Development of the Limpopo Water Management Area North Reconciliation Strategy

Background Information Document No. 1

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PURPOSE OF THIS DOCUMENT

This background information document (BID) provides information about the study, initiated by the Department of Water and Sanitation (DWS), to develop the Limpopo Water Management Area (WMA) North Reconciliation Strategy.

A Reconciliation Strategy identifies, prioritises and confirms the interventions required to reconcile the water requirements with the available water resources in a catchment or water system for a specific number of years.

Stakeholders are invited to participate in the process by commenting on information that is sent to them, attending meetings or by corresponding with the public participation office or the technical team at the addresses provided below.

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STUDY AREA

The Limpopo Water Management Area (WMA) is the most northern water management area in South Africa.

The Limpopo WMA forms part of the internationally shared Limpopo Basin. The Limpopo River forms the entire length of the international border between the WMA and Botswana and Zimbabwe before flowing into Mozambique.

The main towns within the WMA include; Mokopane, Polokwane, Mookgophong, Modimolle, Lephalale, Musina and Makhado together with approximately 760 rural communities scattered throughout the area. Economic activity is mainly centred on livestock farming and irrigation, together with increased mining operations.

The region is semi-arid to arid with the mean annual rainfall ranging between 300-700mm. The water resources, especially surface water resources, are heavily stressed due to the present levels of development. The main catchments in the WMA are the Matlabas,Mokolo, Lephalala, Mogalakwena, Sand, Nzhelele and Nwanedi. The topography is generally flat to rolling, with the Waterberg on the south and Soutpansberg in the north-east as main topographic features. Grassland and sparse bushveld shrubbery and trees cover most of the terrain, which is also known for its splendorous Boabab trees. The southern and western parts of the WMA are mainly underlain by sedimentary rocks, whilst metamorphic and igneous rocks are found in the northern and eastern parts.

With the exception of some alluvium deposits and dolomites near Mokopane and Thabazimbi, the formations are mostly not of high water bearing capacity. The mineral rich Bushveld Igneous Complex extends across the south-eastern part of the WMA, and precious metals are mined at various localities throughout the area. Large coal deposits are found in the north-west.

Several wildlife and nature conservation areas have been proclaimed in the water management area, of which the Nylsvlei Nature Reserve and Marehele National Park are probably the best known.

The study area is depicted in **Figure 1**.

STUDY OBJECTIVES

The main objective of the study is to develop a Reconciliation Strategy for the Limpopo WMA North. The Reconciliation Strategy should a) address growing water demands as well as water quality problems experienced in the catchment, b) identify resource development options and c) provide reconciliation interventions, structural and administrative / regulatory.

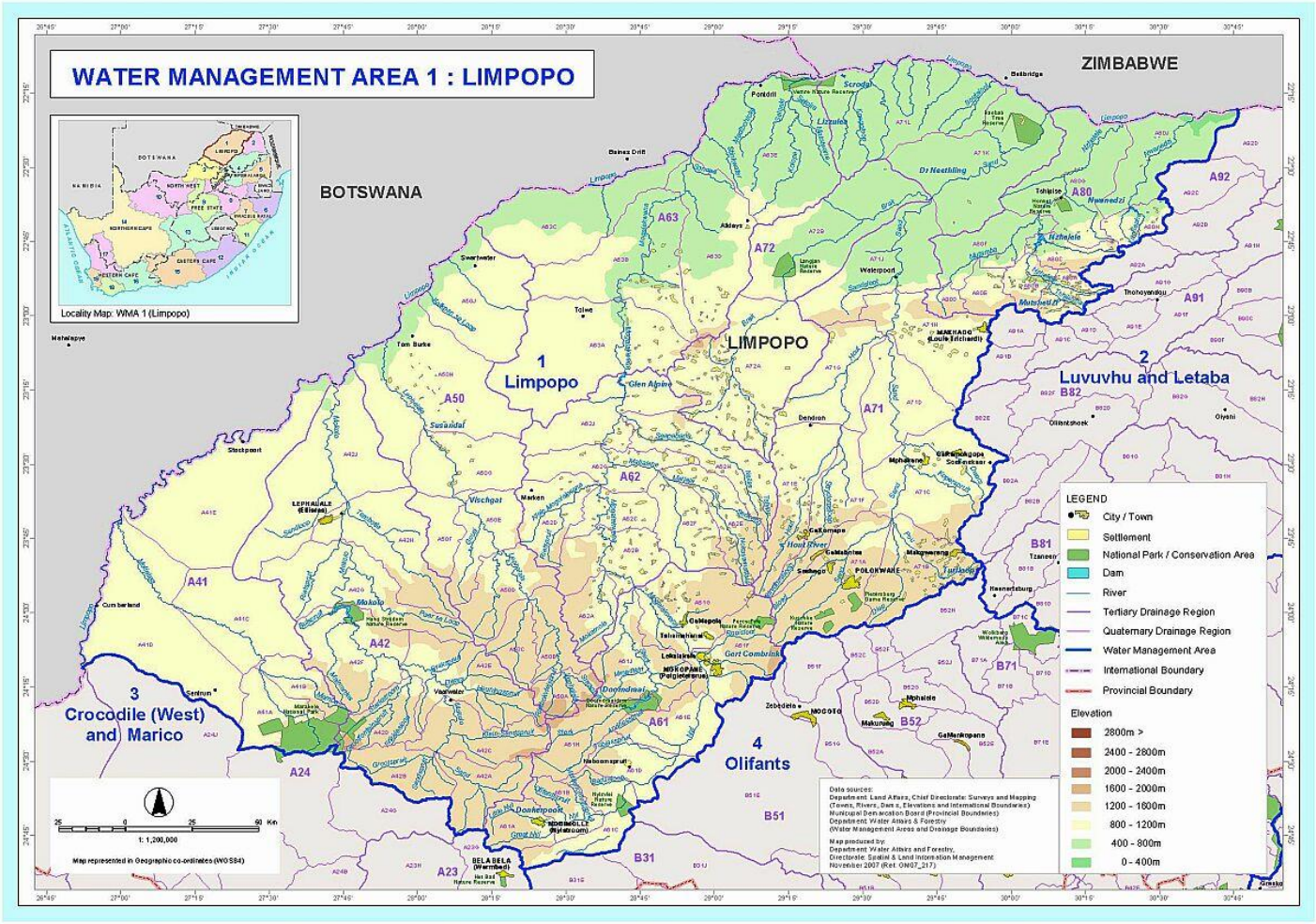

Figure 1: Limpopo Water Management Area (WMA) North (Study Area)

To achieve the objective, the following aspects are included in the study:

- Review of all available information regarding current demands, future demand projections and options for reconciliations;
- Determine current and future water demand requirements and return flows and compile demand projection scenarios;
- Address water quality problems experienced in the study area.
- Configure the system models (WRSM2000, WRYM, WRPM) in the Study Area at a quaternary catchment scale, or finer where required, in a manner that is suitable for allocable water quantification. This includes updating the hydrological data and accounting for groundwater surface water interaction;
- Assess the water resources and existing infrastructure and incorporate the potential for Water Conservation and Water Demand Management (WCWDM) as well as water reuse as reconciliation options.
- Develop a preliminary short-term reconciliation strategy followed by a final long-term reconciliation strategy.

The study will identify groups of options which will collectively form reconciliation scenarios.

STUDY TASKS

The process to formulate the Limpopo WMA North Reconciliation Strategy will be done in three phases, broken down into different tasks. **Table 1** below provides a summary of the phases, tasks, task activities and the reports associated with the tasks.

Table 1: Summary of phases, tasks, task activities and associated reports

	Task	Task Activities	Report
	Phase 1: Study Planning and Process Initiation		
		• Compile a Study Plan and an Inception Report	• Inception Report (Report 1)
	Phase 2: Study Implementation		
1	**Summarise previous and current studies**	• Establish current demands and seasonal variations • Contact municipalities, organised agriculture and industries regarding future demand growth • Develop demand projection scenarios	• Literature Review (Report 2)
2	**Hydrological Analysis**	• Data collection, analysis review and update of rainfall data, evaporation data, streamflow data, groundwater assessment and investigate groundwater-surface water interaction. • Updating and calibration of models • Naturalisation of flow records • Verification and validation of stochastic hydrology	• Hydrological Analysis Report (Report 3).
3	**Current and Future Water Requirements and Return Flows**	• Gather information, meetings and discussions with water authorities and informed people.	• Water Requirements and Return Flows Report (Report 4)
4	**Water Conservation and Water Demand Management**	• Identify key demand centres, undertake status quo and priority assessment • Assess potential savings and scenario development	• WCWDM Status Report (Supporting document to Report 4)
5	**Opportunities for Water Reuse**	• Collate info from water treatment works and verify • Assess potential for reuse	• Opportunities for Water Reuse Report (Supporting document to Report 10)
6	**Invasive Alien Plants**	• Determine water savings due to removal of IAPs • Develop reconciliation scenario	• Summary included in Report 3: Hydrological Analysis
7	**Water Quality**	• Collate water quality information • Do a risk assessment in Water Supply Systems • Rate risks and outline mitigating factors	• Water Quality Assessment Report (Report 5)
8	**Reserve Requirement Scenarios**	• Assess existing Reserve information, develop Reserve scenarios and determine implications on yield	• Reserve Requirement Scenarios Report (Supporting document to Report 7)
9	**Groundwater Utilisation Scenarios**	• Determine groundwater options in terms of management, conjunctive utilization, estimated yield, water quality aspects, unit and infrastructure costs, Reserve requirements and environmental impacts	• Groundwater Assessment and Utilisation Scenarios Report (Report 6)
10	**International Obligations**	• Meet with relevant parties to discuss latest Treaties and Protocols on international obligations and rights • Collate planning analysis results on impacts of water demand on Limpopo River	• International Obligations Report (Report 12)
11	**Yield Analysis**	• Update and test model configuration • Undertake systems analysis and interpret results	• Yield Analysis Report (Report 7).
12	**Water Quality Modelling**	• Gathering, evaluation and patching of water quality data • Set-up and test Water Quality model	• Water Quality Modelling Report (Report 8)
13	**Planning Analysis**	• Set-up and test Water Resource Planning Model • Scenario development and implementation	• Planning Analysis Report (Report 9)

	Task	Task Activities	Report
14	**Review Schemes and update Cost Estimates**	• Investigate the current state of infrastructure • Update cost estimates for selected schemes • Prepare Unit Reference Values (URVs)	• Water Supply Schemes Report (Report 10)
15	**Review or Assess Social and Environmental Impacts**	• Environmental Status Quo Assessment • Due Diligence Review	• Environmental Impacts Screening Report (Supporting document to Report 10)
16	**Assembly of information and formulation of scenarios**	• Develop short-term reconciliation study (up to 2015) • Develop final long-term reconciliation (up to 2040) • Compile the final reconciliation Strategy	• Reconciliation Strategy Report (Report 11)
17	**Stakeholder engagement**	• Identify stakeholders and compile a database • Project announcement and information distribution • Arrangements for SSC meetings • Compile and distribute newsletters • Arrange and conduct a public meeting	
18	**Training and Capacity Building**	• Identify trainees and develop material • Conduct training and analyse impact	• Training Report (Report 13)

DESCRIPTION OF TASKS

As the study unfolds, stakeholders will be kept abreast of the tasks to be undertaken, the expected outcomes of the tasks and how the outcomes will relate and assist with the development of the Reconciliation Strategy.

Summary of previous and current studies: This task will involve compiling a summary report of information from previous studies, to assist in the refinement of the scope in the inception report. The Limpopo WMA has been the subject of many studies from different perspectives, and it is essential to collate and understand the approaches as well as the assumptions used in the previous studies. This is necessary to be in a position to undertake a synthesis of all available information and adding perspectives on whether the previously identified interventions are suitable for further consideration and assessment in this study. The summary report will also list all relevant recommendations from previous reports and current water resource management processes in order to ensure that the developed strategy is not in contradiction with previous recommendations and the formulation is coherent with activities currently happening in the area.

SYSTEM ANALYSIS

Hydrological: The hydro-meteorological data of the Limpopo WMA North, with specific focus on the current Limpopo River Basin Monograph Study, the Water Resources of South Africa 2005 (WR2005) and the Updating the Hydrology and Yield Analysis in the Mokolo River Catchments of 2008 will be reviewed. The existing data sets covering the entire study area will be collated as part of the Monograph study but recalibration of the WRSM2000 model will not be undertaken as part of this study. Groundwater, streamflow records and rainfall statistics will be incorporated into the study. Rainfall records and natural streamflow records will be produced for each of the sub-catchments to cover the entire record period 1920 to 2010 hydrological years.

Yield Analysis: The objective of this task will be to determine the water supply potential (yield) from the large dams in the Limpopo WMA North based on the updated hydrological data sets. Available Water Resource Yield Modelling (WRYM) model configuration data sets will be updated and historical and stochastic yield analyses will be undertaken for all large dams (in excess of 1 million m^3) and for the scenarios identified.

Planning Analysis: The WRYM and Water Quality model data sets will be used as a basis for developing the Water Resource Planning Model (WRPM) model configuration. The setting up and testing of the WRPM will be undertaken in a stepwise manner, whereby the water quantity component of the WRPM (which is based on the WRYM data sets) will first be compiled, tested and confirmed to be functional for each of the main river catchments individually. Thereafter the salinity component will be added and tested. The existing WRPM configuration for the Mokolo will be reviewed and updated where new information is available, including new water users and projected water requirement scenarios. The water users within the WMA will then be categorised to allow the selection of appropriate assurance of supply criteria. With future water requirements included in the

model, the WRPM will be used to perform scenario analyses and associated water balances. These results will be used as input in the formulation of the Reconciliation Strategy for the entire Limpopo WMA.

Water Quality: In order to develop a water quality profile of the Limpopo WMA North, water quality information will be collected and collated. The objective of the task is to outline the current situation and all potential impacts from new developments on the water quality of the study area. A Water Quality and Sulphates (WQT) model will be configured as it is required as input to the WRPM.

WATER USE AND NEEDS

Water use requirements and return flows: This task will focus on collecting and processing the water requirements and related data for the different water use categories such as domestic (urban and rural), industrial, mining, power generation, irrigation, afforestation, etc. The project team will liaise closely with the local authorities and DWS officials to utilise existing information and water requirement projection methods that are being applied.

The water requirements scenarios will be developed by first defining the baseline year to be used which will default to the year of the last comprehensive national census and then through:

- consultation with key stakeholders to ensure that reference is made to the most recent data sets (population, demographics, historic water demands, land-use, urbanisation, economic, socio-economic indicators, etc.);
- analysis of current data to firm up on identified drivers which impact water usage (population – direct water use, socio-economic profile of residential water use categories and other economic indicators – indirect water use) and their correlation with actual water usage data;
- development of water requirement scenarios, which will include the views of key sectors and reflect realistic possibilities for the region, in terms of historic water demands and demographic, economic, geographic and climatological factors; and
- in addition to the volumetric water requirements, it will be necessary to define the water supply reliability requirements for the different water user groups in the system. The priority classification tables based on the profile of users will be compiled.

Invasive alien plants: The current extent of IAP infestation will be determined based on information from the recently published National Invasive Alien Plant Survey by the Agricultural Research Council. Associated water use will be estimated using the WRSM2000 model and the results incorporated into the WRYM to determine the possible benefit of eradication on system yield. Furthermore, eradication scenarios will be formulated and evaluated in the WRPM model as part of proposed reconciliation scenarios.

Reserve requirements: Reserve requirements and catchment configurations from previous studies will be incorporated into the yield model(s) set up during the Reconciliation Strategy. Should any strategies impact on areas where Reserve Ecological Categories are not available, data from the national Present Ecological State / Ecological Importance / Ecological Sensitivity (PES/EI/ES) study recently completed for the Limpopo WMA, will be used as a desktop indication of PES and Recommended Ecological Category (REC). Reserve Requirements can then be generated using the Desktop Reserve Model.

International obligations: The current inter-basin transfer information affecting the study area will be sourced, which will include source, quantity and operating rules. This information will be ascertained for use in the update and configuration of the Water Resource Yield Model and Water Resource Planning Model. A detailed appraisal of the international water-related aspects of the WMA will be provided along with a summary of the possible impacts of water resource management in the Limpopo WMA on the water quantity and the quality in the main stem of the Limpopo River

INTERVENTION OPTIONS

Water Conservation and Water Demand Management: Institutions such as district and local municipalities, water boards, other water services providers, water user associations, as well as the proto-CMA function / unit within the DEA regional offices will be targeted for assessing the status quo with regards to their WCWDM activities. Additionally, potential for WCWDM in the irrigation sector as a whole will be considered and cost-benefits will be assessed to determine where potential savings could be achieved.

Water Re-use: The role that the re-use of treated effluent from the wastewater treatment plants (WWTP) can play in achieving reconciliation, will also be assessed. Opportunities will be identified across the study area.

Water Supply Schemes: The configurations for the bulk infrastructure for water supply, irrigation and other major users of the schemes identified at the first SSC meeting will be reviewed and adjustments will be made if necessary to ensure that current and future water requirements can be supplied. The cost estimates of the schemes will also be updated accordingly. The state and operational status of the existing bulk infrastructure for water supply, irrigation and other major users will be assessed to determine maintenance and/or refurbishment requirements.

Groundwater utilisation will be determined to supplement or serve as the primary source of water supply. Various scenarios related to groundwater utilisation will be assessed. The feasibility of utilising groundwater will be assessed through costing of groundwater options. A process of selecting the most favourable scenarios will then be undertaken as

recommendation to the strategy.

Social and Environmental Assessment: The socio-economic analysis will review and analyse the population and their characteristics, settlement patterns, socio-economics, and change in circumstances in terms of impacts of schemes previously identified and assessed by earlier studies. All available information will be evaluated to determine the environmental sensitivity of options and whether any of the circumstances have changed since previous assessments. The sensitivity will be rated from low to high. No specialist investigations will be conducted during the process.

FORMULATION OF SCENARIOS TO INFORM STRATEGY

The approach for this task will be to use the information from the other study activities to formulate scenarios of how sufficient water at acceptable water quality can be made available to supply the water requirements in all supply areas until the year 2040. The identification and formulation of the scenarios will be based on a synthesis of information on the water resource availability, water quality, distribution infrastructure, potential schemes and interventions (such as WCWDM) as well as future water requirement and return flow growth centres in the study area.

Annual projected water balance (yield versus water requirement) graphs will be compiled for each sub-system and for each scenario. The balances will account for any interdependencies (transfers, etc.) between the sub-systems where both the yield and the conveyance infrastructure capacity limitations are taken into consideration.

Preliminary Reconciliation Strategy

The Preliminary Reconciliation Strategy will be completed by July 2015. Due to the time required for the completion of the Hydrology task and the subsequent Yield and Planning Analysis tasks, which will only produce results after twelve months, the water availability (yields) for the Preliminary Strategy will be based on existing available data and model results.

The existing WRYM configurations will be applied in cases where sub-system yields are not available from existing reports. Although the focus period of the Preliminary Reconciliation Strategy will be on the initial ten years the annual water balances and sequencing of interventions will be carried out until the year 2040.

Final Reconciliation Strategy

The Final Reconciliation Strategy will define the proposed actions and interventions (demand management and infrastructure) that will be required to make sufficient water available to supply the water needs in the study are up to the year 2040.

STAKEHOLDER ENGAGEMENT

Stakeholders who represent all relevant sectors of society in the Limpopo WMA will be identified and invited to nominate or serve a representative for the Strategy Steering Committee. The Strategy Steering Committee will meet bi-annually to oversee the study and provide strategic advice and guidance.

Stakeholders will continue to be informed of progress with the study through a newsletter and will be asked for their inputs on an on-going basis. The DWS website will also be used for the publishing of information regarding this study. The reports listed earlier in the document will be made available for comment and review to all stakeholders.

The study will be concluded with a public meeting where stakeholders will be invited to share their views and also provide their agreement on the most favourable future reconciliation options and sequence of implementation and planning priorities in the medium and long term.

The first SSC meeting is planned to take place on Wednesday, 18 February 2015. The main aim of this meeting will be for stakeholders to evaluate the scenarios or options presented by the DWS and its study team. The various options will be explained in a document that will be distributed to all stakeholders who will attend this workshop. Stakeholders will be given the opportunity to identify issues and concerns related to water resource management that may influence the reconciliation strategy.