

TERMS OF REFERENCE FOR A DIRECTED WRC PROJECT

THEME: Water Availability

TITLE: Technical review and contextual refinement of groundwater Resource Quality Objectives (RQOs) in relation to water quality parameter specifications

ToR:

1. Rationale

Groundwater plays a critical role in supporting water security, particularly in water-scarce regions of South Africa. The establishment and implementation of Resource Quality Objectives (RQOs) are central to protecting groundwater resources and ensuring their sustainable use. Within the broader Water Resource Classification System (WRCS), groundwater RQOs give effect to the assigned resource class and play an important role in supporting both groundwater quality protection and sustainable resource management. However, challenges remain in translating RQOs into practical, defensible and consistently applied water quality parameter specifications, particularly within regulatory and operational contexts.

Existing RQO frameworks provide a strong policy and regulatory foundation but are often applied inconsistently due to variability in hydrogeological settings, limited contextualisation for groundwater systems, and ambiguity in parameter selection and threshold specification. This creates uncertainty in water use licensing, environmental impact assessments and compliance monitoring, ultimately affecting decision-making and enforcement.

There is therefore a need for a structured technical review of current groundwater RQO approaches, with a focus on refining how water quality parameters are selected, interpreted, and implemented in practice. This includes aligning RQOs with hydrogeological realities such as aquifer type, vulnerability, flow systems, and contamination pathways, as well as strengthening the linkage between scientific understanding and regulatory application. While the primary focus of this study is groundwater quality parameter specification, the study should acknowledge the interrelationship between groundwater quantity and quality within integrated groundwater resource management.

This project aims to critically assess and refine the application of groundwater RQOs in South Africa by developing a technically sound and context-sensitive framework for water quality parameter specification. The outcome will support improved consistency, defensibility, and usability of RQOs across regulatory, planning, and operational environments. The project will place particular emphasis on ensuring that outputs are directly applicable within regulatory processes, including water use licensing and compliance monitoring, thereby supporting more effective and defensible groundwater management. Consideration should also be given to the applicability of the framework within data-scarce environments where groundwater monitoring information may be spatially or temporally limited.

2. Main Objective

To undertake a technical review and contextual refinement of groundwater Resource Quality Objectives (RQOs) to improve the consistency, defensibility, and regulatory application of water quality parameter specification in South Africa.

Specific Objectives

1. To review existing groundwater RQO frameworks, methodologies, and applications within South Africa and internationally, including the relationship between groundwater classification and RQO development within the WRCS context

2. To identify gaps, inconsistencies, and challenges in the specification and implementation of water quality parameters for groundwater RQOs.
3. To evaluate the suitability of current parameter selection approaches in relation to different hydrogeological settings (e.g. fractured-rock, dolomitic, and alluvial systems).
4. To develop a refined framework for groundwater RQO parameter specification that integrates hydrogeological context, risk, and intended water use, and practical implementation considerations in data-constrained environments.
5. To align the refined framework with existing regulatory processes, including water use licensing and compliance monitoring.
6. To demonstrate and/or test selected components of the framework through one or more pilot applications or case studies, including areas characterised by limited groundwater data availability where feasible.
7. To engage with key stakeholders (regulators, practitioners, and researchers) to ensure practical applicability and uptake of the proposed refinements.
8. To produce guidance and recommendations for improving consistency and implementation of groundwater RQOs nationally.

3. Expected Deliverables

1. Inception report. Detailing the review approach, methodology, and stakeholder engagement plan.
2. Comprehensive technical review report. Assessment of existing RQO frameworks, including identified gaps and challenges in parameter specification.
3. Framework and decision-support guideline for groundwater RQO parameter specifications. A refined, context-sensitive framework with practical tools for regulatory application, including demonstration and/or testing through selected pilot case studies where feasible, particularly within data-constrained environments.
4. Stakeholder engagement report. Summary of stakeholder consultations, workshops, and incorporation of feedback into the framework.
5. Final report and implementation guideline. Consolidated report providing practical guidance for implementation within regulatory and operational contexts.

Total Budget: R 2 000 000

Year 1: R 300 000

Duration: 3 years