Determining the Water Resource Classes and Resource Quality Objectives in the Lower Orange River Catchment

Project Steering Committee Meeting 1

Background Information Document

July 2024

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

PURPOSE OF THIS DOCUMENT

The purpose of this background information document (BID) is to provide Project Steering Committee Members with information about the current study underway that will determine water resource classes and Resource Quality Objectives (RQOs) for all significant water resources in the Lower Orange River catchment, as well as the coastal F1-F6 secondary catchments between Alexander Bay and Malkopbaai, in the Northern Cape Province within the Vaal-Orange Water Management Area (WMA).

It serves to provide baseline information to members in preparation for the 1st meeting to be held in Upington on 25 July 2024, at which member input, guidance and review is required on the first two steps of the water resource classification process that have been completed.

Further details or clarifications can be obtained from the stakeholder engagement office or the technical team at the addresses provided below.

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BACKGROUND

The National Water Act (NWA), Act No. 36 of 1998, 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. To achieve this objective, Chapter 3 of the NWA provides for the protection of water resources through the implementation of Resource Directed Measures (RDM).

The Chief Directorate: Water Ecosystems Management (CD: WEM) of the Department of Water and Sanitation (DWS) is responsible for the determination of the RDM. The aim of determining the RDM is to ensure that a balance is sought between the need to protect and sustain water resources on one hand and the need to develop and use them on the other.

The DWS is underway with the process of classifying all river systems in South Africa and setting associated Resource Quality Objectives (RQO. The DWS is currently undertaking the process to classify all significant water resources (rivers, dams, wetlands, estuaries, and groundwater) in the Lower Orange River Catchment, including the coastal F1-F6 secondary catchments, of the Vaal-Orange Water Management Area (WMA), simply referred to as the Lower Orange River catchment from here onwards. The study initiation was announced to stakeholders through various platforms encouraging participation in the study.

The classification and determination of RQOs of water resources in the Upper Orange and Lower Orange River catchments are undertaken as separate projects; however, the studies are running parallel to ensure relevant catchment links and continuity along the river system. This Background Information Document (BID) relates to the Lower Orange River Catchment and serves to provide an overview of the outcomes on the first two tasks of the water resource classification process in support of the upcoming first project steering committee meeting.

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LOWER ORANGE STUDY AREA

The Lower Orange River catchment in includes the main towns of Upington, Springbok, Pofadder, Kakamas, Keimoes, De Aar, Prieska, Kenhardt, Sutherland, Brandvlei and Williston. The catchment area can be subdivided by its 3 district municipalities (DM), *viz*. Pixley ka Seme DM, Z F Mgcawu DM and Namakwa DM.

The Orange River catchment, comprising of the Upper Orange and Lower Orange catchments, is the largest in the country covering 50% of the land area and forms part of the Orange-Senqu River Basin which straddles four International Basin States (Lesotho, South Africa, Botswana, and Namibia). The Orange River WMA has recently been merged with the Vaal WMA and will be managed as one area, the Vaal-Orange WMA, (WMA 4) (**Error! Reference source not found.**).

Groundwater is an extremely valuable source in the Lower Orange catchment. It is the most important source of bulk water supply to local towns and rural settlements. Several towns and villages are solely dependent on groundwater resources and in some cases potable water is piped from farms several kilometres from the town/village. Groundwater quality is variable depending on the geology of the area and the land-use activities.

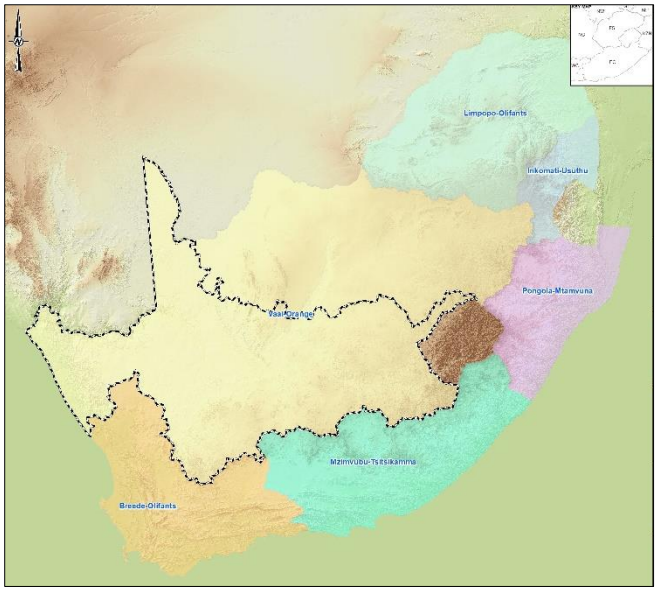

Figure 1: Orange River catchment within the Vaal-Orange WMA

The Lower Orange River section includes the stretch of Orange River between the Orange-Vaal confluence, 20km from Douglas, and Alexander Bay (Atlantic Ocean). The Orange River, also forms the border between South Africa and Namibia, flowing over a distance of approximately 550 km.

The Lower Orange catchment is the largest, but also the driest and most sparsely populated catchment in South Africa. The area is mostly arid with rainfall varying from 400 mm in the east to 50 mm in the west coast. The topography of the area is in general flat, including large pans or endorheic areas. The average mean annual evaporation for this area is 2600 mm/a.

The Orange, the primary river in the catchment. The major tributaries along the Lower Orange River portion from the north include:

- the Molopo, Kuruman and Nossob rivers in Namibia, Botswana and the Northern Cape Province; and
- the Fish River draining the southern part of Namibia.

Major tributaries to the Lower Orange River from the south draining the Karoo include:

- the Ongers River,
- the Sak River, and
- the Hartbeest River.

The catchment area includes the coastal seasonal draining rivers and estuaries along the Atlantic Ocean from Papendorp north towards Visagiesfontein, (F primary sub-catchment), with the Buffels, Holgat and Brak as the main rivers.

The study area for this undertaking comprises only the South African portion of the Lower Orange River Catchment that includes the tertiary and quaternary catchment areas of C92B-C92C (some parts), portions of D41, D42, D51 to D58, D61, D62, D71 to D73 (excluding some portions D73), D81, D82 and primary catchment F with some exclusions (Figure 2), with a larger map of the study area included at the end of this document (see Figure 6).

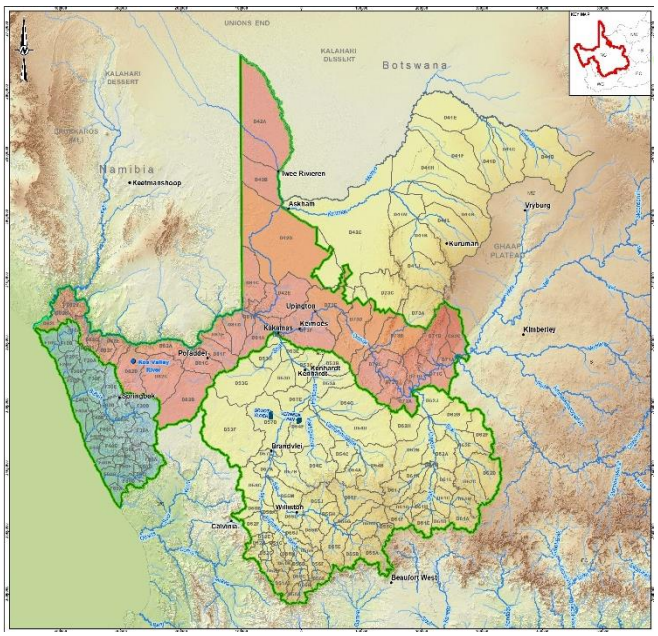

Figure 2: Lower Orange catchment – study area

Among the more valued natural resources in the river basin is a transboundary Ramsar protected wetland at the mouth of the Orange River. Important nature conservation areas include the Kgalagadi Transfrontier Park, the Ai-Ais-Richtersveld Transfrontier Park, and the Augrabies Falls National Park.

Six main wetland types have been identified in the Lower Orange River catchment including depressions (pans), unchanneled valley bottom, channelled valley bottom, floodplain and flats, which are associated with major rivers in the catchment (Orange, Molopo, Auob and Nossob).

Wetlands systems are associated with the Orange River Mouth.

The Lower Orange River serves as a significant resource to the Northern Cape Province, and is used for industrial, agricultural, recreational and domestic purposes. While most of the catchment is unsuitable for dry land cropping, the Orange River Valley, especially around Upington, Keimoes and Kakamas, has extensive grape and fruit cultivation. Water is abstracted for irrigation, urban and mining use along the main stem of the Orange River at various points, and for stock watering in the Kalahari.

There are many well-structured irrigation schemes located within the study area. However, there is also a large component of individual irrigators abstracting water directly from the river, farm dams and boreholes to supply irrigation developments. The Orange River Project is the largest water supply scheme and comprises several sub-schemes that are all supplied from the Gariep and Vanderkloof dams in the Upper Orange River catchment. Approximately 75 million m^3/a is supplied from the Lower Orange River to Namibia for irrigation purposes.

Boegoeberg, Neusberg and Vioolsdrift storage weirs are used for the regulation of flows into canal systems for irrigation purposes, and two small dams are located in the Orange River tributaries' sub-areas *viz*. Smartt Syndicate Dam on the Ongers River; and Rooiberg Dam on the Hartebeest River. Water is also transferred via pipelines to the Aggenys mines and the town of Springbok. Mining operations in the Lower Orange include underground and surface mines as well as quarries.

THE WATER RESOURCE CLASSIFICATION SYSTEM

The 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 that society requires of different water resources, and reflects the importance given to protection and/or development. The implementation of the WRCS therefore requires consideration of the social, economic, and environmental landscape in a catchment to assess the costs and benefits associated with utilisation versus protection of a water resource.

The water resource classification process is a consultative process that allows stakeholders to provide input in the setting of the water resource classes. The outcome of the classification process in the Lower Orange River catchment will be the gazetting of the water resource classes and RQOs approved by the Minister of Water and Sanitation. The gazetted classes and RQOs will be binding on all authorities or institutions when exercising any power or performing any duty under the National Water Act, 1998.

The Water Resource Class essentially describes the desired condition of the resource, along with the degree to which it can be utilised., A water resource class ranges from minimally used to heavily used (Figure 3).

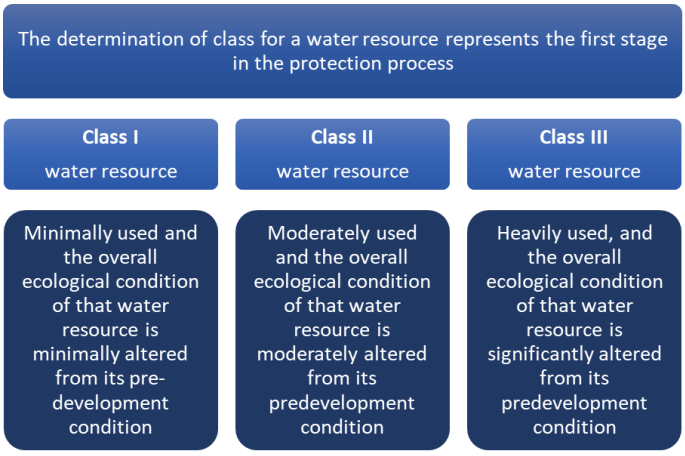

Figure 3: Water Resource Class descriptions

The class of a water resource sets the boundaries for the volume, distribution, and quality of the Reserve and RQOs and therefore informs the determination of the allocatable portion of a water resource for use.

RESOURCE QUALITY OBJECTIVES

Once the water resource classes are set, Resource Quality Objectives (RQOs), are then determined for the water resources. RQOs are a set of narrative and/or numerical management objectives defined for any resource, and which are set to support the achievement of the water resource class. RQOs encompass four components of the resource:

- Water quantity
- Water quality
- Habitat integrity; and
- Biotic characteristics.

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

WHERE ARE WE IN THE CLASSIFICATION PROCESS?

To classify a water resource, the WRCS lays out a set of procedures grouped together in seven steps that, when applied to a specific catchment, will result in the determination of a water resource class.

The 7-step classification process is indicated in Figure 4 and the detail of the procedures can be found in supporting technical guideline documents available at: https://www.dws.gov.za/RDM/Documents.aspx.

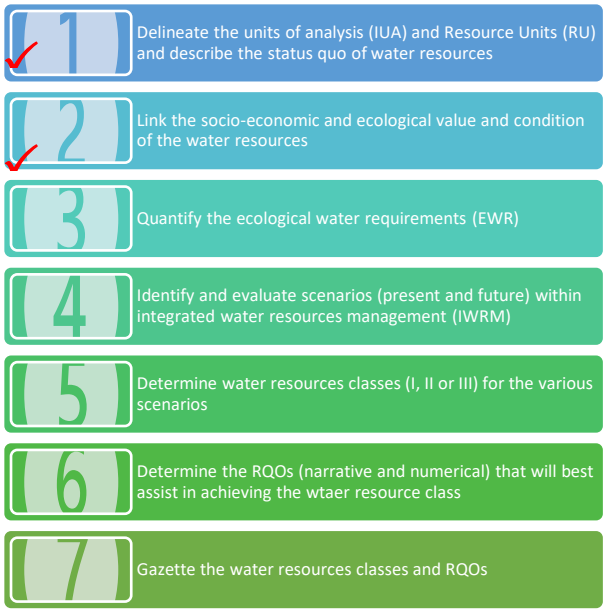

Figure 4: Steps for determining water resource classes and RQOs

The study is currently in Steps 1 and 2 of the water resource classification process. A detailed status quo assessment of the catchment (evaluation of water resource quality and quantity, ecology, water resource impacts, existing monitoring programmes, infrastructure, institutional environment, socioeconomics, sectoral water uses and users) has been undertaken to understand the current conditions.

Further to this, a socio-economic analysis of the catchment was also undertaken to understand the socio-economic conditions and the community well-being; and based on the analysis, Socio-Economic Zones (SEZs) for the Lower Orange catchment have been defined. SEZs are defined as zones of relatively homogenous socio-economic characteristics and dependencies to the services provided by associated aquatic ecosystems. In other words, areas that represent a relatively similar mix of social wellbeing and economic drivers for the purposes of providing input into the step 1 of the classification process.

These two outputs of Steps 1 and 2 serve as the basis and the primary inputs to the next steps of the classification process.

STAKEHOLDER CONSULTATION

The classification and RQO study process is supported by a comprehensive stakeholder engagement throughout the study process aligned to the technical steps of the study. Stakeholders representing relevant interests and sectors of society, and organs of state in the catchment, form part of the process and are/have been invited to participate. One of the key platforms is a PSC and state its role is to:

- Provide strategic direction and guidance on the study process and tasks;
- Guide the study team on the desired state of water resources within the Lower Orange catchment;
- Provide input to the technical process ;
- Provide direction on the significant water resources to be classified and RQOs determined;
- Serve as representatives of the stakeholder bodies and organisations and report back to them on an ongoing basis regarding the study decisions and results.

PSC representatives for the study have been identified to serve as members for the duration of this project.

STEP 1 OUTCOME: PROPOSED INTEGRATED UNITS OF ANALYSIS

Step 1 (see Figure 4) of the classification process is to delineate the Integrated Units of Analysis (IUAs) - the spatial units (catchments) that will be defined as a network of significant water resources. Each IUA represents a homogenous area which requires its own specification of the water resource class.

The delineation of a catchment into IUAs is done primarily according to a number of socio-economic criteria, drainage region (catchment) boundaries and land use characteristics. IUAs are therefore a combination of SEZs and watershed boundaries. Ecological information also plays a role in their delineation, as well as the assessment of the present state of water resources and impacts, and key modelling points in the system.

IUA Delineation Results

The results of the delineation are presented in Table 1 below and illustrated in Figure 7 and will be presented in detail at the 1st PSC meeting.

STEP 2 OUTCOME: LINKING THE SOCIOECONOMICS AND ECOLOGICAL VALUE OF WATER RESOURCES

Step 2 of the water resource classification process (Figure 4) requires that "the quantification of the relationships that link the change in the configuration of scenarios to a resulting change in economic value and social wellbeing as they relate to the water resources", be defined.

This linkage step is used to inform the evaluation of scenarios (step 4) at a later stage in the classification process. Linkages are assessed through an Integrated Economic Model (Figure 5).

The aim of this step has been to demonstrate the linkages between the socio-economic and ecological value and condition of water resources as they currently stand in the Lower Orange River catchment.

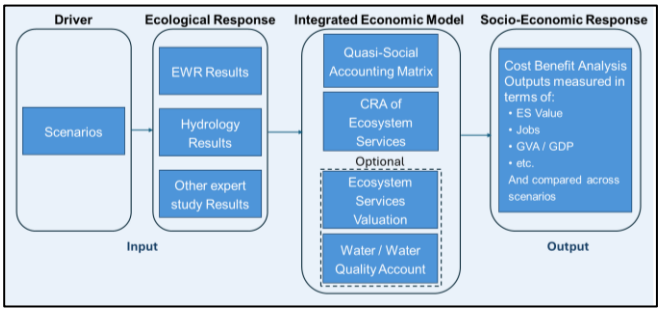

Figure 5: Integrated Economic Model

The 10 proposed IUAs as defined in step 1, broadly represent diverse socio-economic drivers, well-being & characteristics of beneficiaries of ecosystem services in catchment. Based on variation in distribution of ecological infrastructure:

- each IUA benefits to varying degrees from flow and direct use of ecosystem services.
- Variation between beneficiaries is further subdivided into formal and informal users.

Key ecosystem services identified and prioritised across the Lower Orange catchment include:

- Fresh Water Provisioning (predominant);
- Water Quantity Regulation;
- Food, Raw Materials and Wild Collected Products Provisioning;
- Erosion Regulation;
- Water Quality Regulation: Purification and Waste Management;
- Tourism, Recreational and Amenity Services; and
- Biodiversity Support.

The main ecological infrastructure identified to support these ecosystem services included estuaries; national parks (such as Kgalagadi Transfrontier Park, Ai-Ais-Richtersveld Transfrontier Park, Augrabies Falls National Park, Namaqua National Park), nature reserves and protected areas; rivers, groundwater (an important source within the catchment) and wetlands.

The ecosystem linkages between the ecosystem benefits and the beneficiaries identified for the Lower Orange Catchment are presented in Table 2.

THE WAY FORWARD

This BID has presented an overview of the outcomes of the first two tasks of the water resource classification process being undertaken in the Lower Orange Catchment. The full volume of information available for these milestones is available as study reports to be shared with the PSC members following the meeting.

DEFINITIONS AND ACRONYMS

Ecological infrastructure refers to functioning ecosystems that deliver valuable services to people such as fresh water, water and climate regulation, cultural services and soil formation.

Ecological Water Requirements (EWR): The flow patterns (magnitude, timing and duration) and water quality needed to maintain a riverine ecosystem in a particular condition. This term is used to refer to both the quantity and quality components. The EWRs as determined during preliminary Reserve studies will be applied in this study.

Ecological Water Requirement Sites: EWR sites are set at specific points on the river. These sites provide sufficient indicators for the specialists to assess environmental flows and information about the variety of conditions in a river reach. An EWR site consists of a length of river which may consist of various cross-sections for both hydraulic and ecological purposes.

Integrated Units of Analysis (IUAs): The basic unit of assessment for the classification of water resources. The IUAs incorporates socio-economic zones and is defined by catchment area boundaries.

Resource Quality Objectives (RQOs): RQOs provide numerical and narrative descriptors of quality, quantity, habitat, and biotic conditions as a basis from which management actions can be implemented for the sustainable use of all water resources.

Socio-economic Zone: Zones of relatively homogenous socio-economic characteristics and dependencies to the services provided by associated aquatic ecosystems.

CRA	Comparative Risk Assessment
EI	Ecological Infrastructure
ES	Ecosystem Services
EWR	Ecological Water Requirement
GDP	Gross Domestic Product
GVA	Gross Value Added
IEM	Integrated Economic Model
IPBES	International Panel on Biodiversity and Ecosystem Services
IUA	Integrated Unit of Analysis
MEA	Millennium Ecosystem Assessment
PES	Present Ecological State
RDM	Resource Directed Measures
RQO	Resource Quality Objectives
SAM	Social Accounting Matrix
SANBI	South African National Biodiversity Institute
Stats SA	Statistics South Africa
SWSA	Strategic Water Source Area
TEEB	The Economics of Ecosystems and Biodiversity

Figure 6: Lower Orange catchment – Study area

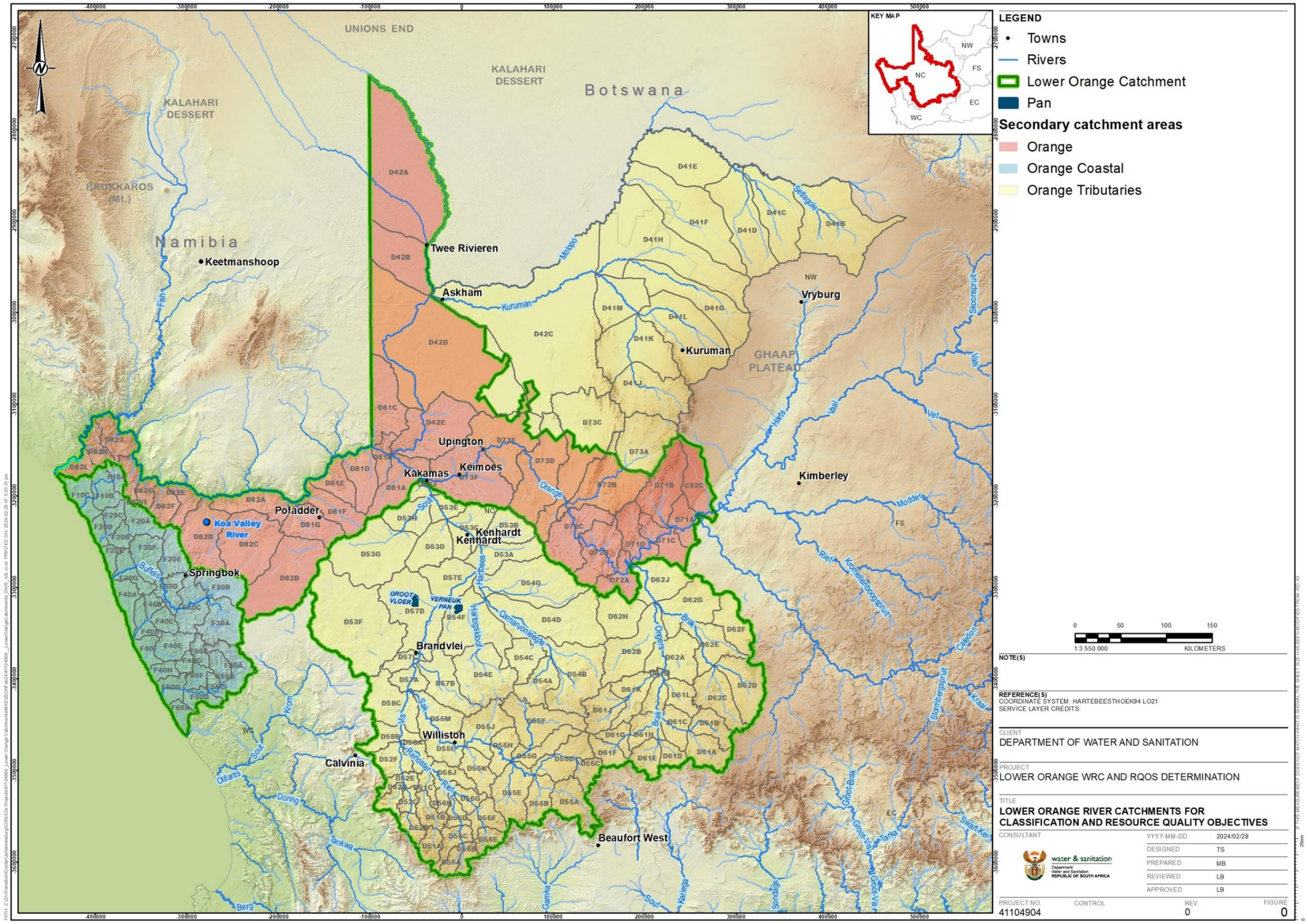

Table 1: Preliminary Integrated Units of Analysis (IUAs) in the Lower Orange River catchment

IUA	Delineation	Quaternary Catchment
1	Orange from Vaal confluence to Augrabies Waterfall	C92C, D71A, D71B, B71C, D71D, D72A, D72B, C72C, D73B, D73C, D73D, D73E, D73F, ~80%D81A
2	Downstream Augrabies to Pella	Portion of D81A – D81G
3	Pella to Vioolsdrift weir	D82A – D82G
4	Downstream Vioolsdrift to Orange River Mouth	D82H, D85J, D82J, D82L
5	Orange River Mouth	Orange River Mouth
6	Ongers/Brak	D61A, D61B, D61C, D61D, D61E, D61F, D61G, D61H, D61J, D61K, D61L, D61M, D62A, D62B, D62C, D62D, D62E, D62F, D62G, D62H, D62J
7	Hartbees/Sak	D52 - D58
8	Coastal Area	F10A to F60A
9	Upper Molopo and Upper Kuruman	D41B, D41C, D41D, D41E, D41F, D41H, D41K, D41G, D41M
10	Lower Kuruman and Lower Molopo	D42A, D42B, D42C, D42D, D42E, D81C

Figure 7: Map of Preliminary IUAs Delineated

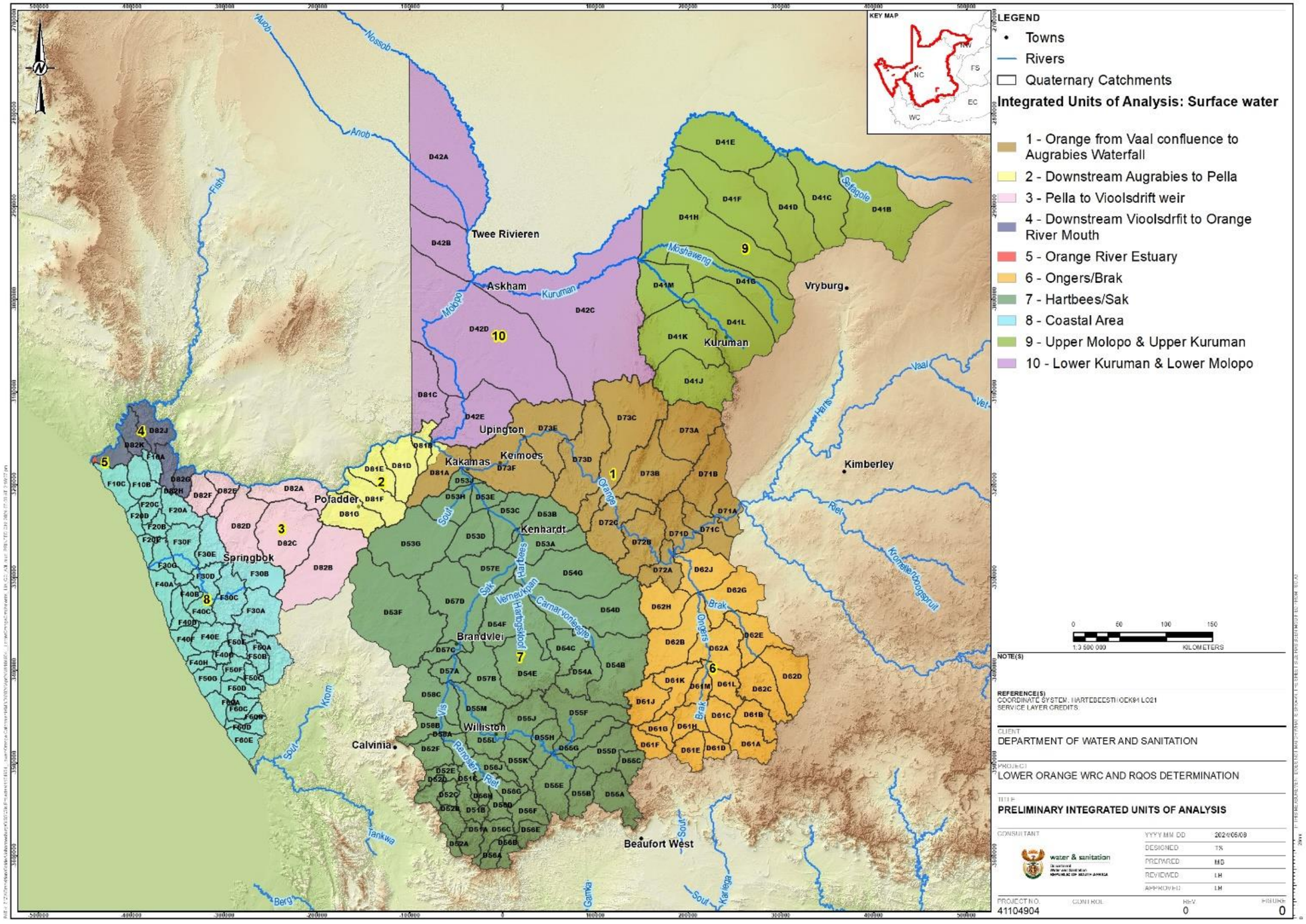

Table 2: Ecosystem Services Linkages with beneficiaries in the Lower Orange River catchment

Intermediate Ecosystem Service	Final Ecosystem, Services	General Sector	Beneficiary Class
Water Quality Regulation Water Quantity Regulation	Food Provisioning	Informal Households	Informal, illicit, non-profit, and households
		Agriculture	Agriculture
Erosion and Soil Regulation	Fresh Water (water quantity) Provisioning	Households (formal and informal)	Informal, illicit, non-profit, and households
			Households
		Agriculture (irrigation)	Agriculture
		Mining	Metal ores
			Stone
		Manufacturing	Meat, fish, fruit, vegetables, oils and fats
			Dairy
			Grain and animal feeds
			Other food products
			Beverages
			Tobacco
			Textiles
		Manufacturing	Wood products
			Paper
			Printing and reproduction
			Basic chemicals
			Other chemicals
			Iron and steel
			Precious metals
			General purpose machinery
			Other electric components
			Vehicle parts
			Ships, boats
			Locomotives
			Equipment
			Furniture
			Other manufacturing
			Recycling
		Government Services	Electricity
			Water
			Sewage and refuse
	Raw Materials Provisioning	Informal Households	Informal, illicit, non-profit, and households

Intermediate Ecosystem Service	Final Ecosystem, Services	General Sector	Beneficiary Class
	Medicinal resources Provisioning	Informal Households	Informal, illicit, non-profit, and households
	Tourism, Recreational and Amenity Services	Catering & accommodation	Hotels Restaurants
			Real estate activities (Lease and Fee basis)
		Households	Informal, illicit, non-profit, and households
			Households
		Community, social & personal services	Recreation (Sporting and other recreational activities)