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An operation and maintenance report for rural water schemes

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PEOPLE AND SYSTEMS FOR WATER, SANITATION AND HEALTH

An operation and maintenance report for rural water schemes

David A. Stephen, South Africa

AN OPERATION AND MAINTENANCE Report has been developed and is being used to monitor and evaluate a number of rural water schemes in KwaZulu-Natal, South Africa. It is anticipated that it will form part of the reporting requirements of Section 23 of the Water Services Act (No. 108 of 1997) (DWAF, 1997) which makes it compulsory for Water Services Providers to give information to a wide range of interested parties, including the Water Services Authorities, Provincial Authorities, the Minister of Water Affairs and Forestry and consumers (both existing and potential).

The O&M Report serves as a valuable **management tool** for Water Services Providers (WSPs) by providing a record, on a regular monthly basis, of both the technical and financial aspects of water schemes, and by providing a means for sound business planning.

It also serves as a **management information system** for the Water Services Authorities (WSAs) by providing the information necessary for appropriate and timeous interventions to assist in the long-term functional and financial sustainability of schemes.

Support Services Agents (SSAs), who may be contracted to provide support to either the WSP or the WSA (or both), could assist in the report's preparation, its interpretation (to both WSA and WSP), or use it as a teaching tool. Improvements in the managerial, technical, financial or administrative aspects of schemes are some of the desired outcomes arising from the use of the report.

The O&M Report provides information relating to schemes at both Local Water Committee (LWC) and overall project level (i.e. including external support and mentoring costs), in both tabular and graphical forms.

It is intended to complement the graphed Performance Indicators which have been developed specifically for LWCs (Stephen, 2000).

Development of the O&M report

The O&M Report was developed during 2000 in consultation with a number of people who were directly involved with the management and support of rural water schemes operating within KwaZulu-Natal, including Implementing Agents, local government officials, consulting engineers, and staff from the Department of Water Affairs and Forestry's Monitoring and Evaluation Unit. The report has been used and tested for many rural water schemes of varying size, technical complexity, dispensing methods, and different local authority areas. It is intended for water schemes in the operation and maintenance stage of development (i.e. after construction and commissioning of the scheme).

The O&M Report is structured as a series of linked worksheets, within a workbook file, using a well-known commercially available spreadsheet-type software application package. The data required on a monthly basis is generally able to be obtained from the LWC, taken from manual records kept on site. The transfer of data into the workbook requires someone who is reasonably experienced in working with spreadsheets. The interpretation of the information presented in the report is relatively self-explanatory to engineers and others who are involved in the rural water sector. With regular use, the amount of time required to complete and analyze the monthly report reduces significantly, compared with the initial stages.

The report includes, *inter alia*, the following data: O&M expenditure, water sales revenue, operating profit (or loss), unit cost of water, water consumption figures, water losses, number of supply points, population served, unit consumption per person per day, water quality compliance records, and reliability of supply. An explanation of the report, including its structure and content, is given in more detail below.

Structure and content

The O&M Report contains the following six linked worksheets within one workbook:

- Overall Project Status;
- Local Water Committee Status;
- Input Data Sheet;
- Overall Project Graph;
- Local Water Committee Graph; and
- Monitoring & Evaluation Key Performance Indicators (M&E KPI's).

Introductory notes are included in the workbook for ease of reference for the first-time user, and an unlinked worksheet, entitled "General-Budgets-Targets", has been included for "what if ?" analyses.

Figure 1 illustrates the first page of the report. Each cell is colour-coded according to the legend shown on the right-hand side of the sheet. Information either remains constant, changes occasionally, is brought forward from the data input sheet, is provided monthly, or is automatically calculated.

The top section provides basic project information such as: project name and number, local authority area, brief description, and the month of reporting. The primary source of water, length of piping, capital costs, design

population, and commissioning date are given. The sustainable yield of the source, capacities of treatment works, pumping plant and pipelines are listed as a reminder of some of the physical constraints of the scheme. Tariffs applicable to bulk and various supply options are also given.

The main body of the report includes information under the following categories: (i) Financial; (ii) Volumes; (iii) Losses; (iv) Population Served; and (v) Quality & Supply. For each category, monthly targets, accumulated totals, the current month's information, totals to date, and averages to date are given. **It is important to note that much of the information in the table is automatically brought forward from the input data sheet (which contains all the historical data), or is calculated for the user. The completion of the report on a monthly basis is therefore not as daunting as it may at first seem to be!**

The lowest section of the report contains basic employment information for the current month.

Interpretation of results

The information provided in the O&M Report is intended to be useful to the WSA, the WSP and the SSA, but possibly in different ways. The input data included in the report should be as accurate and as complete as possible, and should adhere to the definitions given for each item. With adequate training, much of the information should be able to be obtained from the LWC.

From a financial point of view, the "Unit Cost of Water" (i.e. total O&M expenditure divided by the total metered volume at all connections) is critical at both LWC and overall project levels, and should be compared with the most generally used tariff. The "% of Limiting Scheme Capacity" gives an indication of utilization of the available resources and informs decision-makers about the need for possible upgrading of certain components of the scheme.

Although a subject in its own right, "Unaccounted For Water", both as a volume per month, and as a percentage of adjusted bulk supply, is crucial when considering both physical and financial losses within a scheme. The report provides "Equivalent Volumes Sold at all Connections" (being water sales revenue divided by the applicable tariff for each connection type), and the "Value of Loss of Water Sales Revenue" in order to highlight the possible discrepancies between physically metered volumes and volumes derived from financial information.

The "Overall Unit Consumption" is also a key indicator derived from total metered volume at all connections divided by the estimated total population served. Whereas the metered volumes may be easily determined, the population served may be more difficult to assess, given the fact that many people from outside the area may derive benefit from the scheme. Nevertheless, this should be given sufficient attention, as it impacts on the WSA's performance in ensuring access to water services to **all consumers** in its area of jurisdiction. Knowing the amount of water being used per person is important from a number of points of view, including financial (in terms of sales revenue and tariff setting), socio-economic (in terms of water usage patterns and affordability), and health and hygiene.

Important aspects of water quality and reliability of supply are covered under the "Quality and Supply" category. At LWC level, water quality is based on consumers' satisfaction with appearance, taste and odour of samples drawn at selected points, which may vary from month to month. A more formalized Water Quality Programme is also essential, albeit on a less frequent basis, to ensure that water quality is measured against known standards. Service interruptions, and by extension the percentage availability of water at supply points, are measured against the required daily demand for water, which may increase over time. A simple matrix with a list of supply points and days in the month is used to record the basic information.

The number of "Incidents of Vandalism" is an important social barometer, and may provide valuable information relating to the socio-political environment within the scheme's area (and possibly beyond). Sudden changes in the number of events should be thoroughly investigated and dealt with.

Through the correct interpretation of the figures, and a good understanding of the scheme being reported on, appropriate and timeous interventions should be possible in order to either prevent or deal with problems in an effective way. A clear understanding of and appreciation for the inter-relationships between the various aspects of the scheme as provided in the report are essential for good management (on a day-to-day basis) and longer-term planning.

Lessons learned

The O&M Report has been used successfully at both LWC and overall project levels to provide the necessary information for a clear understanding of the performance of any given scheme at a particular point in time, and over a period of time.

The O&M Report has served as a useful teaching tool for LWCs (often with limited literacy and numeracy skills).

The report has been used as a planning tool, e.g. for budgeting, assessing the impact of a change in tariff, varying consumption patterns, assessing the gains resulting from an improved cost recovery programme or a reduction in water losses.

The definitions of each input data field, and the administrative and financial procedures which are adopted and used by the LWC staff on site should be carefully worked out before any data is collected and entered into the report. Also, the person responsible for the accuracy and completeness of the report should have a clear understanding of both the source(s) of input data, and the way in which the report operates. By using consistent definitions, it may be possible to compare the relative performances of a number of schemes.

Challenges

One of the major training challenges of any support organization is to create, amongst the members and staff of the LWC, an awareness, understanding and appreciation of the inter-relatedness between the technical and financial aspects of the scheme. The LWC should be encouraged to develop its own management interventions arising out of the interpretation of the O&M Report.

Incentives to achieve monthly targets which are within the control of the LWC should be considered (these do not necessarily have to be financial). Perhaps the simplest and most effective incentive to encourage any practice is to monitor it.

Conclusion

In terms of the Water Services Act, it is the duty of every WSA to "progressively ensure efficient, affordable, economical and sustainable access to water services" (Section 11(1)). In rural areas, the challenge of achieving delivery of infrastructure and on-going water services provision in a sustainable way is well known. A number of delivery mechanisms exist for the efficient and cost-effective planning and implementation of schemes.

Within the context of new legislation[1,2,3,4] relating to local government structures, systems and financing arrangements, there are still many challenges facing the operation and maintenance stage. The "Free Basic Water" policy (which was first announced in September 2000) has not been fully implemented in the context of rural water schemes, nor indeed its impact assessed from a financial or socio-economic perspective.

In addition, the outbreak of cholera in many parts of KwaZulu-Natal since August 2000 has brought into sharp focus the need for effective management of rural water schemes which continue to require close monitoring and, in many cases, significant financial and technical support. The provision of adequate sanitation services, the safe removal of human excreta, waste water and domestic waste, and the promotion of good health and hygiene practices amongst all sectors of society, are all vital in order to achieve improved living conditions and quality of life within rural communities. For this, close liaison between WSAs, WSPs, SSAs, the Department of Water Affairs and Forestry, the Department of Agriculture, the Department of Health and the Department of Education is vital.

The diligent recording of information and the production of regular O&M Reports for water schemes will not in themselves produce improved access to water services, nor ensure on-going water services provision in a sustainable manner. However, it should be noted that the intended purpose of the O&M Report is to provide a means of collecting information in a systematic way, analyzing it, and using it to take corrective action where necessary, to develop medium- to long-term intervention strategies, or for policy or planning purposes.

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MONTHLY O & M REPORT - OVERALL PROJECT STATUS — Reporting Month: Jan-01

PROJECT NAME: | DWAF PROJECT CODE: (old) (new)

Regional Council :

NOTE: All Rand-values include VAT

Brief Description :

Length of Piping (as built) | Sustainable Yield of Source (kl/d): | Source type

Capital Cost (Actual to date)
Phase 1 R -
Phase 2 (cumulative) R -
Further phases (cumulative) R -

Treatment Capacity (kl/d): Based on max. 16 hours/day operation

Pumping Capacity (kl/d): Based on max. 16 hrs/day electric or 10 hrs/day diesel

Pipeline Capacity (kl/d): Limited to 1,5 m/s velocity in key supply link(s)

Design Population (as per BP)
Phase 1
Phase 2 (cumulative)
Further phases (cumulative)

Current Limiting Scheme Capacity (minimum of above): kl/d

Legend of Colour Coding
Information that remains constant
Information that changes occasionally
Information from Input Data Sheet
Information to be provided monthly
Information calculated by spreadsheet

Commissioning date: Date | Age (months in operation):

TTP Commencement date: Date | Age (months in TTP):

Buy-in Tariff (R / kl) (incl. VAT) *Only if applicable*	Communal Standpipe Tariff (R / kl) (incl. VAT)	Yard/House Connection Tariff (R / kl) (incl. VAT)	Institutional Connection Tariff (R / kl) (incl. VAT)
R0.00	R0.00	R0.00	R0.00

	Item	Monthly Target	Accumulated previous	This month	Total to date	Average to date	Comments
Financial	Overheads	R -	R -	R -	R -		
	Repairs & maintenance	R -	R -	R -	R -		
	Buy-in or Production Cost	R -	R -	R -	R -		
	Support & Mentoring cost	R -	R -	R -	R -		
	Total O&M Expenditure	**R -**	R -	R -	**R -**		
	Water Sales Revenue	**R -**	R -	R -	**R -**		
	Other Income	**R -**	R -	R -	**R -**		
	Profit/(Loss)	**R 0**	R 0	R 0	**R 0**		
	Unit cost of water (R/kl)				N/A		
Volumes	Bulk Supply, Buy-in or Production Volume (kl/mth)	0.0	0.0	0.0	0.0		
	% of Limiting Scheme Capacity				N/A		
	Metered Volume at Communal Standpipes (kl/mth)	0.0	0.0	0.0	0.0		
	Metered Volume at Yard / House Connections (kl/mth)	0.0	0.0	0.0	0.0		
	Metered Volume at Institutional Connections (kl/mth)	0.0	0.0	0.0	0.0		
	Total metered volume at all connections (kl/mth)	**0.0**	**0.0**	**0.0**	**0.0**		
Losses	Unavoidable Losses (kl/mth)	0.0	0.0	0.0	0.0		
	Adjusted Bulk Supply, Buy-in/Production Vol (kl/mth)	0.0	0.0	0.0	0.0		
	Unaccounted for water (kl/mth)	0.0	0.0	0.0	0.0		
	UFW as a percentage of adjusted bulk supply (L(abs) %)				N/A		
	Equivalent Volume Sold at all connections (i.e. Sales/Tariff) (kl)	0.0		0.0	0.0		
	Value of Loss of Water Sales Revenue	R -	R -	R -	R -		
Population Served	No. of Communal Standpipes		0	0	0	N/A	
	Estimated population served at Communal Standpipes		0	0	0	N/A	
	Unit consumption at Communal Standpipes (litres/person/day)			N/A	N/A		
	No.of Yard/House Connections		0	0	0	N/A	
	Estimated population served at Yard/House Connections		0	0	0	N/A	
	Unit consumption at Yard/House Connections (litres/person/day)			N/A	N/A		
	No. of Institutional Connections		0	0	0	N/A	
	Estimated Total Population Served		**0**	**0**	**0**	N/A	
	Overall Unit Consumption (litres/person/day)				N/A		
Quality & Supply	No. of Days Quality Not Satisfactory		0	0	0		
	Service Interruptions (supply-point days)		0	0	0		
	Percentage availability of water supply at supply points				N/A		
	Incidents of Vandalism		0	0	0		

	Categories	Male	Female	Disabled	Total	
Employment	Permanent				0	Current month
	Part Time				0	Current month
	Value of Wages (R / month)	R 0	R 0		R 0	Current month

Figure 1. Extract from O&M report (first page only)