
**Water Quality
Management Series**

WASBANK RIVER CATCHMENT

**WATER QUALITY MANAGEMENT
STRATEGY**

FINAL REPORT

Department of Water Affairs and Forestry

May 2000



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DOCUMENT INDEX

This document is the third in a series of three documents comprising the Development of a Water Quality Management Strategy for the Wasbank River Catchment.

1. Community Facilitation and Capacity Building
2. Water Quality Situation Assessment of the Wasbank River Catchment
3. **Water Quality Management Strategy for the Wasbank River Catchment**

APPROVAL

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for the Wasbank River Catchment

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EXECUTIVE SUMMARY

The Department of Water Affairs and Forestry (DWAF) initiated a project to develop a water quality management strategy (WQMS) for the Wasbank River catchment up to its confluence with the Sundays River. Subsequently, other stakeholders, i.e. the farming community, other government departments, provincial authorities and local communities also became involved. Participation of stakeholders was maintained throughout the course of the project.

The WQMS for the Wasbank River catchment represents only the water quality component of a catchment management strategy (CMS). Other components of a CMS, such as specific land use activities and water allocation, are addressed only as far as its possible impact on the water quality of the Wasbank River. The WQMS identifies the management actions necessary to ultimately achieve the management objective (and subsequently the water quality objectives) set for the catchment, and defines the time frame for implementation of these actions.

The WQMS was preceded by a Water Quality Situation Assessment, from which it became evident that the water quality in the catchment is not fit for use for the identified users in the catchment. It was therefore necessary to develop a WQMS to ensure fitness for use in the catchment and the improvement of water quality. The WQMS reflected in this document was approved at the Wasbank River Steering Committee of 5 May 2000.

The management objective of the WQMS for the Wasbank River catchment is to ensure water quality fit for use:

- for informal domestic purposes in the lower portions of the catchment;
- for agricultural purposes (irrigation and livestock watering); and
- to maintain a healthy natural aquatic environment.

Currently coal mining is the major activity adversely affecting water quality in the catchment. In future, due to the influx of people into the catchment, deteriorating water quality attributed to informal and semi-formal settlements could become more pronounced if not managed properly.

The main water quality issue of concern in the Wasbank River catchment is the elevated salinity-level of the water, associated with the impact caused by the defunct coal mines in the upper reaches of the catchment. The variables of concern identified during the Water Quality Situation Assessment are sulphate (SO₄), sodium (Na) and total dissolved solids (TDS).

Bacteriological pollution, in specific high *E. coli* - counts, occur from time to time. Therefore, the protection of public health, in this case in particular the people from the

informal settlements still relying on river water, needs to be addressed.

From the biological survey performed during the Water Quality Situation Assessment it was concluded that the Wasbank River appears to be in generally good condition as far as the in-stream macroinvertebrate fauna is concerned, and that there is no cause for concern in this regard. However, the results could be improved if the riparian surrounds were better managed and if less sediment was derived from the catchment.

An iterative process was followed in setting the final water quality objectives for the Wasbank River catchment. During this process, an attempt was made to attain a sustainable balance between the ideal user requirements of the recognised users and other factors pertaining specifically to the Wasbank River catchment. The final water quality objectives were determined after consultation with and agreement by the various stakeholders represented on the Wasbank River Steering Committee. For the purpose of compliance, the Wasbank River catchment has been subdivided into an Upper and Lower subcatchment and water quality objectives were set for these two subcatchments, based on the water user requirements.

Efforts to curb water pollution embodied in the WQMS mainly focus on control of pollution emanating from mining activities, and to a lesser degree on the proper management of sewage works and informal settlements. The management approach embodied in the WQMS to ensure achievement of the management objective is a combination of the following:

- Implementation of pollution control at source
- Residual impact control
- Remediation
- Ensure adequate surface water flow
- Creation of an enabling environment

In order to become effective and implementable, these approaches were translated into practical management actions. An action plan to effect the implementation of the WQMS was developed. An effort was made to clearly define actions and allocate responsibility unambiguously. It was endeavoured to adhere to the principle of subsidiarity and responsibilities were placed at the appropriate level that will ensure effective performance of the WQMS. The action plan is dynamic and should be reviewed on a regular basis by the Wasbank River Forum to ensure the successful implementation of the WQMS.

The Wasbank River Forum, a non-statutory, voluntary organisation with no executive powers, will play an advisory role during the implementation process. It will act as an advisory committee to the DWAF on aspects relating to water quality issues. The degree of commitment of the members of the forum to the WQMS will ultimately determine the success of the WQMS.

WASBANK RIVER CATCHMENT WATER QUALITY MANAGEMENT STRATEGY

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CHAPTER 1

BACKGROUND

1.1 INTRODUCTION

The Department of Water Affairs and Forestry (DWAf) is the public trustee of the nation's water resources, the ultimate aim of water resource management being the sustainable and equitable use of water for the benefit of all users. To ensure the sustainability of the nation's water resources in the interests of all water users, there is a need for the integrated management of all aspects of water resources, one being the protection of the quality of water resources.

The National Water Act, 1998 (Act 36 of 1998) requires the establishment of catchment management strategies for the protection, use, development, conservation, management and control of water resources within a water management area. In practice such a strategy consists of a number of sub-strategies, which *inter alia* include strategies for water quality management, water supply and sanitation, water apportionment, water use charges, etc. Water quality management strategies provide the coherent framework to ensure that fitness for use and the water quality requirements of the water users are honoured at catchment level.

The Sundays River catchment was identified as a catchment for which a water quality management strategy has to be developed as a matter of priority. Initially it is the intention to develop a water quality management strategy for the Wasbank River, a highly impacted subcatchment of the Sundays River, and to expand this later to include the whole of the Sundays River.

1.2 PURPOSE OF DOCUMENT

This document describes the water quality management strategy (WQMS) for the Wasbank River as approved by the Wasbank River Steering Committee on 5 May 2000. Its main features are:

- management objective of the WQMS
- management approaches and associated actions
- action plan for implementation.

The WQMS for the Wasbank River catchment identifies the actions necessary to ultimately achieve the management objective (and subsequently the water quality objectives) set for the catchment, and defines the time frame for implementation of these actions. It does not, however, prescribe the manner in which these actions should be implemented, which remains the prerogative of the responsible organisation/individual.

The intention of this document is further not to describe an integrated catchment management strategy (CMS) for the Wasbank River catchment, but represents only the water quality component of a CMS. Other components of a CMS, such as specific land use activities and water allocation, are addressed only as far as its possible impact on the water quality of the Wasbank River. However, this document will be used as an important input during the eventual development of a CMS for the Tugela water management area (WMA).

1.3 STUDY AREA

The Wasbank River catchment is situated in Northern KwaZulu/Natal and forms part of the Tugela WMA. The study area includes the whole of the Wasbank River catchment, from where it originates in the slopes of the Biggarsberg up to its confluence with the Sundays River (refer to Figure 1.1).

Agriculture is the main activity in the catchment, consisting mainly of livestock breeding and dryland agriculture. Due to the poor water quality, no or limited irrigation is currently practised within the catchment. The potential for irrigation varies from high in the upper reaches to moderate or low in the lower reaches of the catchment area.

Also important is the increased development of informal and semi-formal settlements in the lower portions of the Wasbank River catchment. Besides a group of existing towns/settlements, a number of new settlement developments are either currently underway or being planned.

Water quality in the Wasbank River is currently adversely impacted by decants from historical coal mining operations in the upper reaches of the river, the main variables of concern being sulphate, sodium and total dissolved solids. In addition, the influx of people into the catchment may result in further deterioration in water quality if these settlements remain poorly serviced.

1.4 OUTLINE OF A WQMS

The development and implementation of WQMS's are an integral part of the Department's water quality management policy. However, the development of WQMS's cannot be done in isolation. It requires the involvement of all stakeholders in a particular catchment. Public participation is therefore an integral part of both the development and the eventual implementation of a strategy.

Specific water quality objectives are developed during the process of formulating a WQMS. These water quality objectives are stipulated to adequately secure the water resource for potential water use and future generations. These objectives must, however, be practical and must be the result of consensus among the majority of stakeholders in

the catchment.

Furthermore, practical implementation of a WQMS requires the allocation and acceptance of responsibility by government at national, provincial and local levels, as well as by industry and business, communities and individuals for certain actions. The strategy therefore requires a practical statement of the actions required, those responsible for the actions, and the time frame in which they are to be achieved.

A typical strategy is based on a clearly delineated management unit, which in most cases will be a river catchment. The WQMS should be developed to such a level of detail that it will be readily implementable and will ensure consistent implementation in order to enable the effective management of water quality on a sustained basis.

Thus, the strategy will have to address the following:

- what must be achieved and implemented, where and when
- how must the implementation be administered or managed
- who is responsible for what.

This will entail:

- knowledge of the users and their requirements
- understanding the land uses and impacts on water resources
- information regarding water resources and associated water quality
- setting of water quality objectives
- development and implementation of management strategies and tools
- involvement of all stakeholders (interested and affected parties).

The WQMS should guide the implementation of water quality aspects addressed in the National Water Act, 1998, in the catchment, e.g. determination of the Reserve and resource quality objectives, classification of the river, water use licences, waste standards, general authorisations, compulsory licences, registration of water users, etc.

WQMS's may vary with respect to the catchment size, the recognised users, dominant land uses and the catchment realities and issues, which ultimately result in strategies of a different complexity and extent.

1.5 PROCESS OF DEVELOPMENT

The formulation of the WQMS was preceded by a Water Quality Situation Assessment. This document provided the baseline/background information required for the development of the WQMS and was developed in-house by the DWAF with the assistance of the Wasbank River Steering Committee. The development process of the WQMS for the Wasbank River catchment is briefly outlined hereunder.

1.5.1 Wasbank River Steering Committee

The first meeting of the Wasbank River Steering Committee took place on 24 July 1997 and was constituted of all interested and affected parties (I&AP's) located within the Wasbank River catchment. The Wasbank River Steering Committee assisted with the development of the development of the Water Quality Situation Assessment and the Water Quality Management Strategy.

The following I&AP's are represented on the committee:

- Mining Industry
- Farming Community
- Representatives from the informal settlements[#]
- Local Authorities
- Regional Services Councils
- Department of Water Affairs and Forestry
- Department of Agriculture and Environmental Affairs
- Department of Minerals and Energy
- Department of National Health and Population Development
- KwaZulu Nature Conservation Services (KZNCS).

Important issues on which consensus were reached during the process of participation included:

- recognised water users in the catchment
- activities which affect water quality due to addition of pollution (or waste) or reduction of dilution capacity as a result of water abstractions
- quantities of water abstractions
- quality and quantity of waste discharges
- water quality requirements of recognised users
- in-stream water quality objectives
- control points for measuring compliance to in-stream water quality objectives
- management approaches and actions to achieve the management objective.

In the formulation of the WQMS, every effort was made to relate decisions on the above aspects as closely as possible to the initial decisions. Due to the fact that initial decisions were not always formulated to the required level of detail or in the context of the WQMS, minor adaptations had to be made.

Note:

- #** The representatives from the informal settlements were identified during the Community Facilitation and Capacity Building process that was initiated in the catchment by the DWAF and performed by The Bridge Foundation during 1997 -1998. The process is described in detail in the first report that forms part of the Wasbank River Water Quality Management Strategy (refer to page i).

1.5.2 Guiding principles

The guiding principles embodied in the process of development and execution of the WQMS for the Wasbank River catchment are:

- **Transparency:** the process and its deliverables must be open and available to all participants.
- **Participation:** all major stakeholders must participate in the process.
- **Simplicity:** the WQMS should be simple and easy to understand and implement, with respect to all levels of participation and training.
- **Partnership:** the WQMS should bind the government and all participating stakeholders to collectively carry out their respective roles in ensuring success.
- **Accountability and responsibility:** these aspects must be clearly defined and unambiguously allocated.
- **Subsidiarity:** responsibilities must be placed at the appropriate level to ensure consistent, effective system performance.
- **Measurability:** all the objectives must be tangible and measurable.
- **Integration:** an integrated approach must be followed during the development and implementation of the WQMS.

1.5.3 Key success factors

Factors considered vital to the success of the WQMS were identified as follow, and every effort were made to adhere thereto:

- affordability to both the government and the participating stakeholders
- practical implementation with the human resources and technology available
- flexibility in order to cater for on-going change
- sustainability in the long term
- consistent with similar situations nation-wide
- implementability considering all of the above.

CHAPTER 2

OBJECTIVES OF THE WATER QUALITY MANAGEMENT STRATEGY

2.1 MANAGEMENT OBJECTIVE

The management objective of the water quality management strategy for the Wasbank River catchment is to ensure water quality fit for use:

- for informal domestic purposes in the lower portions of the catchment;
- for agricultural purposes (irrigation and livestock watering); and
- to maintain a healthy natural aquatic environment.

In the light of the above management objective, water quality objectives were set at strategic points within the Wasbank River catchment, as described below.

2.2 WATER QUALITY OBJECTIVES

2.2.1 Water quality variables of concern

The main water quality issue of concern in the Wasbank River catchment is the elevated salinity-level of the water, associated mainly with high concentrations of sulphate (SO₄), sodium (Na) and total dissolved solids (TDS).

Calcium and magnesium tend to be a problem only in the lower reaches of the Wasbank River, while the ammonium, nitrate, fluoride and chloride concentrations exceed the user requirements occasionally at some of the sampling points. Although pH seems to be a variable of concern, only the upper limit of 8.5 is exceeded, indicating the alkaline nature of the water. No metal problems are anticipated for the catchment, which is also reflected by the biomonitoring data.

Bacteriological pollution, in specific high *E. coli* – counts, occur from time to time. Therefore, the protection of public health, in this case in particular the people from the informal settlements still relying on river water, needs to be addressed.

From the biological survey it was concluded that the Wasbank River appears to be in generally good condition as far as the in-stream macroinvertebrate fauna is concerned, and that there is no cause for concern in this regard. However, the results could be improved if the riparian surrounds were better managed and if less sediment was derived from the catchment.

The current water quality status of the Wasbank River catchment is described in more

detail in the Water Quality Situation Assessment report.

2.2.2 In-stream water quality objectives

The setting of water quality objectives is a quantitative statement of the water quality that must be achieved and maintained to ensure fitness for use, and is mainly determined by the water user requirements. The final in-stream water quality objectives for the Wasbank River catchment, together with the ideal user requirements as determined during the Water Quality Situation Assessment, are given in Table 2.1.

The ideal user requirements for agricultural use and the natural aquatic environment were determined from the South African Water Quality Guidelines (DWA, 1996). Class 0 guidelines (ideal water quality requirements) for informal use were used as the ideal user requirements for domestic use in the catchment (A guide for the health-related assessment of the quality of water supplies: DWA, 1996).

An iterative process was followed in setting the final water quality objectives for the Wasbank River catchment, as set out in Table 2.1. During this process, an attempt was made to attain a sustainable balance between the ideal user requirements of the recognised users and other factors pertaining to the catchment. Concessions had to be made mainly by the users. The final water quality objectives for domestic and agricultural use were determined after consultation with and agreement by the various stakeholders represented on the Wasbank River Steering Committee. The process followed during the setting of the water quality objectives is described in more detail in the Water Quality Situation Assessment report.

For the purpose of compliance, the Wasbank River catchment has been subdivided into an Upper and Lower subcatchment. The water quality objectives that should be met within these two subcatchments are similar (refer to Table 2.1), except for sulphate, which is 400 mg/ℓ and 200 mg/ℓ for the Upper and Lower subcatchments, respectively.

The control points for measuring compliance with the in-stream water quality objectives, as well as the monitoring programme to determine compliance are discussed in more detail in Appendix A.

Table 2.1: Final in-stream water quality objectives for the Wasbank River catchment, reflected as 95-percentile values.

| Water Quality Variable | Units | Ideal User Requirement* | Water Quality Objective |
|------------------------|----------------------|-------------------------|-------------------------|
| PHYSICAL | | | |
| pH | - | 6.5-8.4 | 6.5 – 8.4 |
| Conductivity | mS/m | 40 | 70 |
| TDS | mg/l | 280 | 595 |
| Turbidity | NTU | 1 | 1 |
| CHEMICAL | | | |
| Calcium | mg/l | 32 | 80 |
| Magnesium | mg/l | 30 | 70 |
| Potassium | mg/l | 50 | 50 |
| Sodium | mg/l | 70 | 100 |
| Sulphate | mg/l | 200 | 200 (400)** |
| Chloride | mg/l | 100 | 100 |
| Fluoride | mg/l | 0.75 | 1.0 |
| SAR | meq/l ^{0.5} | 1.5 | 1.5 |
| Silicon | mg/l | 150 | 150 |
| METALS | | | |
| Manganese | mg/l | 0.05 | 0.18 |
| Iron | mg/l | 0.1 | 1.0 |
| Aluminium | mg/l | 0.01 | 0.5 |
| NUTRIENTS | | | |
| Ammonia | mgN/l | 1.0 | 1.0 |
| Nitrate/Nitrite | mgN/l | 6 | 6 |
| Total Nitrogen | mgN/l | 0.2 | 0.5 |
| Total Phosphorus | mgP/l | 0.005 | - |
| MICROBIOLOGICAL | | | |
| Faecal Coliform | counts per 100 ml | 0 | 100 |

Notes:

- * The ideal user requirement was based on the most sensitive requirements for the identified water users.
- ** An objective of 400 mg/l sulphate is allowable in the upper reaches of the Wasbank River where no informal domestic use has been identified.

CHAPTER 3

MANAGEMENT APPROACH AND ASSOCIATED ACTIONS

3.1 MANAGEMENT APPROACH

The management approach embodied in the WQMS to ensure achievement of the water quality objectives is a combination of the following:

- Implementation of pollution control at source
- Residual impact control
- Remediation
- Ensure adequate surface water flow
- Creation of an enabling environment.

In order to become effective and implementable, these approaches need to be translated into practical management actions, as discussed below.

3.2 MANAGEMENT ACTIONS

The management actions associated with each management approach are identified below. The allocation of responsibility and the time frame for the execution of the various management actions are reflected in the Action Plan for Implementation (Appendix B).

3.2.1 Approach to pollution control at source

Assessment of pollution sources

To successfully implement this approach, a detailed assessment of the pollution sources situated within the Wasbank River catchment is required. The impact caused by each pollution source needs to be identified and quantified as far as possible.

The major activities that influence the water quality of the Wasbank River were identified during the Water Quality Situation Assessment and associated meetings with the stakeholders in the catchment. However, numerous problem areas were identified where information regarding the pollution sources is still inadequate. The following actions were identified to further assess the pollution sources within the catchment:

- Identify and quantify possible sources of pollution in the lower subcatchments.
- Identify and quantify (as far as possible) diffuse sources of pollution associated with the salinity-problems experienced in the catchment.
- Installation of flow-measuring weirs at strategic points in the catchment to quantify the impact from various sources.

- Verify the background TDS-values for the lower Wasbank River catchment.

Development of land use and operational strategies

To ensure adequate pollution prevention and control at source, it is necessary to develop strategies for certain activities within the catchment, namely:

- Implement available land use strategies for afforestation and erosion control in the Wasbank River catchment to minimise impact from these land use activities.
- Develop and implement a strategy to conserve and rehabilitate the Paddavlei-area in the upper reaches of the Wasbank River catchment.
- Develop and implement operational strategies for sewage pump stations and pipelines in formal settlements.

Management of informal and semi-formal settlements

Due to the current influx of people into the catchment, the poorly managed and poorly serviced settlements were identified as a major potential pollution source in the lower portion of the catchment. In order to prevent future deterioration of the water quality as a result of these settlements, it is necessary to identify and provide for the water supply, sanitation facility and waste disposal needs in these settlements situated in the lower reaches of the catchment.

3.2.2 Approach to residual impact control

Pollution prevention is not sufficient to ensure fitness for use in the Wasbank River catchment. Those discharges and diffuse mobilisation of pollutants that result even after the application of pollution prevention measures must be judiciously managed to ensure fitness for use.

Refinement of objectives

The in-stream water quality objectives for the Wasbank River catchment have been set through a consultative process as discussed in section 2.2. However, owing to the fact that irrigation was identified as a user for the whole catchment, very strict objectives were set, especially in respect of certain salinity-related constituents. To ensure that unnecessary effort and cost to achieve the user requirements for irrigation is not employed, it is important to determine the actual potential (commercial and economical) for irrigation in the catchment. Further, in terms of the National Water Act, the WQMS need to be expanded to include the determination of the class of water resources and resource quality objectives.

Thus, in order to refine the water quality objectives for the Wasbank River, the following actions were identified:

- Determine the actual potential (commercial and economical) for irrigation.

- Determine the current and future class of the Wasbank River.
- Determine the resource quality objectives for the Wasbank River.

Setting of compliance requirements

To ensure that the desired water quality is attained, it is necessary to set compliance requirements for those activities that could adversely affect water quality. These could either be specified waste discharge requirements or in-stream compliance requirements downstream of the particular activity. The activities identified in the Wasbank River catchment, for which compliance requirements need to be set, are:

- sewage works (both formal and informal settlements);
- operational or moth-balled mines;
- abandoned mines (government responsibility); and
- waste disposal sites.

These requirements should be enforced through the water use licences of each activity. All current water uses should be revised after the setting of the compliance requirements and new licences granted in terms of the set objectives (also refer to section 3.2.4 below).

Treating of residual impact

The necessary treatment options of any residual impact emanating from any of the activities listed above should be employed to achieve the set compliance requirements and water quality objectives. Further, the necessary back-up systems should be developed and implemented in the case of failure of the pollution prevention systems or the occurrence of an emergency spill to prevent unnecessary contamination of the water resource.

This is specifically applicable to sewage pump stations and pipelines in formal settlements, as well as the defunct coal mines situated in the upper reaches of the catchment. The actions that were identified to address these issues are:

- Develop and implement backup systems for sewage pump stations and pipelines in formal settlements in the case of failure or emergency spills.
- Investigate the option of flood-releases during high-flow periods.
- Investigate treatment options to reduce the residual impact from the coal mines situated in the upper reaches of the catchment.

3.2.3 Approach to remediation

Coal mining was an important land use in the past; however, most mining activities have ceased, with defunct mines now being the norm. Water quality in the Wasbank River is currently adversely impacted by decants from these historical coal mining operations in the upper reaches of the river, the main water quality problems being salinity-related.

Inadequate or the absence of pollution prevention measures at these sites is causing unacceptable degradation of the water resources. To achieve the water quality objectives set for the Wasbank River catchment, it is essential that these mines be remediated as far as practically possible to reduce the impact emanating from these sites. The actions necessary for remediation of these mines are:

- Develop and implement management plans to address the impact from these sites.
- Implementation and upgrading of pollution control structures at the sites.
- On-going maintenance programme to ensure the functionality of the pollution control structures.

3.2.4 Approach to adequate surface water flow

From a water quality management perspective, adequate base-flow is required to ensure a measure of dilution of pollutants during periods of low-flow to maintain the water quality objectives, and to ensure the continuous functioning of aquatic ecosystems. The approach to increase flow will endeavour to exert influence on land use activities that impair base-flow and encourage the run-off of clean stormwater. Further, in terms of the National Water Act, a determination of the basic human needs Reserve and the ecological Reserve needs to be determined before any new water use activity may be authorised.

The actions identified to ensure adequate surface water flow, especially during base-flow conditions, are:

- Re-evaluate the hydrology pattern of the Wasbank River catchment based on additional flow records obtained through the installation of flow-measuring weirs (refer to section 3.2.1).
- Determine the basic human needs Reserve and ecological Reserve for the Wasbank River catchment.
- Quantify and assess water use and land use in the catchment in accordance to the Reserve determination and based on the refined hydrology pattern of the catchment.
- Implement available land use strategies for afforestation, irrigation and impoundments in the Wasbank River catchment to encourage unpolluted runoff where possible throughout the catchment.
- Identify and remove alien vegetation in the catchment (*Working for Water*) to increase the base-flow.

3.2.5 Approach to creating an enabling environment

The approach to creating an enabling environment has bearing on all the other approaches and mainly pertains to carrying out the following guiding principles:

- creation of ownership of the WQMS; and
- formulation of partnerships for the implementation of the WQMS.

To accomplish the above, the following must be established with stakeholders:

- Knowledge, i.e. what ownership and partnership of the WQMS entails and what is required in order to fulfil the commitments as stated therein.
- Skill, i.e. stakeholders must be informed and able to do what is required.
- Will, i.e. the desire and motivation to do what is required.

The actions identified to achieve the above were identified as follow:

- Continue with the capacity building program in the settlement areas initiated by The Bridge Foundation.
- Initiate regular information sessions to inform the stakeholders of new projects and developments.
- Develop and publish a simplified version of the WQMS.
- Translate and publish a simplified version of the WQMS into Zulu.
- Develop simplified summaries of all land use strategies and guidelines for use by the community.
- Involve the community during routine inspections of the catchment, thereby capacitating them to actively participate during the implementation of the WQMS.
- Identify and develop necessary management instruments and tools to assist stakeholders in implementing the WQMS.
- Identify other stakeholders as the need arise, and empower them to participate in the implementation of the WQMS.
- Maintain commitment to the WQMS.

3.3 ACTION PLAN FOR IMPLEMENTATION

The purpose of the action plan is to effect the implementation of the WQMS. Key management actions required for this has been identified, and was discussed under each management approach under section 3.2. The allocation of responsibility and the time frame for the execution of the various actions has been done, as reflected in the Action Plan for Implementation (attached as Appendix B). All effort was made to clearly define actions and allocate responsibility unambiguously. It was endeavoured to adhere to the principle of subsidiarity and responsibilities were placed at the appropriate level that will ensure effective performance of the WQMS.

In addition to the management actions reflected in section 3.2, a number of implementation actions have been identified to ensure the efficient and effective implementation of the WQMS. The list of implementation actions is not exhaustive and should be expanded as future management actions are identified as the strategy is updated and revised.

These implementation actions were categorised as follow:

Strategic actions

- Integrate future development in the Wasbank River catchment with the WQMS.
- Cost-benefit analysis to determine the actual socio-economic impacts associated with each of the management actions.
- Evaluation of the management actions by means of an appropriate water quality simulation model before implementation.
- On-going maintenance and revision of the WQMS.

Operational actions

- Development and calibration of an appropriate water quality simulation model.
- Management and dissemination of information.
- Continued chemical, bacteriological and biological monitoring.
- Maintenance of awareness with respect to progress on the implementation of the WQMS and communication thereof to all stakeholders.

Control actions

- Evaluation and monitoring of implementation of the WQMS.
- Audit achievement of in-stream water quality objectives.
- Audit achievement of compliance requirements and licence conditions.

CHAPTER 4

WAY FORWARD

4.1 INTRODUCTION

The need to fulfil a role, which encompasses the under-mentioned functions, has been identified. These functions are mainly to ensure:

- implementation of the WQMS as agreed upon by all participatory stakeholders
- coherent and consistent implementation of the WQMS
- auditing of the implementation of the WQMS and monitoring programme
- adjustment or revision of the WQMS on a regular basis
- adequate supply of advise/information to role-players.

It is proposed that the above-mentioned role be fulfilled by the Wasbank River Forum, within the framework discussed below. However, it is further proposed that the DWAF remains the custodian of the implementation, auditing and control of the WQMS.

4.2 ESTABLISHMENT OF THE WASBANK RIVER FORUM

As discussed previously in section 1.5, the Wasbank River Steering Committee, constituted of all I&AP's, participated during the process of the development of the WQMS. However, due to the long duration of the project, enthusiasm waned during the course of the development of the WQMS. It is therefore proposed that the existing committee be streamlined to involve only those organisations and/or individuals that are willing and able to make a meaningful contribution, but also be expanded to include those stakeholders that need to come aboard to successfully implement the WQMS, to establish the Wasbank River Forum.

The Wasbank River Forum should be representative of all the major stakeholders in the catchment. Typically, the forum will be comprised as follow:

- three members from national government (2 from DWAF, 1 from Department of Minerals & Energy)
- three members from provincial government (Department of Agriculture and Environmental Affairs, KwaZulu Nature Conservation Services, Department of Health)
- two members from the local authorities
- two members from the Regional Council
- two members from the Regional Water Services Council
- one member from the mining community, representing the operational mines
- three representatives from the agricultural community

- three representatives from the urban community (informal settlements).

Criteria for membership should be founded on current land use. This implies that any activity, organisation or individual will only participate as long as that specific activity, organisation or individual is involved in the catchment. New stakeholders that become involved in the catchment should be identified on an on-going basis and invited to participate on the Forum.

It is envisaged that it would not be necessary for the Forum to convene more than twice a year.

4.3 ROLE OF THE WASBANK RIVER FORUM

The Wasbank River Forum will be a non-statutory, voluntary organisation with no executive powers. It will act as an Advisory Committee who will supply both the role-players and the decision-makers (especially the DWAF) with adequate information and advise on aspects pertaining, in this case, specifically to water quality.

The responsibilities of the Forum are listed in the Action Plan for Implementation (Appendix B), and relates mainly to the following:

- creation of an enabling environment to ensure successful implementation of the WQMS
- on-going maintenance and revision of the WQMS
- management and dissemination of information
- maintenance of awareness with respect to progress on the implementation of the WQMS and communication thereof to all stakeholders
- evaluation and monitoring of implementation of the WQMS
- auditing the achievement of the in-stream water quality objectives.

It is essential that all the members of the Wasbank River Forum be fully committed to the WQMS, as well as to the role to be fulfilled by the Forum, in order for the WQMS to be successfully implemented.

APPENDIX A

MONITORING PROGRAMME FOR THE WASBANK RIVER CATCHMENT

Control points

For the purpose of compliance, the Wasbank River catchment has been subdivided into an Upper and Lower subcatchment. The water quality objectives that should be met within these two subcatchments are similar (refer to Table 2.1, section 2.2), except for sulphate, which is:

- Upper subcatchment : 400 mg/ℓ
- Lower subcatchment : 200 mg/ℓ

The control points for measuring compliance with the in-stream water quality objectives set for each of the two subcatchments are shown on Figure A.1 and listed in Table A.1.

Monitoring programme

The Department of Water Affairs and Forestry established a water quality monitoring network in the Wasbank River catchment during late 1995. Water quality at the twelve control points has been monitored on a monthly basis since December 1995. Apart from the chemical monitoring, bacterial and biological monitoring were conducted as part of the Water Quality Situation Assessment. The current water quality monitoring network was expanded and updated according to the requirements of the WQMS, as summarised in Table A.2. This programme will be implemented in January 2000.

The Wasbank River Forum (refer to chapter 4) should meet bi-annually to review the results as well as the progress made in reaching the in-stream water quality objectives. During this meeting the DWAF should report back on the results of the water quality analysis and the achievement of the water quality objectives.

Table A.1: Control points for the Wasbank River catchment.

| Control point | Description | Longitude | Latitude |
|---------------------------|--|------------------|-----------------|
| UPPER SUBCATCHMENT | | | |
| V6H009 | Wasbank River at Burnside Estate | 30.04.34 | 28.10.44 |
| V6H010 | Manzimnyana River u/s Wasbank River confluence | 30.05.29 | 28.10.23 |
| V6H011 | Wasbank River u/s Uithoekspruit confluence | 30.07.27 | 28.12.45 |
| V6H012 | Uithoekspruit u/s Wasbank River confluence | 30.07.56 | 28.12.16 |
| V6H013 | Wasbank River d/s Busana River confluence | 30.07.20 | 28.17.29 |
| V6H014 | Biggarsgatspruit u/s Wasbank River confluence | 30.09.20 | 28.18.00 |
| LOWER SUBCATCHMENT | | | |
| V6H003 | Wasbank River at flow-measuring weir | 30.08.54 | 28.18.36 |
| V6H016 | Mkomazana River u/s Wasbank River confluence | 30.07.40 | 28.19.02 |
| V6H017 | Blinkwater River u/s Wasbank River confluence | 30.10.24 | 28.20.00 |
| V6H018 | Tholeni River u/s Wasbank River confluence | 30.10.27 | 28.27.10 |
| V6H019 | Wasbank River d/s Tholeni River confluence | 30.10.45 | 28.27.31 |
| V6H020 | Wasbank River u/s Sundays River confluence | 30.06.54 | 28.31.52 |

Table A.2: Monitoring programme for the Wasbank River catchment.

| Monitoring programme | Flow monitoring | Chemical monitoring | Bacteriological monitoring | Biological monitoring |
|-----------------------------|---|--|-----------------------------------|--------------------------------------|
| Responsibility | DWAF | DWAF Licence holders | DWAF | DWAF |
| Points | Flow-measuring weirs at Burnside Colliery | DWAF – control points Licence holders – as per licence conditions | Control points | V6H009 V6H011 V6H003 V6H020 |
| Frequency | Weekly | Monthly | Quarterly | Bi-annually |
| Variables | Flow | Macro: all variables Trace: Al, Fe, Mn (soluble fraction) | <i>E. coli</i> | |
| Method | Visual observation | Grab samples | Grab samples | SASS4 |
| Analyses | - | SABS-methods | SABS-methods | - |

APPENDIX B

WASBANK RIVER WATER QUALITY MANAGEMENT STRATEGY ACTION PLAN FOR IMPLEMENTATION