water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF WATER AFFAIRS
CHIEF DIRECTORATE: RESOURCE DIRECTED MEASURES

THE DETERMINATION OF WATER RESOURCE CLASSES AND ASSOCIATED RESOURCE QUALITY OBJECTIVES IN THE INKOMATI WATER MANAGEMENT AREA

INCEPTION REPORT

Report Number: RDM/WMA05/00/CON/CLA/0113

MAY 2013

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REFERENCE

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INCEPTION REPORT

Report Number: RDM/WMA5/00/CON/CLA/0113

Approved for IWR Water Resources by:

……
Stephen Mallory
Project Manager

13 December 2013
Date

DEPARTMENT OF WATER AFFAIRS (DWA)

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Date

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TERMINOLOGY AND ACRONYMS

BID	Background Information Document
CD:RDM	Chief Directorate: Resource Directed Measures
D:RQS	Directorate: Resource Quality Services
DAM	Desktop adjustment model
DRM	Desktop reserve model
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
ECs	Ecological Categories
EGS	Ecological Goods and Services
EGSA	Ecological Goods and Services Attributes
EI	Ecological Importance
EIS	Ecological Importance and Sensitivity
ES	Ecological Sensitivity
ER	Economic Region
EWR	Ecological Water Requirements
GDP	Gross Domestic Product
G&S	Goods and Services
HDI	Historically Disadvantaged Individuals
IFR	Instream Flow Requirements
IHI	Index of Habitat Integrity
IUA	Integrated Unit of Analysis
IWAAS	Inkomati Water Availability Assessment Study
IWRM	Integrated Water Resources Monitoring
KNP	Kruger National Park
KOBWA	Komati Basin Water Authority
MC	Management class
NGO	Non Governmental Organization
PES	Present Ecological State
PMT	Progress Management Team
PSC	Project Steering Committee
PSP	Professional Service Provider
REC	Recommended Ecological Category
RDRM	Revised desktop reserve model
RHAM	Rapid Habitat Assessment Method
RQO	Resource Quality Objectives
RQS	Resource Quality Services
RWQO	Resource Water Quality Objective
RU	Resource Unit
SCI	Socio-Cultural importance
SPATSIM	Spatial and Time Series Information Modelling
SQ	Sub quaternary
TOR	Terms of Reference
TPC	Threshold of Potential Concern
VEGRAI	Vegetation Response Assessment Index
WIM	Water Impact Model
WMA	Water Management Area
WRC	Water Research Commission
WRCS	Water Resource Classification System
WRPM	Water Resources Planning Model

WRUI	Water resource use importance
WRYM	Water resources yield model

1 INTRODUCTION

1.1 BACKGROUND

The Chief Directorate: Resource Directed Measures (CD: RDM) of the Department of Water Affairs (DWA) initiated a study for the provision of professional services to undertake the implementation of the Water Resources Classification System (WRCS) and determination of the Resource Quality Objectives (RQOs) for significant water resources in the Inkomati Water Management Area. IWR Water Resources was appointed as the Professional Service Provider (PSP) to undertake this study.

1.2 STUDY AREA OVERVIEW

The study area is the Inkomati Water Management Area (WMA) which includes the three main river catchments, the Komati, Crocodile and Sabie catchments (see Figure 1.1). A part of Swaziland falls within the Komati catchment and while the classification process will not apply to Swaziland, the water resources and water use within Swaziland will be taken into account when classifying the resources upstream and downstream of Swaziland.

The Inkomati WMA is located in the north east of South Africa. The WMA consists of three main rivers, the Komati in the South, the Sabie in the North and the Crocodile River in centre. All three of these rivers flow into Mozambique to form the Incomati River which flows into the Indian Ocean just north of the city of Maputo.

The main urban area in the Inkomati study area is Nelpsruit and surrounding towns such as Kanyamazane and White River. The sprawling urban and semi-urban area is centrally located near the Crocodile River. Other significant towns are Barberton, Hazeyview, Sabie, Graskop, Acronhoek, Carolina and Badplaas. Within the WMA there are also large areas of rural or semi-urban development with large populations of largely unemployed inhabitants. The Bushbuckridge area is a good example of this type of development.

Rainfall in the WMA is seasonal with relatively high summer rainfall and zero or minimal rainfall during winter months. Rainfall varies from over 1 000 mm/annum in the high lying area in the west to as low as 500 mm/annum in the east.

Intensive irrigation farming is practiced throughout the WMA but especially in the lower reaches of the Komati and Crocodile Rivers. Sugarcane is the dominant crop but citrus, tropical fruit and nuts are also found. Irrigation is by far the largest water use sector in the WMA.

Forestry is practiced extensively in the high rainfall areas on the upper plateau. Indirect water use by forestry through streamflow reduction is also the second highest user of water in the WMA.

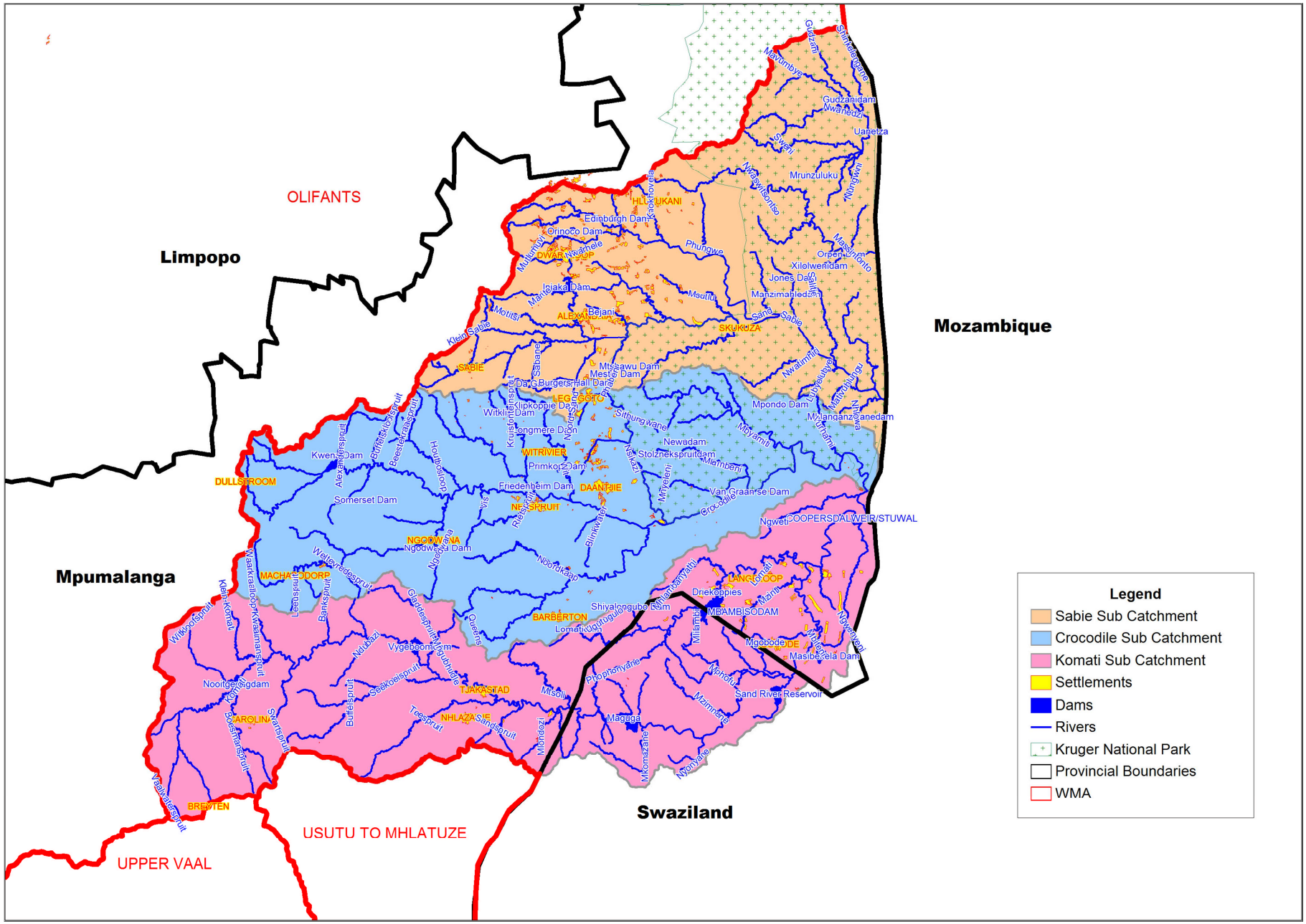

Figure 1.1 Study area: Inkomati WMA

2 AVAILABLE INFORMATION

2.1 HYDROLOGICAL DATA, PREVIOUS AND PARALLEL STUDIES

The most recent source of hydrological data within the Inkomati Water Management Area is the Inkomati Water Availability Assessment. This was a study carried out of DWA and completed in 2009. This study firstly re-evaluate the hydrology of the WMA from first principles using the latest hydrological models and new water use information collected as part of the validation of water use conducted in 2006. The hydrological data was determined at a much finer resolution than in previous studies, with the previously used quaternary catchments being subdivided into quinary catchments. Natural flow, water use and streamflow reduction information is now available at this scale throughout the WMA.

In addition to revising the hydrology for the WMA, the Water Resources Yield Model (WRYM) was also set up to evaluate the water balance within the WMA. While this is one of the tools that could be used for scenario modelling during the classification process, other more advanced models have been set up as part of parallel process and studies to develop operating rules for the WMA. These studies are referred to further in this report as the following:

- Crocodile real-time operating rules
- Sabie real-time operating rules

The Crocodile Operating Rules study was completed about three years ago and then proceeded into an implementation phase which is managed by the Inkomati Catchment Management Agency (ICMA). The purpose of the operating rules is to manage releases from the Kwena Dam and restrict water users when necessary so that the ecological flow requirements and cross-border flows into Mozambique can be sustained.

The Sabie real-time operating rules were completed in April 2013 and will also now move into an implementation phase under the ICMA. One of the main functions of the Sabie operating rules is to determine the releases required from the Inyaka Dam to ensure that the ecological flow requirements of the Sabie River are met.

Other important parallel studies are:

- Verification of Water Use:
  - This study being carried out by the ICMA will improve the knowledge of water use within the WMA.
- Mbombela Reconcilation Strategy
  - This study only focused on the Mbombela Municipal area but the proposed development scenario emanating from this study could have an influence on the classification process.

2.2 RIVER RESERVE STUDIES

The ecological Reserve in the Inkomati WMA has been comprehensively determined. The preliminary Reserve in the Komati catchment was determined in 2006 while in the Crocodile and Sabie river catchments the process was completed in 2010. The ecological water requirements (EWR) determined as part of these studies will form the basis of scenario modelling within the WMA.

A possible concern and issues that will need to be addressed early on in this classification project is the recommended Reserve in the Crocodile River catchment. The preliminary Reserve recommended in this case was the so-called present-day flow. In other words, the intention is to

maintain the current flow regime in order to maintain the ecology of the river in its current state. There are two issues with this that need to be resolved. Firstly, if the ecological state is declining under the current flow regime then maintaining the flow regime will not necessarily maintain the ecological status. Secondly, maintaining the current flow regime implies that there can never be any additional water use in the catchment. This will have serious implications for socio-economic development in the catchment. The suggested approach is to address this problem by reviewing and updating the preliminary Reserve in the Crocodile catchment (where necessary) as part of the classification process.

As already mentioned in section 2.1, processes are in place to ensure that the ecological Reserve is met within the Sabie and Crocodile catchments, at least at broad catchment scale. Within the Komati catchment, the system is operated by the Komati Basin Water Authority (KOBWA) and while the preliminary Reserve is not actively implemented, the recent development of the Strategy and Policy to Implement the Reserve (KOBWA, 2010) indicated that the current operating rules within the Komati River Basin do substantially meet the preliminary ecological Reserve.

2.3 GROUNDWATER STUDIES

The last catchment wide analysis of groundwater within the WMA was carried out as part of the Inkomati Water Availability Assessment (DWA, 2009). This study did not however consider the groundwater resource but only estimated groundwater use. What is clear, however, is that groundwater is not an abundant source of water in the Inkomati WMA or it would have been utilised much more than it has. While there is zone of dolomitic rock stretching through the upper reaches of the Sabie and Crocodile catchments, the typically abundant water resources associated with dolomitic rock formation does not apply in these catchments since the high baseflow in the Sabie and Crocodile River is directly dependant on dolomites. Hence the water resources associated with these dolomites cannot be seen to be a separate resource.

A recent detailed analysis carried out as part of the Mbombela Reconcilation Strategy (DWA, 2013), indicates that there are limited groundwater resources within the largely granitic rock within the Mbombela area. Nevertheless groundwater could be used to supplement the water supply to small villages and isolated communities which cannot easily be supplied from surface water resources.

3 INFORMATION AND REQUIREMENTS

3.1 WATER RESOURCE MODELLING

There are essentially two water resources models available in the Inkomati Water Management Area. The Water Resources Yield Model, which was set up as part of the Inkomati Water Availability Assessment (DWA, 2009), and the Water Resources Modelling Platform (WReMP) (Mallory *et al*, 2011) which was used for most of the other projects listed in Section 1, including the Reserve determination study and the Operational studies, which are already giving effect to the Reserve.

The main difference between these models is that WReMP takes into account the actual operating rules within the WMA in terms of modelling restrictions which are frequently applied to the irrigation sector and hence replicates the actual river flows more realistically than WRYM. It is noted that the ToR for this study requires an evaluation of the models available in the catchment and it is suggested that a decision on which model to use be made as part of this task.

3.2 RIVERINE RESERVE DETERMINATION

3.2.1 Present Ecological State (status quo) of biophysical nodes

A vital contribution to the classification study is the results of the ongoing study: Review and update of the desktop Present Ecological State (PES) and Ecological Importance (EI) – Ecological Sensitivity (ES) of South African rivers according to sub-quaternary catchments: Inkomati Primary Catchment (WRC project number: K5/2041).

3.2.2 Comprehensive Reserve results (2006) study (Komati River (X1))

As mentioned in Chapter 2, a comprehensive Reserve was completed in the Komati catchment in 2006 study. This therefore means that the focus of the EWR quantification during the WRCS will be for the desktop biophysical nodes.

3.2.3 Comprehensive Reserve results (2010) study (Sabie and Crocodile Rivers (X2 and X3))

A detailed comprehensive Reserve study was undertaken by this team. This study was an update of studies that have been taking place since 1996 on the systems and more information is available on these systems than most rivers in the country in terms of EWRs. The results of this study and the modelling have been set up at an extensive number of nodes.

3.2.4 Implementation of the Reserve

Most of the specialists on this study team were involved in the study: Development and Pilot Implementation of a Framework to Operationalise the Reserve (DWAF 2009). As the title implies, this study included pilot studies of which one was the Komati River. Subsequent to this study, IWR Water Resources improved on these methodologies. See WRC report KV 282/11. These improved methodologies are being applied in near-real time to give effect to the Reserve in the Crocodile and Sabie River catchments.

3.2.5 Biomonitoring activities

Biomonitoring has been taking place within the Kruger National Park (KNP) regularly and with a higher frequency since 2006. In addition, there is a River Health Programme that monitors rivers in the remainder of the WMA. The DWAF 2009 operationalisation study also included a monitoring

component. The Rapid Habitat Assessment Method (RHAM) was developed as part of the monitoring component and was pilot tested on the Crocodile and Sabie Rivers amongst others. Monitoring in terms of the RHAM is still ongoing as part of a WRC KNP initiative and as members of this proposed study team are involved in this work, the results can be utilised, especially in the determination of the RQOs.

3.3 SOCIO-ECONOMIC INFORMATION

During the two ecological Reserve studies referred to in Section 3.2 (the Comprehensive Reserve Study of Komati River (2006) and the Comprehensive Reserve Study of the Sabie and Crocodile Rivers) an economic and socio-economic evaluation was carried out. The results of these components of the Reserve studies are well documented and will be used as the starting point for this Classification Study.

The socio-economic results are reported in terms of economic zones and in terms of several user sectors. These zones will be reviewed and revised if necessary as will the sectors. The sectors used in the Komati Catchment can probably be expanded while in the Crocodile Catchment there is probably too much detail in that numerous different crop types were evaluated – probably too detailed for the classification process.

The preliminary review of these economic studies suggests that the information in both reports is out of date and will need to be updated as part of this study. The Stats SA data will be sourced for this purpose and local knowledge will add value to these data sources.

A recent publication by the Water Research Commission on Economic Goods and Services will be sourced and evaluated in terms of the methodologies applied as well as data for the Inkomati WMA. The report by Turpie (for DWA) on Good and Services in the Olifants and Inkomati WMA is also a possible data source.

4 PROJECT PLAN

4.1 INTEGRATION OF WATER RESOURCE CLASSIFICATION SYSTEM AND RESOURCE QUALITY OBJECTIVE STEPS

According to the Terms of Reference (TOR) the main aim of this study is two-fold:

- To co-ordinate the implementation of the Water Resource Classification System (WRCS) in order to classify all significant water resources in the Inkomati Catchment.
- To determine Resource Quality Objectives (RQOs) using the DWA procedures.

It is therefore evident that the classification process has to be applied within the scope of this study and that RQOs must be determined. Underlying these linked processes is also the eight step Reserve process. Even though the Reserve has been undertaken, any integration also has to consider the Reserve steps due to the extremely close relationship between these three processes. To ensure integration of these processes, Reserve determination documentation for Rivers (DWAF, 1999b; Kleynhans and Louw, 2007; DWAF, 2008a) as well as the seven step procedure for determining the water resource class (DWAF, 2007b) and for RQOs and the associated guideline documentation (DWA, 2011c) were consulted by key specialists in the study team. Based on this information an integrated project plan and approach for this study was formulated. Due to the significant overlap within these three processes, the project plan focussed on designing an integrated process and steps. Furthermore, the lessons learnt during pilot studies on the WRCS (the Vaal River) (DWAF, 2007b) were incorporated into the design of this integrated process.

All RQO steps will be addressed and RQOs generated either within the Reserve determination and/or the broader WRCS process. Note that the use of the RQO toolkits has proved to be impractical as much of the information cannot be supplied as Excel spreadsheet format. However, the processes outlined in the toolkits will be followed.

The integrated process is provided in Figure 4.1 (Louw and Scherman, 2012) and forms the basis of the scope of this study. The scope of the study is therefore designed to address all the steps of the Classification and RQO procedures, with the Integrated Steps followed to enable easy understanding and management of the outputs.

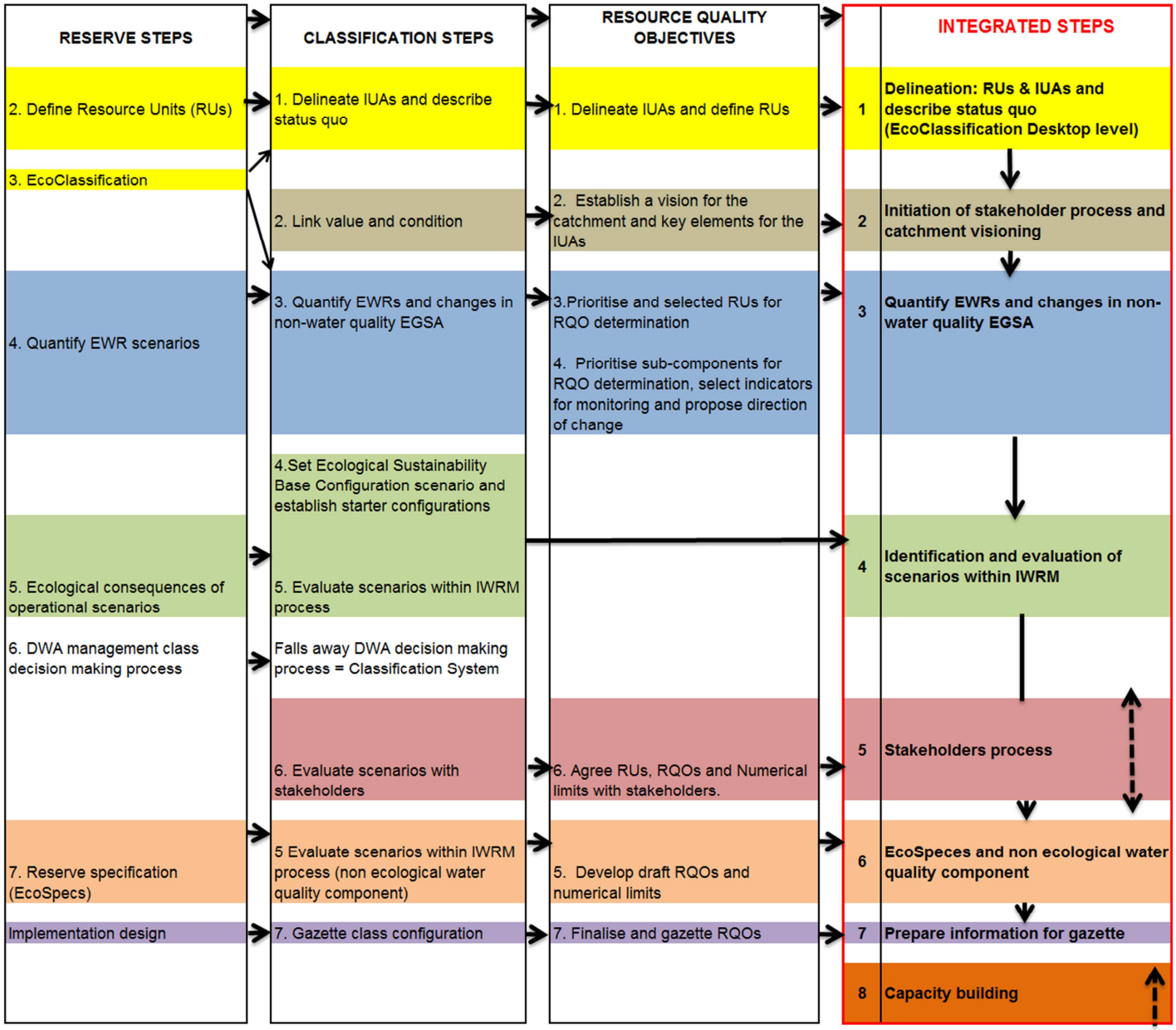

Figure 4.1 Integrated project plan derived from the Reserve, Classification and RQO steps and guidelines

4.2 CHALLENGES

4.2.1 Output of the Reserve study

Reserve results are generated as an EWR rule which is a flow duration table. The natural simulated hydrology is used to generate the final output for the classification process in terms of time series. If the hydrology changes, then the final EWR output is not valid anymore, especially if changes are significant. It was recognised that the hydrology used for the 2006 EWR study of the Komati system was outdated and it is likely that there will be significant changes. Therefore, the basis of the EWRs (dry and wet drought and maintenance EWRs) will have to be used to generate new EWR rules. The problem is further exacerbated as the EWR data and the scenarios that were developed towards the end of the study were not stored in the correct format in Spatial and Time Series Information Modelling (SPATSIM).

4.2.2 Availability of tools used in Reserve and RQO studies

Although some of the tools used during the Reserve determination process have been finalised and manuals provided (e.g. EcoStatus (ecological status) determination process manuals emanating from WRC project K8/619), some other tools are still under development or in an early stage of testing. An example is the process to determine EcoSpecs (ecological specifications) for fish using the output of the Rapid Habitat Assessment Method, which is currently under development by Dr Kleynhans of the Directorate: Resource Quality Services (D: RQS). The availability of this tool will be assessed during the study at the time when required and, subject to approval by DWA; the most recent version available from Dr Kleynhans will be used to generate the results. Note therefore that methods are currently available to determine EcoSpecs for fish. The study specialists will also attempt to be in continuous contact with the developers of the relevant models to ensure they are up to date regarding new approaches and developments. It is of utmost importance that the developers of these tools and models will be prepared to provide guidance, training and manuals to ensure proper and accurate application and results.

The Revised Desktop Reserve Model (RDRM) (Hughes *et al*., 2011) has been developed and documented. The revision was undertaken to provide desktop estimates for rivers with higher confidence and with direct ecological input compared to the existing Desktop Reserve Model. It is proposed to make use of this model in terms of estimating EWRs, but it is acknowledged that this model has not been rigorously tested and/or applied for numerous nodes.

4.2.3 Economic and economic related terminology

Economics, Socio economics and Ecosystem Services are dealt with as separate components of the study. Due to the confusion that often result in the use of the various terms (including Goods and Services, macro-economics and Ecosystem services), an explanation is provided below of the use of these terms within this study:

The economic components considers the formal and market linked economy. This relates to the aspects of the water usage that has a known or estimated value that can be measured as part of the overall economy of the catchment. This component is sometimes called “socio-economic” as changes to the economic usage of water and decisions made to alter resource allocation has a social impact. The social impact is often linked to employment creation (or loss of employment) and increases and decreases in wealth allocated to particular sectors of society.

Ecosystem Services (previously referred to as Goods & Services) refers to the usage of goods, services, and attributes linked to the resource in question. Usage is often, although not always,

linked to communities that are vulnerable and defined as poor. The use of these goods and services is not captured in formal market analysis. This is of particular importance within the context of this study. Ecosystem Services can provide values that contribute to overall economic wellbeing but because these services are supplied without a formal "market" intervention these are often ignored or underestimated.

4.3 STUDY RISKS AND UNCERTAINTIES

A number of factors have been identified that could have a significant influence on the execution and completion of the classification of water resources and determination of the RQOs in the Inkomati WMA. These factors could influence both the cost and the timing of the study. Table 4.1 provides a summary of the activities in the study along with the possible delays, associated cost implications and an explanation of these.

Table 4.1 Possible delays to the study programme and additional costs resulting from Study uncertainties

Task description	Duration (weeks)		Comment
	Possible Duration Delay (weeks)	Possible Increase in Cost (R excl VAT)	
Task D5: Stakeholder processes: Need for more public meetings	12	R250 000	Stakeholder processes always pose a risk since it cannot be known before hand what issues stakeholders will raise and in a truly open and transparent process DWA should respond fully to all issues. Already there have been calls from the ICMA for multiple public meetings while the PSP only allowed for one public meeting based on processes followed in other classification projects.
Task D5: Stakeholder processes: Sector meetings	4	R100 000	While sector meeting have been catered for in the budget, it is not known at the start of the project how many of these will be required. Should additional meetings be requested beyond those envisaged at tender stage then there will be additional time and cost implications.
Task A: Project Management: Technical Task Group meetings	2	R50 000	The ToR refers to possible 'Technical Task Group Meetings but did not indicate how many these there could be. There is a risk that these meeting could escalate and delay the project.

The above possible additional costs will be dealt with in two ways. Firstly, the ICMA will be approached for funding should they insist on additional public meetings. Secondly, other possible additional meetings (sector meetings and support group meetings) will be absorbed within the existing budget by reducing expenditure on other items.

5 SCOPE OF WORK: PROJECT MANAGEMENT, INCEPTION, AND INFORMATION COLLATION

5.1 TASK A - PROJECT MANAGEMENT

The objective of this task is to ensure effective, efficient and pro-active management. The aim is to ensure that comprehensive technical documents that detail the results of a successful study process are delivered on time, on budget and as per brief. This task requires a multi-disciplinary team and the management structure has been designed accordingly.

5.1.1 A1 Project Management Meetings (Progress meetings)

The proposal caters for five Project management committee (PMC) meetings to be held in either Nelspruit or Pretoria. The Client has accepted responsibility for the provision of venues and dates of the meetings as well as providing the agenda and the minutes. A detailed progress report will be provided by the PSP prior to every meeting. An additional PMC meeting, which serves as the inaugural or inception meeting, will be held at the initiation of the study to approve the inception report.

Task responsibility: Mallory, Louw, Lotter
Actions

- Prepare progress reports.
- Participate in meetings.

Deliverables and milestones

- Progress reports – Deliverable 1.

Responsibility of the Consultant

- Preparation of the progress reports and participation in the meetings.
- The Consultant is not responsible for the logistical arrangements of meetings, the agenda or the minutes.

5.1.2 A2 Technical team management and coordination

Integration and coordination between the various tasks is essential as well as the technical management of the tasks. All coordination within, and between tasks (i.e. between task leaders) are included here.

Task responsibility: Mallory, Louw, Koekemoer, van Jaarsveld
Actions

- Liaison as and when required.

5.1.3 A3 Project Steering Committees

Stakeholders representing specific sectors of society (e.g. agriculture, mines, government (local, provincial and national), and conservation) will be identified at the Public meeting and asked to serve on a Project Steering Committee (PSC) for the duration of this project. The PSC members will provide representative inputs and perspectives, ensure strategy implementation and provide strategic advice and guidance. All reports will be made available to PSC members for their comments and approval.

Three meetings are allowed for in the budget of this task. Meetings are to be held in Nelspruit and it is anticipated to take place at six monthly intervals to ensure discussions at key milestone of the project as follows:

PSC meeting 1:

Discussion: Status quo assessment and delineation of Integrated Unit of Analysis (IUAs). Identification of priority areas and desktop biophysical nodes.
Catchment visioning for IUAs based on Status Quo.

PSC meeting 2:

Discussion: EWR results for EWR sites.
Selecting and defining operational scenarios.

PSC meeting 3:

Discussion: Consequences of operational scenarios (estuary, river, economics, EGSA).
Presentation of Management Classes (MC).
RQOs.

Invitation letters and proposed agendas will be distributed to the PSC members providing them with sufficient information about the status of the project, the purpose of the meetings and what will be expected of them (e.g. read through documents prior to the meeting and provide inputs and comments) before each PSC meeting. Discussions of each meeting will be recorded and minutes will be compiled and distributed within two weeks of each meeting.

Task responsibility: Mallory, Lotter, Louw D, van Jaarsveld

Information required

- An agreed list of PSC members following on from the 1st stakeholder meeting.

Actions

- Keep PSC member list up to date throughout the course of the project.
- Two weeks before each meeting, compile an invitation letter and agenda and distribute electronically to all PSC members.
- Compile minutes of each meeting and distribute within two weeks after each meeting.
- Obtain approval from DWA for the distribution of all documents prior to distribution.
- Arrange logistics for all meetings (arrangement of venue, catering (if not held at DWA), printing of attendance registers and related supporting documents, arrangement of projector and laptop).

Deliverables and milestones

- Invitation letters, agendas, attendance registers and minutes of the PSC meetings as mentioned above.
- PSC membership list.
- Invitation letter to identified stakeholders to become members of the PSC.
- Terms of Reference for the PSC.
- Project Steering Committee meetings (Deliverable 2)

Responsibility of the Consultant

- Confirmation of information to be discussed at each meeting one month before the meeting.
- Approval of the DWA on all documents that will be made public prior to distribution.
- Inviting PSC members to attend meetings – however consultants will not be responsible to ensure attendance of any member.
- Review of the BID which the client will prepare.

5.1.4 Technical Task Group (TTG) meetings

Technical Task Group meetings will be held as and when required to discuss and resolve technical issues.

Task responsibility: Mallory, Louw and whichever Task leader is responsible for the technical issue to be discussed.

Information required

- Details of the technical issues to be addressed. This will come out of Steering Committee Meetings.

Actions

- Clearly document the issue.
- Prepare a presentation for the TTG.
- Carry out logistic arrangements for the TTG.

Deliverables and milestones

- A technical note which gives the background to the problem and documents the agreed solution.

Responsibility of the Consultant

- Logistic arrangements for the meeting
- Preparation of the Technical Note

5.1.5 A4 Financial management

Financial management consists of the management of the project budget including the monthly invoices, budget balancing and cash flow projections. Invoices will be time and cost based as per contract. Monthly invoices will be provided if work has been undertaken for the study as well as a monthly summary progress report. Outputs and deliverables (where applicable) will also be provided as a portfolio of evidence for the reporting period.

Task responsibility: Mallory, Louw

Actions

- Prepare monthly cash flow projections.
- Prepare monthly invoices.
- Provide summary progress report to accompany invoices.

Deliverables and milestones

- Invoices and cash flow projections.

5.2 TASK B - PROJECT INCEPTION

The objective of the project planning and process integration task is to produce a concise, clear and unambiguous Inception Report. This is required to ensure the Client and consultants are clear as to the deliverables, timing and budget of the programme. The project inception phase will involve assessing available information as obtained during Task C to refine the scope of work through liaison with the DWA project manager. During the project inception, agreement will be reached with the Client on the following aspects:

- Obtain consensus on the approach of this study.
- Prioritisation of additional sites (nodes) and scenarios within the constraints of the study budget.
- Evaluation and agreement of information sources to be applied in the study especially where the data differs significantly.
- Capacity building activities. This includes formal training and mentorship.

Task responsibility: Mallory, Louw D, Lotter, van Jaarsveld

Information required:

- Information from DWA regarding Rapid Reserves and the Intermediate and Comprehensive Reserves on the Komati, Sabie and Crocodile Rivers. Already obtained.
- Hydrological models and setups. Already obtained.

Actions

- Internal planning liaison.
- DWA inception meeting (see Task A1. Complete)

Deliverables and milestones

- DWA inception meeting (29 April 2013). Complete
- Draft Inception Report: 31 May 2013 – Report 1.
- Sub-consultants appointed (D4): Jun 2013

Responsibility of the Consultant

- Ensuring that agreement is reached during negotiations and are incorporated in the Inception Report and conveyed to the rest of the team.
- Appoint the sub-consultants as approved by the DWA. Note however that the Consultant cannot be held responsible if indicated specialists resign or leave their work – however it is the responsibility of the consultant to find suitable replacements. Any replacements must be agreed on by the Consultant and the Client.

5.3 TASK C - WATER RESOURCE INFORMATION AND DATA GATHERING

The information on the water resources will be based on the latest hydrological and modelling tasks from the various studies in progress in the WMA. This data is available at high resolution (mostly sub-quaternary) and appropriate level of confidence. No gathering of data will be required. It is proposed that a summary of the data and information be prepared in line with the Classification Study procedures.

In preparation for the identification of the IUAs and biophysical nodes, a description of the water resource components, operating rules and relevant development planning considerations will be compiled.

The proposed study team is not aware of any catchment-wide water quality model for the study area and therefore detailed simulations of water quality will not be possible in the Classification Study. However, from previous work carried out in the WMA (DWA, 2010b) we believe detailed modelling is not necessary in the WMA. Should hot spots be identified that require modelling (e.g. Ngodwana paper mill, mine water decant in the upper Komati) then water quality modelling can be carried out at this local scale up to the point in the downstream catchment where dilution makes further modelling unnecessary.

Reserve information will be obtained from existing reports.

Task responsibility: Mallory, Desai, Louw D

Information required

- Information from previous study reports.
- Information from the DWA Reserve database and DWA directorates active in the study area.
- All available flow and dam balance information from DWA.

Actions

- Data gathering and desktop analysis of available information.

Deliverables and milestones

- Data availability tables (Water resources and Reserve) - July 2013 (Deliverable 5).

Responsibility of the Consultant

- Collect, collate and review of all the required water resources information available.

5.4 TASK D - DETERMINATION OF THE MANAGEMENT CLASS AND RQOs

This task forms the major component of the study and is addressed in Chapter 6 according to a hierarchical task structure which is summarised in Table 5.1.

Table 5.1 Tasks and subtasks proposed for the Determination of the Management Class and RQOs

TASK STRUCTURE
TASK D: DETERMINE MANAGEMENT CLASS & RQO: TASK STRUCTURE
TASK D1: DELINEATE IUA & DESCRIBE STATUS QUO
Task D1.1 Water resources component
Task D1.2 Economic Component
Task D1.3: Goods & Services component
Task D1.4: Water Quality Status Quo
Task D1.5 Rivers and associated aquatic ecosystems
Task D1.6: Integration of above components to identify and define IUAs
Task D1.7: Identification of river biophysical nodes and level of assessment.
Task D1.8: Status Quo Report
TASK D2: INITIATION OF THE STAKEHOLDER PROCESS AND CATCHMENT VISIONING
Task D2.1 Stakeholder Identification and database compilation
Task D2.2 Project Announcement (BID and Advertisement)
Task D2.3 Issues and Response Report
TASK D3: QUANTIFY EWRS AND CHANGES IN NON-WATER QUALITY EGSAS
Task D3.1 Setting up system model and provision of natural and present day data.
Task D3.2 EWRs for key biophysical nodes (EWR sites)
Task D3.3 EWRs for desktop biophysical nodes
Task D3.4 Consequences of G & S at sites where the REC is an improvement of the PES
Task D3.5 EWR report
TASK D4 IDENTIFICATION AND EVALUATION OF OPERATIONAL SCENARIOS TO IDENTIFY CONSEQUENCES
Task D4.1 Identification of scenarios
Task D4.2 Ecological consequences
Task D4.3 Economic consequences
Task D4.4 EGSA consequences
Task D4.5 Water quality consequences
Task D4.6 Integration of consequences to provide preliminary Management Class for stakeholder evaluation
TASK D5: STAKEHOLDER INVOLVEMENT
Task D5.1 Newsletters
Task D5.2 Public meeting
TASK D6 RQO
Task D6.1 EcoSpecs & TPCs
Task D6.2 Non-ecological water quality
Task D6.1 Groundwater RQO
TASK D7: IMPLEMENTATION PLAN
TASK D8:CAPACITY BUILDING
TASK D9: MAIN REPORT
TASK 10: PREPARING INFORMATION FOR GAZETTING (TEMPLATES)

6 DETERMINATION OF THE MANAGEMENT CLASS & RQOS: TASK D

6.1 TASK D1: DESCRIBE STATUS QUO, DELINEATE IUAs AND RUs, IDENTIFY BIOPHYSICAL NODES

The objective of defining Integrated Units of Analysis (IUAs) is to establish broader-scale units for assessing the socio-economic implications of different catchment configuration scenarios and to report on ecological conditions at a sub-quaternary (SQ) scale. IUAs are therefore a combination of the socio-economic zones defined in watershed boundaries, within which ecological information is provided at a finer scale.

The objective of this task is to describe and document the status quo which includes various components such as water use, economy, EGSA, river and wetland ecology, etc, and to identify water quality problems. This information is used to define the IUAs. The process is summarised in a flow diagram, Figure 6.1. Once the IUAs are delineated, biophysical nodes must be identified for different levels of EWR assessment.

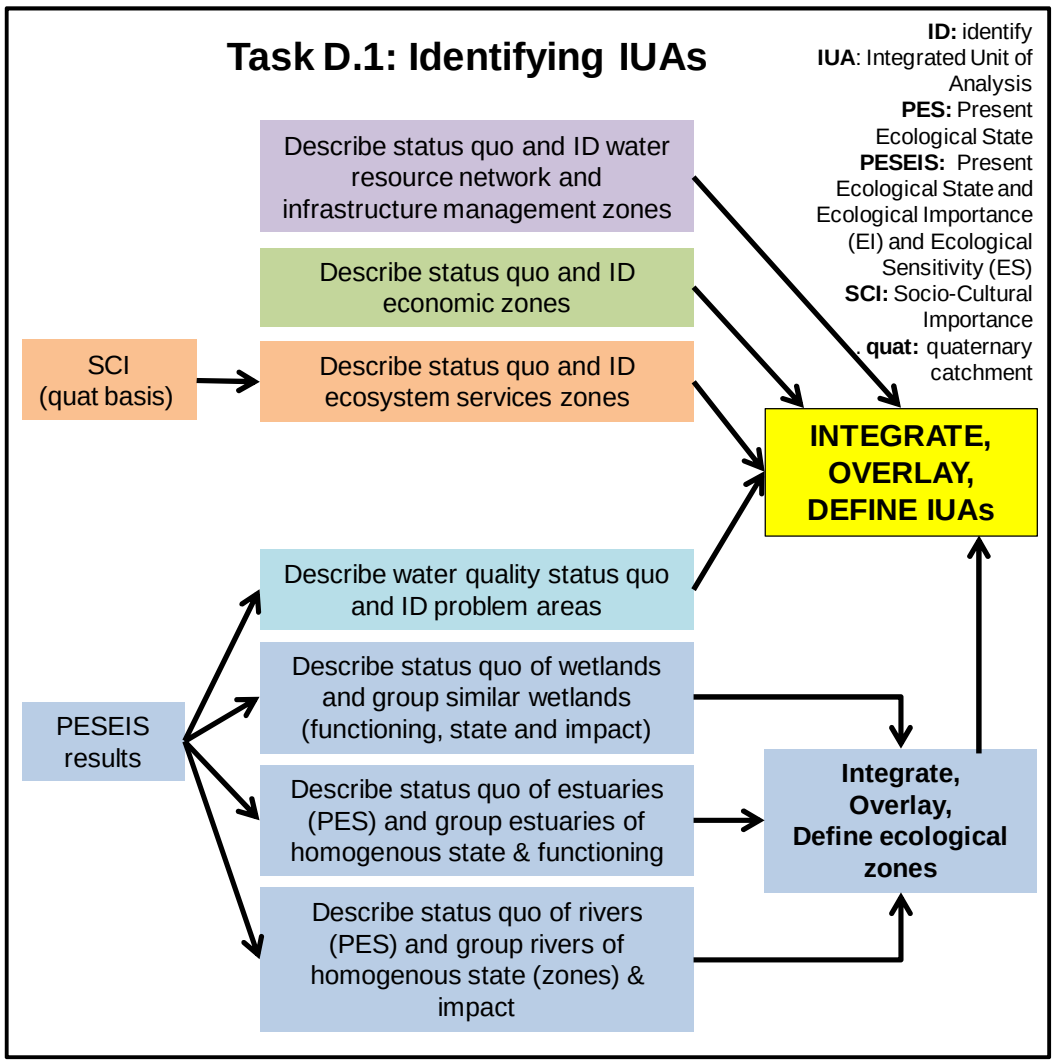

Figure 6.1 Summary of process to identify IUAs

6.1.1 Task D1.1: Water resources component

The water resource network and infrastructure information from previous water resources studies will be assessed for the purpose of defining the IUAs, identification of nodes and sites with respect

to water abstraction infrastructure. Operational and development planning information from the previous studies will be integrated in the definition of the IUAs and nodes. The most up to date information on the water use as well as data for possible future scenarios will be summarised for use in the scenario evaluation task. This task will include collection and reporting on the groundwater resources and groundwater use.

A consolidated description of the water resource network and infrastructure will be compiled and all nodes for analysis will be identified and presented. Coordination with the ICMA and KOBWA will ensure appropriate nodes are built into the models.

As part of this assessment, the Water Resource Use Importance (WRUI) must be undertaken as well as the Socio-Cultural Importance (SCI). These will likely be undertaken on a sub-quaternary scale but grouped where similar.

Task responsibility: Mallory, Desai, Holland

Information required

- Schematics of all model networks and configurations.
- Reports of all available hydrological and yield analysis studies including operational models.

Actions

- Develop map of all important land and water use information, major dams (including planned), points with acceptable observed data and planned operational strategies. Also an indication of level of modelled data confidence.
- Develop summary of all major water and land uses.
- Undertake a Water Resource Use Importance (WRUI) assessment

Deliverables and milestones

- Spreadsheets with WRUI results: July 2013 – Deliverable 6
- Status quo of water resources described and operational zones defined: July 2013 – Deliverable 6.

6.1.2 Task D1.2: Economic component

It is proposed that the Inkomati WMA be sub-divided into eighteen water economic zones to accommodate the different climatic and economic realities of the catchment. The factors considered for the sub-division of the catchment will include the climatic conditions, the economic activities, the operation of the water resources infrastructure and the scheduled water use per hectare in the case of irrigation agriculture.

The Inkomati catchment has four distinct socio-economic characteristics which can be described as follows:

(i) Commercial forestry located in the upper reaches of the Komati, Crocodile and Sabie catchment.
(ii) Irrigated agriculture with its high value crops, such as citrus, avocados and bananas located in the middle and lower reaches of the Komati, Crocodile and Sabie River catchments.
(iii) Irrigated agriculture of sugar cane in the lower reaches of the Crocodile and Komati River catchments.
(iv) The residential areas of the Nelspruit and surrounding towns.
(v) The tourism sector which is situated mostly in the lower reaches of the Sabie and Crocodile River catchments and relates mostly to presence of the world renowned Kruger National Park.

The present-day socio-economic status of the whole catchment will be described and quantified based on the economic social level using appropriate economic and social models.

In the Inkomati WMA it is necessary to model the value of water used by each of the main water users that exist within each sub-system. These water users include:

- Irrigated Agriculture that includes high value crops (citrus, avocados, bananas) and lower value crops (sugar cane).
- Game Farming outside the Kruger National Park and eco-tourism activities in and outside the Kruger National Park.
- Commercial Forestry.
- Domestic Households, especially the rural communities.
- Mining (coal, gold, and magnetite)
- Industry (saw mills, sugar mills and metal processing), and
- Ecology.

The value of water within this context will not only be the direct value but also consider the value chain of linked activities. This is especially important for the irrigation sectors which supports many associated industries such as packaging, processing and transport.

Task responsibility: van Jaarsveld, van der Merwe

Information required

- Hydrology: Volume of water used per activity per catchment (domestic, irrigation, and industry).
- Information to be collected includes:
  - Irrigation database: Hectares, crops specification, production budget requirements (ton/ha), labour requirements for the different users in this sector.
  - Commercial Forestry: Production budget
  - Heavy Industry: Saw Mills (forestry beneficiation).
  - Metal refining industries
  - Mining activities
  - Power generation

Actions

- Analysis of economic activity for the catchment and disaggregating of activities into regions:
- Develop applicable Water Impact Model (WIM) for each Economic Regions.

Deliverables and milestones

- Prepare Economic Zone baseline of the major water users for the Status Quo Report (Report 2): August 2013 – Deliverable 7.
- Economic regions description with quantification of economic sectors per region (provided in the Status Quo Report, Report 2).
- A framework or methodology to evaluate the consequences.

6.1.3 Task D1.3: Ecosystem Services

The present-day socio-economic status of the whole catchment will be described, based on the economic and social importance assessed from a literature review as well as mapping information and site visits if required. This information is mostly already available from the Reserve studies carried out in the WMA. Where quantitative data is not available a qualitative description will be provided. The objective of describing communities and their well-being within each socio-economic region to provide the baseline against which to estimate changes in social wellbeing for each of the catchment configuration scenarios evaluated. This requires a description of the levels of financial,

physical, human, social and natural capital available to each community, and constructing a measure or index of social well-being from the data collected.

It should be noted that the objective in describing and valuing the use of aquatic ecosystems is to determine the way in which aquatic ecosystems are currently being used in each socio-economic region, and to estimate the value generated by that use. This will provide the baseline against which the socio-economic and ecological implications of different catchment configuration scenarios can be compared.

It is important to point out that while Ecosystem Services will be identified and described in qualitative terms, a baseline value can often only be described for some of these, as the information required is not available without investing in a costly survey. As such it is therefore more practical to measure changes in Ecosystem Services relative to a reference point rather than computing a baseline value. As such, values with importance in terms of Ecosystem Services will be analysed in this step and the value will be attached as an output of Tasks 4 and 5 (Steps 4 and 5).

Water quality input to the Ecosystem Services component will be provided as part of the consequences of scenarios on Ecosystem Services.

Task responsibility: Huggins
Information required
- Economic information.
- Demographic information.
- Maps of the study area and Economic Zones.

Actions
- Identifying Ecosystem Services provide importance and complete a Socio-Cultural Importance evaluation.

Deliverables and milestones
- Delineating and describing communities that are deemed to be important with respect to Ecosystem Services: July 2013 – Deliverable 8.
- SCI importance for quaternary catchments

Responsibility of the Consultant
- Provision of the Status Quo Ecosystem Services component.

6.1.4 Task D1.4: Water Quality Status Quo

This task will utilize all available information to identify water quality issues (surface and groundwater) and problems in the catchment, including areas outside of the ecological biophysical nodes and EWR sites. Present state assessments will therefore be conducted where data are available and where water quality hot spots have been identified. The Reserve results area available for the catchment.

Task responsibility: Scherman, Holland
Information required
- Water quality metric information from the PESEIS project.
- All Reserve-related water quality data currently available for sites in the WMA.

Actions
- Water quality analysis and producing a map showing water quality hotspots, with associated reasons.

Deliverables and milestones

- Water quality component of the Status Quo Report: July 2013 – Deliverable D9.

6.1.5 Task D1.5: Rivers and associated aquatic ecosystems

Currently a country wide study, commissioned by DWA and the WRC is being undertaken to determine the PES and Ecological Importance (EI) – Ecological Sensitivity (ES) of South African Rivers at sub-quaternary (SQ) level; referred to as the PESEIS study. SQ reaches are delineated on the basis of hydrological changes, i.e. at tributary confluences and is provided by DWA: Resource Quality Services (RQS). Each of the SQ reaches represents a Resource Unit (RU), i.e. the length of river for which a status assessment and EWR assessment will be valid for.

The Present Ecological State (PES) information used as part of this process will therefore be sourced from the desktop PESEIS study. It is imperative that DWA should give guidance and make the final decision on which EI and ES ratings should be used (i.e. those based on medians, maximums, etc.) as it is contained in the final model.

During this task, existing information on wetlands obtained from the Reserve study and the PESEIS information will be used to group river related wetlands and to determine importance. The wetland status quo assessments will also be incorporated and used together with the river information to define the ecological zones. All of the above mentioned information will be captured in excel spreadsheets that will allow integration of the different parameters or metrics considered (such as river PES, river EI, river ES, wetland PES, wetland EIS).

The water resource zones will be used as an indication of how the system is being operated and the different land uses. Within these (as these zones are usually at a larger scale than the final IUAs), the different Ecological Categories (ECs) for each of the SQ reaches (276) will be assessed and grouped according to similarity of impacts and state.

Task responsibility: Kotze P, Louw D, Mackenzie J, Deacon A, Huggins G, Koekemoer S
Information required

- PESEIS results in the required format (available).
- Wetland and water quality information in the correct format.
- Economic and hydrology zones.

Actions

- Specialist session to integrate results, overlay and determines ecological zones. Status quo will also be summarised

Deliverables and milestones

- Status quo assessment of rivers and wetlands (PESEIS) and identified ecological areas of homogenous state: August 2013 - Deliverable 10.

6.1.6 Task D1.6: Integration of above components to identify and define IUAs

All information generated during the preceding tasks will be used to integrate the results by overlaying the different zones and defining the IUAs (Figure 6.1). These IUAs will be presented to the steering committee and the final IUAs documented in the Status Quo Report.

Task responsibility: Louw, Mallory, van Jaarsveld, Huggins
Information required

- Maps illustrating the outcomes of all information emanating from Tasks D1.1 to D1.6.

Actions

- Meeting.

Deliverables and milestones

- IUAs identified and mapped: August 2013 - Deliverable 11

6.1.7 Task D1.7: Identification of river biophysical nodes and level of assessment

IUAs are a combination of the socio-economic region defined in watershed boundaries, within which ecological information is provided at a finer scale. This requires that biophysical nodes be nested within the IUAs (DWA, 2007b). As a starting point, each SQ reach being assessed will represent a biophysical node. Due to the large number of nodes, the process described in the Classification guideline (which refers to the Desktop EcoClassification and the identification of hotspots (Louw & Huggins, 2007)) will be used to identify the final nodes for which EWRs will be assessed and at what level. The focus will be on the desktop biophysical nodes, as the EWRs from the Reserve study are accepted.

The process used is described in Figure 6.2 and relies on the results of the PESEIS study. The total number of initial biophysical zones within the Inkomati WMA is 276 river nodes. It is proposed that all the nodes are considered in terms of ecological requirements, but that approximately 150 - 200 be selected for EWR estimation. Nodes that will not be used for estimation are those lying within the KNP and those with no water resource demands on them (often ephemeral drainage lines).

As part of this assessment, the Water Resource Use Importance (WRUI) must be undertaken as well as the Socio-Cultural Importance (SCI). These will likely be undertaken on a sub quaternary scale but grouped where similar.

Task responsibility: **Louw,** Koekemoer, Kotze, Mackenzie

Actions

- Specialist meeting (part of Task D1.5).
- Analysis of results.

Deliverables and milestones

- River biophysical nodes (which can include wetlands) and level of EWR assessment identified: September 2013 – Deliverable 12.

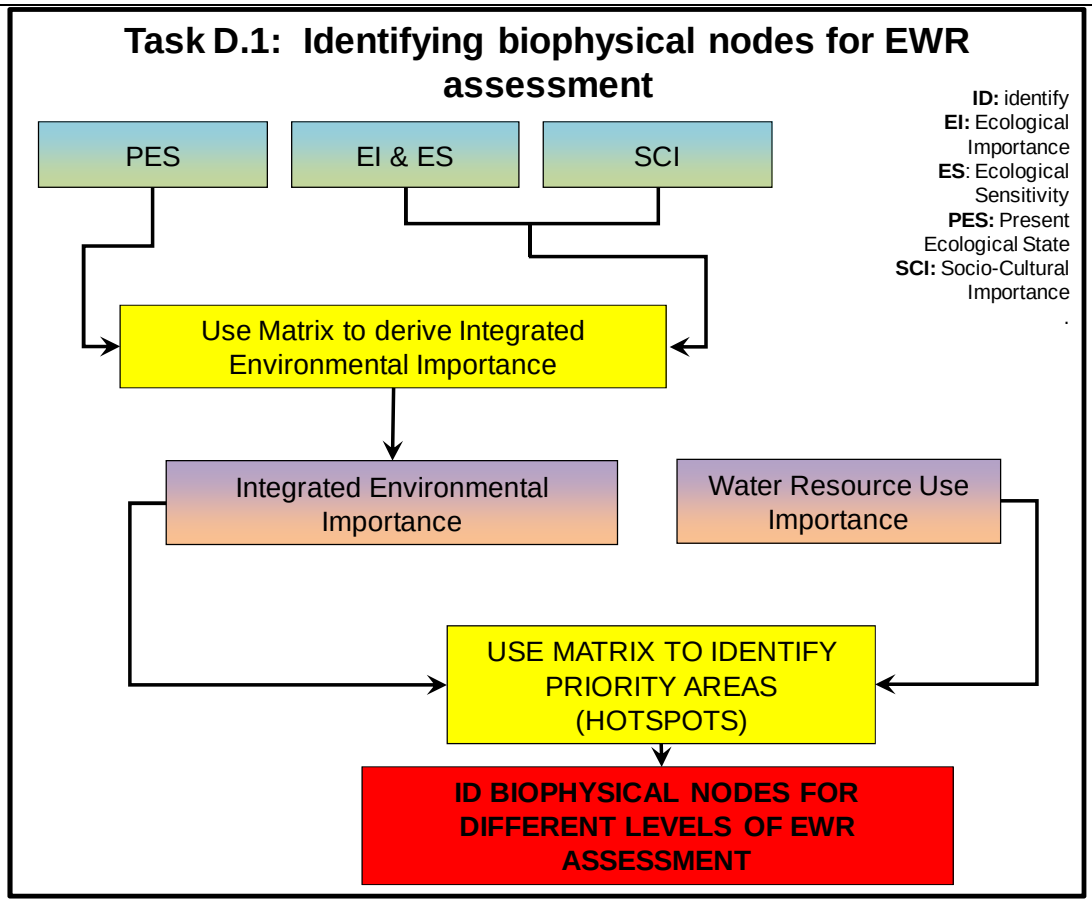

Figure 6.2 Summary of the process to identify biophysical nodes for EWR assessment

6.1.8 Task D1.8 Status Quo Report

All the above information will be documented in a report which will provide the approach, reasoning and results regarding the selection and locality of biophysical nodes and IUAs.

Task responsibility: Louw D, Koekemoer, Mallory
Deliverables and milestones

- First draft Status Quo Report: September 2013 – Report 2 which includes all information generated during Tasks D1.1 - D1.9.

6.2 TASK D2: INITIATION OF STAKEHOLDER PROCESS AND CATCHMENT VISIONING

The stakeholder engagement process has to complement the technical activities which are proposed within the project. It should be designed to ensure that stakeholder inputs feed into the technical process and simultaneously, the technical process has to empower stakeholders to assist with their inputs to ensure the efficient classification of water resources.

6.2.1 Task D2.1 Stakeholder identification and database compilation

The identification of stakeholders will be an on-going process, refined throughout the process as the on-the-ground understanding of affected stakeholders improves through interaction with various stakeholders in the Inkomati WMA. The identification of key stakeholders and community representatives for this project is important and will be done in collaboration with the ICMA and the Department, and stakeholders in the study area.

Stakeholders' details will be captured on an electronic database management software programme that automatically categorises every mailing to stakeholders, thus providing an on-going record of

communications. In addition, comments and contributions received from stakeholders are recorded linking each comment to the name of the person who made it.

Typically, our team would identify stakeholders representing the following sectors of society:

- National, provincial and local government (relevant local and district municipalities);
- Relevant residents' associations, rates payers organisations, community based organisations, agricultural organisations and Non Government organisations (NGOs);
- Environmental and water bodies, forums, groups and associations;
- Private sector (mining, business, industries) in the vicinity;
- Civil society; and
- Regional and local media.

The draft database will be compiled during the first few weeks of the project implementation period; however a database is dynamic and will be constantly updated as more information becomes available and as stakeholder information change. The ICMA has an existing database that will be used as a basis for the development of a specific database for this project.

Announce the project

The study will be announced by means of the following:

a) Background Information Document (BID);
b) Public meeting to be held on 12 June 2013;
c) At fora meetings in the Inkomati WMA;
d) On the web sites of the DWA and ICMA;
e) Local Radio Station;
f) Local Print Media.

A Background Information Document (BID) will be compiled for distribution to all stakeholders that are listed in the database. The purpose of this document will be to announce that the DWA is undertaking the classification process of significant water resources in the Inkomati WMA, the proposed process to be followed, anticipated activities, proposed time lines as well as how stakeholders can become involved in the project.

The BID will be accompanied by an announcement letter and a comment/reply sheet to provide people the opportunity to comment on the classification study and to register as a stakeholder or provide names of other possible stakeholders.

This document will also aim to explain the necessity of the project and the context of the study. Information such as where more information can be obtained, the web address for downloading of information, etc will also be shared. At this early stage in the project stakeholders will be requested to provide their comments and inputs. Responses will be captured in an Issues and Responses Report.

The Inkomati WMA has several active fora (irrigation boards, committee's, etc) and the study to be undertaken will be announced at each of these forum meetings.

The Departmental and ICMA web sites will be used to publish documents for stakeholder review and inputs. The BID will be the first document to be published. Stakeholders will be made aware of these web sites in the BID and also at the public meeting to be held on 12 June to announce the commencement of the study.

Task responsibility: A Lotter, ICMA (for project announcement)
Information required

- Stakeholder databases from the ICMA, existing fora and recent DWA studies

Actions

- Develop a stakeholder database in close liaison with the ICMA
- Facilitate the distribution of background information

Deliverables and milestones

- BID (to be drafted by DWA and reviewed by the PSP)
- *Production of a stakeholder database*
- *Maintenance and updating of the stakeholder database during the duration of the project.*

6.2.2 Task D2.3 Issues and Responses Report

An Issues and Responses Report will be compiled and updated throughout the period of the implementation of the project. This report will list all the comments from stakeholders (to be received from comment sheets, at meetings, via telephone calls, etc) and responses from the project team. Towards the end of the project, one consolidated Issues and Response Report will be available – recording all the issues and comments raised throughout the project duration.

Task responsibility: A Lotter

Information required

- Minutes from public and stakeholder meetings

Actions

- Develop an issues and responses report

Deliverables and milestones

- Issues and responses report

6.2.3 Visioning

Catchment visioning is a requirement of the RQO process and has been included in Task 2 of the integrated process. At the first PSC meeting where stakeholders will be presented, the status quo in the catchment for various aspects (ecology, economy, water resources, Ecosystem Services) will be presented and the reasons for the status provided. Preliminary IUAs will also be presented. Stakeholders will be required to indicate what their catchment vision are and how they would like the status quo to change. At the end of the study, this vision will be revisited as the implications on different users and the ecology will then be presented and based on this, the future vision will be refined.

Task responsibility: A Lotter, Mallory S, Louw D, Scherman P

Information required

- Minutes from public and stakeholder meetings

Actions

- Compile a visioning report

Deliverables and milestones

- Visioning report

6.2.4 Stakeholder engagement plan

In addition to the three Project Steering Committee and two Public meetings (the 2nd subject to budget being made available by the ICMA), Catchment and River forums meetings and different sector meetings (e.g. municipality, domestic, industrial, and agricultural) will be conducted by the DWA and ICMA with the support of the PSP in order to implement their Stakeholder Engagement Plan. The purpose of the engagement will be as follows:

- To serve as information sharing with different sectors.
- To engage with key stakeholders in each sector on the water related issues of the Inkomati WMA.
- To provide the opportunity for each sector to comment and raise issues on project deliverables.

The stakeholder involvement process which will be followed by the PSP for this project is described in Section 5. Note that this is additional to the stakeholder activities described above and undertaken by DWA and the ICMA.

6.3 TASK D3: QUANTIFY EWRS AND CHANGES IN NON-WATER QUALITY ECOSYSTEM SERVICES

6.3.1 Task D3.1: Setting up system model and provision of natural and present day data

Since the high resolution models suitable for analysis of biophysical nodes are available in the Inkomati WMA, it is anticipated that only minor adjustments will have to be made to account for particular requirements for the Classification Study.

Significant groundwater resources will be identified in the study area based on the hydrological analysis from the Inkomati Water Availability Assessment Study IWAAS Study and more recent work carried out as part of the Mbombela Reconciliation Strategy Study. Particular attention will be given to the area where the groundwater-surface interaction is prominent and is likely to influence river base flow.

While existing nodes in models will be used, new nodes will be added for hotspots that are identified during the course of the study. All nodes will be linked to PES/EIS study. It is possible that the PES /EIS study will reveal the necessity for additional node. If this is the case then these additional nodes will be added.

Task responsibility: Mallory, Desai
Information required
- WReMP configurations
- Required biophysical nodes

Actions
- Run WReMP and obtain required natural and present day data

Deliverables and milestones
- System model set up with all nodes
- Provision of natural and present day hydrology at all nodes: October 2013 – Deliverable D15

6.3.2 Task D3.2: EWRs for key biophysical nodes (EWR sites)

There are six EWR sites in the Komati and 15 in the Sabie and Crocodile Catchments, Although these Reserves are in the process of being signed off (with the Komati already signed off), the decision on the Ecological Category and associated Ecological Reserve must now be revisited as part of the stakeholder programme in terms of the selected operational scenario and Management Classes. The flow duration table (the Reserve output (a .rul table)) for the Komati is however not stored in the correct format within the Spatial and Time Series Information Modelling (SPATSIM) framework so that adjustments can be made and changes where required for future scenario evaluation. During this task, the existing results will be converted within SPATSIM if possible.

Task responsibility: Louw D, Hughes

Information required

- Require revised natural flow regime at the EWR sites from Task D3.1.
- Require the previous study's EWR results – original and scenarios.

Actions

- Source available data
- Regeneration of EWRs and the rules associated with the scenarios.

Deliverables and milestones

- Modified EWR rules: November 2013 (Deliverable D16)

Responsibility of the Consultant

- The consultant is not responsible for redoing a Comprehensive EWR if the results with the new hydrology indicate that there are problems. In this (unlikely) situation, the EWRs will be adjusted with available information

6.3.3 Task D3.3: EWRs for desktop biophysical nodes

One of the requirements of the Classification System (DWAF, 2007b) is the assessment of the Reserve by means of estimating EWRs at approximately 150 - 200 desktop biophysical nodes. An appropriate desktop model will be used to estimate EWRs for those sites which are not addressed through the key biophysical sites. As a first option, the RDRM will be used rather than the Desktop Adjustment Model (DAM) (Birkhead, 2008) or the Desktop Reserve Model (DRM).

The output of this task will be the standard requirement, i.e. the rule files for the REC at each EWR site. The EcoClassification information from the PES/EIS study will be used to determine the REC at each of the nodes. It is important to note that the models that will be used are not appropriate where present day flows are higher than natural.

Task responsibility: Louw, Birkhead, Hughes

Information required

- PESEIS information.

Actions

- Natural and present day hydrology at each desktop biophysical nodes.

Deliverables and milestones

- EWR rule and tab tables: Feburary 2014 – Deliverable 17.

Responsibility of the Consultant

- The consultant is not responsible for developing or applying an ecological similarity process to determine where estimation can be used from EWR sites.
- The consultant is not responsible for developing new models. All attempts will be made to use the most appropriate model/s to estimate EWRs. Required adjustments will be made if it is possible within the scope of this project.

6.3.4 Task D3.4: Consequences of Ecosystem Services at sites where the REC is an improvement of the PES

Where the REC is an improvement on the PES at the desktop biophysical nodes, a qualitative statement will be made that will describe the likely outcome and significance of a REC that improves conditions beyond that of the PES. This qualitative statement will consider the improvements that will be required which one assumes will be mostly flow related. This will be confined to a description of changes for communities that have a livelihood dependence on the resources under consideration and the significance that the change may bring about. Only Ecosystem Services that are a) likely to change under scenarios and b) are important to vulnerable

or critical communities will be described or c) those that have a critical non market economic impact.

Task responsibility: **Huggins,**
Information required

- List of EWR and or other critical geographic entities where the REC is a change from the PES.

Actions

- Qualitative analysis of the EWR and or other critical geographic entities where the REC is a change from the PES.

Deliverables and milestones

- Consequences arising from analysis of the EWR and or other critical geographic entities where the REC is a change from the PES: January 2013 - Deliverable 18 included in Report 3.

6.3.5 Task D3.5: EWR report

All the above information will be documented in a report which will provide information on the hydrology and systems model, as well the results and output of all the other tasks.

Task responsibility: Louw, Koekemoer, Mallory, Desai
Deliverables and milestones

- First draft EWR Report: February 2013 – Report 3

6.4 TASK D4: IDENTIFICATION AND EVALUATION OF OPERATIONAL SCENARIOS TO IDENTIFY CONSEQUENCES

This task is associated with steps 4 and 5 of the WRCS. In practice, these two steps function as one and are integrated as Task 4 (or step 4 within the integrated approach).

6.4.1 Task D4.1: Identification of scenarios

Operational scenarios will be defined in accordance with the previous Reserve study, the Reconciliation Strategy Study as well as discussions with the ICMA and KOBWA. Any other recent planning information of proposed developments will be obtained and applied.

Scenario definition will be carried during the scenarios definition workshop where the baseline water resource reconciliation status will be presented for each IUA. This will ensure alignment and enhance integration in the formulation of coherent scenarios.

The water resources model will be configured for each scenario by incorporating the required EWR rule definitions where appropriate. The proposed approach for determining the usable water will be as follows: Using the accepted operating rule and target assurance of supply, the available resource is estimated by incrementally increasing the water demand until the system fails i.e. assurance of supply to existing user drops below the accepted target assurance. This process will be followed for a maximum of six development scenarios in each of the three main catchments (Komati, Crocodile and Sabie) and a further three scenarios relating to development in lower Incomati within Mozambique.

Systems supplying urban users:
In these IUAs an analysis of the additional augmentation that would be required to supply the urban sector (relative to the baseline scenario) will be carried out. This will be one of the scenarios referred to above. The additional augmentation needs will be used in the Socio-economic analysis to determine the relevant consequences.

Systems supplying irrigation users:
It is likely that scenario analysis will indicated that irrigation cannot be met at the target assurances in many of the IUA areas where there is a lot of irrigation water use. An analysis will the be carried out to determine by how much the irrigation will have to be reduced to achieve the selected ecological flow requirements and maintain the target assurance of supply. This information will be used in the Socio-Economic assessment to quantify the relevant consequences.

It is assumed for budgeting purposes that there will be a maximum of **12** scenarios analysed within the whole Incomati River Basin, including possible scenarios relating to water use in Mozambique and Swaziland. These will all be analysed based on the historical hydrology only. Stochastic analyses are not envisaged as part of this study.

Water resource analysis information will be described in chapters of the relevant task report. The scenarios analysis, assumptions and results, will be described in a chapter of the Main Report. Appropriate graphical and tabular summaries of the results will be prepared in annexure of the reports.

*Task responsibility***:** Mallory, Desai, Louw D
Information required
- Reconciliation Strategy Study outcomes for inputs into operating scenarios
- Proposed developments
- EWR Rule definitions

Actions
- Source the information required.
- Define scenarios in conjunction with DWA.
- DWA to select and confirm the final operational scenarios.
- Conduct water resource analysis for selected scenarios.

Deliverables and milestones
- Development of Operational scenarios defined: January 2014 - Deliverable 19.
- The scenarios definitions, analysis, assumptions and results: April 2014 – Contribution to Report 4

Responsibility of the Consultant
- The consultant is responsible for facilitating the process to define the operational scenarios but is not responsible for the final decision making.
- The consultant is responsible for analysing the selected scenarios (to a maximum of 12 scenarios in total) (selected by the PSC).

6.4.2 Task D4.2: River ecological consequences

At the key biophysical nodes (EWR sites), each operational scenario will be evaluated and the impact on the Ecological Category determined. This assessment forms part of the EcoClassification process where the rule-based models are used in a predictive manner. A specialist meeting will be held during which the assessment will take place.

As no detailed field work on the desktop biophysical nodes will be undertaken, estimated changes in flows for different ECs cannot be directly related to the responses of biota and the change in functions and attributes for each of these. Broad based assumptions only can be made.

Task responsibility: Louw D, Kotze P, Mackenzie J, Deacon A, Scherman P, Huggins G, Koekemoer S

Information required

- Final agreed scenarios from DWA.

Actions

- Determine an approach on how to use to assess scenarios as the information is not set up to use Habitat Flow Stressor Response

Deliverables and milestones

- Ecological consequences of operational scenarios: August 2014 - Deliverable D20 as part of Report 4

Responsibility of the Consultant

- Co-ordinating and facilitating the specialist meeting where the EcoStatus of the river for each operational flow scenario will be determined.
- Translating the flow scenarios to the required format, and providing specialists with the templates and instructions of what is required.
- Integrating the results and providing the ecological consequences and recommendations.
- Undertaking the logistical arrangements for the consulting team.
- The consultant is not responsible for analysing more than six flow scenarios per system.

6.4.3 Task D4.3: Economic consequences

The task of estimating the impact of any water allocation changes can only be implemented once the operational scenarios are available. The application of a decision support tool referred to as the Water Impact Model (WIM) will be used to estimate the economic consequences of operational scenarios together with the scoring system will be utilized to determine the relative impact of the water availability change. This evaluation will take into account the value chain of the activity.

Firstly, the WIM will be used to determine the current situation, which will be extended with the use of a multiplier methodology for use in calculating the impact of any water supply changes. It will be expressed in ratios on economic indicators such as GDP/Water, Labour/Water and also the different household's Income/Water. This will be derived from the sectors used in the current situation modeling such as irrigation agriculture. Furthermore, ratios will be determined on each specific economic region identified. It will, as was determined for the current situation impacts, also be expressed in terms of the indicators GDP, Employment Creation, and the distribution of income to the Low Income Households and Total Households. It will, for this analysis, identify the changes if; i.e. water is reduced at a specific catchment in the irrigation sector. This strategy will assist in evaluating the most acceptable option to classify the river system from an economic viewpoint.

Secondly, to contribute to the overall evaluation of the consequences the scenarios can have, the scoring system will be applied for a more diverse representation of all the disciplines involved in classifying the river system. The elements to be used are the ecological conditions, the economic impact and the social impact.

The cost relating to water users who pollute the water to the extent that downstream users experience increased treatment costs will be taken into account in the economic analysis. This will be done either using the Waste Discharge Charge System or direct costing in the case of Acid Mine Drainage (AMD). The PSP's experience with costing the treatment of AMD in the Vaal catchment will be used to estimate the cost related to future coal mine discharges in the upper Komati catchment.

Task responsibility: Van der Merwe, van Jaarsveld

Information required

- Hydrological results.

Actions

- Analysis of operational scenarios determining economic impacts.

Deliverables and milestones

- Economic consequences of operational scenarios: August 2014 - Deliverable D21 as part of Report 4.

6.4.4 Task D4.4: EcoSystem Services consequences

Assessment of the impacts of the various scenarios will be based on the Millennium Ecosystem Assessment Framework. With the aid of this modelling approach, the direction of change (either positive or negative) will be identified and the magnitude of the change in benefits and costs that may be experienced within the river system. The process adopted will ensure the analysis of potential economic changes based on a valuation of the status quo, that is, the value of the EcoSystem Services currently provided by the water in Komati, Crocodile and Sabie rivers, identifying the potential change that each of the key EcoSystem Services may undergo in each of the scenario clusters. Where required the current value of EcoSystem is multiplied by these factors for each scenario, to provide an indication of the potential future value of the EcoSystem Services. The change in value is thus measured as a magnitude of impact and is not costed in "rands and cents". The magnitude of change is estimated by the relevant specialists but facilitated by the EcoSystem Services task leader. EcoSystem Services that are considered are those that are a) of consequence to identified communities and b) likely to change under identified scenarios. This will be addressed during the workshop as set out above.

Task responsibility: Huggins G

Information required

- Input at workshop from key specialists with respect to populating the EcoSystem Services matrix.

Actions

- Workshop and consequences report and matrix production that sets out the consequences of operational scenarios of critical EcoSystem Services

Deliverables and milestones

- EcoSystem Services consequences of operational scenarios: August 2014 - Deliverable D22 as part of Report 4.

6.4.5 Task D4.5: Water quality consequences (other than water quality consequences associated with the ecological component)

Step 5 of the WRCS is broadly named "assess water quality implications" and includes identifying water quality users and present state. An important factor is assessing the assimilative capacity of the water resource and impacts on downstream users. Determining the levels of protection needed for various users is critical and important information needed by DWA to effectively manage the system.

The following tasks will be undertaken:

- *Assessment of status quo:* to be undertaken as part of Task 1. Note that this task also covers area outside of the ecological biophysical nodes and EWR sites. Present state assessments

will therefore be conducted where data are available and where water quality hot spots have been identified.

- *Water quality modelling* to inform the loading of salts and available assimilative capacity. Since there is no water quality model currently available in the Inkomati WMA, the suggested approach is to model salt loads only at identified hotspots, e.g. Ngodwana paper mill and in the upper Komati where acid mine water decant has become a problem ad carry out salinity modelling for these hotspots only i.e. the upstream catchments down to the point where there is sufficient dilution. An approach for dealing with nutrients will be designed as part of the study, utilizing a hotspot area related to nutrient enrichment.
- *Water quality consequences* of the selected catchment configuration scenarios will be derived as part of the scenario assessment step, and at points where such scenarios are applicable. This task relates to this task at water quality hotspot areas outside of EWR sites and biophysical nodes.
- *Fitness-for-use for all users* will be assessed using any interim Resource Water Quality Objectives (RWQOs) already designed for the Inkomati WMA and water quality EcoSpecs (or ecological specifications) available from the Reserve studies. The setting of interim RWQO require a detailed stakeholder process and or DWA workshops to set up or verify RWQO, which will not be undertaken during this study. The proposal clearly states that existing information only will be used and that a detailed stakeholder process will not be undertaken. If RWQO are not available, the approach will be meetings with DWA: Water Quality Planning and national and regional water quality DWA personnel and use of available water quality objectives. The alternative approach would, for example, also include the use of water quality guidelines and undertaking a desktop verification process with the water quality DWA team. Should this proposed approach be followed, it is assumed that further work in the catchment will be undertaken by DWA: Water Quality Planning.

Note that it is critical for the PSP to liaise with DWA: Water Quality Planning, both at the national level and any water quality personnel in the region so as to access any water quality objectives available if an RWQO model is not in place.

Task responsibility: Scherman, Mallory

Information required

- Water quality EcoSpecs available for previous Reserve studies.
- RWQOs if produced.

Actions

- Liaison with DWA: Water Quality Planning, both at the national and regional level, in terms of an approach that meets their requirements, data availability and the review of results.

Deliverables and milestones

- An assessment of whether current levels of protection are adequate for the system.
- Water quality consequences of operational scenarios: August 2014 - Deliverable D23 as part of Report 4.

Responsibility of the Consultant

- The Consultant will not undertake stakeholder or DWA workshops for this task, other than input to stakeholder workshops as required during the study.
- Limited water quality modelling will be undertaken, and only in critical hot spot salt load areas.

6.4.6 Task D4.6: Integration of consequences to provide preliminary Management Class for stakeholder evaluation

All of the above consequences will be considered to determine the preliminary Management Classes (MC) which will be recommended by the study team and DWA and presented to stakeholders (refer to Task D5). At this stage there are no guidelines that are practical to integrate the different consequences and describe the Management Class. If no process is developed in the interim, a qualitative process will be followed with reasoning and arguments being provided for the recommended Management Classes (DWA, 2012).

Task responsibility: Louw, Scherman, van Jaarsveld, Mallory, Huggins G

Actions

- Specialist meeting.

Deliverables and milestones

- Recommended operational scenarios, preliminary Management Classes for stakeholder evaluation and report: September 2014 - Deliverable D24
- Consequences report - R4 September 2014.

Responsibility of the Consultant

- The consultant is not responsible for applying Multi-Criteria Decision Making approaches unless a specific approach is recommended by DWA and can be accommodated within the existing budget.

6.5 TASK D5: STAKEHOLDER INVOLVEMENT

Stakeholders need to be taken by the hand from the beginning to the end of a project to keep their involvement and interest in the outcomes of the study. It is recommended that stakeholders be updated every six months on the status of the project. Stakeholders can comment at all times, however a six-monthly interval for providing project information also correlates with the technical milestones of the project. This will be done through a combination of the distribution of, a) the announcement activities (background information document and public meeting on 12 June 2013), b) a letter to all stakeholders on the database, including the media informing them of progress made, c) invitations to stakeholders to attend meetings and d) the distribution newsletters with information on the classification of important water resources in the study area. The DWA and ICMA websites need to be utilised for the publishing of all public information (announcement documentation, minutes of meeting, etc) to enable stakeholders with access to electronic media to stay updated.

6.5.1 Task D5.1: Newsletters

Three editions of an Inkomati Catchment newsletter, specifically for this project will be produced during the contract period. The purpose of the newsletter will be to provide the broader range of stakeholders, updated information on progress made with the project.

The newsletter will be distributed to all stakeholders listed in the stakeholder database. The newsletters will be distributed as follows:

Edition 1: Content based on discussions at 1st PSC meeting
Edition 2: Content based on discussions at 2nd PSC meeting
Edition 3: Content based on discussions at 3rd PSC meeting

Please note that the first communication received by stakeholders will be the BID announcing the project.

Task responsibility: Lotter, Mallory

Actions

- Compile, print and distribute three editions of the newsletter to the stakeholders listed in the database.

Deliverables and milestones

- Three editions of newsletters (Deliverable D25a; October 2013, March 2014 and October 2014).

Responsibility of the Consultant

- Prior approval of document contents from DWA before printing and distribution of the newsletters.

6.5.2 Task D5.2: Public meeting

A public meeting will be held on 12 June 2013 in Nelspruit to introduce the project, select representative stakeholders for the PSC, and carry out a visioning process.

The ICMA requested a second public meeting (supported by DWA) towards the end of the project to inform the broader stakeholder base of the progress made and to obtain their inputs and comments with regards to the technical work completed. It is proposed that the second meeting be held either in Nelspruit or in each sub-catchment to enable as many as possible people to attend to present the following:

- Operational scenarios, consequences and recommended scenario
- Preliminary management classes based on recommended scenario
- Qualitative RQOs

Before the meeting an invitation letter with a reply/comment sheet and an agenda will be distributed to all on the stakeholder database. Edition 3 of the Inkomati Catchment newsletter will be used to provide sufficient information to stakeholders to ensure their productive and meaningful participation at the meeting. Minutes of the meeting will be produced and distributed within two weeks after the meeting.

It is acknowledged that a second public meeting (or series of meetings if held at more than one location) is required but funding for these additional meeting is not available.

Task responsibility: Lotter, Mallory

Actions

- Compilation and distribution of an invitation letter, reply/comment sheet and agenda.
- Arrange logistics for the public meeting (arrangement of venue, catering, printing of attendance registers and related supporting documents, arrangement of projector and laptop).
- Compilation and distribution of minutes within two weeks after the meeting.

Deliverables and milestones

- Public meeting 1 (Deliverable 25b, June 2013)
- Public meeting 2 (Deliverable 25c, January 2015) (**Subject to ICMA funding**)

Approach to meeting arrangements:

Prior to the hosting of any meetings the necessary documentation will be compiled and distributed. All meetings will be formally hosted with a facilitator, formal presentations and thorough minutes will be taken as a record of stakeholder comments and inputs. These comments and responses will be recorded in the Issues and Responses Report.

The communication members of the team will assist with all the arrangements of meetings. Our proposed methodology for arranging any type of meeting is as follows:

- There must be a clear purpose for a meeting and the objectives of what needs to be achieved by the meeting should be clearly defined. Stakeholders must receive notification of the meeting dates and its objectives at least three weeks in advance. A formal advance registration process will be allowed. Stakeholders must receive documentation such as a draft agenda and an information document for the meeting at least five working days before the meeting.
- A dry run meeting for project team members must be conducted in advance to agree on the content of the meeting, the comprehension levels of presentations and to strategise for discussion sessions.

6.6 TASK D6: RESOURCE QUALITY OBJECTIVES

Figure 6.3 is modified from DWA 2011 and illustrates the approach to achieve the RQOs.

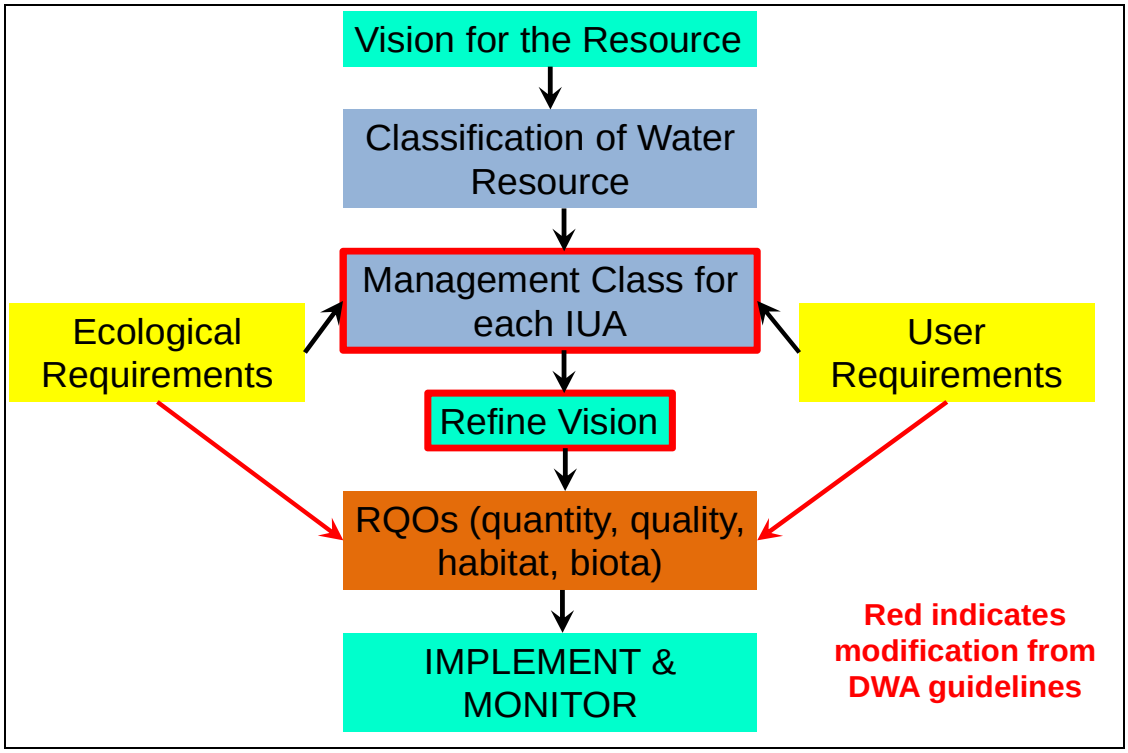

Figure 6.3 RQO process

Figure 6.4 illustrates the relationship between numerical and descriptive RQOs and the tasks where the results are generated. User requirements within this context include the socio economic impact of these requirements. This task D6 integrates all the information in the other tasks and generates any RQO results that have not yet been generated. Figure 6.4 shows that water quality objectives are produced for both the ecology and other users with EcoSpecs for Biota and Habitat indicated in the green boxes.

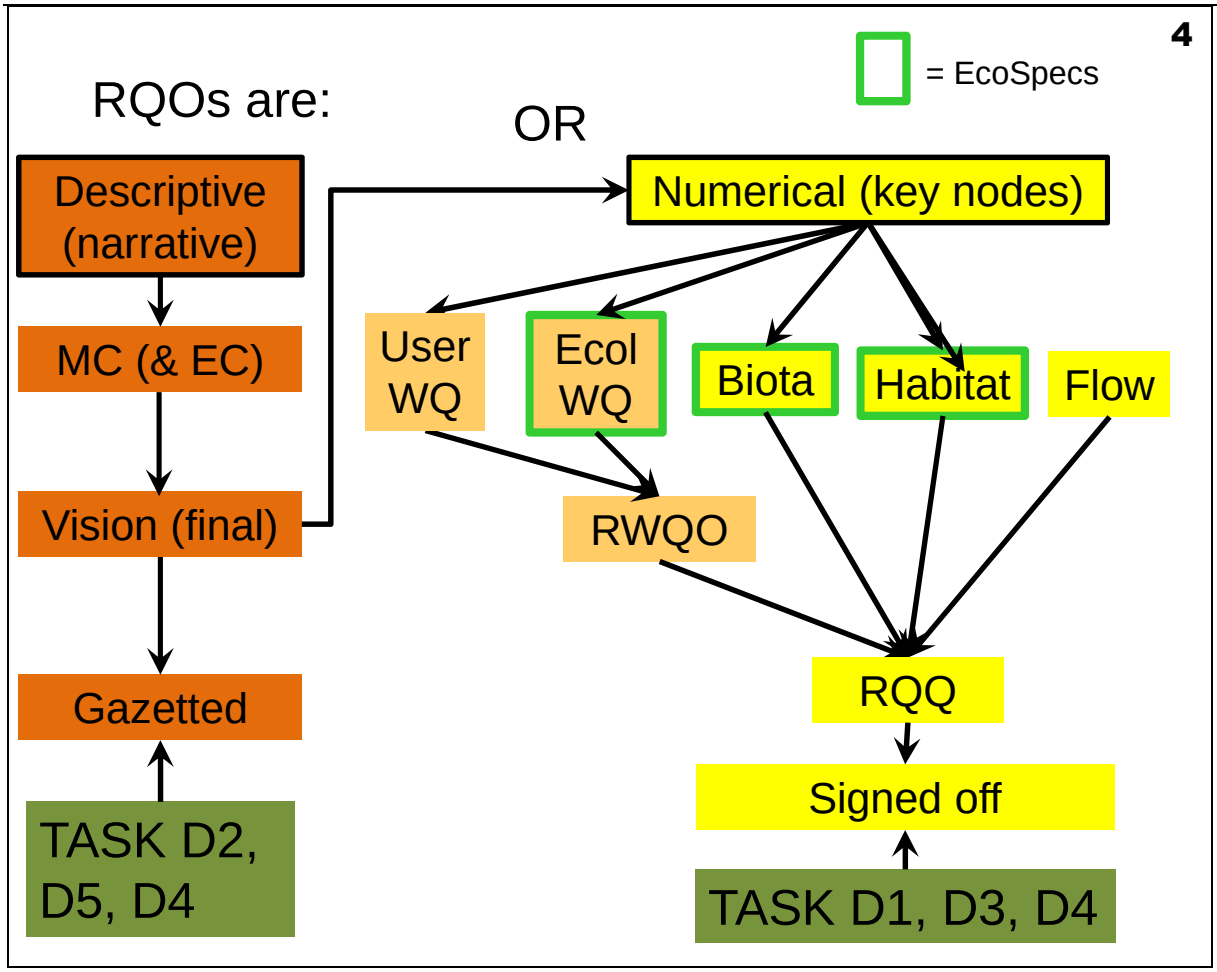

Figure 6.4 Descriptive and numerical RQOs

The only steps within RQOs which are therefore not addressed within previous tasks (as shown in the integration diagram – Figure 3.1), are the groundwater RQOs, the determination of Ecological Specifications (EcoSpecs) and Thresholds of Potential Concerns (TPCs) as well as addressing RQOs for water quality aspects which are not part of the Ecological Reserve. Both of these aspects are described below and these aspects will be combined in Report 5.

6.6.1 Task D6.1: EcoSpecs and Thresholds of Potential Concerns

The objective of this task is to determine the EcoSpecs (the ecological component of RQOs) for the recommended EC and link the ECs to TPCs (Thresholds of Potential Concerns). EcoSpecs will be set for flow, quality, habitat and biota. The quality and flow EcoSpecs are dependent on a decision regarding an acceptable operational scenario as the Ecological Reserve and Management Class. The habitat and biota EcoSpecs must be linked to the relevant category and will be quantified as far as possible. Detailed EcoSpecs can only be provided for the key biophysical nodes whereas broad qualitative statements only can be made for the desktop biophysical nodes.

The Consultant is aware that D: RQS is in the process of method development of determining EcoSpecs and TPCs (*Pers. Comm*. Dr. N. Kleynhans) for rivers. The Consultant will use the most applicable and latest available information and tools at the stage when this Task commences. The Consultant will therefore attempt to liaise with the developers on a continual basis to keep updated regarding the status of new developments. Should the new developments not be available for use, those methods applied in previous studies (Upper Vaal River, Crocodile East, and Mokolo River Reserve studies) will be applied and adapted for the purpose of the current study. General wetland RQOs will also be included in this section.

Task responsibility: Mackenzie J, Louw D, Kotze P, Deacon A, Koekemoer S, Scherman P

Information required

- Available processes or models from D: RQS.

Actions

- Specialist meeting.

Deliverables and milestones

- RQO toolkit checklist: December 2014 - Deliverable D26
- EcoSpecs and TPCs: January 2014 – Report 5.

Responsibility of the Consultant

- The Consultant is not responsible for the development of approaches to determine EcoSpecs and TPCs other than those available, but will attempt to apply the latest development and models if adequate guidance is provided by the developers (DWA).

6.6.2 Task D6.2: Non-Ecological water quality

As the major component of the work related to setting RQOs is contained within the Classification and Reserve processes, this sub-task will focus on non-ecological water quality RQOs, and will serve primarily as a step to review and finalize the water quality component. Note that RWQO represent the water quality component of the RQO.

Task responsibility: Scherman

Information required

- Resource Water Quality Objectives (RWQOs) if produced.
- RQO model set up for the area.

Actions

- Liaison with DWA: Water Quality Planning, both at the national and regional level, in terms of an approach that meets their requirements, data availability and the review of results.

Deliverables and milestones

- RQOs for non-ecological water quality uses: January 2015 – Report 5.

Responsibility of the Consultant

- The Consultant will not undertake stakeholder or DWA workshops for this task, other than liaison with national and regional water quality officers.

6.6.3 Task D6.3: Groundwater RQOs

Setting RQOs requires an understanding of groundwater resources and their boundary conditions, uses of groundwater, the importance of various uses and the agreed degree of modification of the resource as measured through the Classification (Dennis, 2011).

RQOs can include any objective or goal that may need to be met to ensure that the groundwater resource is maintained in a desired and sustainable state. These typically relate to groundwater levels and gradients. Groundwater quality, groundwater abstraction volumes, land use activities that may impact the quantity and quality of the groundwater resource and the aquifer structure and integrity (Parsons & Wentzel, 2007).

General aquifer management philosophies will be specified in terms of the groundwater RQOs as suggested in the pilot study presented in the Groundwater Resource Directed Measures Manual (Parsons & Wentzel, 2007). As also specified in the same report, it is recommended that detailed RQOs need to be set on a site specific basis per license application in future.

Task responsibility: Witthauser

Information required

- Groundwater abstraction volumes, water levels and gradients, water quality and landuse activities.

Actions

- Analysis and data.

Deliverables and milestones

- RQOs for groundwater: January 2015 – Report 5.

Responsibility of the Consultant

- Develop RQOs for groundwater at the scale of the IUAs.

6.7 TASK D7: PREPARE AN IMPLEMENTATION PLAN

The ecological flow requirements and the related water resources classification is an important step towards ensuring the flow requirements for sustaining the ecology of the river in a desired state. However, steps need to be taken to actually implement these flows. The Inkomati WMA is leading the country in Reserve implementation in that Real-time models have been developed (for DWA) and are managed by the ICMA to implement the Reserve of the Crocodile and Sabie Rivers. The suggested implementation plan is therefore to update these models with the latest classification and Reserve information. A implementation plan will be developed to describe how this should be done. A plan will also be developed for the Komati River.

Task responsibility: Louw, Mallory

Information required

- The latest operating rules of the Komati, Crocodile and Sabie systems.

Actions

- Liaise with catchment operators and operational forums
- Prepare an implementation plan

Deliverables and milestones

- Implementation plan report: March 2015 – Deliverable 32

Responsibility of the Consultant

- Prepare a realistic and implementable plan to enable that the flow regime required by the Reserve can be implemented in practice

6.8 TASK D8: CAPACITY BUILDING

The TOR requires capacity building and training to focus on skills required by water resource managers in the study area, including national CD: RDM staff responsible for this area. Capacity building and training will therefore take place at two levels. These levels can broadly be defined and **formal training** and **mentorship,** which will include in-service training. In addition, all identified trainees may attend workshops to gain experience in the 7 step classification process.

Dr Scherman will be responsible for managing and auditing the training programme. She will be assisted by Dr Sawunyama, based in Nelspruit and Mr Mallory, based in Pretoria.

6.8.1 Formal Training sessions

The training sessions listed below are preliminary, and can be adjusted by the client according to specific needs, bearing in mind that the proposal allowed for three formal training sessions.

- Training session 1: Introductory session: Integration of the WRCS, the Reserve and RQO. Three very distinct processes, which show significant overlap within its individual process descriptions and manuals, were integrated and integrated steps designed. This integration

process and the rationale therefore will be presented and discussed with participants. It is foreseen that this will be a one day training session.

- Training session 2: Status quo assessment. It is foreseen that this will be a two day training session. The status quo, both process, results and integration, will be demonstrated using this study area results. Presenters will address the following components: Ecology rivers, water quality issues, economy, Ecosystem Services, and water resources.
- Training session 3:.Water resources modelling with an emphasis on the type of modelling required for Resources Classification. A two day training session is envisaged which will commence with basic modelling concepts and progress to actual hands-on model runs.

Task responsibility: Scherman, Louw, Mallory, Sawunyama

Information required

- Any changes in trainee composition must be forwarded to Mr Mallory.
- Input will be requested regarding training evaluation. This information should be forwarded timeously when requested.

Actions

- Dr Sawunyama will be responsible for advising trainees and workshop presenters regarding training sessions.

Deliverables and milestones

- Training session 1: Introduction and integration: October 2014 – Deliverable 28
- Training session 2: Water resources modelling: January 2014, - Deliverable 30
- Training session 3: Status Quo: March 2014 – Deliverable 32

6.8.2 Mentoring

Mentoring will be provided by the following individuals (within their fields of expertise) throughout the course of the study:

- Dr T Sawunyama: Hydrology
- M S Mallory: Water resources systems and modelling
- Dr P Scherman: Resource Quality Objectives
- M P van Jaarsveld: Resources Economics
- Ms D Louw: Reserve determination and the classification process
- Mr G Huggins: Socio-economics
- Mr M Holland: Geohydrology

Due to the intensity of mentoring in terms of the highly skilled manhours required, it is suggested that mentoring be limited to three persons; two from the RDM Chief Directorate and one from the ICMA.

Task responsibility: Scherman, Louw, Mallory, Sawunyama

Information required

- The names of the persons to me mentored must be forwarded to Mr Mallory.

Actions

- Dr Sawunyama will arrange mentorship opportunities in close liaison with the DWA Project Manager.

Deliverables and milestones

- A mentoring opportunity has been arranged with Prof Hughes on the Revised Desktop Model. This will take place in November 2013. This will be followed up with sessions with the fish specialists and ecological specialist if required.

- Other mentoring opportunities will be determined on an ad-hoc basis during the course of the project. This will include attendance and involvement in all specialist workshops.
  An appendix of the Main Report regarding the capacity building through mentoring will will be included in Report 6. Deliverable 31.

Responsibility of the Consultant

- Plan and coordinate the capacity building programme, including mentorship.
- Contact mentees timeously regarding mentorship opportunities.
- Audit and report on the mentorship training programme.

6.9 TASK D9: MAIN REPORT

The objective of this task is to:

- Document the final EWR rules (based on the recommended operational scenario and the resulting MC and EC);
- Summarise the technical reports in a main report.
- Document rationale and decision-making process regarding the final selected Management Classes (i.e., the resulting MC and reasoning if stakeholders recommend changes from the preliminary MCs).
- Document the lessons learnt chapter.

Accompanied with the main report will be a CD with all electronic data which will include reports, EcoClassification models, spreadsheets, photographs and raw data. The CD will be designed with folders representing the steps and subfolders the subsidiary steps. A 'readme' file will be provided to guide users through the setup of the CD.

Task responsibility: **Louw**, Mallory, Van Jaarsveld, Huggins, Scherman, Lotter, Koekemoer

Information required

- Results from all the previous tasks.
- All data required for the CD

Actions

- Collating all existing project data and results.

Deliverables and milestones

- Main Report: March 2015 – Report 6.
- Electronic data CD: March 2015 – Deliverable 32 as part of Report 6
- Closing report: March 2015 - Report 8

6.10 TASK D10: PREPARING INFORMATION FOR GAZETTING (TEMPLATES).

The PSP will prepare the IWRM summary template in accordance with the format that will be developed in cooperation with the Client. The gazetting will address the Management Class and RQOs. DWA officials will then submit the documentation through the appropriate internal channels for the approval by the Minister of delegated authority. Technical comments will be addressed by the consultants when received during the 60 days comment period.

Task responsibility: Louw, Koekemoer and Scherman

Information required

- The required templates to be completed by the Consultant. Final templates for completion must be provided at the beginning of Task D7.

Actions

- Completion of the templates according to DWA requirements.
- Review of the information to be sent to the region, if required by DWA.

Deliverables and milestones

- Completion of draft templates for review by DWA.
- Finalization of templates: November 2014 – Deliverable 27.

Responsibility of the Consultant

- The Consultant will not provide a template for use, as this will be provided by DWA.
- The Consultant will not be responsible for completion of the legal component of the gazetting process, e.g. the signing-off of templates by the delegated authority.
- The consultant will be responsible for addressing technical comments after contract expiry received during the 60 days gazetting period. This will not include undertaking any studies that may arise from the comments.

7 STUDY PROGRAMME

7.1 MILESTONES: DELIVERABLES AND REPORTS

All deliverables and reports are seen as milestones and are tabled in Table 7.1. The timing is provided in the Gantt (Table 7.). All references to deliverables are preceded with a 'D' and reports with a 'R' as provided in the tables below and the Gantt. Q refers to the yearly quarter of three months, i.e. Q1-12 would refer to the first quarter in 2012 which covers April, May and June.

Table 7.1 Milestones: Deliverables and Reports

Deliverables & Reports		Date	Tasks	Q	Included in Report
D4	Subconsultants appointed with TOR & budget	Jun-13	B	Q2-12	n/a
R 1	Inception report	May-13	B	Q2-12	n/a
D1	PMC (Inception meeting)	May-13	B	Q2-12	n/a
D1	PMC Meeting 1	Jul-13	A3	Q3-12	n/a
D14b	Advertisement	Jun-13	D2	Q3-12	n/a
D14c	Announcement Letter	Jun-13	D2	Q3-12	D31
D5	Index identification tables	Jul-13	C	Q3-12	DWA report
D13	BID	Jun-13	D2	Q3-12	D31
D14a	Stakeholder Database (first draft)	Jun-13	D2	Q3-12	D31
D6	Water resources zones & Water Resource Use Importance	Jul-13	D1.1	Q3-12	R 2
D7	Economic zones (Regions)	Aug-13	D1.2	Q3-12	R 2
D8	Ecosystem Services component: Delineation, description and SCI	Jul-13	D1.3	Q3-12	R 2
D9	Water quality status quo	Jul-13	D1.4	Q3-12	R 2
D10	Ecological zones based on PESEIS information	Jul-13	D1.5	Q3-13	R 2
D12	Identification of river biophysical nodes for level of assessment.	Sep-13	D1.7	Q3-13	R 2
D11	IUAs selected and mapped	Sep-13	D1.6	Q3-13	R 2
R 2	Status quo report	Sep-13	D1.8	Q4-13	n/a
D28	Training session 1	Oct-13	D8	Q4-13	R 6
D1	PMC meeting 2	Oct-13	A1	Q4-13	n/a
D2	PSC meeting 2	Aug-13	A3	Q4-12	n/a
D25a	Newsletters and Progress Feedback Letters	Oct-13	D2	Q4-13	D31
R 7	Visioning report	Dec-13		Q4-13	n/a
D29	Mentoring on the Desktop Model	Nov-13	D8	Q4-13	R 6
D15	Natural and present day hydrology	Oct-13	D3.1	Q4-13	D31
D16	EWRs for EWR sites converted into SPATSIM	Nov-13	D3.2	Q4-13	R 3
D18	Ecosystem Services related to REC (if improved from PES)	Jan-14	D3.4	Q1-14	R 3
D30	Training session 2	Jan -14	D8	Q1-14	R6
D17	EWR results for all desktop biophysical nodes	Feb-14	D3.3	Q4-13	R 3
R 3	EWR report	Feb-14	D3.5	Q1-14	n/a
D19	Operational scenarios defined	Feb-14	D4.1	Q1-14	R 4
D1	PMC Meeting 3	Feb-14	A1	Q1-14	n/a
D1	PSC meeting 2	Mar-14	A3	Q1-14	n/a
D25a	Newsletters and Progress Feedback Letters	Mar-14	D2	Q1-14	D31
D32	Training session 3	Mar-14	D8	Q1-14	R6
D1	PMC Meeting 4	Jul14	A1	Q2-14	n/a

Deliverables & Reports		Date	Tasks	Q	Included in Report
D20	Ecological consequences of operational scenarios	Aug-14	D4.2	Q3-14	R 4
D21	Economic consequences of operational scenarios	Aug-14	D4.3	Q3-14	R 4
D22	Ecosystem Services consequences of operational scenarios	Aug-14	D4.4	Q3-14	R 4
D23	Water quality consequences of operational scenarios	Aug-14	D4.5	Q3-14	R 4
R 4	Operational scenarios and consequences report	Sept-14	D4.6	Q4-14	n/a
D25a	Newsletters and Progress Feedback Letters	May 14	D2	Q1-15	D31
D1	PMC meeting 5	Nov-14	2	Q4-13	n/a
D2	PSC meeting 3	Nov-14	A2	Q4-14	n/a
D300	Training session 3	Dec-14	D8	Q4-14	R 6
D24	Recommended operational scenario and preliminary Management Classes	Sept-14	D4.6	Q4-14	R 4
D26	RQO toolkit checklist	Nov-14	D6	Q1-14	R 5
D27	Templates	Nov-15	D7	Q1-15	n/a
R 5	RQO report	Dec-14	D6	Q1-15	n/a
D25b	Public meeting	Jan-15	D5	Q1-15	n/a
D14d	Stakeholder Issues and responses	Mar-15	D2	Q1-15	R 6
R 6	Main report	Mar-15	D9	Q1-15	n/a
D32	Implementation Plan	Mar-15		Q1-15	R6
R 8	Closing report	Mar-15		Q1-15	n/a
D33	Electronic data CD	Mar-15	D9	Q1-15	n/a

Note that all deadlines provided for reports refer to the first draft to be provided to the client. It is expected that the client will provide comments within a month and that the report can be finalised afterwards. Depending on the time to provide comments, reports should be able to be finalised within 6 weeks of providing the first draft.

The programme and budget allowed for comments from the following:

- Directorate: Classification (Project Manager)
- Directorate: Classification (Director)
- ICMA, PMC and PSC members

A spreadsheet summarising all substantial comments (i.e. not minor editorial comments) and the response of the client will be provided with the final report to indicate how the comments have been addressed.

7.2 GANTT CHART

According to the information provided by the Client, the study is to be completed within a 24 month period. A Gantt chart is provided (Table 7.2).

Table 7.2 Gantt chart

Tasks	2013									2014												2015		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
TASK A- PROJECT MANAGEMENT																								
A.1 Project Management Meetings (Progress meetings)	D1			D1			D1			D1			D1			D1			D1				D1	
A.2 Technical team management and coordination																								
A.3 Project Steering Committees					D2							D2								D2				
A.4 Financial management		D3	D3	D3	D3	D3	D3	D3	D3	D3	D3	D3	D3	D3	D3	D3	D3	D3	D3	D3	D3	D3	D3	D3
TASK B - PROJECT INCEPTION																								
Task B.1: Inception report planning																								
Task B.2: Inception report		R 1																						
Task B.3: Mobilisation of study team			D4																					
TASK C: WATER RESOURCE INFORMATION AND DATA GATHERING				D5																				
TASK D: DETERMINE MANAGEMENT CLASS & RQO: TASK STRUCTURE																								
TASK D.1: DELINEATE UOA & DESCRIBE STATUS QUO																								
Task D.1.1 Water resources component				D6																				
Task D.1.2 Economic Component					D7																			
Task D.1.3: Goods & Services component				D8																				
Task D.1.4: Water Quality Status Quo				D9																				
Task D.1.5 Rivers and associated aquatic ecosystems					D10																			
Task D.1.6: Integration of above components to identify and define IUAs					D11																			
Task D.1.7: Identification of river biophysical nodes and level of assessment.						D12																		
Task D.1.8: Status Quo Report						R2																		
TASK D.2: PREPERATION FOR STAKEHOLDER ENGAGEMENT																								
Task D.2.1 Stakeholder Identification and database compilation			D14a																					
Task D.2.2 Project Announcement (BID and Advertisement)			D13, 14b,c																					
Task D.2.3 Issues and Response Report																								D14d
Task D2.4 Visioning			D14d					D14d	R7															
TASK D.3: QUANTIFY EWRS AND CHANGES IN NON-WATER QUALITY EGSAS																								
Task D3.1 Setting up system model and provision of natural and present day data.							D15																	
Task D.3.2 EWRs for key biophysical nodes (EWR sites)								D16																
Task D.3.3 EWRs for desktop biophysical nodes											D17													
Task D.3.4 Consequences of G & S at sites where the REC is an improvement of the PES										D18														
Task D3.5 EWR report											R 3													
TASK D.4 IDENTIFICATION AND EVALUATION OF OPERATIONAL SCENARIOS TO IDENTIFY CONSEQUENCES																								
Task D.4.1 Identification of scenarios											D19													
Task D.4.2 Ecological consequences																	D20							
Task D.4.3 Economic consequences																	D21							
Task D.4.4 G&S consequences																	D22							
Task D.4.5 Water quality consequences																	D23							
Task D.4.6 Integration of consequences to provide preliminary Management Classfor stakeholder evaluation																			D24					
Report																			R 4					
TASK D5: STAKEHOLDER INVOLVEMENT																								
Task D5.1 Newsletters							D25a					D25a							D25a					
Task D5.2 Public meeting			D25b																			D25c		
TASK D6: RQO																								
Task D6.1 EcoSpecs & TPCs																			D26	R 5				
Task D6.2 Non-ecological water quality																			D26	R 5				
Task D6.3 Groundwater RQOs																			D26	R 5				
TASK D7: IMPLEMENTATION PLAN																								
TASK D8: CAPACITY BUILDING																							D32	
Training session 1: Introductory workshop, incl. integration							D28																	
Training session 2: Desktop model								D29																
Training session 3: Yield modelling workshop										D30														
Training session 4: Status quo																								
Training: Menotring												D32									D31			
TASK D9: MAIN REPORT																								R 6
TASK D10: GAZETTING (TEMPLATES)																								

8 STUDY TEAM

IWR Water Resources was appointed to undertake the study and have appointed various sub-consultants to undertake the multidisciplinary tasks as required by the TOR. The study team consists of individuals with extensive experience in the field of water resource planning. The team members have been involved in a variety of studies for DWA since 1988. An organogram is provided to illustrate the study team structure (Figure 8.1). The task leaders are listed below:

- Study Leader – S Mallory
- Co Study Leader – D Louw
- River Team Leader – D Louw
- Economics Team Leader – B van der Merwe
- Ecosystem Goods, Services and Attributes Team Leader – G Huggins
- Stakeholder Participation Team Leader – A Lotter
- Water Quality Team Leader – P Scherman
- Hydrology Team Leader – S Mallory
- Capacity Building Team Leader – P Scherman

The following organizations are represented by the teams:

- IWR Water Resources
- Rivers for Africa (R4A)
- Delta H
- Urban Econ

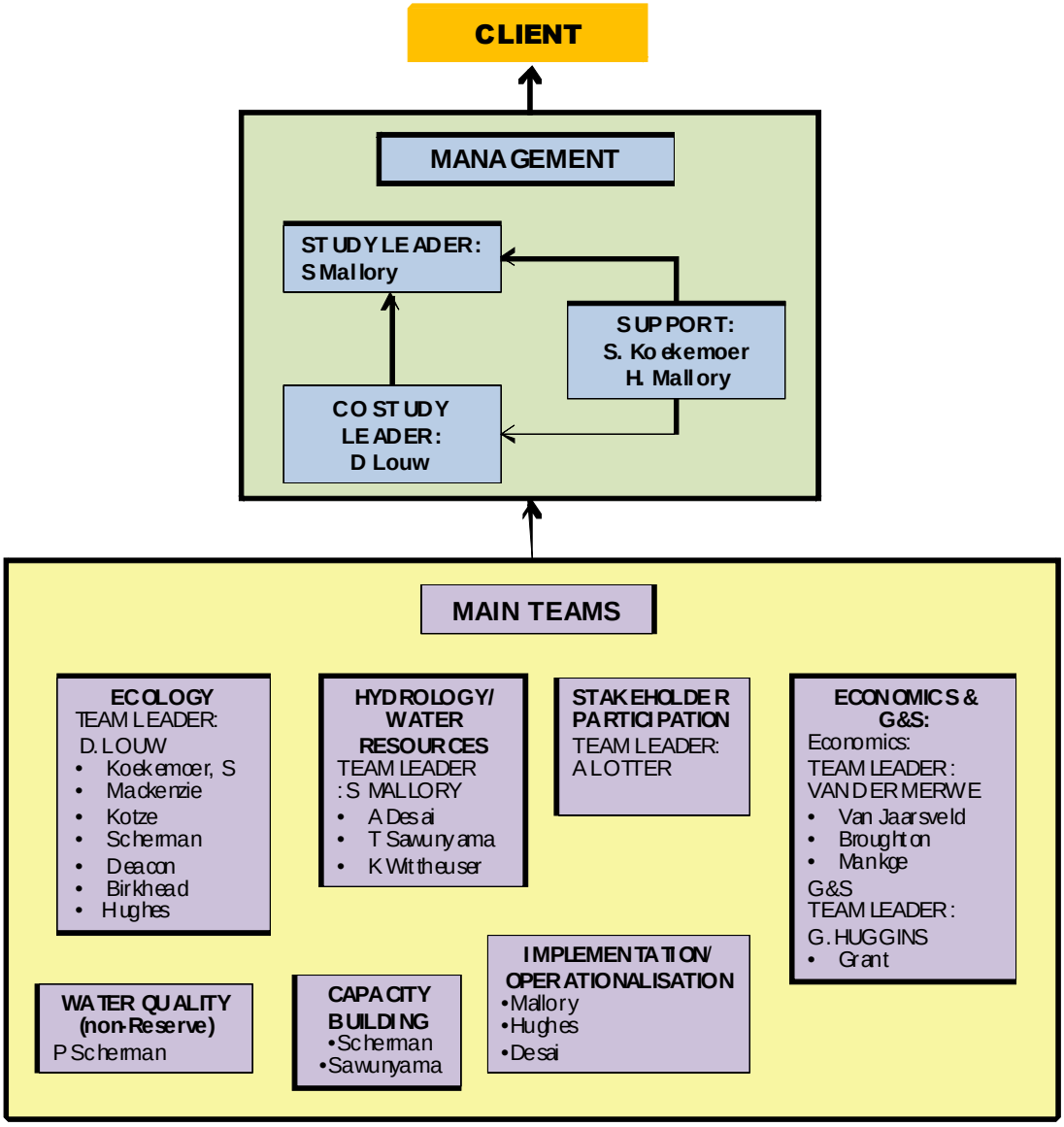

Figure 8.1 Team organogram

9 FINANCIAL SUMMARY

The budget for this study for time, disbursements, escalation and VAT is R 4 976 053.26 (four million, nine Hundred and seventy six thousand, and fifty three). A summary of this information per task is provided in Table 9.1.

Table 9.1 Budget summary

TASK	COST	14% VAT	TOTAL INCL VAT
TASK A- PROJECT MANAGEMENT	R648,800.00	R90,832.00	R739,632.00
TASK B - PROJECT INCEPTION	R90,000.00	R12,600.00	R102,600.00
TASK C: WATER RESOURCE INFORMATION AND DATA GATHERING	R62,900.00	R8,806.00	R71,706.00
TASK D: DETERMINE MANAGEMENT CLASS & RQO: TASK STRUCTURE			
TASK D1: DELINEATE IUA & DESCRIBE STATUS QUO	R662,000.00	R92,680.00	R754,680.00
TASK D2: STEP 2 - PREPERATION FOR STAKEHOLDER ENGAGEMENT AND VISIONING	R55,200.00	R7,728.00	R62,928.00
TASK D3: STEP 3 - QUANTIFY EWRS AND CHANGES IN NON-WATER QUALITY EGSAS	R864,800.00	R121,072.00	R985,872.00
TASK D4 IDENTIFICATION AND EVALUATION OF OPERATIONAL SCENARIOS TO IDENTIFY CONSEQUENCES	R772,650.00	R108,171.00	R880,821.00
Task D5: STAKEHOLDER INVOLVEMENT	R130,400.00	R18,256.00	R148,656.00
TASK D6: RQO	R372,800.00	R52,192.00	R424,992.00
TASK D7: PREPARING INFORMATION FOR GAZETTING (TEMPLATES)	R82,400.00	R11,536.00	R93,936.00
TASK D8: CAPACITY BUILDING	R190,200.00	R26,628.00	R216,828.00
TASK D9: MAIN REPORT	R130,400.00	R18,256.00	R148,656.00
DISBURSEMENTS	R292,609.00	R40,965.26	R333,574.26
TOTAL	**R4,355,159.00**	**R609,722.26**	**R4,964,881.26**

A cash flow projection table and graph is provided in Table 9.2 and Figure 9.1.

Table 9.2 Cash flow table

TASK	2013									2014													2015				TOTAL
	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	
TASK A- PROJECT MANAGEMENT			R 32,158	R 32,158	R 32,158	R 32,158	R 32,158	R 32,158	R 32,158	R 32,158	R 32,158	R 32,158	R 32,158	R 32,158	R 32,158	R 32,158	R 32,158	R 32,158	R 32,158	R 32,158	R 32,158	R 32,158	R 32,158	R 32,158	R 32,158	R 32,158	**R739,632**
TASK B - PROJECT INCEPTION			R 61,560		R 20,520			R 20,520																			**R102,600**
TASK C: WATER RESOURCE INFORMATION AND DATA GATHERING				R 71,706																							**R71,706**
TASK D: DETERMINE MANAGEMENT CLASS & RQO: TASK STRUCTURE																											
TASK D1: DELINEATE IUA & DESCRIBE STATUS QUO				R 188,670	R 188,670	R 188,670	R 188,670																				**R754,680**
TASK D2: STEP 2 - LINK VALUE AND CONDITION				R 62,928																							**R62,928**
TASK D3: STEP 3 - QUANTIFY EWRS AND CHANGES IN NON-WATER QUALITY EGSAS							R 164,312	R 164,312	R 164,312	R 164,312	R 164,312	R 164,312															**R985,872**
TASK D4 IDENTIFICATION AND EVALUATION OF OPERATIONAL SCENARIOS TO IDENTIFY CONSEQUENCES												R 125,832	R 125,832	R 125,832	R 125,832	R 125,832	R 125,832	R 125,832									**R880,821**
Task D5: STAKEHOLDER INVOLVEMENT								R 49,552							R 49,552							R 49,552					**R148,656**
TASK D6: RQO																						R 141,664	R 141,664	R 141,664			**R424,992**
TASK D7: PREPARING INFORMATION FOR GAZETTING (TEMPLATES)																									R 93,936		**R93,936**
TASK D8: CAPACITY BUILDING				R 10,857	R 10,857	R 10,857	R 10,857	R 10,857	R 10,857	R 10,857	R 10,857	R 10,857	R 10,857	R 10,857	R 10,857	R 10,857	R 10,857	R 10,857	R 10,857	R 10,857	R 10,857	R 10,857	R 10,857	R 10,857	R 10,857	R 10,857	**R228,000**
TASK D9: MAIN REPORT																							R 49,552	R 49,552	R 49,552		**R148,656**
DISBURSEMENTS				R 15,162	R 15,162	R 15,162	R 15,162	R 15,162	R 15,162	R 15,162	R 15,162	R 15,162	R 15,162	R 15,162	R 15,162	R 15,162	R 15,162	R 15,162	R 15,162	R 15,162	R 15,162	R 15,162	R 15,162	R 15,162	R 15,162	R 15,162	**R333,574**
TOTAL			R 93,718	R 381,482	R 267,368	R 246,848	R 411,160	R 292,562	R 222,490	R 222,490	R 222,490	R 348,321	R 184,009	R 184,009	R 233,561	R 184,009	R 184,009	R 184,009	R 58,178	R 58,178	R 58,178	R 249,394	R 249,394	R 249,394	R 201,666	**R4,976,053**

Figure 9.1 Projected Cash Flow

10 REFERENCES

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Parsons, R and Wentzel, J. 2007. Water Research Commission: Groundwater Resource Directed Measures Manual. WRC Report No TT 299/07.

11 APPENDIX A: REPORT COMMENTS

Page &/ or Section	Report Statement	Comments	Addressed in report?	Author Comment
5.1.3	The PSC members will provide representative inputs and perspective, ensure strategy implementation and strategic advice and guidance	**Comment:** It is not only about inputs, advice and guidance. I recommend that the PSC must approve or support the final report otherwise it is again another consultative process where participants input could be ignored. This should be captured in the TOR.		All reports will be made available to PSC members for their comments and approval
6.1.2	In the Inkomati WMA it is necessary to model the value the water used by each of the main water users…….	**Comment:** The value of water can't be determined at farm gate level only, but you should determine the value of the total value chain especially the inclusion of agric-processing as well. This should be the case regarding all products from the primary sector. Farm gate value of water is irrelevant.		The value of water within this context will not only be the direct value but also consider the value chain of linked activities. This is especially important for the irrigation sectors which support many associated industries such as packaging, processing and transport.
6.1.2	Irrigation database	**Comment:** We would like to see the detail of this database		A decision support tool referred to as the Water Impact Model (WIM) will be used. This evaluation will take into account the value chain of the activity.
6.4.3	It will, for this analysis, identify the changes if i.e. water is reduced at a specific catchment in the irrigation sector	**Comment:** It must reflect the impact of the reduction in economic activity of the whole value chain i.e. if you reduce water allocation to cane production with 15% you need to close down one mill which means a 50% loss in production, jobs, economic activity of the whole value chain.	Yes	The cost relating to water users who pollute the water to the extent that downstream users experience increased treatment costs will be taken into account in the economic analysis. This will be done either using the Waste Discharge Charge System or direct costing in the case of Acid Mine Drainage (AMD). The PSP's experience with costing the treatment of AMD in the Vaal catchment will be used to estimate the cost related to future coal mine discharges in the upper Komati catchment.

Page &/ or Section	Report Statement	Comments	Addressed in report?	Author Comment
6.6	Figure 6.3 is modified from DWA 2011 and illustrates the approach to achieve…	**User requirements:** It is not only the users and their requirements that need to be taken into account but the broader socio-economic impact as well.		User requirements within this context include the socio economic impact of these requirements.
6.1.4”		Does this study address groundwater quality?	Yes	Yes, ground water quality will also be considered in this study.
2.2		All reference to Reserves must be preceded by “preliminary”	Yes	
2.2	A possible concern and issues that will need to be addressed early on in this classification project is the recommended Reserve in the Crocodile River catchment. The Reserve recommended in this case was the so-called present-day flow. In other words, the intention is to maintain the current flow regime in order to maintain the ecology of the river in its current state. There are two issues with this that need to be resolved. Firstly, if the ecological state is declining under the current flow regime then maintaining the flow regime will not necessarily maintain the ecological status. Secondly, maintaining the current flow regime implies that there can never be any additional water use in the catchment. This will have serious implications for socio-economic development in the catchment	Consider revising. The Reserve remains preliminary until the class is determined. Thereafter all preliminary Reserves will be reviewed in order to give effect to the class. In determining the scenarios, aspects such as lowering ecological protection to allow for more use will be considered.	Yes	The paragraph in the report has been removed.
4.1	The integrated process is provided in Figure 4.1 (Louw and Scherman, 2012) and forms the basis of the scope of this study. The scope of the study is therefore designed around the INTEGRATED STEPS and not the individual process steps.	It must be clearly specified that <u>All</u> steps as required by the Regulations will be addressed and there will be outcomes for each. The management of the workflow of the technical process is based on integration of similar steps.	Yes	The process submitted by the PSP in their proposal is based on the ‘Integrated Process’ which was derived from lessons learnt during the Vaal Classification Study. This deviates somewhat from the 7 step process. The ‘Linking of water to value’ step is dealt with in Step 1 (Status Quo) and Step 3, (Evaluation of scenarios).
5.4		TOR also required that the plan for implementation/operationalisation of the classes and RQOs be developed	Yes	Section on Implementation added
6.1.2		Framework to evaluate consequences?	Yes	Section added to exp[lain how consequences are to be evaluated

Page &/ or Section	Report Statement	Comments	Addressed in report?	Author Comment
6.2.1		Include stakeholder plan and clearly delineate responsibilities	Yes	Stakeholder plan and responsibilities added
6.6	The Consultant is not responsible for the detailed groundwater RQOs on a site specific basis but general aquifer management philosophies will be specified.	Not sure what this means. How will this be implemented?	Yes	The PSP will develop RQOs for groundwater at the scale of the IUAs.
7.1	Note that the budget caters only for one round of comments	TOR stated that at least 2 rounds of comments on a draft report must be expected	Yes	The programme and budget allowed for comments from the following: Directorate: Classification (Project Manager) Directorate: Classification (Director) ICMA, PMC and PSC members
8.1	Separate out Training from Mentoring	Done	Yes	The training and mentorship tasks are now described separately.
9.1	Please acknowledge in the Inception Report that the 2nd Public meeting needs to be held but there are no finances available for that	Amended in the report. Reference to the ICMA funding the 2nd public meeting has been removed.	Yes	