5	6	5	5	5	5	6	6	6	6	7	7	6	6	6	5	6	5	6
	Grassing	per m²	27	30	29	23	25	24	27	30	28	24	26	25	22	24	23	26	29	28	29	32	30	26	29	28	23	25	24	27
	Irrigation	per m²	26	29	27	21	24	22	25	28	26	22	25	23	21	23	22	25	28	26	27	30	29	25	28	26	21	24	23	25
	Ablution facility	per m²	7,688	8,542	8,115	6,338	7,042	6,690	7,472	8,303	7,888	6,655	7,394	7,025	6,174	6,860	6,517	7,384	8,204	7,794	8,113	9,014	8,563	7,384	8,204	7,794	6,401	7,113	6,757	7,460
	Fencing (1,8m high concrete palisade fencing)	per meter	769	854	812	634	704	669	747	830	789	665	739	702	617	686	652	738	820	779	811	901	856	738	820	779	640	711	676	746
Cemeteries	Basic level of service	per m²	1,793,844	1,993,160	1,893,502	1,478,849	1,643,166	1,561,008	1,743,563	1,937,293	1,840,428	1,552,792	1,725,324	1,639,058	1,440,558	1,600,620	1,520,589	1,722,860	1,914,288	1,818,574	1,892,927	2,103,252	1,998,090	1,722,860	1,914,288	1,818,574	1,493,638	1,659,598	1,576,618	1,740,716
	Higher level of service	per m²	4,100,216	4,555,795	4,328,005	3,380,227	3,755,808	3,568,018	3,985,288	4,428,098	4,206,693	3,549,239	3,943,598	3,746,418	3,292,703	3,658,559	3,475,631	3,937,965	4,375,516	4,156,741	4,326,691	4,807,434	4,567,063	3,937,965	4,375,516	4,156,741	3,414,029	3,793,366	3,603,698	3,978,779
	Intermediate level of service: Regional cemetery	per m²	3,075,162	3,416,846	3,246,004	2,535,170	2,816,856	2,676,013	2,988,966	3,321,073	3,155,020	2,661,929	2,957,699	2,809,814	2,469,528	2,743,920	2,606,724	2,953,474	3,281,637	3,117,555	3,245,018	3,605,576	3,425,297	2,953,474	3,281,637	3,117,555	2,560,522	2,845,025	2,702,773	2,984,084
	Highest level of service: Memorial parks	per m²	8,542,116	9,491,240	9,016,678	7,042,140	7,824,600	7,433,370	8,302,683	9,225,203	8,763,943	7,394,247	8,215,830	7,805,039	6,859,799	7,621,999	7,240,899	8,204,093	9,115,659	8,659,876	9,013,939	10,015,488	9,514,714	8,204,093	9,115,659	8,659,876	7,112,561	7,902,846	7,507,704	8,289,122
Fencing Security	Concrete Pales Palisade Fencing 2,4m high	per meter	1,005	1,116	1,060	828	920	874	976	1,085	1,031	870	966	918	807	896	852	965	1,072	1,018	1,060	1,178	1,119	965	1,072	1,018	836	929	883	975
	Wire Fencing 2,4m high	per meter	564	626	595	465	516	491	548	609	578	488	542	515	453	503	478	541	602	572	595	661	628	541	602	572	469	522	496	547
Public	Concrete Pales Palisade Fencing 1,8m high	per meter	564	626	595	465	516	491	548	609	578	488	542	515	453	503	478	541	602	572	595	661	628	541	602	572	469	522	496	547
	Wire Fencing 1,2m high	per meter	273	304	289	225	250	238	266	295	280	237	263	250	220	244	232	263	292	277	288	320	304	263	292	277	228	253	240	265
	Wire Fencing 1,83m high	per meter	420	467	444	346	385	366	408	454	431	364	404	384	338	375	356	404	448	426	443	493	468	404	448	426	350	389	369	408
Gates/Security	Double leaf 4m wide 2,4m high	per gate	4,100	4,556	4,328	3,380	3,756	3,568	3,985	4,428	4,207	3,549	3,944	3,746	3,293	3,659	3,476	3,938	4,376	4,157	4,327	4,807	4,567	3,938	4,376	4,157	3,414	3,793	3,604	3,979
	Double leaf 6m wide	per gate	5,467	6,074	5,771	4,507	5,008	4,757	5,314	5,904	5,609	4,732	5,258	4,995	4,390	4,878	4,634	5,251	5,834	5,542	5,769	6,410	6,089	5,251	5,834	5,542	4,552	5,058	4,805	5,305
	Single pedestrian 1,0m wide	per gate	1,905	2,117	2,011	1,570	1,745	1,658	1,851	2,057	1,954	1,649	1,832	1,741	1,530	1,700	1,615	1,830	2,033	1,931	2,010	2,233	2,122	1,830	2,033	1,931	1,586	1,762	1,674	1,848
Libraries	Per m2	per m²	10,251	11,389	10,820	8,451	9,390	8,920	9,963	11,070	10,517	8,873	9,859	9,366	8,232	9,146	8,689	9,845	10,939	10,392	10,817	12,019	11,418	9,845	10,939	10,392	8,535	9,483	9,009	9,947
Solid Waste Disposal Site	Landfill Maximum Communal <25	tonnes per day	3,426,555	3,807,283	3,616,919	2,829,336	3,143,706	2,986,521	3,343,893	3,715,437	3,529,665	2,965,541	3,295,046	3,130,294	2,756,779	3,063,087	2,909,933	3,305,350	3,672,611	3,488,980	3,623,901	4,026,557	3,825,229	3,300,754	3,667,505	3,484,130	2,853,574	3,170,638	3,012,106	3,331,531
	Small >25<150	tonnes per day	5,139,832	5,710,925	5,425,378	4,244,004	4,715,560	4,479,782	5,015,839	5,573,155	5,294,497	4,448,312	4,942,569	4,695,441	4,135,168	4,594,631	4,364,899	4,958,024	5,508,916	5,233,470	5,435,852	6,039,835	5,737,843	4,951,132	5,501,257	5,226,195	4,280,361	4,755,957	4,518,159	4,997,296
	Medium >150<500	tonnes per day	23,985,884	26,650,982	25,318,433	19,805,351	22,005,945	20,905,648	23,407,251	26,008,056	24,707,654	20,758,790	23,065,322	21,912,056	19,297,450	21,441,611	20,369,531	23,137,447	25,708,274	24,422,860	25,367,308	28,185,897	26,776,603	23,105,281	25,672,535	24,388,908	19,975,019	22,194,465	21,084,742	23,320,715
	Large >500	tonnes per day	41,118,658	45,687,397	43,403,027	33,952,030	37,724,478	35,838,254	40,126,716	44,585,240	42,355,978	35,586,497	39,540,552	37,563,524	33,081,343	36,757,048	34,919,196	39,664,194	44,071,327	41,867,761	43,486,813	48,318,681	45,902,747	39,609,053	44,010,059	41,809,556	34,242,889	38,047,655	36,145,272	39,978,368
Social Institutions and Micro Enterprises																														
Local Economic Development	Street trading	per 4m²	9823	10915	10369	8098	8998	8548	9548	10609	10079	8503	9448	8976	7889	8765	8327	9435	10483	9959	10366	11518	10942	9435	10483	9959	8179	9088	8634	9532
	Markets	per 6m²	33314	37016	35165	27464	30516	28990	32380	35978	34179	28838	32042	30440	26753	29726	28240	31996	35551	33774	35154	39060	37107	31996	35551	33774	27739	30821	29280	32328
Social Institutions:	Old-age homes	per inhabitant	153758	170842	162300	126759	140843	133801	149448	166054	157751	133096	147885	140491	123476	137196	130336	147674	164082	155878	162251	180279	171265	147674	164082	155878	128026	142251	135139	149204
	Orphanages	per orphan	153758	170842	162300	126759	140843	133801	149448	166054	157751	133096	147885	140491	123476	137196	130336	147674	164082	155878	162251	180279	171265	147674	164082	155878	128026	142251	135139	149204
	Churches	per m²	10251	11389	10820	8451	9390	8920	9963	11070	10517	8873	9859	9366	8232	9146	8689	9845	10939	10392	10817	12019	11418	9845	10939	10392	8535	9483	9009	9947
	Créches	per m²	7688	8542	8115	6338	7042	6690	7472	8303	7888	6655	7394	7025	6174	6860	6517	7384	8204	7794	8113	9014	8563	7384	8204	7794	6401	7113	6757	7460

Appendix 3: Public Municipal Service Infrastructure: Community Services

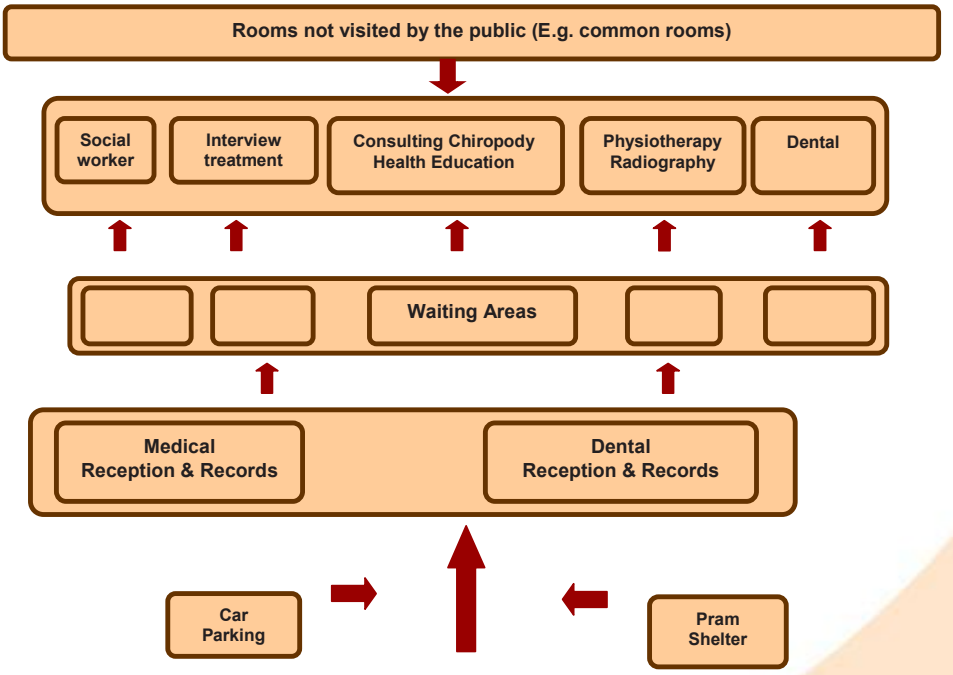
HEALTH SERVICES

Suggested layout of community health center's

Description of spaces

a) Car parking

On-site car parking (25m^2 per car) should be allowed for staff in the amount of 1.5 spaces per consulting room, and for patient's 2.5 spaces per consulting room. Space for maneuvering ambulances should be allowed.



Suggested layout of community health centers

Comment [G1]: If to stay suggest we change to… Example of typical layout of CHC
Marlene: tempted to let this go, BUT keep until next draft as per your suggestion EXAMPLE of …

b) Main entrance

A main entrance should be clearly visible, identifiable and easily accessible to all patients and staff.

c) Reception

The reception staff has to cope with the direction of patients to waiting areas, the making of appointments etc. allow 5.5m^2 per receptionist on duty at peak hours.

d) Record storage

Usually associated with reception, but ideally not part of it, is record storage. Assuming that all records (of A4 size) are centralized, allow 1.4m^2 per 1000 patients. It is important that the area is out of sight of waiting patients and that it can be extended.

e) Administration

Associated with the record storage are the clerical/administrative area, and the telephone switchboard. In total, 5.5m^2 should be allowed for each typist/secretary. In small center's, the switchboard may be manned by the receptionist, but if separate, allow 7.5m^2 per telephonist.

f) Waiting areas

Waiting areas are usually located with the reception desk. In larger center's, waiting areas can be decentralized, but only when the policy for reception and control of patients is closely identified. It is vital that waiting areas are not part of the circulation pattern. In total 6 seats should be allowed for each consulting room and treatment room which should be 1,4m^2 each. Location of ablution facilities and pram parks should be carefully considered in relation to waiting and reception rooms.

g) Consulting rooms

Consulting rooms are usually provided for each doctor on a personal basis. Where this results in under-use, there might be advantages in scheduling the use of rooms for other purposes, e.g. hospital consultants, social workers etc. As a general rule allow 17m^2 per combined consulting/examination rooms.

h) Treatment rooms

The treatment rooms are used primarily by nurses performing simple therapeutic techniques. For a room where one nurse treats patients, 17m^2 should be allowed. If more than one nurse is to be employed at the same time, treatments may be performed on two patients in one room of 25m^2.

Appendix 4: Cost breakdown Example Eastern Cape

(Rates & quantities used to calculate price)

EASTERN CAPE

Escalation of unit Costs to
August 2009

Cost difference to Gauteng

Description	***% Cost***
Material	1.00%
Plant	-6.40%
Ready Mix Concrete	18%
Preliminary & General	12%
Labour	65.00
Supervision	120.00

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
1	**General water supply**										
1a	**Stand pipes & Communal taps**										
1	25 mm Garden tap	no	1	160.70	0.2011	193.02	1.00%	194.95	194.95	15.00%	224.20
2	150mm x 25mm galv. Threaded pipe	no	1	5.50	0.2011	6.61	1.00%	6.67	6.67	15.00%	7.67
3	25mm galv Elbow	no	2	5.28	0.2011	6.34	1.00%	6.41	12.81	15.00%	14.73
4	1200mm x 25mm galv. Threaded pipe	no	1	39.90	0.2011	47.93	1.00%	48.40	48.40	15.00%	55.67
5	25mm x 32mm compression male adaptor	no	2	10.04	0.2011	12.06	1.00%	12.18	24.36	15.00%	28.01
6	110mm x 32 mm saddle	no	1	82.45	0.2011	99.03	1.00%	100.02	100.02	15.00%	115.03
7	50mm pvc trap	no	1	19.90	0.2011	23.90	1.00%	24.14	24.14	15.00%	27.76
8	50 mm 45 deg elbow	no	1	3.45	0.2011	4.14	1.00%	4.19	4.19	15.00%	4.81
9	50mm pvc pipe	m	3	7.50	0.2011	9.01	1.00%	9.10	27.30	15.00%	31.39
10	32mm hdpe pipe	m	15	6.93	0.2011	8.32	1.00%	8.41	126.11	15.00%	145.02
11	1.2 m 110mm upvc pipe to standpipe	no	1	20.00	0.2011	24.02	1.00%	24.26	24.26	15.00%	27.90
12	19mm concrete stone to drain	m3	1	165.00	0.2011	198.19	1.00%	200.17	200.17	15.00%	230.19
13	Concrete to plinth complete	m3	0	683.25	0.2011	820.67	18.20%	970.04	194.01	15.00%	223.11
14	Budem to drain	m2	6	14.00	0.2011	16.82	1.00%	16.98	101.90	15.00%	117.19
15	Excavation to trench and drain	m3	2	15.00	0.2011	18.02	-6.40%	16.86	33.31	15.00%	38.30
16	Labour man days	no	3	65.00	0.2011	78.07	0.00%	78.07	234.22	15.00%	269.35
17	Supervision	no	0	120.00	0.2011	144.14	0.00%	144.14	43.24	15.00%	49.73
										Total	1,610.07

		Percentage
Preliminary & General	%	12.00%

	193.21
Total Cost	**1,803.28**

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
1b	**Yard tap**										
1	25 mm Garden tap	no	1	160.70	0.2011	193.02	1.00%	194.95	194.95	15.00%	224.20
2	150mm x 25mm galv. Threaded pipe	no	1	5.50	0.2011	6.61	1.00%	6.67	6.67	15.00%	7.67
3	25mm galv Elbow	no	2	2.97	0.2011	3.57	1.00%	3.60	7.21	15.00%	8.29
4	1200mm x 25mm galv. Threaded pipe	no	1	39.90	0.2011	47.93	1.00%	48.40	48.40	15.00%	55.67
5	25mm x 32mm compression male adaptor	no	2	10.04	0.2011	12.06	1.00%	12.18	24.36	15.00%	28.01
6	110mm x 32 mm saddle	no	1	82.45	0.2011	99.03	1.00%	100.02	100.02	15.00%	115.03
10	32mm hdpe pipe	m	15	6.93	0.2011	8.32	1.00%	8.41	126.11	15.00%	145.02
11	1.2 m 110mm upvc pipe to standpipe	no	1	52.62	0.2011	63.20	1.00%	63.84	63.84	15.00%	73.41
13	Concrete to plinth	m3	0	683.25	0.2011	820.67	18.20%	970.04	194.01	15.00%	223.11
15	Excavation to trench	m3			0.2011	0.00	-6.40%	0.00	0.00	15.00%	0.00
16	Labour man days	no	2	65.00	0.2011	78.07	0.00%	78.07	156.15	15.00%	179.57
17	Supervision	no	0	120.00	0.2011	144.14	0.00%	144.14	36.03	15.00%	41.44
			Percentage							**Total**	1,101.41
	Preliminary & General	%	12.00%								132.17
									Total Cost		**1,233.58**

1c	**5000 l Yard tank**										
1	25 mm Garden tap	no	1	160.70	0.2011	193.02	1.00%	194.95	194.95	15.00%	224.20
2	150mm x 25mm galv. Threaded pipe	no	1	5.50	0.2011	6.61	1.00%	6.67	6.67	15.00%	7.67
3	25mm galv Barrel nipple	no	1	2.07	0.2011	2.49	1.00%	2.51	2.51	15.00%	2.89
4	5000 l Jojo tank	no	1	2,850.00	0.2011	3,423.23	1.00%	3,457.46	3457.46	15.00%	3,976.08
5	Concrete to foundation	m3	1	683.25	0.2011	820.67	18.20%	970.04	1164.04	15.00%	1,338.65
6	Concrete bricks to stand	no	1100	1.06	0.2011	1.27	1.00%	1.29	1414.53	15.00%	1,626.71
7	Brick force	m	40	0.60	0.2011	0.72	1.00%	0.73	29.12	15.00%	33.48
8	Cement to brickwork	no	5	48.00	0.2011	57.65	1.00%	58.23	291.15	15.00%	334.83
9	Building sand	m3	2	280.00	0.2011	336.32	1.00%	339.68	509.52	15.00%	585.95
10	Backfill material	m3	8	85.00	0.2011	102.10	1.00%	103.12	773.38	15.00%	889.39
11	Concrete to slab	m3	1	683.25	0.2011	820.67	18.20%	970.04	582.02	15.00%	669.33
12	Reinforcing mesh to slab	m2	6	22.80	0.2011	27.39	1.00%	27.66	159.32	15.00%	183.22
13	Gage 8 galv. Wire to tie down tank.	m	38	4.95	0.2011	5.95	1.00%	6.01	228.19	15.00%	262.42
14	Excavation to foundation	m3	1	42.00	0.2011	50.45	-6.40%	47.22	56.66	15.00%	65.16

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
16	Labour man days	no	32	65.00	0.2011	78.07	0.00%	78.07	2498.36	15.00%	2,873.11
17	Supervision	no	8	120.00	0.2011	144.14	0.00%	144.14	1153.09	15.00%	1,326.05
			Percentage							**Total**	14,399.13
	Preliminary & General	%	12.00%								1,727.90
									Total Cost		**16,127.02**

1d **House Connection (Including water meter)**

1	15 mm boxed tap stop valve complete	no	1	1,288.25	0.2011	1,547.36	1.00%	1,562.83	1562.83	15.00%	1,797.26
2	15mm x 25mm compression male adaptor	no	3	7.85	0.2011	9.43	1.00%	9.52	28.57	15.00%	32.85
3	75mm x 25 mm saddle	no	1	30.70	0.2011	36.87	1.00%	37.24	37.24	15.00%	42.83
4	15mm hdpe pipe	no	18	2.78	0.2011	3.34	1.00%	3.37	60.71	15.00%	69.81
5	25mm Compression end cap.	no	1	9.07	0.2011	10.89	1.00%	11.00	11.00	15.00%	12.65
6	Excavation to trench and drain	m	5	22.00	0.2011	26.42	-6.40%	24.73	123.67	15.00%	142.22
7	Labour man days	no	2	65.00	0.2011	78.07	0.00%	78.07	156.15	15.00%	179.57
8	Supervision	no	0	120.00	0.2011	144.14	0.00%	144.14	36.03	15.00%	41.44
			Percentage							**Total**	2,318.64
	Preliminary & General	%	12.00%								278.24
									Total Cost		**2,596.87**

2 Bulk Water Supply

2a **Cost/m from Municipal supply**

110 mm supply

			Calculated to 1000m								
1	Clear & grub	m2	2000	1.25	0.2011	1.50	1.00%	1.52	3032.86	15.00%	3,487.79
2	Remove topsoil	m2	2000	2.35	0.2011	2.82	1.00%	2.85	5701.78	15.00%	6,557.05
3	Trench Excavation (machine)	m	1000	23.00	0.2011	27.63	1.00%	27.90	27902.32	15.00%	32,087.67
4	Bedding & Backfill	m3	520	48.00	0.2011	57.65	1.00%	58.23	30280.09	15.00%	34,822.10
5	160 mm upvc class 12 pipe	m	1000	110.59	0.2011	132.83	1.00%	134.16	134161.65	15.00%	154,285.90
6	160 mm 90 deg bend	no	4	360.00	0.2011	432.41	1.00%	436.73	1746.93	15.00%	2,008.97
7	160 mm 90 deg bend	no	4	360.00	0.2011	432.41	1.00%	436.73	1746.93	15.00%	2,008.97
8	160 mm Flanged valve (Rsi)	no	1	1,991.00	0.2011	2,391.46	1.00%	2,415.37	2415.37	15.00%	2,777.68
9	160mm Flanged adaptors	no	7	202.69	0.2011	243.46	1.00%	245.89	1721.25	15.00%	1,979.43
10	Bolts & gasket sets	no	4	75.00	0.2011	90.08	1.00%	90.99	363.94	15.00%	418.53

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
11	Anchor blocks	m3	5	683.25	0.2011	820.67	18.20%	970.04	4850.18	15.00%	5,577.71
12	Air valve 50mm double orifis	no	1	3,500.00	0.2011	4,203.97	1.00%	4,246.01	4246.01	15.00%	4,882.91
13	160 mm x 50 mm flanged t	no	1	351.92	0.2011	422.70	1.00%	426.93	426.93	15.00%	490.97
14	1000mm x 50mm galv. Threaded pipe	no	1	112.00	0.2011	134.53	1.00%	135.87	135.87	15.00%	156.25
15	Air valve chamber	no	1	1,481.00	0.2011	1,778.88	1.00%	1,796.67	1796.67	15.00%	2,066.17
16	Valve chamber complete	no	1	495.00	0.2011	594.56	1.00%	600.51	600.51	15.00%	690.58
17	testing	m	1000	5.00	0.2011	6.01	0.00%	6.01	6005.67	15.00%	6,906.52
18	Labour man days	no	220	65.00	0.2011	78.07	0.00%	78.07	17176.20	15.00%	19,752.64
19	Supervision	no	16	120.00	0.2011	144.14	0.00%	144.14	2306.18	15.00%	2,652.10
			Percentage							**Total**	283,609.93
	Preliminary & General	%	12.00%								34,033.19
									Total Cost		**317,643.12**
									Unit Cost to 1m		**317.64**

2a **Cost/m from Municipal supply**

160 mm supply

1	Clear & grub	m2	2000	1.25	0.2011	1.50	1.00%	1.52	3032.86	15.00%	3,487.79
2	Remove topsoil	m2	2000	2.35	0.2011	2.82	1.00%	2.85	5701.78	15.00%	6,557.05
3	Trench Excavation (machine)	m	1000	23.00	0.2011	27.63	1.00%	27.90	27902.32	15.00%	32,087.67
4	Bedding & Backfill	m3	520	48.00	0.2011	57.65	1.00%	58.23	30280.09	15.00%	34,822.10
5	200 mm upvc class 12 pipe	m	1000	154.26	0.2011	185.29	1.00%	187.14	187139.67	15.00%	215,210.62
6	200 mm 90 deg bend	no	4	578.55	0.2011	694.92	1.00%	701.86	2807.46	15.00%	3,228.58
7	200 mm 90 deg bend	no	4	578.55	0.2011	694.92	1.00%	701.86	2807.46	15.00%	3,228.58
8	200 mm Flanged valve (Rsi)	no	1	3,033.00	0.2011	3,643.04	1.00%	3,679.47	3679.47	15.00%	4,231.39
9	200mm Flanged adaptors	no	7	300.85	0.2011	361.36	1.00%	364.97	2554.82	15.00%	2,938.04
10	Bolts & gasket sets	no	4	95.00	0.2011	114.11	1.00%	115.25	460.99	15.00%	530.14
11	Anchor blocks	m3	6	683.25	0.2011	820.67	18.20%	970.04	5820.22	15.00%	6,693.26
12	Air valve 50mm double orifis	no	1	3,500.00	0.2011	4,203.97	1.00%	4,246.01	4246.01	15.00%	4,882.91
13	200 mm x 50 mm flanged t	no	1	457.52	0.2011	549.54	1.00%	555.04	555.04	15.00%	638.29
14	1000mm x 50mm galv. Threaded pipe	no	1	112.00	0.2011	134.53	1.00%	135.87	135.87	15.00%	156.25
15	Air valve chamber	no	1	1,481.00	0.2011	1,778.88	1.00%	1,796.67	1796.67	15.00%	2,066.17
16	Valve chamber complete	no	1	495.00	0.2011	594.56	1.00%	600.51	600.51	15.00%	690.58
17	testing	m	1000	5.00	0.2011	6.01	0.00%	6.01	6005.67	15.00%	6,906.52
18	Labour man days	no	220	65.00	0.2011	78.07	0.00%	78.07	17176.20	15.00%	19,752.64

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
19	Supervision	no	16	120.00	0.2011	144.14	0.00%	144.14	2306.18	15.00%	2,652.10
			Percentage							**Total**	350,760.68
	Preliminary & General	%	12.00%								42,091.28
									Total Cost		**392,851.96**
									Unit Cost to 1m		**392.85**

2a **Cost/m from Municipal supply**

250 mm supply

1	Clear & grub	m2	2000	1.25	0.2011	1.50	1.00%	1.52	3032.86	15.00%	3,487.79
2	Remove topsoil	m2	2000	2.35	0.2011	2.82	1.00%	2.85	5701.78	15.00%	6,557.05
3	Trench Excavation (machine)	m	1000	31.00	0.2011	37.24	1.00%	37.61	37607.48	15.00%	43,248.60
4	Bedding & Backfill	m3	680	48.00	0.2011	57.65	1.00%	58.23	39597.04	15.00%	45,536.59
5	250 mm upvc class 12 pipe	m	1000	285.00	0.2011	342.32	1.00%	345.75	345746.19	15.00%	397,608.12
6	250 mm 90 deg bend	no	4	795.00	0.2011	954.90	1.00%	964.45	3857.80	15.00%	4,436.47
7	250 mm 90 deg bend	no	4	795.00	0.2011	954.90	1.00%	964.45	3857.80	15.00%	4,436.47
8	250 mm Flanged valve (Rsi)	no	1	5,350.00	0.2011	6,426.06	1.00%	6,490.32	6490.32	15.00%	7,463.87
9	250 mm Flanged adaptors	no	7	565.00	0.2011	678.64	1.00%	685.43	4797.99	15.00%	5,517.68
10	Bolts & gasket sets	no	4	62.50	0.2011	75.07	1.00%	75.82	303.29	15.00%	348.78
11	Anchor blocks	m3	6	683.25	0.2011	820.67	18.20%	970.04	5820.22	15.00%	6,693.26
12	Air valve 50mm double orifis	no	1	3,500.00	0.2011	4,203.97	1.00%	4,246.01	4246.01	15.00%	4,882.91
13	250 mm x 50 mm flanged t	no	1	610.40	0.2011	733.17	1.00%	740.50	740.50	15.00%	851.58
14	1000mm x 50mm galv. Threaded pipe	no	1	112.00	0.2011	134.53	1.00%	135.87	135.87	15.00%	156.25
15	Air valve chamber	no	1	1,481.00	0.2011	1,778.88	1.00%	1,796.67	1796.67	15.00%	2,066.17
16	Valve chamber complete	no	1	495.00	0.2011	594.56	1.00%	600.51	600.51	15.00%	690.58
17	testing	m	1000	5.00	0.2011	6.01	0.00%	6.01	6005.67	15.00%	6,906.52
18	Labour man days	no	240	65.00	0.2011	78.07	0.00%	78.07	18737.68	15.00%	21,548.33
19	Supervision	no	18	120.00	0.2011	144.14	0.00%	144.14	2594.45	15.00%	2,983.61
			Percentage							**Total**	565,420.63
	Preliminary & General	%	12.00%								67,850.48
									Total Cost		**633,271.10**
									Unit Cost to 1m		**633.27**

2a **Cost/m from Municipal supply**

315 mm supply

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
1	Clear & grub	m2	2000	1.25	0.2011	1.50	1.00%	1.52	3032.86	15.00%	3,487.79
2	Remove topsoil	m2	2000	2.35	0.2011	2.82	1.00%	2.85	5701.78	15.00%	6,557.05
3	Trench Excavation (machine)	m	1000	51.52	0.2011	61.88	1.00%	62.50	62501.21	15.00%	71,876.39
4	Bedding & Backfill	m3	960	48.00	0.2011	57.65	1.00%	58.23	55901.70	15.00%	64,286.95
5	315 mm upvc class 12 pipe	m	1000	382.13	0.2011	458.99	1.00%	463.58	463578.92	15.00%	533,115.75
6	315 mm 90 deg bend	no	4	2,769.00	0.2011	3,325.94	1.00%	3,359.20	13436.79	15.00%	15,452.31
7	315 mm 90 deg bend	no	4	2,769.00	0.2011	3,325.94	1.00%	3,359.20	13436.79	15.00%	15,452.31
8	315 mm Flanged valve (Rsi)	no	1	6,057.00	0.2011	7,275.26	1.00%	7,348.02	7348.02	15.00%	8,450.22
9	315 mm Flanged adaptors	no	7	562.00	0.2011	675.04	1.00%	681.79	4772.51	15.00%	5,488.39
10	Bolts & gasket sets	no	4	150.00	0.2011	180.17	1.00%	181.97	727.89	15.00%	837.07
11	Anchor blocks	m3	12	683.25	0.2011	820.67	18.20%	970.04	11640.44	15.00%	13,386.51
12	Air valve 50mm double orifis	no	1	2,720.00	0.2011	3,267.08	1.00%	3,299.75	3299.75	15.00%	3,794.72
13	315 mm x 50 mm flanged t	no	1	1,980.00	0.2011	2,378.24	1.00%	2,402.03	2402.03	15.00%	2,762.33
14	1000mm x 50mm galv. Threaded pipe	no	1	76.20	0.2011	91.53	1.00%	92.44	92.44	15.00%	106.31
15	Air valve chamber	no	1	1,640.00	0.2011	1,969.86	1.00%	1,989.56	1989.56	15.00%	2,287.99
16	Valve chamber complete	no	1	595.00	0.2011	714.67	1.00%	721.82	721.82	15.00%	830.09
17	testing	m	1000	7.00	0.2011	8.41	0.00%	8.41	8407.93	15.00%	9,669.12
18	Labour man days	no	240	65.00	0.2011	78.07	0.00%	78.07	18737.68	15.00%	21,548.33
19	Supervision	no	14	120.00	0.2011	144.14	0.00%	144.14	2017.90	15.00%	2,320.59
			Percentage							**Total**	781,710.21
	Preliminary & General	%	12.00%								93,805.23
									Total Cost		**875,515.43**
									Unit Cost to 1m		**875.52**

3 Meters (apital cost)

3a Domestic meters (15 mm)

1	15 mm boxed Kent Water meter complete	no	1	1,288.25	0.2011	1,547.36	1.00%	1,562.83	1562.83	15.00%	1,797.26
19	Labour man days	no	1	65.00	0.2011	78.07	0.00%	78.07	78.07	15.00%	89.78
20	Supervision	no	1	120.00	0.2011	144.14	0.00%	144.14	72.07	15.00%	82.88
			Percentage							**Total**	1,969.92
	Preliminary & General	%	12.00%								236.39
									Total Cost		**2,206.31**

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
3a1	**Domestic meters (25 mm)**										
1	25 mm boxed Kent Water meter complete	no	1	1,519.00	0.2011	1,824.52	1.00%	1,842.77	1842.77	15.00%	2,119.18
19	Labour man days	no	1	65.00	0.2011	78.07	0.00%	0.00	0.00	15.00%	0.00
20	Supervision	no	1	120.00	0.2011	144.14	0.00%	0.00	0.00	15.00%	0.00
			Percentage							**Total**	2,119.18
	Preliminary & General	%	12.00%								254.30
									Total Cost		**2,373.48**
3a1	**Domestic meters Pre paid (15 mm)**										
1	15 mm Pre paid Kent Water meter	no	1	1,587.00	0.2011	1,906.20	1.00%	1,925.26	1925.26	15.00%	2,214.05
19	Labour man days	no	2	65.00	0.2011	78.07	0.00%	0.00	0.00	15.00%	0.00
20	Supervision	no	1	120.00	0.2011	144.14	0.00%	0.00	0.00	15.00%	0.00
			Percentage							**Total**	2,214.05
	Preliminary & General	%	12.00%								265.69
									Total Cost		**2,479.74**
2	**Bulk Water Supply**										
2b	**Boreholes - Shallow 50 m - Semi Rural (100 km radius)**										
1	Divine Water - Position of Hole	ea	1	7,692.31	0.2011	9,239.49	Included in Prov. Rate	9,239.49	9239.49	15.00%	10,625.41
2	Drill Hole to 50 m	m	50	150.00	0.2011	180.17	Included in Prov. Rate	180.17	9008.50	15.00%	10,359.77
3	Supply and Fit Borehole Lining (PVC)	m	50	192.31	0.2011	230.99	Included in Prov. Rate	230.99	11549.50	15.00%	13,281.92
4	Install Pump, Motor, Cabling, Control Panel	ea	1	25,000.00	0.2011	30,028.33	Included in Prov. Rate	30,028.33	30028.33	15.00%	34,532.58
5	Transport to Site and Return	km	200	15.00	0.2011	18.02	Included in Prov. Rate	18.02	3603.40	15.00%	4,143.91
6	Labour man days - Included in Drilling Rate	no	0	0.00	0.2011	0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00
7	Supervision - Included in Drilling Rate	no	0	0.00	0.2011	0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00
			Percentage							**Total**	72,943.60
	P & G - Included in Prov. Rate above	%	0.00%								0.00
									Total Cost		**72,943.60**
									Unit Cost to 1m		**1,458.87**

2b **Boreholes - Shallow 50 m - Deep Rural (250 km radius)**
165 mm ID Hole

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
1	Divine Water - Position of Hole	ea	1	7,692.31	0.2011	9,239.49	Included in Prov. Rate	9,239.49	9239.49	15.00%	10,625.41
2	Drill Hole to 50 m	m	50	150.00	0.2011	180.17	Included in Prov. Rate	180.17	9008.50	15.00%	10,359.77
3	Supply and Fit Borehole Lining (PVC)	m	50	192.31	0.2011	230.99	Included in Prov. Rate	230.99	11549.50	15.00%	13,281.92
4	Install Pump, Motor, Cabling, Control Panel	ea	1	25,000.00	0.2011	30,028.33	Included in Prov. Rate	30,028.33	30028.33	15.00%	34,532.58
5	Transport to Site and Return	km	500	15.00	0.2011	18.02	Included in Prov. Rate	18.02	9008.50	15.00%	10,359.77
6	Labour man days - Included in Drilling Rate	no	0	0.00	0.2011	0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00
7	Supervision - Included in Drilling Rate	no	0	0.00	0.2011	0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00
			Percentage							**Total**	79,159.46
	P & G - Included in Prov. Rate above	%	0.00%								0.00
									Total Cost		**79,159.46**
									Unit Cost to 1m		**1,583.19**

2b **Boreholes - Deep 200 m - Semi Rural (100 km radius)**

165 mm ID Hole

1	Divine Water - Position of Hole	ea	1	7,692.31	0.2011	9,239.49	Included in Prov. Rate	9,239.49	9239.49	15.00%	10,625.41
2	Drill Hole to 200 m	m	200	150.00	0.2011	180.17	Included in Prov. Rate	180.17	36034.00	15.00%	41,439.09
3	Supply and Fit Borehole Lining (PVC)	m	200	192.31	0.2011	230.99	Included in Prov. Rate	230.99	46197.98	15.00%	53,127.68
4	Install Pump, Motor, Cabling, Control Panel	ea	1	25,000.00	0.2011	30,028.33	Included in Prov. Rate	30,028.33	30028.33	15.00%	34,532.58
5	Transport to Site and Return	km	100	15.00	0.2011	18.02	Included in Prov. Rate	18.02	1801.70	15.00%	2,071.95
6	Labour man days - Included in Drilling Rate	no	0	0.00	0.2011	0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00
7	Supervision - Included in Drilling Rate	no	0	0.00	0.2011	0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00
			Percentage							**Total**	141,796.72
	P & G - Included in Prov. Rate above	%	0.00%								0.00
									Total Cost		**141,796.72**
									Unit Cost to 1m		**708.98**

2b **Boreholes - Deep 200 m - Deep Rural (250 km radius)**

165 mm ID Hole

1	Divine Water - Position of Hole	ea	1	7,692.31	0.2011	9,239.49	Included in Prov. Rate	9,239.49	9239.49	15.00%	10,625.41
2	Drill Hole to 200 m	m	200	150.00	0.2011	180.17	Included in Prov. Rate	180.17	36034.00	15.00%	41,439.09
3	Supply and Fit Borehole Lining (PVC)	m	200	192.31	0.2011	230.99	Included in Prov. Rate	230.99	46197.98	15.00%	53,127.68
4	Install Pump, Motor, Cabling, Control Panel	ea	1	25,000.00	0.2011	30,028.33	Included in Prov. Rate	30,028.33	30028.33	15.00%	34,532.58

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
5	Transport to Site and Return	km	500	15.00	0.2011	18.02	Included in Prov. Rate	18.02	9008.50	15.00%	10,359.77
6	Labour man days - Included in Drilling Rate	no	0	0.00	0.2011	0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00
7	Supervision - Included in Drilling Rate	no	0	0.00	0.2011	0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00
			Percentage							**Total**	150,084.54
	P & G - Included in Prov. Rate above	%	0.00%								0.00
									Total Cost		**150,084.54**
									Unit Cost to 1m		**750.42**

2 **Bulk Water Supply**

2b **Boreholes - Shallow 50 m - Semi Rural (100 km radius)**

208 mm ID Hole

1	Divine Water - Position of Hole	ea	1	7,692.31	0.2011	9,239.49	Included in Prov. Rate	9,239.49	9239.49	15.00%	10,625.41
2	Drill Hole to 50 m	m	50	150.00	0.2011	180.17	Included in Prov. Rate	180.17	9008.50	15.00%	10,359.77
3	Supply and Fit Borehole Lining (PVC)	m	50	192.31	0.2011	230.99	Included in Prov. Rate	230.99	11549.50	15.00%	13,281.92
4	Install Pump, Motor, Cabling, Control Panel	ea	1	25,000.00	0.2011	30,028.33	Included in Prov. Rate	30,028.33	30028.33	15.00%	34,532.58
5	Transport to Site and Return	km	200	15.00	0.2011	18.02	Included in Prov. Rate	18.02	3603.40	15.00%	4,143.91
6	Labour man days - Included in Drilling Rate	no	0	0.00	0.2011	0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00
7	Supervision - Included in Drilling Rate	no	0	0.00	0.2011	0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00
			Percentage							**Total**	72,943.60
	P & G - Included in Prov. Rate above	%	0.00%								0.00
									Total Cost		**72,943.60**
									Unit Cost to 1m		**1,458.87**

2b **Boreholes - Shallow 50 m - Deep Rural (250 km radius)**

208 mm ID Hole

1	Divine Water - Position of Hole	ea	1	7,692.31	0.2011	9,239.49	Included in Prov. Rate	9,239.49	9239.49	15.00%	10,625.41
2	Drill Hole to 50 m	m	50	150.00	0.2011	180.17	Included in Prov. Rate	180.17	9008.50	15.00%	10,359.77
3	Supply and Fit Borehole Lining (PVC)	m	50	192.31	0.2011	230.99	Included in Prov. Rate	230.99	11549.50	15.00%	13,281.92
4	Install Pump, Motor, Cabling, Control Panel	ea	1	25,000.00	0.2011	30,028.33	Included in Prov. Rate	30,028.33	30028.33	15.00%	34,532.58
5	Transport to Site and Return	km	500	15.00	0.2011	18.02	Included in Prov. Rate	18.02	9008.50	15.00%	10,359.77
6	Labour man days - Included in Drilling Rate	no	0	0.00	0.2011	0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00
7	Supervision - Included in Drilling Rate	no	0	0.00	0.2011	0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
			Percentage							**Total**	79,159.46
	P & G - Included in EC Prov. Rate above	%	0.00%								0.00
									Total Cost		**79,159.46**
									Unit Cost to 1m		**1,583.19**

2b **Boreholes - Deep 200 m - Semi Rural (100 km radius)**
208 mm ID Hole

1	Divine Water - Position of Hole	ea	1	7,692.31	0.2011	9,239.49	Included in Prov. Rate	9,239.49	9239.49	15.00%	10,625.41
2	Drill Hole to 200 m	m	200	150.00	0.2011	180.17	Included in Prov. Rate	180.17	36034.00	15.00%	41,439.09
3	Supply and Fit Borehole Lining (PVC)	m	200	192.31	0.2011	230.99	Included in Prov. Rate	230.99	46197.98	15.00%	53,127.68
4	Install Pump, Motor, Cabling, Control Panel	ea	1	25,000.00	0.2011	30,028.33	Included in Prov. Rate	30,028.33	30028.33	15.00%	34,532.58
5	Transport to Site and Return	km	100	15.00	0.2011	18.02	Included in Prov. Rate	18.02	1801.70	15.00%	2,071.95
6	Labour man days - Included in Drilling Rate	no	0	0.00	0.2011	0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00
7	Supervision - Included in Drilling Rate	no	0	0.00	0.2011	0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00
			Percentage							**Total**	141,796.72
	P & G - Included in EC Prov. Rate above	%	0.00%								0.00
									Total Cost		**141,796.72**
									Unit Cost to 1m		**708.98**

2b **Boreholes - Deep 200 m - Deep Rural (250 km radius)**
208 mm ID Hole

1	Divine Water - Position of Hole	ea	1	7,692.31	0.2011	9,239.49	Included in Prov. Rate	9,239.49	9239.49	15.00%	10,625.41
2	Drill Hole to 200 m	m	200	200.00	0.2011	240.23	Included in Prov. Rate	240.23	48045.33	15.00%	55,252.13
3	Supply and Fit Borehole Lining (PVC)	m	200	192.31	0.2011	230.99	Included in Prov. Rate	230.99	46197.98	15.00%	53,127.68
4	Install Pump, Motor, Cabling, Control Panel	ea	1	25,000.00	0.2011	30,028.33	Included in Prov. Rate	30,028.33	30028.33	15.00%	34,532.58
5	Transport to Site and Return	ea	500	15.00	0.2011	18.02	Included in Prov. Rate	18.02	9008.50	15.00%	10,359.77
6	Labour man days - Included in Drilling Rate	no	0	0.00	0.2011	0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00
7	Supervision - Included in Drilling Rate	no	0	0.00	0.2011	0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00
			Percentage							**Total**	163,897.57
	P & G - Included in Prov. Rate above	%	0.00%								0.00

Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
								Total Cost		**163,897.57**
								Unit Cost to 1m		**819.49**

4 **Sanitation**

4a **VIP tioilets or equivalent (single pit fixed top structure)**

Substructure - single pit										
Concrete bricks	brick	320			2.29	Included in Prov. Rate	2.29	732.80	15.00%	842.72
Mortar sand	m3	0			268.04	Included in Prov. Rate	268.04	80.41	15.00%	92.47
Cement	bag	2			72.55	Included in Prov. Rate	72.55	145.09	15.00%	166.86
Superstructure - fixed										
Concrete bricks	brick	480			2.29	Included in Prov. Rate	2.29	1099.20	15.00%	1,264.08
Mortar sand	m3	1			268.04	Included in Prov. Rate	268.04	187.63	15.00%	215.77
Concrete to floors	m3	1			592.65	Included in Prov. Rate	592.65	355.59	15.00%	408.93
Cement	bag	4			72.55	Included in Prov. Rate	72.55	290.18	15.00%	333.71
Corrugated iron (0.67m width x 1.8m length)	m	3			81.26	Included in Prov. Rate	81.26	243.77	15.00%	280.33
Timber wall plates	m	2			36.00	Included in Prov. Rate	36.00	72.00	15.00%	82.80
Timber trusses	m	3			54.73	Included in Prov. Rate	54.73	164.19	15.00%	188.82
Timber brandering	m	3			0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00
Reinforcing Mesh Ref 113	m2	2			55.39	Included in Prov. Rate	55.39	116.33	15.00%	133.77
Steel door frames	ea	1			162.40	Included in Prov. Rate	162.40	162.40	15.00%	186.76
Steel doors	ea	1			315.00	Included in Prov. Rate	315.00	315.00	15.00%	362.25
Breeze bricks	ea	2			24.00	Included in Prov. Rate	24.00	48.00	15.00%	55.20
Hinges	ea	2			37.85	Included in Prov. Rate	37.85	75.70	15.00%	87.06
Brick force	m	25			0.50	Included in Prov. Rate	0.50	12.50	15.00%	14.38
3.5mm wire - roof ties	kg	0			11.00	Included in Prov. Rate	11.00	1.10	15.00%	1.27
Fixtures										
Precast toilet pedestal	ea	1			195.85	Included in Prov. Rate	195.85	195.85	15.00%	225.23
Seat cover	ea	1			48.95	Included in Prov. Rate	48.95	48.95	15.00%	56.29
110mm PVC wall brackets	ea	4			13.50	Included in Prov. Rate	13.50	54.00	15.00%	62.10
PVC pipe 110 mm	m	3			36.90	Included in Prov. Rate	36.90	110.71	15.00%	127.32
Aluminium 110mm fly screen	ea	1			18.00	Included in Prov. Rate	18.00	18.00	15.00%	20.70
Hand washing facility	ea	1			97.22	Included in Prov. Rate	97.22	97.22	15.00%	111.81
Labour										

Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
Labour excavation	m3	3			60.00	Included in Prov. Rate	60.00	180.00	15.00%	207.00
Labour lining	person days	1			102.51	Included in Prov. Rate	102.51	102.51	15.00%	117.89
Labour build top structure and roof	person days	3			102.51	Included in Prov. Rate	102.51	307.53	15.00%	353.66
Labour found and floor	person days	2			102.51	Included in Prov. Rate	102.51	205.02	15.00%	235.77
Labour fixtures	person days	1			102.51	Included in Prov. Rate	102.51	51.26	15.00%	58.94
		Percentage							**Total**	6,293.89
P & G - Included in Prov. Rate above	%	10.00%								629.39
								Total Cost		**6,923.28**

Community Development										
Commuity liaison, builder and quality assessor training and record keeping	person days	1			150.00	Included in Prov. Rate	150.00	150.00	0%	150.00
Health, hygiene and user education materials	user material pack	1			100.00	Included in Prov. Rate	100.00	100.00	0%	100.00
Health, hygiene and user education training	person days	0.5			150.00	Included in Prov. Rate	150.00	75.00	0%	75.00
Peer education house to house visits (x 3)	visit	3			40.00	Included in Prov. Rate	40.00	120.00	0%	120.00
								Total Com Dev Cost		**445.00**

4b **VIP tioilets or equivalent (double pit fixed top structure)**

Substructure - double pit										
Concrete bricks	brick	380			2.29	Included in Prov. Rate	2.29	870.20	15.00%	1,000.73
Mortar sand	m3	1			268.04	Included in Prov. Rate	268.04	134.02	15.00%	154.12
Cement	bag	3			72.55	Included in Prov. Rate	72.55	217.65	15.00%	250.30
Superstructure - fixed										
Concrete bricks	brick	480			2.29	Included in Prov. Rate	2.29	1099.20	15.00%	1,264.08
Mortar sand	m3	1			268.04	Included in Prov. Rate	268.04	187.63	15.00%	215.77
Concrete to floors	m3	1			592.65	Included in Prov. Rate	592.65	355.59	15.00%	408.93
Cement	bag	4			72.55	Included in Prov. Rate	72.55	290.18	15.00%	333.71
Corrugated iron (0.67m width x 1.8m length)	m	3			81.26	Included in Prov. Rate	81.26	243.77	15.00%	280.33

Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
Timber wall plates	m	2			36.00	Included in Prov. Rate	36.00	72.00	15.00%	82.80
Timber trusses	m	3			54.73	Included in Prov. Rate	54.73	164.19	15.00%	188.82
Timber brandering	m	3			0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00
Reinforcing Mesh Ref 113	m2	2			55.39	Included in Prov. Rate	55.39	116.33	15.00%	133.77
Steel door frames	ea	1			162.40	Included in Prov. Rate	162.40	162.40	15.00%	186.76
Steel doors	ea	1			315.00	Included in Prov. Rate	315.00	315.00	15.00%	362.25
Breeze bricks	ea	2			24.00	Included in Prov. Rate	24.00	48.00	15.00%	55.20
Hinges	ea	2			37.85	Included in Prov. Rate	37.85	75.70	15.00%	87.06
Brick force	m	25			0.50	Included in Prov. Rate	0.50	12.50	15.00%	14.38
3.5mm wire - roof ties	kg	0			11.00	Included in Prov. Rate	11.00	1.10	15.00%	1.27
Fixtures										
Precast toilet pedestal	ea	1			195.85	Included in Prov. Rate	195.85	195.85	15.00%	225.23
Seat cover	ea	1			48.95	Included in Prov. Rate	48.95	48.95	15.00%	56.29
110mm PVC wall brackets	ea	4			13.50	Included in Prov. Rate	13.50	54.00	15.00%	62.10
PVC pipe 110 mm	m	3			36.90	Included in Prov. Rate	36.90	110.71	15.00%	127.32
Aluminium 110mm fly screen	ea	1			18.00	Included in Prov. Rate	18.00	18.00	15.00%	20.70
Hand washing facility	ea	1			97.22	Included in Prov. Rate	97.22	97.22	15.00%	111.81
Labour										
Labour excavation	m3	3			60.00	Included in Prov. Rate	60.00	180.00	15.00%	207.00
Labour lining	person days	1			102.51	Included in Prov. Rate	102.51	102.51	15.00%	117.89
Labour build top structure and roof	person days	3			102.51	Included in Prov. Rate	102.51	307.53	15.00%	353.66
Labour found and floor	person days	2			102.51	Included in Prov. Rate	102.51	205.02	15.00%	235.77
Labour fixtures	person days	1			102.51	Included in Prov. Rate	102.51	51.26	15.00%	58.94
		Percentage							**Total**	6,596.99
P & G - Included in Prov. Rate above	%	10.00%								659.70
								Total Cost		**7,256.69**

Community Development										
Commuity liaison, builder and quality assessor training and record keeping	person days	1			150.00	Included in Prov. Rate	150.00	150.00	0%	150.00

Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
Health, hygiene and user education materials	user material pack	1			100.00	Included in Prov. Rate	100.00	100.00	0%	100.00
Health, hygiene and user education training	person days	0.5			150.00	Included in Prov. Rate	150.00	75.00	0%	75.00
Peer education house to house visits (x 3)	visit	3			40.00	Included in Prov. Rate	40.00	120.00	0%	120.00
								Total Com Dev Cost		**445.00**

4c **VIP tioilets or equivalent (single pit movable top structure)**

Substructure - single pit										
Concrete bricks	brick	320			2.29	Included in Prov. Rate	2.29	732.80	15.00%	842.72
Mortar sand	m3	0			268.04	Included in Prov. Rate	268.04	80.41	15.00%	92.47
Cement	bag	2			72.55	Included in Prov. Rate	72.55	145.09	15.00%	166.86
Superstructure - movable										
Pre-fabricated top structure (all incl: walls, roof, door)	unit	1			2,878.00	Included in Prov. Rate	2,878.00	2878.00	15.00%	3,309.70
Mortar sand	m3	1			268.04	Included in Prov. Rate	268.04	187.63	15.00%	215.77
Concrete to floors	m3	1			592.65	Included in Prov. Rate	592.65	355.59	15.00%	408.93
Cement	bag	4			72.55	Included in Prov. Rate	72.55	290.20	15.00%	333.73
Reinforcing Mesh Ref 113	m2	2			55.39	Included in Prov. Rate	55.39	116.32	15.00%	133.77
Fixtures										
Precast toilet pedestal	ea	1			195.85	Included in Prov. Rate	195.85	195.85	15.00%	225.23
Seat cover	ea	1			48.95	Included in Prov. Rate	48.95	48.95	15.00%	56.29
110mm PVC wall brackets	ea	4			13.50	Included in Prov. Rate	13.50	54.00	15.00%	62.10
PVC pipe 110 mm	m	3			36.90	Included in Prov. Rate	36.90	110.71	15.00%	127.32
Aluminium 110mm fly screen	ea	1			18.00	Included in Prov. Rate	18.00	18.00	15.00%	20.70
Hand washing facility	ea	1			97.22	Included in Prov. Rate	97.22	97.22	15.00%	111.81
Labour										
Labour excavation	m3	3			60.00	Included in Prov. Rate	60.00	180.00	15.00%	207.00
Labour lining	person days	1			102.51	Included in Prov. Rate	102.51	102.51	15.00%	117.89
Labour build top structure and roof	person days	1			102.51	Included in Prov. Rate	102.51	102.51	15.00%	117.89
Labour found and floor	person days	2			102.51	Included in Prov. Rate	102.51	205.02	15.00%	235.77

Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
Labour fixtures	person days	1			102.51	Included in Prov. Rate	102.51	51.26	15.00%	58.94
		Percentage							Total	6,844.88
P & G - Included in Prov. Rate above	%	10.00%								684.49
								Total Cost		7,529.37

Community Development										
Commuity liaison, builder and quality assessor training and record keeping	person days	1			150.00	Included in Prov. Rate	150.00	150.00	0%	150.00
Health, hygiene and user education materials	user material pack	1			100.00	Included in Prov. Rate	100.00	100.00	0%	100.00
Health, hygiene and user education training	person days	0.5			150.00	Included in Prov. Rate	150.00	75.00	0%	75.00
Peer education house to house visits (x 3)	visit	3			40.00	Included in Prov. Rate	40.00	120.00	0%	120.00
								Total Com Dev Cost		445.00

4d **VIP tioilets or equivalent (double pit movable top structure)**

Substructure - double pit										
Concrete bricks	brick	380			2.29	Included in Prov. Rate	2.29	870.20	15.00%	1,000.73
Mortar sand	m3	1			268.04	Included in Prov. Rate	268.04	134.02	15.00%	154.12
Cement	bag	3			72.55	Included in Prov. Rate	72.55	217.65	15.00%	250.30
Superstructure - movable										
Pre-fabricated top structure (all incl: walls, roof, door)	unit	1			2,878.00	Included in Prov. Rate	2,878.00	2878.00	15.00%	3,309.70
Mortar sand	m3	1			268.04	Included in Prov. Rate	268.04	187.63	15.00%	215.77
Concrete to floors	m3	1			592.65	Included in Prov. Rate	592.65	355.59	15.00%	408.93
Cement	bag	4			72.55	Included in Prov. Rate	72.55	290.20	15.00%	333.73
Reinforcing Mesh Ref 113	m2	2			55.39	Included in Prov. Rate	55.39	116.32	15.00%	133.77
Fixtures										
Precast toilet pedestal	ea	1			195.85	Included in Prov. Rate	195.85	195.85	15.00%	225.23
Seat cover	ea	1			48.95	Included in Prov. Rate	48.95	48.95	15.00%	56.29
110mm PVC wall brackets	ea	4			13.50	Included in Prov. Rate	13.50	54.00	15.00%	62.10
PVC pipe 110 mm	m	3			36.90	Included in Prov. Rate	36.90	110.71	15.00%	127.32
Aluminium 110mm fly screen	ea	1			18.00	Included in Prov. Rate	18.00	18.00	15.00%	20.70

Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
Hand washing facility	ea	1			97.22	Included in Prov. Rate	97.22	97.22	15.00%	111.81
Labour										
Labour excavation	m3	3			60.00	Included in Prov. Rate	60.00	180.00	15.00%	207.00
Labour lining	person days	1			102.51	Included in Prov. Rate	102.51	102.51	15.00%	117.89
Labour build top structure and roof	person days	1			102.51	Included in Prov. Rate	102.51	102.51	15.00%	117.89
Labour found and floor	person days	2			102.51	Included in Prov. Rate	102.51	205.02	15.00%	235.77
Labour fixtures	person days	1			102.51	Included in Prov. Rate	102.51	51.26	15.00%	58.94
		Percentage							**Total**	7,147.98
P & G - Included in Prov. Rate above	%	10.00%								714.80
								Total Cost		**7,862.78**

Community Development										
Commuity liaison, builder and quality assessor training and record keeping	person days	1			150.00	Included in Prov. Rate	150.00	150.00	0%	150.00
Health, hygiene and user education materials	user material pack	1			100.00	Included in Prov. Rate	100.00	100.00	0%	100.00
Health, hygiene and user education training	person days	0.5			150.00	Included in Prov. Rate	150.00	75.00	0%	75.00
Peer education house to house visits (x 3)	visit	3			40.00	Included in Prov. Rate	40.00	120.00	0%	120.00
								Total Com Dev Cost		**445.00**

4e **ONSITE - URINE DIVERSION**

Substructure										
Concrete bricks	brick	200			2.29	Included in Prov. Rate	2.29	458.00	15.00%	526.70
Mortar sand	m3	0			268.04	Included in Prov. Rate	268.04	80.41	15.00%	92.47
Cement	bag	2			72.55	Included in Prov. Rate	72.55	145.09	15.00%	166.86
Superstructure										
Concrete bricks	brick	480			2.29	Included in Prov. Rate	2.29	1099.20	15.00%	1,264.08
Mortar sand	m3	1			268.04	Included in Prov. Rate	268.04	187.63	15.00%	215.77
Concrete to floors	m3	1			592.65	Included in Prov. Rate	592.65	474.12	15.00%	545.24
Cement	bag	4			72.55	Included in Prov. Rate	72.55	290.18	15.00%	333.71

Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
Corrugated iron (0.67m width x 1.8m length)	m	3			81.26	Included in Prov. Rate	81.26	243.77	15.00%	280.33
Timber wall plates	m	2			36.00	Included in Prov. Rate	36.00	72.00	15.00%	82.80
Timber trusses	m	3			54.73	Included in Prov. Rate	54.73	164.19	15.00%	188.82
Timber brandering	m	3			0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00
Reinforcing Mesh Ref 113	m2	2			55.39	Included in Prov. Rate	55.39	116.33	15.00%	133.77
Steel door frames	ea	1			162.40	Included in Prov. Rate	162.40	162.40	15.00%	186.76
Steel doors	ea	1			315.00	Included in Prov. Rate	315.00	315.00	15.00%	362.25
Floor slab frame	ea	1			0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00
Breeze bricks	ea	2			24.00	Included in Prov. Rate	24.00	48.00	15.00%	55.20
Hinges	ea	2			37.85	Included in Prov. Rate	37.85	75.70	15.00%	87.06
Brick force	m	25			0.50	Included in Prov. Rate	0.50	12.50	15.00%	14.38
3.5mm wire - roof ties	kg	0			11.00	Included in Prov. Rate	11.00	1.10	15.00%	1.27
Fixtures										
Precast toilet pedestal	ea	1			195.85	Included in Prov. Rate	195.85	195.85	15.00%	225.23
Seat cover	ea	1			48.95	Included in Prov. Rate	48.95	48.95	15.00%	56.29
110mm PVC wall brackets	ea	4			13.50	Included in Prov. Rate	13.50	54.00	15.00%	62.10
PVC pipe 110 mm	m	3			36.90	Included in Prov. Rate	36.90	110.71	15.00%	127.32
25mm DHPE piping	m	8			3.84	Included in Prov. Rate	3.84	30.72	15.00%	35.33
Access cover	ea	1			82.00	Included in Prov. Rate	82.00	82.00	15.00%	94.30
Aluminium 110mm fly screen	ea	1			18.00	Included in Prov. Rate	18.00	18.00	15.00%	20.70
Hand washing facility	ea	1			70.00	Included in Prov. Rate	70.00	70.00	15.00%	80.50
Labour										
Labour excavation	m3	1			60.00	Included in Prov. Rate	60.00	60.00	15.00%	69.00
Labour UDS chamber and drainage	person days	1			102.51	Included in Prov. Rate	102.51	102.51	15.00%	117.89
Labour build top structure and roof	person days	3			102.51	Included in Prov. Rate	102.51	307.53	15.00%	353.66
Labour found and floor	person days	2			102.51	Included in Prov. Rate	102.51	205.02	15.00%	235.77
Labour fixtures	person days	1			102.51	Included in Prov. Rate	102.51	51.26	15.00%	58.94

		Percentage			
				Total	6,074.50
P & G - Included in Prov. Rate above	%	10.00%			607.45
			Total Cost		**6,681.95**

Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
Community Development										
Commuity liaison, builder and quality assessor training and record keeping	person days	1			150.00	Included in Prov. Rate	150.00	150.00	0%	150.00
Health, hygiene and user education materials	user material pack	1			100.00	Included in Prov. Rate	100.00	100.00	0%	100.00
Health, hygiene and user education training	person days	0.5			150.00	Included in Prov. Rate	150.00	75.00	0%	75.00
Peer education house to house visits (x 3)	visit	3			40.00	Included in Prov. Rate	40.00	120.00	0%	120.00
								Total Com Dev Cost		**445.00**

4f **Onsite Septic Tank**

Substructure										
Concrete bricks	brick	350			2.29	Included in Prov. Rate	2.29	801.50	15.00%	921.73
Mortar sand	m3	2			268.04	Included in Prov. Rate	268.04	402.06	15.00%	462.37
Plaster sand	m3	2			161.13	Included in Prov. Rate	161.13	241.70	15.00%	277.95
Cement	bag	4			72.55	Included in Prov. Rate	72.55	290.18	15.00%	333.71
Superstructure										
Concrete bricks	brick	480			2.29	Included in Prov. Rate	2.29	1099.20	15.00%	1,264.08
Mortar sand	m3	1			268.04	Included in Prov. Rate	268.04	187.63	15.00%	215.77
Plaster sand	m3	1			161.13	Included in Prov. Rate	161.13	112.79	15.00%	129.71
Concrete to floors	m3	1			693.58	Included in Prov. Rate	693.58	520.19	15.00%	598.21
Cement	bag	4			72.55	Included in Prov. Rate	72.55	290.18	15.00%	333.71
Corrugated iron (0.67m width x 1.8m length)	m	3			133.13	Included in Prov. Rate	133.13	399.38	15.00%	459.29
Timber wall plates	m	2			36.00	Included in Prov. Rate	36.00	72.00	15.00%	82.80
Timber trusses	m	3			54.73	Included in Prov. Rate	54.73	164.19	15.00%	188.82
Timber brandering	m	3			0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00
Reinforcing Mesh Ref 113	m2	2			55.39	Included in Prov. Rate	55.39	116.33	15.00%	133.77
Steel door frames	ea	1			59.82	Included in Prov. Rate	59.82	59.82	15.00%	68.80
Steel doors	ea	1			315.00	Included in Prov. Rate	315.00	315.00	15.00%	362.25
Floor slab frame	ea	1			0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00
Breeze bricks	ea	2			24.00	Included in Prov. Rate	24.00	48.00	15.00%	55.20
Hinges	ea	2			0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00

Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
Brick force	m	25			0.50	Included in Prov. Rate	0.50	12.50	15.00%	14.38
3.5mm wire - roof ties	kg	0			110.00	Included in Prov. Rate	110.00	11.00	15.00%	12.65
Plumbing Water										
110 mm Saddle	ea	1			89.70	Included in Prov. Rate	89.70	89.70	15.00%	103.15
Plason male adaptor	ea	2			13.28	Included in Prov. Rate	13.28	26.55	15.00%	30.54
Galv 15mm bend	ea	1			4.61	Included in Prov. Rate	4.61	4.61	15.00%	5.30
Galv 15mm T	ea	1			3.92	Included in Prov. Rate	3.92	3.92	15.00%	4.51
Galv 15mm 1700 mm pipe	ea	1			59.86	Included in Prov. Rate	59.86	59.86	15.00%	68.84
Galv 15mm 400 mm pipe	ea	1			16.26	Included in Prov. Rate	16.26	16.26	15.00%	18.69
15mm brass stop valve	ea	1			82.95	Included in Prov. Rate	82.95	82.95	15.00%	95.40
Garden Tap	ea	1			51.97	Included in Prov. Rate	51.97	51.97	15.00%	59.77
DHPE pipe	m	6			3.92	Included in Prov. Rate	3.92	23.51	15.00%	27.03
Handwashing facility	ea	1			97.22	Included in Prov. Rate	97.22	97.22	15.00%	111.81
Plumbing Sewer										
Cistern	ea	1			245.95	Included in Prov. Rate	245.95	245.95	15.00%	282.84
Pan	ea	1			156.74	Included in Prov. Rate	156.74	156.74	15.00%	180.25
Toilet seat	ea	1			44.97	Included in Prov. Rate	44.97	44.97	15.00%	51.71
Concrete basin	ea	1			0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00
Ballcock valve	ea	1			30.42	Included in Prov. Rate	30.42	30.42	15.00%	34.99
PVC pipe 50 mm	m	3			15.91	Included in Prov. Rate	15.91	47.74	15.00%	54.90
PVC pipe 110 mm	m	3			47.61	Included in Prov. Rate	47.61	119.02	15.00%	136.88
2 way 50mm vent valve	ea	1			21.30	Included in Prov. Rate	21.30	21.30	15.00%	24.50
PVC bend vent and serv.	ea	1			52.49	Included in Prov. Rate	52.49	52.49	15.00%	60.37
Hose bib	ea	1			49.00	Included in Prov. Rate	49.00	49.00	15.00%	56.34
Concrete gully	ea	1			398.66	Included in Prov. Rate	398.66	398.66	15.00%	458.45
PVC gully	ea	1			76.95	Included in Prov. Rate	76.95	76.95	15.00%	88.50
PVC gully trap	ea	1			154.96	Included in Prov. Rate	154.96	154.96	15.00%	178.21
110 PVC T	ea	1			54.66	Included in Prov. Rate	54.66	54.66	15.00%	62.86
50mm bens	ea	1			67.01	Included in Prov. Rate	67.01	67.01	15.00%	77.07
110 mm 45 deg	ea	1			44.67	Included in Prov. Rate	44.67	44.67	15.00%	51.37
Rodding eye	ea	1			44.06	Included in Prov. Rate	44.06	44.06	15.00%	50.67
110 x 50 red T	ea	1			53.86	Included in Prov. Rate	53.86	53.86	15.00%	61.94
Labour										
Labour excavation	m3	5			60.00	Included in Prov. Rate	60.00	300.00	15.00%	345.00

Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
Labour build septic tank	person days	2			101.50	Included in Prov. Rate	101.50	202.99	15.00%	233.44
Labour build top structure and roof	person days	3			101.50	Included in Prov. Rate	101.50	304.49	15.00%	350.16
Labour found and floor	person days	2			101.50	Included in Prov. Rate	101.50	202.99	15.00%	233.44
Labour fixtures	person days	1			101.50	Included in Prov. Rate	101.50	50.75	15.00%	58.36
		Percentage							**Total**	9,572.50
P & G - Included in Prov. Rate above	%	10.00%								957.25
								Total Cost		**10,529.75**

Community Development										
Commuity liaison, builder and quality assessor training and record keeping	person days	1			150.00	Included in Prov. Rate	150.00	150.00	0%	150.00
Health, hygiene and user education materials	user material pack	1			100.00	Included in Prov. Rate	100.00	100.00	0%	100.00
Health, hygiene and user education training	person days	0.5			150.00	Included in Prov. Rate	150.00	75.00	0%	75.00
Peer education house to house visits (x 3)	visit	3			40.00	Included in Prov. Rate	40.00	120.00	0%	120.00
								Total Com Dev Cost		**445.00**

4g **Onsite Full Flush**

Superstructure										
Concrete bricks	no	480			2.29	Included in Prov. Rate	2.29	1099.20	15.00%	1,264.08
Mortar sand	m3	1			268.04	Included in Prov. Rate	268.04	160.83	15.00%	184.95
Plaster sand	m3	1			161.13	Included in Prov. Rate	161.13	112.79	15.00%	129.71
Concrete to floors	m3	0			693.58	Included in Prov. Rate	693.58	208.07	15.00%	239.29
Cement	no	4			72.55	Included in Prov. Rate	72.55	290.18	15.00%	333.71
Corrugated iron (0.67m width x 1.8m length)	m	3			133.13	Included in Prov. Rate	133.13	399.38	15.00%	459.29
Timber wall plates	m	2			36.00	Included in Prov. Rate	36.00	72.00	15.00%	82.80
Timber trusses	m	3			54.73	Included in Prov. Rate	54.73	164.19	15.00%	188.82
Timber brandering	m	3			0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00
Reinforcing Mesh Ref 113	m2	2			55.39	Included in Prov. Rate	55.39	116.33	15.00%	133.77

Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
Steel door frames	no	1			135.00	Included in Prov. Rate	135.00	135.00	15.00%	155.25
Steel doors	no	1			315.00	Included in Prov. Rate	315.00	315.00	15.00%	362.25
Floor slab frame	no	1			0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00
Breeze bricks	no	2			24.00	Included in Prov. Rate	24.00	48.00	15.00%	55.20
Hinges	no	2			0.00	Included in Prov. Rate	0.00	0.00	15.00%	0.00
Brick force	m	25			0.50	Included in Prov. Rate	0.50	12.50	15.00%	14.38
3.5mm wire - roof ties	kg	0			110.00	Included in Prov. Rate	110.00	11.00	15.00%	12.65
Plumbing Water										
110 mm Saddle	no	1			121.72	Included in Prov. Rate	121.72	121.72	15.00%	139.98
Plason male adaptor	no	2			30.84	Included in Prov. Rate	30.84	61.67	15.00%	70.92
Galv 15mm bend	no	1			7.75	Included in Prov. Rate	7.75	7.75	15.00%	8.91
Galv 15mm T	no	1			5.53	Included in Prov. Rate	5.53	5.53	15.00%	6.36
Galv 15mm 1700 mm pipe	no	1			71.93	Included in Prov. Rate	71.93	71.93	15.00%	82.72
Galv 15mm 400 mm pipe	no	1			23.24	Included in Prov. Rate	23.24	23.24	15.00%	26.72
15mm brass stop valve	no	1			94.06	Included in Prov. Rate	94.06	94.06	15.00%	108.17
Garden Tap	no	1			56.38	Included in Prov. Rate	56.38	56.38	15.00%	64.84
DHPE pipe	m	6			14.41	Included in Prov. Rate	14.41	86.43	15.00%	99.40
Handwashing facility	ea	1			89.17	Included in Prov. Rate	89.17	89.17	15.00%	102.55
Plumbing Sewer										
Cistern	no	1			354.10	Included in Prov. Rate	354.10	354.10	15.00%	407.22
Pan	no	1			154.92	Included in Prov. Rate	154.92	154.92	15.00%	178.16
Toilet seat	no	1			44.26	Included in Prov. Rate	44.26	44.26	15.00%	50.90
Ballcock valve	no	1			30.42	Included in Prov. Rate	30.42	30.42	15.00%	34.99
PVC pipe 50 mm	m	3			15.91	Included in Prov. Rate	15.91	47.74	15.00%	54.90
PVC pipe 110 mm	m	3			47.61	Included in Prov. Rate	47.61	119.02	15.00%	136.88
2 way 50mm vent valve	no	1			21.30	Included in Prov. Rate	21.30	21.30	15.00%	24.50
PVC bend vent and serv.	no	1			52.49	Included in Prov. Rate	52.49	52.49	15.00%	60.37
Hose bib	no	1			49.00	Included in Prov. Rate	49.00	49.00	15.00%	56.34
Concrete gully	no	1			398.66	Included in Prov. Rate	398.66	398.66	15.00%	458.45
PVC gully	no	1			76.95	Included in Prov. Rate	76.95	76.95	15.00%	88.50
PVC gully trap	no	1			154.96	Included in Prov. Rate	154.96	154.96	15.00%	178.21
110 PVC T	no	1			54.66	Included in Prov. Rate	54.66	54.66	15.00%	62.86
50mm bens	no	1			67.01	Included in Prov. Rate	67.01	67.01	15.00%	77.07
110 mm 45 deg	no	1			44.67	Included in Prov. Rate	44.67	44.67	15.00%	51.37

Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
Rodding eye	no	1			44.06	Included in Prov. Rate	44.06	44.06	15.00%	50.67
110 x 50 red T	no	1			53.86	Included in Prov. Rate	53.86	53.86	15.00%	61.94
Labour										
Labour excavation	m3	5			60.00	Included in Prov. Rate	60.00	300.00	15.00%	345.00
Labour pipework	person days	1			101.50	Included in Prov. Rate	101.50	101.50	15.00%	116.72
Labour build top structure and roof	person days	3			101.50	Included in Prov. Rate	101.50	304.49	15.00%	350.16
Labour found and floor	person days	2			101.50	Included in Prov. Rate	101.50	202.99	15.00%	233.44
Labour fixtures	person days	1			101.50	Included in Prov. Rate	101.50	50.75	15.00%	58.36
		Percentage							**Total**	7,463.72
P & G - Included in Prov. Rate above	%	10.00%								746.37
								Total Cost		**8,210.09**

Community Development										
Commuity liaison, builder and quality assessor training and record keeping	person days	1			150.00	Included in Prov. Rate	150.00	150.00	0%	150.00
Health, hygiene and user education materials	user material pack	1			100.00	Included in Prov. Rate	100.00	100.00	0%	100.00
Health, hygiene and user education training	person days	0.5			150.00	Included in Prov. Rate	150.00	75.00	0%	75.00
Peer education house to house visits (x 3)	visit	3			40.00	Included in Prov. Rate	40.00	120.00	0%	120.00
								Total Com Dev Cost		**445.00**

5 **Bulk Waste Water Supply**

5a **Cost/m from Municipal supply**

75 mm supply

1	Clear and grub	m2	2000			1.82	Included in Prov. Rate	1.82	3642.60	15.00%	4,189.00
2	Remove topsoil	m2	2000			3.44	Included in Prov. Rate	3.44	6880.48	15.00%	7,912.55
3	Trench excavation (machine)	m	1000			57.58	Included in Prov. Rate	57.58	57584.63	15.00%	66,222.33
4	Bedding and backfill	m3	1105			61.38	Included in Prov. Rate	61.38	67830.02	15.00%	78,004.52
5	75 mm PVC sewer pipe	m	1000			25.12	Included in Prov. Rate	25.12	25120.00	15.00%	28,888.00
6	Concrete to manhole base	no	3			1,077.15	Included in Prov. Rate	1,077.15	3662.31	15.00%	4,211.66

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
7	Concrete to benching	no	4			1,077.15	Included in Prov. Rate	1,077.15	4577.89	15.00%	5,264.58
8	Starter ring	ea	13			551.98	Included in Prov. Rate	551.98	7175.75	15.00%	8,252.11
9	1000mm dia x 500 mm m/h ring	ea	39			709.69	Included in Prov. Rate	709.69	27677.89	15.00%	31,829.58
10	Manhole cover	ea	13			346.96	Included in Prov. Rate	346.96	4510.47	15.00%	5,187.04
11	Manhole lid	ea	13			181.37	Included in Prov. Rate	181.37	2357.75	15.00%	2,711.41
12	Testing	m	1000			7.89	Included in Prov. Rate	7.89	7885.44	15.00%	9,068.26
13	Labour person days	no	220			102.51	Included in Prov. Rate	102.51	22552.36	15.00%	25,935.21
14	Supervision person days	no	16			145.58	Included in Prov. Rate	145.58	2329.24	15.00%	2,678.62
			Percentage							**Total**	280,354.85
	Preliminary & General	%	10.00%								28,035.49
									Total Cost		**308390.34**
									Unit Cost to 1m		**308.39**

15b **Cost/m from Municipal supply**

90 mm supply

1	Clear and grub	m2	2000			1.82	Included in Prov. Rate	1.82	3642.60	15.00%	4,189.00
2	Remove topsoil	m2	2000			3.44	Included in Prov. Rate	3.44	6880.48	15.00%	7,912.55
3	Trench excavation (machine)	m	1000			57.58	Included in Prov. Rate	57.58	57584.63	15.00%	66,222.33
4	Bedding and backfill	m3	1105			61.38	Included in Prov. Rate	61.38	67830.02	15.00%	78,004.52
5	90 mm PVC sewer pipe	m	1000			30.12	Included in Prov. Rate	30.12	30120.00	15.00%	34,638.00
6	Concrete to manhole base	no	3			1,077.15	Included in Prov. Rate	1,077.15	3662.31	15.00%	4,211.66
7	Concrete to benching	no	4			1,077.15	Included in Prov. Rate	1,077.15	4577.89	15.00%	5,264.58
8	Starter ring	ea	13			551.98	Included in Prov. Rate	551.98	7175.75	15.00%	8,252.11
9	1000mm dia x 500 mm m/h ring	ea	39			709.69	Included in Prov. Rate	709.69	27677.89	15.00%	31,829.58
10	Manhole cover	ea	13			346.96	Included in Prov. Rate	346.96	4510.47	15.00%	5,187.04
11	Manhole lid	ea	13			181.37	Included in Prov. Rate	181.37	2357.75	15.00%	2,711.41
12	Testing	m	1000			7.89	Included in Prov. Rate	7.89	7885.44	15.00%	9,068.26
13	Labour person days	no	220			102.51	Included in Prov. Rate	102.51	22552.36	15.00%	25,935.21
14	Supervision person days	no	16			145.58	Included in Prov. Rate	145.58	2329.24	15.00%	2,678.62
			Percentage							**Total**	286,104.85
	Preliminary & General	%	10.00%								28,610.49
									Total Cost		**314715.34**
									Unit Cost to 1m		**314.72**

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
5c	**Cost/m from Municipal supply**										
	110 mm supply										
			Calculated to 1000m average depth of 1.6m / Manholes @ 60m average								
1	Clear and grub	m2	2000			1.82	Included in Prov. Rate	1.82	3642.60	15.00%	4,189.00
2	Remove topsoil	m2	2000			3.44	Included in Prov. Rate	3.44	6880.48	15.00%	7,912.55
3	Trench excavation (machine)	m	1000			57.58	Included in Prov. Rate	57.58	57584.63	15.00%	66,222.33
4	Bedding and backfill	m3	1105			61.38	Included in Prov. Rate	61.38	67830.02	15.00%	78,004.52
5	110 mm PVC sewer pipe	m	1000			33.12	Included in Prov. Rate	33.12	33118.85	15.00%	38,086.67
6	Concrete to manhole base	no	3			1,077.15	Included in Prov. Rate	1,077.15	3662.31	15.00%	4,211.66
7	Concrete to benching	no	4			1,077.15	Included in Prov. Rate	1,077.15	4577.89	15.00%	5,264.58
8	Starter ring	ea	13			551.98	Included in Prov. Rate	551.98	7175.75	15.00%	8,252.11
9	1000mm dia x 500 mm m/h ring	ea	39			709.69	Included in Prov. Rate	709.69	27677.89	15.00%	31,829.58
10	Manhole cover	ea	13			346.96	Included in Prov. Rate	346.96	4510.47	15.00%	5,187.04
11	Manhole lid	ea	13			181.37	Included in Prov. Rate	181.37	2357.75	15.00%	2,711.41
12	Testing	m	1000			7.89	Included in Prov. Rate	7.89	7885.44	15.00%	9,068.26
13	Labour person days	no	220			102.51	Included in Prov. Rate	102.51	22552.36	15.00%	25,935.21
14	Supervision person days	no	16			145.58	Included in Prov. Rate	145.58	2329.24	15.00%	2,678.62
			Percentage							**Total**	289,553.52
	Preliminary & General	%	10.00%								28,955.35
									Total Cost		**318508.88**
									Unit Cost to 1m		**318.51**

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
5d	**Cost/m from Municipal supply**										
	160 mm supply										
			Calculated to 1000m average depth of 1.6m / Manholes @ 60m average								
1	Clear and grub	m2	2000			1.82	Included in Prov. Rate	1.82	3642.60	15.00%	4,189.00
2	Remove topsoil	m2	2000			3.44	Included in Prov. Rate	3.44	6880.48	15.00%	7,912.55
3	Trench excavation (machine)	m	1000			57.58	Included in Prov. Rate	57.58	57584.63	15.00%	66,222.33
4	Bedding and backfill	m3	1105			61.38	Included in Prov. Rate	61.38	67830.02	15.00%	78,004.52
5	160 mm PVC sewer pipe	m	1000			66.24	Included in Prov. Rate	66.24	66237.69	15.00%	76,173.34
6	Concrete to manhole base	no	3			1,077.15	Included in Prov. Rate	1,077.15	3662.31	15.00%	4,211.66
7	Concrete to benching	no	4			1,077.15	Included in Prov. Rate	1,077.15	4577.89	15.00%	5,264.58
8	Starter ring	ea	13			551.98	Included in Prov. Rate	551.98	7175.75	15.00%	8,252.11
9	1000mm dia x 500 mm m/h ring	ea	39			709.69	Included in Prov. Rate	709.69	27677.89	15.00%	31,829.58

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
10	Manhole cover	ea	13			346.96	Included in Prov. Rate	346.96	4510.47	15.00%	5,187.04
11	Manhole lid	ea	13			181.37	Included in Prov. Rate	181.37	2357.75	15.00%	2,711.41
12	Testing	m	1000			7.89	Included in Prov. Rate	7.89	7885.44	15.00%	9,068.26
13	Labour person days	no	220			102.51	Included in Prov. Rate	102.51	22552.36	15.00%	25,935.21
14	Supervision person days	no	16			145.58	Included in Prov. Rate	145.58	2329.24	15.00%	2,678.62
			Percentage							**Total**	327,640.20
	Preliminary & General	%	10.00%								32,764.02
									Total Cost		**360404.22**
									Unit Cost to 1m		**360.40**

5e **Cost/m from Municipal supply**
250 mm supply

1	Clear and grub	m2	2000			1.82	Included in Prov. Rate	1.82	3642.60	15.00%	4,189.00
2	Remove topsoil	m2	2000			3.44	Included in Prov. Rate	3.44	6880.48	15.00%	7,912.55
3	Trench excavation (machine)	m	1000			57.58	Included in Prov. Rate	57.58	57584.63	15.00%	66,222.33
4	Bedding and backfill	m3	1105			61.38	Included in Prov. Rate	61.38	67830.02	15.00%	78,004.52
5	250 mm PVC sewer pipe	m	1000			208.18	Included in Prov. Rate	208.18	208175.60	15.00%	239,401.94
6	Concrete to manhole base	no	3			1,077.15	Included in Prov. Rate	1,077.15	3662.31	15.00%	4,211.66
7	Concrete to benching	no	4			1,077.15	Included in Prov. Rate	1,077.15	4577.89	15.00%	5,264.58
8	Starter ring	ea	13			551.98	Included in Prov. Rate	551.98	7175.75	15.00%	8,252.11
9	1000mm dia x 500 mm m/h ring	ea	39			709.69	Included in Prov. Rate	709.69	27677.89	15.00%	31,829.58
10	Manhole cover	ea	13			346.96	Included in Prov. Rate	346.96	4510.47	15.00%	5,187.04
11	Manhole lid	ea	13			181.37	Included in Prov. Rate	181.37	2357.75	15.00%	2,711.41
12	Testing	m	1000			7.89	Included in Prov. Rate	7.89	7885.44	15.00%	9,068.26
13	Labour person days	no	220			102.51	Included in Prov. Rate	102.51	22552.36	15.00%	25,935.21
14	Supervision person days	no	16			145.58	Included in Prov. Rate	145.58	2329.24	15.00%	2,678.62
			Percentage							**Total**	490,868.79
	Preliminary & General	%	10.00%								49,086.88
									Total Cost		**539955.67**
									Unit Cost to 1m		**539.96**

5f **Cost/m from Municipal supply**
300 mm supply

1	Clear and grub	m2	2000			1.82	Included in Prov. Rate	1.82	3642.60	15.00%	4,189.00
2	Remove topsoil	m2	2000			3.44	Included in Prov. Rate	3.44	6880.48	15.00%	7,912.55

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
3	Trench excavation (machine)	m	1000			57.58	Included in Prov. Rate	57.58	57584.63	15.00%	66,222.33
4	Bedding and backfill	m3	1105			61.38	Included in Prov. Rate	61.38	67830.02	15.00%	78,004.52
5	300 mm PVC sewer pipe	m	1000			288.18	Included in Prov. Rate	288.18	288180.00	15.00%	331,407.00
6	Concrete to manhole base	no	3			1,077.15	Included in Prov. Rate	1,077.15	3662.31	15.00%	4,211.66
7	Concrete to benching	no	4			1,077.15	Included in Prov. Rate	1,077.15	4577.89	15.00%	5,264.58
8	Starter ring	ea	13			551.98	Included in Prov. Rate	551.98	7175.75	15.00%	8,252.11
9	1000mm dia x 500 mm m/h ring	ea	39			709.69	Included in Prov. Rate	709.69	27677.89	15.00%	31,829.58
10	Manhole cover	ea	13			346.96	Included in Prov. Rate	346.96	4510.47	15.00%	5,187.04
11	Manhole lid	ea	13			181.37	Included in Prov. Rate	181.37	2357.75	15.00%	2,711.41
12	Testing	m	1000			7.89	Included in Prov. Rate	7.89	7885.44	15.00%	9,068.26
13	Labour person days	no	220			102.51	Included in Prov. Rate	102.51	22552.36	15.00%	25,935.21
14	Supervision person days	no	16			145.58	Included in Prov. Rate	145.58	2329.24	15.00%	2,678.62
			Percentage							**Total**	582,873.85
	Preliminary & General	%	10.00%								58,287.39
									Total Cost		**641161.24**
									Unit Cost to 1m		**641.16**

5g **Cost/m from Municipal supply**

400 mm supply

1	Clear and grub	m2	2000			1.82	Included in Prov. Rate	1.82	3642.60	15.00%	4,189.00
2	Remove topsoil	m2	2000			3.44	Included in Prov. Rate	3.44	6880.48	15.00%	7,912.55
3	Trench excavation (machine)	m	1000			57.58	Included in Prov. Rate	57.58	57584.63	15.00%	66,222.33
4	Bedding and backfill	m3	1105			61.38	Included in Prov. Rate	61.38	67830.02	15.00%	78,004.52
5	400 mm PVC sewer pipe	m	1000			378.18	Included in Prov. Rate	378.18	378180.00	15.00%	434,907.00
6	Concrete to manhole base	no	3			1,077.15	Included in Prov. Rate	1,077.15	3662.31	15.00%	4,211.66
7	Concrete to benching	no	4			1,077.15	Included in Prov. Rate	1,077.15	4577.89	15.00%	5,264.58
8	Starter ring	ea	13			551.98	Included in Prov. Rate	551.98	7175.75	15.00%	8,252.11
9	1000mm dia x 500 mm m/h ring	ea	39			709.69	Included in Prov. Rate	709.69	27677.89	15.00%	31,829.58
10	Manhole cover	ea	13			346.96	Included in Prov. Rate	346.96	4510.47	15.00%	5,187.04
11	Manhole lid	ea	13			181.37	Included in Prov. Rate	181.37	2357.75	15.00%	2,711.41
12	Testing	m	1000			7.89	Included in Prov. Rate	7.89	7885.44	15.00%	9,068.26
13	Labour person days	no	220			102.51	Included in Prov. Rate	102.51	22552.36	15.00%	25,935.21
14	Supervision person days	no	16			145.58	Included in Prov. Rate	145.58	2329.24	15.00%	2,678.62
			Percentage							**Total**	686,373.85

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
	Preliminary & General	%	10.00%								68,637.39
									Total Cost		**755011.24**
									Unit Cost to 1m		**755.01**
5h	**Cost/m from Municipal supply**										
	500 mm supply										
1	Clear and grub	m2	2000			1.82	Included in Prov. Rate	1.82	3642.60	15.00%	4,189.00
2	Remove topsoil	m2	2000			3.44	Included in Prov. Rate	3.44	6880.48	15.00%	7,912.55
3	Trench excavation (machine)	m	1000			57.58	Included in Prov. Rate	57.58	57584.63	15.00%	66,222.33
4	Bedding and backfill	m3	1105			61.38	Included in Prov. Rate	61.38	67830.02	15.00%	78,004.52
5	500 mm PVC sewer pipe	m	1000			478.18	Included in Prov. Rate	478.18	478180.00	15.00%	549,907.00
6	Concrete to manhole base	no	3			1,077.15	Included in Prov. Rate	1,077.15	3662.31	15.00%	4,211.66
7	Concrete to benching	no	4			1,077.15	Included in Prov. Rate	1,077.15	4577.89	15.00%	5,264.58
8	Starter ring	ea	13			551.98	Included in Prov. Rate	551.98	7175.75	15.00%	8,252.11
9	1000mm dia x 500 mm m/h ring	ea	39			709.69	Included in Prov. Rate	709.69	27677.89	15.00%	31,829.58
10	Manhole cover	ea	13			346.96	Included in Prov. Rate	346.96	4510.47	15.00%	5,187.04
11	Manhole lid	ea	13			181.37	Included in Prov. Rate	181.37	2357.75	15.00%	2,711.41
12	Testing	m	1000			7.89	Included in Prov. Rate	7.89	7885.44	15.00%	9,068.26
13	Labour person days	no	220			102.51	Included in Prov. Rate	102.51	22552.36	15.00%	25,935.21
14	Supervision person days	no	16			145.58	Included in Prov. Rate	145.58	2329.24	15.00%	2,678.62
			Percentage							**Total**	801,373.85
	Preliminary & General	%	10.00%								80,137.39
									Total Cost		**881511.24**
									Unit Cost to 1m		**881.51**
6	**Bus Shelters**										
6a	**Bus Shelters for bus ranks**										
1	Bus Shelter	m2	1	1,450.00	0.2150	1,761.75	1.00%	1,779.37	1779.37	15.00%	2,046.27
			Percentage							**Total**	2,046.27
	Preliminary & General	%	12.00%								245.55
									Total Cost		**2,291.83**
6b	**Bus Shelters for streets**										
1	Bus Shelter for streets	m2	1	1,450.00	0.2150	1,761.75	1.00%	1,779.37	1779.37	15.00%	2,046.27
			Percentage							**Total**	2,046.27

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
	Preliminary & General	%	12.00%								245.55
									Total Cost		**2,291.83**
7	**Taxi Ranks**										
7a	**Paved Sidewalks**										
1	Paved Sidewalks	m2	1	105.00	0.2150	127.58	1.00%	128.85	128.85	15.00%	148.18
			Percentage							**Total**	148.18
	Preliminary & General	%	12.00%								17.78
									Total Cost		**165.96**
7b	**Unpaved Sidewalks**										
1	Gravel sidewalks	m2	1	65.00	0.2150	78.98	1.00%	79.76	79.76	15.00%	91.73
			Percentage							**Total**	91.73
	Preliminary & General	%	12.00%								11.01
									Total Cost		**102.74**
8	**Disaster Management Facilities**										
8a	**Offices for staff**										
1	Offices for staff	m2	1	2,700.00	0.2150	3,280.50	1.00%	3,313.31	3313.31	15.00%	3,810.30
			Percentage							**Total**	3,810.30
	Preliminary & General	%	12.00%								457.24
									Total Cost		**4,267.54**
8a	**Small Conference room**										
1	Small conference room	m2	1	2,650.00	0.2150	3,219.75	1.00%	3,251.95	3251.95	15.00%	3,739.74
			Percentage							**Total**	3,739.74
	Preliminary & General	%	12.00%								448.77
									Total Cost		**4,188.51**
8a	**Ablution Facilities**										
1	Ablution Facilities	m2	1	2,900.00	0.2150	3,523.50	1.00%	3,558.74	3558.74	15.00%	4,092.55
			Percentage							**Total**	4,092.55
	Preliminary & General	%	12.00%								491.11
									Total Cost		**4,583.65**
8a	**Small Kitchen**										
1	Small Kitchen	m2	1	3,150.00	0.2150	3,827.25	1.00%	3,865.52	3865.52	15.00%	4,445.35
			Percentage							**Total**	4,445.35

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
	Preliminary & General	%	12.00%								533.44
									Total Cost		**4,978.79**
9	**Health Services**										
9a	**Car parking bay**										
1	Car parking bay	Unit	1	5,100.00	0.2150	6,196.50	1.00%	6,258.47	6258.47	15.00%	7,197.23
			Percentage							**Total**	7,197.23
	Preliminary & General	%	12.00%								863.67
									Total Cost		**8,060.90**
9b	**Main Entrance**										
1	Main Entrance	m2	1	4,500.00	0.2150	5,467.50	1.00%	5,522.18	5522.18	15.00%	6,350.50
			Percentage							**Total**	6,350.50
	Preliminary & General	%	12.00%								762.06
									Total Cost		**7,112.56**
9c	**Reception**										
1	Reception	m2	1	4,500.00	0.2150	5,467.50	1.00%	5,522.18	5522.18	15.00%	6,350.50
			Percentage							**Total**	6,350.50
	Preliminary & General	%	12.00%								762.06
									Total Cost		**7,112.56**
9d	**Record storage**										
1	Record storage	m2	1	4,500.00	0.2150	5,467.50	1.00%	5,522.18	5522.18	15.00%	6,350.50
			Percentage							**Total**	6,350.50
	Preliminary & General	%	12.00%								762.06
									Total Cost		**7,112.56**
9e	**Administration**										
1	Administration	m2	1	4,500.00	0.2150	5,467.50	1.00%	5,522.18	5522.18	15.00%	6,350.50
			Percentage							**Total**	6,350.50
	Preliminary & General	%	12.00%								762.06
									Total Cost		**7,112.56**
9f	**Waiting Areas**										
1	Waiting Areas	m2	1	4,500.00	0.2150	5,467.50	1.00%	5,522.18	5522.18	15.00%	6,350.50
			Percentage							**Total**	6,350.50
	Preliminary & General	%	12.00%								762.06

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
									Total Cost		**7,112.56**
9g	**Consulting rooms**										
1	Consulting rooms	m2	1	4,500.00	0.2150	5,467.50	1.00%	5,522.18	5522.18	15.00%	6,350.50
			Percentage							**Total**	6,350.50
	Preliminary & General	%	12.00%								762.06
									Total Cost		**7,112.56**
9h	**Treatment rooms**										
1	Treatment rooms	m2	1	4,500.00	0.2150	5,467.50	1.00%	5,522.18	5522.18	15.00%	6,350.50
			Percentage							**Total**	6,350.50
	Preliminary & General	%	12.00%								762.06
									Total Cost		**7,112.56**
10	**Multi Purpose Centre/ Facilities**										
10a	**Facility (400/600 m2) seating 1200-2500**										
1	Facility (400/600 m2) seating 1200-2500	Unit	1	2,900,000.00	0.2150	3,523,500.00	1.00%	3,558,735.00	3558735.00	15.00%	4,092,545.25
			Percentage							**Total**	4,092,545.25
	Preliminary & General	%	12.00%								491,105.43
									Total Cost		**4,583,650.68**
10b	**Outdoor**										
1	Outdoor	Unit	1	2,000,000.00	0.2150	2,430,000.00	1.00%	2,454,300.00	2454300.00	15.00%	2,822,445.00
			Percentage							**Total**	2,822,445.00
	Preliminary & General	%	12.00%								338,693.40
									Total Cost		**3,161,138.40**
10c	**Hall**										
1	Outdoor	Unit	1	2,500,000.00	0.2150	3,037,500.00	1.00%	3,067,875.00	3067875.00	15.00%	3,528,056.25
			Percentage							**Total**	3,528,056.25
	Preliminary & General	%	12.00%								423,366.75
									Total Cost		**3,951,423.00**
10d	**Sports and recreation hall**										
1	Outdoor	Unit	1	3,600,000.00	0.2150	4,374,000.00	1.00%	4,417,740.00	4417740.00	15.00%	5,080,401.00
			Percentage							**Total**	5,080,401.00

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
	Preliminary & General	%	12.00%								609,648.12
									Total Cost		**5,690,049.12**
11	**Multi Purpose Community Centre**										
11a	**Offices for all service providors ($12m^2$)**										
1	Offices for all service providors ($12m^2$)	m2	1	4,500.00	0.2150	5,467.50	1.00%	5,522.18	5522.18	15.00%	6,350.50
			Percentage							**Total**	6,350.50
	Preliminary & General	%	12.00%								762.06
									Total Cost		**7,112.56**
11b	**A community hall/ sports complex.**										
1	A community hall/ sports complex.	Unit	1	5,400,000.00	0.2150	6,561,000.00	1.00%	6,626,610.00	6626610.00	15.00%	7,620,601.50
			Percentage							**Total**	7,620,601.50
	Preliminary & General	%	12.00%								914,472.18
									Total Cost		**8,535,073.68**
11c	**Reception area with general service counter**										
1	Reception area with general service counter	Unit	1	108,000.00	0.2150	131,220.00	1.00%	132,532.20	132532.20	15.00%	152,412.03
			Percentage							**Total**	152,412.03
	Preliminary & General	%	12.00%								18,289.44
									Total Cost		**170,701.47**
11d	**A furnished sheltered waiting room for clients**										
1	A furnished sheltered waiting room for clients	Unit	1	102,000.00	0.2150	123,930.00	1.00%	125,169.30	125169.30	15.00%	143,944.70
			Percentage							**Total**	143,944.70
	Preliminary & General	%	12.00%								17,273.36
									Total Cost		**161,218.06**
11e	**Centre managers office**										
1	Centre managers office	Unit	1	112,500.00	0.2150	136,687.50	1.00%	138,054.38	138054.38	15.00%	158,762.53
			Percentage							**Total**	158,762.53
	Preliminary & General	%	12.00%								19,051.50

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
									Total Cost		**177,814.04**
11f	**Furnished telecommunication/computer center**										
1	Furnished telecommunication/computer center	Unit	1	750,000.00	0.2150	911,250.00	1.00%	920,362.50	920362.50	15.00%	1,058,416.88
			Percentage							**Total**	1,058,416.88
	Preliminary & General	%	12.00%								127,010.03
									Total Cost		**1,185,426.90**
11g	**Boardroom for MCPC stakeholders meetings**										
1	Boardroom for MCPC stakeholders meetings	Unit	1	500,000.00	0.2150	607,500.00	1.00%	613,575.00	613575.00	15.00%	705,611.25
			Percentage							**Total**	705,611.25
	Preliminary & General	%	12.00%								84,673.35
									Total Cost		**790,284.60**
11h	**Parking area paved (600 m2)**										
1	Parking area paved (600 m2)	Unit	1	150,000.00	0.2150	182,250.00	1.00%	184,072.50	184072.50	15.00%	211,683.38
			Percentage							**Total**	211,683.38
	Preliminary & General	%	12.00%								25,402.01
									Total Cost		**237,085.38**
12	**Parks and open spaces**										
12a	**Earthworks per m^2**										
1	Earthworks per m^2	m^2	1	3.50	0.2150	4.25	1.00%	4.30	4.30	15.00%	4.94
			Percentage							**Total**	4.94
	Preliminary & General	%	12.00%								0.59
									Total Cost		**5.53**
12b	**Grassing per m^2**										
1	Grassing per m^2	m^2	1	16.00	0.2150	19.44	1.00%	19.63	19.63	15.00%	22.58
			Percentage							**Total**	22.58
	Preliminary & General	%	12.00%								2.71
									Total Cost		**25.29**

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
12c	**Irrigation per m^2**										
1	Irrigation per m^2	m^2	1	15.00	0.2187	18.28	1.00%	18.46	18.46	15.00%	21.23
			Percentage							**Total**	21.23
	Preliminary & General	%	12.00%								2.55
									Total Cost		**23.78**
12d	**Ablution facility m^2**										
1	Ablution facility m^2	m^2	1	4,500.00	0.2150	5,467.50	1.00%	5,522.18	5522.18	15.00%	6,350.50
			Percentage							**Total**	6,350.50
	Preliminary & General	%	12.00%								762.06
									Total Cost		**7,112.56**
12e	**Fencing (1.8m high concrete palisade fencing/m)**										
1	Fencing (1.8m high concrete palisade fencing/m)	ha	1	450.00	0.2150	546.75	1.00%	552.22	552.22	15.00%	635.05
			Percentage							**Total**	635.05
	Preliminary & General	%	12.00%								76.21
									Total Cost		**711.26**
13	**Cemeteries**										
13a	**Basic level of service**										
1	Basic level of service	Unit	1	1,050,000.00	0.2150	1,275,750.00	1.00%	1,288,507.50	1288507.50	15.00%	1,481,783.63
			Percentage							**Total**	1,481,783.63
	Preliminary & General	%	12.00%								177,814.04
									Total Cost		**1,659,597.66**
13b	**Higher level of service**										
1	Higher level of service	Unit	1	2,400,000.00	0.2150	2,916,000.00	1.00%	2,945,160.00	2945160.00	15.00%	3,386,934.00
			Percentage							**Total**	3,386,934.00
	Preliminary & General	%	12.00%								406,432.08
									Total Cost		**3,793,366.08**
13c	**Intermediate level of service Regional cemetery**										

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
1	Intermediate level of service Regional cemetery	Unit	1	1,800,000.00	0.2150	2,187,000.00	1.00%	2,208,870.00	2208870.00	15.00%	2,540,200.50
			Percentage							**Total**	2,540,200.50
	Preliminary & General	%	12.00%								304,824.06
									Total Cost		**2,845,024.56**
13d	**Highest level of service Memorial parks**										
1	Highest level of service Memorial parks	Unit	1	5,000,000.00	0.2150	6,075,000.00	1.00%	6,135,750.00	6135750.00	15.00%	7,056,112.50
			Percentage							**Total**	7,056,112.50
	Preliminary & General	%	12.00%								846,733.50
									Total Cost		**7,902,846.00**
14	**Fencing Security**										
14a	**Concrete palisade 2.4m high / m**										
1	Concrete palisade 2.4m high / m	m	1	588.00	0.2150	714.42	1.00%	721.56	721.56	15.00%	829.80
			Percentage							**Total**	829.80
	Preliminary & General	%	12.00%								99.58
									Total Cost		**929.37**
14b	**Wire Fencing 2.4m high / m**										
1	Wire Fencing 2.4m high / m	m	1	330.00	0.2150	400.95	1.00%	404.96	404.96	15.00%	465.70
			Percentage							**Total**	465.70
	Preliminary & General	%	12.00%								55.88
									Total Cost		**521.59**
	Public										
14c	**Concrete Palisade fencing 1.8m high / m**										
1	Concrete Palisade fencing 1.8m high / m	m	1	330.00	0.2150	400.95	1.00%	404.96	404.96	15.00%	465.70
			Percentage							**Total**	465.70
	Preliminary & General	%	12.00%								55.88
									Total Cost		**521.59**
	Public										

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
14d	**Wire Fencing 1.2m high / m**										
1	Wire Fencing 1.2m high / m	m	1	160.00	0.2150	194.40	1.00%	196.34	196.34	15.00%	225.80
			Percentage							**Total**	225.80
	Preliminary & General	%	12.00%								27.10
									Total Cost		**252.89**
	Public										
14e	**Wire Fencing 1.8m high / m**										
1	Wire Fencing 2.4m high / m	m	1	246.00	0.2150	298.89	1.00%	301.88	301.88	15.00%	347.16
			Percentage							**Total**	347.16
	Preliminary & General	%	12.00%								41.66
									Total Cost		**388.82**
	Security Gates										
14f	**Double leaf 4m wide 2.4m high**										
1	Double leaf 4m wide 2.4m high	Unit	1	2,400.00	0.2150	2,916.00	1.00%	2,945.16	2945.16	15.00%	3,386.93
			Percentage							**Total**	3,386.93
	Preliminary & General	%	12.00%								406.43
									Total Cost		**3,793.37**
	Security Gates										
14g	**Double leaf 6m wide**										
1	Double leaf 6m wide	Unit	1	3,200.00	0.2150	3,888.00	1.00%	3,926.88	3926.88	15.00%	4,515.91
			Percentage							**Total**	4,515.91
	Preliminary & General	%	12.00%								541.91
									Total Cost		**5,057.82**
	Security Gates										
14g	**Single pedestrian 1,0m wide**										
1	Single pedestrian 1,0m wide	Unit	1	1,115.00	0.2150	1,354.73	1.00%	1,368.27	1368.27	15.00%	1,573.51
			Percentage							**Total**	1,573.51
	Preliminary & General	%	12.00%								188.82
									Total Cost		**1,762.33**

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
15	**Libraries**										
1	Libraries m2	m2	1	6,000.00	0.2150	7,290.00	1.00%	7,362.90	7362.90	15.00%	8,467.34
			Percentage							**Total**	8,467.34
	Preliminary & General	%	12.00%								1,016.08
									Total Cost		**9,483.42**
16	**Solid waste disposal**										
16a	**Landfill Maximum Communal <25**										
1	Communal<25	Unit	1	2,000,000.00	0.2187	2,437,302.35	1.00%	2,461,675.37	2461675.37	15.00%	2,830,926.68
			Percentage							**Total**	2,830,926.68
	Preliminary & General	%	12.00%								339,711.20
									Total Cost		**3,170,637.88**
16b	**Small**										
1	Landfill Maximum Small >25<150	Unit	1	3,000,000.00	0.2187	3,655,953.53	1.00%	3,692,513.06	3692513.06	15.00%	4,246,390.02
			Percentage							**Total**	4,246,390.02
	Preliminary & General	%	12.00%								509,566.80
									Total Cost		**4,755,956.82**
16c	**Medium**										
1	Landfill Maximum Medium >150<500	Unit	1	14,000,000.00	0.2187	17,061,116.46	1.00%	17,231,727.62	17231727.62	15.00%	19,816,486.76
			Percentage							**Total**	19,816,486.76
	Preliminary & General	%	12.00%								2,377,978.41
									Total Cost		**22,194,465.17**
16d	**Large**										
1	Landfill Maximum Small >500	Unit	1	24,000,000.00	0.2187	29,247,628.21	1.00%	29,540,104.49	29540104.49	15.00%	33,971,120.17
			Percentage							**Total**	33,971,120.17
	Preliminary & General	%	12.00%								4,076,534.42
									Total Cost		**38,047,654.59**
16	**Wastewater Treatment Plant per ML**										
16a	**Preliminary**										
1	Preliminary	ML	1	4,000,000.00	0.2011	4,804,532.75	1.00%	4,852,578.08	4852578.08	15.00%	5,580,464.79

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
			Percentage							**Total**	5,580,464.79
	Preliminary & General	%	12.00%								669,655.77
									Total Cost		**6,250,120.57**
16b	**Secondary**										
1	Preliminary	ML	1	5,500,000.00	0.2011	6,606,232.53	1.00%	6,672,294.86	6672294.86	15.00%	7,673,139.09
			Percentage							**Total**	7,673,139.09
	Preliminary & General	%	12.00%								920,776.69
									Total Cost		**8,593,915.78**
16c	**Tertiary**										
1	Preliminary	ML	1	6,000,000.00	0.2011	7,206,799.13	1.00%	7,278,867.12	7278867.12	15.00%	8,370,697.19
			Percentage							**Total**	8,370,697.19
	Preliminary & General	%	12.00%								1,004,483.66
									Total Cost		**9,375,180.85**
17	**Social Institutions and Micro Enterprises**										
	Local Economic Development										
17a	**Street trading per unit (4m²) & communal ablution**										
1	Street trading per unit (4m²) & communal ablution	Unit	1	5,750.00	0.2150	6,986.25	1.00%	7,056.11	7056.11	15.00%	8,114.53
			Percentage							**Total**	8,114.53
	Preliminary & General	%	12.00%								973.74
									Total Cost		**9,088.27**
17b	**Markets - per unit brick side walls (6m²) & communal ablution**										
1	Markets - per unit brick side walls (6m²) & communal ablution	Unit	1	19,500.00	0.2150	23,692.50	1.00%	23,929.43	23929.43	15.00%	27,518.84
			Percentage							**Total**	27,518.84
	Preliminary & General	%	12.00%								3,302.26
									Total Cost		**30,821.10**
17d	**Old-age homes per inhabitant (full service)**										
1	Old-age homes per inhabitant (full service)	Unit	1	90,000.00	0.2150	109,350.00	1.00%	110,443.50	110443.50	15.00%	127,010.03
			Percentage							**Total**	127,010.03

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
	Preliminary & General	%	12.00%								15,241.20
									Total Cost		**142,251.23**
17e	**Orphanages per orphan**										
1	Orphanages per orphan	Unit	1	90,000.00	0.2150	109,350.00	1.00%	110,443.50	110443.50	15.00%	127,010.03
			Percentage							**Total**	127,010.03
	Preliminary & General	%	12.00%								15,241.20
									Total Cost		**142,251.23**
17f	**Churches per m² (Main Hall)**										
1	Churches per m² (Main Hall)	m2	1	6,000.00	0.2150	7,290.00	1.00%	7,362.90	7362.90	15.00%	8,467.34
			Percentage							**Total**	8,467.34
	Preliminary & General	%	12.00%								1,016.08
									Total Cost		**9,483.42**
17g	**Créches**										
1	Créches	m2	1	4,500.00	0.2150	5,467.50	1.00%	5,522.18	5522.18	15.00%	6,350.50
			Percentage							**Total**	6,350.50
	Preliminary & General	%	12.00%								762.06
									Total Cost		**7,112.56**
9	**ROADS**										
9a	**Unpaved Gravel Rural :- Storm Water separate; not included. Road width 5m**										
	Roadbed										
1	Clear and Grub	m2	28800	3.17	0.2104	3.84	1.94%	3.91	112644.17	Incl. in rate	112,644.17
2	Strip and Remove Topsoil	m3	4320	23.38	0.2104	28.30	1.94%	28.85	124619.27	Incl. in rate	124,619.27
3	Roadbed preparation and Compaction	m3	3240	22.97	0.2104	27.80	1.94%	28.34	91825.43	Incl. in rate	91,825.43
4	Rectification, treatment of faulty roadbed	m3	650	42.45	0.2104	51.38	1.94%	52.38	34044.58	Incl. in rate	34,044.58
5	Cut to Fill	m3	1200	39.45	0.2104	47.75	1.94%	48.67	58409.73	Incl. in rate	58,409.73
6	Cut to Spoil (Soft, Medium, Hard, Boulders)	m3	3050	66.74	0.2104	80.78	1.94%	82.35	251155.68	Incl. in rate	251,155.68
7	Borrow to Fill from off-site sources	m3	4600	46.54	0.2104	56.33	1.94%	57.42	264144.25	Incl. in rate	264,144.25
	Subbase/Gravel Wearing course										
1	Construct gravel layers ex borrowpit	m3	2900	43.90	0.2104	53.13	1.94%	54.17	157079.49	Incl. in rate	157,079.49

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
2	Constr gravel wearing course ex borrowpit	m3	3200	43.90	0.2104	53.13	1.94%	54.17	173329.09	Incl. in rate	173,329.09
3	Mixing, Blending materials ex 2 borrowpits	m3	2500	14.11	0.2104	17.08	1.94%	17.41	43517.35	Incl. in rate	43,517.35
4	Overhaul	m3/km	15250	9.41	0.2104	11.39	1.94%	11.61	177058.35	Incl. in rate	177,058.35
5	Remove oversized material	m3	250	66.79	0.2104	80.84	1.94%	82.41	20601.95	Incl. in rate	20,601.95
	Road Signage										
1	Supply and erect road signs as needed	ea	26	686.95	0.2104	831.45	1.94%	847.58	22037.15	Incl. in rate	22,037.15
	Labour man days (included in rates)	ea	0				0.00%	0.00	0.00	Incl. in rate	0.00
	Supervision (included in rates and in P&G)	ea	0				0.00%	0.00	0.00	Incl. in rate	0.00
			Percentage							**Total**	1,530,466.48
	Preliminary & General	%	15.50%								237,222.31
									Total Cost		**1,767,688.79**
									Unit Cost to 1km		**491,024.66**

9b Unpaved Gravel Urban :- Storm Water separate; not included. Road width 5m

	Roadbed										
1	Clear and Grub	m2	65000	0.49	0.2104	0.59	3.46%	0.61	39882.82	Incl. in rate	39,882.82
2	Strip and Remove Topsoil	m3	4065	21.23	0.2104	25.70	3.46%	26.58	108065.47	Incl. in rate	108,065.47
3	Roadbed preparation and Compaction	m3	4065	24.74	0.2104	29.94	3.46%	30.98	125932.16	Incl. in rate	125,932.16
4	Rectification, treatment of faulty roadbed	m3	50	257.86	0.2104	312.10	3.46%	322.89	16144.72	Incl. in rate	16,144.72
5	Cut to Fill	m3	300	45.18	0.2104	54.68	3.46%	56.57	16972.42	Incl. in rate	16,972.42
6	Cut to Spoil (Soft,Medium,Hard,Boulders)	m3	300	53.88	0.2104	65.21	3.46%	67.47	20240.69	Incl. in rate	20,240.69
7	Borrow to Fill	m3	100	65.09	0.2104	78.78	3.46%	81.51	8150.62	Incl. in rate	8,150.62
	Subbase/Gravel Wearing course										
1	Construct gravel layers ex comm sources	m3	4065	165.41	0.2104	200.20	3.46%	207.13	841974.07	Incl. in rate	841,974.07
	Verges										
1	Trim, shape and roll verges	m2	38818	5.85	0.2104	7.08	3.46%	7.33	284357.98	Incl. in rate	284,357.98
2	Topsoiling of verge areas	m2	38818	5.85	0.2104	7.08	3.46%	7.33	284357.98	Incl. in rate	284,357.98
	Road Signage										
1	Supply and erect road signs as needed	ea	20	855.80	0.2104	1,035.82	3.46%	1,071.64	21432.79	Incl. in rate	21,432.79

Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
Labour man days (included in rates)	ea	0				0.00%	0.00	0.00	Incl. in rate	0.00
Supervision (included in rates and in P&G)	ea	0				0.00%	0.00	0.00	Incl. in rate	0.00
		Percentage							Total	1,767,511.72
Preliminary & General	%	25.50%								450,715.49
								Total Cost		2,218,227.20
								Unit Cost to 1km		446,323.38

9c Paving Blocks Urban :- Storm Water separate- not included; Road width 6m

	Roadbed										
1	Clear and Grub	m2	27000	0.48	0.1994	0.58	0.00%	0.58	15544.02	Incl. in rate	15,544.02
2	Strip and Remove Topsoil	m3	4049	17.94	0.1994	21.52	0.00%	21.52	87122.13	Incl. in rate	87,122.13
3	Roadbed preparation and Compaction	m3	2110	16.82	0.1994	20.17	0.00%	20.17	42566.38	Incl. in rate	42,566.38
4	Cut to Road Fill	m3	4159	35.32	0.1994	42.36	0.00%	42.36	176184.57	Incl. in rate	176,184.57
5	Cut to Spoil (Soft, Medium, Hard, Boulders)	m3	2428	20.75	0.1994	24.89	0.00%	24.89	60426.17	Incl. in rate	60,426.17
6	Construct Selected Layer	m3	2110	119.98	0.1994	143.90	0.00%	143.90	303633.42	Incl. in rate	303,633.42
	Subbase										
1	Construct Layer material ex commercial sources	m3	2110	129.02	0.1994	175.00	0.00%	175.00	369250.00	Incl. in rate	369,250.00
	Base										
1	Construct Layer material ex commercial sources	m3	0	181.66	0.1994	217.88	0.00%	217.88	0.00	Incl. in rate	0.00
	Block pavers										
1	80mm interlocking blocks, incl 25mm sand bed, cutting and locking up.	m2	11696	115.09	0.1994	143.75	0.00%	143.75	1681300.00	Incl. in rate	1,681,300.00
	Kerbing										
1	Edging strips	m	83	88.31	0.1994	105.92	0.00%	105.92	8791.16	Incl. in rate	8,791.16
2	Kerbing and Channeling straight	m	3459	127.16	0.1994	152.51	0.00%	152.51	527544.79	Incl. in rate	527,544.79
3	Kerbing and Channeling curves	m	478	147.18	0.1994	176.53	0.00%	176.53	84379.11	Incl. in rate	84,379.11
	Accommodation of Existing Services										
1	Constructing of layer works at services	m3	472	168.20	0.1994	201.74	0.00%	201.74	95219.58	Incl. in rate	95,219.58
	Verges										
1	Trim, shape and roll verges	m2	16621	5.05	0.1994	6.06	0.00%	6.06	100671.56	Incl. in rate	100,671.56
2	Topsoiling of verge areas	m2	16621	5.05	0.1994	6.06	0.00%	6.06	100671.56	Incl. in rate	100,671.56

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
	Road Signage										
1	Supply and erect road signs as needed	ea	26	841.02	0.1994	1,008.71	0.00%	1,008.71	26226.35	Incl. in rate	26,226.35
2	Road safety Barriers	ea	68	353.23	0.1994	423.66	0.00%	423.66	28808.77	Incl. in rate	28,808.77
	Labour man days (included in rates)	ea	0				0.00%	0.00	0.00	Incl. in rate	0.00
	Supervision (included in rates and in P&G)	ea	0				0.00%	0.00	0.00		0.00
										Total	3,708,339.54

	Percentage	
Preliminary & General	%	25.50%

	945,626.58
Total Cost	**4,653,966.13**
Unit Cost to 1km	**3,579,973.95**

9d Paved Chip and Spray Urban :- Storm Water separate; not included. Road width 6m

	Roadbed										
1	Clear and Grub	m2	27000	0.48	0.1977	0.57	4.97%	0.60	16293.00	Incl. in rate	16,293.00
2	Strip and Remove Topsoil	m3	4049	17.94	0.1977	21.49	4.97%	22.55	91320.05	Incl. in rate	91,320.05
3	Roadbed preparation and Compaction	m3	2110	16.82	0.1977	20.14	4.97%	21.15	44617.41	Incl. in rate	44,617.41
4	Cut to Road Fill	m3	4159	35.32	0.1977	42.30	4.97%	44.40	184673.91	Incl. in rate	184,673.91
5	Cut to Spoil (Soft,Medium,Hard,Boulders)	m3	2428	20.75	0.1977	24.85	4.97%	26.09	63337.76	Incl. in rate	63,337.76
6	Construct Selected Layer	m3	2110	119.98	0.1977	143.69	4.97%	150.84	318263.79	Incl. in rate	318,263.79
	Subbase										
1	Construct Layer material ex comm sources	m3	2110	129.02	0.1977	154.52	4.97%	162.20	342243.66	Incl. in rate	342,243.66
	Base										
1	Construct Layer material ex comm sources	m3	1441	181.66	0.1977	217.57	4.97%	228.38	329093.43	Incl. in rate	329,093.43
	Asphalt Base and Surfacing										
1	Prime Coat Bitumen	m2	11696	7.66	0.1977	9.17	4.97%	9.63	112632.07	Incl. in rate	112,632.07
2	Chip and Spray	m2	11696	41.49	0.1977	49.69	4.97%	52.16	610065.85	Incl. in rate	610,065.85
	Kerbing										
1	Edging strips	m	83	88.31	0.1977	105.76	4.97%	111.02	9214.76	Incl. in rate	9,214.76
2	Kerbing and Channelling straight	m	3459	127.16	0.1977	152.29	4.97%	159.86	552964.19	Incl. in rate	552,964.19
3	Kerbing and Channelling curves	m	478	147.18	0.1977	176.27	4.97%	185.03	88444.86	Incl. in rate	88,444.86
	Accommodation of Existing Services										
1	Constructing of layer works at services	m3	472	168.20	0.1977	201.45	4.97%	211.46	99807.67	Incl. in rate	99,807.67
	Verges										

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
1	Trim, shape and roll verges	m2	16621	5.05	0.1977	6.05	4.97%	6.35	105522.35	Incl. in rate	105,522.35
2	Topsoiling of verge areas	m2	16621	5.05	0.1977	6.05	4.97%	6.35	105522.35	Incl. in rate	105,522.35
	Road Signage										
1	Supply and erect road signs as needed	ea	26	841.02	0.1977	1,007.25	4.97%	1,057.31	27490.05	Incl. in rate	27,490.05
2	Road safety Barriers	ea	68	353.23	0.1977	423.05	4.97%	444.07	30196.90	Incl. in rate	30,196.90
	Labour man days (included in rates)	ea	0				0.00%	0.00	0.00	Incl. in rate	0.00
	Supervision (included in rates and in P&G)	ea	0				0.00%	0.00	0.00	Incl. in rate	0.00
										Total	3,131,704.07
			Percentage								
	Preliminary & General	%	25.50%								798,584.54
									Total Cost		**3,930,288.61**
									Unit Cost to 1km		**3,946,072.90**

9e Paved Bitumen Premix Urban :- Storm Water separate; not included. Road width 6m

	Roadbed										
1	Clear and Grub	m2	27000	0.48	0.1977	0.57	4.97%	0.60	16293.00	Incl. in rate	16,293.00
2	Strip and Remove Topsoil	m3	4049	17.94	0.1977	21.49	4.97%	22.55	91320.05	Incl. in rate	91,320.05
3	Roadbed preparation and Compaction	m3	2110	16.82	0.1977	20.14	4.97%	21.15	44617.41	Incl. in rate	44,617.41
4	Cut to Road Fill	m3	4159	35.32	0.1977	42.30	4.97%	44.40	184673.91	Incl. in rate	184,673.91
5	Cut to Spoil (Soft,Medium,Hard,Boulders)	m3	2428	20.75	0.1977	24.85	4.97%	26.09	63337.76	Incl. in rate	63,337.76
6	Construct Lower Selected Layer	m3	2110	114.94	0.1977	137.66	4.97%	144.50	304894.49	Incl. in rate	304,894.49
7	Construct Upper Selected Layer	m3	2110	119.98	0.1977	143.69	4.97%	150.84	318263.79	Incl. in rate	318,263.79
	Subbase										
1	Construct Layer material ex comm sources	m3	2110	129.35	0.1977	154.92	4.97%	162.62	343119.03	Incl. in rate	343,119.03
	Base										
1	Construct Layer material ex comm sources	m3	1441	181.66	0.1977	217.57	4.97%	228.38	329093.43	Incl. in rate	329,093.43
	Asphalt Base and Surfacing										
1	Prime Coat Bitumen	m2	11696	7.66	0.1977	9.17	4.97%	9.63	112632.07	Incl. in rate	112,632.07
2	Bitumen Premix 40 mm	m2	11696	49.04	0.1977	58.73	4.97%	61.65	721080.49	Incl. in rate	721,080.49
	Kerbing										
1	Edging strips	m	83	88.31	0.1977	105.76	4.97%	111.02	9214.76	Incl. in rate	9,214.76
2	Kerbing and Channelling straight	m	3459	127.16	0.1977	152.29	4.97%	159.86	552964.19	Incl. in rate	552,964.19
3	Kerbing and Channelling curves	m	478	147.18	0.1977	176.27	4.97%	185.03	88444.86	Incl. in rate	88,444.86
	Accommodation of Existing Services										

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
1	Constructing of layer works at services	m3	472	168.20	0.1977	201.45	4.97%	211.46	99807.67	Incl. in rate	99,807.67
	Verges										
1	Trim, shape and roll verges	m2	16621	5.05	0.1977	6.05	4.97%	6.35	105522.35	Incl. in rate	105,522.35
2	Topsoiling of verge areas	m2	16621	5.05	0.1977	6.05	4.97%	6.35	105522.35	Incl. in rate	105,522.35
	Road Signage										
1	Supply and erect road signs as needed	ea	26	841.02	0.1977	1,007.25	4.97%	1,057.31	27490.05	Incl. in rate	27,490.05
2	Road safety Barriers	ea	68	353.23	0.1977	423.05	4.97%	444.07	30196.90	Incl. in rate	30,196.90
	Labour man days (included in rates)	ea	0				0.00%	0.00	0.00	Incl. in rate	0.00
	Supervision (included in rates and in P&G)	ea	0				0.00%	0.00	0.00	Incl. in rate	0.00
			Percentage							**Total**	3,548,488.56
	Preliminary & General	%	25.50%								904,864.58
									Total Cost		**4,453,353.14**
									Unit Cost to 1km		**4,948,170.16**

10 STORM WATER

10a Unlined (Rural) :- Excluding Roadworks

	Side Drains										
1	Clear and Grub	m2	14400	3.23	0.2187	3.94	-1.09%	3.89	56064.07	Incl. in rate	56,064.07
2	Strip and Remove Topsoil	m3	2160	21.73	0.2187	26.48	-1.09%	26.19	56576.11	Incl. in rate	56,576.11
3	Cut to Spoil (Soft,Medium,Hard,Boulders)	m3	2700	65.71	0.2187	80.08	-1.09%	79.20	213852.75	Incl. in rate	213,852.75
4	Trimming Side Drains to Profile, Compact	m	7200	21.73	0.2187	26.48	-1.09%	26.19	188587.04	Incl. in rate	188,587.04
5	Construct Mitre Drains where required	m	200	43.47	0.2187	52.97	-1.09%	52.40	10479.47	Incl. in rate	10,479.47
6	Construct Scour Protection (steep sections)	ea	150	353.82	0.2187	431.18	-1.09%	426.48	63972.49	Incl. in rate	63,972.49
7	Levelling Verges	m	7200	15.00	0.2187	18.28	-1.09%	18.08	130179.73	Incl. in rate	130,179.73
	Labour man days (included in rates)	ea	0			0.00	0.00%	0.00	0.00	Incl. in rate	0.00
	Supervision (included in rates and in P&G)	ea	0			0.00	0.00%	0.00	0.00	Incl. in rate	0.00
			Percentage							**Total**	719,711.66
	Preliminary & General	%	15.50%								111,555.31
									Total Cost		**831,266.97**
									Unit Cost to 1km		**230.91**

10b Lined :- Excluding Roadworks

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
	Side Drains										
1	Clear and Grub	m2	14400	3.02	0.2187	3.68	6.49%	3.92	56436.19	Incl. in rate	56,436.19
2	Strip and Remove Topsoil	m3	2160	20.10	0.2187	24.49	6.49%	26.08	56342.75	Incl. in rate	56,342.75
3	Cut to Spoil (Soft,Medium,Hard,Boulders)	m3	2700	60.78	0.2187	74.07	6.49%	78.88	212967.19	Incl. in rate	212,967.19
4	Trimming Side Drains to Profile, Compact	m	7200	20.10	0.2187	24.49	6.49%	26.08	187809.17	Incl. in rate	187,809.17
5	Concrete Lining to Side Drains	m2	12960	112.21	0.2187	136.74	6.49%	145.62	1887229.87	Incl. in rate	1,887,229.87
6	Construct Mitre Drains where required	m	200	154.85	0.2187	188.71	6.49%	200.96	40191.06	Incl. in rate	40,191.06
7	Levelling Verges	m	7200	14.03	0.2187	17.10	6.49%	18.21	131092.67	Incl. in rate	131,092.67
	Labour man days (included in rates)	ea	0			0.00	0.00%	0.00	0.00	Incl. in rate	0.00
	Supervision (included in rates and in P&G)	ea	0			0.00	0.00%	0.00	0.00	Incl. in rate	0.00
										Total	2,572,068.90

	Percentage	
Preliminary & General	%	15.50%

	398,670.68
Total Cost	**2,970,739.58**
Unit Cost to 1km	**825.21**

10c Pipe Culverts :- 600 mm Class 100 D; single pipe (Excluding Roadworks)

	Trenches for Pipe Culverts										
1	Excavate all Material, backfill and compact	m	1238	83.83	0.1989	100.51	6.49%	107.03	132502.84	Incl. in rate	132,502.84
2	Excavate unsuitable material and spoil	m3	20	215.07	0.1989	257.86	6.49%	274.59	5491.80	Incl. in rate	5,491.80
	Excavation Ancillaries										
1	Make up deficiency in backfill material	m3	14	191.41	0.1989	229.49	6.49%	244.38	3421.35	Incl. in rate	3,421.35
	Particular Item										
1	Shore excavated Trench	m	24	1,016.22	0.1989	1,218.38	6.49%	1,297.46	31138.96	Incl. in rate	31,138.96
	Bedding										
1	Supply of Bedding ex commercial source	m3	1248	169.68	0.1989	203.44	6.49%	216.64	270364.90	Incl. in rate	270,364.90
	Pipes										
1	Supply and Lay Class 100 D	m	1367	554.46	0.1989	664.76	6.49%	707.91	967706.82	Incl. in rate	967,706.82
	Manholes and Catchpits										
1	Manholes and catchpits to particular specs	ea	28	11,377.36	0.1989	13,640.73	6.49%	14,526.02	406728.49	Incl. in rate	406,728.49
2	Headwalls to Pipe Culverts	m2	12	3,015.70	0.1989	3,615.63	6.49%	3,850.29	46203.45	Incl. in rate	46,203.45
	Erosion Protection										
1	Gabions, Reno Mattress, Stone Pitching	m2	235	270.64	0.1989	324.48	6.49%	345.54	81201.66	Incl. in rate	81,201.66
2	Geotextile	m2	114	10.16	0.1989	12.18	6.49%	12.97	1478.78	Incl. in rate	1,478.78

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
	Labour man days (included in rates)	ea	0			0.00	0.00%	0.00	0.00	Incl. in rate	0.00
	Supervision (included in rates and in P&G)	ea	0			0.00	0.00%	0.00	0.00	Incl. in rate	0.00
			Percentage							**Total**	1,946,239.05
	Preliminary & General	%	25.50%								496,290.96
									Total Cost		**2,442,530.01**
									Unit Cost to 1km		**3,864.76**

10d Box Culverts :- 1500 x 1500 mm ; single box shute (Excluding Roadworks)

	Trenches for Box Culverts										
1	Excavate all Material, backfill and compact	m	9904	101.08	0.1989	121.19	6.49%	129.05	1278147.37	Incl. in rate	1,278,147.37
2	Excavate unsuitable material and spoil	m3	20	215.07	0.1989	257.86	6.49%	274.59	5491.80	Incl. in rate	5,491.80
	Excavation Ancillaries										
1	Make up deficiency in backfill material	m3	14	191.41	0.1989	229.49	6.49%	244.38	3421.35	Incl. in rate	3,421.35
	Particular Item										
1	Shore excavated Trench	m	24	1,016.22	0.1989	1,218.38	6.49%	1,297.46	31138.96	Incl. in rate	31,138.96
	Bedding										
1	Cast Concrete Blinding	m3	3120	860.29	0.1989	1,031.43	6.49%	1,098.37	3426924.49	Incl. in rate	3,426,924.49
	Boxes										
1	Supply and Place 1500 x 1500 mm Sections	m	1367	2,357.39	0.1989	2,826.36	6.49%	3,009.79	4114385.85	Incl. in rate	4,114,385.85
2	Wingwalls to Box Culverts	m2	30	3,015.70	0.1989	3,615.63	6.49%	3,850.29	115508.64	Incl. in rate	115,508.64
	Erosion Protection										
1	Gabions, Reno Mattress, Stone Pitching	m2	588	270.64	0.1989	324.48	6.49%	345.54	203004.15	Incl. in rate	203,004.15
2	Geotextile	m2	114	10.16	0.1989	12.18	6.49%	12.97	1478.78	Incl. in rate	1,478.78
	Labour man days (included in rates)	ea	0			0.00	0.00%	0.00	0.00	Incl. in rate	0.00
	Supervision (included in rates and in P&G)	ea	0			0.00	0.00%	0.00	0.00	Incl. in rate	0.00
			Percentage							**Total**	9,179,501.38
	Preliminary & General	%	25.50%								2,340,772.85
									Total Cost		**11,520,274.24**
									Unit Cost to 1km		**18,228.28**

10e Low Level Stream Crossings :- Excluding Roadworks (6m roadwidth) - length 17.08m

	Accommodation of Traffic										

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
1	Maintain deviations and Accomm Traffic	km	0	8,415.90	0.1989	10,090.13	6.49%	10,744.98	3223.49	Incl. in rate	3,223.49
	Clearing and Grubbing										
1	Clear and Grub	ha	1	21,560.86	0.1989	25,850.11	6.49%	27,527.78	16241.39	Incl. in rate	16,241.39
	Prefabricated Culverts										
1	Excavate material	m3	74	83.58	0.1989	100.21	6.49%	106.71	7896.58	Incl. in rate	7,896.58
2	Backfilling with selected material	m3	75	120.63	0.1989	144.63	6.49%	154.01	11551.06	Incl. in rate	11,551.06
3	Concrete Pipe Culverts	m	30	1,995.59	0.1989	2,392.59	6.49%	2,547.86	76435.95	Incl. in rate	76,435.95
4	Portal Rectangular Culverts	m	17	9,047.09	0.1989	10,846.89	6.49%	11,550.85	197288.53	Incl. in rate	197,288.53
5	Cast In-situ Concrete incl Formwork	m3	60	1,653.61	0.1989	1,982.57	6.49%	2,111.24	126674.56	Incl. in rate	126,674.56
6	Concrete Backfill and slab for culvert	m3	25	1,960.20	0.1989	2,350.16	6.49%	2,502.68	62567.02	Incl. in rate	62,567.02
7	Reinforcing Steel	ton	2	18,094.19	0.1989	21,693.79	6.49%	23,101.71	38117.83	Incl. in rate	38,117.83
8	Precast inlets, Manholes, Catchpits	ea	8	4,975.90	0.1989	5,965.79	6.49%	6,352.97	50823.75	Incl. in rate	50,823.75
9	Access and Drainage	l sum	1	11,221.20	0.1989	13,453.51	6.49%	14,326.64	14326.64	Incl. in rate	14,326.64
	Gabions, Reno Mattresses										
1	Excavated Trench	m3	20	502.62	0.1989	602.61	6.49%	641.72	12834.38	Incl. in rate	12,834.38
2	Prepare Bedding for Gabions	m2	90	25.14	0.1989	30.14	6.49%	32.10	2888.77	Incl. in rate	2,888.77
3	Gabions	m3	87	1,507.85	0.1989	1,807.82	6.49%	1,925.14	167487.52	Incl. in rate	167,487.52
4	Geo Textile (Filter Fabric - Bidim)	m2	630	30.16	0.1989	36.16	6.49%	38.51	24259.23	Incl. in rate	24,259.23
	Road Signs										
	Road Signs	ea	6	827.56	0.1989	992.19	6.49%	1,056.59	6339.51	Incl. in rate	6,339.51
	Testing of Material										
1	Test required by the Engineer	Prov S	1	18,702.00	0.1989	22,422.51	6.49%	23,877.73	23877.73	Incl. in rate	23,877.73
	Labour man days (included in rates)	ea	0			0.00	0.00%	0.00	0.00	Incl. in rate	0.00
	Supervision (included in rates and in P&G)	ea	0			0.00	0.00%	0.00	0.00	Incl. in rate	0.00
			Percentage							**Total**	842,833.94
	Preliminary & General	%	25.50%								214,922.65
									Total Cost		**1,057,756.59**
									Unit Cost to 1km		**61,929.54**

10 STORM WATER :- DEWATERING

10f Dewatering - Subsoil Drains :- 110 mm diameter; single pipe wrapped in geotextile (Excluding Roadworks); 10 m long section

Subsoil Drains										

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
1	Clear and Grub	m2	30	3.02	0.1989	3.62	6.49%	3.86	115.67	Incl. in rate	115.67
2	Strip and Remove Topsoil	m3	5	20.10	0.1989	24.10	6.49%	25.66	115.48	Incl. in rate	115.48
	Trenches for Subsoil Drains										
1	Excavate all Material, backfill and compact	m	10	83.83	0.1989	100.51	6.49%	107.03	1070.30	Incl. in rate	1,070.30
2	Excavate unsuitable material and spoil	m3	1	215.07	0.1989	257.86	6.49%	274.59	274.59	Incl. in rate	274.59
	Excavation Ancillaries										
1	Make up deficiency in backfill material	m3	1	191.41	0.1989	229.49	6.49%	244.38	244.38	Incl. in rate	244.38
	Bedding										
1	Supply of Bedding ex commercial source	m3	6	169.68	0.1989	203.44	6.49%	216.64	1299.83	Incl. in rate	1,299.83
	Pipes										
1	Supply and Lay Findrain 110 mm	m	6	147.06	0.1989	176.32	6.49%	187.76	1126.55	Incl. in rate	1,126.55
2	Geotextile Bidim U24 wrapping	m2	5	12.03	0.1989	14.42	6.49%	15.36	76.80	Incl. in rate	76.80
	Labour man days (included in rates)	ea	0			0.00	0.00%	0.00	0.00	Incl. in rate	0.00
	Supervision (included in rates and in P&G)	ea	0			0.00	0.00%	0.00	0.00	Incl. in rate	0.00
			Percentage							**Total**	4,323.60
	Preliminary & General	%	25.50%								1,102.52
									Total Cost		**5,426.12**
									Unit Cost to 1km		**542.61**

10g Gabions (2.0 x 1.0 x 1.0 PVC boxes)

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
	Foundation trench excavation and backfilling										
1	Excavate material	m3	0	83.58	0.0000	83.58	6.49%	89.00	17.80	15.00%	17.80
2	Surface bed preparation for bedding of gabions	m2	2	14.00	0.0000	14.00	106.49%	28.91	57.82	15.00%	57.82
	Gabions										
1	Gabions (2.0 x 1.0 x 1.0) PVC coated gabion boxes 2,7mmm diameter galvanised wire, to SANS 1580, including rock infill	m3	2	1,013.50	0.0000	1,013.50	6.49%	1,079.28	2158.55	15.00%	2,158.55
2	Geo Textile (Filter Fabric - Bidim)	m2	2	16.92	0.0000	16.92	6.49%	18.02	36.04	15.00%	36.04
	Labour man days (included in rates)	ea	1	120.00		120.00	0.00%	120.00	60.00	Incl. in rate	60.00
	Supervision (included in rates and in P&G)	ea	1	120.00		120.00	0.00%	120.00	60.00	Incl. in rate	60.00
			Percentage							**Total**	2,390.21
	Preliminary & General	%	25.50%								609.50

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
									Total Cost		**2,999.71**
									Unit Cost to 1m^3		**1,499.85**

10g Reno Mattresses (3.0 x 1.0 x 0.3 PVC boxes)

	Foundation trench excavation and backfilling										
1	Excavate material	m3	0	83.58	0.0000	83.58	6.49%	89.00	8.90	15.00%	8.90
2	Surface bed preparation for bedding of gabions	m2	1	14.00	0.0000	14.00	106.49%	28.91	26.02	15.00%	26.02
	Gabions										
1	Reno Mattresses (3.0 x 1.0 x 0.3) PVC coated 2,7mmm diameter galvanised wire, to SANS 1580, including rock infill	m3	1	1,166.67	0.0000	1,166.67	6.49%	1,242.39	1118.15	15.00%	1,118.15
2	Geo Textile (Filter Fabric - Bidim)	m2	3	16.92	0.0000	16.92	6.49%	18.02	54.05	15.00%	54.05
	Labour man days (included in rates)	ea	0	120.00		120.00	0.00%	120.00	30.00	Incl. in rate	30.00
	Supervision (included in rates and in P&G)	ea	0	120.00		120.00	0.00%	120.00	30.00	Incl. in rate	30.00
			Percentage							**Total**	1,267.12
	Preliminary & General	%	25.50%								323.12
									Total Cost		**1,590.24**
									Unit Cost to 1m^3		**1,766.93**

12 STREET AND COMMUNITY LIGHTING

12a Street Lighting :- Excludes Internal Reticulation (Assume it exist)

	Overhead Network										
1	Struts	ea	6	966.41	0.1989	1,158.66	4.97%	1,216.25	7297.50	Incl. in rate	7,297.50
2	Install Bundle Conductors and Equipment	ea	298	58.99	0.1989	70.73	4.97%	74.24	22123.62	Incl. in rate	22,123.62
3	LV Bundle Conductors	m	4,309	48.28	0.1989	57.88	4.97%	60.76	261821.43	Incl. in rate	261,821.43
4	SIMIL IPC connectors to ESKOM Specs	ea	664	52.51	0.1989	62.96	4.97%	66.09	43880.50	Incl. in rate	43,880.50
5	Termination of Cables/ABC	ea	322	6.04	0.1989	7.24	4.97%	7.60	2447.68	Incl. in rate	2,447.68
	Excavations										
1	Trenches and Poles	ea	179	89.33	0.1989	107.10	4.97%	112.42	20123.88	Incl. in rate	20,123.88
2	Hard Excavation	m3	38	491.66	0.1989	589.47	4.97%	618.77	23513.10	Incl. in rate	23,513.10
	Street Lighting										
1	Mark Positions, Supply and erect pole	ea	179	410.34	0.1989	491.97	4.97%	516.42	92439.66	Incl. in rate	92,439.66
2	LV pole mounted circuit breaker, brackets	ea	322	451.09	0.1989	540.83	4.97%	567.71	182801.82	Incl. in rate	182,801.82

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
3	Luminaires	ea	322	1,349.66	0.1989	1,618.16	4.97%	1,698.58	546942.52	Incl. in rate	546,942.52
	Labour man days (included in rates)	ea	0		0.1989	0.00	0.00%	0.00	0.00	Incl. in rate	0.00
	Supervision (included in rates and in P&G)	ea	0		0.1989	0.00	0.00%	0.00	0.00	Incl. in rate	0.00
			Percentage							**Total**	1,203,391.69
	Preliminary & General	%	15.09%								181,591.81
									Total Cost		**1,384,983.50**
									Unit Cost per Street Light		**7,737.34**

12b High Mast Lighting :- Excludes Internal Reticulation (Assume it exist)

	High Mast										
1	Complete incl foundation and Luminaires	ea	1	114,986.30	0.1989	137,861.29	4.97%	144,713.00	144713.00	Incl. in rate	144,713.00
2	Labour to construct and erect	m/day	565	71.27	0.1989	85.45	4.97%	89.69	50677.67	Incl. in rate	50,677.67
	Labour man days (included in rates)	ea	0			0.00	4.97%	0.00	0.00	Incl. in rate	0.00
	Supervision (included in rates and in P&G)	ea	0			0.00	4.97%	0.00	0.00	Incl. in rate	0.00
			Percentage							**Total**	195,390.67
	Preliminary & General	%	7.50%								14,654.30
									Total Cost		**210,044.97**
									Unit Cost per High Mast		**210,044.97**

13 SIDEWALKS

13a Paved Sidewalks

	Sidewalk										
	Clear and Remove Topsoil	m2	9940	5.61	0.2045	6.76	4.97%	7.09	70503.14	Incl. in rate	70,503.14
	Prepare sidewalk area and compact	m2	4970	28.51	0.2045	34.34	4.97%	36.05	179148.36	Incl. in rate	179,148.36
	Cut to Fill	m3	100	32.79	0.2045	39.49	4.97%	41.46	4145.73	Incl. in rate	4,145.73
	Cut to Spoil	m3	100	27.32	0.2045	32.91	4.97%	34.54	3454.14	Incl. in rate	3,454.14
	Import selected Fill	m3	75	136.61	0.2045	164.54	4.97%	172.72	12953.97	Incl. in rate	12,953.97
	Paving										
	Construct concrete paving (100 mm)	m3	497	874.28	0.2045	1,053.04	4.97%	1,105.38	549371.55	Incl. in rate	549,371.55
	Verges										
	Trim, shape adjacent areas	m2	4970	5.61	0.2045	6.76	4.97%	7.09	35251.57	Incl. in rate	35,251.57

	Description	Unit	Qty	Rate (2007)	CPAF	Escalated GP Rate (2009)	Prov. %	EC Prov. Rate	Sub Total	Construction Margin %	Total
	Labour man days (included in rates)	ea	0		0.2045	0.00	4.97%	0.00	0.00	Incl. in rate	0.00
	Supervision (included in rates and in P&G)	ea	0		0.2045	0.00	4.97%	0.00	0.00	Incl. in rate	0.00
			Percentage							Total	854,828.46
	Preliminary & General	%	25.50%								217,981.26
									Total Cost		1,072,809.71
									Unit Cost per 1m		215.86

13b **Unpaved Sidewalks**

	Sidewalk										
1	Clear and Remove Topsoil	m2	9940	5.61	0.2045	6.76	4.97%	7.09	70503.14	Incl. in rate	70,503.14
2	Prepare sidewalk area and compact	m2	4970	28.51	0.2045	34.34	4.97%	36.05	179148.36	Incl. in rate	179,148.36
3	Cut to Fill	m3	100	32.79	0.2045	39.49	4.97%	41.46	4145.73	Incl. in rate	4,145.73
4	Cut to Spoil	m3	100	27.32	0.2045	32.91	4.97%	34.54	3454.14	Incl. in rate	3,454.14
5	Import selected Fill	m3	75	136.61	0.2045	164.54	4.97%	172.72	12953.97	Incl. in rate	12,953.97
	Gravel Wearing course										
1	Construct Gravel Layer ex comm sources	m3	497	136.61	0.2045	164.54	4.97%	172.72	85841.66	Incl. in rate	85,841.66
	Verges										
1	Trim, shape adjacent areas	m2	4970	5.61	0.2045	6.76	4.97%	7.09	35251.57	Incl. in rate	35,251.57
	Labour man days (included in rates)	ea	0		0.2045	0.00	4.97%	0.00	0.00	Incl. in rate	0.00
	Supervision (included in rates and in P&G)	ea	0		0.2045	0.00	4.97%	0.00	0.00	Incl. in rate	0.00
			Percentage							Total	391,298.57
	Preliminary & General	%	25.50%								99,781.14
									Total Cost		491,079.71
									Unit Cost per 1m		98.81

Appendix 5: Costing of Crematorium

ROOM FUNCTION	ROOM SIZE	m^2	OCCUPANCY CLASS	DESIGN POPULATION	NO	FIRE POPULATION REQ.	LIGHTING	VENTILATION #	ACOUSTICS	USERS	DESIGN COST (R4270/ m2)
Memorial Service	20mx25m	500	Worship - A4	1 person/ $1m^2$	50	30 min	Natural	3.5 ltr/ person	Yes	Public	R 2,135,000.00
Memorial Service	10mx15m	150	Worship - A4	1 person/ $1m^2$	20	30 min	Natural	3.5 ltr/ person	Yes	Public	R 640,500.00
Memorial Service	10mx15m	150	Worship - A4	1 person/ $1m^2$	20	30 min	Natural	3.5 ltr/ person	Yes	Public	R 640,500.00
Family Room	5mx5m	25	Exhibition Hall - C1	1 person/ $10m^2$	5	60 min	Natural	5 ltr/ person	Yes	Public	R 106,750.00
Clerical	5mx3m	15	Offices- G1	1 person/$15m^2$	5	30 min	Natural	5 ltr/ person	Yes	Staff	R 64,050.00
Sacristy	3mx3m	9	Offices- G1	1 person/$15m^2$	2	30 min	Natural	5 ltr/ person	Yes	Staff	R 38,430.00
Sacristy	3mx3m	9	Offices- G1	1 person/ $15m^2$	2	30 min	Natural	5 ltr/ person	Yes	Staff	R 38,430.00
Clerical	3mx3m	9	Offices- G1	1 person/ $15m^2$	2	30 min	Natural	5 ltr/ person	Yes	Staff	R 38,430.00
Circulation	10mx5m	50	Worship - A4	1 person/ $1m^2$	20	30 min	Natural	3.5 ltr/ person	Yes	Public	R 213,500.00
Circulation	10mx10m	100	Worship - A4	1 person/ $1m^2$	50 Per table 6	30 min	Artificial	3.5 ltr/ person	Yes	Public	R 427,000.00
Ablutions	5mx5m	25	Worship - A4	Per table 6 #	# Per table 6	30 min	Artificial	25 ltr/ person	No	Public	R 106,750.00
Ablutions	5mx5m	25	Worship - A4	Per table 6 #	#	30 min	Artificial	25 ltr/ person	No	Public	R 106,750.00
Disposal Room	10mx10m	100	Moderate Risk Industrial- D2	1 person/ $15m^2$	4	30 min	Natural	7.5 ltr/ person	No	Staff	R 427,000.00
Circulation	10mx5m	50	Moderate Risk Industrial- D2	1 person/ $15m^2$	2	30 min	Natural	7.5 ltr/ person	No	Staff	R 213,500.00
Clerical	3mx3m	9	Offices- G1	1 person/ $15m^2$	2	30 min	Natural	7.5 ltr/ person	Yes	Staff	R 38,430.00

ROOM FUNCTION	ROOM SIZE	m^2	OCCUPANCY CLASS	DESIGN POPULATION	NO	FIRE POPULATION REQ.	LIGHTING	VENTILATION #	ACOUSTICS	USERS	DESIGN COST (R4270 / m2)
Storage	6mx2m	12	Moderate Risk Industrial- D2	1 person/ 50m^2	1	60 min	Artificial	7.5 ltr/ person	No	Staff	R 51,240.00
Medical Doctor	3mx3m	9	Offices- G1	1 person/ 15m^2	2	30 min	Artificial	5 ltr/ person	Yes	Staff	R 38,430.00
Refinement of Ashes	2mx2m	4	Low Risk Storage- J3	1 person/ 50m^2	2	60 min	Artificial	5 ltr/ person	Yes	Staff	R 17,080.00
Storage	2mx2m	4	Low Risk Storage- J3	1 person/ 50m^2	1	60 min	Artificial	1 ltr/ person	No	Staff	R 17,080.00
Storage	2mx2m	4	Low Risk Storage- J3	1 person/ 50m^2	1 Per table 6	60 min	Artificial	1 ltr/ person	No	Staff	R 17,080.00
Ablutions	5mx5m	25	Moderate Risk Industrial- D2	Per table 6 #	#Per table 6	30 min	Artificial	25 ltr/ person	No	Staff	R 106,750.00
Ablutions	5mx5m	25	Moderate Risk Industrial- D2	Per table 6 #	#	30 min	Artificial	25 ltr/ person	No	Staff	R 106,750.00
Internment of Ashes	30mx30m	900	Low Risk Storage- J3	1 person/ 50m^2	20	60 min	Natural	5 ltr/ person	Yes	Staff	R 3,843,000.00
Staff Relaxation	10mx5m	50	Entertain & Public Assembly-A1	1 person/ 1m^2	10	30 min	Natural	17.5 ltr/ person	Yes	Staff	R 213,500.00
Services	5mx3m	15	Plant Room- D4	1 person/ 50m^2		30 min	Artificial	1 ltr/ person	Yes	Staff	R 64,050.00
Services	5mx3m	15	Plant Room- D4	1 person/ 50m^2	2	30 min	Artificial	1 ltr/ person	No	Staff	R 64,050.00
Services	3mx3m	9	Plant Room- D4	1 person/ 50m^2	2	30 min	Artificial	1 ltr/ person	No	Staff	R 38,430.00
Services	5mx5m	25	Plant Room- D4	1 person/ 50m^2	2	30 min	Artificial	1 ltr/ person	Yes	Staff	R 106,750.00
Storage	100 Vehicles		Open Parking	None	None	None	None	None	None	Staff & Public	R 0.00

Note: The February 2007 crematorium costs were escalated to August 2009, by multiplying the design cost per m^2 by an escalation factor of 1,22 (i.e. R3500/m^2 x 1,22 = R4270/m^2).