Determining the Water Resource Classes and Resource Quality Objectives in the Thukela River Catchment

Public Meeting

Background Information Document

November 2021

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

PURPOSE OF THIS DOCUMENT

The purpose of this background information document (BID) is to inform stakeholders on the progress of the study being undertaken by the Department of Water and Sanitation (DWS), to determine Resource Quality Objectives (RQOs) for significant water resources in the Thukela Catchments in the Pongola-Mtamvuna Water Management Area (WMA 4).

This BID provides

- A brief overview of the process to date
- A brief description of the steps undertaken for the classification and RQO development process
- A map showing the proposed classes, and
- An extract of proposed Draft RQOs for the upper reach of the Upper Buffalo River for illustrative purposes.

Stakeholders are invited to participate in the process by attending the stakeholder meeting or by corresponding with the technical team at the addresses provided below.

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INTRODUCTION

The National Water Act, Act No. 36 of 1998 (NWA) is founded on the principle that National Government has overall responsibility for and authority over water resource management for the benefit of the public. It also requires that the nation's water resources be protected, used, developed, conserved, managed and controlled in an equitable, efficient and sustainable manner. In order to achieve this objective, Chapter 3 of the National Water Act, 1998 (Act 36 of 1998) provides for the protection of water resources through the implementation of Resource Directed Measures (RDM). These measures include the classification of water resources, setting the Reserve and determining Resource Quality Objectives (RQOs).

The key aims of this study was to co-ordinate the implementation of the Water Resource Classification System (WRCS) published as Regulation 810 in September 2010 for determination of water resource classes and associated RQOs for the Thukela catchment. The study was linked to the preliminary Reserve determination studies and other water resource management initiatives within the study area. Where the preliminary Reserve was available and relevant, the information was adopted and where needed, within the ambit of the study, gaps were filled.

The water resource classes and associated RQOs that have been determined will assist the Department in ensuring that water resources within the Thukela catchment are protected to achieve equitable share in a sustainable manner. In determining classes and associated RQOs, socio-economic factors and ecological goals were considered by evaluating the magnitude of impacts in the present, as well as proposed future developments. The water resource classes and associated RQOs will also assist the Department in the authorisation of future water uses, operation and management of the system and the evaluation of the magnitude of the impacts of the present and proposed developments, as well as ensure that economic, social, and ecological goals are attained.

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What is Water Resource Classification

The Water Resource Classification System (WRCS) is a set of procedures for determining the desired characteristics of a water resource and is represented by a water resource class. The class outlines the attributes society requires of different water resources and reflects the importance given to protection and/or development. The implementation of the WRCS, therefore requires considering the social, economic and environmental landscape in a catchment in order to assess the costs and benefits associated with utilization versus protection of a water resource.

Why do we need to classify water resources?

The determination of a class for a water resource represents the first stage in the protection process.

What is a water resource class?

A water resource class, which will range from minimally used to heavily used (Class I to Class III), describes the desired condition of the resource, along with the degree to which it can be utilised.

Class I water resource is one which is minimally used, and the overall ecological condition of that water resource is minimally altered from its predevelopment condition.

Class II water resource is one which is moderately used, and the overall ecological condition of that water resource is moderately altered from its predevelopment condition.

Class III water resource is one which is heavily used, and the overall ecological condition of that water resource is significantly altered from its predevelopment condition.

What are Resource Quality Objectives

Resource quality objectives (RQOs) are a set of narrative and/or numerical management objectives defined for any particular resource, once the class is determined. RQOs encompass four components of the resource:

- Water quantity
- Water quality (chemical, physical and biological)
- Habitat integrity, and
- Biotic characteristics.

RQOs are important management objectives against which resource monitoring will be assessed.

Compliance monitoring will provide an indication as to whether the water resource class is being maintained.

In general, RQOs will form important sustainability indicators for water resource management.

THE STUDY AREA

The Thukela River catchment drains an area of 29,039 km^2, rising on the escarpment of the Drakensberg and flowing approximately 512 km through the eastern slopes, discharging via the Thukela Estuary into the Indian Ocean. The Thukela River catchment is the largest river system within the Pongola to Mtamvuna Water Management Area (WMA 4)(Figure 1).

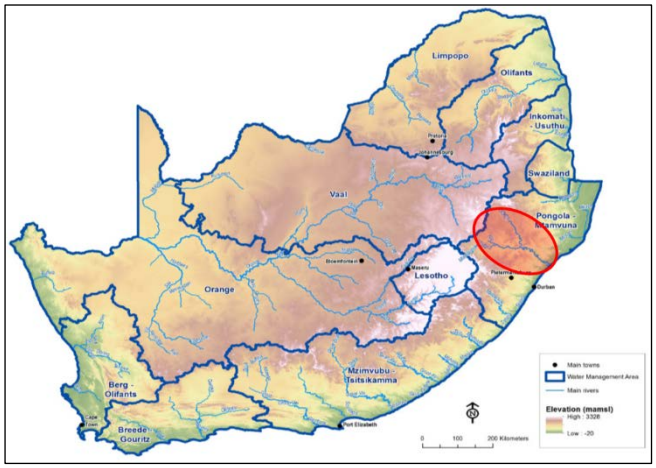

Figure 1: Thukela Catchments within the Pongola-Mtamvuna WMA

The main topographic feature is the Drakensberg Mountain Range in the west, demarcating the continental divide between the Thukela River system flowing eastward to the Indian Ocean, and the Orange/Vaal River basin with its outflow to the Atlantic Ocean. The climate is strongly influenced by the topography and mean annual rainfall ranges from 600 mm to approximately 1,500 mm, with most of the runoff originating in the vicinity of the escarpment and in the upper reaches of tributary streams, where waterfalls are a significant feature.

The main river rises above Bergville. Major tributaries flowing into the Thukela River from the north include:

- The Klip River, passing through Ladysmith
- The Sundays River, and
- The Buffalo River, rising above Newcastle.

Major tributaries into the Thukela River from the south include:

- The Little Thukela River
- The Bloukrans River

- The Bushmans River, passing though Estcourt, and
- The Mooi River.

The resources of the Thukela River are predominantly used to support requirements for water in other parts of the country, with approximately 70 % of yield transferred to the Vaal River System, to the Mhlatuze catchment to its north and the Mooi-Mgeni system to its south.

The total population of the catchment is about 1.56 million and the major towns are Newcastle, Dundee, Ladysmith and Estcourt. The catchment also includes the districts of Msinga, Nkandla and Nquthu which, despite being predominantly rural, are nevertheless heavily settled. Most people in the catchment are dependent on agriculture for their livelihood. Subsistence farming is practised on communal land, which covers much of the catchment area. Agriculture includes large areas of beef and dairy pastures, some sugar cane near the coast and around Weenen (both dry land and irrigated), vegetables, nuts and some citrus farming on the coast near Mandini. There is a limited forestry in the southern and eastern areas. The catchment also includes a paper mill at Mandini. Irrigation is extensive in the catchment. Coal mining is also predominant in the Thukela catchment in the Newcastle area.

Considering the water uses and land use in the catchments, the major areas of concern that impact the water resources directly relate to:

- Inadequate flow (quantity) to supply the current users
- Water quality impacts from:
  - Urban areas, including poorly performing wastewater treatments works and solid waste
  - Agricultural areas including runoff with elevated nutrients and pesticides
  - Mining including elevated salts and metals
- Alien invasive plants, and
- Sedimentation because of erosion due to poor land management, such as uncontrolled cattle grazing.

SUMMARY OF PROJECT OUTCOMES

As part of the classification system 15 Integrated Units of Analysis (IUAs) (Figure 2) were delineated based on socio-economic zones (SEZs), catchment area boundaries (drainage regions and water resource systems), similar land use characteristics/ land-based activities, eco-regions and geomorphology, ecological information, Present Ecological State (PES) and stakeholder input.

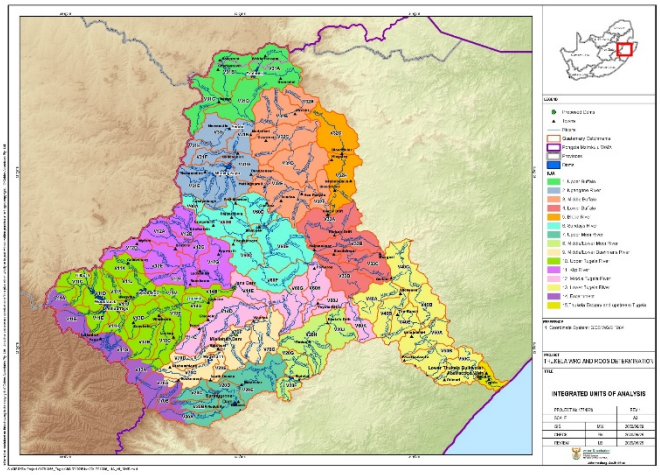

Figure 2: The fifteen Integrated Units of Analysis delineated for the Thukela Catchments

WATER RESOURCES CLASSES

The approach applied to determining the proposed water resource class for each of the IUAs was to follow the guidelines of the WRCS. In summary the WRCS guidelines recommend that the water resource class be determined based on the ecological categories (EC) of the biophysical nodes residing in an IUA. The proposed classes per IUA are set out in Table 1 and Figure 3, illustrating that the majority are hardworking catchments and are classed as Class III, and only the lower Buffalo and lower Thukela, including the estuary (a Marine Protected Area), being classed as Class II, and the escarpment IUAs classed as Class I because of their status as Strategic Water Source Areas (SWSA).

Table 1: IUAs and proposed water resource classes

IUA	Catchment area	Water Resource Class
1	Upper Buffalo	III
2	Ngagane River	III
3	Middle Buffalo	III
4	Lower Buffalo	II
5	Blood River	III
6	Sundays River	III
7	Upper Mooi River	III
8	Mooi River	III
9	Middle/Lower Bushmans River	III
10	Upper Thukela River	III
11	Klip River	III
12	Middle Thukela River	III
13	Lower Thukela River	II
14	Escarpment	I
15	Thukela Estuary	II

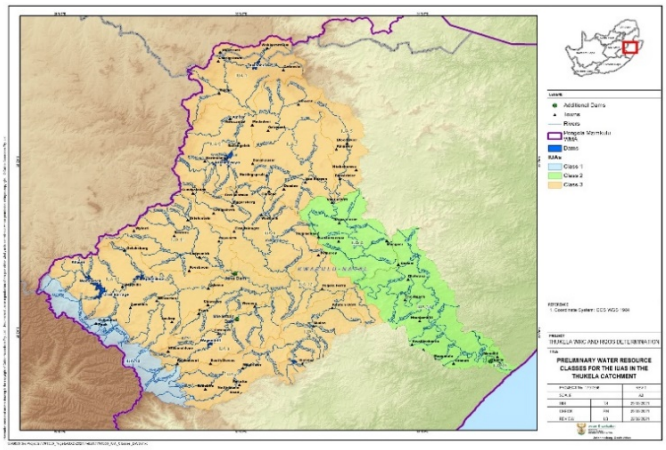

Figure 3: Proposed Water Resource Classes for the Thukela catchments

RESOURCES QUALITY OBJECTIVES

As part of the determination of Resource Quality Objectives (RQOs), the area was delineated into 75 Resource Units (RU) (Figure 4), of which 52 were prioritised for RQO determination based on the position of RUs within an IUA, importance of the RU to water users, threat posed to water resource quality for users and the environment, ecological considerations, practical constraints such as the ability to take samples at the location, and management considerations (Figure 5).

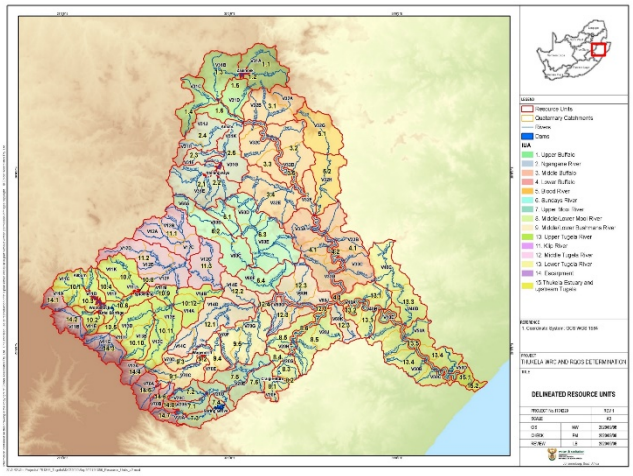

Figure 4: Delineated Resource Units (RU) for the Thukela catchments

As part of this study, RQOs for rivers, groundwater, dams, wetland resources and the estuary have been determined. While there are a wide range of sub-components and indicators for which RQOs could have been set, it was not practical or necessary to set RQOs for all sub-components in each prioritised resource unit. A rationalisation process was therefore undertaken to evaluate and prioritise the sub-components for RQO determination.

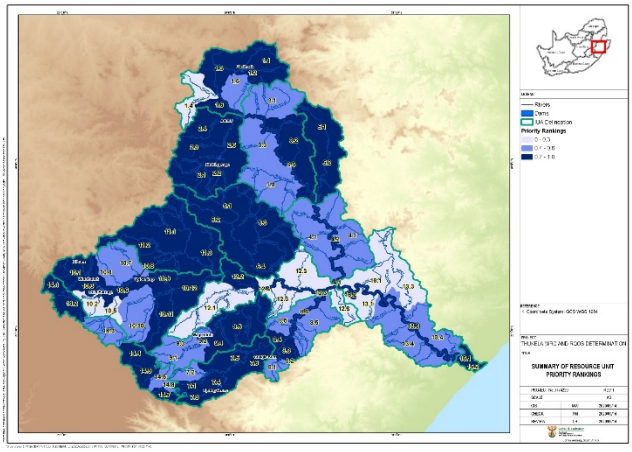

Figure 5: Prioritised RUs for rivers and dams (dark blue)

Priority Groundwater Areas

Five areas in the Thukela Catchment have been marked as reporting high rated impact conditions that will require clearly defined resource quality objectives for medium and long-term groundwater management protocols. The quaternary catchments include:

- V32B to V32D (IUA 3),
- V60A, V60B, V60C, V60D and V60E (IUA 6),
- V70C (IUA 9), and
- V11M, V13E and V14A (IUA 10),
- V11C, V11D, V11F and V11J (IUA 10).

Priority Wetland Areas

The Thukela catchment includes a number of protected wetland systems and areas (Figure 7).

- Groenvlei
- Wakkerstroom (Fig 6)
- Boschoffsvlei
- Blood River Vlei
- Upper Bloed
- Boschbergvlei
- Paddavlei
- Stillerust
- Hlatikulu
- Scawby, Dartmoor, Melmoth
- Ntabamhlope
- Highmoor

Figure 6: Wakkerstroom wetlands

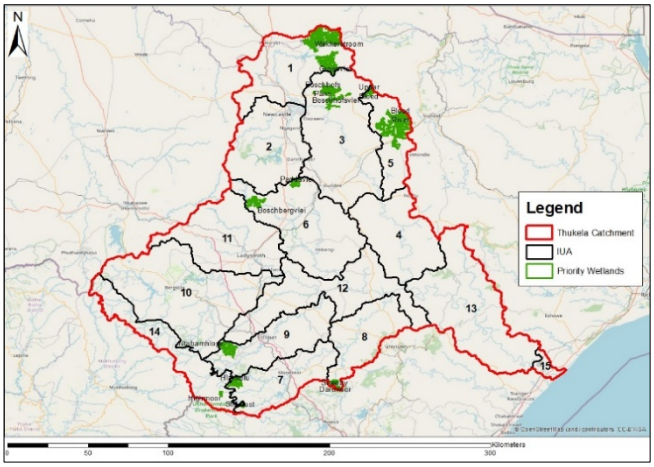

Figure 7: Priority wetland locations

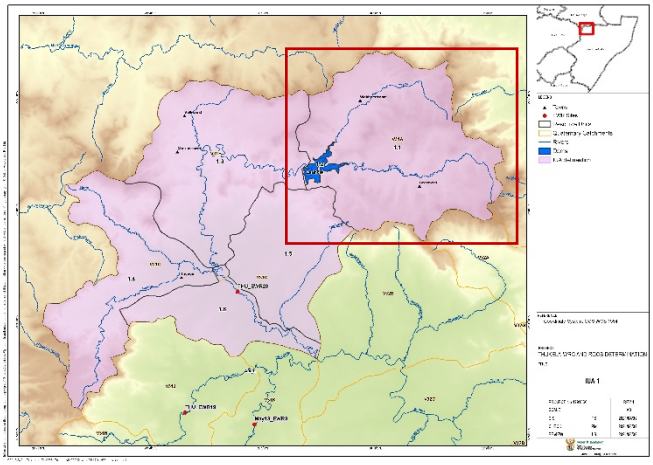

Figure 8: Resource units 1.1 and 1.2 within IUA 1

Components and sub-components

Components and sub-components for which numerical/ narrative RQOs have been set are:

- Quantity: Low Flows, High Flows
- Quality: Nutrients, Salts, Systems variables., Toxics and Pathogens
- Habitat: Instream and Riparian habitat
- Biota: Fish, Aquatic and Riparian plant species, Mammals, Birds, Amphibians and Reptiles, Periphyton, Aquatic invertebrates and Diatoms.

EXAMPLE OF DRAFT RQOs

An extract of the Thukela Catchments RQO Template is provided in Table 2 below for illustrative purposes to provide an indication of what the RQOs and numerical limits will comprise in the draft Gazette. This example illustrates the proposed RQOs for the Resource Unit 1.1 for the Upper Buffalo River which includes the Thaka and Slang Rivers to the Zaaihoek Dam which fall into Resource Unit 1.2, illustrated in Figure 8.

This example illustrates the RQOs for the rivers and dam component, however RQOs for priority wetlands and groundwater resources have also been developed. In this case, the flow and quality are also relevant to the Wakkerstroom Wetlands.

All RQOs will be gazetted for 60 day comment.

The images below illustrate various rivers in the Thukela catchment

STAKEHOLDER ENGAGEMENT

The RQO study process was supported by focused stakeholder engagement at various levels and was aligned to the technical steps of the study. Stakeholders representing various and all relevant interests and sectors of society, and organs of state in the catchment area have formed part of the process.

At this stage of the process, it is necessary that broader stakeholders are introduced to the draft classes and RQOs and numerical limits. It provides an opportunity to give comment on the draft classes and RQOs for the Thukela Catchment.

Stakeholders are invited to attend **any one** of the two meetings to be held. Registration for any one of these meetings may be done by contacting the stakeholder engagement office (details on page 1) or by completion of the registration sheet enclosed with this BID.

Stakeholder meetings will be held as follows:

Estcourt
Date: **Tuesday, 16 November 2021**
Time: **10h00 to 13h00**
Venue: **Blue Haze Country Lodge**

Newcastle
Date: **Wednesday, 17 November 2021**
Time: **10h00 to 13h00**
Venue: **The Pines Conference Village**

Table 2: Example set of RQOs for Resources Units 1.1 and 1.2 in the Upper Buffalo Integrated Unit of Analysis

IUA	Class	River	Resource Unit	Component	Sub-component	RQO	Indicator	Numerical Limit/ measure		
IUA 1: UPPER BUFFALO RIVER	III	Wetland resource unit: Wakkerstroom **V31A**	1.1	Quantity	Low flows	Ecological Water Requirements (EWR) maintenance low and drought flows: Slang River at V3R003 in V31A NMAR = 97.065 x10^{6}m^{3} Target Ecological Category (TEC) of a B. The maintenance low flows and drought flows must be attained to support the upstream aquatic ecosystem.	Maintenance and drought flows - specifically required for wetlands upstream of the Zaaihoek Dam (V3R003) Monitoring of flows at V3R003		Maintenance Low flows (m^3/s)	Drought Low flows (m^3/s)
								Oct	0.221	0.007
								Nov	0.418	0.081
								Dec	0.610	0.075
								Jan	0.83	0.180
								Feb	1.069	0.231
								Mar	0.812	0.176
								Apr	0.576	0.127
								May	0.319	0.004
								Jun	0.185	0.039
								Jul	0.142	0.036
								Aug	0.121	0.032
								Sep	0.137	0.035
				Quality	Nutrients	Nutrient levels should not deteriorate and should support aquatic ecosystem and sustain the present ecological state (PES B)	Orthophosphate as P	≤0.01 mg/L (50th percentile)		
							Total Inorganic Nitrogen (TIN)	≤0.5 milligrams/litre (mg/L) (50th percentile)		
					Salts	Total Dissolved Solids needs to be maintained to support aquatic ecosystem and sustain the present ecological state (PES B)	Total Dissolved Solids	≤120 milligrams/litre (mg/L) (95th percentile)		
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Colony forming units per 100 millilitres (CFU/100 mL)		
				Biota	Fish	Flow and water quality sensitive Fish species to be maintained in a PES B ecological category.	*Barbus (Enteromius) anoplus* (BANO) *Amphilius natalensis* (ANAT) *Anguilla mossambica* (AMOS)	During survey in all flow habitat classes all species present. BANO and ANAT ≥ 5 individuals per species		
					Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages must be maintained within a B ecological category or improved upon.	Baetidae 2 sp Perlidae Tricorythidae Hydropsychidae 1 sp Leptoceridae Ancyidae Psephenidae	At least 2 biotopes sampled: assemblages to be ≥ A abundances South African Scoring System (SASS) 5 score ≥180 Average Score per Taxon (ASPT): ≥6.0 Macroinvertebrate Response Assessment Index (MIRAI) Ecological Category: B (80- 90%)		
					Diatoms	Ecological water quality should be maintained as *good quality*	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: ≥15 PTV: 20 to < 40%		
		Zaaihoek Dam	1.2	Quantity	Dam level	Update and review operating rules to sustain optimal dam levels to support	Minimal operating level required in the dam.			

IUA	Class	River	Resource Unit	Component	Sub-component	RQO	Indicator	Numerical Limit/ measure
		V31A				users and downstream aquatic ecosystem. The dam level must be managed to protect ecosystem function as well as downstream users.		
				Quality	Nutrients	Nutrient levels must be maintained to sustain good water quality state and ecological condition. Impacts must be limited to prevent deterioration.	Orthophosphate (PO_4^-) as Phosphorus	≤0.01 milligrams/litre (mg/L) (50^{th} percentile)
							Total Inorganic Nitrogen (TIN^-) as Nitrogen	≤0.5 milligrams/litre (mg/L) (50^{th} percentile)
					Salts	Salinity concentrations must be maintained to sustain good water quality state and ecological condition.	Total Dissolved Solids	≤120 milligrams/litre (mg/L) (95^{th} percentile)
					System variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	6.5 (5^{th} percentile) and 9.0 (95^{th} percentile)
						Maintain baseline clarity	Turbidity	Must not deviate more than 10% from background levels
					Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Colony forming units per 100 millilitres (CFU/ 100 mL)