IMPROVING KNOWLEDGE OF TRANSBOUNDARY GROUNDWATER SYSTEMS IN THE ORANGE SENQU RIVER BASIN

TERMS OF REFERENCES

JANUARY 2018

1. Background

1.1 The Orange Senqu River Commission (ORASECOM)

ORASECOM is one of the first Shared Watercourse Institutions (SWIs) established in 2000, under the SADC Protocol on Shared Watercourses. ORASECOM provides technical advice to its State Parties on matters relating to the development, utilisation and conservation of the water resources in the Orange-Senqu River System. ORASECOM comprises of the Council of Commissioners, the Secretariat, the Groundwater Hydrology Committee (GWHC) and four Task Teams responsible for technical, communications, finance and legal issues. There is also a working group responsible for water resources quality management in the Basin, which meets on an ad-hoc basis. The 2000 ORASECOM Agreement is also being revised to include a Committee of Ministers Responsible for Water in the Basin, known as the Forum of the Parties.

1.2 Groundwater Resources Studies and Management in the Basin

1.2.1 Overview

From 2000 to 2014, ORASECOM undertook a number of studies and projects aimed at:- (i) creating a common understanding of issues relating to the development, conservation & management of the water resources of the Basin, including those on groundwater, (ii) building robust governance for the basin water resources, and (iii) development of basin level Integrated Water Resources Management (IWRM) Plan.

The importance of groundwater has generally been understated in the past. Since its inception ORASECOM has made efforts to resolve this, but it is only in recent years that the significance of groundwater at the regional and basin wide level is being given due consideration. This is important for the following reasons:- (i) groundwater provides the single important water supply source, water security and supports livelihoods of majority of rural communities and those resident in the semi-arid and arid regions of the basin; (ii) groundwater and surface water are closely linked. This is especially true in the wetter source areas where the strengths of springs and the base flows of perennial streams are closely related to the condition of the water table; (iii) there are four transboundary aquifers in the basin (see Figure A and Table 1 below for some details on the aquifers). Shared management is clearly essential; and (iv) the conjunctive use of groundwater and surface water storage can contribute to improved water security.

Figure A: Map Showing the Four Transboundary Aquifers and the Mean Annual Recharge over the Orange-Senqu River Basin

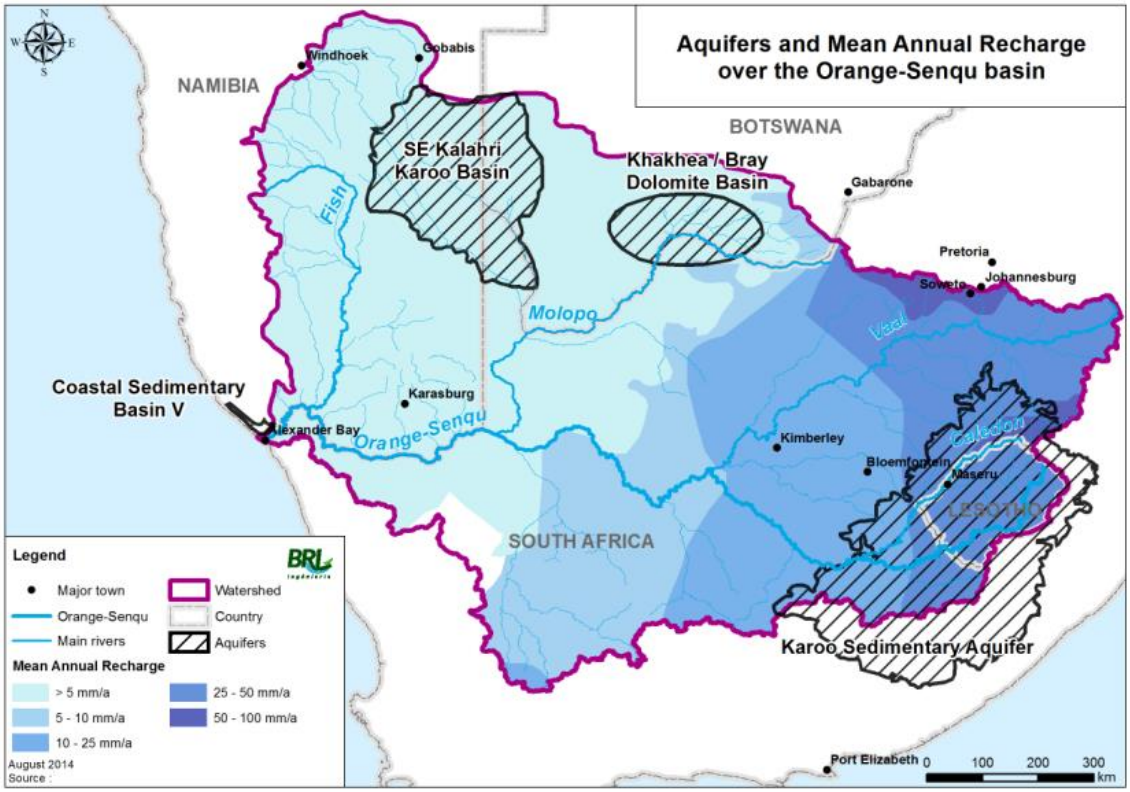

Table A: Summary Information on Four Transboundary Aquifers of the Orange-Senqu River Basin

Name	Sharing countries	Type	Area (km^2)
Karoo Sedimentary Aquifer	Lesotho, South Africa	Fissured; Limited/local	165,900
Coastal Sedimentary Basin V	Namibia, South Africa	Limited/local	undefined
Khakhea / Bray Dolomite	Botswana/South Africa	Intergranular; Fissured	29,700
SE Kalahari/Karroo Basin (Stampriet Transboundary Aquifer System)	Botswana, Namibia, South Africa	Intergranular1	85,100

1.2.2 Review of the Groundwater Resources in the Orange River Catchment

Between 2004 and 2007, collection and collation of existing national information related to groundwater resources situation, development and management was

undertaken. The study was commissioned as part of phase I of the development of the IWRM Plan. Objectives of the study were to give overview of the available data on groundwater & the state of groundwater; and assess levels of groundwater development, stress on groundwater development & capacity for further groundwater development. The study was supported by the German International Cooperation (GIZ).

1.2.3 Groundwater Review of the Molopo-Nossob Basin for Rural Communities including Assessment of National Databases at the Sub-basin Level for Possible Future Integration

Between 2007 and 2009, a study aimed at reviewing the potential for both surface and groundwater resources development in the Molopo-Nossob sub-basin, which forms the north-western part of the Orange-Senqu River Basin, was undertaken. The study was supported by the French Global Environment Facility (FGEF). A follow-on study titled "*Groundwater Review of the Molopo-Nossob Basin for Rural Communities including Assessment of National Databases at the Sub-basin Level for Possible Future Integration*" was also undertaken.

The main objective of the follow-on study was to evaluate the groundwater resources of the Molopo-Nossob sub-Basin based on an exhaustive analysis of the available data and information. This included a thorough analysis of the data/databases in each of the basin states in order to make recommendations on how data can best be shared between the basin states and integrated in a common database.

The following key recommendations were made by the follow-on study:- (i) Database integration was needed to allow countries to share information, (ii) Ground water monitoring including water chemistry, recharge and flow should be extended to remote areas including west and central part of Molopo-Nossob in Botswana, to capture natural changes e.g. those which are climate change induced, (iii) Continuation of the Nossob sandstone aquifer from Namibia into Botswana should be investigated/confirmed, (iv) Changes in groundwater resources e.g. ongoing lowering of the groundwater table should be monitored (as currently done in the Northern Cape Province of South Africa), and (v) More approaches were recommended to be employed to determine recharge (in addition to Chloride Mass Balance applied in this study).

1.2.4 UN's Internationally Shared Aquifer Resources Management (ISARM) Programme

In 2000, the Internationally Shared Aquifer Resources Management (ISARM) Programme was established by the United Nations (UN), led by its Education, Scientific, and Cultural Organisation (UNESCO), in direct response to the chal-

lenges of shared water resources set out in the Declaration of The Hague Ministerial Conference.

Some of the deliverables of the programme thus far include delineations, information sheets and maps depicting:- (i) Transboundary Aquifers of the World; (ii) Rivers & Groundwater Basins of the World; (iii) the Global Groundwater Vulnerability to Floods & Droughts; (iv) Groundwater Development Stress; (v) Groundwater Pollution & Quality; (vi) Groundwater Abstractions & Dependency; (vii) Predominant Porosity; (viii) Geology/Lithology; (ix) Groundwater Discharge Mechanisms (springs, river base flow, evapotranspiration, etc); (x) Depths to Aquifer (in meters); (xi) Recharge; and (xii) Population & Densities.

The data, information sheets and maps are available on the following web-based groundwater information portal of the Netherlands-based Non-Profit Foundation called "International Groundwater Resources Assessment Centre (IGRAC)":- https://www.un-igrac.org/global-groundwater-information-system-ggis. IGRAC is part of the UNESCO water family and works very closely with the UNESCO-International Hydrological Programme (IHP).

1.2.5 UN's Groundwater Resources Governance in Transboundary Aquifers Project

From 2013 to date, UNESCO, with the support of the Swiss Agency for Development and Cooperation (SDC), is implementing a project aimed at improving Groundwater Resources Governance in the Stampriet Transboundary Aquifer System (STAS). The STAS is shared by Botswana, Namibia and South Africa. The project objectives include improvement of knowledge and recognition of transboundary groundwater resources, establishment of a cross-border dialogue and cooperation mechanism, development of shared management tools, and facilitation of governance reforms focusing on improving livelihoods, economic development and environmental sustainability.

1.2.6 SADC Groundwater Management Programme

Between 2004 and 2011, UNESCO and other development partners such as GIZ supported the SADC Water Division in implementing a groundwater and drought management Project. One of the main outputs of the project was a SADC hydrogeological map.

In 2016, the SADC Water Division launched a project, with funding from the World Bank and the Global Environment Facility (GEF), to implement the Sustainable Groundwater Management Programme in the SADC member states. The primary objective of the programme is to set up the SADC Groundwater Management Institute (SADC-GMI), hosted by the University of the Free State, to lead the implementation of the project and programme.

The project has other three additional components, namely strengthening of the institutional capacity of SADC and its member States; advancement of

knowledge on transboundary and national groundwater; and promotion of groundwater infrastructure management and development. To date, the 2010 SADC hydrogeological map (https://ggis.un-igrac.org/ggis-viewer/viewer/sadcgip/public/default) has been resuscitated and updated by the SADC-GMI. The map provides information on among other characteristics, geography; hydrology & climate; aquifers; borehole data; and population distributions, in the Region.

1.3 Rational for this Study

1.3.1 Recharge

The current understanding of transboundary aquifers is poor as is the management of such resources. Main recharge areas, recharge magnitudes and flow patterns are poorly known. Estimation of recharge in semi-arid to arid environments, such as the Orange-Senqu River Basin, has been proven to be rather difficult. Not much has been done in terms of employing variety of recharge estimation methods, which could give a better understanding of the replenishment of the aquifers within the Basin (ORASECOM, 004/2007).

Recharge estimates made by previous studies need to be reviewed and updated on a regular basis due to among other factors, role of recharge knowledge in the sustainable management of the available groundwater resources, ongoing changes in land use practices, increasing effects of climate variability and change, availability of more data from existing monitoring programmes/studies and improvement of requisite recharge estimation methods / technologies. Information on recharge is also important for determining the aquifer water potential, modelling of the aquifers, monitoring impact of climate variability and change and establishing water balances of the aquifers.

The ORASECOM's IWRM Plan requires achievement of the following relevant outputs as part of its implementation, during the period 2015 to 2024:- (i) ***Improved Understanding of Aquifers*** (Storage Capacities, ***Recharge Rates***, Sustainable Yields and Other Characteristics (***output 1.1.2***); and (ii) Adaptive management approaches utilised including application and continuous/regular use of surface and groundwater resources planning/allocation tools (e.g. Water Resources Planning Model), including proactive, transparent and coordinated approach with empowered regional participation and gender mainstreaming (Output 1.2.1).

1.3.2 Monitoring of Important Features and Characteristics of Transboundary Aquifers in the Basin

Studies mentioned in the sub-chapters above have shown that countries have relatively good groundwater monitoring programmes. Nevertheless, there are still some challenges which need further attention. There may be some variations regarding methods used to collect, store and share data among the users. There is still a need for improvement of data quality control methods and proce-

dures. Due to operational challenges at the national level, there exist gaps in some of the data being monitored.

Most of the countries have more than one institution with overlapping mandates as far as groundwater development and management is concerned. As such data sets are sometimes spread across the institutions. Updating of such datasets and databases is also infrequent due to among other challenges, limited human resources capacity.

Most of the databases are main-frame-based and therefore not immediately accessible, to the users, as that would be easier with web-based databases. Units of measurements for some of the data found in the databases or used in the reports are not clearly defined, making use of such data difficult.

Existence of substantial backlogs in the conversion of data from hardcopy formats to digital/electronic formats has also been identified as one of the challenges. The other challenge is that some of the data were captured using proprietary computer soft wares which require annual licence fees renewals and use of dongles to access such data. More often than not, these proprietary soft wares come with externally funded national groundwater projects, and once such projects come to an end, member States are no longer able to maintain such databases or transfer data from such programmes to easily accessible programmes such as Microsoft Excel.

There are currently no joint monitoring programmes of the four transboundary aquifers of the Orange-Senqu River Basin, except the STAS. Discussions are advanced for the STAS to establish a Multi-Country Cooperation Mechanism (MCCM) which will be nested under ORASECOM. Some work has already be undertaken, using existing data from the three riparian countries to come up with a groundwater conceptual model for the Aquifer, as part of the UNESCO's GGRETA Project, which started in 2013 and is planned to continue until 2019.

Through its 5-Year Water Resources Quality Joint Basin Survey (JBS) which started in 2010, and which also based itself on the work of the 2007-2009 Molopo-Nossob Sub Basin groundwater review study, ORASECOM has been monitoring water quality from six boreholes in the Molopo-Sub Basin. Some of the boreholes are also located in the STAS area.

The idea of a "JBS" was introduced into the Orange-Senqu River Basin as a result of the visit of the ORASECOM Commissioners to the International Commission for the Protection of the Danube River (ICPDR), in Europe, in 2008. The ICPDR has a Transnational Water Resources Monitoring Network, abbreviated as "TNMN". The programme includes both surface water and groundwater monitoring. In 2010, the ICPDR's Groundwater Task Group developed a groundwater guidance document. The guidance document summarises the particular groundwater related procedures according to the needs within the ICPDR framework.

It provides brief technical information on the characterisation and grouping of groundwater (GW) bodies and necessary explanation on monitoring parameters, aggregation procedures, data reporting including reporting frequencies, the presentation of status and information reporting on the programme of measures in order to contribute to harmonisation of approaches within the Danube River Basin (DRB). Furthermore, the guidance documents the ways of data exchange towards the ICPDR TNMN-Groundwater, either when fulfilling the European Union (EU) Water Framework Directive (WFD) reporting requirements or when contributing to the ICPDR's Annual Yearbook.

Between 2009 and 2011, as part of phase II of the IWRM Plan Development, ORASECOM also developed its water quality monitoring programme and data management framework (ORASECOM, 007/2011). The programme covers the following aspects:- ***description of the monitoring programme*** (*sampling points* ***including the 12 points of transboundary importance****, analytical laboratories, water quality variables to be analysed at sampling sites & sampling frequency*); ***sampling protocols*** (procedures, field forms, agreed procedures for sample collection, storage, etc); ***data management***; ***inter-laboratory bench marking***; and ***agreed trigger values***. This programme is currently being implemented as part of the 5-Year JBSs, especially at the agreed 12 surface water quality points of basin wide importance, and the identified 6 boreholes in the Molopo-Nossob Sub Basin.

The ORASECOM's IWRM Plan requires "***improvement of the reliability, usefulness, trans-boundary confidence areal coverage of groundwater monitoring networks at the transboundary and national (sub-catchment) levels***, as Output 5.1.3.

1.3.3 Groundwater Focused Information System

As part of an environmental transboundary diagnostic analysis (TDA) study undertaken between 2009 and 2014, funded by the United Nations Development Programme (UNDP) and the Global Environment Facility (UNDP-GEF), ORASECOM developed an internet-based water information system, commonly known as "WIS".

The WIS (http://wis.orasecom.org/) currently provides the following functions:- (i) repository and cataloguing to ensure integrity of data and information acquired and produced by ORASECOM and the projects associated with it; (ii) web-based search and discovery of data to enable discovery of ORASECOM data and information; (iii) data exchange and sharing with appropriate users, including download of ORASECOM data and information for different user groups, while respecting third party data ownership rights; (iv) web based provision of data products to the general public, e.g. visualisation of selected data in thematic maps; and (v) profiles of the data custodians in the riparian States and links to their websites to facilitate data and information discovery and sharing. Unfortu-

nately, the majority of the information and data found on the WIS are on surface water.

As part of the implementation of the ICPDR's River Basin Management Plan and its Groundwater guidance document, the riparian countries provide data on agreed parameters, intervals and formats to the ICPDR Secretariat. The Secretariat then process the data into among other formats geographic information system (GIS), information sheets, pdf reports and put them onto the Commission's internet based GIS portal, commonly known as "DanubeGIS" (https://www.danubegis.org/). The same data and information is used by the member States for reporting on status of their groundwater bodies to the EU, as required by the EU Water and Groundwater Framework Directives or for inclusion in the ICPDR's water resources yearbook.

2. Objective

The objective of this Consultancy is to contribute towards the improved understanding of groundwater systems in the Orange-Senqu River Basin. Achievement of the objective will be through undertaking the following four main tasks:- (i) ***documentation of groundwater recharge*** in the Karroo Sedimentary and the Khakhea/Bray Dolomite Transboundary Aquifers; (ii) ***development of a robust framework for monitoring*** of important features and characteristics of all transboundary aquifers in the Basin. The framework should be compatible or capable of feeding into or being incorporated into the overall integrated water resources management plan for the Orange-Senqu River Basin. The framework will incorporate elements such as effective monitoring of agreed groundwater quantity and quality parameters and variables at selected key points/boreholes, and characteristics and features of the transboundary aquifers; and appropriate forms of capacity building in each Basin State; and (iii) ***establishment of a groundwater focused information system*** at the Secretariat, with agreed aquifer characteristics/features, and groundwater parameters & variables, for monitoring by the mandated national agencies; possibilities of including citizen science in mobilising data and information especially from remote areas of the basin; and (iv) ***supervision of a joint survey***, by the members of the GWHC, of selected transboundary aquifers based on a robust checklist of parameters and features for observation.

3. Scope

The Consultant will configure this Consultancy into appropriate phases and carry out the identified tasks so that the objectives can be achieved in a timely and effective manner. This Consultancy will include (but may not be limited to) the following tasks:

3.1 Documenting of Groundwater Recharge in the Karroo Sedimentary and the Khakhea/Bray Dolomite Aquifers

i. Undertake a Literature review of all groundwater recharge estimation studies undertaken in the Karroo Sedimentary and the Khakhea/Bray Dolomite Aquifers;
ii. Based on own assessment and the latest information, update and document the latest groundwater recharge estimates at key recharge areas in the Karroo Sedimentary and the Khakhea/Bray Dolomite Aquifers;
iii. Validate the groundwater recharge estimates with the key stakeholders through a workshop; and
iv. Develop a final report on updated recharge estimates in the two aquifers based on inputs from the stakeholders' workshop.

3.2 Development of a Robust Framework for Monitoring of Important Features and Characteristics of all Transboundary Aquifers in the Basin

i. Undertake a Literature review of all groundwater monitoring studies undertaken in the Basin, including those mentioned under chapter 1 of these TORs;
ii. Assess and reach agreement on the needs of the respective State Parties and their relevant national departments for monitoring, reporting and management of features & characteristics of transboundary aquifers, groundwater quantity and quality in the Orange-Senqu River Basin (building on the results of previous studies);
iii. Draw up a list of priority transboundary aquifer features & characteristics, and groundwater quantity and quality parameters, and variables of concern, and areas (sub-catchments) that require special attention for each State Party, and assess the extent to which current monitoring programmes are appropriate and sufficient for these features, characteristics, parameters, variables and areas of concern;
iv. Review existing data acquisition and storage systems in each State as well as systems used elsewhere to identify best practice;
v. Define all protocols and procedures for data sharing between States and acceptability to the wider public;
vi. Develop a detailed product specification for an internet-based, groundwater quantity & quality and characterisation system in response to the identified needs of each State, which have been agreed by the relevant national departments within each State. The system should be compatible with existing national systems or should incorporate recommendations for the upgrading of existing national systems to ensure smooth basin wide integration;
vii. Validate the proposed transboundary aquifer characterisation, and groundwater quantity & quality monitoring programme/framework with the key stakeholders through a workshop; and

viii. Develop a final report on the agreed transboundary aquifer characterisation, and groundwater quantity & quality monitoring framework/programme based on inputs from the stakeholders' workshop.

3.3. Establishment of a Groundwater Focused Information System at the Secretariat

i. Undertake a groundwater information needs assessment of ORASECOM;
ii. Review the current ORASECOM Water Information System at the Secretariat and establish gaps that need to be addressed for the proposed groundwater information system to be established. The gap analysis should look at both software and hardware capacity requirements for this additional groundwater information system;
iii. Based on needs and capacity gap analyses done as per items (i) and (ii) above, and also based on the information systems existing at the national level, propose a suitable system (software) that can be adopted by the Secretariat for the processing, storage and sharing of the transboundary aquifer features & characteristics, and groundwater quantity & quality data and information;
iv. Based on the approval by ORASECOM, establish a Groundwater Focused Information System at the Secretariat; and
v. Prepare and submit to the Secretariat a user manual, describing the design philosophy and functioning of the information system.

3.4 Supervision of a Joint Survey of Selected Transboundary Aquifer Systems

i. Propose a robust checklist of parameters and features for observation by a joint team of officials responsible for groundwater from the four State Parties, including the GWHC Members;
ii. Liaise with the Secretariat and the respective state Parties on selection of the transboundary aquifers to be jointly surveyed;
iii. Work with the Secretariat on logistics and arrangements for the trip; and
iv. Produce a report on the joint survey, including a technical report, a process report and a proposal on further and similar joint surveys, including their frequency, and proposal for opportunities to visit other RBOs with similar joint Ground Water programmes.

4. Deliverables

It is envisaged that this Consultancy will produce the following deliverables:-

4.1 Overall

i. An Inception Report that contains a clearly defined programme of work that has been confirmed with the Secretariat and the Groundwater Hydrology Committee (GWHC); and
ii. Progress reports as agreed in the inception report.

4.2 Documenting of Groundwater Recharge in the Karroo Sedimentary and the Khakhea/Bray Dolomite Aquifers

i. Draft final report with updated groundwater recharge estimates in the main recharge areas in the Karroo Sedimentary and the Khakhea/Bray Dolomite Aquifers;
ii. A report indicating inputs made at the stakeholders workshop; and
iii. Final report with updated groundwater recharge estimates in the main recharge areas in the Karroo Sedimentary and Khakhea/Bray Dolomite Aquifers.

4.3 Development of a Robust Framework/Programme for Monitoring of Important Features and Characteristics of all Transboundary Aquifers in the Basin

i. An agreed list of priority transboundary aquifer features & characteristics, and groundwater quantity & quality parameters and variables of concern, and a list of those areas within the Orange-Senqu River Basin where aquifer characteristics, and groundwater quantity and quality issues are of particular concern; and
ii. A web-based robust framework/programme/system for monitoring and management of important transboundary aquifer features/characteristics, and groundwater quantity & quality of all transboundary aquifers in the Basin.

4.4 Establishment of a Groundwater Focused Information System at the Secretariat

i. Functional Groundwater Information System at the Secretariat; and
ii. A user manual, describing the design philosophy and the functioning of the established groundwater information system.

4.5 Joint Survey of selected transboundary aquifers

i. A successfully supervised joint survey of selected transboundary aquifers; and
ii. A report on the joint survey, including technical report, process report and proposal on further and future joint surveys, including their frequency.

5. Time Schedule

The Consultancy is expected to start in February 2018 and be completed by no later than 30th June 2018.

6. Indicative Budget

It is anticipated that this Consultancy will have a total duration of 51 person-days, broken down as in Table 1.

Table 1: Anticipated Tasks and Person Days

Tasks	No of Person Days
Task 1. Documenting of Groundwater Recharge in the Karroo Sedimentary and the Khakhea/Bray Dolomite Aquifers	
i. Undertake a Literature review of all groundwater recharge estimation studies undertaken in the Karroo Sedimentary and the Khakhea/Bray Dolomite Aquifers;	4 days
ii. Based on own assessment and the latest information, update and document the latest groundwater recharge estimates at key recharge areas in the Karroo Sedimentary and the Khakhea/Bray Dolomite Aquifers;	3 days
iii. Validate the groundwater recharge estimates with the key stakeholders through a workshop; and	3 days
iv. Develop a final report on updated recharge estimates in the two aquifers based on inputs from the stakeholders' workshop.	2 days
Sub Total	**12 days**
Task 2. Development of a Robust Framework/Programme for Monitoring of Important Features and Characteristics of all Transboundary Aquifers in the Basin	
i. Undertake a Literature review of all groundwater monitoring studies undertaken in the Basin, including those mentioned under chapter 1 of these TORs;	3 days
ii. Assess and reach agreement on the needs of the respective State Parties and their relevant national departments for monitoring, reporting and management of features & characteristics of transboundary aquifers, groundwater quantity and quality in the Orange-Senqu River Basin;	4 days
iii. Draw up a list of priority transboundary aquifer features & characteristics, and groundwater quantity and quality parameters, and variables of concern, and areas (sub-catchments) that require special attention for each State Party, and assess the extent to which current monitoring programmes are appropriate and sufficient for these features, characteristics, parameters, variables and areas of concern;	2 days
iv. Review existing data acquisition and storage systems in each State as well as systems used elsewhere to identify best practice;	2 days
v. Define all protocols and procedures for data sharing between States and acceptability to the wider public;	2 days
vi. Develop a detailed product specification for an internet-based,	

groundwater quantity & quality and characterisation system in response to the identified needs of each State, which have been agreed by the relevant national departments within each State. The system should be compatible with existing national systems or should incorporate recommendations for the upgrading of existing national systems to ensure smooth basin wide integration;	4 days
vii. Validate the proposed transboundary aquifer characterisation, and groundwater quantity & quality monitoring programme/framework with the key stake-holders through a workshop; and	3 days
viii. Develop a final report on the agreed transboundary aquifer characterisation, and groundwater quantity & quality monitoring framework/programme based on inputs from the stakeholders' workshop.	2 days
Sub Total	**22 days**
Task 3: Establishment of a Groundwater Focused Information System at the Secretariat	
i. Undertake a groundwater information needs assessment of ORASECOM;	1 day
ii. Review the current ORASECOM Water Information System at the Secretariat and establish gaps that need to be addressed for the proposed groundwater information system to be established. The gap analysis should look at both software and hardware capacity requirements for this additional groundwater information system;	1 day
iii. Based on needs and capacity gap analyses done as per items (i) and (ii) above, and also based on the information systems existing at the national level, propose a suitable system (software) that can be adopted by the Secretariat for the processing, storage and sharing of the transboundary aquifer features & characteristics, and groundwater quantity & quality data and information;	1 day
iv. Based on the approval by ORASECOM, establish a Groundwater Focused Information System at the Secretariat; and	3 days
v. Prepare and submit to the Secretariat a user manual, describing the design philosophy and functioning of the information system.	3 days
Sub Total	**9 days**
Task 4: Joint Survey of selected transboundary aquifers	
i. Propose a robust checklist of parameters and features for observation by a joint team of officials responsible for groundwater from the four State Parties, including the GWHC Members;	1 day
ii. Liaise with the Secretariat and the respective state Parties on selection of the transboundary aquifers to be jointly surveyed;	1 day
iii. Work with the Secretariat on logistics and arrangements for the trip; and	3 days
iv. Produce a report on the joint survey, including a technical report, a process report and a proposal on further and similar joint surveys, includ-	3 days

ing their frequency, and proposal for opportunities to visit other RBOs with similar joint Ground Water programmes.	
Sub Total	**8 days**
Total	**51 days**

7. Requirements

The following additional requirements will apply to this Consultancy:-

i. A Consultant with postgraduate qualification in groundwater resources management with knowledge of information systems, and at least 15 years working experience is sought to undertake this work;
ii. The Consultant must demonstrate close familiarity with the existing approaches used within the Basin States to estimate groundwater recharge, characterise aquifers, monitor & assess groundwater quantity & quality, and develop systems (databases) used to manage the data in the Orange-Senqu River Basin;
iii. The Consultant must have demonstrated capability to evaluate all of the different methodologies for estimating groundwater recharge and measurement systems used to obtain high-quality data for all the groundwater quantity and quality parameters and variables that are measured; and
iv. Familiarity with the Orange-Senqu River Basin's transboundary aquifers will be an added advantage.

8. Reporting

i. The Secretariat staff and the members of the GWHC must be fully engaged in the consultative and investigative process followed during the tenure of this Consultancy;
ii. Regular progress reports should be submitted to the Secretariat, based on frequency to be agreed in the inception report;
iii. All electronic and written products produced during this Consultancy should conform to the formats and styles agreed with the Secretariat;
iv. All products and technical outputs emanating from this Consultancy will be reviewed by the GWHC, the Secretariat and Council before the products are released into the public domain; and
v. The ORASECOM Secretariat retains copyright of all the data, information, products and reports gathered and developed from this consultancy work.