water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

RESERVE DETERMINATION STUDIES FOR SELECTED SURFACE WATER, GROUNDWATER, ESTUARIES AND WETLANDS IN THE USUTU/MHLATUZE WATER MANAGEMENT AREA
WP 10544

CLOSURE REPORT

JULY 2016

Report No. RDM/WMA6/CON/COMP/2913

water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF WATER & SANITATION

CHIEF DIRECTORATE: WATER ECOSYSTEMS

CONTRACT NO. WP 10544

RESERVE DETERMINATION STUDIES FOR SELECTED SURFACE WATER, GROUNDWATER, ESTUARIES AND WETLANDS IN THE USUTU/MHLATUZE WATER MANAGEMENT AREA:

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Contract Title: Reserve determination studies for selected surface water, groundwater, estuaries and wetlands in the Usutu - Mhlathuze Water Management Area

Report Title: Closure Report

Author: A Singh

Revision	Date	Report Status
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Consultants: Tlou Consulting (Pty) Ltd

Approved for the Consultants by:

……..

A Singh

Project Manager

Client: Department of Water & Sanitation

Approved for the DWS:

……..

N Mohapi

Chief Director: Water Ecosystem

ACKNOWLEDGEMENTS

The following individuals are thanked for their contributions to this project.

Name	Organisation	Responsibility
Project Management Team		
Adhishri Singh	Tlou Consulting (Pty) Ltd	Project Manager Team Leader - Rivers
Cate Brown	Southern Waters	Team Leader: Lake Sibaya; Pongola Floodplain
Barry Clark	Anchor Environmental Consultants (Pty) Ltd	Team Leader: Lake St Lucia estuarine system
Lara van Niekerk	CSIR Natural Resources and the Environment	Team Leader: Kosi estuarine system
Molla Demlie	Independent specialist	Team Leader: Groundwater
Gary Marneweck	Wetland Consulting Services (Pty) Ltd	Team Leader: Wetlands
André Görgens	Aurecon	Team Leader: Hydrology

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1 INTRODUCTION

1.1 Background and purpose of study

The Chief Directorate: Resource Directed Measures issued an open tender invitation for the "Appointment of a Professional Service Provider to undertake Reserve Determinations for selected Surface water, Groundwater, Estuaries and Wetlands in the Usutu to Mhlatuze Basins". The focus on this area was a result of the high conservation status and importance of various water resources in the basin and the significant development pressures in the area affecting the availability of water.

Preliminary Reserve determinations are required to assist the DWA in making informed decisions regarding the authorisations of future water use and the magnitude of the impacts of the proposed developments on the water resources in the WMA, and to provide the input data for Classification of the area's water resources, and eventual gazetting of the Reserve (DWAF1999a).

DWA appointed Tlou Consulting to undertake the project in July 2013.

1.2 Overview of the study area

The Usutu Mhlatuze Water Management Area (WMA) is situated in the northern portion of KwaZulu-Natal Province. The WMA is bordered by Swaziland and Mozambique to the northern side, the Indian Ocean to the east and the Drakensbery range to the north west. The Pongola River and Usutu Rivers are shared watercourses, with the Usutu River having its headwaters in South Africa, flowing through Swaziland and back into South Africa, before joining the Pongola River and flowing into Mozambique. The WMA comprises a number of basins, namely the Lake Sibaya and Kosi basins; the Pongola, Upper Usutu, Mkuze, Mfolozi, Mhlatuze and Matikulu basins. Figure 1 provides an overview of the study area.

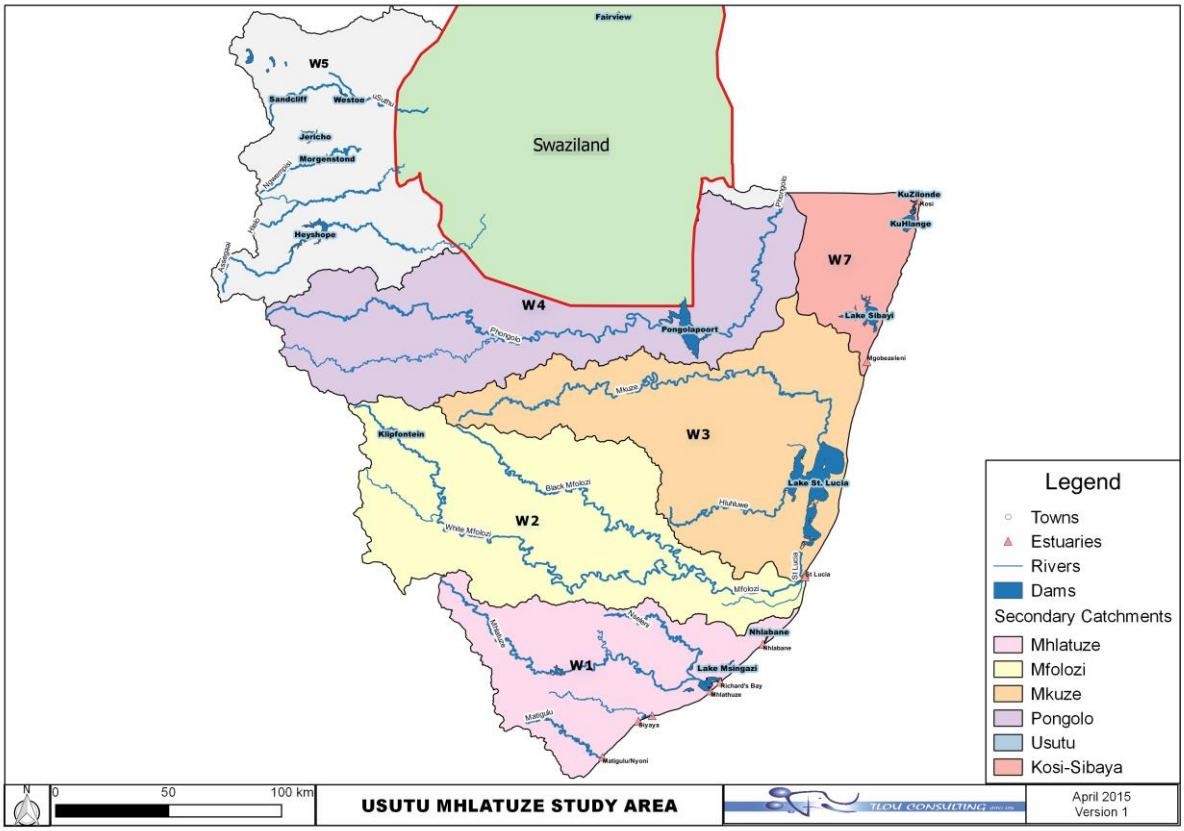

Figure 1. Overview of Usutu Mhlatuze study area

1.3 Study Objectives

The objectives of the study were to:

- determine the Ecological Reserve (DWAF 1998), at various levels of detail, for the Nyoni, Matigulu, Mlalazi, Mhlatuze, Mfolozi, Nyalazi, Hluhluwe, Mzinene, Mkuze, Assegaai and Pongola Rivers;
- determine the Ecological Reserve, at an Intermediate level for the Pongola floodplain;
- determine the Ecological Reserve, at an Intermediate level for the St Lucia/Mfolozi, Estuary System;
- determine the Ecological Reserve, at a Rapid level for the Mlalazi Estuary;
- determine the Ecological Reserve, at a Rapid level for the Amatikulu Estuary;
- determine the Ecological Reserve, at an Intermediate level for Lake Sibaya;
- determine the Ecological Reserve, at a Rapid level for Kosi Lake and Estuary;
- classify the causal links between water supply and condition of key wetlands
- incorporate existing EWR assessments on the Mhlatuze (river and estuary) and Nhlabane (lake and estuary) into study outputs;

- determine the groundwater contribution to the Ecological Reserve, with particular reference to the wetlands;
- determine the Basic Human Needs Reserve for the Usutu/Mhlatuze WMA;
- outline the socio-economic water use in the Usutu/Mhlatuze WMA;
- build the capacity of team members, DWA Officials and stakeholders with respect to EWR determinations and the ecological Reserve.

1.4 Purpose and outline of report

The purpose of the closure report is to:

- Review and validate the success of the project,
- Confirm outstanding issues, risks and recommendations,
- Obtain approval from the Client to close the project.

The report has been structured as follows:

Section 1 provides the background to the project, an overview of the study area and the objectives of the study.

Section 2 provides an overview of the study arrangements and project resource management, focussing on the various roles of the different committees, teams and project tasks.

Section 3 provides a record of the project scope performance and change management.

Section 4 provides a review of the project performance in relation to the work programme and deliverables set out during the Inception Phase.

Section 5 provides a review of the financial performance of the project, including budget, invoicing and cash flow.

Section 6 provides an overview of the communication management during the project.

Section 7 provides a review of the capacity building plan that was implemented at Inception

Section 8 provides an review of the quality management control implemented during the study

Section 9 documents the risks highlighted at Inception and their mitigation during the project.

Section 10 provides a summary of identified tasks or gaps that need to be addressed during the Classification process.

2 STUDY ARRANGEMENTS AND PROJECT RESOURCE MANAGEMENT

2.1 Study appointment and duration

Tlou Consulting (Pty) Ltd was appointed as the lead consultant on the project, with specialist teams appointed as sub-consultants to undertake the technical aspects on the study.

The Letter of Notification of Appointment for undertaking the study was received on the 24 February 2012. However, substantial delays were encountered with the finalisation of the contractual agreement, which was officially approved on the 8 August 2013. A project initiation meeting was held on the 23 August 2013 at the Department of Water and Sanitation offices in Pretoria.
The timeframe for the study was 36 months, with study end date the 7 August 2016.
No variations were requested on the timeframes.

2.2 Study Management

The study responsibilities in terms of managerial, technical and co-ordination functions are discussed below, while details of the study team composition are given in Section 2.3 . Study tasks and associated study milestones and deliverables are discussed in Section 3.3 and Section 3.4.

2.2.1 Client

The Department of Water and Sanitation (DWS) was the Client, with the Directorate: Reserve Requirements within the Chief Directorate: Water Ecosystems responsible for the execution of the project.

The study resided under the responsibility of the Director: Mr Yakeen Atwaru. Mr Simphiwe Mazibuko acted as the DWS Project Manager from initiation until the end of December 2014. Thereafter Mr Molefi Mazibuko took over responsibility as the DWS Project Co-ordinator and then Project Manager.
Mr Molefi Mazibuko was responsible for the administrative liaison with the PSP.

2.2.2 Professional Service Provider

2.2.2.1 Project Management

The project management of the study was undertaken by Ms Adhishri Singh of Tlou Consulting, supported by Mrs Magda Taylor and Mr Tobias Sibande. She was supported on the technical side by Prof. Cate Brown from Southern Waters who assisted with technical review, advice and guidance. Their role was to ensure the that the project was undertaken in an efficient and timeous manner within the allocated budget and in accordance with the scope of work, all as contained within the approved Inception Report.

They were responsible for the following project management and administrative functions:

- Study secretariat and coordination
- Work programme coordination
- Stakeholder communication
- Financial administration and management
- Technical review
- Monitoring and performance review of PSP team and deliverables
- Progress reporting in the form of reports and presentations
- Minuting the Steering Committee and Stakeholder meetings (see Annexure 2)
- Maintaining the Decision Register (see Annexure 4)
- Maintaining the Issues and Response Register see Annexure 6)

2.2.2.2 Stakeholder Communication

Tlou Consulting handled the stakeholder communications for the project and was responsible for:

- Stakeholder identification and database compilation and maintenance
- Compilation of the Information Documents (x3) and the distribution thereof
- Stakeholder communication
- Arrangement of stakeholder workshops; coordination; preparation of workshop packs, comprising the study reports, presentations and information documents, minutes and agenda; and minute taking at these meetings.
- Co-ordinating comments received and feedback to stakeholders
- Coordinating stakeholder input into final study documentation

2.2.2.3 Technical Management

The study was divided into tasks based on the water resources that were to be assessed. Task Leaders were appointed as sub-consultants to Tlou Consulting to assist with the technical co-ordination and management of the specialist studies, compilation of technical reports, coordination of specialist workshops and technical feedback at PMC/PSC meetings, and to stakeholders and the DWS. The technical task leaders are indicated in Table 1.

Table 1. Task Team Leaders

Task Leader	Water Resource Component
Ms A Singh (mentored by Prof C Brown)	Rivers
Prof Cate Brown	Pongola Floodplain
Prof Cate Brown	Lake Sibaya
Prof Digby Cyrus	Amatikulu-Nyoni estuary
Prof Digby Cyrus	Mlalazi estuary
Mrs Lara van Niekerk	Kosi estuarine lakes
Dr Barry Clark	Lake St Lucia
Mr Gary Marneweck	Wetlands
Dr Molla Demlie	Groundwater

2.2.3 Project Management Committee

The study was carried out under the guidance of the Project Management Committee (PMC), comprising representatives from the DWS Chief Directorate: Water Ecosystems and other DWS Directorates and the DWS KZN Regional Office, as well as the PSP Project Manager. When required, Technical Task Leaders as well as key stakeholders, such as Isimangaliso Wetland Park Authority and the Inkomati Usutu Catchment Management Agency, were invited to attend specific PMC meetings. Table 2 provides a list of the core PMC members.

The PMC was responsible for guiding the project toward a well-defined and effective formulation, execution and conclusion of the study, ensuring integration with other initiatives by the DWS.

Responsibilities of the PMC were as follows:

- Assessing the scope of work and objectives of the study
- Monitoring and evaluating study progress
- Monitoring the project budget and expenditure against deliverables produced
- Evaluating all reports, including the format and scope of reports as agreed to in the Inception Phase
- Address issues that require the attention of the DWS
- Provide recommendations on various aspects of the study where required.

Table 2. Project Management Committee members

Name	Affiliation
Ndileka Mohapi	DWS: CD-WE
Yakeen Atwaru	DWS: D-RR
Simphiwe Mazibuko	DWS: SWRR (Project Manager – Initiation to Decembr 2014)
Molefi Mazibuko	DWS:SWRR (Project Manager – January 2015 to closure)
Barbara Weston	DWS: SS - SWRR
Philane Khoza	DWS:GWRR
Mmaphefo Thwala	DWS: Classification
Nobubele Boniwe	DWS: SWRR
Niel van Wyk	DWS: Planning
Geert Grobler	DWS: WRPS
Kobus Bester	DWS:OA (East)
Beason Mwaka	DWS: WRPS
Celiwe Ntuli	DWS: WRPS
Wietsche Roets	DWS
Anet Muir	DWS: Compliance Monitoring
Naomi Fourie	DWS: SFRA
Xolani Hadebe	DWS: SFRA
Tsunduka Khosa	DWS
Ashley Starkey	DWS: KZN Region
Jay Reddy	DWS: KZN Region

Name	Affiliation
Norman Ward	DWS: KZN Region
Mxolisi Buthelezi	DWS: KZN Region
Siyabonga Buthelezi	DWS: KZN Region
Bongani Mdluli	DWS: KZN Region
Marcus Selepe	IUCMA
Adhishri Singh	Tlou Consulting
Cate Brown	Southern Waters

2.2.4 Project Steering Committee

The Project Steering Committee (PSC) was established to engage with the key stakeholders in the study area, on the activities currently undertaken and proposed in the catchment, inform them on the approach to undertaking the assessments and obtain their feedback on the findings of the study. Where feedback could not be incorporated into the study, this was documented to take forward in subsequent interventions by the DWS. The PSC comprised members of the PMC and other external stakeholders, as indicated in Table 3.
Meetings were planned to take place at critical points in the study programme. The first meeting took place after submission of the Inception Report and was handled as a PMC meeting to which key stakeholders, such as IUCMA and Isimangaliso WPA were invited.

The second meeting was held on the 17th August 2015, in Empangeni and was dedicated to presenting the findings of the completed EWR assessments which included the:

- Rivers Intermediate assessment and the extrapolated results,
- Pongola Intermediate assessment
- Amatikulu-Nyoni estuary assessment
- Mlalazi estuary assessment
- Wetland desktop assessment

Progress on the Lake Sibaya, Kosi estuarine lakes, Lake St Lucia and the groundwater assessments were also tabled.

Meeting three was held on the 2 June 2016 in Empangeni, once all EWR assessments were completed. The focus of this meeting was to present the findings of:

- Lake St Lucia
- Kosi estuarine Lakes
- Lake Sibaya

Minutes of meetings 2 and 3 are provided in Annexure 2.

Table 3. Project Steering Committee members

Name	Affiliation
Ndileka Mohapi	DWS: CD-WE
Yakeen Atwaru	DWS: D-RR
Molefi Mazibuko	DWS:SWRR (Project Manager – January 2015 to closure)
Philane Khoza	DWS:GWRR
Nobubele Boniwe	DWS:SWRR
Shane Naidoo	DWS: D - Classification
Mmaphefo Thwala	DWS: Classification
Nancy Motebe	DWS:D-GWRR
Barbara Weston	DWS: SS - SWRR
Niel van Wyk	DWS: Planning
Kobus Bester	DWS:OA (East)
Tony Moore	DWS: CE-OA
Neels Kleynhans	DWS:RQIS
Pieter Viljoen	DWS: WQP
Naomi Fourie	DWS:SFRA
Xolani Hadebe	DWS:SFRA
Celiwe Ntuli	DWS:WRPS
Norman Ward	DWS: KZN Region
Ashley Starkey	DWS:KZN Region

Name	Affiliation
Angela Masefield	DWS:KZN Region
Manisha Maharaj	DWS:KZN Region
Bongani Mduli	DWS:KZN Region
Jay Reddy	DWS:KZN Region
Gerhard Cilliers	DWS:RQIS
Masala Mulaudzi	DWS:KZN Region
Ernst Kubayi	DWS: RBIG
Ntobeko Cele	DWS
Melusi Nhleko	Umhlatuze Municipality
Sabelo Hlela	Umhlatuze Municipality
Neeran Maharaj	Umhlatuze Municipality
Thembinkosi Zondi	Umhlatuze Municipality
Thuthukani Hlatswayo	Umhlatuze Municipality
Domnic Mkhwanazi	Umhlatuze Municipality
Brain Jackson	IUCMA
Marcus Selepe	IUCMA
Marius Kolesky	IUCMA
Scotty Kyle	Ezemvelo KZN Wildlife
Bert Kirsten	Umhlatuze Water
Zama Zuma	Umhlatuze Water
Mbali Carol Kubheka	DEA
Nkosi Mandla	Uthungulu DM

Name	Affiliation
Karoon Moodley	DMR
Andrew Zaloumis	Isimangaliso WPA
Bronwyn James	Isimangaliso WPA
Nicolette Forbes	MER for Isimangaliso WPA
Themba Thwala	DARDLA
Thulani Zikali	DAEA
Sam Ngubane	Zululand DM
S Landman	Zululand DM
Desire Sibande	Umhanyakude DM
Anthony Wagenaar	Umkanyakude DM
Thabani Mtetwa	Uthungulu DM
Sharin Govender	City of Mhlatuze
Siboniso Zungu	City of Mhlatuze
C Mutero	Gert Sibande DM
Richard Howes	SA Cane Growers Association
Kathy Hurly	SA Cane Growers Association
D P Rossler	SA Sugar Millers Association
Babalwa Matiwane	Chamber of Mines
Nonhlanhla Qhobosheane	COGTA
Inkosi Mabhudu Israel Tembe	Tembe Traditional Council
K A Zwane	Chairperson: Kosi Fish Trap Committee
Inkosi Douglas Vusi Zondo	Zululand Local House of Traditional Leaders

Name	Affiliation
Inkosi Voctoria Thembelihle Dube	Uthungulu Local House of Traditional Leaders
Inkosi Vela Thandamuphi Shange	Uthungulu Local House of Traditional Leaders
Sibusiso Ngwane	Liaison for Traditional Leaders
Mduduzi Nkuna	IUCMA
Dieter Heinsohn	ACER for Isimangaliso WPA
Adrian Wynne	Umfolozi Sugar Mill
Richard Oertel	SFRA Consultant
Bruce Kelbe	Univ of Zululand
Tony Mitchell	SAPPI
John Scotcher	Forestlore Consulting
Gerry Barry	Tongaat Hulett

2.3 Study Team

Senior and key staff members involved in the Project Management and Technical Tasks are provided in Table 4 to Table 17 below. Changes to the team and reasons for the change are documented in Section 2.3.2.

2.3.1 Project Management team

Details of the Project Management Team members and their responsibilities are provided in Table 4.

Table 4. Project Management Team Members

Name	Affiliation	Responsibility
Adhishri Singh	Tlou Consulting	Project Leader
Cate Brown	Southern Waters	Technical and Quality Control

Alison Joubert	Southern Waters	DSS Management
Tobias Sibande	Tlou Consulting	Project Adminstration
Magda Taylor	Tlou Consulting	Project Administration Financial Control Stakeholder Participation Administrator

2.3.2 Technical Teams

The technical component of the study was managed by Ms Adhishri Singh of Tlou Consulting, with the support of Technical Task Leaders, who took responsibility for the technical leadership of the various study components. The technical tasks and team members involved are provided in Table 5 to Table 17.

2.3.2.1 Hydrology Team

The Aurecon team was appointed, after approval from the DWS, to undertake the hydrology for the project. Their appointment was necessitate after the resignation of Dr Washington Nyabeze, effective from the 24 June 2014. Their team was selected on the basis that they are experienced, capable and reliable hydrologists who had the added benefit of having the various hydrological models already set up for selected catchments, such as the Mfolozi, Usutu, Pongola and Mhlatuze. They also indicated their ability to meet our timeframes and enable the project to proceed as per programme.
The team responsible for the hydrology on the project is shown in Table 5.

Table 5. Hydrology team members

Person	Affiliation	Responsibility
Prof. A. Gorgens	Aurecon	Hydrology Task Leader
Mr A. Sparks	Aurecon	System Modeller
Mr G. Howard	Aurecon	Hydrologist
C Beuster	Aurecon	GIS

2.3.2.2 Rivers Team

The rivers team is provided in Table 6.

Table 6. Rivers Team Members

Person	Affiliation	Responsibility
Ms A Singh	Tlou Consulting	Task Leader
Mr T Sibande	Tlou Consulting	Coordinator
Prof. C Brown	Southern Waters	DRIFT Mentor
Dr A. Joubert	Southern Waters	DSS Manager
Dr K. Reinecke	Southern Waters	DRIFT assistance
Prof. A. Gorgens	Aurecon	Hydrology
Mr A. Sparks		
Mr G. Howard		
Mr M Kleynhans	Aurecon	Hydraulics
Dr H Malan	Independent	Water Quality
Mr M Rountree	Fluvius Environmental Consultants	Geomorphology
Mr J MacKenzie	MacKenzie Ecological and Development Services CC	Riparian vegetation
Ms C Todd	Independent	Macroinvertebrates
Dr B Paxton	Freshwater Research Centre	Fish
Mr T Tlou	Tlou Consulting	Socio-Economics
Mr W Mullins	Mosaka Economists	Socio-Economics

Changes to the rivers project team was mainly as a result of the delayed start of the project, which was two years after submitting the proposal. These changes include:

- Mark Rountree replaced Lindo Hlongwane as the geomorphologist. Lindo changed career path.
- Bruce Paxton replaced Johan Engelbrecht as the fish specialist. Johan passed away.
- James McKenzie replaced Anton Linstrom as the riparian vegetation specialist.
- Heather Malan replaced Peter Wade as the water quality specialist. Peter was experiencing health problems.

2.3.2.3 Pongola Floodplain Team

The Pongola floodplain team members are given in Table 7.

Table 7. Pongola Floodplain Team Members

Name	Affiliation	**Responsibility**

Adhishri Singh	Tlou Consulting	Project Manager & Task Co-ordinator
Cate Brown	Southern Waters	Process Manager
Alison Joubert	Southern Waters	DSS Manager
Andrew Birkhead	Streamflow Solutions	Hydrodynamic Modeller
Anton Sparks	Aurecon	Water-resource Modeller
Gary Marneweck	Wetland Consulting Services	Vegetation/wetland ecologist
Bruce Paxton	Private	Fish ecologist
Toriso Tlou	Tlou Consulting	Social assessor

2.3.2.4 Wetlands Team

The Wetlands team members are given in Table 8.

Table 8. Wetlands Team Members

Name	Affiliation	Responsibility
Gary Marneweck	Wetland Consulting Services	Wetland Task Leader
Molla Demlie	University of KZN	Geohydrologist
Cate Brown	Southern Waters	Advisor
Adhishri Singh	Tlou Consulting	Project Manager

2.3.2.5 Groundwater Team

The Groundwater team members are given in Table 9.

Table 9. Groundwater team members

Name	Affiliation	Responsibility
Molla Demlie Bekele	University of KZN	Geohydrologist
Adhishri Singh	Tlou Consulting	Project Manager

Dr Demlie Bekele was approved to be appointed onto the study after receiving notification from the CSIR team that they were withdrawing from the project as they could not meet the project Terms of Reference and timeframes. Dr Demlie brought to the project extensive experience on groundwater-surface water interactions and his existing work on the conceptual and numerical modelling of Lake Sibaya and modelling of the Kosi estuarine lakes.

2.3.2.6 Lake St Lucia Team

The Lake St Lucia team members are given in Table 10.

Table 10. Lake St Lucia team members

Name	Affiliation	Responsibility
Barry Clark	Anchor Environmental	St Lucia estuary team leader
Jane Turpie	Anchor Environmental	Birds, co-leader
Andre Görgens	Aurecon	Hydrology
Anton Sparks	Aurecon	Hydrology
Gerald Howard	Aurecon	Hydrology
Gerrit Basson	ASP Technology	Hydrodynamics
Janine Adams	Nelson Mandela Metropolitan University	Microalgae & Macrophytes
Renzo Perissinotto	Nelson Mandela Metropolitan University	Invertebrates
Digby Cyrus	CRUZ Environmental	Fish
Cate Brown	Southern Waters	Internal review
Adhishri Singh	Tlou Consulting	Project Manager

2.3.2.7 Mlalazi Estuary Team

The Mlalazi team members are given in Table 11.

Table 11. Mlalazi estuary team members

Name	Affiliation	Responsibility
Prof D.P.Cyrus	CRUZ Environmental	Workshop co-ordinator, Report production, Birds and Fish
Ms L van Niekerk	CSIR, Stellenbosch	Hydrodynamics
Mr H.M.M.Mzimela	Department of Zoology, University of Zululand	Water Quality
Prof G.Bate	Diatom Environmental Management, Nelson Mandela Metropolitan University	Microalgae
Dr R.Taylor	Independent Ecologist	Macrophytes
Dr H.Jerling	Department of Zoology, University of Zululand	Zooplankton
Dr L.Vivier	Department of Zoology, University of Zululand	Macrobenthos and Macrocrustacea

2.3.2.8 Amatikulu-Nyoni Estuary Team

The Amatikulu-Nyoni team members are given in Table 12.

Table 12. Amatikulu-Nyoni estuary team members

Name	Affiliation	Responsibility
Prof D.P.Cyrus	CRUZ Environmental	Workshop co-ordinator, Report production, Birds and Fish
Ms L van Niekerk	CSIR, Stellenbosch	Hydrodynamics
Mr H.M.M.Mzimela	Department of Zoology, University of Zululand	Water Quality
Prof G.Bate	Diatom Environmental Management, Nelson Mandela Metropolitan University	Microalgae
Dr R.Taylor	Independent Ecologist	Macrophytes
Dr H.Jerling	Department of Zoology, University of Zululand	Zooplankton
Dr L.Vivier	Department of Zoology, University of Zululand	Macrobenthos and Macrocrustacea

2.3.2.9 Kosi estuarine Lakes Team

The Kosi Estuarine Lakes team members are given in Table 13.

Table 13. Kosi Estuarine Lake team members

Name	Affiliation	Responsibility
Ms L van Niekerk	CSIR, Stellenbosch	Physical processes and Report production
Dr S Taljaard	CSIR, Stellenbosch	Water Quality
Prof JB Adams	Nelson Mandela Metropolitan University NMMU	Microalgae and Macrophytes
F MacKay	Oceanographic Research Institute	Invertebrates
SP Weerts	CSIR	Fish
Dr R. Taylor	Independent	Birds
A Singh	Tlou Consulting	Project Manager and task co-ordinator
Supporting expertise on analysis of data and compiling the report		
Mr P Huizinga C-L Ramjukadh	Independent NRF intern	Physical processes and Report production
D Lemley	Nelson Mandela Metropolitan University	Microalgae and Macrophytes
M Fernandes Dr R Taylor	Nelson Mandela Metropolitan University Independent Ecologist	Macrophytes
Dr SJ Lamberth	Department of Agriculture, Forestry and Fisheries	Fisheries and fish

The Kosi team composition was modified at Inception Phase to include the expertise of and the use of data collected by Fiona MacKay and Steven Weerts for their PhD purposes. The data collected was unpublished at the time of the study. Their experience, knowledge of the system and the data added a degree of confidence to the analysis and interpretation of findings on the Kosi estuarine lakes.

2.3.2.10 Mhlatuze & Nhlabane EWR Review Team

The Mhlatuze and Nhlabane review team members are given in Table 14.

Table 14. Mhlatuze Nhlabane review team members

Name	Affiliation	Responsibility
A Singh	Tlou Consulting	Project Manager
K Reineke	Southern Waters	Task Leader
C Brown	Southern Waters	Advisor

2.3.2.11 Lake Sibaya Team

The Lake Sibaya team members are given in Table 15.

Table 15. Lake Sibaya team members

Name	Affiliation	Role
Adhishri Singh	Tlou Consulting	Project Manager
Alison Joubert	Southern Waters	DRIFT DSS manager
Karl Reinecke	Southern Waters	EWR process co-ordinator
Drew Birkhead	Streamflow Solutions	Hydraulics
Susan Taljaard	CSIR	Water quality
James MacKenzie	BioRiver Solutions	Vegetation
Ricky Taylor	University of KZN	Herpetofauna, semi-aquatic mammals, molluscs and crustacea
Steven Weerts	CSIR	Ichthyofauna
Jane Turpie	Anchor Environmental	Avifauna
Toriso Tlou	Tlou Consulting	Social
Cate Brown	Southern Waters	Internal review

The approach to undertaking the EWR assessment for Lake Sibaya changed after Inception Phase, once detailed research was conducted into the system and its functioning. Refer to section 3.2 for an elaboration on the change in approach. As a result of this change the team was reconstituted to provide the relevant expertise.

2.3.2.12 Basic Human Needs Team

The team members involved in determining the Basic Human Needs Reserve are given in Table 16.

Table 16. Basic Human Needs team members

Name	Affiliation	Role
Adhishri Singh	Tlou Consulting	Project reporting
Tobias Sibande	Tlou Consulting	Population estimations
Ciska Engelbrecht	TGIS	Spatial Analysis

2.3.2.13 Socio-Economics Team

The Socio-Economics team members are given in Table 17.

Table 17. Socio-Economics team members

Name	Affiliation	Role
Toriso Tlou	Tlou Consulting	Ecosystem function and services, Valuation of aquatic ecosystems, Project reporting
Adhishri Singh	Tlou Consulting	Socio-economic zone delineation, identification of ecosystem function and services, valuation of aquatic ecosystems
William Mullins	Mosaka Economists	Economic zonation and Economic analysis

3 PROJECT SCOPE PERFORMANCE

3.1 Scope of work and change management

The Scope of Work as contained in the Inception Report, differed somewhat from the Project ToR and the original proposal submitted to the DWS. At a meeting on the 4th May 2012, the

Client requested that the PSP look at priority water resources in the entire Usutu/Mhlatuze WMA and not just focus on the northern parts of the catchment, as was referred to in the ToR. The additional work was to be conducted at the initially approved budget, so compromises needed to be made. These and other amendments to the scope, as a result of meetings with the Client and key stakeholders during the Inception Phase are outlined below. The Scope of Work as contained in the Inception report with subsequent changes formed the contractual basis upon which the work was undertaken.

The changes to the scope of work included the following:

- The Ngobezeleni estuary was removed as a priority site and the Mlalazi estuary and the Amatikulu-Nyoni estuaries were included, due to the pristine state of the Mlalazi and that the Amatikulu-Nyoni estuary is one of the few temporary open/closed systems in KZN.
- The proposed Lake St Lucia Rapid level EWR was to be conducted at an Intermediate level of assessment. This was however dependent on receiving and utilising outputs of the Isimangaliso GEF-funded study.
- The Pongola Floodplain was included at an Intermediate level of assessment.

The project description as documented in the Inception Report, was to achieve the following objectives:

- determine the Ecological Reserve (DWAF 1998), at various levels of detail, for the Nyoni, Matigulu, Mlalazi, Mhlatuze, Mfolozi, Nyalazi, Hluhluwe, Mzinene, Mkuze, Assegaai and Pongola Rivers;
- determine the Ecological Reserve, at an Intermediate level for the Pongola floodplain;
- determine the Ecological Reserve, at an Intermediate level for the St Lucia/Mfolozi, Estuary System;
- determine the Ecological Reserve, at a Intermediate level for the Mlalazi Estuary;
- determine the Ecological Reserve, at a Rapid level for the Amatikulu Estuary;
- determine the Ecological Reserve, at an Intermediate level for Lake Sibaya;
- determine the Ecological Reserve, at a Rapid level for Kosi Lake and Estuary;
- classify the causal links between water supply and condition of key wetlands
- incorporate existing EWR assessments on the Mhlatuze (river and estuary) and Nhlabane (lake and estuary) into study outputs;
- determine the groundwater contribution to the Ecological Reserve, with particular reference to the wetlands;
- determine the Basic Human Needs Reserve for the Usutu/Mhlatuze WMA;
- outline the socio-economic water use in the Usutu/Mhlatuze WMA;
- build the capacity of team members, DWA Officials and stakeholders with respect to EWR determinations and the ecological Reserve.

3.2 Change management

Changes to the scope of work was requested or necessitate during the study. These are documented in Table 18.

Table 18. Record of Change Management

Change	Date requested	Effect
The Mlalazi estuary Reserve to be undertaken at a Rapid level instead of Intermediate, as development pressures and stresses similar to that on the Amatikulu-Nyoni estuary.	5 November 2013	Savings incurred were shifted to the Lake St Lucia EWR determination.
Change in approach in Lake Sibaya EWR assessment	8 July 2014	The approach was changed to tie all deliberations to water level. With minimum biotic sampling and emphasis on the salinities in response to water level changes. Dependencies on literature was a key component. A water balance model based on groundwater-lake level was focused on. As a result the team was changed to address the revised focus.
Undertake detailed groundwater modelling on the Kosi and Lake Sibaya systems.	August 2014	Use was made of the comprehensive groundwater Reserve assessment that was done for the WMA in 2009 to determine the groundwater contribution to the wetlands, in order to meet original objective. A water balance model was developed for each system and numerical groundwater flow model for the Lake Sibaya system. Internal contingency funds were allocated to cover the additional expenses.
Undertake a pro-rata assessment of the EWR for the Black and White Mfolozi River using the WR2012 generated hydrology. This stems from concern with using ACRU for EWR assessments in the catchment.	27 October 2015	This would entail determining the EWR through the Desktop Model, using the flow pattern as generated through DRIFT. This would enable a comparison between the EWRs generated through the 2 different “hydrologies”. The results will be documented in the Rivers EWR report. Funds were taken from the internal contingency budget to cover the work.
To generate a flow scenario for a B ecological category for the St Lucia	14 July 2016	iSimangaliso WPA did not accept the recommendation of maintaining present flow conditions as the Reserve for the St Lucia, which

		would achieve a C ecological category. The team was requested to generate a hypothetical flow scenario to achieve the B ecological category, which would be used in the preliminary Reserve. Further optimisation of the flows would need to be investigated during the Classification process.

3.3 Project Management and Technical Tasks

3.3.1 Project Management Tasks

A summary of the study management component tasks undertaken is provided in Table 19.

Table 19. Project Management Tasks

Activity	Tasks
Activity 1: Project Management	Overall project coordination and management
	PMC meetings
	PSC Meetings (stakeholder liaison)
	Background information documents
	Focus Discussion sessions
	Scenario selection & reporting
	Technical monitoring and control
	Financial control
	Progress reporting
Activity 2: Project Inception	Catchment overview
	Workplan refinement
	Inception Report
	ToRs for team members

Activity	Tasks
	Team appointments and mobilisation
	Water resources prioritisation and delineation
	PMIS Implementation
Activity 16: Study Closure	Reserve templates
	Prepare letters to the Region
	Final summary report
	Project audit and closure

3.3.2 Technical Tasks

A summary of the technical tasks conducted in the study are provided in Table 20.

Table 20. Technical Tasks

Activity	Tasks
Activity 3: Hydrology	Overview of hydrological data
	DRIFT analysis
	Flow scenarios for rivers, lakes and estuaries
	River EWR sites X8: WRYM or WR2005 – natural and present day
	River EWR sites X8: WRYM or WR2005 – scenarios X6
	Naturalised monthly flows at 51 river nodes: WRYM, ACRU or WR2005
	Pongola Floodplain: WRYM natural, present day and scenarios X6
	St Lucia: Mkuze & Mfolozi – ACRU natural and present day at lake
	St Lucia: Nyalazi, Msinene and Nzimane – ACRU natural and present day at lake

Activity	Tasks
	St Lucia – ACRU scenarios X4 for 3 of 5 rivers
	Estuaries: Kosi, Mlalazi & Amatikulu-Nyoni - WR2005 natural and present day
	Estuaries: Kosi, Mlalazi & Amatikulu-Nyoni – WR2005 scenarios x6
	Disaggregate monthly flows (x56) and prepare input files (x80) for DRIFT
	Reporting
	Technical Leadership
Activity 4: Intermediate EWR for Rivers	Literature review
	Site selection
	Data collection
	Data analysis and modelling
	Ecoclassification
	Determine EWRs
	Scenario analysis
	RQOs and monitoring
	Internal review and reporting
Activity 5: Rapid EWR for Rivers	Ecoclassification
	DRIFT (extrapolation and adjustments)
	Extrapolation to all 51 WRCS nodes
	Internal review and reporting
Activity 6: Pongola floodplain	Literature review
	Data for gauge W4H013 and Water Level Gauges

Activity	Tasks
	Survey water level gauges relative to MSL
	Landsat 5 and 7 scenes
	Inundation computations
	Wetland typing and ecoclassification
	Application of DRIFT (preparation and workshop)
	RQOs and monitoring
	Operating rules
	Internal review and reporting
Activity 7: Wetlands and Groundwater	Literature review and acquisition of data
	Delineation and wetland typing
	Geohydrology characterisation and acquifer boundaries
	Ecoclassification
	ID of links between abstraction and wetland conditions
	Ground truthing
	Integration workshops
	Coarse level water balance
	Internal review and reporting
Activity 8: St Lucia Intermediate EWR	Management and Planning
	Prepare hydrodynamic model
	Setting of EWRs
	Ecological specifications and monitoring programme
	Internal review and reporting

Activity	Tasks
Activity 9: Mlalazi Estuary Rapid EWR	Data collection
	Data analysis and specialist report writing
	Ecoclassification and setting of EWR
	Ecological specifications and monitoring
	Internal review and reporting
Activity 10: Amatikulu Estuary Rapid EWR	Data collection
	Data analysis and specialist report writing
	Ecoclassification and setting of EWR
	Ecological specifications and monitoring
	Internal review and reporting
Activity 11: Kosi Estuary Rapid EWR	Data collection
	Data analysis and specialist report writing
	Ecoclassification and setting of EWR
	Ecological specifications and monitoring
	Internal review and reporting
Activity 12: Review of the Mhlatuze and Nhlabane EWRs	Review existing studies
	Reformat and incorporate into results
	Internal review and reporting
Activity 13: Lake Sibaya Intermediate EWR	Literature and available data/models reviews
	Delineation of the aquifer
	Identification of biophysical indicators
	Summary of geohydrological modelling results

Activity	Tasks
	Data collection and analysis
	Ecoclassification
	Setting of EWR and scenario analysis
	Ecological specifications and monitoring programme
	Internal review and reporting
Activity 14: Socio-economic profile	Identify water use sectors
	Delineate socio-economic zones
	Ecosystem function and services identification and assessment
	Summarise value of aquatic ecosystems
	Internal review and reporting
Activity 15: Basic Human Needs Reserve	Estimate population directly dependant on water resource
	Scenarios of water use
	Mapping
	Internal review and reporting

3.4 Performance monitoring

Project Performance monitoring and reporting was based on monthly progress reports, feedback at Project Management Committee and Project Steering Committee meetings and delivery of milestone reports.
Each of these are discussed below.

3.4.1 Progress reporting

The intention at Inception Phase was to generate six monthly progress reports, outlining the

- Progress per task against programme

- Expenditure against budget
- Progress against expenditure
- Summary of progress, potential problems and possible changes to the scope of work
- A summary of the training/capacity building programme.

Five progress reports were delivered, covering the periods as follows:

- June 2013– October 2013
- November 2013 – February 2014
- March 2014 – May 2014
- June 2014
- July 2014 – November 2014

Copies of these progress reports are provided in Annexure 1

In December 2014, the Client requested that this approach be changed to one-page monthly progress reports summarising the activities undertaken that month. These reports were to accompany the monthly invoices.

3.4.2 Feedback at PMC/PSC meetings

3.4.2.1 PMC meetings

The intention at Inception of the study was to have quarterly Project Management Committee Meetings (PMC) between the Client and PSP. The purpose and constitution of this Committee is provided in Section 2.2.3.

According to the ToR the PMC meetings were the responsibility of the Client and as such was organised and minuted by the Client. A summary of PMC meetings held are provided in Table 21. The table includes interim status meetings which were held between the PSP and the Client.

Minutes of PMC meetings are contained in Annexure 2.

Table 21. Summary of PMC meetings

Meeting	Date
Inception meeting with Client	4 May 2012
PMC 1 – Project Initiation / PSC 1	23 August 2013
PMC 2	26 February 2014

Meeting	Date
PMC 3	10 June 2014
Interim status meeting 1	11 February 2015
PMC 4	7 August 2015
Interim status meeting 2	7 April 2016
Interim status meeting 3	10 May 2016
Special PMC meeting	31 May 2016

3.4.2.2 PSC meetings

The purpose and constitution of the PSC meetings is provided in Section 2.2.4. A summary of the meetings held are provided in Table 22.

Minutes of the PSC meetings are provided in Annexure 3

Table 22. Summary of PSC meetings

Meeting	Date
PSC 1 / Initiation meeting	23 August 2013
PSC 2	17 August 2015
PSC 3	2 June 2016

3.4.2.3 Presentation at meetings

Each of the four PMC meetings held during the study included progress feedback in terms of both the Project Management and Technical Components in the form of presentations. The Project Management Component primarily concentrated on administrative and financial matters, while technical progress feedback on the Technical Component was discussed in detail. The latter not only included progress feedback, but also covered discussions on matters in question and the associated way forward.

Feedback at the two PSC meetings primarily concentrated on the Technical Component progress and findings. The aim was also to obtain feedback from stakeholder concerns and recommendations with specific reference to potential water resource use and developments, resources that require priority protection as well as measures for coordinating management efforts to protect and manage water resources.

Interim Status Reporting focused on Technical progress and planned activities and deliverables for the forthcoming months. The aim was to address any challenges, matters in question and the associated way forward.

3.4.2.4 Actions and Decisions Register

All action items and decisions arising from the PMC, PSC and interim status meetings were recorded in the Actions and Decisions Register. See Annexure 4.

The purpose of the register was to keep record of all action items and to follow up progress on any outstanding action as well as to keep record of all decisions taken.

3.4.3 Technical study reporting

Various project reports were produced for the technical activities undertaken during the study. The main reports or study deliverables were determined in consultation with the Client during the Inception Phase of the project. Minor adjustments, such as the introduction of reporting volumes were implemented during the implementation phase of the project.

Report standards related to report numbering, report format, references and the internal review mechanism was set in consultation with the DWS. Report numbers were confirmed with the DWS. A summary of the reports is provided in Table 23.

Table 23. Technical report list

Activity	Milestone / Deliverable	Report Number
Activity 1: Project Management	Flow Related Development Scenarios	RDM/WMA6/CON/COMP/0313
Activity 2: Project Inception	Project Inception Report	RDM/WMA6/CON/COMP/0113
Activity 3: Hydrology	Hydrology report	RDM/WMA6/CON/COMP/1013
	Hydrology datasets for rivers, estuaries and lakes	
Activity 4: Intermediate EWR for Rivers	Delineation and Site Selection Report	RDM/WMA6/CON/COMP/0213
	RIVER Intermediate EWR: Volume 1 Ecoclassification	RDM/WMA6/CON/COMP/0613

Activity	Milestone / Deliverable	Report Number
	RIVER Intermediate EWR: Volume 2 EWR Assessment Results	RDM/WMA6/CON/COMP/0713
	RIVER Intermediate EWR: Volume 3 Specialist Reports	RDM/WMA6/CON/COMP/0813
	RIVER Intermediate EWR: Volume 4 Ecospecs and Monitoring Program	RDM/WMA6/CON/COMP/0913
	DRIFT DSS	Software
Activity 5: Rapid EWR for Rivers	River Rapid EWR Report	RDM/WMA6/CON/COMP/1513
Activity 6: Pongola floodplain	Inundation Modelling Report	RDM/WMA6/CON/COMP/1213
	Wetland Typing and Ecoclassification Report	
	Pongola Floodplain EWR Report (Incl the inundation modelling and ecoclassification)	
	DRIFT DSS	Software
Activity 7: Wetlands and Groundwater	Wetland Prioritisation Report	RDM/WMA6/CON/COMP/1113
	Groundwater :Main Findings and Conceptualisations	RDM/WMA6/CON/COMP/0513
	Literature Review, Hydrogeological Conceptualization of the Aquifer System and Determination of the Groundwater Component of the Reserve for the Lake Sibaya and Kosi Bay Catchments	RDM/WMA/CON/COMP/2113
Activity 8: St Lucia	St Lucia Intermediate EWR: Volume 1- Ecoclassifications & EWR Assessments	RDM/WMA6/CON/COMP/2213
	ST Lucia Intermediate EWR: Volume 2- Hydrodynamic modelling of salinity and suspended sediment	RDM/WMA6/CON/COMP/2313
Activity 9: Mlalazi Estuary Rapid EWR	Mlalazi Estuary EWR Report	RDM/WMA6/CON/COMP/1313
Activity 10: Amatikulu Estuary Rapid EWR	Amatikulu-Nyoni Estuary EWR Report	RDM/WMA6/CON/COMP/1413

Activity	Milestone / Deliverable	Report Number
Activity 11: Kosi Estuary Rapid EWR	Kosi Estuarine Lake EWR Report Vol 1	RDM/WMA6/CON/COMP/2613
	Estuarine Lake EWR Vol 2: Macroalgae and Macrophytes	RDM/WMA6/CON/COMP/2713
Activity 12: Review of the Mhlatuze and Nhlabane EWRs	Summary of EWR info for Mhlatuze, Nhlabane estuaries	RDM/WMA6/CON/COMP/2013
Activity 13: Lake Sibaya Intermediate EWR	Lake Sibaya Intermediate EWR: Volume 1 Ecoclassification	RDM/WMA6/CON/COMP/1613
	Lake Sibaya Intermediate EWR: Volume 2- EWR Report	RDM/WMA6/CON/COMP/1713
	Lake Sibaya Intermediate EWR: Volume 3- Specialists Reports	RDM/WMA6/CON/COMP/1813
	Lake Sibaya Intermediate EWR: Volume 4- EcoSpecs and Monitoring	RDM/WMA6/CON/COMP/1913
Activity 14: Socio-economic profile	Socio-economic assessment of Usutu-Mhlathuze Catchments	RDM/WMA6/CON/COMP/0413
Activity 15: Basic Human Needs Reserve	Basic Human Needs Reserve Report	RDM/WMA6/CON/COMP/2513
Activity 16: Study Closure	Final summary report	RDM/WMA6/CON/COMP/2813
	Preparation of project audit and closure report	RDM/WMA6/CON/COMP/2913

4 SCHEDULE PERFORMANCE

4.1 Study Programme

A detailed implementation programme and milestone/deliverable schedule was developed in consultation with the Client during the Inception Phase. It was identified that the following tasks were on the critical path and delays in inputs and decisions from the Client could result in overall delay in the project:

- Approval of the Final Inception Report, which was required before the PSP could finalise the Terms of Reference and appointments of sub-consultants
- Approvals of new team members and rates, which are required before the PSP could finalise the appointments of sub-consultants
- Finalisation of an MOU with iSimangaliso WPA to enable the acquisition of data and access to the specialist team to complete the Scope of Work for the St Lucia/Mfolozi system
- Confirmation with iSimangaliso WPA of the proposed approach for the Kosi and Lake Sibaya systems.

Approval of the Inception Report and team members and rates was received on the 13 May 2014, 9 months after signing the contract for the study. This resulted in a need to reschedule fieldwork to allow for appropriate seasonal sampling.

The MOU between DWS and Isimangaliso WPA was signed 22 September 2015 and thereafter a research agreement between Isimangaliso and Tlou Consulting was requested by Isimangaliso WPA. This agreement was signed on the 25th November 2015. This MoU and Research Agreement then allowed the PSP to initiate work on the St Lucia EWR assessment. This resulted in significant delays in achieving the deliverables on the St Lucia system. Refer to Activity 8 in Table 24.

Finalisation of the Reserve templates, letters to the Region, final summary report and the closure report were thereby also delayed.

Nevertheless, all activities and tasks were completed within the scheduled contract period.

4.2 Deliverables

Table 24 provides a comparison of the planned scheduled milestone/deliverable dates and the actual submission of the draft reports.

Table 24. Comparison of Planned and Actual Milestone and Deliverable dates

Milestone			Planned date	Actual date
Activity 1: Project Management	Deliverable 1.1	Quarterly progress reports.	Every 4 months	Monthly
	Deliverable 1.2	Milestone invoices.	Monthly	Monthly
	Deliverable 1.3	Minutes of stakeholder meetings.	2 weeks after meetings	2 weeks after meeting. PMC meetings minuted by Client

Milestone			Planned date	Actual date
	Deliverable 1.4	Background Information Documents: • Document 1 • Document 2 • Document 3		November 2014 August 2015 May 2016
Activity 2: Inception	Deliverable 2.1	Inception Report	30 September 2013	30 September 2013
	Deliverable 2.2	Prioritisation and delineation of water resources (incl in deliverable 4.1)	31 March 2014	3 April 14
Activity 3: Hydrology	Deliverable 3.1	Baseline Hydrology report	October 2014	October 2014
	Deliverable 3.2	Scenario hydrology report	November 2014	Draft: 8 December 2014 Final: 28 May 2015 (incl St Lucia new developments)
	Deliverable 3.3	Hydrology datasets required for river and estuary EWR assessments	August 2014	August 2014
Activity 4: Intermediate EWR for Rivers	Deliverable 4.1	River delineation and site selection report	March 2014	Final 3 April 2014
	Deliverable 4.2	Data Collection Trip Report 1	January 2014	6 March 2014
	Deliverable 4.3	Data Collection Trip Report 2	July 2014	13 July 2014
	Deliverable 4.4	River Ecoclassification Report	August 2014	4 September 2014
	Deliverable 4.5	River IRD – Specialist Reports	October 2014	2 October 2014.
	Deliverable 4.6	River IRD – EWR Report	September 2014	4 November 2014
	Deliverable 4.7	River IRD – Ecospecs & Monitoring	November 2014	8 December 2014
	Deliverable 4.8	DRIFT-DSS populated for eight sites	December 2014	12 December 2014
Activity 5: Rapid EWR for rivers	Deliverable 5.1	River RRD – EWR Report	March 2015	5 May 2015
Activity 6: Pongola floodplain	Deliverable 6.1	Inundation Modelling Report	March 2014 Revised date: May 2015	5 May 2015
	Deliverable 6.2	Wetland Typing and Ecoclassification Report Incl in deliverable 6.3.	September 2014	2 June 2015
	Deliverable 6.3	Pongola Floodplain – EWR Report (including the social concerns & recommended rules for Dam releases; wetland typing and	May 2015	2 June 2015

Milestone			Planned date	Actual date
		inundation modelling)		
	Deliverable 6.4	DRIFT_DSS populated for Pongola floodplain	June 2015	2 June 2015
Activity 7: Wetlands and Groundwater	Deliverable 7.1	Wetland typing and ecoclassification report (incl delineation and literature review)	Oct 2014	4 September 2014
	Deliverable 7.2	Integrated groundwater and wetland water resource units based on key drivers	December 2014	8 December 2014
	Deliverable 7.3	Wetlands EWR report. Revised to be called Prioritisation report, which includes RQOs, Management and Monitoring Requirements	March 2015	3 June 2015
	Deliverable 7.4	Groundwater EWR report – Lake Sibaya and Kosi systems	April 2015	14 August 2015
Activity 8: St Lucia/Mfolozi	Deliverable 8.1	Estuarine EWR report (incl ecoclassification, ecospecs and monitoring)	September 2014	28 April 2016
	Deliverable 8.2	Ecospecifications report 9incl in Deliverable 8.1)	October 2014	28 April 2016
	Deliverable 8.3	Resource Monitoring Programme report (incl in deliverable 8.1)	November 2014	28 April 2016
	Deliverable 8.4	Hydrodynamic Modelling of Salinity and Suspended Sediment		28 April 2016
Activity 9: Mlalazi Estuary Rapid EWR	Deliverable 9.1	Estuarine EWR report (incl Ecospecs & resource monitoring programme)	March 2015 Revised date: May 2015	1 July 2015
	Deliverable 9.2	Ecospecifications report (incl in Deliverable 9.1)	April 2015	1 July 2015
	Deliverable 9.3	Resource Monitoring Programme report (incl in Deliverable 9.1)	April 2015	1 July 2015
Activity 10: Amatikulu Estuary Rapid EWR	Deliverable 10.1	Estuarine EWR report (includes the ecoclassification, EWR and ecospecs & monitoring)	May 2015. Revised to September 2015	1 September 2015
	Deliverable 10.2	Ecospecifications report (incl in Deliverable 10.1)	June 2015. Revised to September 2015	1 September 2015
Activity 11: Kosi Estuary	Deliverable 11.1	Estuarine EWR Report	September 2015. Revised to March	28 April 2016

Milestone			Planned date	Actual date
Rapid EWR			2016	
	Deliverable 11.2	Ecospecifications report (included in deliverable 11.1)	October 2015. Revised to April 2016	28 April 2016
Activity 12: Mhlatuze, Nhlabane and other existing EWRs	Deliverable 12.1	Summary of relevant EWR information for Mhlatuze & Nhlabane estuaries	July 2015	30 July 2015
Activity 13: Lake Sibaya Intermediate EWR	Deliverable 13.1	Lake EWR Report	October 2015	30 October 2015
	Deliverable 13.2	Ecospecifications report	November 2015	27 November 2015
	Deliverable 13.3	Resource Monitoring Programme Report	November 2015	27 November 2015
	Deliverable 13.4	DRIFT-DSS populated	February 2016	29 February 2016
Activity 14: Socio-economic profile of study area	Deliverable 14.1	Socio-economic report	March 2014	May 2014
Activity 15: Basic Human Needs Reserve	Deliverable 15.1	Basic Human Needs Reserve report	March 2014	10 December 2015
Activity 16: Study Closure	Deliverable 16.1	Reserve templates: • Rivers • Estuaries • Lakes • Groundwater • Wetlands	March 2016	31 March 2016 1 July 2016 1 July 2016 29 July 2016 29 July 2016
	Deliverable 16.2	Letter to the Region • Rivers • Estuaries • Lakes • Groundwater • Wetlands	March 2016	31 March 2016 1 July 2016 1 July 2016 29 July 2016 29 July 2016
	Deliverable 16.3	Final Summary report	April 2016	29 July 2016
	Deliverable 16.4	Project audit and Closure report	June 2016	29 July 2016

All deliverables for Activity 2 through to Activity 15 were submitted to the Client, PMC and PSC members for comment. Besides verbal comments received at the PSC 2 on the 2 June 2016 and a meeting between Isimangaliso, the Client and DWS on the 14 July 2016 on the

St Lucia, Kosi and Lake Sibaya systems, no other comments were received on the draft reports. Comments received were reviewed by the task leaders and the reports amended as necessary. The reports hve been finalised on this basis.

5 BUDGET PERFORMANCE

5.1 Approved Study Budget

The approved budget for this study was R14 208 890.13 incl VAT and disbursements.

5.2 Invoicing

Invoicing was conducted as far as possible on a monthly basis. There are periods when no invoicing took place as they were between sampling, analysis and workshops or between the December/January break. The invoices were detailed in terms of study task breakdown. Claims for disbursements were supported by proof of expenditure. All invoices were accompanied by progress reports.
Table 25 provides a summary of the invoices submitted on the project.

Table 25. Summary of invoices submitted

Date of invoice	Invoice No.	Total (Incl VAT)	Total (Excl VAT)	VAT	Non VAT expenses
25/11/2013	Tax Invoice - 13-11/P12273-001#1	R 851 285,90	R 723 128,99	R 101 238,06	R 26 918,85
06/03/2014	Tax Invoice - 14-03/P12273-002#2	R 634 740,17	R 490 365,81	R 68 651,22	R 75 723,14
09/06/2014	Tax Invoice - 14-06/P12273-003#3	R 738 247,63	R 629 358,61	R 88 110,20	R 20 778,82
07/07/2014	Tax Invoice - 14-07/P12273-004#4	R 423 751,11	R 361 012,86	R 50 541,80	R 12 196,45
31/07/2014	Tax Invoice - 14-08/P12273-005#5	R 558 743,83	R 482 956,53	R 67 613,91	R 8 173,39
04/09/2014	Tax Invoice - 14-09/P12273-006	R 1 082 207,00	R 942 975,16	R 132 016,52	R 7 215,32

Date of invoice	Invoice No.	Total (Incl VAT)	Total (Excl VAT)	VAT	Non VAT expenses
01/10/2014	Tax Invoice - 14-10/P12273-007	R 517 553,09	R 442 826,91	R 61 995,77	R 12 730,41
03/11/2014	Tax Invoice - 14-11/P12273-008	R 300 308,53	R 263 344,32	R 36 868,21	R 96,00
03/12/2014	Tax Invoice - 14-12/P12273-009	R 558 908,04	R 474 691,82	R 66 456,86	R 17 759,36
05/02/2015	Tax Invoice - 15-01/P12273-010	R 755 143,11	R 657 142,68	R 91 999,97	R 6 000,46
27/02/2015	Tax Invoice - 15-03/P12273-011	R 778 361,79	R 679 107,04	R 95 074,99	R 4 179,76
17/03/2015	Tax Invoice - 15-03.1/P12273-012	R 146 457,46	R 126 909,55	R 17 767,34	R 1 780,57
05/05/2015	Tax Invoice - 15-04/P12273-013#13	R 625 167,69	R 524 511,35	R 73 431,59	R 27 224,75
01/06/2015	Tax Invoice - 15-05-P12273-014	R 264 457,20	R 231 980,00	R 32 477,20	R -
30/06/2015	Tax Invoice - 15-06/P12273-015	R 594 158,53	R 509 461,48	R 71 324,61	R 13 372,44
30/07/2015	Tax Invoice - 15-07/P12273-016	R 599 191,47	R 525 168,43	R 73 523,59	R 499,45
15/08/31	Tax Invoice - 15-08/P12273-017	R 566 335,53	R 491 100,87	R 68 754,12	R 6 480,54
15/09/30	Tax Invoice - 15-09/P12273-018	R 571 066,60	R 499 018,49	R 69 862,59	R 2 185,52
15/10/30	Tax Invoice - 15-10/P12273-019	R 669 909,86	R 582 884,85	R 81 603,88	R 5 421,13
15/11/27	Tax Invoice - 15-11/P12273-020	R 214 404,53	R 187 969,18	R 26 315,69	R 119,66
16/01/29	Tax Invoice - 16-01/P12273-021	R 700 842,79	R 607 579,96	R 85 061,19	R 8 201,64
16/02/29	Tax Invoice - 16-01/P12273-022	R 571 035,47	R 500 908,31	R 70 127,16	R -
16/03/14	Tax Invoice - 16-01/P12273-023	R 616 095,37	R 533 236,80	R 74 653,15	R 8 205,42
16/04/29	Tax Invoice - 16-04/P12273-024	R 406 102,85	R 354 481,21	R 49 627,37	R 1 994,28
16/06/06	Tax Invoice - 16-06/P12273-025	R 184 753,85	R 155 566,14	R 21 779,26	R 7 408,45

Date of invoice	Invoice No.	Total (Incl VAT)	Total (Excl VAT)	VAT	Non VAT expenses
16/06/30	Tax Invoice - 16-06/P12273-026	R 181 904,89	R 150 535,31	R 21 074,94	R 10 294,64
16/07/29	Tax Invoice - 16-07/P12273-027	R 97 749,30	R 85 745,00	R 12 004,30	
	Total claimed	R 14 208 883,59	R 12 213 967,66	R 1 709 955,49	R 284 960,45

Table 26 shows the budget claimed per activity compared to the estimated budget contained in the Inception Report.

Table 26. Comparison of planned and actual claim per Activity

TASK DESCRIPTION	PROFESSIONAL FEES	
	PROPOSED COST (excl VAT)	ACTUAL COST (incl VAT)
Task 1: Project management	R1 547 480,00	R1 270 711,00
Task 2: Project inception	R440 560,00	R515 508,00
Task 3: Hydrology	R426 000,00	R655 080,00
Task 4: Intermediate river EWRs	R2 092 560,00	R2 136 989,00
Task 5: Rapid River EWRs	R331 840,00	R331 840,00
Task 6: Pongola Floodplain	R787 920,00	R787 920,00
Task 7: Wetlands and Groundwater	R1 057 680,00	R1 057 680,00
Task 8: St Lucia/Mfolozi Intermediate EWR	R546 800,00	R546 800,00
Task 9: Mlalazi Estuary Intermediate EWR	R555 560,00	R713 490,00
Task 10: Amatikulu Estuary Rapid EWR	R433 840,00	R479 515,00
Task 11:Kosi Estuary Rapid EWR	R589 360,00	R745 900,00
Task 12: Mhlatuze, Nhlabane and other existing estuary review EWRs	R60 800,00	R66 785,00
Task 13: Sibaya Lake Intermediate EWR	R1 157 040,00	R1 562 685,00
Task 14: Socioeconomic profile	R384 800,00	R384 800,00
Task 15: Basic Human Needs Reserve	R73 600,00	R73 600,00
Task 16: Study closure	R188 560,00	R160 760,00
Contingency	R314 057,70	

TASK DESCRIPTION	PROFESSIONAL FEES	
	PROPOSED COST (excl VAT)	ACTUAL COST (incl VAT)
Total	R10 988 457,70	R11 490 063,00

A significant increase in cost was experienced on the Lake Sibaya activity as compared to planned, due to the change in approach in undertaking this, after conducting research on the system.

The other significant increase was experienced in the hydrology task. This could be attributed to the additional working required to resolve issues as a result of using hydrology with low confidence. This was however the best available information at our disposal. Several additional meetings were held around the hydrology, particularly in relation to the St Lucia inflowing rivers.

5.3 Cash flow

A comparison of the planned monthly claim to the actual claims made are provided in Table 27.

There was a discrepancy between the planned and actual claims mainly due to the delays in approval of the Inception Report, team members and their rates as well as finalising the MOU between Isimangaliso WPA and the Client. As a result the work programme and associated budget was pushed out later than originally scheduled.

The work was carried out within the approved budget for the project.

Table 27. Comparison of budgeted to actual monthly claims

Month	Monthly budgeted fee (Excl VAT)	Disbursement (Excl VAT)	Total Monthly budget (Excl VAT)	Cumulative budget (Excl VAT)	Actual monthly claim (Excl VAT)	Actual cumulative claim (Excl VAT)
Oct-13						
Nov-13	R665 068,00	R100 000,00	R765 068,00	R765 068,00	R750 047,84	R750 047,84
Dec-13	R792 380,00	R100 000,00	R892 380,00	R1 657 448,00		R750 047,84
Jan-14	R492 880,00		R492 880,00	R2 150 328,00		R750 047,84
Feb-14	R304 400,00		R304 400,00	R2 454 728,00		R750 047,84
Mar-14	R546 380,00		R546 380,00	R3 001 108,00	R566 088,95	R1 316 136,79

Month	Monthly budgeted fee (Excl VAT)	Disbursement (Excl VAT)	Total Monthly budget (Excl VAT)	Cumulative budget (Excl VAT)	Actual monthly claim (Excl VAT)	Actual cumulative claim (Excl VAT)
Apr-14	R541 714,00	R200 000,00	R741 714,00	R3 742 822,00		R1 316 136,79
May-14	R155 040,00		R155 040,00	R3 897 862,00	R650 137,43	R1 966 274,22
Jun-14			R0,00	R3 897 862,00	R373 209,31	R2 339 483,53
Jul-14	R691 600,00	R200 000,00	R891 600,00	R4 789 462,00	R491 129,92	R2 830 613,45
Aug-14	R525 699,00	R200 000,00	R725 699,00	R5 515 161,00	R950 190,48	R3 780 803,93
Sep-14	R866 006,00		R866 006,00	R6 381 167,00	R455 557,32	R4 236 361,25
Oct-14	R1 101 490,00	R100 000,00	R1 201 490,00	R7 582 657,00	R263 440,32	R4 499 801,57
Nov-14	R282 628,00	R50 000,00	R332 628,00	R7 915 285,00	R492 451,18	R4 992 252,75
Dec-14	R806 443,00		R806 443,00	R8 721 728,00		R4 992 252,75
Jan-15	R596 160,00		R596 160,00	R9 317 888,00	R663 143,14	R5 655 395,89
Feb-15	R97 140,00		R97 140,00	R9 415 028,00	R683 286,80	R6 338 682,69
Mar-15	R169 023,00		R169 023,00	R9 584 051,00	R128 690,12	R6 467 372,81
Apr-15	R242 150,00	R100 000,00	R342 150,00	R9 926 201,00	R551 736,10	R7 019 108,91
May-15	R118 940,00		R118 940,00	R10 045 141,00	R231 980,00	R7 251 088,91
Jun-15	R353 113,00		R353 113,00	R10 398 254,00	R522 833,92	R7 773 922,83
Jul-15	R38 660,00	R50 000,00	R88 660,00	R10 486 914,00	R525 667,88	R8 299 590,71
Aug-15			R0,00	R10 486 914,00	R497 581,41	R8 797 172,12
Sep-15		R100 000,00	R100 000,00	R10 586 914,00	R501 204,01	R9 298 376,13
Oct-15	R205 520,00	R100 000,00	R305 520,00	R10 892 434,00	R588 305,98	R9 886 682,11

Month	Monthly budgeted fee (Excl VAT)	Disbursement (Excl VAT)	Total Monthly budget (Excl VAT)	Cumulative budget (Excl VAT)	Actual monthly claim (Excl VAT)	Actual cumulative claim (Excl VAT)
Nov-15	R85 633,00		R85 633,00	R10 978 067,00	R188 088,84	R10 074 770,95
Dec-15			R0,00	R10 978 067,00		R10 074 770,95
Jan-16			R0,00	R10 978 067,00	R615 781,60	R10 690 552,55
Feb-16	R0,00		R0,00	R10 978 067,00	R500 908,31	R11 191 460,86
Mar-16	R209 333,00	R100 000,00	R309 333,00	R11 287 400,00	R541 442,22	R11 732 903,08
Apr-16	R87 940,00		R87 940,00	R11 375 340,00	R356 475,49	R12 089 378,57
May-16			R0,00	R11 375 340,00	R162 974,59	R12 252 353,16
Jun-16	R231 200,00		R231 200,00	R11 606 540,00	R160 829,95	R12 413 183,11
Jul-16	R467 860,00	R46 550,00	R514 410,00	R12 120 950,00	R85 745,00	R12 498 928,11
Total	R10 674 400,00	R1 446 550,00	R12 120 950,00		R12 498 928,11	

5.4 Equity Participation

The mimum target participation HDI rate according to the Terms of Reference was 30% for workload distribution in hours and also 30% for financial distribution. Table 28 provides the actual equity participation at the end of the project. The project was successful in achieving more than the target participation, with 50% HDI participation in terms of workload distribution and 53% for financial distribution.

Table 28. Equity Participation Rate

Personnel	Position in team	Gender	Race	Rate (R/hr)	No of hours	Cost (R)	HDI Participation		% HDI Participation	
							Time	Cost	Time	Cost
A Singh	Project Manager / Rivers Activity Leader	F	I	850	2450	R2 082 435,00	2450	R2 082 435,00	17	18
M Taylor	Admin support	F	W	350	144	R50 410,00	144	R50 410,00	1	0,4
C Engelbrecht	GIS	F	W	700	92	R64 400,00	92	R64 400,00	1	1
T Sibande	Field Assistant / Rivers Co-ordinator	M	B	450	144	R64 800,00				
C Brown	Process Manager	F	W	920	1101	R1 013 014,00	1101	R1 013 014,00	8	9
A Joubert	DSS Manager	F	W	750	775	R581 250,00	775	R581 250,00	5	5
Andre Greyling	DSS programmer	M	W	750	0					
K Reinecke	DSS Trainer	M	W	650	442	R287 300,00				
W Nyabeze	Hydrologist	M	B	980	112	R109 760,00	112	R109 760,00	1	1
M Kleynhans	River hydraulician	M	W	800	276	R220 799,00				
H Malan	River Water Quality	F	W	650	322	R209 300,00	322	R209 300,00	2	2
M Rountree	Geomorphology	M	W	650	354	R230 100,00				
J Mackenzie	Riparian vegetation	M	W	650	497	R323 050,00				
C. Todd	Macroinvertebrates	F	W	650	314	R204 100,00	314	R204 100,00	2	2

Personnel	Position in team	Gender	Race	Rate (R/hr)	No of hours	Cost (R)	HDI Participation		% HDI Participation	
							Time	Cost	Time	Cost
B. Paxton	Fish	M	W	650	336	R218 400,00				
G Marneweck	Wetlands	M	W	650	886	R575 900,00				
A Birkhead	River/floodplain hydraulican	M	W	850	612	R520 200,00				
P Hobbs	Groundwater Activity Leader	M	W	855	32	R27 360,00				
E Kapangaziwiri	Groundwater Support	M	B	690	8	R5 520,00				
D Cyrus	Estuarine Activity Leader / Birds / Fish specialist	M	W	700	660	R461 765,00				
D Cyrus	Estuarine Activity Leader / Birds / Fish specialist	M	W	350	0					
R. Taylor	Macrophytes	M	W	500	527	R263 650,00				
R. Taylor	Macrophytes	M	W	350	0					
G. Bate	Microalgae and Phytoplankton	M	W	500	152	R76 210,00				
G. Bate	Microalgae and Phytoplankton	M	W	350	0					

Personnel	Position in team	Gender	Race	Rate (R/hr)	No of hours	Cost (R)	HDI Participation		% HDI Participation	
							Time	Cost	Time	Cost
L Vivier	Zoobenthos / Macrocrustaceans / Veg mapping	M	W	500	301	R150 310,00				
L Vivier	Zoobenthos / Macrocrustaceans / Veg mapping	M	W	350	0					
H Jerling	Zooplankton	M	W	500	99	R49 740,00				
H Jerling	Zooplankton	M	W	350	0					
M Mzimela	Water quality	M	B	500	102	R51 000,00	102	R51 000,00	1	0,4
L v Niekerk	Hydrodynamics / Estuarine process trainer	F	W	820	579	R474 780,00	579	R474 780,00	4	4
S Taljaard	Estuarine water quality trainer	F	W	910	444	R404 040,00	444	R404 040,00	3	4
B Clark	St Lucia Activity Leader	M	W	800	194	R155 200,00				
J Turpie	Reserve practitioner / modelling / bird specialist	F	W	800	212	R169 600,00	212	R169 600,00	1	1
J Adams	Plants	F	W	800	139	R111 300,00	139	R111 300,00	1	1
D Cyrus	Fish	M	W	800	0					
N Forbes	Invertebrates	F	W	800	36	R28 800,00	36	R28 800,00	0,2	0,3

Personnel	Position in team	Gender	Race	Rate (R/hr)	No of hours	Cost (R)	HDI Participation		% HDI Participation	
							Time	Cost	Time	Cost
G Basson	Hydrodynamics / sediments / salinity	M	W	1920	168	R322 560,00				
T Tlou	Socio-Economics / Scenario development	M	B	1200	362	R434 400,00	362	R434 400,00	2	4
W Mullins	Economist	M	W	850	164	R139 400,00				
A Görgéns	Hydrology Task Leader	M	W	900	120	R108 000,00				
A Sparks	System Modeller	M	W	970	310	R300 720,00				
G Howard	Hydrologist	M	W	880	364	R320 320,00				
C Beuster	GIS - Hydrology	M	W	400	8	R3 200,00				
F MacKay	Invertebrates - Kosi	F	W	750	109	R82 000,00	109	R82 000,00	1	1
S Weerts	Fish - Kosi and Lake Sibaya	M	W	980	219	R214 970,00				
M Demlie	Groundwater	M	B	855	433	R370 000,00			0	0
M Fernandes	Macrophyte trainee - Kosi	F	W	350		R10 000,00	0,0	R10 000,00	0,0	0,1
TOTAL					**14600**	**R11 490 063,00**	**7294**	**R6 080 589,00**	**50**	**53**

6 COMMUNICATION MANAGEMENT

Communication management relates to the communication between the PSP and the Client, PMC, and PSC. It does not cover communication between the PSP project team. At the Inception Phase the following communication channels were established:

- all communication between the PSP and the Client will be through the Project Manager at DWS, who was Mr Molefi Mazibuko (previously Mr Simphiwe Mazibuko) and Ms Adhishri Singh of Tlou Consulting.
- Communication with the PMC will be through the Client's Project Manager.
- During the course of the study, the Client requested that communication with the PSC be through the PSP, Adhishri Singh.

6.1.1 Identification of stakeholders

Public participation was not identified as an objective of this project, however key stakeholders in the catchment were identified to sit on the Project Steering Committee.

A stakeholder/PSC database was developed with input from the Client and the DWS – KZN Region, who run Catchment Management Forums in the study area. Refer to Table 3 for the full complement of PSC members.

6.1.2 Communication methods

Project information was distributed at three levels:

- To the Client through meetings, email and telephonically
- To the PMC through PMC meetings
- To the Stakeholders through the PSC meetings

PMC Meetings were supported by progress reports and presentations.

PSC meetings were supported by presentations and Information Brochures which provided a summary of progress, findings and planned worked. The Information Brochures are provided in Annexure 5.

6.1.3 Focus Discussion Sessions

Focussed discussion sessions were held during the project. These meetings, their purpose and date of meeting are provided in Table 29.

Table 29. Summary of Focus Discussion Session

Meeting	Objective	Stakeholders	Date of meeting
iSimangaliso Wetland Park Authorities Meetings	To agree on the objectives for EWR assessments of water resources within the Park. Obtain permission to utilise the project team and data generated from the GEF-funded study on St Lucia	DWS: Client, GWRR, SFRA, NWRP, Isimangaliso (James, Forbes), PSP (Singh)	4 November 2013
Scenario planning workshop	To identify future development scenarios for each water resource that should be investigated during the EWR process.	DWS: Client, National Water Resources Planning, Options Analysis, SFRA, KZN Regional Office, IUCMA, Classification, GWRR, PSP (Tlou, Singh, Görgéns)	31 July 2014
St Lucia	To seek permission on utilising the team and data generated from the GEF-funded study on St Lucia	DWS: Client; PSP (Singh), Isimangaliso (James, Forbes)	
Effect of plantations on Lake Sibaya and Kosi estuarine lakes	To understanding the findings on the groundwater modelling for Lake Sibaya and Kosi system.	DWS: Client, SFRA (Fourie & Hadebe); PSP (Dr Demlie, Singh)	Written communication on Lake Sibaya – 18 November 2015 Meeting: 7 December 2015
Pongola floodplain	To understand the findings of the EWR assessment and the proposed release scenario	DWS: Client, Options Analysis (Ntuli & Cele), Brown, Singh	30 May 2016

6.1.4 Issues and Response Register

Issues/comments received during Client and Stakeholder communications and responses have been recorded in an Issues and Response Register. Refer to Annexure 6 for the Register.

7 CAPACITY BUILDING

Capacity building formed an integral part of the project design and opportunities for capacity have been incorporated at all levels of seniority. The Inception Report identified the following mechanisms, in consultation with DWS, to ensure capacity building at a broad level:

- The Client will second seven (7) staff members to the appointed project team, while two senior members will be capacitated on DRIFT.
- Participation of DWS officials (CD:WE and Regional Offices) to ensure active sharing of ideas and contribute to the broadening of the RDM skills base. Discussion groups were to be held once a year before the PMC meeting based on topics as requested by the DWS.
- Local specialists and stakeholders (e.g. the DWS Regional Office, iSimangaliso WPA, Ezemvelo KZN Wildlife, Catchment Management Agencies, Local Authorities and Environmental Groups) will be involved in the PSC. Through their participation these groups will develop an understanding of water resource protection through the Reserve determination methodologies and its relevance. This will also assist in the enhancement of their understanding of the concepts of integrated water resource managemenet and sustainable development.
- Specific intra-team arrangements for capacity building.

Table 30 provide the DWS staff that participated in the project in a capacity building role and their focus areas.

Table 30. Capacity Building Plan for DWS

DWA personnel	Specialist field	Mentor	Area of capacity building
Mazibuko Molefi Jacob	Fish	Bruce Paxton	Field work Participation at EWR workshop Review specialist report
Boniwe Nobubele	SASS & Wetlands	Gary Marneweck – Wetlands (Pongola floodplain) Colleen Todd – River (SASS)	Field work on Pongola floodplain and Rivers Participation at EWR workshop for rivers Review the Pongola floodplain wetland report Review the macro invertebrate specialist report
Mazibuko Simphiwe	Project Management & Socio-economics	Toriso Tlou (Socio-Economics) Adhishri Singh (Project Management)	Participation on defining socio-economic zones Review socio-economic report Review progress reports (Which provides achievement, planned activities and financial control of project) Interaction with PSP throughout the project
Mpete Tinyiko	Hydraulics	Martin Kleynhans	Field work - rivers Review specialist report

Qoko Mathabo	VEGRAI and Water Quality	James MacKenzie – vegetation Heather Malan – water quality	Participation at EWR workshop (Veg & Water Quality) Review specialist reports
Ntwampe Leshego	Groundwater quality (GRDM 2012)	Phil Hobbs / Molla Demlie	Participation at Groundwater/Wetland discussions Review groundwater/wetland report
Nzama Stanley	Groundwater quality (GRDM 2012)	Phil Hobbs / Molla Demlie	Participation at Groundwater/Wetland discussions Review groundwater/wetland report
Philani Khoza	Groundwater (GRDM)	Molla Demlie Bekele (Groundwater) Gary Marneweck (wetlands)	Fieldwork – rivers, Lake Sibaya, Kosi estuarine lakes Participation at Groundwater/Wetland discussions Review groundwater/wetland report
Motebe Nancy	DRIFT	Cate Brown	2 hr DRIFT discussion and demonstrations: Methodological understanding Information requirements and output of DRIFT DSS.
Weston Barbara	DRIFT	Cate Brown	2 hr DRIFT discussion and demonstrations: Methodological understanding Information requirements and output of DRIFT DSS.

A capacity building plan was developed on the project, which was used for progress reporting. Refer to Table 31 for capacity building activities undertaken during project life. The project met all its capacity building initiatives, except for the following which was outside of the control of the Project Team:

- Groundwater data collection. The CSIR withdrew from the project before having undertaken any data collection. Dr Demlie who was appointed to replace the CSIR, already had a system of data gathering, with a team of students from the University of KZN who routinely collected data. As such there was no opportunity for the groundwater specialist and DWS officials to go to site and hence this activity fell away.
- DWS officials were invited to all field trips and workshops, but in some instances could not attend. It was also a concern that the specialist reports were not reviewed by the trainees, which made it difficult to ascertain the gaps in their training or knowledge acquired during the field trips and workshops.

Table 31. Capacity building Implementation Plan

Task	Target audience	Mentor	Capacity building per task	Level of training	Time frame	Key performance areas	Knowledge area gap	Learning area addressed	Comment
Task 1: Project management	Adhishri Singh	Cate Brown	Mentoring in all aspects of Reserve determination studies	Mentoring	3,5 years	Management and co-ordination of Reserve determinations	Overall Project Coordination and River Reserve Determinations	Co-ordination of multi-disciplinary teams;integrating components of study	Successful completion
	DWS	Cate Brown	DRIFT demonstrations	Discussion and demonstration	2 hours	Management implications: EF Determinations	Methodological understanding	Information requirements and output of DRIFT DSS	Took place 4-8 August 2014
	PSC and DWS	Cate Brown	Scenario discussions	Discussion and demonstration	2 hours	Management implications: Scenarios	Understanding of the composition of various scenarios and concerns	Composition of scenarios	Discussions took place: Scenario workshop - 31 July 2014; PSC meeting - 17 August 2015; PSC meeting - 2 June 2015; Rivers workshop - 4-8 August 2014; Pongola meeting - 30 May 2016
Task 2: Project inception	All project specialists	Cate Brown	DRIFT Introductory Training	Discussion and demonstration	6 hours	Technical application: EF Determinations	Technical data provision	Information requirements and output of DRIFT DSS	Took place June 2013
	Project river specialists	Cate Brown	DRIFT Application	Hands on application	8 days	Technical application: EF Determinations	Technical data provision	Information requirements and output of DRIFT DSS	Took place 4-8 August 2014
	Adhishri Singh	Cate Brown	Report writing - RU delineation report for rivers	Mentoring	2 day	Delineation reporting	Technical presentation of findings	Communication of results	Took place March 2014
Task 3: Hydrology	Project specialists	C Brown / K Reineke	Application of DRIFT	Mentoring	5 day	Technical application: EF Determinations. Technical application: Extrapolation	Data input to DRIFT	Information requirements and output of DRIFT DSS	Took place 4-8 Aug & 25-29 August 2014

Task	Target audience	Mentor	Capacity building per task	Level of training	Time frame	Key performance areas	Knowledge area gap	Learning area addressed	Comment
Task 4: Intermediate river EWRs	Tobias Sibande	Cate Brown	Site selection	Participation in site selection activities	10 days	Technical application: Site selection	Technical understanding of site selection but also many other aspects that were discussed during the journey	Site selection and first-hand experience of the study basins. Also issues pertaining to aquatic ecosystems that will enhance his understanding of the issues pertaining to RDM investigations	29 July - 2 August 2013
	DWS - Molefi J Mazibuko	Bruce Paxton	Data collection	Participation in low-flow field work / data collection	8 days	Data collection in field	Hands on sampling	Practical application of sampling techniques and data recording	7-13 July 2014
	DWS - Nobubele Boniwe	Colleen Todd	Data collection	Participation in low-flow field work / data collection	8 days	Data collection in field	Hands on sampling	Practical application of sampling techniques and data recording	7-13 July 2014
	DWS - Tinyiko Mpete	Martin Kleynhans	Data collection	Participation in low-flow field work / data collection	8 days	Data collection in field	Hands on sampling	Practical application of sampling techniques and data recording	7-13 July 2014
	DWS - Mathabo Qoko	James McKenzie	Data collection	Participation in low-flow field work / data collection	8 days	Data collection in field	Hands on sampling	Practical application of sampling techniques and data recording	Did not attend
	DWS - Mathabo Qoko	Heather Malan	Data collection	Participation in data collection activities	6 days	Electronic data collection	Sourcing and sifting through water quality data	Identifying and sorting data	4-8 August 2014 & 25-29 August 2014
	Project river specialists	Cate Brown / Aliso Joubert / Karl Reineke	DRIFT Application	Hands on application	8 days	Technical application: EF Determinations	Technical data provision	Information requirements and output of DRIFT DSS	4-8 August 2014 & 25-29 August 2014
	DWS - Molefi J Mazibuko	Bruce Paxton	DRIFT Application	Hands on application	8 days	Technical application: EF Determinations	Technical data provision	Information requirements and output of DRIFT DSS	4-8 August 2014 & 25-29 August 2014

Task	Target audience	Mentor	Capacity building per task	Level of training	Time frame	Key performance areas	Knowledge area gap	Learning area addressed	Comment
	DWS - Nobubele Boniwe	Colleen Todd	DRIFT Application	Hands on application	8 days	Technical application: EF Determinations	Technical data provision	Information requirements and output of DRIFT DSS	4-8 August 2014 & 25-29 August 2014
	DWS - Tinyiko Mpete	Martin Kleynhans	DRIFT Application	Hands on application	8 days	Technical application: EF Determinations	Technical data provision	Information requirements and output of DRIFT DSS	4-8 August 2014 & 25-29 August 2014
	DWS - Mathabo Qoko	James McKenzie	DRIFT Application	Hands on application	8 days	Technical application: EF Determinations	Technical data provision	Information requirements and output of DRIFT DSS	4-8 August 2014 & 25-29 August 2014
	DWS - Mathabo Qoko	Heather Malan	DRIFT Application	Hands on application	8 days	Technical application: EF Determinations	Technical data provision	Information requirements and output of DRIFT DSS	4-8 August 2014 & 25-29 August 2014
	Project river specialists	Cate Brown / Adhishri Singh	Report review	Detailed comment on reports	1 day per report	Writing and presentation of data	Assistance with improved presentation and clarity	Communication of results	Sep-14
	DWS - Molefi J Mazibuko	Bruce Paxton	Specialist Report review	Detailed comment on specialist reports	1 day per report	Writing and presentation of data	Technical presentation of results	Communication of results	Oct-14
	DWS - Nobubele Boniwe	Colleen Todd	Specialist Report review	Detailed comment on specialist reports	1 day per report	Writing and presentation of data	Technical presentation of results	Communication of results	Oct-14
	DWS - Tinyiko Mpete	Martin Kleynhans	Specialist Report review	Detailed comment on specialist reports	1 day per report	Writing and presentation of data	Technical presentation of results	Communication of results	Oct-14
	DWS - Mathabo Qoko	James McKenzie	Specialist Report review	Detailed comment on specialist reports	1 day per report	Writing and presentation of data	Technical presentation of results	Communication of results	Oct-14
	DWS - Mathabo Qoko	Heather Malan	Specialist Report review	Detailed comment on specialist reports	1 day per report	Writing and presentation of data	Technical presentation of results	Communication of results	Oct-14
Task 5: Rapid River EWRs	Adhishri Singh	Cate Brown	Extrapolation DSS application using DRIFT / Standard Desktop Model	Discussion and demonstration	2 days	Technical application: Extrapolations	Technical understanding of extrapolation using DRIFT & Std Dekstop Model	Information DSS for extrapolation	24-28 November 2014

Task	Target audience	Mentor	Capacity building per task	Level of training	Time frame	Key performance areas	Knowledge area gap	Learning area addressed	Comment
	Tobias Sibande	Adhishri Singh	Extrapolation DSS application using DRIFT / Standard Desktop Model	Hands on application	2 day	Technical application: Extrapolations	Applying extrapolation using Desktop model	Information needs for using Desktop Model for extrapolation	November/December 2014
Task 6: Pongola Floodplain	Gary's assistant	Gary Marneweck	Data collection	Participation in data collection activities	5 days	Technical application: Data collection	Experience in collection of data for wetland assessment	First-hand experience of the Pongola Floodplain and data collection for wetland assessments.	18-22 November 2014
	DWS- Nobubele Boniwe	Gary Marneweck	Data collection	Participation in data collection activities	5 days	Technical application: Data collection	Experience in collection of data for wetland assessment	First-hand experience of the Pongola Floodplain and data collection for wetland assessments.	Invited, but did not attend
	DWS - T Mpete	Gary Marneweck	Data collection	Participation in data collection activities	5 days	Technical application: Data collection	Experience in collection of data for wetland assessment	First-hand experience of the Pongola Floodplain and data collection for wetland assessments.	Invited, but did not attend
	Project wetland specialists	Cate Brown / Alison Joubert	DRIFT Application	Hands on application	8 days	Technical application: EF Determinations	Use of DRIFT in setting EWR for floodplain	Setting EWR for floodplains	24-28 November 2014
	DWS - Nobubele Boniwe	Cate Brown / Gary Marneweck	DRIFT Application	Participation in DRIFT workshop	4 days	Technical application: EF Determinations	Use of DRIFT in setting EWR for floodplain	Setting EWR for floodplains	Did not attend
	DWS - T Mpete	Cate Brown / Gary Marneweck	DRIFT Application	Participation in DRIFT workshop	4 days	Technical application: EF Determinations	Use of DRIFT in setting EWR for floodplain	Setting EWR for floodplains	Did not attend
	Project wetland specialists	Cate Brown	Internal review	Detailed comment on reports	1 day per report	Writing and presentation of data	Assistance with improved presentation and clarity	Communication of results	28-May-15
	DWS - T Mpete	Gary Marneweck	Report review	Detailed comment on reports	1 day per report	Writing and presentation of data	Technical presentation of findings	Communication of results	No comments received

Task	Target audience	Mentor	Capacity building per task	Level of training	Time frame	Key performance areas	Knowledge area gap	Learning area addressed	Comment
	DWS - Nobubele Boniwe	Gary Marneweck	Report review	Detailed comment on reports	1 day per report	Writing and presentation of data	Technical presentation of findings	Communication of results	No comments received
Task 7: Wetlands and Groundwater	Univ KZN Students	Molla Demlie	Data collection	Participation in data collection activities	6 days	Technical application: Data collection	Experience in collection of data for groundwater assessment	First-hand experience of data collection for groundwater assessments.	29 September 2014 - August 2015
	Bhuti Dlamini & Heinz Ortmann	Gary Marneweck	Data collection	Participation in data collection activities	10 days	Technical application: Data collection	Experience in collection of data for wetland assessment	First-hand experience of data collection for wetland assessments.	22-25 July 2014 & 13-19 August 2014
	DWS - Nobubele Boniwe	Gary Marneweck	Data collection	Participation in data collection activities	10 days	Technical application: Data collection	Experience in collection of data for wetland assessment	First-hand experience of data collection for wetland assessments.	Invited but did not attend
	DWS- T Mpete	Gary Marneweck	Data collection	Participation in data collection activities	10 days	Technical application: Data collection	Experience in collection of data for wetland assessment	First-hand experience of data collection for wetland assessments.	Invited but did not attend
	DWS - Leshego Ntwampe	Phil Hobbs / Molla Demlie	Data collection	Participation in data collection activities	6 days	Technical application: Data collection	Experience in collection of data for groundwater assessment	First-hand experience of data collection for groundwater assessments.	Data collected by Univ KZN student assistants
	DWS - Stanley Nzama	Phil Hobbs / Molla Demlie	Data collection	Participation in data collection activities	6 days	Technical application: Data collection	Experience in collection of data for wetland and groundwater assessment	First-hand experience of data collection for wetland and groundwater assessments.	Data collected by Univ KZN student assistants
	Univ KZN Students	Molla Demlie	Integration workshop	Participation in discussions around wetland / groundwater interaction	3 days	Area specific groundwater-wetland integration	Technical understanding of wetland/groundwater linkages for specific area	Consolidation of data collected and application in establishing wetland groundwater linkages	November 2014 - August 2015

Task	Target audience	Mentor	Capacity building per task	Level of training	Time frame	Key performance areas	Knowledge area gap	Learning area addressed	Comment
	Bhuti Dlamini & Heinz Ortmann	Gary Marneweck	Integration workshop	Participation in discussions around wetland / groundwater interaction	3 days	Area specific groundwater-wetland integration	Technical understanding of wetland/groundwater linkages for specific area	Consolidation of data collected and application in establishing wetland groundwater linkages	19-Mar-15
	DWS - Nobubele Boniwe	Gary Marneweck	Integration workshop	Participation in discussions around wetland / groundwater interaction	3 days	Area specific groundwater-wetland integration	Technical understanding of wetland/groundwater linkages for specific area	Consolidation of data collected and application in establishing wetland groundwater linkages	19-Mar-15
	DWS - T Mpete	Gary Marneweck	Integration workshop	Participation in discussions around wetland / groundwater interaction	3 days	Area specific groundwater-wetland integration	Technical understanding of wetland/groundwater linkages for specific area	Consolidation of data collected and application in establishing wetland groundwater linkages	July-August 2014; 19 March 2015
	DWS - Leshego Ntwampe	Molla Demlie	Integration workshop	Participation in discussions around wetland / groundwater interaction	3 days	Area specific groundwater-wetland integration	Technical understanding of wetland/groundwater linkages for specific area	Consolidation of data collected and application in establishing wetland groundwater linkages	19-Mar-15
	DWS - Stanley Nzama	Molla Demlie	Integration workshop	Participation in discussions around wetland / groundwater interaction	3 days	Area specific groundwater-wetland integration	Technical understanding of wetland/groundwater linkages for specific area	Consolidation of data collected and application in establishing wetland groundwater linkages	19-Mar-15
	Other DWS GRDM and SWRR attendees, including senior managers	Gary Marneweck & Molla Demlie	Integration workshop	Participation in discussions around wetland / groundwater interaction	3 days	Area specific groundwater-wetland integration	Technical understanding of wetland/groundwater linkages for specific area	Consolidation of data collected and application in establishing wetland groundwater linkages	19-Mar-15

Task	Target audience	Mentor	Capacity building per task	Level of training	Time frame	Key performance areas	Knowledge area gap	Learning area addressed	Comment
	Univ KZN Students	Molla Demlie	Report writing	Mentoring	2 day per report	Writing and presentation of data	Technical presentation of findings	After the workshop the assistants will be encouraged to draft the technical reports to gain skills in the communication of results	13 August 2014, 19 April 2016; 9 May 2016
	Bhuti Dlamini	Gary Marneweck	Report writing	Mentoring	2 day per report	Writing and presentation of data	Technical presentation of findings	After the workshop the assistants will be encouraged to draft the technical reports to gain skills in the communication of results	September 2014; December 2014; June 2015; May 2016
	DWS - Nobubele Boniwe	Gary Marneweck	Report review	Detailed comment on reports	1 day per report	Writing and presentation of data	Technical presentation of findings	Communication of results	No comments received on report provided
	DWS - T Mpete	Gary Marneweck	Report review	Detailed comment on reports	1 day per report	Writing and presentation of data	Technical presentation of findings	Communication of results	No comments received on report provided
	DWS - Leshego Ntwampe	Molla Demlie	Report review	Detailed comment on reports	1 day per report	Writing and presentation of data	Technical presentation of findings	Communication of results	No comments received on report provided
	DWS - Stanley Nzama	Molla Demlie	Report review	Detailed comment on reports	1 day per report	Writing and presentation of data	Technical presentation of findings	Communication of results	No comments received on report provided
Task 8: St Lucia/Mfolozi Intermediate EWR	Outsourced								
Task 9: Mlalazi Estuary Intermediate EWR	Digby Cyrus	Lara van Niekerk	Mentoring by Lara van Niekerk in management of Intermediate Estuarine Reserve determination studies	Mentoring	3 years	Management & Coordination & facilitation of Estuarine Reserves	Management and co-ordination of Estuarine Reserves	Management & Coordination of all technical specialists on Estuarine Reserves. Facilitation of estuarine workshop. Compilation of estuary EWR report	15-17 February 2015

Task	Target audience	Mentor	Capacity building per task	Level of training	Time frame	Key performance areas	Knowledge area gap	Learning area addressed	Comment
	Water quality - Mzimela	Susan Taljaard	Mentoring by Susan Taljaard in provision of water quality data for Estuarine Reserve determination studies	Mentoring	4 days	Application of water quality data collection and methods for estuarine Reserve	Data collection and analysis for estuarine Reserves	Analysis and interpretation of water quality data for estuary Reserve	15-17 February 2015
	Univ. Zululand students	Digby Cyrus	Field data collection	Hands on application	10 days	Data collection in field	Hands on sampling	• site selection, • scientific sampling techniques, • boating skills, • species identification in the field, and • observational skills needed to identify the relationship between river inflows and abundance/species composition	May-13
		Digby Cyrus	Data analysis and report writing	Hands on application	2 months	Data analysis for estuary Reserve; reporting writing	Data analysis and reporting	After completion of the field exercises, students/assistants will also be involved in the data analysis and will be encouraged to develop their report writing skills	May-14
	DWS: Molefi Mazibuko; Qoko Mathabo; Mpete Tinyiko; Nobubele Boniwe)	Digby Cyrus & team	Technical integration of specialist data at EWR workshop	Participation at EWR workshop	2 days	Technical application: EF Determinations	Technical data provision	Information integration for EWR process	14-16 April 2015

Task	Target audience	Mentor	Capacity building per task	Level of training	Time frame	Key performance areas	Knowledge area gap	Learning area addressed	Comment
	DWS: Molefi Mazibuko; Qoko Mathabo; Mpete Tinyiko; Nobubele Boniwe)	Digby Cyrus & team	Report review	Detailed comment on reports	1 day per report	Writing and presentation of data	Technical presentation of findings	Communication of results	No comments received
Task 10: Amatikulu Estuary Rapid EWR	Digby Cyrus	Lara van Niekerk	Mentoring by Lara van Niekerk in management of Rapid Estuarine Reserve determination studies	Mentoring	3 years	Management & Coordination & facilitation of Estuarine Reserves	Management and co-ordination of Estuarine Reserves	Management & Coordination of all technical specialists on Estuarine Reserves. Facilitation of estuarine workshop. Compilation of estuary EWR report	14-16 April 2015
	DWS	Digby Cyrus & team	Technical integration of specialist data at EWR workshop	Participation at EWR workshop	2 days	Technical application: EF Determinations	Technical data provision	Information integration for EWR process	Nov-13
	Univ. Zululand students	Digby Cyrus	Field data collection	Hands on application	10 days	Data collection in field	Hands on sampling	• site selection, • scientific sampling techniques, • boating skills, • species identification in the field, and • observational skills needed to identify the relationship between river inflows and abundance/species composition	May-14
		Digby Cyrus	Data analysis and report writing	Hands on application	2 months	Data analysis for estuary Reserve; reporting writing	Data analysis and reporting	After completion of the field exercises, students/assistants will also be involved in the data analysis and will be encouraged to develop their report writing skills	15-17 February 2015

Task	Target audience	Mentor	Capacity building per task	Level of training	Time frame	Key performance areas	Knowledge area gap	Learning area addressed	Comment
	Water quality - Mzimela	Susan Taljaard	Mentoring by Susan Taljaard in provision of water quality data for Estuarine Reserve determination studies	Mentoring	4 days	Application of water quality data collection and methods for estuarine Reserve	Data collection and analysis for estuarine Reserves	Analysis and interpretation of water quality data for estuary Reserve	6-12 February 2016 (fieldwork); February/March (data analysis)
	DWS: Molefi Mazibuko; Qoko Mathabo; Mpete Tinyiko; Nobubele Boniwe)	Digby Cyrus & team	Technical integration of specialist data at EWR workshop	Participation at EWR workshop	2 days	Technical application: EF Determinations	Technical data provision	Information integration for EWR process	14-16 April 2015
	DWS: Molefi Mazibuko; Qoko Mathabo; Mpete Tinyiko; Nobubele Boniwe)	Digby Cyrus & team	Report review	Detailed comment on reports	1 day per report	Writing and presentation of data	Technical presentation of findings	Communication of results	No comments received
Task 11: Kosi Bay	M Fernandes	Janine Adams	Field data collection and analysis	Hands on application	2 months	Macrophyte Data collection in field	Hands on sampling of macrophytes	• site selection, • scientific sampling techniques, • species identification in the field, and • observational skills needed to identify the relationship between inflows and abundance/species composition scientific analysis and reporting	February/March 2016
	D Lemley	Janine Adams	Macrophytes and Microalgae analysis	Hands on application	2 months	Analysis of Macrophytes and Microalgae	Hands on analysis of macrophyte and macroalgae samples	scientific analysis and reporting	10-11 March 2016

Task	Target audience	Mentor	Capacity building per task	Level of training	Time frame	Key performance areas	Knowledge area gap	Learning area addressed	Comment
	C-L Ramjukadh (NRF Intern)	Lara van Niekerk	Physical processes and report writing	Hands on application	3 days	Estuarine physical processes & reporting	Hydrodynamics in estuaries; estuarine EWR reporting	February/march 2016	February/March 2016
	Students at ORI and Nelson Mandela Metropolitan Municipality & CSIR	Fiona MacKay	Data analysis - Invertebrates	Hands on application	2 months	Data analysis for invertebrates in estuary	Data analysis and reporting	scientific analysis and reporting	Mr Molefi was unavailable during fieldwork due to family responsibilities
	DWS - Molefi Mazibuko	Steven Weerts	Data collection	Participation in field work / data collection	7 days	Data collection in field	Hands on sampling	Practical application of sampling techniques and data recording	Invited but did not attend
	DWS - Nobubele Boniwe	Lara van Niekerk	Data collection	Participation in field work / data collection	7 days	Data collection in field	Hands on sampling	Practical application of sampling techniques and data recording	Invited but did not attend
	DWS: Philani Khoza	Lara van Niekerk / Molla Demlie	Data collection	Participation in field work / data collection	7 days	Data collection in field	Hands on sampling	Practical application of sampling techniques and data recording	Ms Weston spent 2 days in field, familiarising herself with the Kosi system, was involved in the data collection and discussions around findings and functioning of the system
	DWS - Barbara Weston	Susan Taljaard, Lara van Niekerk	Data collection; Estuarine processes	Participation in field work / data collection; Discussion and demonstration	2 days	Data collection in field	Hands on sampling	Practical application of sampling techniques and data recording	Took place 10-11 March 2016
	DWS - Molefi Mazibuko	Steven Weerts	Technical integration of specialist data at EWR workshop	Participation at EWR workshop	2 days	Technical application: EF Determinations	Technical data provision	Information integration for EWR process	Took place 10-11 March 2016
	DWS - Nobubele Boniwe	Lara van Niekerk	Technical integration of specialist data at EWR workshop	Participation at EWR workshop	2 days	Technical application: EF Determinations	Technical data provision	Information integration for EWR process	Took place 10-11 March 2016

Task	Target audience	Mentor	Capacity building per task	Level of training	Time frame	Key performance areas	Knowledge area gap	Learning area addressed	Comment
	DWS: Philani Khoza	Lara van Niekerk / Molla Demlie	Technical integration of specialist data at EWR workshop	Participation at EWR workshop	2 days	Technical application: EF Determinations	Technical data provision	Information integration for EWR process	2016/04/28. No comment received
	DWS - Molefi Mazibuko	Steven Weerts	Specialist Report review	Detailed comment on specialist reports	1 day per report	Writing and presentation of data	Technical presentation of results	Communication of results	2016/04/28. No comment received
	DWS - Nobubele Boniwe	Lara van Niekerk	Specialist Report review	Detailed comment on specialist reports	1 day per report	Writing and presentation of data	Technical presentation of results	Communication of results	2016/04/28. No comment received
	DWS: Philani Khoza	Lara van Niekerk/Molla Demlie	Specialist Report review	Detailed comment on specialist reports	1 day per report	Writing and presentation of data	Technical presentation of results	Communication of results	2016/04/28. No comment received
Task 12: Mhlatuze, Nhlabane and other existing estuary review EWRs	Adhishri Singh	Cate Brown	Updating of existing Reserves	Mentoring	2 days	Assessing existing Reserves and aligning with new hydrology to make comparable to outcome of study	Updating of existing Reserve with updated hydrology	Review and reformating existing Reserves	June 2015, Task completed successfully
Task 13: Sibaya Lake Intermediate EWR	Project specialists	Cate Brown	Development of method for Lake Reserve	Hands-on	18 months	Methodology development. Application of DRIFT to Lake EWR	Setting EWR for Lakes	Participation in method development and application of DRIFT in generating outputs	31 August - 4 September 2015
Task 14: Socioeconomic profile	DWS - Simphiwe Mazibuko	Toriso Tlou & William Mullins	Participation in defining the socio-economic zone &	Discussion and demonstration	1 day	Socio-economic assessment	Socio-economic zone delineation	socio-economic characterisation	05-Jun-14
			Report review	Detailed comment on specialist reports	1 day per report	Writing and presentation of data	Assistance with improved presentation and clarity	Communication of results	No comment received

Task	Target audience	Mentor	Capacity building per task	Level of training	Time frame	Key performance areas	Knowledge area gap	Learning area addressed	Comment
Task 15: Basic Human Needs Reserve	Tobias Sibande	Adhishri Singh	Mapping of population dependencies	Mentoring	2 days	Determination and mapping of dependent populations	Determining populations dependent on water resource	Mapping	11-May-15
			Report review	Detailed comment on reports	1 day	Writing and presentation of data	Assistance with improved presentation and clarity	Communication of results	Oct-15

8 QUALITY MANAGEMENT

Quality management encompassed quality planning, assurance, control and improvement to deliver a technically robust product while complying to contract requirements of scope, budget and time, and thereby ensuring customer satisfaction.

Quality was ensured on the project through various mechanisms. These include:

- Clear and concise briefs to Activity Leaders and/or team members, detailing their scope and programme of work, budget and schedule of deliverables.
- All Activity Leaders and/or team members were required to sign a sub-consultants agreement to complete the work in the time and budget allocated.
- Sub-consultants performance was managed by the Project Leader as follows:
    - Team members not adhering to the agreed schedules was queried as to the reasons for performance failure and assisted where possible to meet their agreed terms;
    - Payment was made only on evidence of the relevant task having been undertaken;
    - At least 10% of the team member's budget was withheld for each task until that task was completed to the satisfaction of the Activity Leaders and the Project Leader.
    - The intention was to permanently withhold five percent (5%) of each team members budget for non compliance to report formatting. This money was to be used to pay someone else to format their contributions. Fortunately, this did not happen in the project.
    - Replacing of team members were necessary.
- Internal review by the Activity Leader and/or the Project Leader of all deliverables submitted to the Client.
- Development of a Project Management Information Control System to:
    - Monitor task progress against programme
    - Monitor progress against cash flow projections and overall budget
    - Monitor deliverables against work programme.

The project was successfully managed to meet all project deliverables. Changes may have been necessitated on individual deliverable timeframes, as discussed in Section 4.1, but the changes were within the project timeframe. The project was completed within the allocated budget, despite including the analysis of WR2012 data on the Black and White Mfolozi river EWRs and several unplanned activity specific meetings with stakeholders. This money was sourced from the internal contingencies allocated within the Project.

9 RISK MANAGEMENT

The tasks under the Technical Component of the study were specified subject to certain risks, i.e., assumptions and limitations, which was documented in the Inception Report.

Comments on the assumptions/risks and the mitigation measures are contained in Table 32.

Table 32. Identified risk and mitigation measures

Risk Identified	Effect of risk experienced	Comment
Availability of team members	Delays in the approval of Inception Report, the approval of team members and their rates and the approval from iSimangaliso WPA on permission to use team and data, affected work programme schedule and planned deliverable dates	The proposed schedule was modified to accommodate team members availability, within the project timeframe.
Biological sampling and Data analysis	Kosi estuarine lakes Further sampling was found to be necessary on the Kosi estuarine lake system to afford better understanding of the system, however only limited additional data analysis could be paid for by the Project.	Team members and their Organisations participating on the Activity covered remaining data analysis costs.
	Pongola floodplain Extensive floodplain modelling was conducted on the Pongola floodplain to enable a functioning model to allow interpretation of scenarios. This was not envisaged at Inception Phase. A portion of the additional cost was covered by the Project.	The hydrodynamic Modeller invested much of his own time in producing a functioning model, as a research and development project
Contingency	The budgets for the team members were slightly reworked to allow for in-house contingencies.	The contingencies were used for the: Mfolozi (Black and White) River EWR analysis using WR2012, further hydrological analysis as required by Task Teams during EWR workshops, Laboratory analysis of additional samples taken during the fieldwork

Risk Identified	Effect of risk experienced	Comment
		the Pongola floodplain modelling, Groundwater analysis after team member change; and specific meetings with stakeholders, such as on the Pongola Floodplain with the Dir: Options Analysis; the Kosi and Lake Sibaya systems with the Dir: SFRA; Hydrology discussions with the Client.
Lump sum	We assumed that monies could be moved between tasks and between personnel and disbursements as required to successfully complete the project, provided the overall budget is not exceeded	Monies were shifted as required and hence the activity costs as indicated in the Inception Report do not correspond directly with the actual costs. Refer to section 5.3 for detail.
Escalation	No escalation costs were provided in the budget, as the overall budget would need to remain as originally quoted for in 2012.	This lack of escalation of rates, put pressure on team members to undertake work at 2012/13 rates. Members were not happy and there was a risk of them not meeting their deadlines as new work took preference. The Client should take heed of these problems and mitigate against.
External review	The budget did not make provision for external review	Internal review was incorporated into the study, while the PMC and PSC was given opportunity to review and comment on the reports. iSimangaliso WPA provided verbal comments on the Lake Sibaya, Kosi estuarine lakes and the Lake St Lucia reports.
Habitat Integrity	The budget excluded aerial survey	Habitat integrity was assessed on the basis of existing information, Google Earth Maps and information sourced during field surveys and reports.
Hydraulics	The budget included 2 field visits to measure river hydraulics and take fixed-point photography. Budget was not available to replace reference pegs should these be vandalised or swept away. Budget excluded the cost of geo-referencing the EWR profiles	This might be problematic should the DWS need to visit these sites again, although the photographs are available.
Hydrology	St Lucia The budget assumed that use could be made of ACRU hydrological	 Use was made of the ACRU data, however concerns were raised

Risk Identified	Effect of risk experienced	Comment
	data modelled for the St Lucia catchments Rivers To ensure consistency with the St Lucia results, the Rivers team utilised ACRU hydrology for the rivers flowing into St Lucia/Mfolozi. However concerns were raised regarding the use of this data, and the river EWR for the Mfolozi (Black and White) were reassessed using WR2012 data.	regarding the confidence of this data. This needs to be reviewed during Classification. This reassessment using WR2012, resulted in unexpected expenses, which was covered through the internal project contingencies. The updated results were incorporated as an Appendix to the River intermediate EWR report. This information is available to be taken through to Classification. The available hydrology for the WMA needs attention.
Estuaries	St Lucia Activity 8 ws based on the assumption that outputs from the iSimangaliso GEF-funded study will be made available to do the Reserve assessments. Without this permission the Lake St Lucia Reserve assessment could not be undertaken within the budget of the project	Permission to use the team and data was provided very late in the project. This created numerous challenges, from compressing the study into a short timeframe, availability of team members and insufficient time for discussions between the team and Project Manager and the PMC.
Observers	The budget excluded costs for observers or associates of the Client or other I&AP who may attend site visits or meetings	Costs for meals for I&Aps and the Client's representatives attending meetings were covered under the study. However accommodation costs were not covered.
Project Management Committee meetings	The budget made provision for nine PMC meetings, attended by the Project Manager and one Team member.	Nine meetings were held, including the interim status report meetings and the Special PMC meeting. The latter meeting was attended by the full complement of Activity Leaders. Further specific meetings were held, e.g. the scenario planning meeting, which was attended by 4 specialist team members.
Schedule	Delays in various project activities may result in problems with the timing of later activities, and this may require re-scheduling that could affect the budget. We assumed that the Client will respond with comments and feedback on all reports within one month of submission, and that reports will be finalised following one iteration of editing.	Significant delays resulted due to comments on the Inception Report being received 8 months after submission. Very few comments were received from the Client, PMC and PSC on the Deliverables. Finalisation of reports was delayed to project closure phase in in expectation of comments.

Risk Identified	Effect of risk experienced	Comment
		Verbal comments were received from Isimangaliso WPA on the 14 July 2016 on the St Lucia, Lake Sibaya and Kosi EWR Reports. Comment was received from Mr van Wyk on the hydrology used in the river EWRs on the 17 August 2015. The Rivers EWR report was updated to reflect the additional work requested to address his concerns.
Social assessment	Considering the extensive study area, it was not practically possible to identify all ecosystem functions and services and to quantify their value. The budget excluded any public participation in this regard.	The study focussed on a desktop assessment of the macro-economic value and ecosystem function and services valuation, with more focus given to the Pongola floodplain, Lake Sibaya and the Kosi estuarine lakes. Field assessments were conducted for the Pongola Floodplain and Kosi estuarine lake system.
Reporting	The budget allowed for the printing, binding and distribution costs of two draft and two final copies as well as one CD containing the deliverables in Word and PDF format.	Hard and soft copies of deliverables were submitted to the Client as progress with the monthly invoices. CD copies of deliverables were made for distribution at the PMC and PSC meetings. Hard-copies of the Information Documents were made for the PMC and PSC meetings. Meeting packs were prepared for the PMC, Special PMC and PSC meetings, which included the agenda, minutes, progress reports, and presentations.

10 TASKS TO TAKE FORWARD INTO CLASSIFICATION

Findings from the Project that need to be taken forward into the Classification process is detailed in the sections below.

10.1 St Lucia

Recommendations for St Lucia in respect of issues that warrant attention in the Classification process as follows:

- Evaluate additional EWR flow scenarios for the various river systems that discharge into St Lucia (uMfolozi, Mkuze, Hluhluwe, Mzinene, Nyalazi) with a view to identifying at least one scenario that meets the requirements of the Recommended Ecological Category (REC) for the system – i.e. a "B" category (Best Attainable State). Any hydrodynamic and ecological simulation modelling undertaken as part of this exercise should take account of the final end point for any mouth rehabilitation work that is being undertaken by the iSimangaliso Wetland Park Authority.
- Undertake an audit of all existing uses of surface and groundwater in the St Lucia catchments with a view to quantifying all legal and illegal uses of water in these catchments.
- Refurbish and recalibrate and/or install new flow gauging stations in the St Lucia catchments as required to provide accurate data on all freshwater inputs to the St Lucia system.

These should certainly be undertaken before the classification process is complete or signed off.

10.2 Lake Sibaya

The EWRs for Lake Sibaya Assessment were assessed using DRIFT, which used a water-level time-series as the driver of change - in lieu of discharge time-series usually used in river assesments. The assessment showed that Lake Sibaya is almost entirely groundwater fed, with very slow reaction times. As such it should be managed on a long-term cycle based on rainfall.

There is a need to offset current ground and surface-water abstractions in the lake basin in order to set Reserve, and thus, there is both scope for and merit in further optimisation based on the analysis of additional release scenarios for Lake Sibaya either as part of the Classification Process or as part of an adaptive management strategy, or both. The DRIFT database populated in the Lake Sibaya EWR assessment provides a tool to assist in a negotiated and equitable outcome for the Lake Sibaya.

10.3 Rivers

Intermediate EWR determination were done for eight sites in the study area. The results from these (for Catergory B, C and D ecostatus), plus those from a previous EWR study on the Mhlatuze River, were then extrapolated to 49 nodes that cover most of the rivers in study area, and packaged ready for use in Classification. There are however one or two tasks that require attention before Classification can proceed. These related mainly to the updating of

the Mfolozi and Mkuze hydrological time-series. If the baseline hydrology changes significantly, this may trigger:

- the need to reassess the intermediate EWRs for the Mfolozi and Mkuze;
- the need to reassess the St Lucia intermediate EWR assessment;
- updates to extrapolated data (rapid EWR).

New extrapolation sites should be established below the dams on the Ngwempisi and Hlelo Rivers. These two sites were not identified during the NWRCS node delineation process, however they were requested for at the Special PMC meeting at closure of the study.

10.4 Pongola floodplain

The Project Team developed a 2-D, depth-averaged, hydrodynamic model using finite elements, known as RMA. This was used, in conjunction with DRIFT to assess EWRs with a focus on vegetation and fish.

The results showed that releases from Jozini Dam affect the whole Pongola Floodplain, but not all parts are affected equally. Thus, any decisions with respect to the release regime should consider the configuration of different effects in the various parts of the floodplain. Similarly, releases affect all users of the floodplain, but again, not equally. Releases that are designed to support one sector will often prejudice another, particularly if they affect the natural environment negatively. Indeed, ecological considerations on the floodplain are mainly important in so far as they support people's livelihoods. There is no doubt that the baseline (2014) releases, designed to assist agriculture, are negatively affecting fishing and grazing, and that a better designed release regime could considerably aid fishing and grazing and need not necessarily prejudice agriculture.

If implemented, the recommended release scenario will yield a better overall outcome for all users and for the ecosystem as a whole than does the baseline (2014) scenario. However, it may be that the recommended scenario is not the optimal solution for the floodplain, as negotiations, and indeed monitoring and adaptive management, may well result in some refinement. Thus, there is both scope for and merit in further optimisation based on the analysis of additional release scenarios for Jozini Dam either as part of the Classification Process or as part of an adaptive management strategy, or both.

10.5 Kosi estuarine lake system

Key requirements for the Kosi Estuarine Classification process include:

High Priority:

- Detailed simulation of groundwater input into the Kosi Lake system covering at a minimum the period 1950-2015.
- Develop a medium to high confidence water balance model to predict changes in water level, mouth state and salinity

Low priority:

- Very little water quality information exits for this system, but the Rapid EWR indicated that this is not a key driver of change. No additional requirements.

Medium priority:

- Some additional information can be collected on vegetation, invertebrates, fish and birds to provide additional contextual information, but this is not as critical as the Groundwater input simulations and development of higher confidence water balance model.

10.6 Groundwater

The following are the most important gaps or issues that need to be addressed before or during the classification processes:

- During running the water balance of the Kosi Bay system, data related to estuary-ocean water exchange was not available and as a result flow was assumed to be the same on both sides. Therefore, measurements should be taken to improve the water balance and water exchange between the Estuary and the Ocean.
- Lake level data for both the lakes Sibayi and Kosi Bay systems was not dependable and all the water level recorders need to be re-evaluated and reinstalled at appropriate locations.
- Even though maximum effort has been put in place to estimate groundwater use by commercial forests, it is not more than an estimate. Therefore, actual forest groundwater use within the greater water management area needs to be properly quantified as it is one of the most contentious and important component in determining the groundwater reserve.
- The EWR estimate for the Kosi Bay system is based on a global water balance and hence has high uncertainty. Therefore, EWR for the Kosi Lakes and wetlands needs reassessment during the classification process.
- Improved time series groundwater level, lake level and water abstraction from the lakes and groundwater are highly recommended.

Annexure 1: Progress reports

Annexure 2: PMC Minutes and attendance registers

Annexure 3: PSC Minutes and attendance registers

Annexure 4: Actions and Decisions Register

Annexure 5: Information Brochures

Annexure 6: Issues and Response Register