The development of an Activity Based Costing Model for the Water Trading Entity of South Africa

A Research Report submitted by

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Date Submitted: 31 March 2017

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in partial fulfilment of the requirements for the degree of

Master of Commerce

University of the Witwatersrand

Abstract

The Water Trading Entity (WTE) under the Department of Water Affairs and Sanitation in South Africa is mandated by the National Water Act to charge users for raw water supplied, and the tariffs it charges must enable it to fully recover its costs. The entity is concerned that it is not achieving full equity in relation to refining the recovery mechanism to obtain tariffs that represent usage of resources. This research study sought to investigate the possibility of implementing Activity Based Costing (ABC) in order to overcome the deficiencies of using the Traditional Costing system. ABC is a costing tool that measures the cost of activities to provide more accurate cost information for management. This research examines the practicalities of applying ABC in the water sector. WTE supplies raw water to the Water Boards who further supply to Municipalities, which in turn supply to the final consumers. It is possible that due to the limitations of the traditional costing there may be a price distortion throughout the water supply value chain, and if this is corrected consumers may pay a fair price for water. This research paper has revealed that indirect costs are quite significant within the WTE and proposes an ABC model that would be easy to implement to allocate costs more accurately leading to a full recovery of costs.

Keywords: Activity Based Costing, Traditional Costing, Indirect Costs, Water Schemes

Contents

Chapter 1: Introduction

1.1 Background to the problem

The Department of Water Affairs and Sanitation is the regulator of the Water Sector in South Africa. Its mandate is to regulate raw water tariffs. The Department formed the Water Trading Entity (WTE) to take over the supply of raw water to the country through the Public Finance Management Act, 1999 (Act No. 1 of 1999). The WTE is made up of Catchment Management Agencies and National Water Infrastructure Operations.

The National Water Act of 1998 provides for cost recovery on services rendered by the department to water users. It is against this background that the department created the WTE within its administration. The main function of the WTE is development, operation and maintenance of specific water resources infrastructure and managing water resources in specific water management areas.

The Catchment Management Agencies (CMA) are responsible for managing the water resources and for this they have a water resource management charge. Each CMA prepares budgets for its activities and divides their costs by the volume of water under their jurisdiction, measured in cubic metres. The customers are then billed using the cost per cubic metre which is multiplied by the volume of water made available to each of them.

The National Water Infrastructure Operations are responsible for the water infrastructure and for this they levy consumptive charges which are made up of operations and maintenance costs, depreciation, and return on assets calculated on the asset base at depreciated replacement cost. Each Infrastructure Operation includes several Schemes. The schemes are in most cases dams that supply raw water to Water Boards or large customers such as mines and Eskom. At present, the Schemes do not take into account the nature of their customers and assume that there are no differences in costs that arise from servicing each of them.

Organisations have been adopting Activity Based Costing (ABC) systems to overcome the over-generalisations of traditional costing systems, which, with their simplified cost allocations have resulted in lack of visibility of indirect costs (Krishnan, 2007). ABC systems trace an organization's expenses which are both direct and indirect to the products, services and customers that cause those expenses to be incurred. ABC is a method of determining true costs (Kumar and Mahto, 2013). The problem of traditional costing systems as used by the WTE, is that an increasingly large amount of indirect expenses continues to be allocated using allocation bases that are typically unrelated to what causes costs to be incurred. This may lead to inaccurate cost allocations which have serious ramifications (Terzioglu, 2016). The consumption of resources needs to be traced

and assigned as costs based on cause and effect relationships, which is what ABC tries to achieve. The other big factor to consider is that WTE could be using an outdated overhead allocation method that is no longer relevant to the complexities involved in supplying very different types of customers (Chan and Suk-Yee Lee, 2003).

As a result of the current pricing strategy, raw water pricing does not adequately cover the costs of providing water and infrastructure upgrades. It is for this reason that this research report looks into the development of an ABC model as a way to provide a better mechanism to identify how costs are being generated and thus determine more efficient cost recovery and allocation mechanisms for WTE. ABC has proven that indirect costs can be equitably allocated according to the consumption of resources, and this can lead to transparency and equity in the setting of water tariffs (Hofert, 2005).

1.2 Statement of the problem

The main challenge at present for the WTE is financial sustainability. The entity wants to ensure that it earns adequate revenue in order to fund the annual costs related to the management of the country's water resources, the operations, maintenance, refurbishment and betterment of existing Government water schemes and waterworks, and the development of new user funded schemes (DWAF, 2007).

The South African National Treasury has mandated State Owned Companies (SOC) like WTE to ensure that their tariffs achieve full cost recovery. It is imperative that costs are accurately determined to guarantee full cost recovery. The entity pricing of raw water is mainly based on a cost plus basis. This investigation looked at whether the use of ABC can help the entity fully recover the costs of providing water.

WTE is under pressure, like any other government entity, to deal with issues of efficiency related to reducing costs. ABC takes a closer look at organizational activities as the fundamental driver of costs, and then uses these activities as building blocks for allocating costs to cost objects. The system recognizes that products or services consume activities and that these activities consume resources that ultimately drive up costs. The products or services that cannot be allocated directly are captured in overhead cost pools and are then allocated based on activity cost-drivers that have cause-effect relationships. ABC is helpful in providing relatively accurate product cost information, and the value of activity-based costing information goes beyond accurate product costing. When ABC is used in conjunction with Activity-Based Management (ABM), organisations are often able to make dramatic improvements to operations. ABM can help WTE to reduce costs and become more efficient through identifying activities required to provide services, determine whether

activities are value-added or non-value added and continuously improve the value-added activities and minimise or eliminate the non-value added activities.

It has been shown that ABC provides more transparency as to what drives individual customer costs (Oseifuah, 2013). At present, the Infrastructure Operations are not able to determine the costs which are driven by each of its customers. This concern was raised by the Chief Director Revenue Management. The assumption is that the cost of providing water to each of them is the same. This must be resulting in the under recovery of costs from many customers. This in turn should lead to a better cost recovery mechanism to be implemented by the WTE.

1.3 Purpose

The outcome expected from this research is that an ABC model can be developed to help the WTE identify all its costs to ensure full cost recovery and accurately allocate indirect costs to Schemes. WTE is in the process of revising its Pricing Strategy and this research is expected to provide valuable input into this exercise.

1.4 Significance of the study

Public Sector organizations are faced with major challenges relating to service provision. They need to improve efficiency and effectiveness, and they also need to improve accountability in terms of linking budgets with performance. Studies have shown that a strong public service entity is the key to delivering good service outcomes (Oseifuah, 2013). In South Africa, the Water Affairs and Sanitation department is expected to provide water efficiently and effectively to its customers.

The design and implementation of an appropriate ABC system for WTE will help determine accurate costs of providing raw water and at the same time ensure full recovery of costs based on the nature of customers that are being serviced (Matthews et al., 2009). The main objective to be achieved is for WTE to have accurate costs of providing water. Inaccurate costs affect the whole value chain and oftenl result in the final consumers being undercharged, and in some cases, being overcharged. Such inequalities must be avoided in the economy. The WTE has a Pricing Strategy which states that the full financial cost of water resource management and supplying water should be recovered from water users, including the cost of capital.

1.5 Research question

The research aims to answer the following question:

Are there significant differences between the current pricing of water and the pricing of water using ABC? In order to answer this question the current costing system of the WTE was be analysed and

an ABC model was developed to allocate indirect costs. This was be done with the input of key personnel of the WTE.

1.6 Assumptions, limitations and delimitations

This research is limited to the Department of Water Affairs and Sanitation's WTE. WTE's schemes and CMA's are spread throughout the country and it was not possible to visit the regional offices where some of the indirect costs occur. A visit was made to the Northern Operations Area Office at Hartbeespoort to get a full understanding of how the indirect overheads occur and how they are allocated to the Schemes. It is thus assumed that the allocation of costs found at Hartbeespoort Area office can be replicated to other Area offices within the other Clusters.

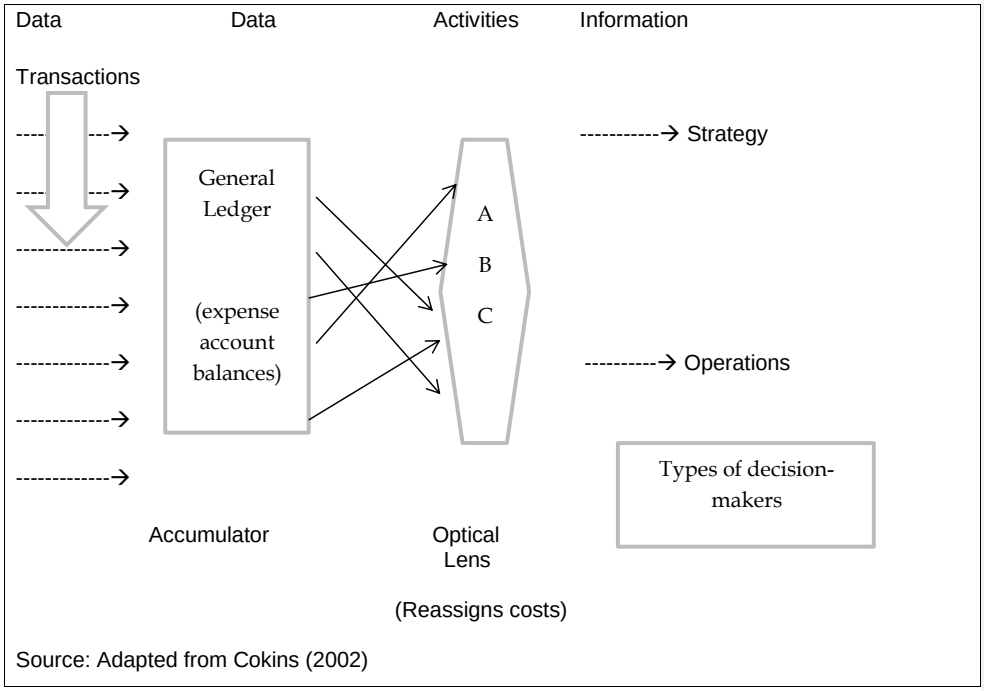
1.7 Abbreviations

ABC	Activity Based Costing
ABM	Activity Based Management
CFO	Chief Financial Officer
CMA	Catchment Management Agency
DDG	Deputy Director General
ERP	Enterprise Resource Planning
IT	Information Technology
NWRI	National Water Resources Infrastructure
SAP	Special Application Products (information system used by WTE)
SOC	State Owned Company
TC	Traditional Costing
Water Affairs	Department of Water Affairs & Sanitation of South Africa
WTE	Water Trading Entity

Chapter 2: Literature review

ABC systems do not replace traditional costing (TC) accounting systems, rather, they reinstate the same data in order to support decision making more effectively (Mushonga, 2015). Raffish and Turney (1991) note that an ABC system is similar to a traditional costing system as it involves a two stage procedure; firstly, charging overhead costs to cost pools; and secondly, deriving and using a series of cost driver rates to trace the pooled costs to products. ABC has become a mature cost estimation and accounting methodology (Ben-Arieh and Qian, 2003).

According to Cokins (1996) an ABC system is able to highlight operating relationships to more effectively support decision making. The diagram below illustrates the relationship between accounting systems and ABC.



Source: Adapted from Cokins (2002)

Figure 1 – The relationship between an accounting system and ABC

Figure 1 shows that ABC does not completely replace an existing accounting system, but enhancesits usefulness as it uses the same data derived from the ledger and allocates it to

activities. When using ABC the total costs do not change; what changes are the allocated amounts based on the consumption of resources by activities.

2.1 Benefits of ABC

In most cases, traditional costing systems do not provide accurate cost information. There are examples of big companies that have abandoned traditional methods to adopt ABC. The main reason given for ABC implementation is that it provides accurate product costs (Cooper and Kaplan, 1988). It is usually big organizations that can afford to implement ABC. ABC has emerged as a modern cost accounting and management innovation that can be used to link an organisation's operational performance and actual financial performance (Paduano, 2001, Cagwin and Bouwman, 2002). ABC is a candidate to be used to allocate costs as it provides the cost control needed in providing services (Maheshwari et al., 2001).

Researchers have demonstrated that organisations tend to adopt ABC to obtain benefits that directly or indirectly impact financial performance measures (Cagwin and Barker, 2006). In South Africa, Oseifuah (2014) reported that the implementation of ABC at the Buffalo Municipality enabled it to efficiently compare the costs of services to the tariffs set out to the public, thus providing transparency to ratepayers. It was shown that at Buffalo Municipality ABC provides more accurate and useful information than traditional costing systems. These results indicate further that management strongly agree the use of ABC improves insight into causes of costs, better cost control and cost management, provides better understanding of cost reduction opportunities, improves managerial decision making, and provides accurate information for product or service costing and pricing. ABC plays an important role in improving financial performance in the public sector.

King et al. (1994) carried out studies on hospitals in the United Kingdom and concluded that the country's National Health Service benefited from the implementation of ABC. Similarly Vazakidis et al. (2010) investigated the relevance of ABC in the Greek public sector. They found that when combined with new technologies and new methods of management, ABC can assist in mitigating the deficiencies of the public sector and help produce services at minimal cost. ABC has the potential to provide management with the resources to streamline business activities, identify fundamental problems, eliminate waste, design costs out of activities and improve efficiencies (Oseifuah, 2014). Granof et al. (2000) argued in their study that universities, government bodies and public entities can improve their financial management by adopting ABC accounting systems that measure inputs and outputs.

2.2 Challenges of ABC implementation

A research survey carried out in South Africa by Sartorius et al. (2007) to identify reasons for the implementation and non-implementation of ABC indicated that ABC implementation is lower in South Africa when compared to developed countries. According to the survey, the issues faced in ABC implementation in South Africa are the same as those in many other countries. The reasons for failure to adopt ABC are the complexity and cost contained in the design and implementation of it, executive orders from top management to implement other costing systems and focus on other priorities which compete for resources and that companies are already satisfied with the current costing system. There is also the perception that ABC is no different to traditional costing systems. The research by Sartorius provides South African companies with a comparative framework of important variables to be taken into account in implementing ABC. Rundora and Selesho (2014) examined the determinants of and barriers to ABC adoption by small manufacturing firms in the Emfuleni Municipality on South Africa. Some of the barriers that were reported are high cost of implementing ABC, resistance to change, lack of top management support, lack of cooperation and commitment among departments, lack of knowledge about ABC, problems in defining cost drivers, problems in identifying activities, high cost of consultations and a high priority of other projects.

In addition, research has been carried out in South Africa to compare the extent and nature of organizational problems that are encountered in respect of ABC implementation in South Africa, British Isles, United States of America and Australia (Wessels, 1999). The results suggest that South African companies face less difficulty in respect of support from senior management and consider the employee resources allocated to ABC projects to be sufficient. It further found out that ABC objectives are aligned with company goals, culture and strategy. The findings for South Africa are different from other countries.

Taba (2005) investigated the implementation of ABC at the South African Post Office and measured the employees' perceptions, benefits and the conditions that affect potential benefits of ABC. His findings ssuggest that technical factors like training, high costs of implementation, lack of software packages, lack of data requirements and co-operation between departments militated against the successful implementation of ABC. Naidoo (2011) examined costing systems of Private Higher Education institutions and found out that although these institutions were using traditional costing systems, a large number were in the process of adopting modern costing systems like ABC. However, these institutions have costs of ABC implementation far exceeding the benefits derived from the ABC systems.

According to Shields (1995) and Malmi (1997), the success of ABC implementation is influenced by behavioural and organisational variables, as opposed to technical variables. The variables are top management support, linkage of ABC systems to competitive strategies, linkage of ABC to performance evaluation and compensation, sufficient internal resources, training in designing and implementing ABC and non-accounting ownership. Research carried out in the field of cost management has concluded that ABC is a tool that can achieve significant benefits for complex organizations that have significant indirect costs (Taba, 2005). The insufficiency of training of users and managers is one of the hindrances to the successful implementation of ABC (Wessels and Shotter, 2000).

2.3 Adoption of ABC in the public sector

ABC use should be recommended for public sector organisations as the system to provide decision makers with valuable information and cost data. Accurate cost data is important it allows decision makers the opportunity to make optimal choices about how best to allocate limited resources. In addition, it enables decision makers to streamline and restructure public entity operations and processes to ensure effectiveness and efficiency. The use of ABC can lead to a better understanding of the strategic linkages that exist between the various cost areas in the organization (Cohen, 2004).

Brimson and Antos (1994) presented examples from the United States Public Sector where the implementations where ABC where successful. These included telecommunications, postal services, hospitals, and electricity and gas companies. ABC enabled these entities to effectively control their costs. Brown et al. (1999) did a study on the implementation of ABC in government departments. They reported that ABC can be difficult to implement but that there were considerable benefits that can be derived from implementing it. The benefits are related to heightened awareness of activities and the costs they create in order to achieve improved decision making. They pointed out that installation of ABC systems is difficult and requires the commitment of management and a careful campaign to overcome the anxieties and concerns which accompany any change.

Moore (2000) argues that, ABC is a methodology that measures the cost and performance of activities, resources, and cost objects such as products and services to provide more accurate cost information for managerial decision making. The study focused on how military organisations in the United States use ABC to improve performance. The results showed little evidence that ABC was consistently used and that information provided was rarely acted upon. Other researchers indicate

that ABC often takes more time to implement than expected and might fail in some cases (Krumwiede, 1998, Landry et al., 1997).

Oseifuah (2013) south to find out, if ABC can be applied in the water sector of South Africa. The main objective was to investigate the possible concomitant improvement in financial performance as a result of ABC implementation, and the conditions under which such improvement is achievable in the South African public sector. It was found out that ABC is an effective means to obtain useful and comparable cost information, which in turn leads to improved financial performance, and provides cost information for accurate pricing as well as service delivery in the public sector. The factors that positively contributed to the successful implementation of ABC for the municipality were high capacity (adequacy of resources), external skills from the private sector, grant funding from National Treasury and management willingness to participate and support the project.

Chapter 3: Methodology

A case study methodology was applied to carry out this research project (Tellis, 1997). Yin (1994) describes this methodology as an empirical enquiry about a contemporary phenomenon set within its real-world context, especially when the boundaries between phenomenon and context are not clearly evident. It assumes that examining the context and other complex conditions related to the case being studied are integral to understanding the case. Cooper and Morgan (2008) state that case study research in managerial accounting is more popular than in other areas of accounting. Cooper and Kaplan (1988) popularized case research in managerial accounting.

Case studies are appropriate when research addresses either a descriptive question – "What is happening or what has happened?" – or an explanatory question – "How or why did something happen?". It is appropriate to answer the "how" and "why" questions (Yin, 1994). In the current study it is used to determine how ABC can be used as an effective cost management tool for WTE. The research involved determining the current costing system of WTE, designing an ABC model and then comparing the results of the two different models. In order to do this the following sources of information were used: WTE's Pricing Strategy, Tariff Calculation Sheets, SAP System Cost Centre Structure, WTE annual reports for year 2015/2016, Strategic Plans, Annual Performance Plans, Monthly Management Reports, General Ledger and Payroll Records.

The six common sources of evidence for the case study research are documents, archival records, interviews, direct observation, participant observation and physical artefacts. The researcher used documents, archival records and interviews to carry out the case study. The first source of evidence was documents. The documents were in the form of financial information which covered monthly management reports, annual report and accounts, employee records, strategic plans, raw water pricing strategy, National Water Act, asset management plans and annual performance plans (Duh et al., 2009). The researcher identified the indirect costs from studying the cost centre structure and interviewing staff involved in the preparation of management accounts. The Pricing Strategy and National Water Act state some of the activities carried out. WTE uses the SAP system and this was a critical source of financial information especially to get full details of costs and how some of them are, allocated and cost centre structure for the Infrastructure Operations. The researcher was also granted access to archival records comprising computer files, statistical data, budgets, personnel records and costing data.

The third source of evidence was interviews. Information about the activities and the cost drivers was obtained by interviewing the staff at Head Office and Hartbeespoort Area office. However, there were cases where communication via emails was done with an Area office in Eastern Cape to understand the cost structure. Interview questions were prepared as per Annexure 1. The

purpose of these questions was to get an understanding of how direct and indirect costs occur. These questions were developed from the literature review. Some of the costs that are incurred by these departments are a result of activities carried out for the Schemes and CMAs. It is only fair that these costs are allocated to the respective CMAs and Schemes. The interviews were open ended and no use of a recorder was done. Notes were made of the interviews carried out with various staff. The use of recorders might have prevented the staff from opening up with information. The researcher also interviewed junior staff and the answers given were collaborated with those from senior staff.

3.1 Data collection and Analysis

There are four principles of data collection that can be used in case studies: use of multiple sources of evidence, creating a case study database, maintaining a chain of evidence and the exercising of care when using data from electronic sources (Yin, 1994). The use of multiple sources of evidence facilitates the triangulation of the data, especially when interviews are conducted and historical accounting information is reviewed. The initial interviews were with the officials who have the history of the current costing model. The researcher constantly checked and rechecked the consistency of the findings from the different sources to establish where the evidence converges. Data triangulation helped to strengthen the construct validity of the case study as it can be burdensome to collect data from multiple sources.

A database was created to contain notes from interviews and evidence from other sources. The notes are comprehensive and organized in terms of themes. The documents are cross-referenced for ease of access and to substantiate the findings from the research. It was important that the researcher maintained a chain of evidence in order to increase the reliability of the information in the case study. This allows any reader of the case study to follow how the evidence was derived from the initial research questions to the ultimate case study conclusions. The sources of evidence were clearly articulated.

Data analysis consists of examining, categorizing, tabulating, or otherwise recombining the evidence to address the initial propositions of a study (Yin, 1994). The techniques of analysing case study evidence are pattern matching, explanation building, time series analysis and replication logic. The researcher focused on pattern matching and explanation building. The pattern matching logic was used to compare the empirically based pattern (based on data collected) with the predicted one by the theory and practice of ABC development methodologies. Trochim (1989) considered pattern matching as one of the most desirable strategies for analysis. If the patterns match, the internal reliability of the study is enhanced.

Explanation building is considered a form of pattern-matching, in which the analysis of the case study is carried out by building an explanation of the case (Yin,1994). The researcher developed and recommended an appropriate ABC model for WTE based on the evidence collected. The model incorporates the basic principles of how indirect costs are supposed to be allocated using the ABC theories.

Chapter 4: ABC Model Development

The process of developing the ABC model was started by interviewing various staff at the WTE head office in Pretoria in order to understand how indirect costs are currently recorded and allocated. In case study research, it is important to validate the responses to questions by asking questions to the staff who are involved in creating and processing the management accounting information. WTE has four Operational Clusters which are Central Operations, Northern Operations, Southern Operations and Eastern Operations. The Northern Operations' Hartbeespoort Area Operations Office was selected as a pilot study to test the applicability of ABC. The Area Operations Offices are structured in a similar way and it was agreed that if ABC could work for one Area Office, it should be easy to replicate in other Area Offices across the country.

The questions that were asked to the WTE officials are outlined in Annexure 1 in order to achieve the research objectives (Reynolds and Van der Poll, 2015). The researcher interviewed a total of 15 staff members at Head Office and Operational Cluster Area office. The questions helped to identify whether indirect costs are an important part of the organization (Saitovic et al., 2007). The questions helped in highlighting how ABC can be useful to WTE (McGowan and Klammer, 1997).

By asking these questions the researcher could establish that Head Office costs are paid for by grants from Treasury and was able to conclude that these costs do not form part of the indirect costs that are allocated to the schemes. The National Water Act is also very clear on which costs are to be included in the pricing of water. The real purpose was to identify the indirect costs. .One of the interviewees mentioned that indirect costs occur at the Operational Cluster Area offices, and direct costs occur at the Schemes.

WTE only allocates the indirect costs at the point of determining the water tariffs. Different Schemes have different water tariffs. Schemes represent the dams or canals owned by WTE that supply raw water to the entity's customers. These are the cost objects. The indirect costs are allocated using the percentage of direct costs for the Schemes in the respective area offices under each of the four Clusters. The implication of this is that Schemes with a higher percentage of direct costs are allocated a bigger share of the indirect costs. The indirect costs incurred are a result of activities carried out at the schemes, but this might lead to cases of under–recovery or over-recovery of costs within the schemes if allocation of costs using percentage of direct costs is flawed. This may result in WTE failing to achieve full cost recovery in some of the Schemes.

4.1 Cost centre structure

WTE uses the SAP system for its accounting and costing functions. WTE has a cost centre structure covering all its functions which are at Head Office, Operational Clusters and Area Offices. I was given a cost centre structure that was downloaded from SAP system. Figure 2 illustrates the structure of the WTE Head Office. WTE has four Operational Clusters which are Central Operations, Northern Operations, Southern Operations and Eastern Operations. The Central operations is made up of Mpumalanga, Free State, part of North West and Gauteng provinces. The Northern Operations is made up of Mpumalanga, part of North West and Limpopo provinces. The Southern Operations comprises Western Cape and Eastern Cape provinces. The Eastern Operations is Kwazulu Natal provinces.

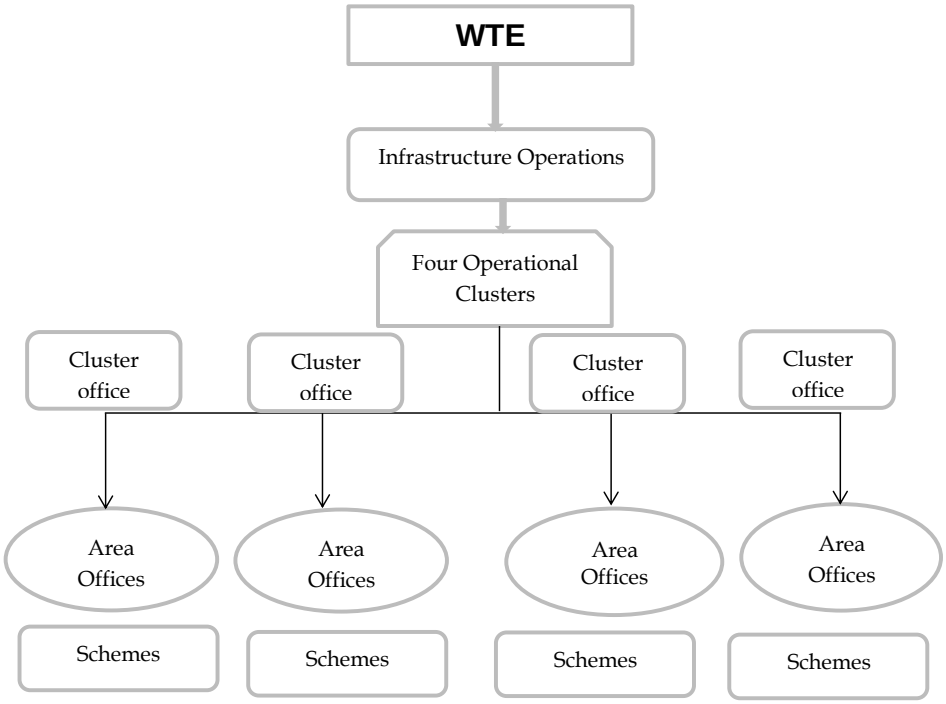


Figure 2: The structure of WTE Head Office

The diagram depicts where the Area Offices are placed within the structure of WTE. The department of Infrastructure Operations at Head Office is responsible for the four Clusters and its area offices. The Cluster offices are also responsible for quality control and managing the illegal consumption of water. It is within the Clusters and its Area offices that indirect costs occur and are allocated to the Schemes in order to arrive at water tariffs. Each of these four Clusters has a

Cluster Office and under these are Area offices which in turn have schemes under them. The schemes represent the dams that supply the water. Each of these schemes is also a cost centre.

Costs are recorded for all the Area offices and schemes under the four Operational Clusters. The costs for the Area Offices and Schemes can easily be determined from the SAP system. Any costs attributable to the Schemes are directly allocated to each of them. The costs incurred at the Cluster level are caused by the schemes. An example would be Civil Engineers at the Cluster who have to visit all the schemes to do some work on the dams. The source of information for the expenses incurred by the clusters is the general ledger.

The Cluster office is responsible for the area offices and schemes under it. There are three main departments in the area offices: Management & Support, Technical and Operations. Management & Support comprises human resources, finance and administration. Technical is responsible for civil, mechanical, electrical and survey services. Operations deals mainly with the maintenance of dams. Technical is also responsible for the rehabilitation and refurbishment of infrastructure.

Each Cluster has Area offices and Schemes as per Table 1 below:

CLUSTER/OPERATIONS	NUMBER OF AREA OFFICES	NUMBER OF SCHEMES
Central Operations	6	87
Northern Operations	3	116
Southern Operations	2	127
Eastern Operations	1	16

Table 1: Number of Area Offices and Schemes in the Clusters

As a result of interactions with staff at Head Office and Cluster Office, it was decided to develop the ABC model for the Hartbeespoort Area Office. The activities in the Area offices for the four clusters are quite similar, and currently the costing system being used applies uniformly across all the area offices.

The cost structure of Hartbeespoort Area office for the financial year 2016/2017 was examined and the indirect costs incurred are shown in Annexure 3. These indirect costs are made up of salaries & wages, goods & services and assets, and amount to R70 517 830 for this area office. The current allocation method can be described as traditional costing and this was collaborated by

some of the staff who answered a question on the method the entity uses to allocate costs. The allocation basis is percentage of direct costs. Annexure 2 shows the direct costs for the area office. This costs amount to R48 224 690. The percentage of direct costs for each scheme is calculated by dividing the total direct cost of each scheme by the total direct cost for the area office.

The total direct and indirect costs of the Hartbeespoort Area Office are R118 742 520 as per Annexure 4. The indirect costs of R70 517 830 are 59% of the total costs. This shows that indirect costs are quite significant and cannot just be allocated arbitrarily as this does not reflect the consumption of resources. Therefore, there is scope to develop an ABC model to allocate indirect costs. The key staff interviewed at the Area office and Head Office concurred with this principle.

4.2 Current cost allocation

The indirect costs are incurred at the Cluster and the Area offices. The direct costs are incurred at the Schemes and these are accounted for in SAP system and can be easily ascertained. The indirect costs form a significant portion of total costs and are not allocated to the Schemes when these are captured and posted to the Ledger. The Cluster Office and Area office provide support to the schemes in the form of supply chain, subsistence and travel, procurement, engineering services and survey services. The indirect costs incurred are a direct result of the activities carried out in the schemes.

It is only when tariffs are calculated that the indirect costs are allocated to the schemes using an Excel spreadsheet. The current method for apportioning the indirect costs to the schemes involves the identification of their direct costs first, and then to allocate indirect costs as a percentage of the direct costs. The operations and maintenance budgets which are the direct costs for each scheme are expressed as a percentage of the total budget for all the schemes in the cluster. These percentages are then used to allocate the indirect costs to the schemes.

4.3 ABC model for an Area Office

The general ledger contains some of the cost data needed to design the ABC model. There are relationships between the various work activities and the elements of cost. Similar expenses can be grouped into resource pools and these pools can be assigned to activities by measurable ways like time spent on activities, charging maintenance via a work order, charging requisitioning activities for supplies or through estimation done through questionnaires and interviews. In the case of the Hartbeespoort Area Office, the data used in the ABC model was obtained from the Tariff Calculation sheets.

The ABC model follows the basic fundamental steps of identifying resources in the general ledger, identifies the activities and lastly the cost objects, which in this case are the schemes (Buys, 2005).

During the first stage, the resources (costs per general ledger) are allocated to the activity pools. During the second stage the cost of activities are allocated to the cost objects (Rof and Capusneanu, 2015).

4.4 Resources

The resources are the expenses or costs incurred by the Area Office as a result of the activities that they carry out for the schemes. These resources can be linked to departments in the Area Offices and are as follows:

- Compensation of employees
- Communication
- Consultation, contract and specialist services
- Consumable materials
- Entertainment
- Lease costs
- Repairs and maintenance
- Staff training and development
- Travel and subsistence
- Utility services
- Venues and facilities

The above expenses are recorded and allocated to the cost centres under the Area offices for the four clusters. When reported these are categorized into salaries & wages, goods & services and assets. The indirect costs are incurred in the Area offices in departments like Civil Maintenance, Electrical Maintenance and Mechanical Maintenance which are also treated as cost centres. The rest of the cost centres are in Annexure 3 with details of indirect costs to be re-allocated. The above resources expenses are captured and allocated to the departments or cost centres under the Area office.

4.5 Activities

The activities are carried out by staff in Technical Support, Survey Services, Finance, Environmental Services, Information Technology, and Hydrometry. All these employees work in the clusters. Technical support comprise of civil, mechanical and electrical disciplines.

4.6 Cost objects

A cost object is the resource that uses or benefits from the item that generates the cost. This might be a product, a project, a customer, a department or an entire region. In the case of WTE the cost objects are the schemes. They benefit from the activities that are carried out by the Area office and WTE they deal with one homogeneous product, which is the water supplied (Rof and Capusneanu, 2015).

4.7 ABC Excel Model

The ABC model was developed using Excel and Annexures 2 to 11 show the inputs and outputs of the model. The model applies to Hartbeespoort Area Office and can be replicated in other area offices within WTE.

The development of the ABC model involved the following:

- Identification of the indirect costs incurred by the Area Office and direct costs incurred by the Schemes;
- Determining how the indirect costs are currently allocated by TC;
- Identification of the activities and activity cost pools;
- Allocation of the indirect costs to activity cost pools;
- Identification of the cost drivers;
- Allocation of the indirect costs into the schemes using the cost drivers;
- Preparation of a schedule showing comparisons of indirect costs allocated by TC, and allocated by ABC. The differences were calculated and shown as percentages;
- Impact on tariffs by indirect costs allocated by TC and ABC respectively was done. A schedule comparing the two was also prepared.

The following are the detailed steps in the development of the ABC model to allocate the indirect costs:

Step 1

The first step was to identify what the indirect costs of the Hartbeespoort Area office are. The area office has 26 schemes under its jurisdiction. The direct costs are incurred at the Scheme level and the indirect costs are incurred at the Area Office. These indirect costs are caused by the activities carried out for the schemes.

The direct costs for the schemes are R48 224 690 as per Annexure 2 and are broken down into salaries & wages, goods & services and assets. The indirect costs incurred at the Area Office are

R70 517 830 as per Annexure 3. These are the indirect costs that were allocated to the Schemes using ABC.

Step 2

This step determined how the indirect costs are allocated using the traditional costing method. These are allocated using the percentage of direct costs. Annexure 4 shows the allocation of the R70 517 830 indirect costs to the different schemes. For example, the calculation of indirect costs to be allocated to one of the schemes, Croc River Roodekopjies, was determined by dividing its direct costs of R737 228 by total direct costs of R48 224 690 to get 1.53%. The 1.53% is multiplied by total indirect costs of R70 517 830, to give indirect costs allocation of R1 078 0321 for Croc River Roodekopjies.

Step 3

This step involved identifying the activities and activity cost pools. Interviews were carried out with the staff at the Area Office and they advised that the main activities carried out were Civil Maintenance, Electrical Maintenance, Mechanical Maintenance, Survey, Financial Services, Administration Support and Logistics. The cost pools created were named the same as the activities.

Step 4

This step involved allocating the indirect costs to activity cost pools. The departments at the Area office are Operations, made up of Infrastructure Operations and Operational Support. Maintenance Management made up of civil, electrical and mechanical maintenance; and Finance & Administrative Support made up of Human Resources Support, Administration Support, Logistics Support, Financial Accounting, and Technical Management and Support.

Commented [A1]: Please call the functions the same as previously. E.g. Technical management and support

The costs were allocated directly and indirectly as per Annexure 7. The indirect costs of R36 828 999 were directly allocated by examining the cost centre structure. The balance of R33 688 831 were allocated to cost pools using time spent by civil, electrical, mechanical and survey maintenance. Interviews with staff at Head Office and Hartbeespoort Area office provided estimates of time spent on dam operations and maintenance activities as follows;

- Civil maintenance 15%
- Electrical maintenance 40%
- Mechanical maintenance 40%
- Survey 5%

Step 5

This step identified the cost drivers to be used to allocate costs to the schemes. Annexure 5 and 6 show the most appropriate cost drivers. These were provided by the staff at the Area Office and Head Office. The cost drivers are percentage of time spent at the schemes, percentage of direct costs, percentage of goods & services and percentage of salaries & wages. The estimates of time spent at the schemes were done using information for dams, capacity in cubic metres of water, dam height and dam length in metres. One of the critical drivers of costs is the quality of water in the dam, and the dirtier the dam the higher the rate of resource consumption. Annexure 5 has the % of time spent at each scheme.

The activity cost pools and the respective cost drivers are as follows:

Civil maintenance	percentage time spent at scheme
Electrical maintenance	percentage time spent at scheme
Mechanical maintenance	percentage time spent at scheme
Survey	percentage time spent at scheme
Financial services	percentage direct costs
Administration Support	percentage salaries & wages
Logistics	percentage goods & services

The total costs allocated to the cost pools are shown in Annexure 7.

Step 6

This step involved allocating the costs in the cost pools into the schemes using the cost drivers in Annexure 5. The indirect costs allocated into each scheme are as per Annexures 8(a) to 8(d). The allocation of costs into the schemes is demonstrated for the Croc River Roodekopjies Scheme.

Activity Cost Pool	Amount in pool	Cost driver	Allocated into Scheme
Civils	R16 945 623	6%	R1 016 737 (6% of R16 945 623)
Electrical	R18 636 258	6%	R1 118 175
Mechanical	R20 986 928	6%	R1 259 216
Survey	R 1 684 442	6%	R 101 066
Financial Services	R 4 767 918	1,53%	R 72 889
Admin Support	R 2 627 503	2,01%	R 52 867
Logistics	R 4 869 158	1,14%	R 55 727

Total allocated to Croc River **R3 676 677**

Step 7

In this step a comparison of the allocated costs by traditional costing and ABC methods was prepared as per the table below. The percentage differences in the costs between the two methods were also calculated. They are significant differences in the costs, some schemes resulted in increases and others resulted in decreases as per Table 2 below:.

Comparison of allocated costs: Traditional Costing vs Activity Based Costing			
	INDIRECT COSTS		
Scheme	**Allocation by TC**	**Allocation by ABC**	**% change**
Croc River Roodekopjies	1 078 032	3 676 677	241%
Vaalkop Dam	2 730 769	3 633 637	33%
Hartbeespoort Dam	2 836 958	5 147 321	81%
Bospoort Dam	1 265 391	2 842 838	125%
Klipvoordam	901 351	3 065 816	240%
Roodeplaat Dam	9 688 022	4 586 460	(53%)
Molatedi Dam	5 246 612	5 069 424	(3%)
Marico Bosveld Dam	4 709 698	5 151 566	9%
Koster Dam	3 130 442	2 584 897	(17%)
Disaneng Dam	310 659	2 099 324	576%
Sehujwane Dam	521 946	1 849 179	254%
Madikwe Dam	483 068	676 547	40%
Setumo Dam	1 077 587	2 520 721	134%
Upper Molopo	9 416 770	3 636 282	(61%)
Klein Marico Poort	5 129 939	2 892 504	(44%)
Lindlyespoort	7 451 656	3 558 777	(52%)
Ngotoane Dam	542 824	2 435 774	349%
Pella Dam	521 946	1 557 912	198%
Lotlamoreng	521 946	975 380	87%
Buffelspoort	5 373 772	2 910 972	(46%)
Mankwe Dam	326 639	1 814 140	455%
Apies Riv Leeukraal (k.	345 355	1 817 953	426%
Nooitgedacht	342 069	1 234 751	261%
Rooikoppies Weir	342 069	652 218	91%
Sterkstroom Middelkraal	342 069	652 218	91%
Marico Bosveld GWS	5 880 242	3 474 542	(41%)
TOTALS	**70 517 830**	**70 517 830**	

Table 2: Comparison of allocated costs - TC versus ABC

The implications are that if ABC was to be implemented by WTE some of the schemes will experience an increase in costs, whereas others will experience a decrease in costs. These are the unit costs of supplying raw water to customers. These costs reflect consumption of resources by the activities carried out for the scheme, and portray a better allocation of costs. The current method of allocating costs using the percentage of direct costs may be causing a distortion of costs.

Step 8

The indirect costs are allocated to the schemes in order to calculate tariffs to charge. The changes in allocated costs will have an impact on tariffs. Annexure 9 has the total direct and indirect costs after the allocation by ABC. Annexure 10 assesses the impact on tariffs using the TC and ABC allocation methods. As can be seen in Annexure 10, there are significant changes in the new tariffs calculated using ABC.

Feedback from the WTE

This new model was presented to the Chief Director and a Director of the WTE for them to review and provide comments. The responses were that the model was satisfactory and could be used to allocate costs to the Schemes. The Area offices in other parts of the country are structured the same as Hartbeespoort Area office and in their opinion the model could be replicated throughout the country. WTE is reviewing its Pricing Strategy and the findings in this research may be considered.

Commented [A2]: Will the consider your study in revision of their pricing strategy?

Chapter 5: Conclusions

The purpose of this research was to determine how ABC can be used by WTE to allocate indirect costs in order to have accurate costs and achieve a mechanism of setting tariffs that fully recover the costs. The indirect costs incurred are quite significant as they represent a high proportion of the total costs included in the setting of water tariffs. One of the area offices was selected as a pilot study to investigate the possibility of using ABC to allocate indirect costs. The findings point to the conclusion that ABC can be adopted by WTE and can be replicated in the other area offices.

WTE is aware that it has indirect costs which are quite significant, and have to be recovered from their customers (the schemes). The entity allocates indirect costs using a TC system where the allocation basis in use is the percentage of direct costs. As a result, there may be a distortion in costs as per Annexure 10. The effect of distorted costs result in cost inaccuracies, and in the case of WTE some customers are undercharged while others are overcharged.

ABC has proven that indirect costs can be equitably allocated according to the consumption of resources, and this can lead to transparency and equity in setting of water tariffs (Hofert, 2005). WTE management are concerned that the entity is not achieving full recovery of costs and this research has tried to address this concern. The recommendation is that WTE considers using ABC to allocate the indirect costs. Cost management is key to the success of any organization, and use of ABC will force management to investigate the occurrence of costs. The current method of allocating costs is not adequate as it uses direct costs of the schemes to allocate costs. These direct costs have no relationship with the indirect costs. For example, the quality of water in the dams is a significant driver of operation and maintenance activities. This fact makes ABC a candidate to be used to allocate costs as it provides the cost control needed in providing services (Maheshwari et al., 2001).

This research did not look at the possibility of using the SAP system to allocate indirect costs using ABC principles. SAP is used extensively within the entity and integration of ABC with the SAP system might have to be considered as a future research project. SAP is a robust system and can be easily configured to provide ABC cost allocations. ABC has to be fitted into the SAP system to guarantee successful implementation. The employees at WTE have been using SAP for a long time and the belief is that ABC will be more acceptable if it can be integrated with it.

WTE is a complex organization and challenges identified in the literature review might also be faced should the entity chose to implement ABC. The implementation of ABC requires time and enormous amounts of resources. It will require strong top management support for successful implementation. It is recommended that a pilot implementation of ABC at one of the Area Offices should precede any widespread implementation across the entity. The positive benefits of ABC,

which include the cutting of costs should be identified and properly communicated to the organization if the full benefits of the system are to be realized.

ANNEXURES

Annex 1	Interview Plan - Questions
Annex 2	Direct costs of the Schemes
Annex 3	Indirect costs to be reallocated to the Schemes
Annex 4	Allocation of Indirect Costs using TC
Annex 5	Hartbeespoort Area Office – Determination of Hours cost driver
Annex 6	Cost Drivers
Annex 7	Allocation of Costs to Cost Pools
Annex 8(a) – (d)	Allocation of Indirect Overhead
Annex 9	Allocation of costs using ABC
Annex 10	Impact of Allocated Costs on Water Tariffs

Annexure 1

QUESTIONS TO BE ASKED TO WTE OFFICIALS

1. What is the costing system being used to allocate the overheads?
2. What is the costing system being used to split the common costs?
3. What are the controllable costs at Head Office?
4. What are the uncontrollable costs at Head Office?
5. What are the controllable costs at CMAs?
6. What are the uncontrollable costs at CMAs?
7. What are the controllable costs at Schemes?
8. What are the uncontrollable costs at Schemes?
9. What are the Head Office costs made up of?
10. What are the CMA costs made up of?
11. What are the Scheme (Infrastructure) operations costs made up of?
12. What comprises the Head Office costs?
13. Do you think there are included in Head Office costs, the costs incurred and can be attributed to the CMAs?
14. Do you think there are included in Head Office costs, the costs incurred and can be attributed to the Schemes?
15. Are any of the Head Office costs allocated to the CMAs?
16. If any of the Head Office costs are allocated to CMAs, which are these?
17. Are any of the Head Office costs allocated to the Schemes?
18. If any of the Head Office costs are allocated to the Schemes, which are these?
19. What allocation method is used to allocate the costs to the CMAs?
20. What allocation method is used to allocate the costs to the Schemes?
21. What are the common costs at Head office?
22. If there are any common costs how are these split among the cost centres at Head Office?
23. If there are any common costs how are these split among the cost centres at CMAs and Schemes?
24. What are the methods of splitting the common costs?
25. What are the operating costs of Construction Division made up of?
26. What are the operating costs of Water Infrastructure Division made up of?

Annexure 2

DIRECT COSTS OF THE SCHEMES					
	2016/2017 Budgeted Costs				
AREA OFFICE HARTBEESPOORT	**Salaries & wages**	**Goods & services**	**Assets**	**Total**	**Direct costs as % of total**
Croc River Roodekopjies	457 228	280 000	0	**737 228**	1.53%
Vaalkop Dam	1 327 078	460 400	80 000	**1 867 478**	3.87%
Hartbeespoort Dam	1 018 097	892 000	30 000	**1 940 097**	4.02%
Bospoort Dam	435 757	429 600	0	**865 357**	1.79%
Klipvoordam	317 603	278 800	20 000	**616 403**	1.28%
Roodeplaat Dam	3 141 701	3 293 600	190 000	**6 625 301**	13.74%
Molatedi Dam	924 872	2 663 103	0	**3 587 975**	7.44%
Marico Bosveld Dam	2 049 284	1 141 515	30 000	**3 220 799**	6.68%
Koster Dam	872 760	1 173 040	95 000	**2 140 800**	4.44%
Disaneng Dam	33 891	178 558	0	**212 449**	0.44%
Sehujwane Dam	56 941	300 000		**356 941**	0.74%
Madikwe Dam	52 699	277 654		**330 354**	0.69%
Setumo Dam	346 924	390 000		**736 924**	1.53%
Upper Molopo	3 418 801	2 841 000	180 000	**6 439 801**	13.35%
Klein Marico Poort	2 068 545	1 344 642	95 000	**3 508 187**	7.27%
Lindlyespoort	3 123 928	1 827 000	145 000	**5 095 928**	10.57%
Ngotoane Dam	59 218	312 000		**371 218**	0.77%
Pella Dam	56 941	300 000		**356 941**	0.74%
Lotlamoreng	56 941	300 000		**356 941**	0.74%
Buffelspoort	2 263 735	1 241 200	170 000	**3 674 935**	7.62%
Mankwe Dam	0	223 377		**223 377**	0.46%
Apies Riv Leeukraal (k.	0	236 176		**236 176**	0.49%
Nooitgedacht	0	233 930		**233 930**	0.49%
Rooikoppies Weir	0	233 929		**233 929**	0.49%
Sterkstroom Middelkraal	0	233 929		**233 929**	0.49%
Marico Bosveld GWS	641 493	3 379 800		**4 021 293**	8.34%
TOTALS	**22 724 435**	**24 465 255**	**1 035 000**	**48 224 690**	**100%**

Annexure 3

INDIRECT COSTS TO BE RE-ALLOCATED TO THE SCHEMES				
	2016/2017 Budgeted Costs			
AREA OFFICE HARTBEESPOORT	**Salaries & wages**	**Goods & services**	**Assets**	**Total**
Manager-Hartbeespoort Office	1 803 037	3 877 527	540 000	**6 220 564**
Div-Operations Management	442 189	108 000	0	**550 189**
Div-Maintenance	431 392	20 000	0	**451 392**
Sub-Div-Infrastructure Operations	369 763	833 600	45 000	**1 248 363**
Div-Finance & Administrative Support	576 297	351 800	30 000	**958 097**
Sec-Management Accounting	1 453 375	331 300	0	**1 784 675**
Sec-Financial Accounting	1 683 745	341 400	0	**2 025 145**
Sec-Logistic Support	2 750 358	2 036 800	82 000	**4 869 158**
Sec-Administrative Support	789 208	232 000	30 000	**1 051 208**
Sec-Personnel Administration	1 110 215	416 080	50 000	**1 576 295**
Sec-Operations Marico	261 381	680 400	25 000	**966 781**
Sec- Operations Pienaars River	615 242	1 033 400	30 000	**1 678 642**
Sec-Operations Crocodile	405 468	313 200	45 000	**763 668**
Sub-Div-Operational Support	990 546	514000	40000	**1 544 546**
Sub-Div-Civil Maintenance	794 164	386100	40000	**1 220 264**
Sec-Civil Maintenance	6 357 234	4 044 800	270 000	**10 672 034**
Sub-Sec-Hartbeespoort Village	1 615 371	1 414 600	80 000	**3 109 971**
Maintenance Roodeplaat Village	1 849 409	1 030 000	140 000	**3 019 409**
Sub-Div-Mechanical/Electrical	336 967	344 400	-	**681 367**
Electrical Maintenance	1 873 142	2 686 900	260 000	**4 820 042**
Mechanical Maintenance	3 397 512	3 488 200	285 000	**7 170 712**
Marico Bosveld GWS	-	-	-	**-**
Director: Northern Operations	7 421 346	6 312 798	401 162	**14 135 306**
TOTALS	**37 327 362**	**30 797 305**	**2 393 162**	**70 517 830**

Annexure 4

DIRECT AND INDIRECT COSTS OF THE SCHEMES			
AREA OFFICE HARTBEESPOORT	Total direct costs 2016/17	Allocation of costs using TC	Total Direct & Indirect costs
Croc River Roodekopjies	737 228	1 078 032	1 815 260
Vaalkop Dam	1 867 478	2 730 769	4 598 246
Hartbeespoort Dam	1 940 097	2 836 958	4 777 054
Bospoort Dam	865 357	1 265 391	2 130 747
Klipvoordam	616 403	901 351	1 517 754
Roodeplaat Dam	6 625 301	9 688 022	16 313 324
Molatedi Dam	3 587 975	5 246 612	8 834 587
Marico Bosveld Dam	3 220 799	4 709 698	7 930 497
Koster Dam	2 140 800	3 130 442	5 271 242
Disaneng Dam	212 449	310 659	523 108
Sehujwane Dam	356 941	521 946	878 886
Madikwe Dam	330 354	483 068	813 422
Setumo Dam	736 924	1 077 587	1 814 511
Upper Molopo	6 439 801	9 416 770	15 856 571
Klein Marico Poort	3 508 187	5 129 939	8 638 126
Lindlyespoort	5 095 928	7 451 656	12 547 584
Ngotoane Dam	371 218	542 824	914 042
Pella Dam	356 941	521 946	878 886
Lotlamoreng	356 941	521 946	878 886
Buffelspoort	3 674 935	5 373 772	9 048 707
Mankwe Dam	223 377	326 639	550 017
Apies Riv Leeukraal (k.	236 176	345 355	581 532
Nooitgedacht	233 930	342 069	576 000
Rooikoppies Weir	233 929	342 069	575 999
Sterkstroom Middelkraal	233 929	342 069	575 998
Marico Bosveld GWS	4 021 293	5 880 242	9 901 534
TOTALS	**48 224 690**	**70 517 830**	**118 742 520**

Annexure 5

HARTBEESPOORT AREA OFFICE - Determination of Hours cost driver				
NAME OF DAM	**Capacity in m³**	**Dam Height in metres**	**Length in metres**	**% Hours spent at each Scheme**
Croc River Roodekopjies	103 000 000	25	4 008	6%
Vaalkop Dam	53 500 000	33	2 491	6%
Hartbeespoort Dam	195 000 000	59	150	8%
Bopoort Dam	18 200 000	23	468	5%
Klipvoordam	47 000 000	29	475	5%
Roodeplaat Dam	43 472 000	55	351	5%
Molatedi Dam	203 000 000	29	260	7%
Marico Bosveld Dam	278 130 000	27	1 695	8%
Koster Dam	11 800 000	26	846	4%
Disaneng Dam	17 400 000	17	780	4%
Sehujwane Dam	4 150 000	26	230	3%
Madikwe Dam	231 000	6	504	1%
Setumo Dam	19 600 000	19	1 600	4%
Upper Molopo				4%
Klein Marico Poort	7 073 000	27	214	4%
Lindlyespoort	14 381 000	38	177	4%
Ngotoane Dam	18 800 000	19	290	4%
Pella Dam	2 200 000	21	230	3%
Lotlamoreng	540 000	7	500	2%
Buffelspoort	10 330 000	31	167	4%
Mankwe Dam	3 760 000	12	560	3%
Apies Riv Leeukraal (k.	4 290 000	17	1 167	3%
Nooitgedacht	1 430 000	12	566	2%
Rooikoppies Weir	700 000	8	150	1%
Sterkstroom Middelkraal	757 000	8.00	580.00	1%
Marico Bosveld GWS	18 700 000			4%
Totals	1 077 444 000	573		100%

Annexure 6

Cost Drivers per Scheme	Hours spent at Scheme as % of total	Salaries & wages as a % of total	Goods & services as a % of total	Budgeted direct costs as % of total
Croc River Roodekopjies	6.00%	2.01%	1.14%	1.53%
Vaalkop Dam	5.50%	5.84%	1.88%	3.87%
Hartbeespoort Dam	8.00%	4.48%	3.65%	4.02%
Bospoort Dam	4.50%	1.92%	1.76%	1.79%
Klipvoordam	5.00%	1.40%	1.14%	1.28%
Roodeplaat Dam	5.00%	13.83%	13.46%	13.74%
Molatedi Dam	7.00%	4.07%	10.89%	7.44%
Marico Bosveld Dam	7.50%	9.02%	4.67%	6.68%
Koster Dam	3.50%	3.84%	4.79%	4.44%
Disaneng Dam	3.50%	0.15%	0.73%	0.44%
Sehujwane Dam	3.00%	0.25%	1.23%	0.74%
Madikwe Dam	1.00%	0.23%	1.13%	0.69%
Setumo Dam	4.00%	1.53%	1.59%	1.53%
Upper Molopo	3.50%	15.04%	11.61%	13.35%
Klein Marico Poort	3.50%	9.10%	5.50%	7.27%
Lindlyespoort	4.00%	13.75%	7.47%	10.57%
Ngotoane Dam	4.00%	0.26%	1.28%	0.77%
Pella Dam	2.50%	0.25%	1.23%	0.74%
Lotlamoreng	1.50%	0.25%	1.23%	0.74%
Buffelspoort	3.50%	9.96%	5.07%	7.62%
Mankwe Dam	3.00%	0.00%	0.91%	0.46%
Apies Riv Leeukraal (k.	3.00%	0.00%	0.97%	0.49%
Nooitgedacht	2.00%	0.00%	0.96%	0.49%
Rooikoppies Weir	1.00%	0.00%	0.96%	0.49%
Sterkstroom Middelkraal	1.00%	0.00%	0.96%	0.49%
Marico Bosveld GWS	4.00%	2.82%	13.81%	8.34%
	100.00%	100.00%	100.00%	100.00%

Annexure 7

Details of Expenses' allocation to Cost Pools	
	Per Ledger
Manager-Hartbeespoort Office	6 220 564
Div-Operations Management	550 189
Div-Maintenance	451 392
Sub-Div-Infrastructure Operations	1 248 363
Sec-Operations Marico	966 781
Sec- Operations Pienaars River	1 678 642
Sec-Operations Crocodile	763 668
Sub-Div-Operational Support	1 544 546
Sub-Sec-Hartbeespoort Village	3 109 971
Maintenance Roodeplaat Village	3 019 409
Director: Northern Operations	14 135 306
Total to allocate to Cost Pools	**33 688 831**

Allocated to Cost Pools----------->>		**Civils**	**Electrical**	**Mechanical**	**Survey**
Allocation by Time Spend Estimations		15%	40%	40%	5%
Manager-Hartbeespoort Office	6 220 564	933 085	2 488 226	2 488 226	311 028
Div-Operations Management	550 189	82 528	220 075	220 075	27 509
Div-Maintenance	451 392	67 709	180 557	180 557	22 570
Sub-Div-Infrastructure Operations	1 248 363	187 254	499 345	499 345	62 418
Sec-Operations Marico	966 781	145 017	386 712	386 712	48 339
Sec- Operations Pienaars River	1 678 642	251 796	671 457	671 457	83 932
Sec-Operations Crocodile	763 668	114 550	305 467	305 467	38 183
Sub-Div-Operational Support	1 544 546	231 682	617 818	617 818	77 227
Sub-Sec-Hartbeespoort Village	3 109 971	466 496	1 243 989	1 243 989	155 499
Maintenance Roodeplaat Village	3 019 409	452 911	1 207 764	1 207 764	150 970
Director: Northern Operations	14 135 306	2 120 296	5 654 122	5 654 122	706 765
TOTAL	**33 688 831**	**5 053 325**	**13 475 532**	**13 475 532**	**1 684 442**

Activity Cost Pools			
	Direct allocation	**Reallocated**	**Total**
Civils	11 892 299	5 053 325	16 945 623
Electrical	5 160 726	13 475 532	18 636 258
Mechanical	7 511 396	13 475 532	20 986 928
Survey		1 684 442	1 684 442
Financial services	4 767 918		4 767 918
Admin Support	2 627 503		2 627 503
Logistics	4 869 158	-	4 869 158
TOTALS	**36 828 999**	**33 688 831**	**70 517 830**

Annexure 8(a)

Croc River Roodekopjies	Allocation of Indirect overhead
Civils	1 016 737
Electrical	1 118 175
Mechanical	1 259 216
Survey	101 066
Financial services	72 889
Admin Support	52 867
Logistics	55 727
Total	**3 676 677**

Vaalkop Dam	Allocation of Indirect overhead
Civils	932 009
Electrical	1 024 994
Mechanical	1 154 281
Survey	92 644
Financial services	184 635
Admin Support	153 443
Logistics	91 630
Total	**3 633 637**

Hartbeespoort Dam	Allocation of Indirect overhead
Civils	1 355 650
Electrical	1 490 901
Mechanical	1 678 954
Survey	134 755
Financial services	191 815
Admin Support	117 717
Logistics	177 529
Total	**5 147 321**

Bopoort Dam	Allocation of Indirect overhead
Civils	762 553
Electrical	838 632
Mechanical	944 412
Survey	75 800
Financial services	85 557
Admin Support	50 384
Logistics	85 500
Total	**2 842 838**

Klipvoordam	Allocation of Indirect overhead
Civils	847 281
Electrical	931 813
Mechanical	1 049 346
Survey	84 222
Financial services	60 943
Admin Support	36 723
Logistics	55 488
Total	**3 065 816**

Roodeplaat Dam	Allocation of Indirect overhead
Civils	847 281
Electrical	931 813
Mechanical	1 049 346
Survey	84 222
Financial services	655 036
Admin Support	363 258
Logistics	655 503
Total	**4 586 460**

Molatedi Dam	Allocation of Indirect overhead
Civils	1 186 194
Electrical	1 304 538
Mechanical	1 469 085
Survey	117 911
Financial services	354 739
Admin Support	106 938
Logistics	530 020
Total	**5 069 424**

Marico Bosveld Dam	Allocation of Indirect overhead
Civils	1 270 922
Electrical	1 397 719
Mechanical	1 574 020
Survey	126 333
Financial services	318 437
Admin Support	236 948
Logistics	227 188
Total	**5 151 566**

Annexure 8(b)

Koster Dam	Allocation of Indirect overhead
Civils	593 097
Electrical	652 269
Mechanical	734 542
Survey	58 955
Financial services	211 658
Admin Support	100 913
Logistics	233 462
Total	**2 584 897**

Disaneng Dam	Allocation of Indirect overhead
Civils	593 097
Electrical	652 269
Mechanical	734 542
Survey	58 955
Financial services	21 005
Admin Support	3 919
Logistics	35 537
Total	**2 099 324**

Sehujwane Dam	Allocation of Indirect overhead
Civils	508 369
Electrical	559 088
Mechanical	629 608
Survey	50 533
Financial services	35 290
Admin Support	6 584
Logistics	59 707
Total	**1 849 179**

Madikwe Dam	Allocation of Indirect overhead
Civils	169 456
Electrical	186 363
Mechanical	209 869
Survey	16 844
Financial services	32 662
Admin Support	6 093
Logistics	55 260
Total	**676 547**

Setumo Dam	Allocation of Indirect overhead
Civils	677 825
Electrical	745 450
Mechanical	839 477
Survey	67 378
Financial services	72 859
Admin Support	40 113
Logistics	77 619
Total	**2 520 721**

Upper Molopo	Allocation of Indirect overhead
Civils	593 097
Electrical	-
Mechanical	-
Survey	-
Financial services	636 696
Admin Support	395 297
Logistics	565 425
Total	**2 190 515**

Klein Marico Poort	Allocation of Indirect overhead
Civils	593 097
Electrical	652 269
Mechanical	734 542
Survey	58 955
Financial services	346 850
Admin Support	239 175
Logistics	267 615
Total	**2 892 504**

Lindlyespoort	Allocation of Indirect overhead
Civils	677 825
Electrical	745 450
Mechanical	839 477
Survey	67 378
Financial services	503 828
Admin Support	361 203
Logistics	363 616
Total	**3 558 777**

Annexure 8(c)

Ngotoane Dam	Allocation of Indirect overhead
Civils	677 825
Electrical	745 450
Mechanical	839 477
Survey	67 378
Financial services	36 702
Admin Support	6 847
Logistics	62 095
Total	**2 435 774**

Pella Dam	Allocation of Indirect overhead
Civils	423 641
Electrical	465 906
Mechanical	524 673
Survey	42 111
Financial services	35 290
Admin Support	6 584
Logistics	59 707
Total	**1 557 912**

Lotlamoreng	Allocation of Indirect overhead
Civils	254 184
Electrical	279 544
Mechanical	314 804
Survey	25 267
Financial services	35 290
Admin Support	6 584
Logistics	59 707
Total	**975 380**

Buffelspoort	Allocation of Indirect overhead
Civils	593 097
Electrical	652 269
Mechanical	734 542
Survey	58 955
Financial services	363 337
Admin Support	261 743
Logistics	247 028
Total	**2 910 972**

Mankwe Dam	Allocation of Indirect overhead
Civils	508 369
Electrical	559 088
Mechanical	629 608
Survey	50 533
Financial services	22 085
Admin Support	-
Logistics	44 457
Total	**1 814 140**

Apies Riv Leeukraal (k.	Allocation of Indirect overhead
Civils	508 369
Electrical	559 088
Mechanical	629 608
Survey	50 533
Financial services	23 350
Admin Support	-
Logistics	47 005
Total	**1 817 953**

Nooitgedacht	Allocation of Indirect overhead
Civils	338 912
Electrical	372 725
Mechanical	419 739
Survey	33 689
Financial services	23 128
Admin Support	-
Logistics	46 558
Total	**1 234 751**

Rooikoppies Weir	Allocation of Indirect overhead
Civils	169 456
Electrical	186 363
Mechanical	209 869
Survey	16 844
Financial services	23 128
Admin Support	-
Logistics	46 557
Total	**652 218**

Annexure 8(d)

Sterkstroom Middelkraal	**Allocation of Indirect overhead**
Civils	169 456
Electrical	186 363
Mechanical	209 869
Survey	16 844
Financial services	23 128
Admin Support	-
Logistics	46 557
Total	**652 218**

Marico Bosveld GWS	**Allocation of Indirect overhead**
Civils	677 825
Electrical	745 450
Mechanical	839 477
Survey	67 378
Financial services	397 580
Admin Support	74 172
Logistics	672 659
Total	**3 474 542**

Annexure 9

DIRECT AND INDIRECT COSTS OF THE SCHEMES			
AREA OFFICE HARTBEESPOORT	**Total direct costs 2016/17**	**Allocation of costs using ABC**	**ABC Total Direct & Indirect costs**
Croc River Roodekopjies	737 228	**3 676 677**	4 413 906
Vaalkop Dam	1 867 478	3 633 637	5 501 115
Hartbeespoort Dam	1 940 097	5 147 321	7 087 418
Bospoort Dam	865 357	2 842 838	3 708 194
Klipvoordam	616 403	3 065 816	3 682 219
Roodeplaat Dam	6 625 301	4 586 460	11 211 761
Molatedi Dam	3 587 975	5 069 424	8 657 399
Marico Bosveld Dam	3 220 799	5 151 566	8 372 365
Koster Dam	2 140 800	2 584 897	4 725 697
Disaneng Dam	212 449	2 099 324	2 311 773
Sehujwane Dam	356 941	1 849 179	2 206 119
Madikwe Dam	330 354	676 547	1 006 901
Setumo Dam	736 924	2 520 721	3 257 645
Upper Molopo	6 439 801	3 636 282	10 076 083
Klein Marico Poort	3 508 187	2 892 504	6 400 691
Lindlyespoort	5 095 928	3 558 777	8 654 705
Ngotoane Dam	371 218	2 435 774	2 806 993
Pella Dam	356 941	1 557 912	1 914 853
Lotlamoreng	356 941	975 380	1 332 320
Buffelspoort	3 674 935	2 910 972	6 585 907
Mankwe Dam	223 377	1 814 140	2 037 517
Apies Riv Leeukraal (k.	236 176	1 817 953	2 054 129
Nooitgedacht	233 930	1 234 751	1 468 681
Rooikoppies Weir	233 929	652 218	886 147
Sterkstroom Middelkraal	233 929	652 218	886 147
Marico Bosveld GWS	4 021 293	3 474 542	7 495 835
TOTALS	**48 224 690**	**70 517 830**	**118 742 520**

Annexure 10

TARIFFS PER CUBIC METRE (m³) OF WATER						
	TC		ABC			
Name of Scheme	**Irrigation**	**Domestic & Industrial**	**Irrigation**	**Domestic & Industrial**	**% Tariff change (Irrigation)**	**% Tariff change (D&I)**
Marico Bosveld						
- Dam	15.96	266.94	15.96	267.93	0%	0%
- Canal	65.70	331.79	68.99	335.09	5%	1%
Bospoort Dam		125.32		162.7		30%
Roodekoppies Dam	5.02	4.40	7.73	7.11	54%	62%
Roodekoppies - Vaalkop Canal		5.96		8.69		46%
Vaalkop Dam		32.00		34.71		8%
Confluence of Elands and Crocodile Rivers		150.00		152.72		2%
Klipvoor Dam		28.02		30.73		10%
Middlekraal Dam	92.42		141.23		53%	
Molatedi Dam	15.12		14.87		(2%)	
Lindleyspoort						
- Dam	47.49	82.4	33.69	68.6	(29%)	(17%)
- Canal	69.32	205.11	69.32	159.1	0%	(22%)
Klein Maricopoort						
- Dam	193.54	416.56	143.41	366.43	(26%)	(12%)
- Canal	333.1	560.31	249.55	476.76	(25%)	(15%)
Koster Dam	171.82	262.4	154.75	245.33	(10%)	(7%)
Buffelspoort Dam						
- Dam	27.64	34.93	20.67	27.96	(25%)	(20%)
- Canal	89.76	100.8	66.52	77.56	(26%)	(23%)
Hartbeespoort Dam	2.19	7.65	3.52	8.97	61%	17%
Roodeplaat Dam						
- Dam		65.29		59.38		(9%)
- Canal	34.32	104.89	23.59	94.15	(31%)	(10%)
Bo-Molopo & Setumo Dam		192.64		161.13		(16%)
Leeuwkraal Dam		5.28		12.01		127%

Commented [A3]: Why is this not the same order as the annex? Where is Croc River given that they had a 241% difference in the two methods?

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