WEM/WMA3/4/00/CON/CLA/0324

water and sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Classification of Significant Water Resources and Determination of Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments

CLOSE OUT REPORT

FINAL
September 2024

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Department of Water and Sanitation

Chief Directorate: Water Ecosystem Management

PROJECT NUMBER**:** WP 11387

Close Out Report

CLASSIFICATION OF SIGNIFICANT WATER RESOURCES AND DETERMINATION OF RESOURCE QUALITY OBJECTIVES FOR WATER RESOURCES IN THE USUTU TO MHLATHUZE CATCHMENTS

SEPTEMBER 2024

REFERENCE

This report is to be referred to in bibliographies as:

Department of Water and Sanitation, South Africa, September 2024. Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: Close Out Report. Prepared by: WRP Consulting Engineers (Pty) Ltd. DWS Report: WEM/WMA3/4/00/CON/CLA/0324.

REPORT SCHEDULE

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1	WEM/WMA3/4/00/CON/CLA/0122	Classification of Significant Water Resources and Determination of Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: **Inception Report including Gap Analysis chapter**
2	WEM/WMA3/4/00/CON/CLA/0222	Classification of Significant Water Resources and Determination of Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: **Status Quo and Delineation of Integrated Units of Analysis and Resource Unit Report**
3	WEM/WMA3/4/00/CON/CLA/0322	Classification of Significant Water Resources and Determination of Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: **Resource Units Delineation and Prioritisation Report**
4	WEM/WMA3/4/00/CON/CLA/0422	Classification of Significant Water Resources and Determination of Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: **Hydrology Systems Analysis Report**
5	WEM/WMA3/4/00/CON/CLA/0522	Classification of Significant Water Resources and Determination of Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: **River EWR estimates for Desktop Biophysical Nodes Report**
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7	WEM/WMA3/4/00/CON/CLA/0722	Classification of Significant Water Resources and Determination of Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: **Basic Human Needs Report**
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9	WEM/WMA3/4/00/CON/CLA/0922	Classification of Significant Water Resources and Determination of Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: **River specialist meeting Report**
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11	WEM/WMA3/4/00/CON/CLA/1122	Classification of Significant Water Resources and Determination of Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: **Wetland Report**
12	WEM/WMA3/4/00/CON/CLA/1222	Classification of Significant Water Resources and Determination of Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: **Ecological Water Requirements Report**
13	WEM/WMA3/4/00/CON/CLA/1322	Classification of Significant Water Resources and Determination of Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: **Scenario Description Report**

Index Number	DWS Report Number	Report Title
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	WEM/WMA3/4/00/CON/CLA/0123, volume 2	Classification of Significant Water Resources and Determination of Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: **Ecological Consequences Report, Volume 2: Estuaries**
15	WEM/WMA3/4/00/CON/CLA/0323	Classification of Significant Water Resources and Determination of Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: **Ecosystem Services Consequences Report**
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18	WEM/WMA3/4/00/CON/CLA/0623, volume 1	Classification of Significant Water Resources and Determination of Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: **Resource Quality Objectives Report, Volume 1: Rivers**
	WEM/WMA3/4/00/CON/CLA/0623, volume 2	Classification of Significant Water Resources and Determination of Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: **Resource Quality Objectives Report, Volume 2: Estuaries**
	WEM/WMA3/4/00/CON/CLA/0623, volume 3	Classification of Significant Water Resources and Determination of Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: **Resource Quality Objectives Report, Volume 3: Wetlands and Groundwater**
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Shaded Grey indicates this report.

APPROVAL

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Report Title:	***Close Out Report***
Author(s):	*Koekemoer, S., Lötter, A., Louw, D., Mackenzie, J., Sami, K., Scherman, P., Seago, C.J. and Van Niekerk, L.*
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Approved for the PSP by:

.....

CJ Seago

Study Leader

Approved for the Department of Water and Sanitation by:

.....

Ms Mohlapa Sekoele

Project Manager

.....

Ms Nolusindiso Jafta

Scientist Manager

.....18/10/2024.....

Ms Lebogang Matlala

Director: Water Resource Classification
of CD: Water Ecosystems Management

ACKNOWLEDGEMENTS

The following persons are acknowledged for their contribution to this report.

Project Management Team

Sekoele, M	DWS: Water Resource Classification
Jafta, N	DWS: Water Resource Classification
Makanda, KC	DWS: Water Resource Classification

AUTHORS

The following persons contributed to this report:

Author	Company
Koekemoer, Shael	Koekemoer Aquatic Services
Lötter, Anelle	Anelle Lotter Communications
Louw, Delana	Rivers for Africa
Mackenzie, James	MacKenzie Ecological & Development Services
Sami, Karim	WSM Leshika
Scherman, Patsy	Scherman Environmental
Seago, Caryn	WRP Consulting Engineers
Van Niekerk, Lara	Council for Scientific and Industrial Research (CSIR)

EXECUTIVE SUMMARY

BACKGROUND

Chapter 3 of the National Water Act, 1998 (NWA) (Act 36 of 1998), deals with the protection of water resources. Section 12 of the NWA requires the Minister to develop a system to classify water resources. In response to this, the Water Resource Classification System (WRCS) was gazetted on 17 September 2010 and published in the Government Gazette no. 33541 as Regulation 810. The WRCS is a step-wise process, whereby water resources are categorised according to specific classes that represent a management vision of a particular catchment. This vision takes into account, the current state of the water resource, the ecological, social, and economic aspects that are dependent on the resource. Once significant water resources have been classified through the WRCS, Resource Quality Objectives (RQOs) have to be determined to give effect to the class.

The Chief Directorate: Water Ecosystems Management (CD: WEM) of the Department of Water and Sanitation (DWS), initiated a study to determine the Water Resource Classes and RQOs for all significant water resources in the Usutu to Mhlathuze Catchment. The Usutu to Mhlathuze Catchments are amongst many water-stressed catchments in South Africa. These catchment areas are important for conservation, and contain a number of protected areas such as natural heritage sites, cultural and historic sites, as well as other conservation areas that need protection.

STUDY AREA

The study area is the Usutu to Mhlathuze Catchment, which has been divided into six drainage areas, as well as secondary catchment areas:

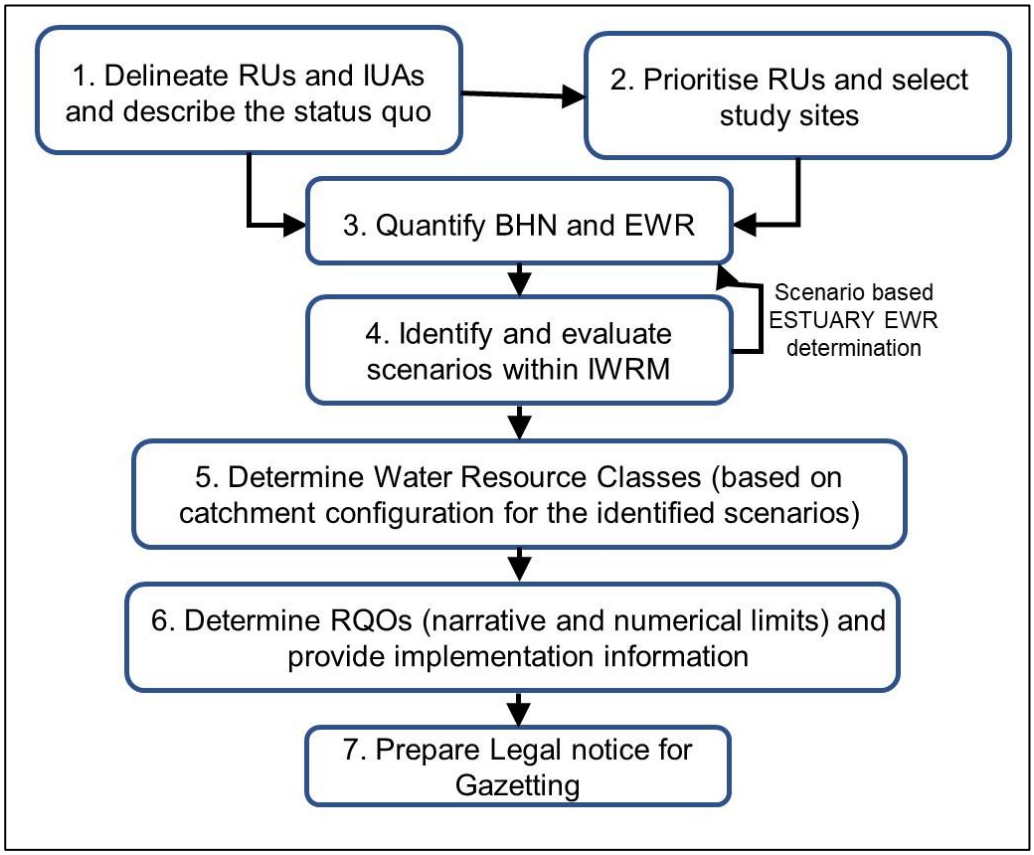
- W1 catchment (main river: Mhlathuze).
- W2 catchment (main river: Umfolozi).
- W3 catchment (main river: Mkuze).
- W4 catchment (main river: Pongola) - part of this catchment area falls within Eswatini.
- W5 catchment (main river: Usutu) - much of this catchment falls within Eswatini.
- W7 catchment (Kosi Bay and Lake Sibaya).

PURPOSE OF THIS REPORT

This report forms the final deliverable of the study and provides feedback on final deliverables, milestones, stakeholder participation, training, challenges and lessons learnt through the undertaking of the determination of the Water Resource Classes and RQOs for all significant water resources in the Usutu to Mhlathuze Catchment. Recommendations on how to prepare for similar challenges or limitations in future studies are also made.

TECHNICAL PROJECT PLAN

The Terms of Reference (ToR) referred to the guidelines and gazetted processes for the Water Resources Classes and Resource Quality Objectives (RQOs). An integrated framework was developed and agreed on and outlined in the figure below.



Project Plan for the Usutu-Mhlathuze Classification study

MILESTONES: DELIVERABLES AND REPORTS

The overall study was broken down into various tasks and sub-tasks with associated deliverables and reports which were the milestones of the study project. **Table 2.1**, **Section 2.1** provides a summary of these and presents a comparison between the original proposed due date and the actual submission date (first draft report). Twenty two formal reports were produced as part of this study.

FINANCIAL SUMMARY

The total budget for the Study was R 8 876 884.50 including 15% VAT. While budgets were reallocated between tasks, no budget variation orders were made throughout the course of the Study to increase the overall budget.

STAKEHOLDER PARTICIPATION

The stakeholder involvement process that was followed for the duration of the contract is outlined in Chapter 4. A focused stakeholder engagement process was undertaken that was aligned to the technical steps of the study. Where possible, linkages and alignment to existing structures and forums were made. A wide and extensive stakeholder database was set up and updated on a continuous basis. Stakeholders representing specific sectors of society (e.g. agriculture, mines, conservation) were identified and asked to serve on a Project Steering Committee (PSC) for the duration of this project. Five PSC meetings, one Technical Task Group (TTG) meeting, one workshop (RQO workshop of August 2023) and two public meetings were held during the course of the study. The stakeholder engagement process followed has provided sufficient opportunities for stakeholders to become involved in the process. Stakeholders received information through a variety of avenues in different languages. The process has taken place over a long enough period to provide sufficient time for stakeholders to contribute. The stakeholder process was transparent;

stakeholders had access to all technical documents and project team members, to clarify any matters of concern.

CAPACITY BUIDING

As itemized in the Terms of Reference, capacity building was planned to take place at three levels, i.e. (1) mentorship of Ms Sekoele (replacing Mr Mnisi who left the team early in the Study) and Ms Makanda, as identified by DWS; (2) broad capacity building workshops that provide an overview of specific study components to DWS and Inkomati-Usuthu Catchment Management Agency (IUCMA) staff; and (3) stakeholder empowerment sessions.
The subject matter of the three Capacity Building/Training workshops is shown below:

- Training Workshop 1, July 2022: An overview of Classification, Reserve and RQOs as Resource Directed Measures tools in IWRM. Delineation of the study area was included as a hands-on session.
- Training Workshop 2, May 2023: Ecological Consequences.
- Training Workshop 3, April 2024: Riparian vegetation; implementation, monitoring and gazetting. The session on Riparian vegetation was included on DWS's request. A legal session was included.

Three other training opportunities were held during the study, as follows:

- Attendance of the river field survey: 18 - 22 July 2022.
- Exposure to the online rivers EWR working session held in September 2022.
- Attendance of the estuary field survey from 3 - 9 October 2022.

INFORMATION REPOSITORY

All the reports, relevant information and raw data utilised and generated during the determination of the Water Resource Classes and RQOs for all significant water resources in the Usutu to Mhlathuze Catchment Study, are provided electronically. The study was structured and divided into various tasks and sub-tasks which forms the basis for the outline and indexing of electronic data (outlined in **Chapter 6**). This index should be used as a 'general road map' when searching for files.

RECOMMENDATIONS

The following recommendations are made based on issues or limitations identified during the Usutu to Mhlathuze study. The full list of information, including identified issues and limitations, can be found in **Chapter 7**.

Estuaries

- Towards more effective monitoring of the estuaries in the region, it is strongly recommended that a formal partnership be formed with the Department of Forestry, Fisheries and the Environment (DFFE): Branch Fisheries research, South African Environmental Observation Network (SAEON), South African Institute for Aquatic Biodiversity (SAIAB), Oceanographic Research Institute (ORI) and the Council for Scientific and Industrial Research (CSIR) to support the DWS in the monitoring of the estuaries in the region. All these entities have a mandate to support a capable state and the required expertise and infrastructure to support the department in its mandate.
- The iSimangaliso Wetland Park Authority is in the process of collecting critical information on the abiotic (e.g. river inflow, Light Detection and Ranging (LiDAR), corrected water levels, salinity in lakes and Narrows, sediment composition) and biotic components (e.g. microalgae,

macrophytes, invertebrates, fish and birds) of the St Lucia/iMfolozi Estuarine Lake System. Once this information is in place the existing numerical modeling results needs to be revisited to see if historical predictions of flow-salinity relationships are still valid, and the EWR be refined to first achieve a C Category (short-term) and ultimately a B Category (long-term).

- Freshwater flow requirements of the marine environment should be considered, particularly during higher confidence studies for identified estuaries.

Wetlands

- It is highly recommended that field visits are undertaken for high priority and important wetlands to verify wetland Present Ecological State (PES) categories and scores using wetland assessment tools such as WetHealth V2 (Macfarlane *et al*., 2020), thereby adding the assessment of hydrology, geomorphology, water quality and vegetation to the landuse information, and also then to update or add to the RQOs, employing the route of strategic adaptive management.
- It is recommended that any future Resource Directed Measures (RDM) studies including important wetlands, include budgets and resources allocated to promote more detailed and scientific investigations, and in some cases having teams of specialists to do field verification, akin to estuarine studies. The nature of the wetlands to be assessed, primarily hydrogeomorphic (HGM) typing and extent, should be taken into account during planning to provide guidance for assessment. The following should be undertaken:
  - 1-person visits for smaller wetlands using WetHealth or similar tools that consider all aspects of wetland form and function, or
  - team visits for larger wetlands or where the HGM necessitates it, and where the team may include various specialists as necessary, e.g. vegetation, fish, herpetofauna, avian, water quality, geomorphological or hydraulic specialists.

Groundwater

- Caution must be utilised when developing RQOs based on monitoring variables that cannot be enforced, such as water levels. There is no legal mandate to monitor borehole water levels except in dedicated DWS boreholes or boreholes where users have a Water Use License (WUL). Even with a WUL, users need only adhere to a volumetric abstraction, not monitor levels. Should RQOs be based on aspects that cannot be enforced or rather use adaptive measurements that can be estimated?
- RQOs should consider that maintaining the groundwater contribution to the Reserve is a broad spatial issue, maintaining baseflow and an aquifer reserve for the Basic Human Needs (BHN). It is a different objective to monitoring water levels to manage a wellfield or borehole, which are point scale objectives. Note that local over-abstraction may have little impact on baseflow. RQOs should therefore rather stipulate spatial volumes of abstraction and distances from a water course that would cause an undesirable impact on low flows or undue aquifer stress.
- The objective of RQOs needs to be stated, and the relevance and realistic ability of a numerical RQO to meet this objective should be assessed in terms of scale issues, spatial variability, natural temporal variability and physical/financial ability to monitor the numerical RQO.
- Workshops between Professional Service Providers (PSPs) and DWS officials, or training if required, should be undertaken before developing RQOs, so that stated objectives can be clarified and RQOs tailored to meet these objectives. This should include discussions related to realistic ability to monitor the RQOs. Having a common starting point and mutual

understanding of the problems can prevent subsequent misunderstandings and unnecessary efforts.

- Integrating RQOs and Classification studies with Reconciliation Strategies, which update the surface and groundwater hydrology, should be considered to avoid water balance discrepancies.
- The incorporation of training on groundwater into water resources courses (e.g. courses on yield modelling or general water resource management) should be considered.

Methods, manuals, terminology and document control

- The DWS website should have a link at all times to the latest methods, manuals and models for use during RDM studies. PSPs should be made aware of specific requirements and manual/models available timeously to ensure assessments are done assessment correctly.
- A process should be followed for updating terminology, and this should be clearly dated and displayed on the DWS website.
- The water quality methods manual must be updated and finalized as a matter of priority.

RQO Implementation and monitoring

- It is highly recommended that DWS monitoring and all other monitoring activities, e.g. IUCMA monitoring, fall within one RQO implementation structure as all should be aimed at measuring compliance to the Class and RQOs. Currently monitoring measure possible change in river health which would link in to RQO monitoring.
- Various *ad hoc* biomonitoring initiatives take place in some areas of the catchment on a regular basis, often initiated as a result of water use licence conditions (especially in the mining industry). These monitoring programmes are generally performed at sampling sites specific to the requirements of the client and generally include the application of fish and macroinvertebrate (South African Scoring System - SASS5) protocols. It is strongly advised that this information should be centralised (such as by the DWS or the IUCMA) and utilised for the determination of the state of the rivers of concern.

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TERMINOLOGY AND ACRONYMS

BHN(R)	Basic Human Needs Reserve
CD: WEM	Chief Directorate: Water Ecosystems Management
CSIR	Council for Scientific and Industrial Research
DFFE	Department of Forestry, Fisheries and the Environment
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
ESS	Ecosystem Services
EWR	Ecological Water Requirement
GRA II	Groundwater Resource Assessment Phase II
HGM	Hydrogeomorphic
IRR	Issues and Response Report
IUA	Integrated Unit of Analysis
IUCMA	Inkomati-Usuthu Catchment Management Agency
IWRM	Integrated Water Resources Management
NAEHMP	National Aquatic Ecosystem Health Monitoring Programme
LiDAR	Light Detection and Ranging
MCA	Multi Criteria Assessment
NWA	National Water Act
ORI	Oceanographic Research Institute
PES	Present Ecological State
PES/EIS	Present Ecological State, Ecological Importance and Sensitivity
PMC	Project Management Committee
PSC	Project Steering Committee
PSP	Professional Service Provider
RBM	Richards Bay Minerals
RDM	Resource Directed Measures
REMP	River EcoStatus Monitoring Programme
RHP	River Health Programme
RQO	Resource Quality Objective
RU	Resource Unit
SAEON	South African Environmental Observation Network
SAIAB	South African Institute for Aquatic Biodiversity
SANLC	South African National Land Cover
SASS	South African Scoring System
SCF	Scenario Comparison Facility
SMME	Small, Medium and Micro Enterprise
SQR(s)	sub-quaternary reach(es)
TEC	Target Ecological Category
ToR	Terms of Reference
TTG	Technical Task Group
WMA	Water Management Area
WRCS	Water Resource Classification System
WUL	Water Use License

SPELLING

There are multiple references to the spelling of various Rivers, Lakes, Dams and Estuaries, depending on the source of information. For the purposes of this report, the following Table presents the selected spelling of indicated water resources and places.

Selected Spelling for this Study	Alternate spellings
Usutu River	Usuthu River
Mhlathuze River	Mhlatuze, uMhlatuze River
Pongola (river, Town & Pongolapoort Dam)	Phongola, Phongolo
Lake Sibaya	Lake Sibiya, Lake Sibhayi, Lake Sibhaya
Eswatini	eSwatini
Umfolozi River	Mfolozi River
Amatigulu River	Amatikulu, Matigulu River
Goedertrouw Dam	Lake Phobane
Mfuli River	Mefule River, Mfule
aMatigulu/iNyoni Estuary	
Sibiya Estuary	
Mlalazi Estuary	
uMhlathuze /Richards Bay Estuary	
iNhlabane Estuary	
uMfolozi/uMsunduze Estuary	
St Lucia Estuary	
uMgobezeleni Estuary	
Kosi Estuary	
Hluhluwe Game Reserve	
iMfolozi Game Reserve	
Ithala Game Reserve	
Ndumo Game Reserve	
Tembe Elephant Reserve	
iSimangaliso Wetland Park	
Kosi Bay and Coastal Forest Area	
uMkhuze Game Reserve	

GLOSSARY

Ecological Water Requirements (EWR)	The flow patterns (magnitude, timing and duration) and water quality needed to maintain a riverine ecosystem in a particular condition. This term is used to refer to both the quantity and quality components.
Integrated Unit of Analysis (IUAs)	An IUA is a homogeneous area that can be managed as an entity. It is the basic unit of assessment for the Classification of water resources, and is defined by areas that can be managed together in terms of water resource operations, quality, socio-economics and ecosystem services.
Resource Quality Objectives (RQOs)	RQOs are numeric or descriptive goals or objectives that can be monitored for compliance to the Water Resource Classification, for each part of each water resource. “The purpose of setting RQOs is to establish clear goals relating to the quality of the relevant water resources” (NWA, 1998).
Scenario	Scenarios, in the context of water resource management and planning, are plausible definitions (settings) of factors (variables) that influence the water balance and water quality in a catchment and the system as a whole. Each scenario represents an alternative future condition, generally reflecting a change to the present condition.
Sub-quaternary reach (SQR)	A finer subdivision of the quaternary catchments (the catchment areas of tributaries of main stem rivers in quaternary catchments), to a sub-quaternary reach.
Target Ecological Category (TEC)	This is the ecological category toward which a water resource will be managed once the Classification process has been completed and the Reserve has been finalised. The draft TECs are therefore related to the draft Classes and selected scenario.
Water Resource Class	The Water Resource Class (hereafter referred to as Class) is representative of those attributes that the DWS (as the custodian) and society require of different water resources. The decision-making toward a Class requires a wide range of trade-offs to be assessed and evaluated at a number of scales. Final outcome of the process is a set of desired characteristics for use and ecological condition of the water resources in a given catchment. The WRCS defines three management classes, Class I, II, and III, based on extent of use and alteration of ecological condition from the predevelopment condition.

1 INTRODUCTION

1.1 BACKGROUND

Chapter 3 of the National Water Act, 1998 (NWA) (Act 36 of 1998), deals with the protection of water resources. Section 12 of the NWA requires the Minister develop a system to classify water resources. In response to this, the Water Resource Classification System (WRCS) was gazetted on 17 September 2010 and published in Government Gazette 33541 as Regulation 810. The WRCS is a stepwise process whereby water resources are categorised according to specific classes that represent a management vision of a particular catchment. This vision takes into account the current state of the water resource, the ecological, social and economic aspects that are dependent on the resource. Once significant water resources have been classified through the WRCS, Resource Quality Objectives (RQOs) must be determined to give effect to the class. The implementation of the WRCS therefore assesses the costs and benefits associated with utilisation versus protection of a water resource. Section 13 of the NWA requires that Water Resource Classes and RQOs be determined for all significant water resources.

Thus, the Chief Directorate: Water Ecosystems Management (CD: WEM) of the Department of Water and Sanitation (DWS) initiated a study for determining the Water Resource Classes and RQOs for all significant water resources in the Usutu to Mhlathuze Catchment. The Usutu to Mhlathuze Catchments are amongst many water-stressed catchments in South Africa. These catchment areas are important for conservation and contain a number of protected areas, natural heritage sites, cultural and historic sites as well as other conservation areas that need protection. There are five RAMSAR[1] sites within the catchment, which includes the world heritage site, St Lucia. The others are Sibaya, Kosi Bay, Ndumo Game Reserve and Turtle Beaches.

1.2 STUDY AREA

The study area is the Usutu to Mhlathuze Catchment that has been divided into six drainage areas and secondary catchment areas as follows (refer to the locality map provided as **Figure 1.1**):

- W1 catchment (main river: Mhlathuze).
- W2 catchment (main river: Umfolozi).
- W3 catchment (main river: Mkuze).
- W4 catchment (main river: Pongola) - part of this catchment area falls within Eswatini.
- W5 catchment (main river: Usutu) - much of this catchment falls within Eswatini.
- W7 catchment (Kosi Bay estuary and Lake Sibaya).

Note that all assessments within Eswatini are excluded apart from the hydrological modelling required to assess any downstream rivers in South Africa that either run through Eswatini or originate (source) in Eswatini.

River Ecological Water Requirements (EWR) sites are shown on **Figure 1.1**.

[1] A Ramsar site is a wetland site designated to be of international importance under the Ramsar Convention, also known as "The Convention on Wetlands", an intergovernmental environmental treaty established in 1971 by UNESCO in the Iranian city of Ramsar, which came into force in 1975.

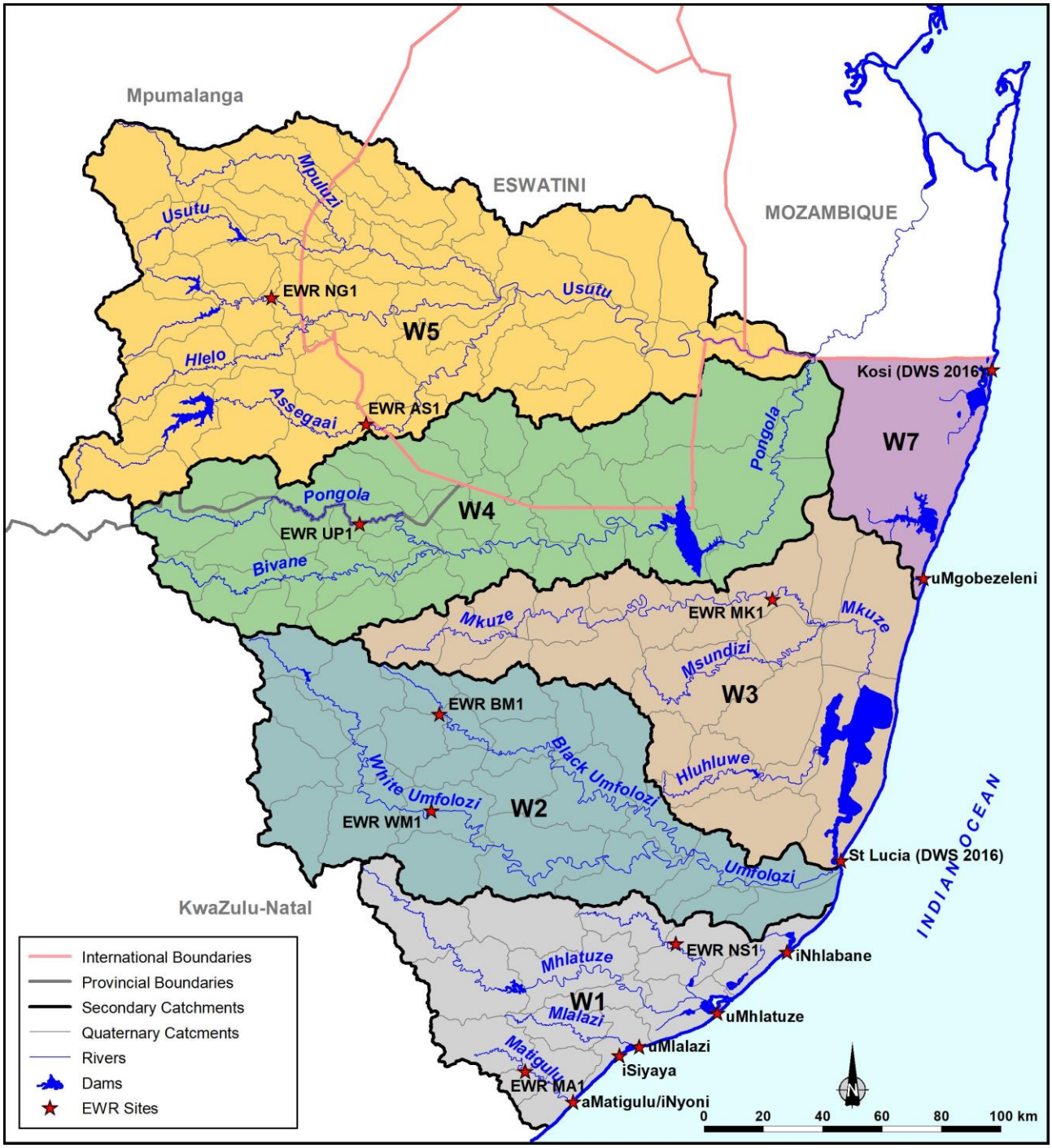


Figure 1.1 Locality Map of the Study Area showing EWR sites and estuaries assessed

1.3 PURPOSE OF THIS REPORT

This report forms part of Task 7, the final deliverable of the study (**Figure 1.2**) and provides feedback on final deliverables, milestones, stakeholder participation, training, challenges and lessons learnt through the undertaking of the determination of the Water Resource Classes and RQOs for all significant water resources in the Usutu to Mhlathuze Catchment. Recommendations on how to prepare for similar challenges or limitations in future studies are also made.

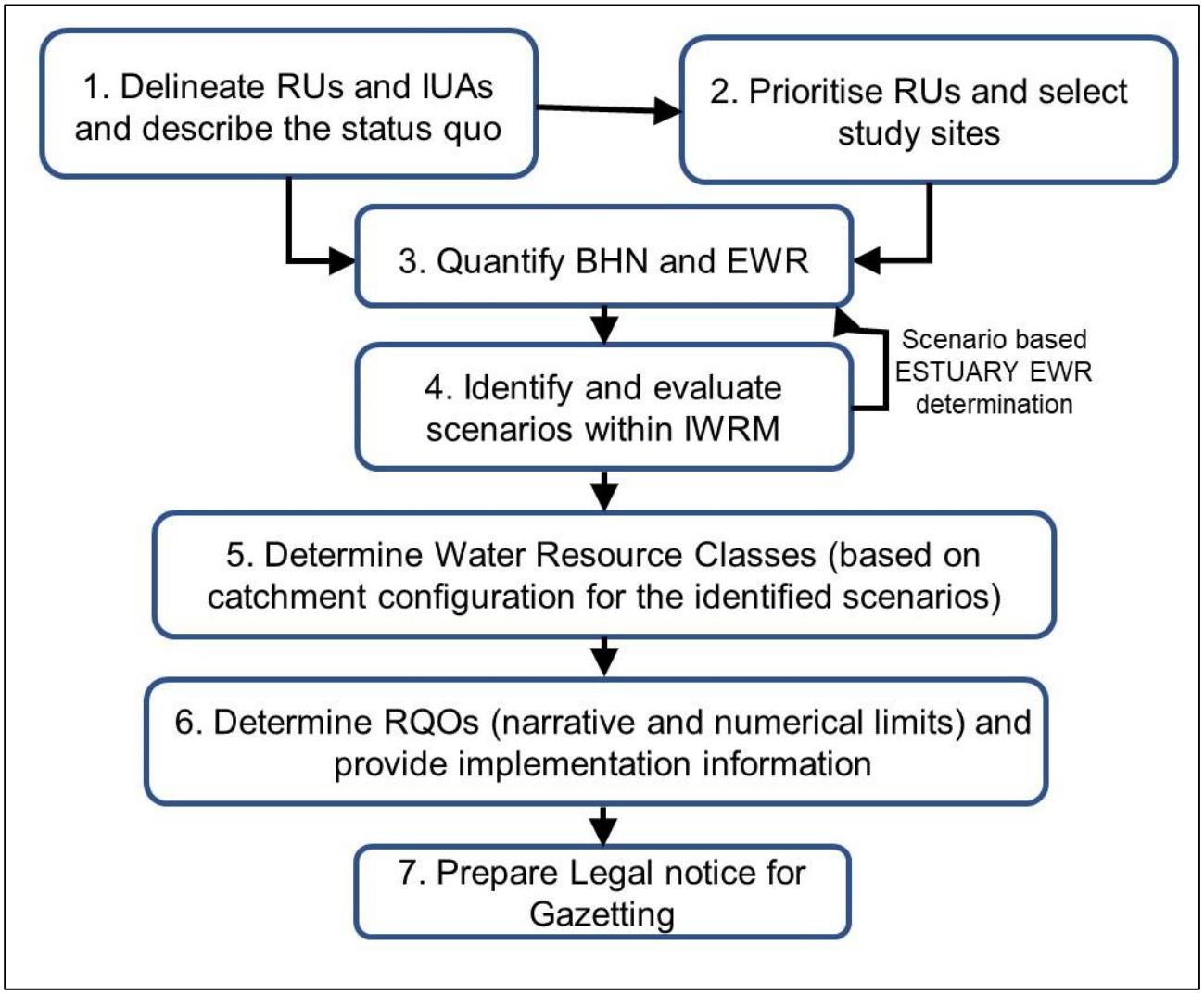


Figure 1.2 Project Plan for the Usutu-Mhlathuze Classification study

1.4 REPORT OUTLINE

The report outline is as follows:

- **Chapter 1** provides general background information on the study area and the Project Plan.
- **Chapter 2** provides a summary of the Study tasks as well as the deliverables and reports produced during the study.
- **Chapter 3** summarises the financial aspects of the project.
- **Chapter 4** describes the stakeholder involvement process that was followed for the duration of the contract.
- **Chapter 5** summarises the capacity building programme for the project.
- **Chapter 6** outlines the directory structure of the electronic data that was collated during the study.
- **Chapter 7** provides more detail regarding the issues and challenges encountered during the study and provides general recommendations.
- **Chapter 8** presents details of the report references throughout the report.

2 MILESTONES: DELIVERABLES AND REPORTS

2.1 DELIVERABLES

The overall study was broken down into various tasks and sub-tasks with associated deliverables and reports which were the milestones of the study project. **Table 2.1** provides a summary of these and presents a comparison between the original proposed due date and the actual submission date (first draft report).

Table 2.1 Summary of Deliverables and dates

No.*	Deliverable	Due Date as per Inception Report	Actual Delivery Date
4.3.1	Inception Report, including Gap Analysis Chapter	Feb-22	Mar-22
4.3.2	Stakeholder Engagement Plan and Stakeholder database	Feb-22	Mar-22
4.3.3	Present Ecological State, Ecological Importance and Ecological Sensitivity (PES/EIS) spreadsheet	Feb-22	Feb-22
4.3.4	Status quo and Delineation of Resource Units and Integrated Units of Analysis Report	May-22	Apr-22
4.3.5	Resource Units Prioritisation Report	May-22	May-22
4.3.6	Hydrology Systems Analysis Report	Jun-22	Jun-22
4.3.7	River EWR for the Desktop Biophysical Nodes Report	Jul-22	Jun-22
4.3.8	River Survey and Site Visit Report	Jul-22	Jul-22
4.3.9	Basic Human Needs Report	Aug-22	Jul-22
4.3.10	Groundwater Report	Sep-22	Aug-22
4.3.11	2x Specialist Workshop Reports (rivers, estuaries)	Sep-22 (rivers) Feb-23 (estuaries)	Sep-22 Mar-23
4.3.12	Estuary Survey and Site Visit Report	Oct-22	Oct-22
4.3.13	Wetland Report	Nov-22	Nov-22
4.3.14	Ecological Water Requirements Report	Dec-22	Nov-22
4.3.15	Scenario Description Report	Feb-23	Feb-23
4.3.16	Classes decision-making tool spreadsheet	Feb-23	Feb-23
4.3.17	Ecological Consequences Report	May-23	Apr-23
4.3.18	Ecosystem Services Consequences Report	Jun-23	May-23
4.3.19	Economic & User Water Quality Consequences Report	Jun-23	May-23
4.3.20	Water Resource Classes Report	Jul-23	Jul-23
4.3.21	RQOs and Numerical Limits Report	Oct-23	Oct-23
4.3.22	Implementation and Monitoring Report	Nov-23	Nov-23
4.3.23	Project Steering Committee Meeting Minutes and updated Issues & Responses Register (5x)	5x throughout lifecycle of project	Various
4.3.24	Technical Task Group Meeting Minutes and updated Issues & Responses Register (3x)	3x throughout lifecycle of project	Various
4.3.25	Public Meeting Minutes and updated Issues & Responses Register (2x)	2x throughout lifecycle of project	Various
4.3.26	RQO Workshop (3 days)	Aug-23	Aug-23
4.3.27	Classes and RQOs Gazette Template (i.e. technical input to the legal notice)	Jan-24	Feb-24
4.3.28	Capacity Building Reports: Mentorship programme; Capacity Building workshops (3x) and Stakeholder Empowerment Sessions (3x)	3x throughout lifecycle of project	Various
4.3.29	Capacity Building of Small, Medium and Micro Enterprise (SMME) (7x)	7x throughout lifecycle of project	Various

No.*	Deliverable	Due Date as per Inception Report	Actual Delivery Date
4.3.30	Project Administration and Management (9x)	9x quarterly	Various
4.3.31	Progress Reports (7x)	7x throughout lifecycle of project	Various
4.3.32	Main Report	Jan-24	Mar-24
4.3.33	Final Issues & Responses Report	May-24	Oct-24
4.3.34	Project Closing report and Electronic Information and Data	May-24	Jul-24

* This numbering refers to that in the Contract.

2.2 REPORTS

Twenty two formal reports were produced as part of this study. The following sub-sections present a summary of the purpose of each report.

2.2.1 Inception Report including Gap Analysis chapter

The report outlined the tasks to be conducted as part of the Usutu-Mhlathuze Classification and RQO study, including deliverable dates and task responsibilities. Chapter 1 provides a context to the study area, while Chapter 2 outlines any gaps encountered during preparation of this document. Chapters 3, 4 and 5 deal with the scope of works for Project Management related activities, the technical work and capacity building and mentorship respectively. Chapters 6 and 7 show the study programme and team. References are listed in Chapter 8. The report is supported by Appendices documenting more detailed information.

2.2.2 Status Quo and Delineation of Integrated Units of Analysis and Resource Unit Report

The purpose of this report was to describe the status quo of the water resources in the Usutu to Mhlathuze Catchment in terms of the water resource system. The report documents the results of Task 1: Delineate Integrated Units of Analysis (IUAs) and Resource Units (RUs) and describe the status quo of the Usutu to Mhlathuze Catchment (**Figure 1.2**).

2.2.3 Resource Units Delineation and Prioritisation Report

The purpose of this report was to document the results of Task 2: Prioritise Resource Units (RUs) and select study sites (**Figure 1.2**). The objective of this task was to identify high priority Resource Units, as these would be the areas where more detailed work for the rest of the steps would be the focus.

2.2.4 Hydrology Systems Analysis Report

The purpose of this report was to describe the hydrology and water resources model configurations used for water resources analyses throughout this study. No new hydrology data was prepared as part of this study, all hydrology data was sourced from other studies as outlined in the report. This report summarises the hydrology and presents the natural and present-day flows at the various required biophysical nodes and EWR sites.

2.2.5 River EWR estimates for Desktop Biophysical Nodes Report

The purpose of this report was to document the results of a component of Task 3: Quantify Basic Human Needs (BHN) and EWRs (**Figure 1.2**). The component represented in this report is the determination of EWRs at those biophysical nodes for which a desktop estimation model was used.

2.2.6 River Survey Report

The purpose of this report was purely to document the activities during the River EWR site visit 18 – 22 July 2022 for invoicing purposes.

2.2.7 Basic Human Needs Report

The purpose of this report was to quantify the Basic Human Needs Reserve (BHNR) as a key component of the Usutu-Mhlathuze Classification study. The National Water Act (Act No. 36 of 1998) ensures that everyone has access to sufficient water by setting aside a certain amount of water to meet everyone's basic needs, i.e. the BHNR. The BHNR is based upon the current and projected population of those either living within the catchment and directly dependant on the catchment or, critically, not being supplied with water from a recognised formal source. This report therefore documents the basic human needs requirements for the population currently and in the reasonably near future, whom would be relying upon, taking water from, or being supplied from the water resource for their essential needs of drinking water, food preparation and personal hygiene.

2.2.8 Groundwater Report

The purpose of this report was to document the results of the groundwater analysis as a key component of the Usutu-Mhlathuze Classification study. The objective of this task was to calculate the Groundwater Component of the Reserve and the Groundwater Classification.

2.2.9 River & Estuary Specialist Meeting Report

The purpose of this report was to document the results of the specialist preparatory work that was undertaken for the rivers component and summarize the outcomes of the workshop (12 – 16 September 2022). The EWR specialist meeting formed part of Task 3: Quantify BHN and EWR (**Figure 1.2**). The detailed results are provided in Report 12: Ecological Water Requirements Report.

The purpose of this report was to document the findings of an estuary specialist workshop that focused on the EcoClassification and evaluation of the consequences of the various operational scenarios in terms of their impact on the estuary ecological states. The results form part of Task 4: Identify and evaluate scenarios within Integrated Water Resources Management (IWRM) (**Figure 1.2**)

2.2.10 Estuary Survey Report

As part of the study a once-off field visit was conducted to the Kosi, uMgobezeleni, iNhlabane, iSiyaya, uMlalazi and aMatigulu/iNyoni estuaries (in spring/summer) in accordance with the data requirements specified in the EWR methods for estuaries. Kosi was not part of the formally planned field trip, but in response to concerns raised about its declining conditions, efforts were made to include this system.

2.2.11 Wetland Report

The purpose of this report was to provide a desktop assessment of the EcoClassification for very high priority wetland and establish EWRs for very high priority wetlands as a key component of the Usutu-Mhlathuze Classification study.

2.2.12 Ecological Water Requirements Report

The purpose of this report was to document the EcoClassification and EWR results of the eight river EWR sites in the Usutu to Mhlathuze Catchment, as well as input on estuary ecological states. The results form part of Task 3: Quantify Basic Human Needs (BHN) and EWR (**Figure 1.2**).

2.2.13 Scenario Description Report

The purpose of this report was to summarise the scenarios that have been assessed using the water resources models. Inputs to the Classification process require the historical time series of flows under both the natural and present-day conditions in order to set environmental requirements at specific predetermined EWR sites. However, it is acknowledged that present-day flows will not necessarily continue into the future as a result of changing conditions (both climatic and man-made) in the catchments. Varying scenarios were therefore simulated using the water resources models in order to assess potential impacts on the EWR sites.

This report summarises the scenarios that have been assessed as well as the results provided to the river and estuary specialists forming part of the study team. The results were further assessed as part of two workshops scheduled in February 2023, and the impacts of the scenarios determined.

2.2.14 Ecological Consequences Report; Volume 1: Rivers, Volume 2: Estuaries

The purpose of this report was to evaluate operational scenarios and to determine the ecological consequences of these scenarios. The consequences were measured as change in ecological state from the baseline (Present Ecological State - PES). If a range of scenarios were evaluated, they were ranked. The results form part of Task 4: Identify and evaluate scenarios within the IWRM (**Figure 1.2**).

2.2.15 Ecosystem Services Consequences Report

The purpose of this report was to describe and document the consequences of the operational scenarios on Ecosystem Services (ESS) in the applicable catchments within the study area. This report presents the approach and methodology used to evaluate the different operational scenarios as well as the results obtained in terms of economic variables and form part of Task 4: Identify and evaluate scenarios within the IWRM (**Figure 1.2**).

2.2.16 Economic & User water quality Consequences Report

The purpose of this report was to evaluate and document the economic and user (non-ecological) water quality consequences of the various operational scenarios on the affected water resources of the study area. Note that this assessment was therefore focused on the rivers where EWR sites were located (user water quality and economics), and on estuaries identified for assessment through this process (economics). The results form part of Task 4: Identify and evaluate scenarios within the IWRM (**Figure 1.2**).

2.2.17 Water Resource Classes Report

The purpose of this report was to document the water Resource Classes and Catchment Configuration. The results forms part of Task 5: Determine Water Resource Classes (based on catchment configuration for the identified scenarios) (**Figure 1.2**).

2.2.18 Resource Quality Objectives Report; Volume 1: Rivers, Volume 2: Estuaries, Volume 3: Wetlands and Groundwater

The purpose of this series of reports was to present the RQOs for rivers (Vol 1) estuaries (Vol 2), Wetlands & Groundwater (Vol 3) of the Usutu to Mhlathuze catchments, as well as the user water quality RQOs (Vol 1). The results form part of Task 6: Determine Resource Quality Objectives (narrative and numerical limits) (**Figure 1.2**).

2.2.19 Monitoring and Implementation Report

The purpose of this report was to provide information that can be used towards implementation of Water Resource Classification and monitoring against RQOs. This information forms part of Task 6: Determine Resource Quality Objectives (RQO) (narrative and numerical limits) (**Figure 1.2**) and provides implementation information.

2.2.20 Main Report

The purpose of this report was to provide a consolidated summary of the work undertaken throughout the study in order to produce the Classes and Resource Quality Objectives for the Usutu to Mhlathuze catchments. Each Task carried out produced a detailed technical report which should be reviewed for more detail on the specific aspects. This Main Report presents an overview of the important information extracted from each of the technical reports.

2.2.21 Issues and Responses Report

The final report will be submitted in October 2024 and will also capture the Comments received and addressed during the gazetting period.

2.2.22 Close Out Report

This report forms part of the final deliverables of the study, and provides feedback on reports, milestones, stakeholder participation, training and challenges through the undertaking of the determination of the Water Resource Classes and RQOs for all significant water resources in the Usutu to Mhlathuze Catchment. Recommendations are also provided.

3 FINANCIAL SUMMARY

The total budget for the Study was R 8 876 884.50 including 15% VAT. While budgets were reallocated between tasks, no budget variations orders were made throughout the course of the study to increase the overall budget. **Table 3.1** presents a summary of the budgets per deliverable.

Table 3.1 Budget per deliverable

No.	Deliverable	Budget
4.3.1	Inception Report, including Gap Analysis Chapter	R 159 206.00
4.3.2	Stakeholder Engagement Plan and Stakeholder database	R 38 525.00
4.3.3	PES/EIS spreadsheet	R 237 820.00
4.3.4	Status quo and delineation of Integrated Units of Analysis and Resource Units Report	R 223 836.00
4.3.5	Resource Units Delineation and Prioritisation Report (selection and prioritization)	R 279 381.00
4.3.6	Hydrology Systems Analysis Report	R 359 467.00
4.3.7	River EWR for the Desktop Biophysical Nodes Report	R 169 970.00
4.3.8	River Survey and Site Visit Report	R 219 420.00
4.3.9	Basic Human Needs Report	R 88 435.00
4.3.10	Groundwater component of the Reserve Report	R 62 445.00
4.3.11	2x Specialist Workshop Reports (rivers, estuaries)	65%: R611 529.75 35%: R329 285.25 Total: R940 815
4.3.12	Estuary Survey and Site Visit Report	R 474 375.00
4.3.13	Wetland Report	R 73 370.00
4.3.14	Ecological Water Requirements Report	R 591 111.50
4.3.15	Scenario Description Report	R 265 075.00
4.3.16	Classes decision-making tool spreadsheet	R 158 700.00
4.3.17	Ecological Consequences Report	R 534 658.00
4.3.18	Ecosystem Services Consequences Report	R 46 575.00
4.3.19	Economic & User Water Quality Consequences Report	R 576 495.00
4.3.20	Water Resource Classes Report	R 141 335.00
4.3.21	RQOs and Numerical Limits Report	R 426 857.00
4.3.22	Implementation and Monitoring Report	R 125 787.00
4.3.23	Project Steering Committee Meeting Minutes and updated Issues & Responses Register (5x)	R 1 000 408.00
4.3.24	Technical Task Group Meeting Minutes and updated Issues & Responses Register (3x)	R 24 303.00
4.3.25	Public Meeting Minutes and updated Issues & Responses Register (2x)	R 275 949.00
4.3.26	RQO Workshop (3 days)	R 225 040.00
4.3.27	Classes and RQOs Gazette Template (i.e. technical input to the legal notice)	R 171 672.00
4.3.28	Capacity Building Reports: Mentorship programme; Capacity Building workshops (3x) and Stakeholder Empowerment Sessions (3x)	R 162 040.00
4.3.29	Capacity building of SMME (7x)	R 80 500.00
4.3.30	Project Administration and Management (9x)	R180 000.00
4.3.31	Progress Reports (7x)	R343 848.00
4.3.32	Main Report	R 103 086.00
4.3.33	Final Issues & Responses Report	R 34 500.00
4.3.34	Project Closing report and Electronic Information and Data	R 81 880.00
		R 8 876 884.50

Figure 3.1 provides the cashflow for the project.

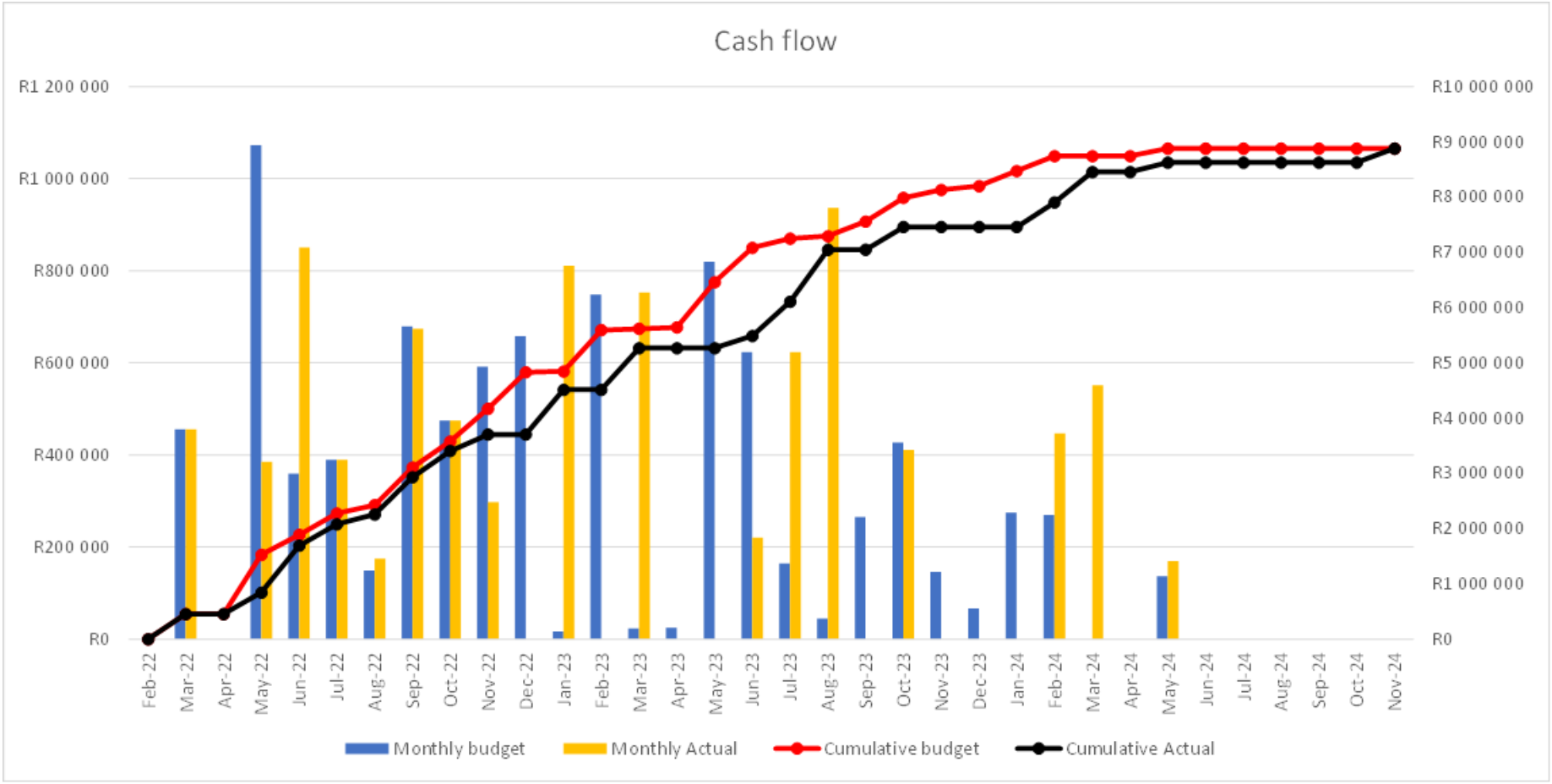


Figure 3.1 Cashflow: Budgeted and actual

4 STAKEHOLDER PARTICIPATION

The National Water Act specifies that stakeholder involvement and participation is a requirement in determining Water Resource Classes and RQOs. A process to involve stakeholders was designed and at the beginning of the implementation thereof stakeholders were requested to comment on proposed process. Based on stakeholder comments the process for participation was finalised and was followed for the duration of the contract period. Stakeholders were reminded during the process that should they have additional needs for participation; the requests will be heard and responded to.

4.1 BRIEF DESCRIPTION OF THE STAKEHOLDER ENGAGEMENT UNDERTAKEN

This Chapter describes the stakeholder involvement process that was followed for the duration of the contract. It is the final deliverable of the stakeholder engagement component of the study and serves as feedback on deliverables, milestones, challenges and lessons learnt through the undertaking of the Usutu to Mhlathuze Catchment Classification and RQOs study. A focused stakeholder engagement process was undertaken that was aligned to the technical steps of the study. Where possible, linkages and alignment to existing structures and forums were made. A wide and extensive stakeholder database was setup and updated on a continuous basis. Stakeholders representing specific sectors of society (e.g. agriculture, mines, conservation) were identified and asked to serve on a PSC for the duration of this project. Five PSC meetings, one TTG meeting, one workshop (a RQO workshop held in August 2023) and two public meetings were held during the course of the study.

Stakeholders were regularly updated on the status of the project. This was done by the distribution of a) the announcement Background Information Document (BID); b) regular notifications to all stakeholders on the database, informing them of progress made; c) study newsletters, and d) information documents/preparation material related to the various meetings which were held.

An Issues and Response Report (IRR) was compiled and updated continually throughout the implementation of the project and submitted to DWS on agreed upon intervals. This was uploaded on the DWS website on a periodic basis for all stakeholders to access and keep them informed of the issues and concerns of fellow stakeholders. Technical reports and all stakeholder engagement materials were uploaded to the DWS website and stakeholders were requested to review and comment on these documents.

4.2 DELIVERABLES

The following deliverables were produced in the contract period:

- **Stakeholder database:** This is a list of all the contact details of the stakeholders that were involved in the study. The list is available electronically in MS Excel.
- **Information Documents/Newsletters:** The purpose of information documents which were sent to all on the stakeholder database was to keep them abreast of the progress made on the study and to provide them with a summary overview of study information. For the announcement of the project and invite stakeholders to become involved, a BID was compiled and distributed to the entire database. The initial BID was followed by a number of information documents which are listed below in **Table 4.1** – copies of the documents are provided electronically.

- **Project Steering Committee:** A PSC was established, and a first meeting was held on 7 June 2022. The PSC was established as a result of a process of nomination which started at a public meeting on 4 May 2022 when a broad range of stakeholders were invited to nominate members that will be able to represent their interests. ToR were developed for the Committee and members discussed the terms of their involvement at the first PSC which was held in June 2022. The ToR was adopted by all members.
- **PSC Meetings:** Members of the PSC were invited for each meeting and received before the meeting an agenda as well as materials which assisted them to prepare meaningfully for the meeting. These materials included an Information Document, presentations to be delivered at the meeting and other relevant information (these documents are also part of the electronic information). Details regarding PSC meetings are provided in **Table 4.2**.
- **Public meetings:** Two public meetings were held. The first meeting (4 May 2022 in Richards Bay and virtually via MS Teams) was held to announce the project and to provide an opportunity for stakeholders to become involved. The second meeting was held over two sessions, i.e. a) on 5 March 2024 at Jozini Tiger Lodge and virtually via MS Teams and b) on 7 March 2024 at the Amsterdam Town Hall and virtually via MS Teams. The purpose of these meetings was to invite a broader audience than only members of the PSC to discuss the preliminary Water Resource Classes and RQOs. All stakeholders on the database received an official invitation from the DWS to attend the meeting. The attendance registers and minutes of the meetings are provided electronically.
- **Technical Task Group (TTG) meeting:** One TTG meeting on water quality was held on 3 November 2022 to gather and discuss information for assessing water quality consequences and deriving river water quality RQOs once Water Resource Classes have been determined. The meeting took place at the Mhlathuze Water Training Room in Richards Bay and virtually via MS Teams and was attended by 34 participants.
- **Workshop:** A workshop on RQOs was held on 21 and 22 August 2023 at the DWS regional office in Durban. The workshop was also held on 24 August 2023 at the DWS regional office in Mbombela. The workshops provided participants across the study area to discuss and deliberate RQOs.
- **Issues and Response Report:** All the engagements with stakeholders - either through the PSC, TTG or public meetings were recorded, and minutes were compiled. From the minutes the Issues and Response Report was compiled. Any other concerns, questions or issues which were received by the DWS and the project team, were captured in the IRR. The IRR is thus a complete record of the interactions the DWS and project team had with stakeholders with regards to this study.

Table 4.1 List of information documents provided during the course of the study

Doc	Date	Information Document
1.	April 2022	Background Information Document for Public Meeting 1.
2.	June 2022	Background Information Document for PSC 1.
3.	November 2022	Background Information Document for PSC 2.
4.	December 2022	Background Information Document for PSC 3.
5.	April 2023	Background Information Document for PSC 4.
6.	September 2023	Background Information Document for PSC 5.
7.	March 2024	Background Information Document for Public Meeting 2.

Table 4.2 Details of PSC meetings

Meeting	Date	Main items of discussion
PSC 1	Tuesday, 7 June 2022 09:00 to 13:00 MS Teams	- Establishment of the Project Steering Committee; - Presentation of the status quo of the study area, IUA delineation and the RU prioritisation.
PSC 2	Friday, 4 November 2022 09:00 to 13:00 Mhlathuze Water in Richards Bay and on the MS Teams Platform	- Presentation of the quantification of Basic Human Needs and riverine Ecological Water Requirements (EWRs); - Presentation of the outcomes of the groundwater and wetlands studies; - Report back on the Estuaries Field Survey.
PSC 3	Friday, 2 December 2022 09:00 to 11:00 MS Teams Platform	- Presentation of the identification and description of operational scenarios within IWRM.
PSC 4	Thursday, 13 April 2023 09:00 to 15:00 Mhlathuze Water: Water Training Room, Richards Bay and MS Teams	- Presentation of the consequences of operational scenarios within IWRM; - Provide proposed Classes and catchment configuration for discussion.
PSC 5	Tuesday, 19 September 2023 09:00 to 14:00 Mhlathuze Water: Water Training Room, Richards Bay and MS Teams	- Presentation of the Resource Quality Objectives (RQOs) for rivers, estuaries, groundwater and wetlands.

The stakeholder engagement process followed has provided sufficient opportunities for stakeholders to become involved in the process. Stakeholders received information through a variety of avenues in different languages. The process has taken place over a long enough period to provide sufficient time for stakeholders to contribute. The stakeholder process was transparent; stakeholders had access to all technical documents and project team members to clarify any matters of concern.

5 CAPACITY BUILDING

5.1 INTRODUCTION

As itemized in the Terms of Reference, capacity building was planned to take place at three levels, i.e. (1) mentorship of Ms Sekoele (replacing Mr Mnisi) and Ms Makanda, as identified by DWS; (2) broad capacity building workshops that provide an overview of specific study components to DWS and IUCMA staff; and (3) stakeholder empowerment sessions.

The feedback provided here is on consolidated training opportunities provided throughout the study. The subject matter of the three Capacity Building/Training workshops is shown below:

- Training Workshop 1, July 2022: An overview of Classification, Reserve and RQOs as Resource Directed Measures tools in IWRM. Delineation of the study area was included as a hands-on session.
- Training Workshop 2, May 2023: Ecological Consequences.
- Training Workshop 3, April 2024: Riparian vegetation; implementation, monitoring and gazetting. The session on Riparian vegetation was included on DWS's request. A legal session was included.

Three other training opportunities were held during the study, as follows:

- Attendance of the river field survey: 18 - 22 July 2022.
- Exposure to the online rivers EWR working session held in September 2022.
- Attendance of the estuary field survey from 3 - 9 October 2022.

A short report was provided on each training opportunity, which are included as a consolidated report-back on training opportunities offered during the study.

5.2 TRAINING WORKSHOP 1: OVERVIEW AND DELINEATION

5.2.1 Agenda and Training Materials

The workshop was run by Dr Scherman and Ms Delana Louw (river task leader) virtually on MS Teams on **29 July 2022**. The agenda for the workshop was circulated to the list of eighteen trainees identified by DWS, and the Small, Medium and Micro Enterprise (SMME) trainee identified for the project, Mr Nathi Ncube, on 28 June 2022. **Table 5.1** shows the trainees invited and those who attended, as well as two additional participants:

Table 5.1 Attendees of Training Workshop 1

No.	Name and Surname	Email address	Attended
1	Manisha Maharaj	maharajm@dws.gov.za	✓
2	Michael Maluleke	malulekem4@dws.gov.za	✓
3	Renelle Pillay	pillayr@dws.gov.za	✓
4	Ziyanda Malibiji	malibijiz@dws.gov.za	✓
5	Krishnee Naidoo	naidook@dws.gov.za	✓
6	Lwandle Sibango	sibangol@dws.gov.za	✓
7	Siphindile Shoba	shobas@dws.gov.za	✓
8	Halalisiwe Mdletshe	mdletsheh@dws.gov.za	x
9	Ivor Hoareau	hoareaul@dws.gov.za	✓

No.	Name and Surname	Email address	Attended
10	Neethan Singh	singhn2@dws.gov.za	x
11	Lodevikus Nel	nell@dws.gov.za	x
12	Nkosinjani Mkhize	mkhizen@dws.gov.za	x
13	Meso Kama	mesok@dws.gov.za	✓
14	Mmangwedi Basetsane	Basetsanem@dws.gov.za	x email bounced back repeatedly
15	Mapule Mokoena	mokoenam@dws.gov.za	✓
16	Mngomezulu Nhlanhla	mngomezulun@dws.gov.za	✓
17	Makanda Koleka	Makandac@dws.gov.za	✓
18	Mnisi Mkhevu	Mnisim2@dws.gov.za	x no longer with the project
19	Nathi Ncube	nathi.ncube@khapheni.co.ca	x
Additional participants			
20	Caroline Shai	ShaiC@dws.gov.za	√
21	S'nothile Khuzwayo	KhuzwayoS@dws.gov.za	√

The agenda is shown as **Table 5.2**.

The following items were e-mailed to participants before the workshop, for their use during the training workshop. Secondary catchment W1 (Mhlathuze) was used as the catchment to be delineated for training purposes. As a large part of the workshop was to be the preparation of spreadsheets needed for delineation and all subsequent tasks, trainees were requested to ensure they had internet connections and Google Earth loaded on your machines. They were advised to work in teams across the various DWS offices participating in the workshop.

- W1 map (to be printed as an A3 map)
- W1 training spreadsheet (without delineated RUs)
- Google Earth files (from the 2014 DWS PES EIS study)
  - W1 RCode
  - W1 RNames
  - W1 Quats

Table 5.2 Agenda for Training Workshop 1

water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

CLASSIFICATION OF SIGNIFICANT WATER RESOURCES AND DETERMINATION OF RESOURCE QUALITY OBJECTIVES FOR WATER RESOURCES IN THE USUTU TO MHLATUZE CATCHMENTS

TRAINING SESSION 1

Date: Friday, 29 July 2022
Venue: Virtual/Online

Aims: (1) Provide background to Resource Directed Measures (RDM) tools; (2) prepare delineation spreadsheets and other information required for Steps 1 and 2 of Classification, Resource Quality Objectives (RQO) and Reserve tasks; and (3) conduct delineation of a catchment into Resource Units (RUs) and Integrated Units of Analysis (IUAs).

Learning outcomes: The training session will provide an introduction to RDM tools, and equip trainees in the process of delination of a catchment for the purposes of conducting Water Resource Classification and determining Ecological Water Requirements (EWR).

Subject	Time
am	**Start 8:30 AM**
SESSION 1: BACKGROUND AND SPREADSHEETS	
1.1 Objectives of training session	Scherman
1.2 Basic concepts and definition of terms, and an introduction to RDM tools	Scherman
TEA	**10.30-10.50 AM**
1.3 Introduction to PES/EIS data used as input to delineation spreadsheets	Scherman + Louw
LUNCH	**13:00 PM**
pm	**Start 13:45 PM**
SESSION 2: DELINEATION	
1.4 Background/Introduction to delineation (Steps 1 and 2)	Louw
1.5 Practical exercise: Delineation of RUs	Louw + Scherman
1.6 Practical exercise: Delineation of IUAs	Louw + Scherman
1.7 Overview of next steps	Scherman
CLOSURE	**16:00 PM**

5.2.2 Workshop

Presentations included the following: 1.1 Objectives and 1.2 Background to Resource Directed Measures (RDM): Scherman; and 1.3 Training: Louw. Spreadsheets were completed by the trainee groups showing their delineation of RUs vs. those of the specialist team. The time allocation also allowed for a final session discussing the grouping of RUs into IUAs, and comparison to the RU1_RU2Map prepared by the specialists.

Trainees were also provided WeTransfer links to two photo guides for riparian and instream habitats, prepared in December 2008 by Louw and Kleynhans as part of Index of Habitat Integrity (IHI) documentation.

5.3 RIVER FIELD SURVEY

The river field survey was held from **18 - 22 July 2022** and attended by the following DWS personnel as a Capacity Building event.

Ms Lwandle Sibango	DWS: KwaZulu-Natal (KZN) regional office; Water Quality Management
Ms Ziyana Malibiji	
Ms Renelle Pillay	
Ms Manhisha Maharaj	
Mr Michael Singh	DWS: KZN regional office; Director: Water Resources Support
Ms Koleka Makanda	DWS: Pretoria (head office); Water Resource Classification
Mr Philani Khoza	DWS: Pretoria (head office); Reserve Determination: Groundwater Reserve Determination
Mr Molefi Mazibuko	DWS: Pretoria (head office); Reserve Determination: Surface Water Reserve Determination

The itinerary is shown below. Activities and outputs from the survey were documented in the River Survey Report[2] of July 2022.

Date	Day	Time	Activity
18 Jul	Day 1	11:40	Meet at EWR MA1
		13:00	Depart EWR MA 1 to EWR NS1
		14:30 – 16.00	EWR NS1
19 Jul	Day 2	09:30	Meet at EWR WM1
		11:30	Depart to EWR BM1
		13:00-15.30	EWR BM1
20 Jul	Day 3	08:00	Depart to EWR MK1
		10:00-14.00	EWR MK1
21 Jul	Day 4	08:00	Depart to EWR UP1
		09:30	Arrive EWR UP1
		12:30	Depart EWR UP1
		14:00-16.30	EWR AS
22 Jul	Day 5	08:00-12.00	Select and work new site in W5

[2] Department of Water and Sanitation, South Africa, June 2022. Classification of Significant Water Resources and Determination of Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: River survey report. Prepared by: WRP Consulting Engineers (Pty) Ltd. DWS Report: WEM/WMA3/4/00/CON/CLA/0622.

5.4 RIVERS EWR WORKING SESSION

The River EWR determination specialist working session was undertaken virtually on MS Teams from **9 - 15 September 2022**, with training sessions shown on the agenda **(Table 5.3)**.

Load-shedding impacted on virtual sessions, with training by Scherman (overview and EcoClassification results), Louw (assessing hydrology before using data for flow requirements), Kotze and Deacon (setting low flow requirements for aquatic biota) and Rowntree (setting high flow/flood requirements for geomorphology and riparian vegetation), conducted as training sessions during selected slots on 13 and 15 September 2022.

Training was attended by the following persons:

- Koleka Makanda
- Mohlapa Sekoele
- Renelle Pillay (selected sessions)
- Manisha Maharaj
- Ivor Hoareau
- Makhanya Kadija
- Philani Khoza
- Molefi Mazibuko
- Krishnee Naidoo
- Siphindile Shoba
- Nhlanhla Mngomezulu
- Nathi Ncube (selected sessions)

Table 5.3 Agenda for the rivers EWR working session

water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

CLASSIFICATION OF SIGNIFICANT WATER RESOURCES AND DETERMINATION OF RESOURCE QUALITY OBJECTIVES FOR WATER RESOURCES IN THE USUTU TO MHLATUZE CATCHMENTS

TRAINING SESSION 2: RIVERS EWR WORKSHOP

Date: Friday, 9 - 15 September 2022 (part-time dedicated sessions)
Venue: Virtual/Online

Aims: (1) Provide background to the EcoClassification and EWR steps (Step 2); (2) information requirements for EcoStatus and EWR determinations; (3) process of determining PES, EC and EWRs, and (4) dedicated question-and-answer sessions with the specialist team.

Learning outcomes: The training session will build on the delineation steps previously covered and provide an understanding of the EcoClassification and EWR determination steps of the process.

Subject	Time
START	**TUESDAY 13 SEPT; 9:00**
SESSION 1: ECOCLASSIFICATION	
Feedback session: EcoClassification and EcoStatus	Tuesday 13th, 9am-12pm: Scherman
SESSION 2: EWR DETERMINATION	
EWR 1 Matigulu	***Tuesday 13th***
EWR process and feedback	2-3pm
Training question and answer session	3.30-4pm
Other EWR sites: daily sessions	***Wednesday and Thursday, 14 and 15th***
Consolidate and feedback from specialists	8-9am
Training question and answer session	10-11am
Consolidate and feedback from specialists	2-3pm
Training question and answer session	3.30-4pm
CLOSURE	**THURSDAY 15 SEPT; 16:00**

Please note the following:
1. Times will be flexible. A WhatsApp group will be set up to confirm times to link in.
2. A single TEAMS link will be sent and used for the entire workshop.

5.5 ESTUARY FIELD SURVEY

A detailed field visit was undertaken to six estuaries between 28 September and 8 October 2022, with trainees attending **the week of 3 October 2022**. Transnet industrial action and civil unrest prevented access to uMhlathuze Sanctuary planned for 6 and 7 October 2022. This system was replaced with the sampling of the uMlalazi and aMatigulu/iNyoni estuaries at short notice.

3 October	Mgobezelini Estuary
4 October	Nhlabane Estuary
5 October	Siyaya Estuary
6 October	uMlalazi Estuary
7 October	aMatigulu/iNyoni estuaries

The following DWS personnel attended the survey as a Capacity Building event:

- Mohlapa Sekoele
- Lwandle Sibango
- Molefi Mazibuko
- Michael Singh
- Nhlanhla Mngomezulu

The following students, interns or early career scientists benefitted from the study:

- Anesu Machite NMU Estuarine macrophytes & mapping
- Dr Daniel Lemley NMU Estuarine microalgae & water quality
- Dr Jackie Raw NMU Blue Carbon
- Bianca McKelvey ORI Estuarine Invertebrates
- Stacey Jordaan ORI Estuarine Invertebrates
- Sivuyisiwe Mbede DFFE Intern Fish & Fisheries
- Zwelakhe Mhlongo DFFE Estuarine Fish & Fisheries

The following survey tasks were undertaken:

Water Quality: Longitudinal salinity and temperature profiles were recorded; as well as water quality measurements along the length of the estuary (surface and bottom) for system variable (pH, dissolved oxygen, suspended solids/turbidity) and inorganic nutrients.

Microalgae: Physico-chemical, phytoplankton, and benthic microalgae were sampled at each of the predetermined locations along the length of the study estuaries. At each site, abiotic and phytoplankton samples were collected from the water column at specified depth intervals.

Macrophytes: Vegetation surveys were conducted at each estuary to determine species composition and abundance.

Invertebrates: Recorded species and abundance of invertebrates across the estuary at each of a series of stations along the estuary, including sediment characteristics, water quality and habitat.

Fish: Record species and abundance of fish using seine-net sampling, and physico-chemical variables, habitat and vegetation.

Birds: Counts of all water-associated birds, identified to species level.

5.6 TRAINING WORKSHOP 2: ECOLOGICAL CONSEQUENCES

The workshop was held virtually on the TEAMS Platform on **18 May 2023** and covered river and estuary ecological consequences to scenarios. The river component was run in the morning by Ms Delana Louw, and the estuary component in the afternoon by Dr Lara van Niekerk. This workshop focussed on the river process for evaluating ecological consequences, as the EWR component was

conducted in September 2022, while the estuary component focussed on methods for the EWR and consequences evaluation steps. The agenda is shown as **Table 5.4**.

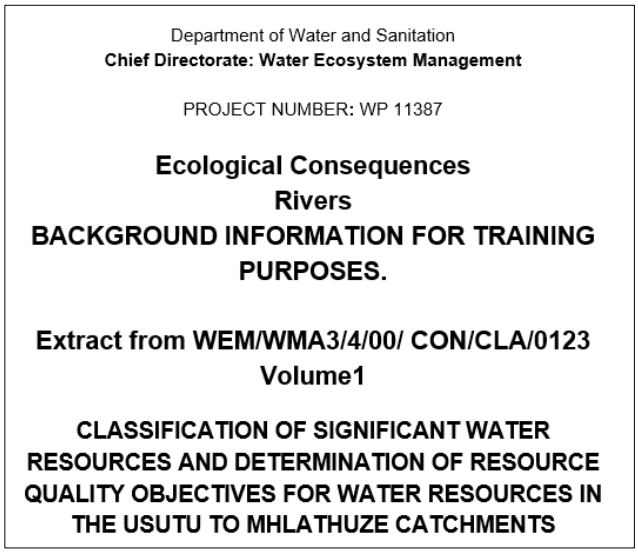
The agenda for the workshop was circulated to the list of trainees, as previously identified by DWS. The following persons attended the training:

- Koleka Makanda
- Nolusindiso Jafta
- Makhanya Kadija
- Philani Khoza
- Ziyanda Malibiji
- Nhlanhla Mngomezulu
- Krishnee Naidoo
- Camagwini Ngodi
- Siphindile Shoba
- Lwandle Sibango
- Kama Meso

Apologies were received from Renelle Pillay, Manisha Maharaj and Molefi Mazibuko, who were unable to attend due to a prior commitment.

The following items were emailed to participants before the rivers component of the workshop, for their use during the training.

- EcolConsRiverTrainingbackground (see cover shown below); i.e. an extract from the River Consequences Report focussing on the EWR river sites to be used for training purposes, i.e. EWR WM1 (White Mfolozi) and EWR AS1 (Assegaai River).



Department of Water and Sanitation
Chief Directorate: Water Ecosystem Management

PROJECT NUMBER: WP 11387

Ecological Consequences
Rivers
BACKGROUND INFORMATION FOR TRAINING PURPOSES.

Extract from WEM/WMA3/4/00/ CON/CLA/0123
Volume1

CLASSIFICATION OF SIGNIFICANT WATER RESOURCES AND DETERMINATION OF RESOURCE QUALITY OBJECTIVES FOR WATER RESOURCES IN THE USUTU TO MHLATHUZE CATCHMENTS

- The presentation prepared for the workshop, titled *Ecological Consequences Training2*.
- A zipped folder titled *SCF Usutu-Mhlatuze (v310123)*, containing the Scenario Comparison Facility (SCF) files used by the trainees during the workshop. This part of the workshop was a hands-on session to demonstrate the use of the SCF for assessing ecological consequences.

Table 5.4 Agenda for Training Workshop 2

water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

CLASSIFICATION OF SIGNIFICANT WATER RESOURCES AND DETERMINATION OF RESOURCE QUALITY OBJECTIVES FOR WATER RESOURCES IN THE USUTU TO MHLATUZE CATCHMENTS

TRAINING SESSION 3: RIVER/ESTUARY SCENARIO WORKSHOP

Date: Thursday, 18 May 2023
Venue: Virtual/Online

Aims: (1) Provide background to the EcoClassification and EWRs of estuaries and assessing ecological consequences; (Steps 3 and 4); (2) background to assessing ecological consequences for rivers (Step 4); (3) use of the Scenario Comparison Facility for rivers; and (4) exposure to the process using examples from the Usutu-Mhlatuze system.

Learning outcomes: The training session will build on the EcoClassification and EWR determination steps of the process, and provide exposure to the evaluation of ecological consequences to operational scenarios.

Subject	Time
START	**08:30**
SESSION 1: RIVERS	**Delana Louw**
Background to and explanation of the process followed to evaluate ecological consequences for rivers	08:30
Explanation of the Scenario Comparison Facility (SCF)	09:00
Trainee assessment of ecological consequences (broad-based assumptions) using the SCF	09:30
Discussion on outcomes and final conclusions	10:30
BREAK	**11:00**
START	**12:00**
SESSION 2: ESTUARIES	**Lara van Niekerk**
Introduction to estuaries	12:00
Delineation of Estuary Boundaries	
Overview of EWR Methods for Estuaries (including how methods integrate scenario assessment)	
Recent development in Water Quality EWR methods	
TEA	**14:00**
Confidence of EWRs: Importance of long-term data sets	14:20
Linking EWRs to Estuary Management Plans & Conservation Plans	
CLOSURE	**16:00**

5.7 TRAINING WORKSHOP 3: RIPARIAN VEGETATION; IMPLEMENTATION, MONITORING AND GAZETTING

Training Workshop 3 was planned to be on RQO and gazetting, but a request from DWS for a RQO workshop to be held as working sessions with the regional offices in August 2023 (21 - 22 August: Durban; 24 August: Mbombela), resulted in the third training workshop covering implementation, monitoring and gazetting instead.

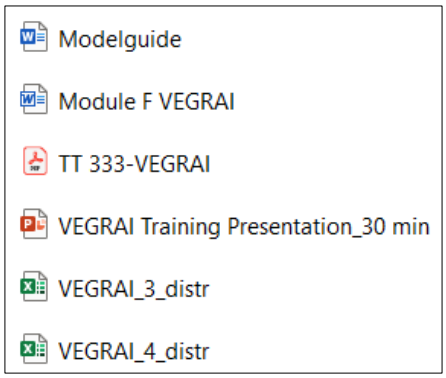
A further request from Ms Jafta of DWS for detailed training on riparian vegetation, particularly the Vegetation Response Assessment Index V4, confirmed the inclusion of this training on 18 April 2024. The training was held virtually on MS Teams on **18 and 19 April 2024**.

Note that the intent of the workshop was to provide short specialist presentations (excluding riparian vegetation and the legal presentation by Mr Hubert Thompson), with the focus being on discussion around implementation and monitoring. A slot was also left at the end of the day for general project discussion.

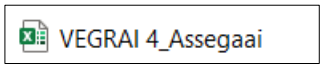
5.7.1 Agenda and Training Materials

The agenda for the workshop was circulated to the list of trainees originally identified by DWS, as well as colleagues from D: RQIS, CD: Water Resource Planning, the IUCMA and Compliance Monitoring: SFRA team (for the riparian vegetation session, in particular). The agenda circulated is shown as **Table 5.5**. The *Implementation and Monitoring Report* and *Draft Gazette* were also circulated.

The following material was circulated as input material for the Riparian vegetation session with James Mackenzie on Day 1. An updated Presentation was sent after training.



The Assegaai River was used as a training example, with the completed the Vegetation Response Assessment Index for the selected sites circulated after the workshop for comparative purposes, i.e. the following file:



Mr Thompson provided attendees with some literature in addition to his Legal presentation:

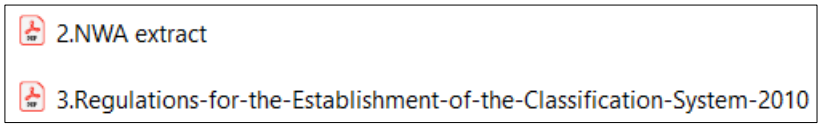


Table 5.5 Agenda for Training Workshop 3

water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

CLASSIFICATION OF SIGNIFICANT WATER RESOURCES AND DETERMINATION OF RESOURCE QUALITY OBJECTIVES FOR WATER RESOURCES IN THE USUTU TO MHLATUZE CATCHMENTS

TRAINING/DISCUSSION SESSION 4: RIPARIAN VEGETATION PROCESS; MONITORING, GAZETTING AND IMPLEMENTATION

Date: Thursday-Friday, 18-19 April 2024
Venue: Virtual/Online

Aims: (1) Provide background to the Riparian Vegetation process throughout Classification and setting of RQOs (requested training); (2) background to preparation of a monitoring programme and Implementation Plan; (3) gazetting: background and setting up the gazette for the Usutu-Mhlatuze study.

Learning outcomes: The training/discussion session will build on previous knowledge of the study, provide an opportunity to discuss monitoring, gazetting and implementation, and any other matters relating to the study.

Subject	Time
DAY 1: THURSDAY, 18 APRIL, SESSION 1	**08:00**
RIPARIAN VEGETATION	**James Mackenzie**
Determining PES: 1) Presentation on VEGRAI; and 2) Interactive session doing the VEGRAI for one site in the system.	
Scenario consequences and RQOs: Using data from VEGRAI to assess consequences and determine RQOs using same site (mix of presentation and interactive).	
Monitoring: Presentation of methods.	
LUNCH	**13:00**
Q&A session	**13:45-14.15**
DAY 1: THURSDAY, 18 APRIL, SESSION 2	**14:30-16.00**
GROUNDWATER	**Karim Sami**
Monitoring & Implementation	
Q&A session	
CLOSURE	**16:00**

Subject	Time
DAY 2: FRIDAY, 19 APRIL, SESSION 1	**08:00**
GAZETTING	**Hubert Thompson**
Introduction & Background: Resource-directed measures and the law.	
NWA & Amendment; Inputs to the Usutu-Mhlatuze Gazette.	
Q&A session	
TEA	**10:00**
DAY 2: FRIDAY, 19 APRIL, SESSION 2	**10:30**
MONITORING & IMPLEMENTATION (excluding rip veg and groundwater)	**Team**
Presentations on Monitoring.	
Discussion session.	
LUNCH	**13:00**
Q&A: Project	
CLOSURE	**15:00**

5.7.2 Attendance

The workshop was joined by approximately 40 attendees, from a wide range of departmental and regional office representatives, as shown on **Table 5.6**.

Table 5.6 Attendees of Training Worksop 6

No.	Name & surname	Departmental details	Email address	Attended			
				18/4: Rip veg	18/4: Groundwater	19/4: Legal	19/4: Other
1	Michael Maluleke	DWS KZN, Water Resources Support	malulekem4@dws.gov.za	✓	✓	✓	
2	Renelle Pillay	DWS KZN	pillayr@dws.gov.za		✓		
3	Ziyanda Malibiji	DWS KZN	malibijiz@dws.gov.za		✓	✓	✓
4	Ivor Hoareau	DWS KZN	hoareauI@dws.gov.za	✓	✓	✓	
5	Ishmael Mpoyana	DWS Water Resource Regulations	MpoyanaI@dws.gov.za	✓	✓	✓	✓
6	Mapule Mokoena		mokoenam@dws.gov.za				
7	Mngomezulu Nhlanhla	DWS Water Resource Regulations	mngomezulun@dws.gov.za				✓
8	Makanda Koleka	DWS Water Resources Classification	MakandaC@dws.gov.za	✓	✓	✓	✓
9	Nolusindiso Jafta	DWS Water Resources Classification	JaftaN@dws.gov.za	✓	✓	✓	✓
10	Mohlapa Sekoele	DWS Water Resources Classification	SekoeleM@dws.gov.za	✓	✓	✓	✓
11	Mpho Mudau	DWS WARMS	MudauM@dws.gov.za		✓	✓	✓
12	Tshiamo Mokwena	DWS Water Resource Regulations	OlifantT@dws.gov.za	✓	✓	✓	✓
13	Mershan Naidoo	DWS Compliance Monitoring: Afforestation (SFRA)	naidoom@dws.gov.za	✓	✓		
14	Noxolo Yoko	DWS Water Resource Regulations	YokoN@dws.gov.za	✓		✓	✓
15	Nedzingahe Thiambi	DWS RQIS	NedzingaheW@dws.gov.za	✓			
16	Baloyi Dikeledi	DWS Water Resource Regulations	Baloyid2@dws.gov.za	✓			
17	Sphe Mnyango	DWS Source Directed Control	MnyangoS@dws.gov.za	✓			
18	Molefi Mazibuko	DWS Reserve Determination	MazibukoM@dws.gov.za	✓			
19	Tinyiko Neswiswi	DWS Reserve Determination	MpeteT@dws.gov.za	✓			
20	Zipho Khoza	IUCMA	khozaz@iucma.co.za	✓			
21	John Isaac Phangisa	DWS Compliance Monitoring: Afforestation (SFRA)	Phangisaj@dws.gov.za	✓			
22	Hlalele Neo	DWS Water Resource Regulations	HlaleleN@dws.gov.za	✓		✓	✓
23	Unknown ?			✓			

No.	Name & surname	Departmental details	Email address	Attended			
				18/4: Rip veg	18/4: Groundwater	19/4: Legal	19/4: Other
24	James Berkland	DWS Water Resource Regulations	BerklandJ@dws.gov.za			✓	✓
25	Dr Bheki Maliba	IUCMA	malibab@iucma.co.za			✓	✓
26	Philani Khoza	DWS Reserve Determination	KhozaP@dws.gov.za			✓	✓
27	Caroline Tlowana	IUCMA	tlowanac@iucma.co.za			✓	✓
28	Thokozane Malibe	IUCMA	MalibeT@iucma.co.za			✓	✓
29	Nsovo Mhlarhi	DWS RQIS	MhlarhiN@dws.gov.za			✓	✓
30	Sibusiso Majola	DWS RQIS	Majola1S@dws.gov.za			✓	✓
31	Maletele B. Nkadimeng	IUMCA	NkadimengM@dws.gov.za			✓	✓
	Attendance numbers			*18*	*11*	*19*	*18*

Monitoring and Implementation presentations were presented in the following sequence:

- Riparian vegetation (as part of the day's module) by James MacKenzie, 18.04.2024.
- Groundwater by Karim Sami, 18.04.2024.
- Hydrology and Flow by Caryn Seago, 19.04.2024.
- Rivers by Delana Louw, 19.04.2024.
- Water quality by Patsy Scherman, 19.04.2024.
- Wetlands by James MacKenzie, 19.04.2024.
- Estuaries by Lara van Niekerk, 19.04.2024.

6 INFORMATION REPOSITORY

All the reports, relevant information and raw data utilised and generated during the determination of the Water Resource Classes and RQOs for all significant water resources in the Usutu to Mhlathuze Catchment study, are provided electronically.

The study was structured and divided into various tasks and sub-tasks which forms the basis for the outline and indexing of electronic data. Data have been indexed according to the main tasks and sub-tasks developed for this Study (outlined in Table 6.1 below) and should be used as a 'general road map' when searching for files. Main tasks and associated index of electronic data have been colour coded for easier reference. The electronic data directory structure used for this purpose is outlined below and indicates electronic data pertaining to main tasks and sub-tasks.

Table 6.1 Outline of indexed electronic data generated per task and sub-task

No.*	Description	Data detail
ADMINISTRATIVE		
4.3.30	Project administration and management (9x)	All Progress Meeting Reports: Includes general feedback on project progress and management.
4.3.31	7x Progress reports (with each PMC meeting)	
REPORTS		
4.3.1	Inception Report, including Gap Analysis Chapter	Final reports provided in MS Word and .PDF format.
4.3.4	Status quo and Delineation of Resource Units and Integrated Units of Analysis Report	
4.3.5	Resource Units Prioritisation Report	
4.3.6	Hydrology Systems Analysis Report	
4.3.7	River EWR for the Desktop Biophysical Nodes Report	
4.3.8	River Survey and Site Visit Report	
4.3.9	Basic Human Needs Report	
4.3.10	Groundwater Report	
4.3.11	2x Specialist Workshop Reports (rivers, estuaries)	
4.3.12	Estuary Survey and Site Visit Report	
4.3.13	Wetland Report	
4.3.14	Ecological Water Requirements Report	
4.3.15	Scenario Description Report	
4.3.16	Classes decision-making tool spreadsheet	
4.3.17	Ecological Consequences Report	
4.3.18	Ecosystem Services Consequences Report	
4.3.19	Economic & User Water Quality Consequences Report	

No.*	Description	Data detail
4.3.20	Water Resource Classes Report	
4.3.21	RQOs and Numerical Limits Report	
4.3.22	Implementation and Monitoring Report	
4.3.32	Main Report	
4.3.33	Final Issues & Responses Report	
4.3.34	Project Closing report and Electronic Information and Data	
STAKEHOLDER ENGAGEMENT		
4.3.2	Stakeholder Engagement Plan and stakeholder database	Stakeholder database (inclusive of PSC member list).
4.3.23	Project Steering Committee Meetings	All documents pertaining to the PSC meetings - BID, agenda, minutes, attendance registers: • PSC 1 – June 2022. • PSC 2 – Nov 2022. • PSC 3 – December 2022. • PSC 4 – April 2023. • PSC 5 – Sept 2023.
4.3.24	Technical Task Group Meeting	Agenda, presentations, notes and populated datasheets, attendance register.
4.3.25	Public Meetings	All documents pertaining to the public meetings – BID, Invitation, Agenda, Minutes, Attendance registers: • Public Meeting 1 (4 May 2022). • Public Meeting 2 (5 and 7 March 2024).
4.3.26	RQO Workshop	Agenda, presentations, notes from the meeting, attendance registers.
		Issues & Responses Register
TASK 1: STEP 1 - DELINEATE RUs AND IUAs AND DESCRIBE THE STATUS QUO		
4.3.3	PES/EIS spreadsheet	PES/EIS spreadsheet that includes the following: • Review of the 2017 PES ratings produced as an updated spreadsheet. • Assessment of the Freshwater Ecosystem Priority Areas, based on the presence of fish and the reviewed PES assessment. • Analysis of the EIS results and adjustment of criteria where required. • Water Resource Index Tables pertaining to Water Resource Use Importance, Goods and Services and Water Quality included.
TASK 2: STEP 2 - PRIORITISE RUs AND SELECT STUDY SITES		
4.3.5	Resource Units Delineation and Prioritisation Report (selection and prioritization)	Deliverable 4.3.3 - Spreadsheet layout according to SQRs for the completion of the Water Resource Use Importance and Socio-Cultural Importance models.
TASK 3: STEP 3 - QUANTIFY BASIC HUMAN NEEDS AND ECOLOGICAL WATER REQUIREMENTS		
4.3.6	Hydrology Systems Analysis Report	Model data sets (Water Resources Yield Model - WRYM) and hydrology used to produce flows (natural, present day and scenarios). Excel spreadsheets used to post process results.
4.3.7	River EWR for the Desktop Biophysical Nodes Report	• The EWR results are provided in the following formats as text files named according to the biophysical node: RDRMv2 generated reports. • Assurance rules for EWR low flows and total flows (in 10^6 m^3). • Time-series of monthly EWR low and total flows (in 10^6 m^3).
4.3.8	River survey and site visit report	Site photos.
4.3.10	Groundwater component of the Reserve Report	Shape files of Groundwater Resource Units and water quality data base.
4.3.12	Estuary survey and site visit report	Includes all survey data collected during site visit.
4.3.13	Wetland report	Wetland models and data used to determine the PES and RQOs.

No.*	Description	Data detail
4.3.14	Ecological Water Requirements Report	• Assessment Indices used to determine the PES and other ECs at the respective EWR sites during the EcoClassification process. Field data included in the Assessment Indices. • EcoStatus and EIS results for the EWR assessment. • Hydraulic data generated during the EWR assessment. • Final EWR results for the EWR sites.
TASK 4: STEP 4 - IDENTIFY AND EVALUATE SCENARIOS WITHIN INTEGRATED WATER RESOURCES MANAGEMENT		
4.3.15	Scenario Description Report	Included in Deliverable 4.3.6.
4.3.16	Classes decision making tool	Multi Criteria Assessment (MCA) model
4.3.17	Ecological Consequences Report and Supporting Estuary electronic reports.	Assessment Indices used to determine the ecological consequences of the Operational scenarios: EIS, EcoStatus, Assessment Indices.
4.3.18	Ecosystem Services Consequences Report	Rivers and Estuaries: EGSA files.
TASK 5: STEP 5 - DETERMINE WATER RESOURCE CLASSES BASED ON CATCHMENT CONFIGURATIONS FOR THE IDENTIFIED SCENARIOS		
CAPACITY BUILDING		
4.3.28	Capacity building information for three training sessions	Agendas, presentations, attendance registers.
MAPPING/GIS		All GIS files and final maps produced during the Study.

* This numbering refers to that in the Contract.

7 ISSUES, CHALLENGES AND RECOMMENDATIONS

7.1 INTRODUCTION

This chapter is a short summary of issues and challenges that faced the study team, and subsequent recommendations for future studies.

7.2 LIMITATIONS IDENTIFIED AND RECOMMENDATIONS FOR FUTURE STUDIES

The following recommendations are made based on issues or limitations identified during the Usutu to Mhlathuze study.

7.2.1 Estuaries

Limitations:

- **Lack of long-term estuary data -** The lack of an investment in the long-term surveying and monitoring of estuaries prevented the study from achieving high confidence in the setting of the EWRs and RQOs for most of the estuaries in the region. It is thus strongly recommended that such an upfront investment be made moving forward.
- **Lack of clarity with regard to the operational rules enforced and the EWR being released to Inhlabane Estuary -** Unfortunately no clarity could be provided on the operational rules being enforced at the Richards Bay Minerals (RBM) weir just above the iNhlabane Estuary, and whether the historical EWR is being released to the estuary. During the site visit it became apparent that no releases had been made to the iNhlabane Estuary in years and that the system had thus been closed for a very long time. This, in turn, impacted the estimates of the flow to the estuary and the system's EWR requirements.
- The limitation presented here is taken from the Inception Report (WEM/WMA3/4/00/CON/CLA/0122):
  The importance of addressing the **freshwater flow requirements of the marine environment** in EWR and Classification studies was highlighted in the Framework for Operationalising RDM (DWS, 2016). Given the importance of freshwater flow from the Umfolozi (and potentially the Mlalazi), it would be important to determine any riverbed dependant nearshore ecosystems in the study area. As the ToR for this study did not include any investigations into the marine component, it should be noted as a gap and requirement for future work.

Recommendations:

- Towards more effective monitoring of the estuaries in the region, it is strongly recommended that a formal partnership be formed with the DFFE, SAEON, SAIAB, ORI and the CSIR to support the DWS in the monitoring of the estuaries in the region. All these entities have a mandate to support a capable state and the required expertise and infrastructure to support the department in its mandate.
- The iSimangaliso Wetland Park Authority is in the process of collecting critical information on the abiotic (e.g. river inflow, LiDAR, corrected water levels, salinity in lakes and Narrows, sediment composition) and biotic components (e.g. microalgae, macrophytes, invertebrates, fish and birds) of the St Lucia/iMfolozi Estuarine Lake System. Once this information is in place the existing numerical modelling results needs to be revisited to see if historical predictions of flow-salinity relationships are still valid, and the EWR be refined to first achieve a C Category (short-term) and ultimately a B Category (long-term).
- Freshwater flow requirements of the marine environment should be considered, particularly during higher confidence studies for identified estuaries.

7.2.2 Wetlands

Limitations:

- The wetland component of this study was limited to a desktop-level assessment, which relied heavily on existing data and information. New databases, such as the newest landuse information (South African National Land Cover (SANLC), 2022) was used to update the evaluation of PES and to set RQOs but was not accompanied by field verification. This limits the detail possible when assessing wetland PES and the resultant RQOs, which becomes largely dependent on landuse information such as the SANLC (2022) database and less reliant on driver information and processes such as hydrology, geomorphology, water quality and vegetation.

Recommendations:

- It is highly recommended that field visits are undertaken for high priority and important wetlands to verify wetland PES categories and scores using wetland assessment tools such as WetHealth V2 (Macfarlane *et al*., 2020), thereby adding the assessment of hydrology, geomorphology, water quality and vegetation to the landuse information, and also then to update or add to the RQOs, employing the route of strategic adaptive management.
- It is recommended that any future RDM studies including important wetlands, include budgets and resources allocated to promote more detailed and scientific investigations, and in some cases having teams of specialists to do field verification, akin to estuarine studies. The nature of the wetlands to be assessed, primarily HGM typing and extent, should be taken into account during planning to provide guidance for assessment. The following should be undertaken:
  - 1-person visits for smaller wetlands using WetHealth or similar tools that consider all aspects of wetland form and function, or
  - team visits for larger wetlands or where the HGM necessitates it, and where the team may include various specialists as necessary, e.g. vegetation, fish, herpetofauna, avian, water quality, geomorphological or hydraulic specialists.

7.2.3 Groundwater

Issues and Challenges:

- A problem is encountered when developing RQOs or undertaking Classification studies in isolation from a revised hydrology that includes groundwater. When aquifer recharge and groundwater baseflow volumes are utilised that do not correspond to an integrated surface and groundwater water balance calibrated to gauging stations, there is a potential for water balance errors. This can be observed if only Groundwater Resource Assessment Phase II (GRA II - DWAF, 2006) or other recharge and baseflow values are utilised that are not calibrated against observed hydrology. Without such a calibrated hydrology it is not possible to calibrate impacts of abstraction on low flows or develop a correct stress index based on a calibrated recharge volume. This often leads to a disconnect between the surface and groundwater balances, such as differences in baseflow volumes, and can result in gazetting RQOs for abstraction and baseflow protection that do not reflect the hydrology.
- One of the most difficult aspects of the water balance to quantify is groundwater abstraction for domestic use. Methodologies utilised should include Schedule 1 use and unregistered water supply schemes. Realistic comparisons should be derived between estimated abstraction for water supply and per capita consumption.

Recommendations:

- Caution must be utilised when developing RQOs based on monitoring variables that cannot be enforced, such as water levels. There is no legal mandate to monitor borehole water levels except in dedicated DWS boreholes or boreholes where users have a WUL. Even with a WUL, users need only adhere to a volumetric abstraction, not monitor levels. Should RQOs be based on aspects that cannot be enforced or rather use adaptive measurements that can be estimated?
- RQOs should consider that maintaining the groundwater contribution to the Reserve is a broad spatial issue, maintaining baseflow and an aquifer reserve for the BHN. It is a different objective to monitoring water levels to manage a wellfield or borehole, which are point scale objectives. Note that local over-abstraction may have little impact on baseflow. RQOs should therefore rather stipulate spatial volumes of abstraction and distances from a water course that would cause an undesirable impact on low flows or undue aquifer stress.
- The objective of RQOs needs to be stated, and the relevance and realistic ability of a numerical RQO to meet this objective should be assessed in terms of scale issues, spatial variability, natural temporal variability and physical/financial ability to monitor the numerical RQO.
- Workshops between PSPs and DWS officials, or training if required, should be undertaken before developing RQOs, so that stated objectives can be clarified and RQOs tailored to meet these objectives. This should include discussions related to realistic ability to monitor the RQOs. Having a common starting point and mutual understanding of the problems can prevent subsequent misunderstandings and unnecessary efforts.
- Integrating RQOs and Classification studies with Reconciliation Strategies, which update the surface and groundwater hydrology, should be considered to avoid water balance discrepancies.
- The incorporation of training on groundwater into water resources courses (e.g. courses on yield modelling or general water resource management) should be considered.

7.2.4 Methods, manuals, terminology and document control

Issues and Challenges:

- Document control and accessibility in terms of latest accepted methods, manuals and models:
  - During the preparation of the River RQO (WEM/WMA3/4/00/CON/CLA/0623, vol 1) and Monitoring and Implementation reports (WEM/WMA3/4/00/CON/CLA/0723), the macroinvertebrate specialist had to revise RQOs extensively, based on Dr Thirion's (D: RQIS) specialist input from her doctoral studies and recent monitoring data collected as part of the River EcoStatus Monitoring Programme (REMP). Dr Thirion also requested the use of MIRAI model ver 2.5A or newer, and monitoring frequencies for fish and invertebrates based on the River EcoStatus Monitoring Programme (REMP) manual[3]. Note that a REMP manual does not exist, and we were referred to the River Health Programme (RHP) Implementation Manual of 2008 (DWA, 2008a). The REMP manual, Dr Thirion's doctorate and MIRAI ver 2.5A were also not readily available and accessible.
- The manual for *Water quality methods for determining the Ecological Reserve in rivers* (DWAF, 2008b) needs revision and finalization by DWS.

[3] Note that a REMP manual does not exist, and we were referred to the River Health Programme (RHP) Implementation Manual of 2008 (DWA, 2008a). It was acknowledged that this document was not easily available and needs revising.

- Although outside of this study, recent Classification and RQO reports refer to Eco-categorization rather than EcoClassification. It is unclear how this change happened, but it is creating confusion.

Recommendations:

- The DWS website should have a link at all times to the latest methods, manuals and models for use during RDM studies. PSPs should be made aware of specific requirements and manual/models available timeously to ensure assessments are done correctly.
- A process should be followed for updating terminology, and this should be clearly dated and displayed on the DWS website.
- The water quality methods manual must be updated and finalized as a matter of priority.

7.2.5 RQO Implementation and monitoring

Recommendations:

- It is highly recommended that DWS monitoring and all other monitoring activities, e.g. IUCMA monitoring, fall within one RQO implementation structure as all should be aimed at measuring compliance to the Class and RQOs. Currently monitoring measure possible change in river health which would link in to RQO monitoring.
- Various *ad hoc* biomonitoring initiatives take place in some areas of the catchment on a regular basis, often initiated as a result of water use licence conditions (especially in the mining industry). These monitoring programmes are generally performed at sampling sites specific to the requirements of the client and generally include the application of fish and macroinvertebrate (SASS5) protocols. It is strongly advised that this information should be centralised (such as by the DWS or the IUCMA) and utilised for the determination of the state of the rivers of concern.

8 REFERENCES

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Macfarlane, D.M., Ollis, D.J. and Kotze, D.C. 2020. WET-Health (Version 2.0) A Refined Suite of Tools for Assessing the Present Ecological State of Wetland Ecosystems. WRC Report No TT 820/20, Water Research Commission, Pretoria.

9 APPENDIX A: COMMENTS AND RESPONSE REGISTER

No.	Section	Comment	From	Addressed?
1.	General	General editorial comments from reviewers were addressed throughout the report.		
2.	Figure 3.1 Pg 3-2	May you re-work this graph as though addressing Gazette comments, PMC and Close out report are paid by November 2024.	N. Jafta	Addressed.
3.	Table 6.1 Pg 6.1	Deliv 4.3.8 - Are there any field sheets/data where there was assessments?	N. Jafta	Yes, all raw data collected during the EWR site visits are included in the assessment models and part of electronic data.
4.	Table 6.1 Pg 6.1	Deliv 4.3.13 - Not just a list of the PES per wetland, right? This would include the models and data used to derive the PES?	N. Jafta	Yes, all included in electronic data. Amended text.
5.	Sec 7.2.2 Pg 7-2	Wetlands - First recommendation: **It is highly recommended that field visits are undertaken for high priority and important wetlands to verify wetland PES categories.** Wetlands: Second recommendation: **It is recommended that any future RDM studies including important wetlands, include budgets and resources allocated to promote more detailed and scientific investigations, and in some cases having teams of specialists to do field verification, akin to estuarine studies.** I support that it is very important to base the RQOs on measured data. What stops the PSP from including these costs when bidding?	N. Jafta	It depends if it is included in the scope of work outlined by DWS.
6.	Sec 7.2.4 Pg 7-2	Methods – First recommendation: I have asked Christa to ensure the latest MIRAI and manuals are on the website. The RQIS website is where all the EcoStatus methods, models, manuals are housed by the Department. May James Mackenzie please share the VEGRAI that he uses so that we can make sure that it is on the website, there seems to be modifications since they published the Methods through the WRC project. Also, here is the link to the RQIS EcoStatus webpage: https://www.dws.gov.za/iwqs/rhp/eco/ecostatus.aspx	N. Jafta	Addressed. Newest VEGRAI model sent to Ms. Jafta, 19 September 2024.
7.	Sec 7.3.2 Pg 7-2	Groundwater - First recommendation: **This often leads to a disconnect between the surface and groundwater balances, such as differences in baseflow volumes, and can result in gazetting RQOs for abstraction and baseflow protection that do not reflect the hydrology.** This is quite valid and requires DWS to align projects. The below recommendation is noted and would be explored.	N. Jafta	Noted.