



Chief Directorate: Water Ecosystems Management
THE DETERMINATION OF WATER RESOURCE CLASSES AND ASSOCIATED
RESOURCE QUALITY OBJECTIVES IN THE LOWER ORANGE CATCHMENT
Sector Meeting: Agriculture Sector Meeting No 2
Minutes (Draft)

Date: Wednesday, 14 October 2025
Time: 10h00
Venue: Upington, Protea Hotel

	ITEM	ACTION
1.	WELCOME AND INTRODUCTIONS	
	Ms Lebogang Matlala (the chairperson) welcomed all attendees to the meeting. The attendees were requested to add their details on the register and under the comments section, for those online.	
2.	ATTENDANCE AND APOLOGIES	
	A copy of the attendance register is included as Appendix A . No apologies were noted.	
3.	ACCEPTANCE OF AGENDA	
	The agenda was accepted with no additions. Mr W Lemmer asked what will be done in relation to the comments sent on the Monday 13 th of October, when this meeting is on 14 th of October? Ms Matlala responded that these will be reviewed and considered for the update of the Resource Quality Objectives (RQOs), however this meeting is not focused on the draft RQOs. A separate workshop is taking place in Springbok on Tuesday, 28 October 2025 and Wednesday and Thursday, 29 and 30 October 2025 in Upington at which the draft RQOs will be engaged on. Stakeholders are welcome to attend if they are interested.	
4.	PURPOSE OF THE MEETING	
	Ms Matlala outlined that the purpose of the meeting was to address concerns that were raised by the stakeholders in the catchment with regards to the proposed water resource classes for the Lower Orange Catchment. She explained that following the presentation of the proposed water resource classes in May 2025, the team conducted additional fieldwork to support the proposed Class III classification and to prepare a presentation on the classification process. Ms Matlala indicated that the meeting presentations would cover the classification process, the concerns raised by stakeholders,	

	and pollution issues in the catchment. The team aimed to respond to these issues through their presentations.	
5.	THE PROCESS OF DETERMINING CLASSES AND RQOs AND OVERALL STUDY PROCESS (WHERE ARE WE)	
5.1	<p>Ms Sekoele presented the classification process, which addressed the following:</p> <ul style="list-style-type: none"> • Protection of water resources, • Legal mandate, • Water Resource Classes and RQOs and • the Study focus and Process • Implications of setting Resource Directed Measures, and • Stakeholder Engagement. <p>The process aims to balance protection and use of water resources while considering social, economic, and ecological factors.</p>	
5.2	<p>Mr Bekker expressed disappointment in that the Lower Orange River had been assigned a Class III, noting that this represents the lowest level of protection. He stated that stakeholders felt that the entire process has been downgraded to allow less flow as a consequence of the Lesotho Highlands Development Project. He further remarked that water users experience 3rd world conditions on the ground, - and argued that although the river is classified as Class III (heavily used) the river can still be clean and therefore could be a Class II.</p>	
5.3	<p>There was a question from Mr Lemmer enquiring who was nominated in May 2024 to serve on the PSC as member to represent agriculture / irrigation in the Lower Orange River Region.</p> <p>Nolusindiso Jafta responded that Mr Fritz Bekker and Willem van Aarde were nominated by the attendees.</p>	
5.4	<p>Mr Lemmer also enquired about 9 October 2024 Sector meeting. He wanted to know about the attendance and if the agriculture sector's perspective was submitted.</p> <p>In response, Ms Jafta indicated that an attendance list for the meeting is available and that the Sector attendees included Mr G van Niekerk (Kakamas WUA); Mr W van Aarde (Karstens Group); Mr G le Roux (Onseepkans IB); Mr N van Niekerk (Kakamas WUA) and Mr L Schonborn (Upington Islands WUA).</p>	
5.5	<p>Mr Lemmer, of Raisins SA, expressed support for the Gariep Watch's concerns noting that a Class III offers the lowest level of protection, which is associated with low flow and lower quality. He highlighted that about 30 000 jobs, as well as irrigation and economic growth in the Northern Cape depends on the Orange River as lifeline to communities in the catchment. He further raised concern that more water transfers from the Lesotho Highland Water Scheme to Gauteng could result in less water (and less quality water) for the Lower Orange River Region. He emphasised that efforts should focus on improvement rather than accommodating a decline in expectations and therefore requested that the river be maintained as a Class II.</p>	
6.	DETERMINING CLASSES AND RQOs FOR THE LOWER ORANGE	

6.1	Condition of the Lower Orange (EWR)	
6.1.1	<p>Ms Moodley, of the study team, presented the overview of the results of classification process and evaluation, and the condition of the Lower Orange River which informed the proposed water resource classes. This included the results of the updated fieldwork conducted on the river at Vioolsdrift and Sendelingsdrift in September 2025, aimed at improving the confidence in the assessment of the ecological status.</p> <p>She explained that the process involves trade-offs between water supply for irrigation and the ecological water requirements. A water resource Class III was proposed for the Lower Orange River corresponding to an overall C category. The evaluation and results were detailed, explaining the rationale and evidence to arrive at the Class III. It was noted that a Class II could be considered; however, this would result in additional water supply deficits to irrigation use.</p>	
6.1.2	<p>Mr Bekker questioned why the illegal deterioration of the river should inform the decision of the class, noting that dysfunctional sewage works are impacting quality and ecological condition.</p> <p><i>The concern was noted. Ms Moodley advised that the RQOs are set to maintain or improve the current condition. The principle is not to deteriorate the river further.</i></p>	
6.1.3	<p>Mr Lemmer stated that the agricultural export sectors in the Lower Orange River are reliant on a sufficient water resource in terms of sufficient water supply (Flow level) and water quality (Clean water) to remain globally competitive. He emphasised that issues should be addressed at source (e.g. Improvement in Municipal Sewage Management), and that acceptable objectives should be set to achieve and maintain higher standards. He further noted that as a community and country, standards should not be lowered to accommodate inefficiencies / failures in public service delivery. He highlighted that regional economic growth, retention of jobs and improved service delivery should be the priority.</p>	
6.1.4	<p>Mr Botha asked whether an impact assessment has been conducted to quantify stakeholder impacts on the system.</p> <p><i>Ms Moodley advised that a catchment status quo assessment had been undertaken identifying sources and drivers of impacts but did not include quantification of impacts of each user. She noted that this must be addressed during a load balance assessment.</i></p> <p><i>Ms Matlala added that such quantification is outside the scope of the current study; however, once classes and RQOs are gazetted, measures will then be put in place to address the identified impacts, allowing for improvements during implementation phase.</i></p>	
6.1.5	<p>Mr Engelbrecht stated that the main message is we should stop talking and we should start doing. He emphasised the need to address municipal pollution and to also start looking at what is happening with Vioolsdrift Dam.</p> <p>He further highlighted the importance of ensuring better management of water supply for this lower part of the Orange River catchment and of determining the cost of the water particularly at the Vioolsdrift.</p>	

6.1.6	<p>Mr Engelbrecht noted concerns regarding the deterioration of water quality, specifically around the export fruit market, highlighting issues such as <i>E-coli</i> counts and fertiliser contamination. Measures to address these issues must also be looked at to improve water quality.</p> <p>He also commented on the impracticality of water from Lesotho being transferred to Botswana via South Africa and highlighted ongoing uncertainty regarding the status of the Vioolsdrift Dam.</p> <p>He concluded that, logically, if there is no water, then the sector can't irrigate. The government must give an indication of what it will cost, and implementation of necessary measures needs to start.</p> <p><i>The concerns were noted, and it was indicated that the pollution aspects and future development would be addressed in later presentations.</i></p>	
6.1.7	<p>Mr Lemmer asked what practical measures the DWS recommends preventing any further degradation of the river and to maintain a Class III classification. He emphasised that export revenue, economic growth, and job retention are at stake, and queried what actions the DWS is taking to address the problem upstream - water losses in Gauteng, pollution by mine water, industries and inefficient municipal sewage systems management.</p> <p>By completion of the Highland Water Scheme - redirection of water for consumption in Gauteng and the construction of an additional dam in Lesotho - the water flow will decline and impact water quality in the Lower Orange River Region.</p> <p><i>Ms Moodley advised that compliance and enforcement measures need to be implemented, and that stricter source controls are required to manage the pollution. An integrated management plan is required.</i></p>	
6.1.8	<p>Mr Lemmer noted that reassessment of sites indicates a B-status in 2016, which has deteriorated to a much lower status now in 2025. He asked about the causes of this decline. Water quality is currently at a C category, with a recommended category of a C/D, while the previous assessment recommended a B/C. He highlighted that the declining trend from 2016 to 2025 is significant and stressed the need to address the deterioration.</p> <p><i>Ms Moodley indicated that the category deterioration is due to poor biota status (presence, diversity, health) that is driving the lower C/D category. She further noted severe declines in fish ecological status, over-use and reduced flows.</i></p> <p><i>She explained that a higher category could be recommended but this would result in additional water supply deficits for irrigation causing a larger economic impact. The C/D category was identified as the best balance, representing a trade-off that could minimise impacts on both irrigation water use and ecological consequences.</i></p>	
6.2	<p>Hydrology and Scenarios for the Orange River, Ecological and Socio-Economic Consequences</p>	
6.2.1	<p>Mr Jonathan Schroder presented the scenarios and water resource modelling, explaining the use of the Water Resource Planning Model to handle the complex system of the Orange River catchment and the importance of considering future water requirements and intervention.</p>	

	The team also presented the impacts to the river flows and ecological components, and the socio-economic consequences.	
6.2.2	Mr Bekker expressed concern that there is and will continue to be insufficient water. He inquired about the number of phases in the Lesotho Highlands Water Project (LHWP). <i>Ms Matlala advised that the later presentation on the water resource developments would address this matter.</i>	
	Mr Bekker stated that they had provided comments on Environmental Impact Assessment (EIA) in Kheis Municipality, where six towns expanded with 100 – 2000 new households. He asked whether these developments had been taken into consideration, noting that they seem to receive preference.	
	<i>In response, it was indicated that increases in domestic and irrigation demand have been included in the scenarios and planning model, and that provisions have been made within the reconciliation strategies.</i>	
6.2.3	Mr Beuce noted that the Orange River has many invasive plants, including eucalyptus and prosopis, and suggested exploring options to convert these into biochar and other products, to benefit communities and help the ecology. He also inquired about the status of the Working for Water (WfW) programme. <i>It was indicated that this matter would be addressed in the implementation plan, and that the status of the WfW programme would be confirmed.</i>	
6.2.4	Mr Lemmer referred to the Ecological Water Requirements (EWRs) presented and noted the 2040 Scenario, specifically: a. Introduce Polihali Dam, b. Noordoewer/ Violsdrift Dam on the Lower Orange River with a focus on Scenario 2b. He asked what the classification of the Orange River would be under this scenario, noting that deficits are already projected in drier seasons and that parts of the river have zero flow. He emphasised that water quality is an issue and needs to be addressed by policing and better management (sewage processing sites) at the source. Mr Lemmer requested that Mr Schroder and the team summarise the most probable scenario up to 2040 and what the impact would be on water flow for irrigation purposes and the most probable socio-economic consequence. He further inquired how future water demand from Gauteng would impact water flow until 2040. <i>From a flow perspective the Scenario 2b is recommended which includes floods during February/March. Lower flows in November do have an impact on ecology specifically at the Violsdrift EWR site – it is a negative consequence as the ecology does not receive the required flows. It is possible to meet the C/D ecological requirement up to 2020.</i> <i>Socio-economics trade-off has the lowest deficit for Scenario 2b: Supply deficit for irrigation water with a loss in GDP for irrigation users is expected (average potential loss). All scenarios result in water deficits impacting on irrigation supply. DWS recommendation - Class III seems to be the most feasible option based on the flow and least economic impact. Water quality is set at Category C which does not represent a downgrade. Quality management is an enforcement and compliance issue.</i>	

6.2.5	<p>Mr Franken stated that for the purpose of such a meeting, it was important to treat the matter with urgency and to prioritise action - e.g., addressing the issue of dysfunctional local municipalities. He mentioned that he had previously started an environmental forum in the Kai! Garib area; however, it was unsuccessful because government departments didn't join. He further noted challenges with solid waste management and indicated that the government authorities have not done enough to regulate and enforce existing conditions. As a result, he eventually went to the police and laid a charge. A map showing the affected areas, along with the videos etc., has been plotted showing the ongoing local municipality dysfunction. Mr Franken expressed concern that the situation will continue to deteriorate and emphasised that discussion alone is insufficient - action is needed.</p>	
6.2.6	<p>Mr Louw, from the Department of Economic Development & Tourism (DEDAT), stated that from a Provincial planning perspective– the water quality is key, as the province is a key destination for tourists. He emphasised that currency earnings for the country in terms of tourism are at risk due to deteriorating water quality. The issues are already being flagged up in Environmental Threat Assessments (ETAs). The DEDAT is in consultation with the DWS to address these concerns in the province.</p> <p>Mr Franken further noted that the province supports the agriculture sector, particularly the export to the European Union (EU) which enforces strict rules. In addition, engagement with the Presidency is ongoing regarding new data centres – there will be a 3 GW data facility in the Northern Cape, and it is an investment priority from government. It is water dependent as it will need water for cooling. He explained that this development, along with the Renewable Energy Independent Power Producer Programme (REIPPP) expansion and the introduction of 4 and 5 kV transmission, highlights the importance of ensuring sufficient water supply for industrial use from both provincial and national perspective.</p>	
	<p><i>Ms Matlala said she was glad that DEDAT is engaging with the provincial DWS heads. She requested that Mr Louw share the policies and growth plans with the study team.</i></p> <p><i>The information is needed to know what is on the planning horizon so that the team can bring in those aspects into the water balance assessment.</i></p> <p><i>This would be in relation to the quantities for data centres and the water quality standards for EU exports.</i></p>	Hendrik Louw – Dept of Tourism
6.2.7	<p>Mr Dippenaar stated that reclassifying the status of the Lower Orange River is not the correct approach. He noted that such a strategy seems to fit in with the current degraded condition of water quality, rather than focusing on improving the quality and restoring the river to Category B classification. He emphasised the importance of repairing, maintaining and managing illegal dumping of sewage.</p> <p>He further noted that several times various presenters referred to low flow and lack of seasonality – which is not entirely true. Since the 2020-2021 summer season until this last cycle, the area has experienced massive high flows and flood conditions. Normal flow of less than 100 m³/s increased to almost 4500 m³ /s. He highlighted that if flows 40-50 times higher than the normal have not improved water quality or supported ecological recovery, - then the problem is more serious that it will not be resolved by just reclassifying the status of the Lower Orange River.</p>	

6.2.7	<p>Mr Dippenaar added that despite the huge additional volumes of water coming down during almost flood like conditions, monitoring results show the exact opposite of the expected dilution effect - with increased levels of heavy metals, massive upsurge in <i>E. coli</i> concentrations - just indicating that even much bigger problem exists, as high water flows merely flush a wider area's sewage into the river.</p>	
6.2.8	<p>Mr Lemmer highlighted that farmers are making significant green investments and noted that agriculture contributes a large deal to the economy compared to other sectors.</p> <p>He requested a summary of the most likely outcome for the next 50 years, considering the delays in the establishment of better infrastructure and the larger investments needed. While the potential benefits of improved infrastructures are understood, he emphasised the importance of portraying South Africa in a positive light and recognised that water is key for the agriculture sector. He further noted the need to be cognisant of the investments that Farmers make every year to improve their production. Mr Lemmer asked for views on what can realistically be expected over the next 50 years and whether an increase or a decrease in flows of the Orange River is anticipated in the future.</p>	
	<p><i>Mr Schroder stated that the scenarios had been discussed. On the water quantity side, DWS has two processes that influence water availability - water planning and water resource classification. On shorter term, the DWS is continuing with operating analyses to put in place short-term water allocation measures and other water allocation interventions. He noted that if the system is managed in terms of the operations and allocations the required water demands should be met. He further proposed that stakeholders get involved in the system operations forums to ensure that their perspectives are considered in aspects related to growth projections, operation and management of the system.</i></p>	
6.2.9	<p>Mr Hanekom stated that there is a misconception that the DWS will be given permission to allow water quality to deteriorate. He expressed interest in to seeing the water resources model and understanding how it functions, particularly how the dams are integrated into the model and operated to manage the system better. It was noted by the study team that while floods were not common previously, they have been occurring every year now over the past four to five years).</p> <p>Mr Hanekom emphasised the importance of operations of the dams in managing releases and floods, noting that farmers have experienced a lot of damage in recent years. He enquired who should be liaised with regarding dam operations.</p> <p><i>Ms. Moodley responded that the DWS has a System Operation for the Orange River that meets annually to discuss operation. Mr Schroder advised that details of the Annual Operating Analysis (AOA) and Operations Forum information can be shared so that stakeholders can participate.</i></p>	
7	ADDRESSING OTHER KEY CONCERNS	
7.1	Water Resource Developments	

7.1.1	Mr Machingambi presented on water resource developments. The water balance of the Orange River system and the integrated Vaal River system was discussed, highlighting potential infrastructure projects and the need for yield replacement solutions to avoid negative impacts on downstream users.	
7.1.2	Mr Bekker stated that the Lower Orange will have to adapt to lower water yield going forward. He noted that slightly saline water is more preferable to no water. He sees that the Lower Vaal River water will flow into the Orange River, while the Lesotho Highlands water is directed to Gauteng. He highlighted that water from the Lower Vaal River is highly polluted but then the flooding water that comes is then lost. He questioned whether the Vaal River is not underutilised and suggested exploring ways to increase the yield to the Lower Orange (e.g. increasing the capacity of Bloemhof Dam/). Mr Bekker also noted that the amount of water (approximately 400Mm ³) discharged from Gauteng is not clean and that Vaal Dam water is used to dilute acid mine drainage. He said that 50% of the water in Lower Orange comes from the Vaal River and queried whether the dam could be better managed to get more water to the Lower Orange.	
	Mr Machingambi stated that DWS cannot provide complete answer at this stage. He noted that the water balances of the systems reflect that some of the Vaal River water flows into the Lower Orange River. When there are spills from the Integrated Vaal River System (IVRS) then less water is needed from the Upper Orange dams. However, concerns about water quality remain. There will be spills but quality needs to be addressed. He added that various options are being considered for the augmentation of the Orange River System.	
7.2	Vaal-Orange Pollution	
7.2.1	The presentation by Mr Mkhalihi covered, monitoring of RQOs in the Vaal, compliance monitoring of waste related discharges, the Green Drop Programme, enforcement. Vaal Anti-Pollution and legislative review to deal with wastewater treatment works.	
7.2.2	Mr Bekker stated that the information on the local municipalities is ghastly. He noted that according to the law, sewage water should be treated before returning to the water resource. In southern Gauteng there is large discharge coming down to the Lower Orange River. He added that if mining water was treated, then there would be an extra 400 Mm ³ water available to the Lower Orange. Consequently, the need for yield replacement in the Lower Orange would be reduced, as properly treated Vaal River water could provide this extra volume to the Lower Orange Catchment.	
	<i>Mr Mkhalihi stated that while AMD water is expensive to treat, it would make a positive contribution if treated.</i>	
7.3	Managing Water Use Efficiency in the Vaal Catchment Area	
7.3.1	Ms Mboweni and Ms Sithole presented on the management of water demands in the Upper and Lower Orange Catchment areas, as well as the water conservation and water demand in agricultural sector.	

7.3.2	<p>Mr Franken stated that the government is supposed to be planning for the future on a regular basis. He expressed concern that, in his view, no money has been set aside in recent years for canal maintenance.</p> <p>Since 2000 agricultural canals have not been upgraded to prevent leakage, resulting in huge financial losses due to leakages in our ground or gravel canals.</p> <p>He highlighted that this issue has been a major concern over many years and remains unresolved as of 2025.</p> <p>He added that it seems local municipalities don't determine whether a person is trainable as once a person is employed, they are trained on the agriculture farmer's account.</p>	
	<p><i>On the issue of training local municipalities, Ms. Mboweni indicated that there are criteria used when it comes to the selection of trainees and municipalities to train, such as, there should be officials with technical duties, someone from finance, level of water losses the municipality experiences, and functionality of the municipality (the DWS looks at infrastructure so that the training can be done properly). Communication is then given to the officials from those local municipalities that meet criteria to be invited to attend training.</i></p> <p><i>Ms. Lebogang Matlala added that a lot of effort is spent in training officials in government, but it is difficult to control resignations. As such training is continuous as new officials come in.</i></p>	
7.3.3	<p>Mr Franken asked how much money has been budgeted and set aside for maintenance of cement canals since the year 2000.</p> <p><i>Ms Sithole stated that the DWS will consult with the rehabilitation of conveyance systems team to gather the detailed information on the budget allocation for cement canals since the year 2000. This information will be communicated back to stakeholders once available.</i></p>	Lindiwe Sithole, DWS
8	ADDITIONAL DISCUSSIONS	
8.1	<p>Mr van Aarde stated that they understand what is being done in the models and the work by the team; however, they have a large concern in terms of the water quality and need to implement additional water purification on farms (all the way from Prieska to Aussenkehr) as water quality issues in drinking water are being experienced. Measures such as UV light treatment, special drainage systems etc, are needed. He expressed concern for the health of farm workers drinking the water.</p>	
	<p><i>Ms Matlala indicated that the study team will review all comments received to determine where the RQOs may need to be revised to address concerns. She said that there will be further opportunities during the RQO process to submit additional comments and make necessary adjustments to the RQOs</i></p>	
8.2	<p>Mr Franken raised concern regarding the issuing of permits to wastewater treatment plants, noting that permits are being issued with unlimited timeframes for compliance. He explained that local municipalities must apply for permits following the findings of assessments and must then achieve compliance within stipulated timeframes – which they don't. He said essentially this lack of compliance gives local municipalities a "blank cheque" regarding the extent and timing of their compliance efforts, which is a point of concern.</p>	

	<p>He further asked whether DWS has the authority to take non-compliant municipalities to court or put them under administration.</p>	
	<p><i>Ms. Thandi Mopai stated that Local municipalities are taken to court. Some have successful cases. She noted that in terms of the Green Drop assessment, most of Northern Cape local municipalities performed badly, and several criminal cases are open.</i></p> <p><i>She emphasised that it should be noted that court processes take time and that local councils are also not approving budgets required for compliance processes. There is a need for local government to prioritize budgets for maintenance, operation and upgrading of wastewater treatment works and it needs multiple processes and interventions.</i></p> <p><i>She further explained that DWS has a dual role of both supporting and regulating local municipalities. On one hand municipalities receive DWS grants to fix the treatment plants, but if they fail to do so, the DWS can take them to court. The funds provided are not ring-fenced, so the money ends up being diverted to other activities. She stressed the need for a mechanism to ring-fence the funds so that they are used for what they are intended for.</i></p>	
8.3	<p>Mr Hanekom asked whether the option of privatising some of the treatment plants has been considered, noting that this could help avoid a situation of one sphere of government acting against the other. Some privatisation may be helpful.</p>	
	<p><i>Mr. Mkhaliphi noted that while the constitutional mandate for services lies with Local Government and not DWS, if a local municipality demonstrated that it has failed, then the private sector could take over operation.</i></p>	
9	WAY FORWARD AND CLOSURE	
9.1	PSC meetings will be held on the 18 November 2025 and 18 February 2026 – invitations will be sent to the PSC members.	
9.2	All presentations will be shared with the stakeholders.	
9.2	Comments will be considered and incorporated where possible. An RQO workshop will be held later in the month - one day in Springbok and two days in Upington. Invites will be sent out in due course.	

Acronyms	
DFFE	Department of Forestry, Fisheries and Environment
DWS	Department of Water and Sanitation
LHWP	Lesotho Highlands Water Project
RQOs	Resource Quality Objectives
RUs	Resource Units
WfW	Working for Water

Actions:

Item Number	Action	Progress
6.2.6	Mr. Louw to provide policies, growth plans and details related to future plans such as the data centre water requirements , as well as the EU water quality requirements for exports.	
7.3.3	Ms Sithole stated to gather detailed information on the budget allocation for cement canals since the year 2000 and share with the stakeholders.	
9	Study team to share meeting presentations with attendees	

Appendix A

ATTENDANCE LIST	
Chantelle Kotze	Raisins SA
Niel Van Niekerk	CEO - Kakamas Water Users Association
Mohlapa Sekoele	DWS - Water Resource Classification
Morne Steenkamp	Southern Farms, Orange Falls, Augrabies Falls Farms (Witklip)
Zinzi Mboweni	DWS: HO, Water Use Efficiency
Tumelo Mathulwe	WSP
Siboniso Mklhalphi	DWS - Compliance Monitoring
Lindiwe Sithole	DWS - Water Use Efficiency
Bradwin Lester	Terrain African Agri Investment
Nolusindiso Jafta	DWS - Water Resource Classification
Peter Joseph	Orange Vaal WUA
Kwazikwakhe Majola	DWS-Pretoria, Directorate: Reserve Determination.
Wessel Lemmer	Raisins SA
Christo Louw	DWS - Upington, Lower Orange WMA - Water Use Authorisation
Lebogang Betty Matlala	Directorate: Water Resource Classification
Tshifhiwa Eunice Nmutudi	DWS - Compliance Monitoring
Fritz Bekker	Gariep Watch
Jurgens Basson	
Naderstaan	Naderstaan Boerdery
Andre Spangenberg	Groenheuwel Boerdery
Alwyn Dippenaar	Dippenaar Choice Fruit
Abraham Vermeulen	Raisins South Africa
Caiphus Zimise Ngubo	Department of Water and Sanitation (DWS)
Zelda van Dyk	Karsten Group
Mongezi Gxamza	Department of Water and Sanitation (DWS)
Janine Byleveld	Agri Northern Cape
Natasja Combrink	Orange River Cellars
Hardus du Toit	South African Pecan Nut Producers Association (SAPPA)
M.C Franken	Landbou
TP Ngilande	Department of Water and Sanitation: NC
HD Niemann	Landbou
JJ Louw Jaco	South African Pecan Nut Producers Association (SAPPA)
Frederil van Watt	Pepsico
BFB van Staden	Bouvleis
Mariza van Wyk	VDC Raisins
JP Beuce	VDC Raisins
Linandle Sibango	Department of Water and Sanitation: NC
Alexia Hlengani	Department of Water and Sanitation: Northern Cape Upington

Niel Maritz	NME Consulting
R Muofhe	Department of Water and Sanitation: Northern Cape Upington
Prosper Jacobs	Department of Water and Sanitation: UPT
GJJ van Niekerk	Marchand LV
Jan Makhetha	Department of Water and Sanitation
AJ van Schalkwyk	SAAFWUA
HL du Toit	ORWUA
David van der Merwe	Raisins SA
Alvin Archer	A Archer
Jonathan Schroder	JHS Water, Study Team
Retha Stassen	JMM Stassen, Study Team
Karen Eatwell	Prime Africa Consulting, Study Team
Priya Moodley	WSP, Study Team
Lee Boyd	WSP, Study Team
SWB Engelbrecht	Oange River LU
P Hanekom	Keimoes WUA
W van Aarde	Karsten Group
Lindiwe Emily Sithole	DWS
Shaun Dark	Trawal Fresh Fruit
Morne Steenkamp	Southern Cross Marketing & Management
Luckson Machingambi	DWS: Water Resources Planning
Kotze Chantelle	Raisins SA
Lester Bradwin	Terrain
Siboniso Mkhalihi	DWS
Kobus Nel	Nel & Vennote
Cameron Ogden	Société Générale de Surveillance SA (SGS)
Zelda van Dyk	Karsten Boerdery
Marda de Kock	AM Fresh
Hendrick Louw	Northern Cape Department of Economic Development and Tourism
Wynand Cillie	CD Group
Thandi Mopai	DWS
Frederik van der Walt	Pepsico
Kobus Luttig	
Mehari Frezghi	DWS: Water Resource Management Plannin
Ferdie Botha	VDCG
Bheki Cele	DWS
Wilco	
GH Nel	
Hannes Koortzen	
Cobus van Rensburg	The South African Pecan Nut Producers Association
JJ Van der Linde	

DETERMINATION OF WATER RESOURCE CLASSES AND RESOURCE QUALITY OBJECTIVES IN THE LOWER ORANGE RIVER CATCHMENT (WP11422)

AGRICULTURAL SECTOR MEETING NO. 02
Protea Hotel, Upington

Presented by: Mohlapa Sekoele
Designation: Scientist (DWS Project Manager)
Directorate: Water Resource Classification
Date: 14 October 2025

WATER IS LIFE - SANITATION IS DIGNITY



water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA



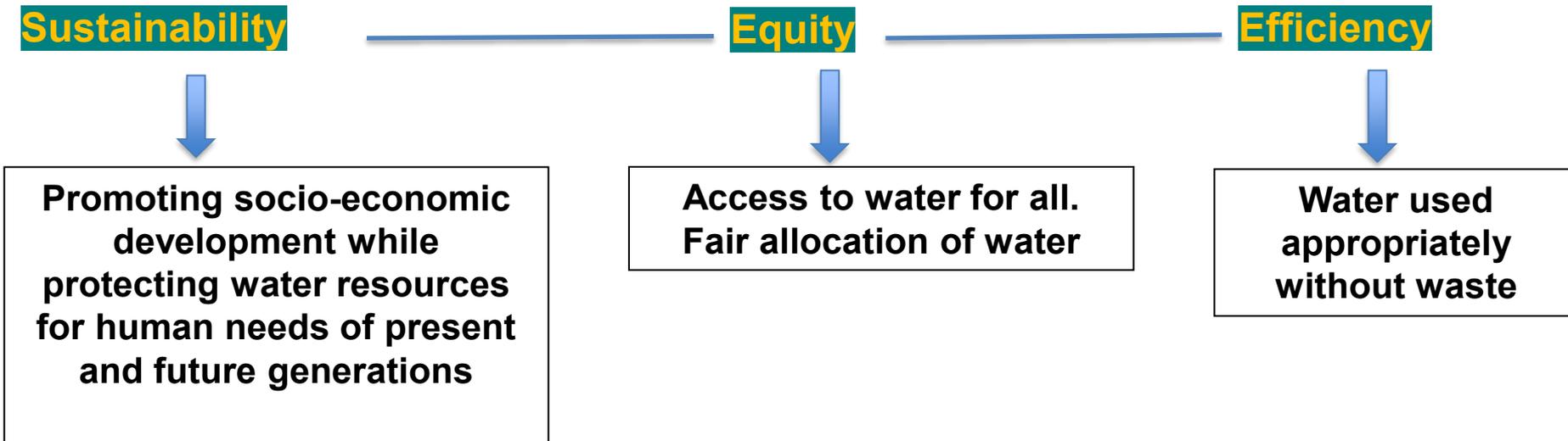
PRESENTATION OUTLINE

1. Introduction
2. Protection of Water Resources
3. RDM Legal Mandate
4. Water Resource Classes
5. Resource Quality Objectives
6. Study Focus
7. Overall Classes and RQOs Process
8. Implications of setting Resource Directed Measures
9. Stakeholder Engagement

1. INTRODUCTION

The National Water Act 1998, (Act 36 of 1998) (NWA)

Purpose: Ensure that nation's water resources are **Protected**; Used; Controlled; Managed; Conserved; Developed - within guiding Principles of:

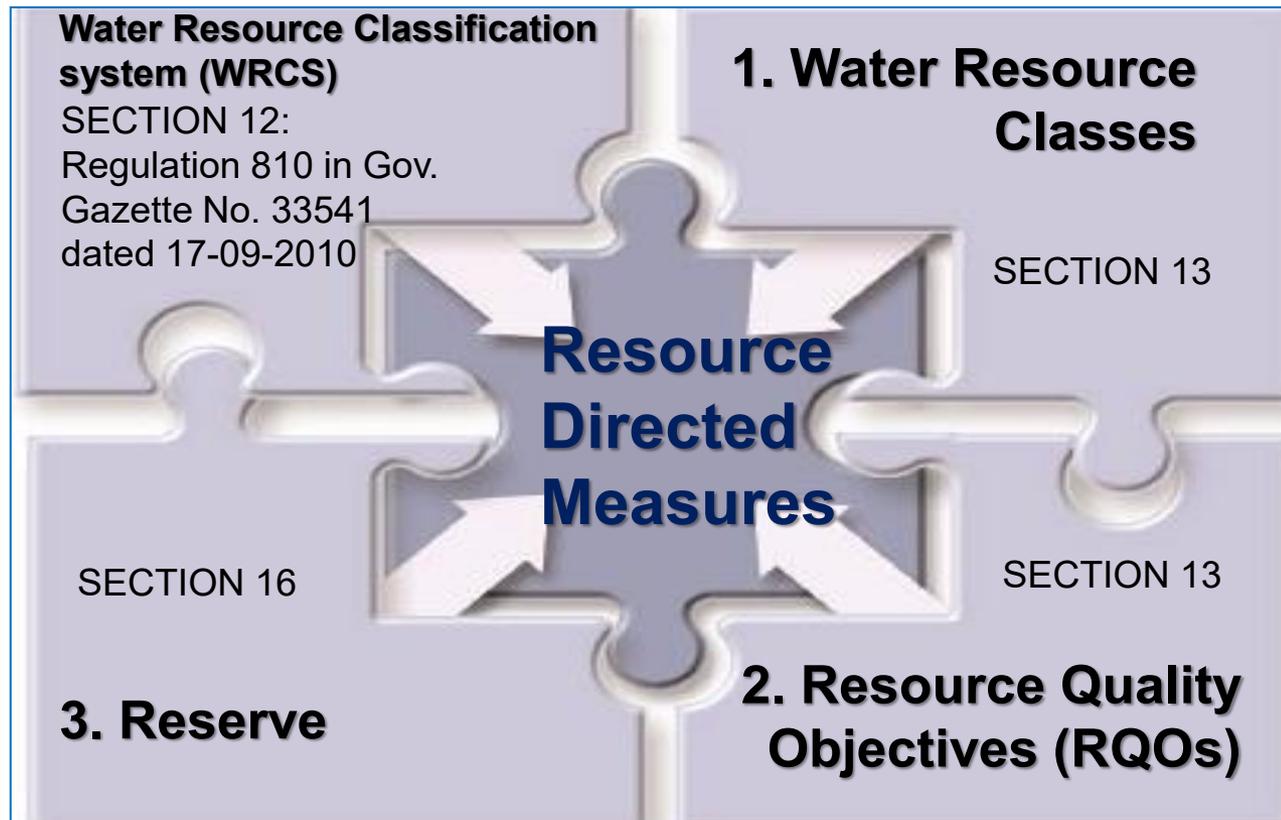


2. PROTECTION OF WATER RESOURCES

- DWS implements the protection of water resources through NWA and other tools
- **Chapter 2:** Water Management Strategies
 - Catchment Management Strategies “must take into account the class, RQOs, Reserve” (*Sec 9(a)*)
 - The National Water Resource Strategy III has strategic objectives. E.g., *Strategic Objective 12.4.1*: To ensure sustainable management of water resources through Resource Directed Measures (RDM) and Source Directed Controls (SDC)
- **Chapter 3:** provides for the protection of water resources through the implementation of:
 - Resource Directed Measures (RDM) (*Part 1, 2 & 3*)
 - Measures for Pollution Prevention (*Part 4*)
- **Chapter 4:** Regulating water use
- **Chapter 14:** Monitoring water resources, including monitoring to assess compliance to Resource Quality Objectives
- **Chapter 16:** Compliance to water use
- Sustainable Development Goals: SDG 6

3. LEGAL MANDATE RELATED TO RESOURCE DIRECTED MEASURES:

National Water Act 1998, (Act 36 of 1998) Chapter 3



5. WHAT IS A WATER RESOURCE CLASS?

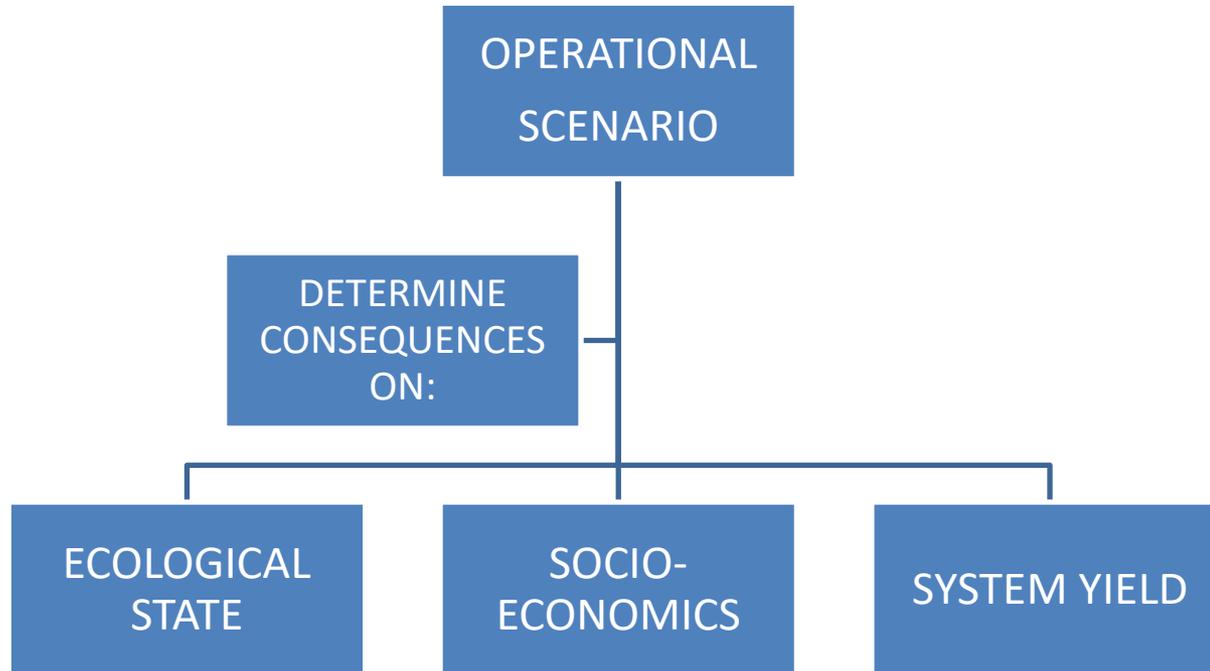
- A water resource class:
 - describes what state/condition the water resource should be in;
 - facilitates the balance between **protection** and **use** of the water resources;
 - is defined by taking into account the social, economic & ecological landscape.

Classes	Description of use	Majority of ecological categories
Class I	Minimally used	A & B
Class II	Moderately used	C
Class III	Heavily used	D

Ecological Category (EC) – represents the health of a water resource . It is measured by determining how much the resource has changed from natural condition. The scale is A (near natural) to F (critically modified)

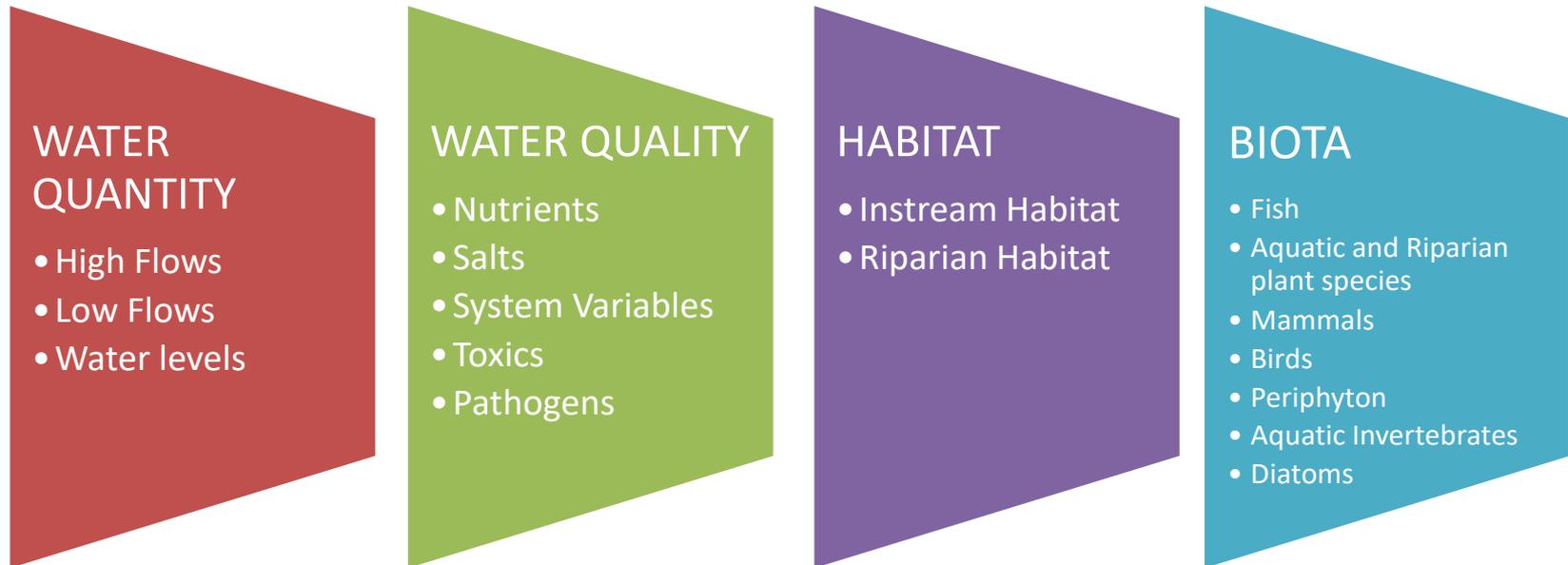
APPROACH TO DETERMINING WATER RESOURCE CLASSES

- Classes are recommended based on evaluated operational scenarios (Step 4 of the process)
- Scenarios in the context of water resource management and planning are plausible definitions (settings) of all the factors (variables) that influence the water balance and water quality in a catchment and the system as a whole.



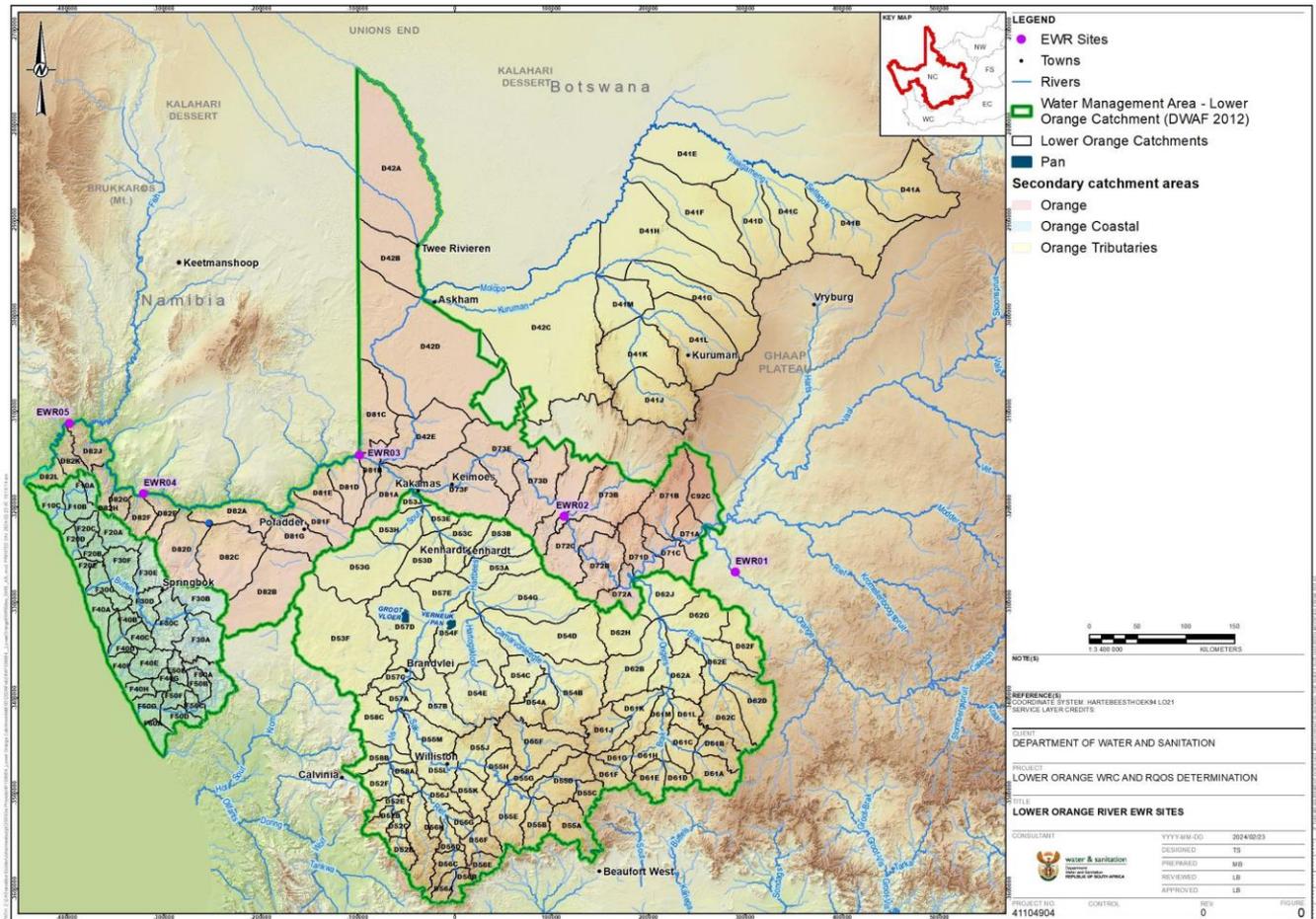
6. WHAT ARE RESOURCE QUALITY OBJECTIVES

- RQOs are numeric or descriptive statements of conditions which should be met in the receiving water resource.
- RQOs provide measurable goals that give direction as to how the resources need to be managed.
- They provide for the following for rivers, wetlands, groundwater and estuaries:



7. STUDY FOCUS: LOWER ORANGE CATCHMENT

- The project started in September 2023 and will be ending in September 2026
- The study objective is to determine water resource **classes** and Resource Quality Objectives (**RQOs**) in the Lower Orange.
- WSP group Africa (PTY) LTD was appointed as the PSP to assist DWS with the study.
- The determined classes and RQOs will be gazetted once approved by the Minister.



4. CLASSIFICATION AND DETERMINATION OF RQOs PROCESS

In accordance with the Classification and RQOs guidelines

1	Describe the status quo and delineate the study area into Integrated Units of Analysis (IUAs)
2	Delineate and prioritise Resource Units (RUs) and select study sites
3	Quantify the Ecological Water Requirements (EWRs)
4	Identify and evaluate scenarios within the IWRM process
5	Determine Water Resource Classes based on catchment configurations
6	Determine RQOs
7	Gazette Water Resource Classes and RQOs



Stakeholder Engagement

We are here

8. IMPLICATIONS OF SETTING CLASSES, RQOs & RESERVE

- Once the Class is set, Reserve & RQOs in place, it is binding on all authorities or institutions when exercising any power or performing any duty under the NWA.
- The implementation of Gazetted Class, Reserve & RQOs may necessitate the Department to, where necessary,:
 - Decline new water use authorisations
 - Revise General Authorisations,
 - Update Discharge Standards,
 - Initiate Compulsory licensing,
 - Update Monitoring Programmes

RESOURCE-DIRECTED MEASURES AND SOURCE-DIRECTED CONTROLS

They work together to protect water resources

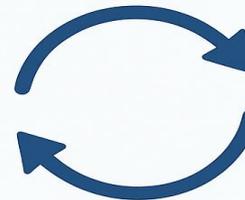
RESOURCE-DIRECTED MEASURES (RDMs)

Focus on the resource itself



Define the desired condition or health of the resource

- Classification
- Reserve
- Resource Quality Objectives (RQOs)



SOURCE-DIRECTED CONTROLS (SDCs)

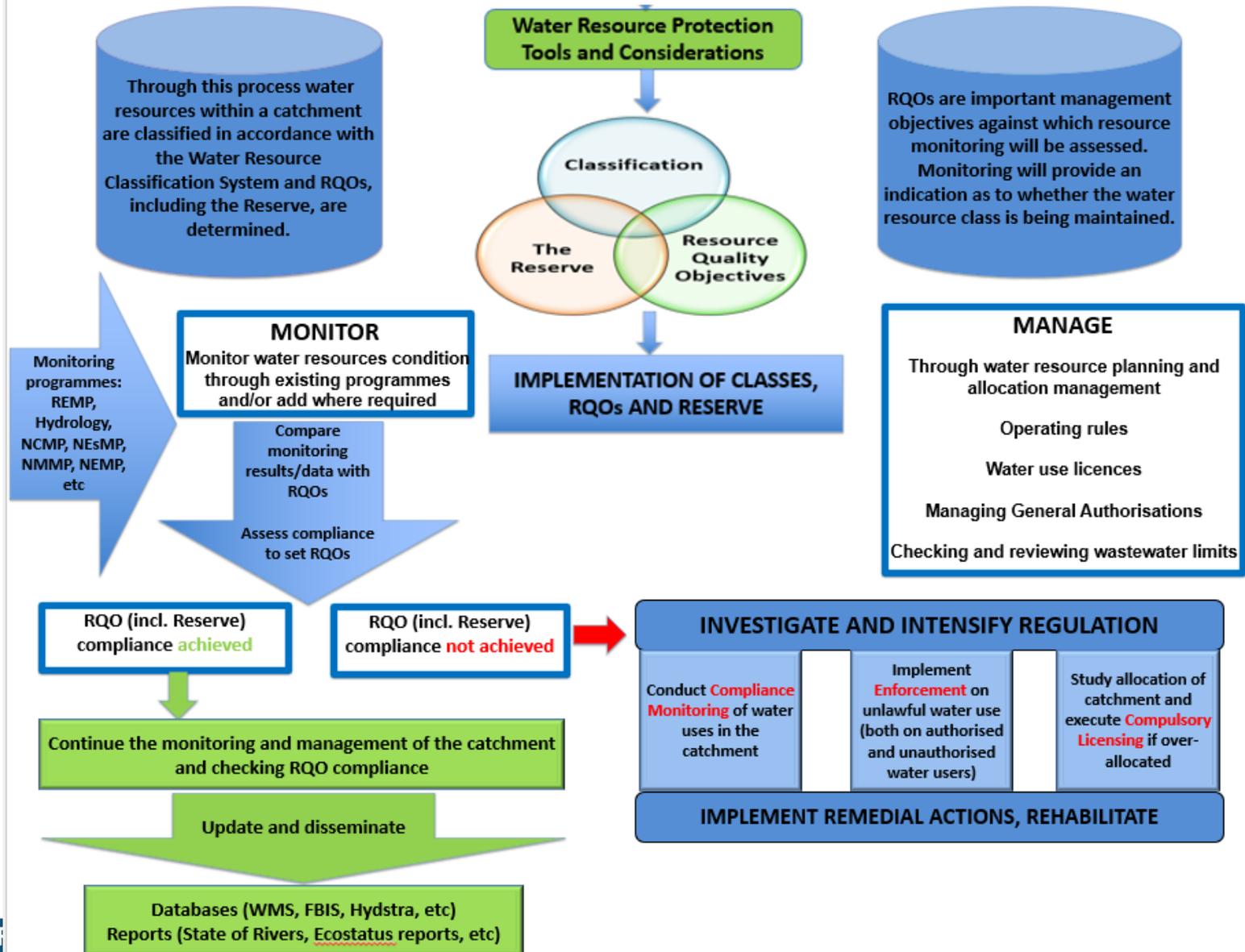
Focus on the activities that use or pollute water



Control how humans impact the resource

- Licensing
- Standards
- Compliance monitoring & enforcement

RESOURCE DIRECTED MEASURES WITHIN CATCHMENT MANAGEMENT



9. STAKEHOLDER ENGAGEMENT

Platform	Purpose	Proposed date	Status
Public Meeting	To introduce the study Invite nominations from stakeholders to serve as PSC members	21 May 2024 (Springbok) 22 May 2024 (Upington)	Completed
	To present the proposed classes & RQOs	Apr 2026	
PSC Meeting	Water Resources Information and gap analysis Status quo and IUAs Linking the value and condition of water resources	25 Jul 2024	Completed
	Resource Units prioritization and sites selection	06 Nov 2024	Completed
	Scenarios, Consequences	06 May 2025	Completed
	Sub-components, indicators, Draft RQOs and numerical limits	18 Nov 2025 (online)	
	Gazette template	18 Feb 2026 (online)	
TTG Meeting	Water quality catchment situation, monitoring and current and future management	10 Oct 2024 (Upington, hybrid)	Completed
	Sub-components prioritisation	02-03 June 2025 (Upington)	Completed
Sector Meeting	Determine what may need to be considered for classification from the Agriculture Sector perspective	09 Oct 2024 (Kakamas)	Completed
	Address concerns raised by stakeholders on proposed classes	14 Oct 2025 (Upington)	<i>This meeting</i>
Workshop	RQOs and numerical limits	28-30 Oct 2025 (Upington/Springbok)	

CONTACT INFORMATION

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<https://www.dws.gov.za/WEM/WRCS/lo.aspx>

THANK YOU!!



DETERMINATION OF WATER RESOURCE CLASSES AND ASSOCIATED RESOURCE QUALITY OBJECTIVES IN THE LOWER ORANGE CATCHMENT, WP 11438

Sector Meeting – Agriculture

Presented by: Priya Moodley, Jonathan Schroder, Retha Stassen, Karen Eatwell
Designation: PSP
Directorate: for Chief Directorate Water Ecosystems Management

Date: 14 October 2025, Protea Hotel. Upington

WATER IS LIFE - SANITATION IS DIGNITY

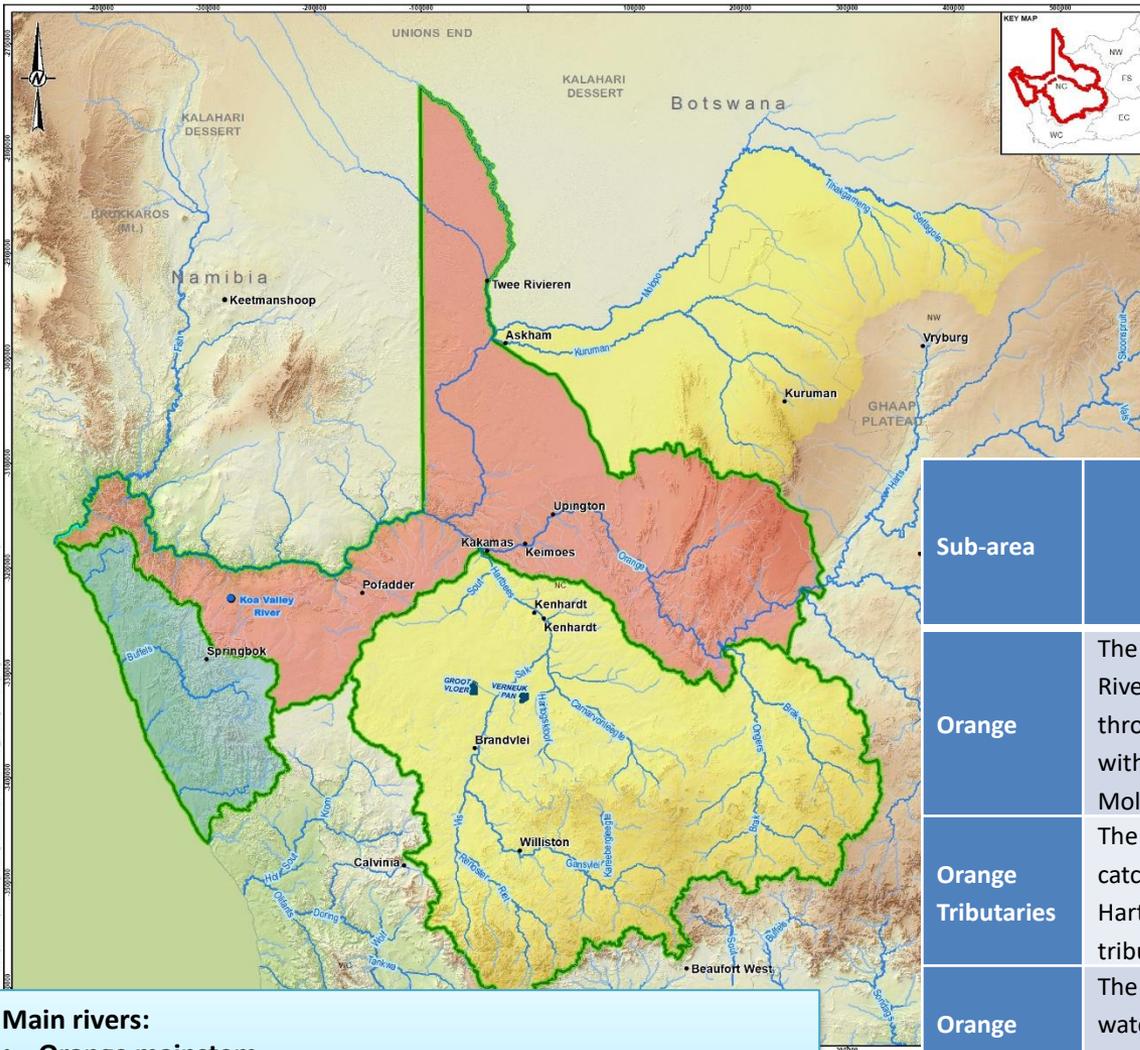


water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA



Catchment Boundaries and drainage areas



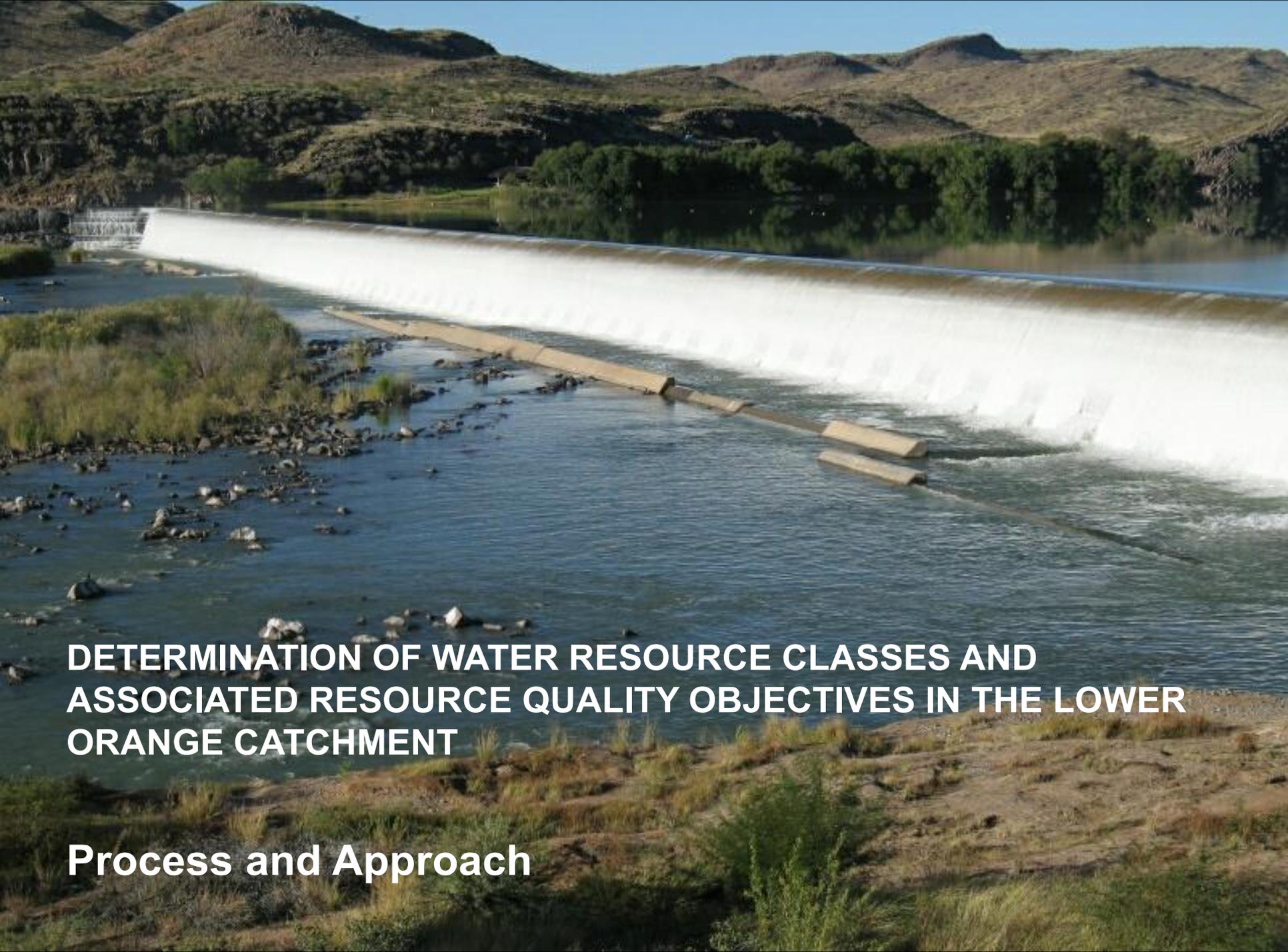
Orange River

Lower D drainage region comprising of the secondary drainage regions D4 to D8

F catchment (exclusions)

Sub-area	Description	Tertiary drainage regions	Catchment area ⁽¹⁾ (km ²)
Orange	The catchment of the lower Orange River over the whole of its length through the catchment, together with minor tributaries of Fish and Molopo.	D41, D42, D7, D8 and C92	165 002
Orange Tributaries	The catchment of comprising the catchments of the Ongers and Hartbees Rivers and of smaller tributaries of Sak and Brak.	D50 and D60	121 976
Orange Coastal	The catchment of the mostly dry water courses which lead directly to the ocean (includes the smaller estuaries)	F10, F20, F30, F40, F50 and F60A	26 405

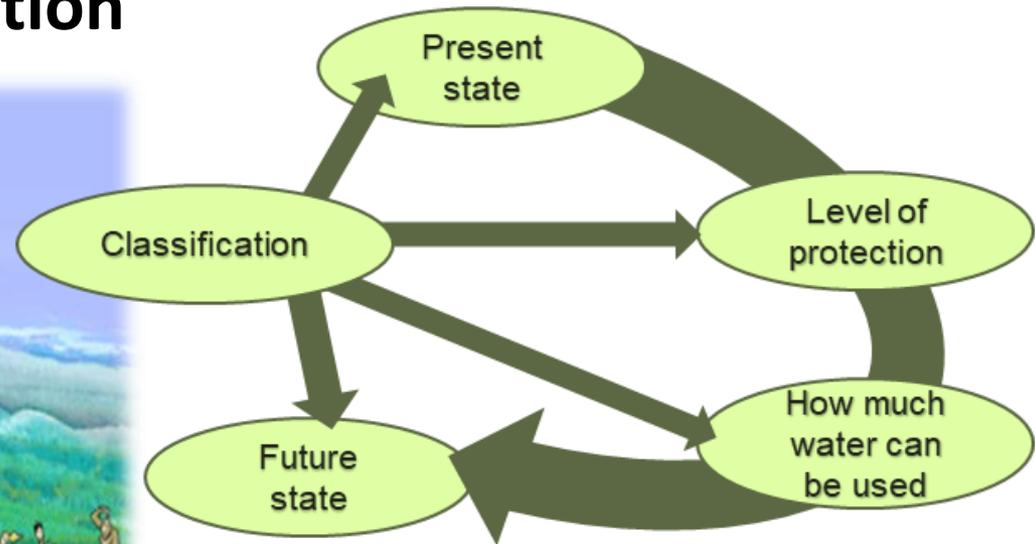
- Main rivers:**
- Orange mainstem
 - Vaal and Upper Orange – main tributaries
 - Ongers, Sak, Hartbees, Brak
 - Molopo and Nossob, Kuruman Rivers.
 - Fish River draining the southern part of Namibia



DETERMINATION OF WATER RESOURCE CLASSES AND ASSOCIATED RESOURCE QUALITY OBJECTIVES IN THE LOWER ORANGE CATCHMENT

Process and Approach

Water Resource Classification



Each class represents:

- a different **level of protection** that is required for the water resource, and the extent to which the water can be used.

Classification is used in two ways:

- To define the **present status** of the water resource
- To define the state towards which the water resource needs **to be managed** sustainably (**future state**).

The process requires a wide range of trade-offs to be evaluated at a number of scales.

Proposed water resource classes

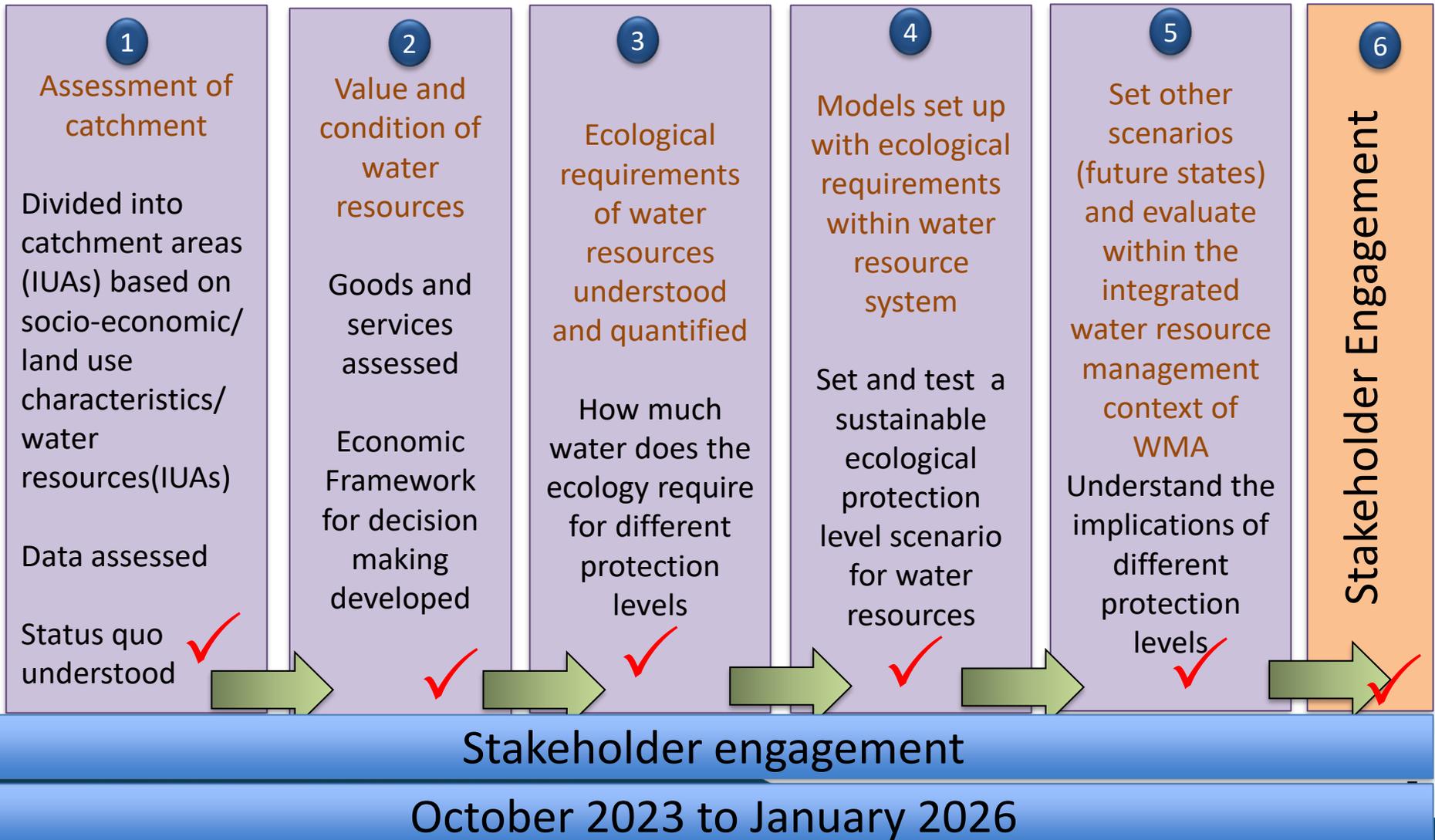
- The aspects considered include:
 - The quantity of water to meet present & future demands & ecologically healthy river system;
 - Identifying sources of this water/system yields (Reconciliation of supply and availability)
 - Where to maintain/make improvements in the system (flow, habitat, biota, quality)
 - Prevent any further degradation

Classification of the Water Resources

- Current and future use (where we want to be) - Planning/development information (reconciliation strategies); ecological condition, conservation targets)
- Socio-economic assessment of the use of water
 - Benefits to the communities - livelihoods
 - Commercial benefits; Employment
- Extent of Goods and services obtained from the river system
- Condition of the water resource (biota, quality, habitat)
- Integrated Upper and Lower Orange catchment

STUDY PROCESS: WHAT HAS BEEN DONE?

In accordance with the classification guidelines: 7 step process applies



Reports distributed for comment

- Scenarios, Consequences and Water Resource Classes Report – April 2025
- Draft Resource Quality Objectives and Numerical Limits Report – August 2025

Reports distributed for comment

Concerns raised:

- “Trade-offs proposed, which will result in deficits in water supply for irrigation and ecological water requirements”
- “A downgraded Water Resource Class 3 is proposed for the lower Orange River,
 - inevitably leading to the lowering of Resource Quality Objectives that will not provide protection for water users against the many risks posed by poor water quality.

Address concerns and misunderstandings

DETERMINATION OF WATER RESOURCE CLASSES AND ASSOCIATED RESOURCE QUALITY OBJECTIVES IN THE LOWER ORANGE CATCHMENT CURRENT CONDITION



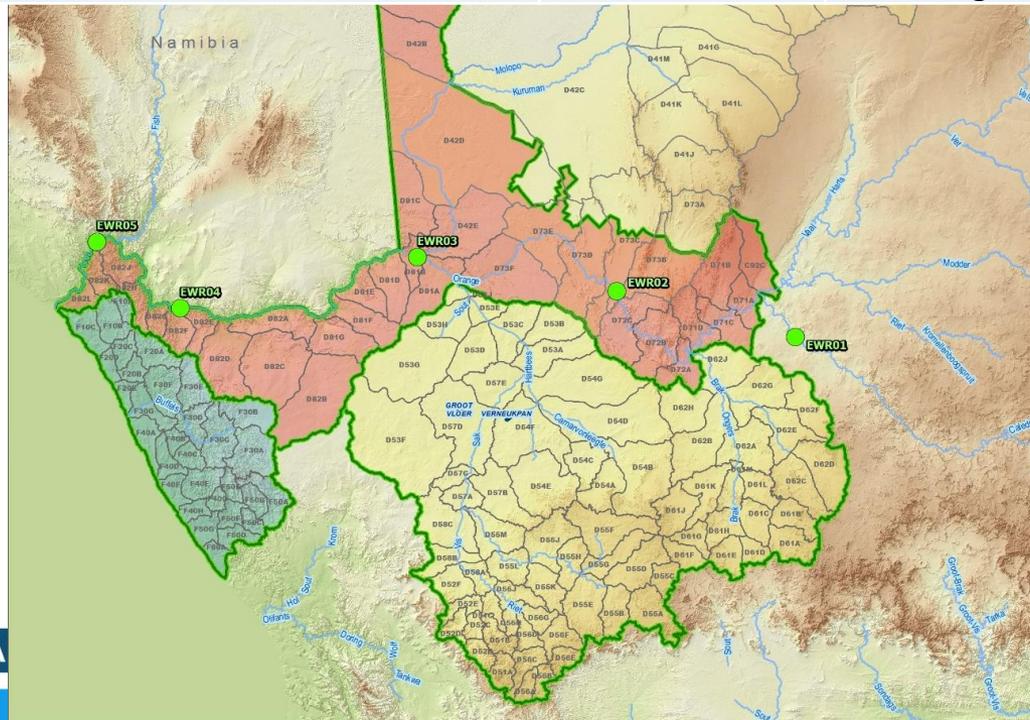
Ecological Character

- Important fish, habitat and biota present in defined reaches of the Orange river
- Orange river is a 'hardworking' river
- Significantly different character river – flow regulation, loss of seasonality
- Some challenges to balance the use and protection (specifically flow) – competing demands; heavily utilised system, water use in Lesotho, Vaal and Upper Orange
- A number of flow and non-flow impacts that are impacting on biodiversity, health and integrity

Ecological Water Requirement Sites (Orange Mainstem)

FLOW REQUIREMENTS DEFINED AT EACH SITE – to be met

	IUA	EWR site	River
1	Orange from Vaal confluence to Augrabies Waterfall	LO_EWR02	Orange @ Boegoeberg
2	Downstream Augrabies to Pella	LO_EWR03	Orange @ Augrabies (Blouputs)
3	Pella to Violsdrift weir	LO_EWR04	Orange @ Violsdrift
4	Downstream Violsdrift to Orange River Estuary	LO_EWR05	Orange @ Sendelingsdrift



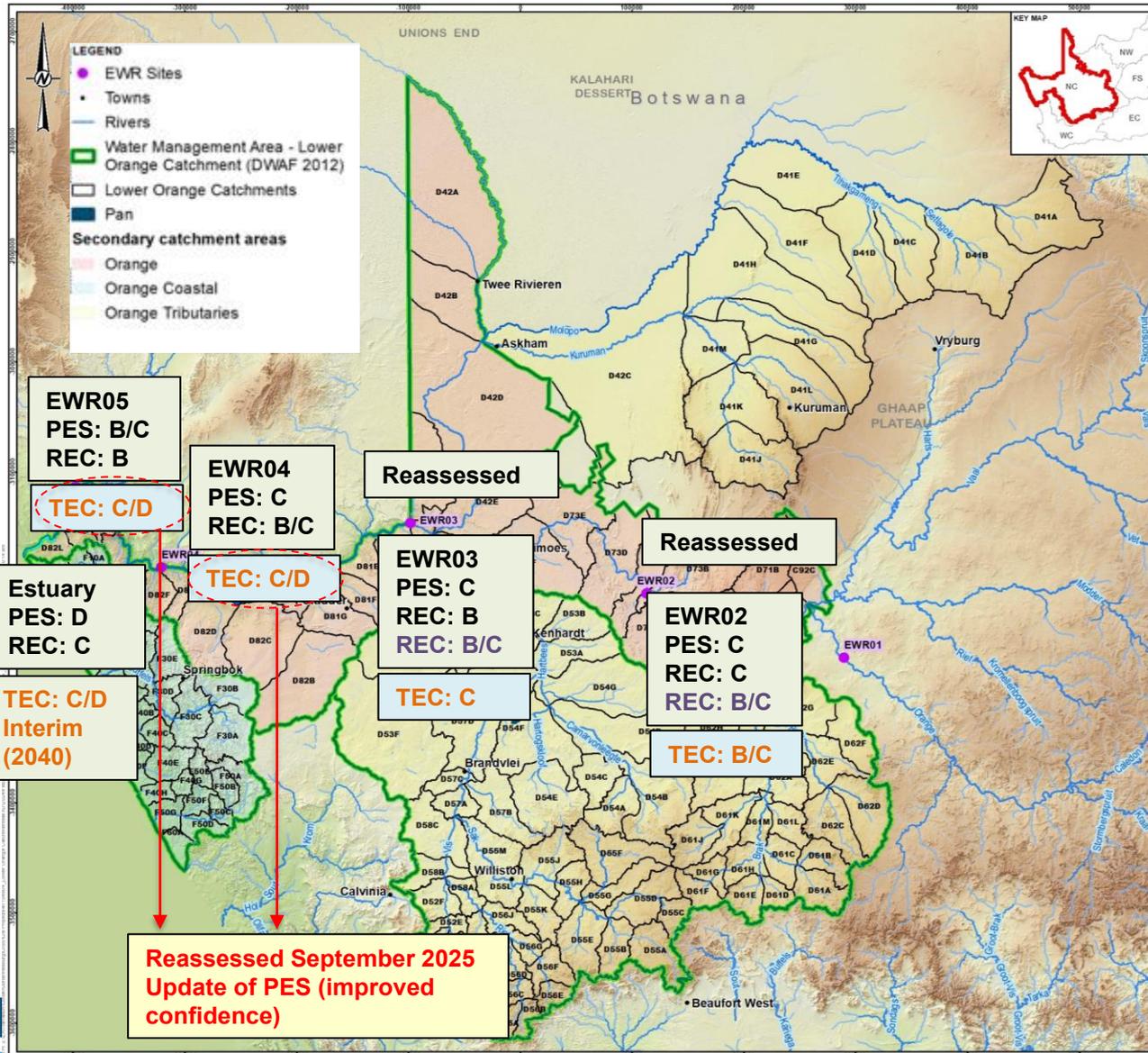
Ecological Water Requirements – Work Done (basis for Classification) (1)

- DWS Eco-classification methodology applied to assess ecological status
- An Intermediate Environmental study (ORASECOM, 2010), three sites:
 - Boegoeberg (EWR 02), Augrabies (EWR 03) and Vioolsdrift (EWR 04).
- Reserve Study by DWS in 2011 at these 3 sites
- Update/ review in 2016 – same sites and included an additional site on the Lower Orange at Sendelingsdrift (EWR 05).

Ecological Water Requirements – Work Done (basis for Classification) (2)

- This study:
 - team reviewed, quantified and updated requirements at Site EWR02 and EWR03 – November 2024
 - Previously in April 2025 Scenarios report –
 - Sites EWR04 and EWR05 – requirements were adopted as is (<5% change in flow) – included in scenario evaluation and proposed Target Ecological Categories for proposed classes
 - To improve confidence and confirm ecological status
 - Team re-surveyed re-assessed sites EWR04 and EWR05 – September 2025

Ecological categories recommended – April 2025

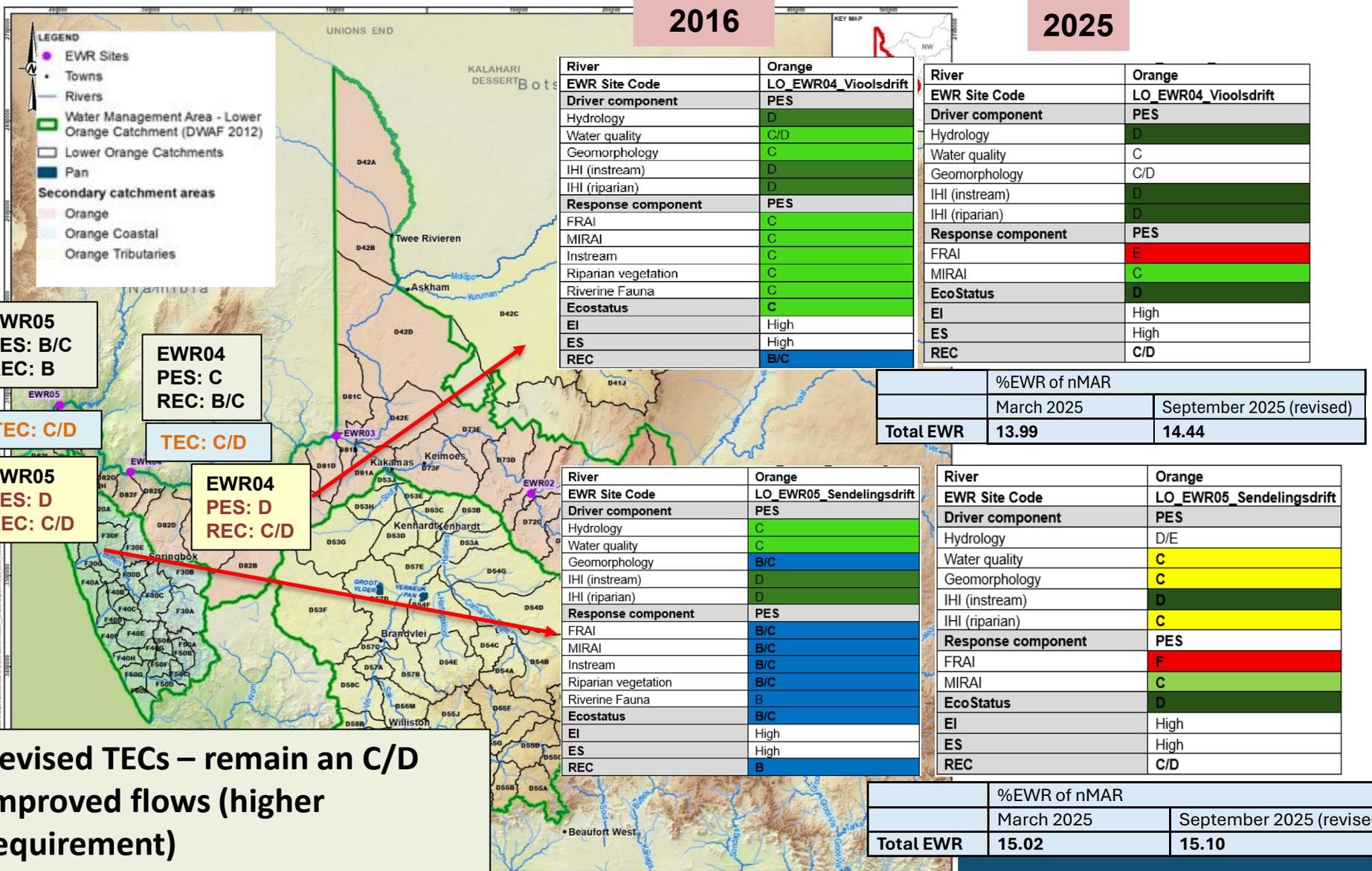


Proposed Target Ecological Category (TEC) – at EWR sites

Flow driven

Least socio-economic impact and ecological consequences (compromise)

Reassessment of Sites - EWR04 and EWR05 (September 2025)



2016

2025

River	Orange
EWR Site Code	LO_EWR04_Vioolsdrift
Driver component	PES
Hydrology	D
Water quality	C/D
Geomorphology	C
IHI (instream)	D
IHI (riparian)	D
Response component	PES
FRAI	C
MIRAI	C
Instream	C
Riparian vegetation	C
Riverine Fauna	C
Ecostatus	C
EI	High
ES	High
REC	B/C

River	Orange
EWR Site Code	LO_EWR04_Vioolsdrift
Driver component	PES
Hydrology	D
Water quality	C
Geomorphology	C/D
IHI (instream)	D
IHI (riparian)	D
Response component	PES
FRAI	E
MIRAI	C
EcoStatus	D
EI	High
ES	High
REC	C/D

	%EWR of nMAR	
	March 2025	September 2025 (revised)
Total EWR	13.99	14.44

River	Orange
EWR Site Code	LO_EWR05_Sendelingsdrift
Driver component	PES
Hydrology	C
Water quality	C
Geomorphology	B/C
IHI (instream)	D
IHI (riparian)	D
Response component	PES
FRAI	B/C
MIRAI	B/C
Instream	B/C
Riparian vegetation	B/C
Riverine Fauna	B
Ecostatus	B/C
EI	High
ES	High
REC	B

River	Orange
EWR Site Code	LO_EWR05_Sendelingsdrift
Driver component	PES
Hydrology	D/E
Water quality	C
Geomorphology	C
IHI (instream)	D
IHI (riparian)	C
Response component	PES
FRAI	F
MIRAI	C
EcoStatus	D
EI	High
ES	High
REC	C/D

	%EWR of nMAR	
	March 2025	September 2025 (revised)
Total EWR	15.02	15.10

EWR05
PES: B/C
REC: B

EWR04
PES: C
REC: B/C

TEC: C/D

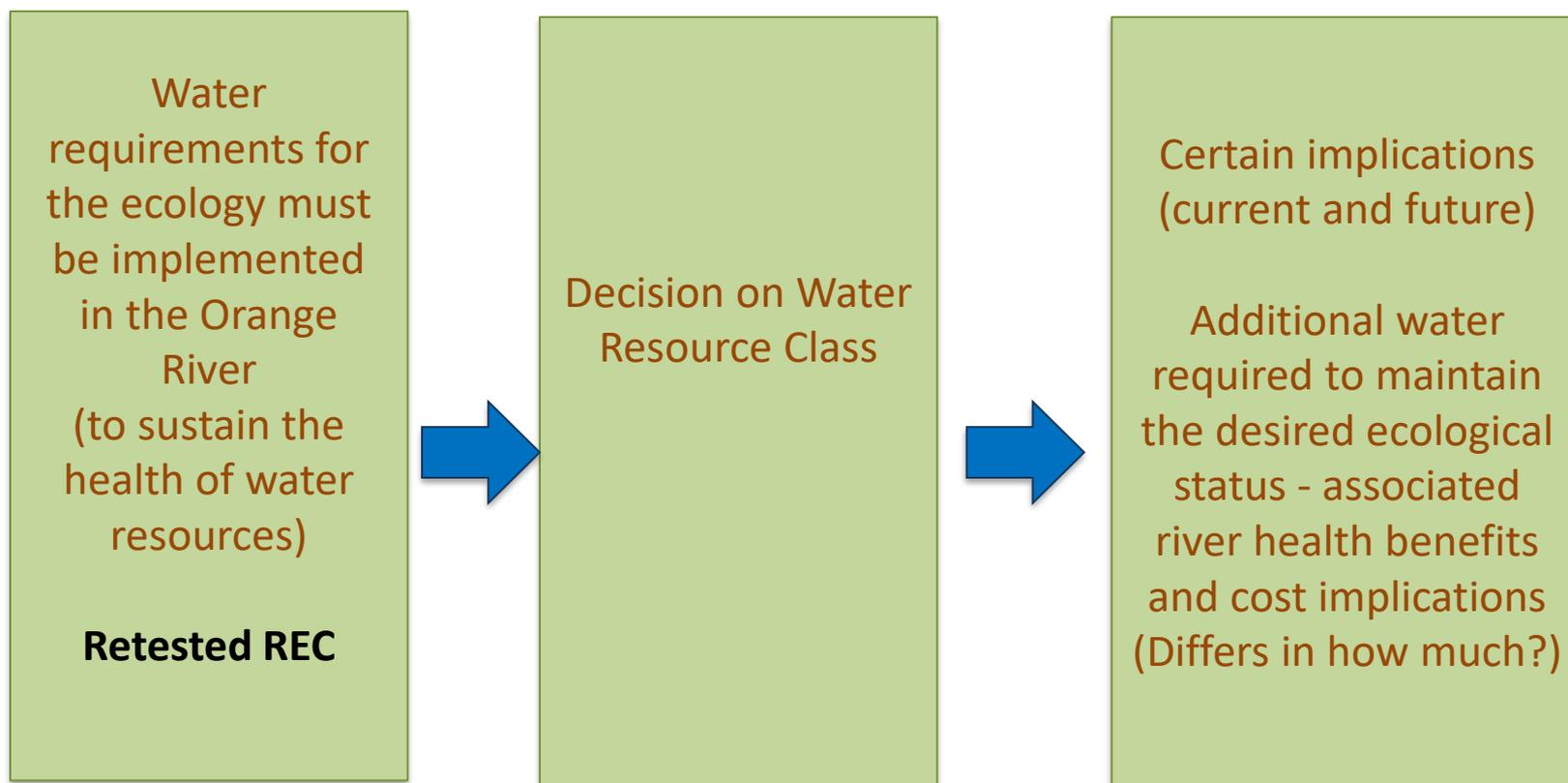
TEC: C/D

EWR05
PES: D
REC: C/D

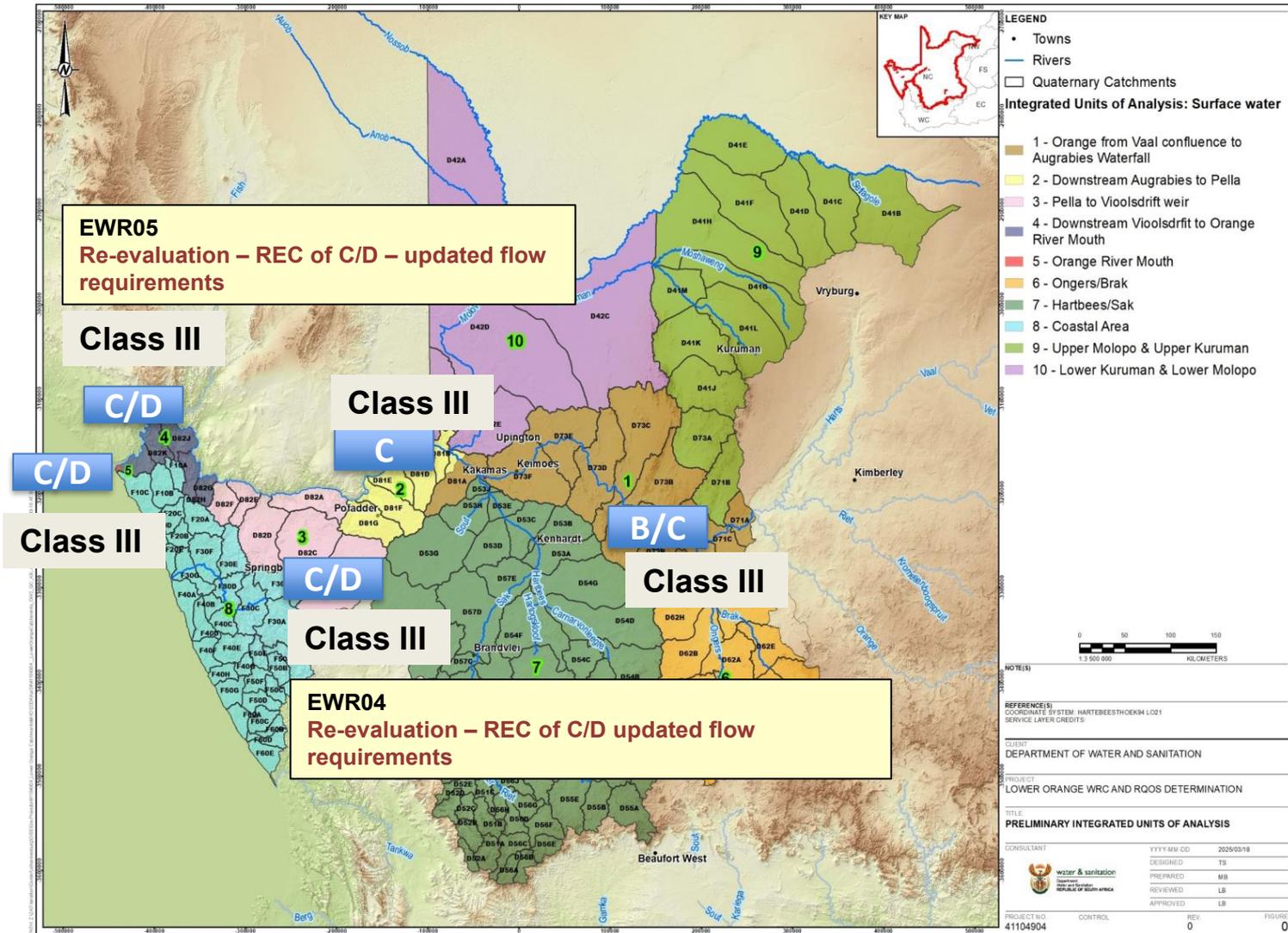
EWR04
PES: D
REC: C/D

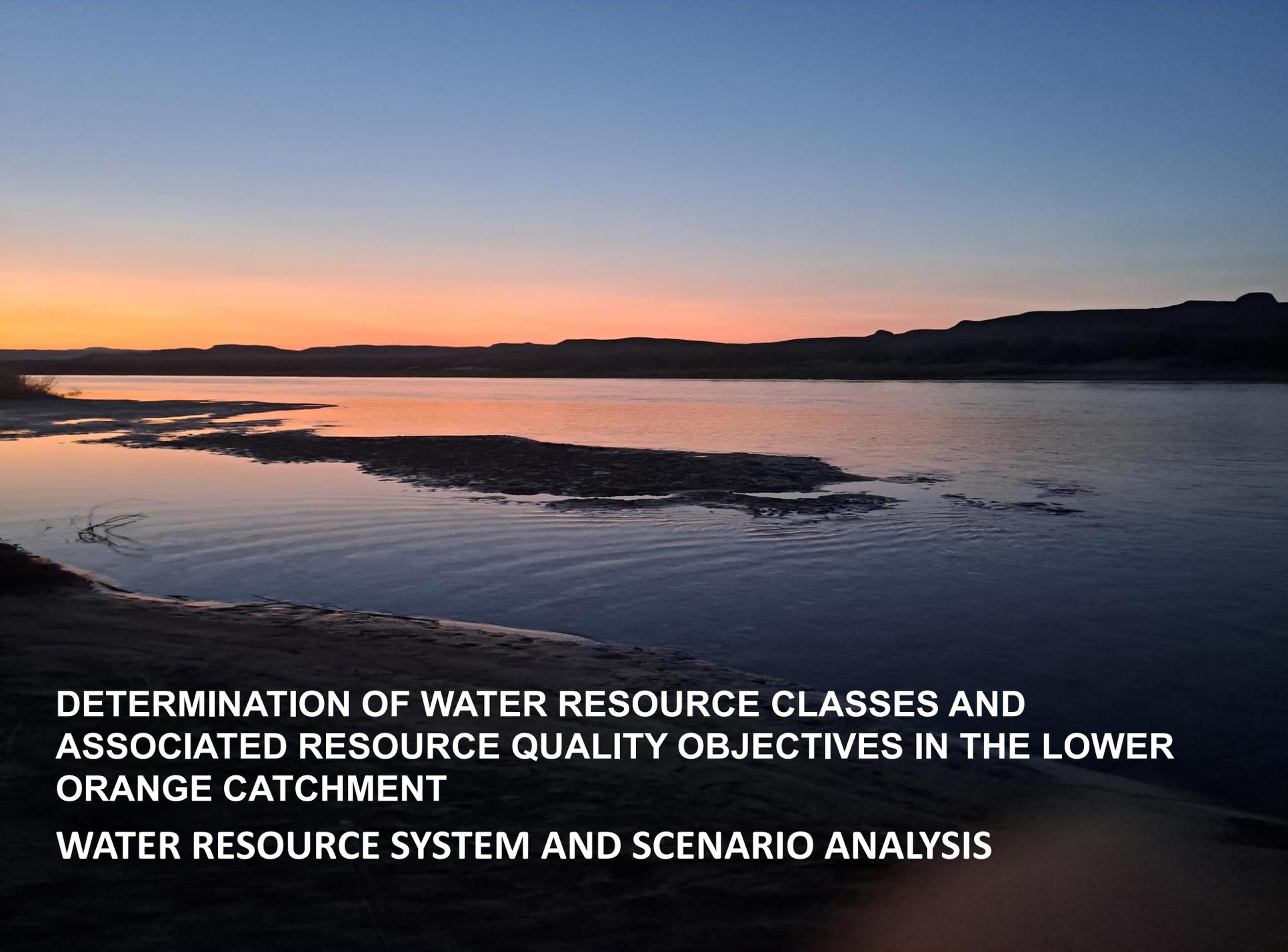
Revised TECs – remain an C/D
Improved flows (higher requirement)

Towards Setting water resource classes



RECOMMENDED TEC for IMPLEMENTATION and PROPOSED CLASSES





**DETERMINATION OF WATER RESOURCE CLASSES AND
ASSOCIATED RESOURCE QUALITY OBJECTIVES IN THE LOWER
ORANGE CATCHMENT**

WATER RESOURCE SYSTEM AND SCENARIO ANALYSIS

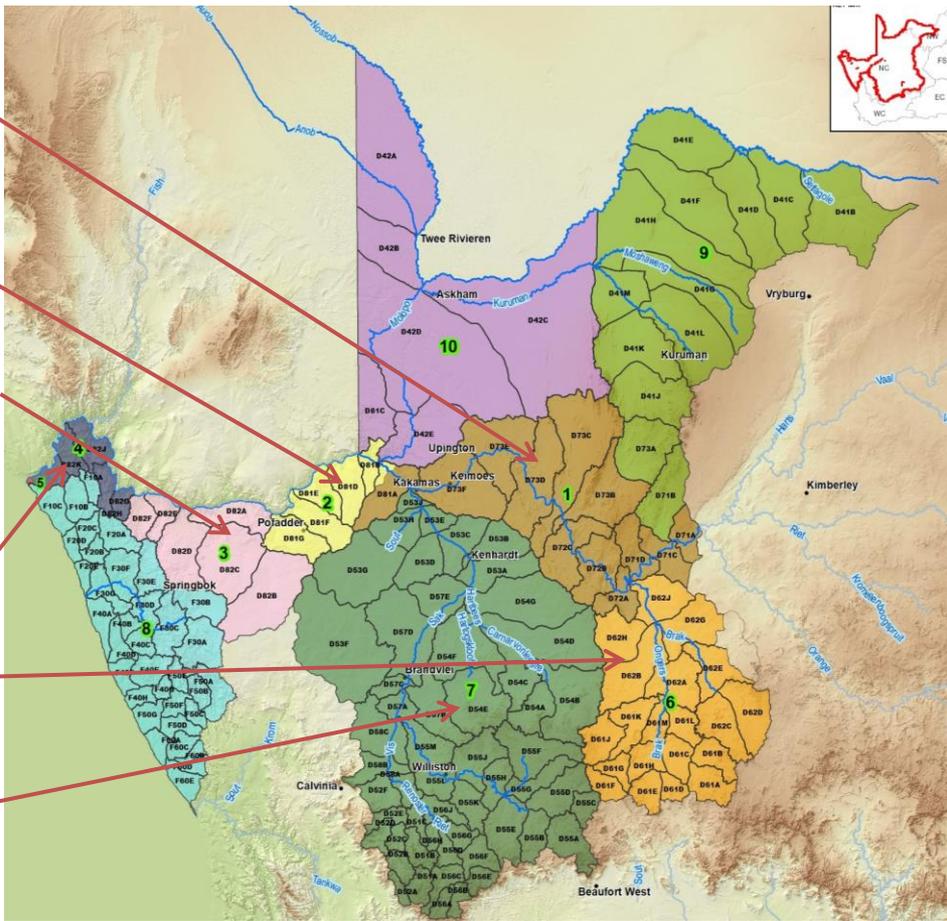
For the scenario evaluation undertaken in the Lower Orange is important to note that:

- Almost all of the water in Lower Orange comes from the Upper catchment, with no regulation available in the lower system.
- The Orange River System (Upper and Lower and associated catchments) is currently operated to achieve the maximum yield benefit of the system.
- The Water Resources Planning Model (WRPM) is applied to the water resource system analysis of the Orange River system for the assessment of a range of scenarios.

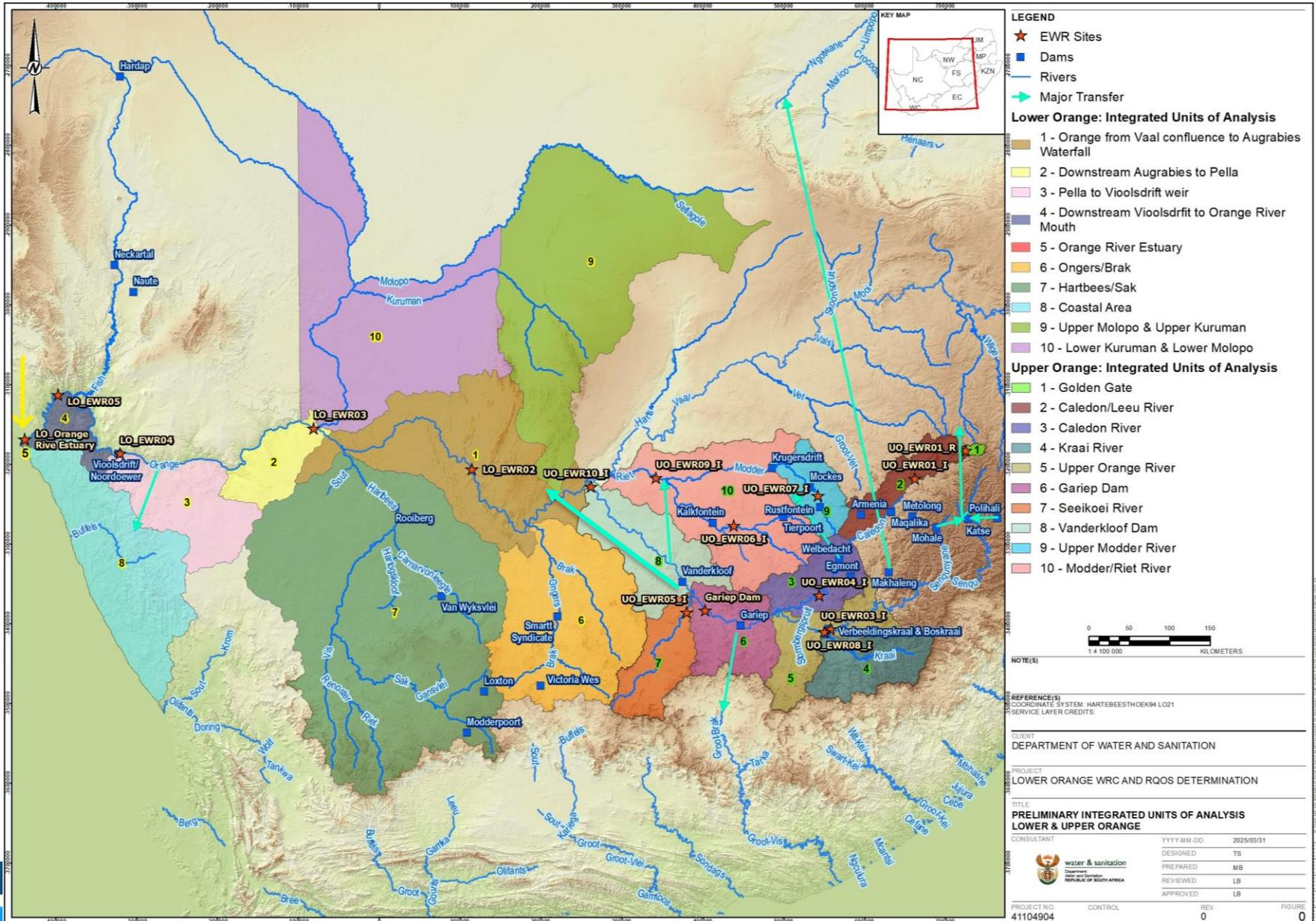
Surface Water Supply/Requirements in each IUA

Average annual water requirements (Million m³/a)

IUA	User Sector	Present	2040	2060
1	Irrigation	582.79	585.28	574.78
	Domestic	42.76	50.94	50.94
	Total	625.55	636.22	625.72
2	Irrigation	310.53	331.32	343.44
	Domestic and small mines	25.96	27.77	27.77
	Total	336.49	359.10	371.21
3	Irrigation	69.95	104.15	103.98
	Domestic	0.00	0.00	0.00
	Total	69.95	104.15	103.98
4	Irrigation	10.05	7.99	7.85
	Domestic and small mines	16.65	16.97	17.89
	Total	26.70	24.97	25.74
6	Irrigation	17.83	17.83	17.83
	Domestic	0.00	0.00	0.00
	Total	17.83	17.83	17.83
7	Irrigation	17.55	17.59	17.59
	Domestic	0.00	0.00	0.00
	Total	17.55	17.59	17.59
Lower Orange Total		1094.07	1159.85	1162.07
System total		2265.35	2398.18	2464.44



System Planning Analysis: System dependencies/linkages



System Planning Analysis

3 Development time slices

- Present-Day development with and without EWR supply.
- 2040 Development with and without EWR supply; and
- 2060 Development with and without EWR supply.

Development levels

- **Scenario 0:** Natural catchment state.
- **Scenario 1:** Present day catchment state, based on recent studies on the catchment conditions and development levels.
- **Scenario 2:** Medium term with water requirements projected for approximately the year 2040. Associated infrastructure developments will be required to increase water supply potential for the projected growing water requirements.
- **Scenario 3:** Long term with water requirements projected for approximately the year 2060. Additional interventions will be required to meet the water requirements for the longer-term projection horizon.

System Planning Analysis

The large dam options are based on existing planning as part of the Reconciliation Strategy (DWS, 2015), and the ORASECOM Core Scenario Report (ORASECOM, 2020):

- Polihali Dam as part of the Lesotho Highlands Water Project (LHWP) Phase 2.
- Noordoewer / Vioolsdrift Dam (NVD) on the Lower Orange.
- Verbeeldingskraal Dam on the Upper Orange (above Gariep Dam).
- Boskraai Dam on the Kraai River
- The Raising of Gariep Dam
- Makhaleng Dam on the Makhaleng River in Lesotho

Polihali Dam has been designed and is proceeding into implementation.

Options for other future infrastructure are still being finalised.

As such, there are different sizes, or combinations of infrastructure options possible. These possible alternatives have been included in the scenarios with the goal to capture the ranging ecological and socio-economic impacts and consequences.

System Planning Analysis

Summary of Planning Scenarios Tested with REC

Scenario number	Scenario Name	Time slice / dev. level	Interventions included	Operations
0	Natural	N/A	none	
1a	Present day <u>without</u> EWRs	2020	As per present day (excl. LHWP2).	Supply to users prioritised
1b	Present day <u>with</u> EWRs	2020	As per present day (excl. LHWP2)	EWR prioritised
2a	Medium term <u>without</u> EWRs	2040	LHWP2-Poliwali, Vioolsdrift (size option 2 – 700 million m ³), Gariep to Bloem pipeline	Supply to users prioritised
2b	Medium term <u>with</u> EWRs	2040	LHWP2-Poliwali, Vioolsdrift (size option 2 – 700 million m³), Gariep to Bloem pipeline	EWR prioritised
2.1a	Medium term alternative <u>without</u> EWRs	2040	LHWP2-Poliwali, Vioolsdrift (size option 3 – 2800 million m ³), Gariep to Bloem pipeline	Supply to users prioritised
2.1b	Medium term alternative <u>with</u> EWR	2040	LHWP2-Poliwali, Vioolsdrift (size option 3 -2800 million m ³), Gariep to Bloem pipeline	EWR prioritised
3a	Long term <u>without</u> EWRs	2060	LHWP2-Poliwali, Vioolsdrift (size option 2), Gariep to Bloem pipeline, with Verbeeldingskraal,	Supply to users prioritised
3b	Long term <u>with</u> EWRs	2060	LHWP2-Poliwali, Vioolsdrift (size option 2), Gariep to Bloem pipeline, with Verbeeldingskraal	EWR prioritised
3.1b	Long term alternative 1 <u>with</u> EWRs	2060	LHWP2-Poliwali, Vioolsdrift (Size option 2), Gariep to Bloem pipeline, Verbeeldingskraal and Makhaleng Dam	EWR prioritised
3.2a	Long term alternative 1 <u>without</u> EWRs	2060	LHWP2-Poliwali, Vioolsdrift (Size option 1), Gariep to Bloem pipeline, Boskraai Dam and Makhaleng Dam	Supply to users prioritised
3.2b	Long term alternative 1 <u>with</u> EWRs	2060	LHWP2-Poliwali, Vioolsdrift (Size option 1), Gariep to Bloem pipeline, Boskraai Dam and Makhaleng Dam	EWR prioritised

Recommended medium term - retested

Recommended long term - retested

System Planning Analysis

Results of Water Supply Potential with EWR included

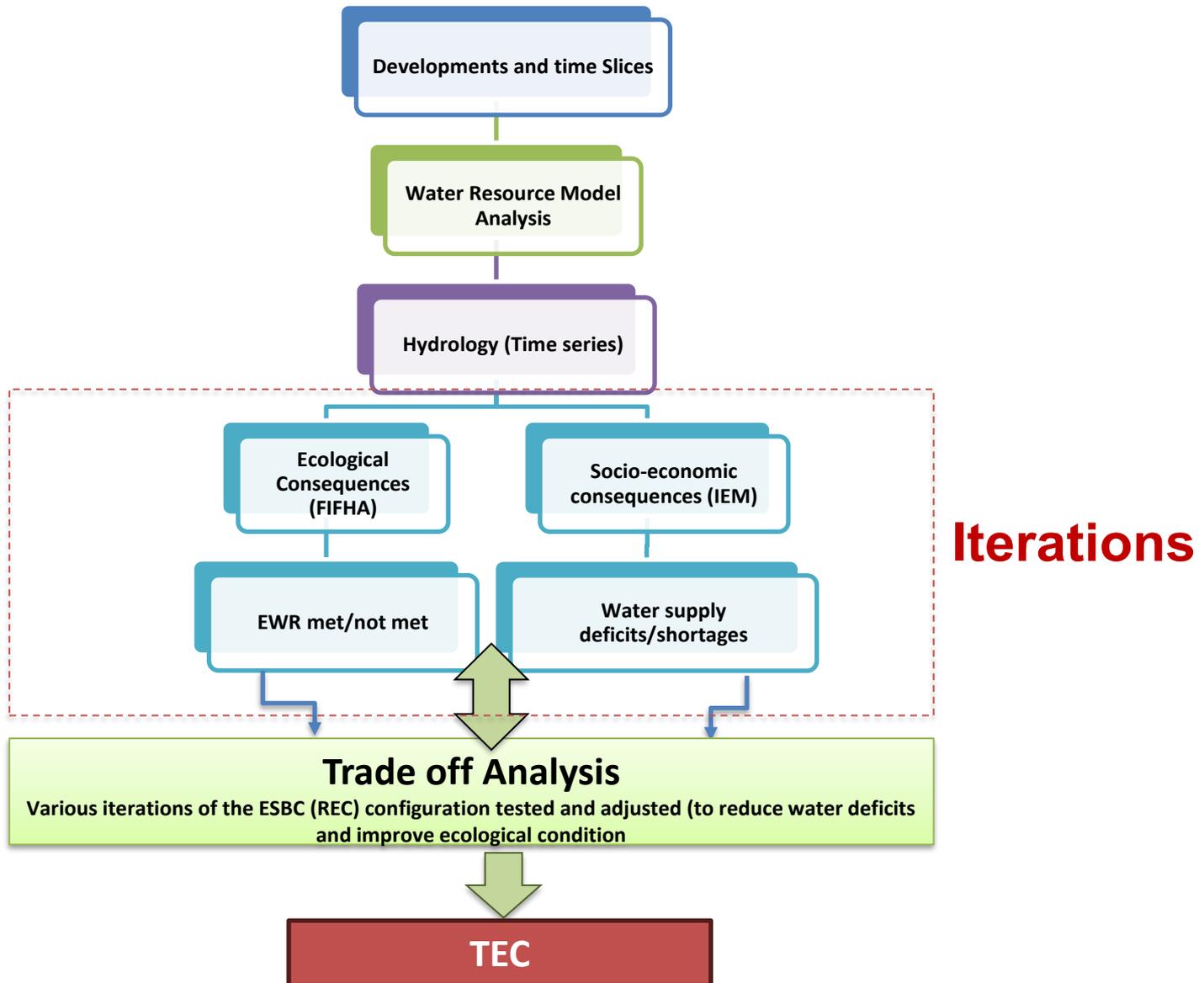
- Some areas of the Upper and Lower Orange catchments are projected to be in a deficit.
- Scenario analysis in the model were set up **to prioritise the EWRs** and thus the impacts of water shortages in the system are realised as supply shortages on other users (specifically irrigation).
- Some IUAs are impacted, and some are even projected to have shortages **without EWRs** implemented in the future.
- The Orange River catchment requires a **combination of review and trade-offs between the EWRs and the water supply requirements**, and the urgent implementation of the water resources developments as planned.

System Planning Analysis

Results of Water Supply Potential with EWR included

- The Orange River system , which is operated in an **integrated manner as a system**, water is currently **released from the Upper Orange dams**, to supply users in the Lower Orange main stem. This same applies to meet and comply with EWRs in the Lower Orange catchment.
- Thus, the **consequences of EWR implementation often extends beyond the IUA** in which they are located, and the cumulative impact on water supply potential had to be considered for linked IUAs upstream. The link is through integrated operations, transfers and releases.

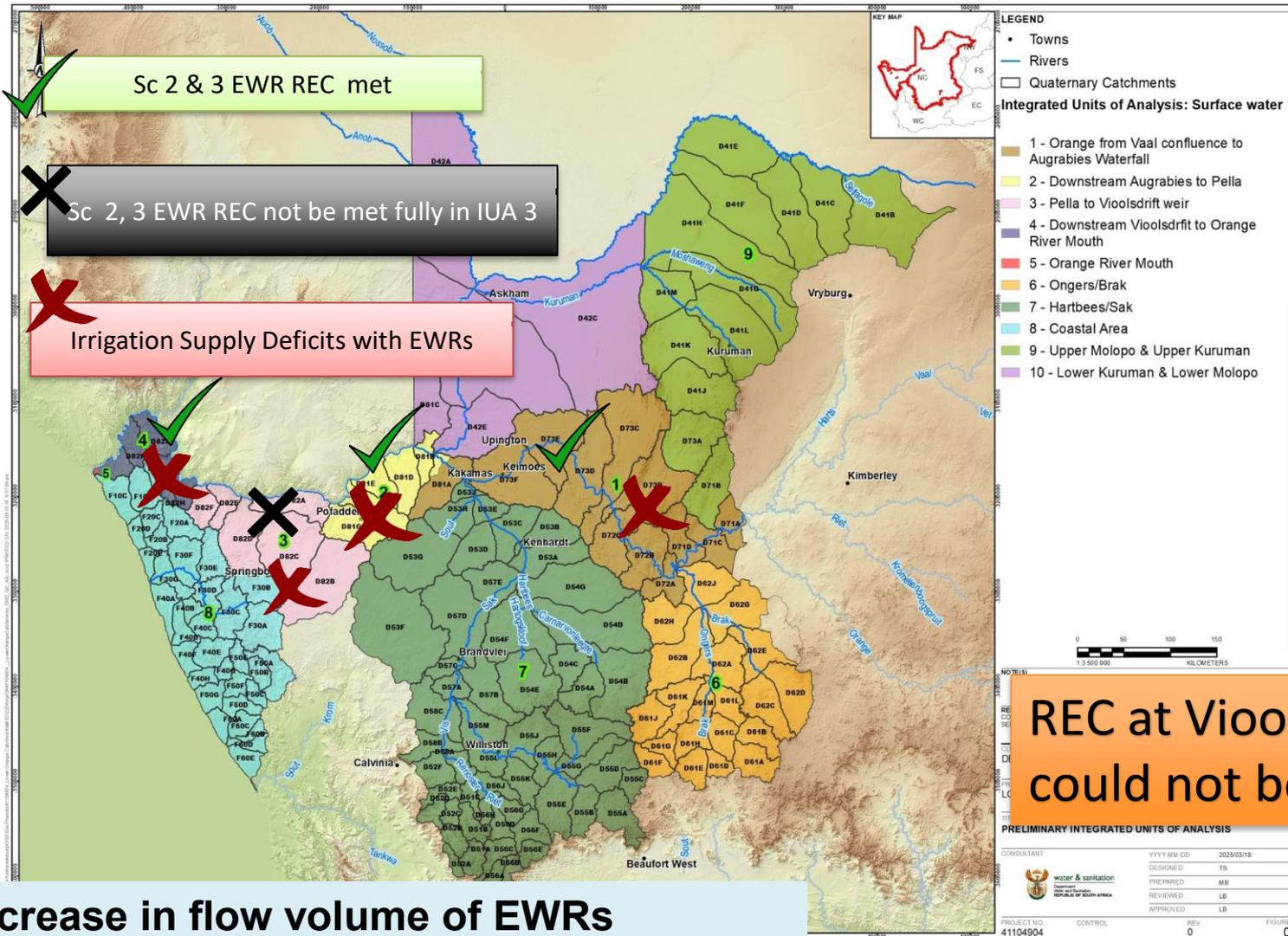
TRADE OFF ANALYSIS TO TARGET ECOLOGICAL CATEGORY



EWRs – Categories evaluated based resurvey and reassessment of all sites)

EWR site code	Site description/ Location	Ecological category (March 2025)			Sept 2025	
		PES	REC	TEC	PES	REC
EWR02	Boegoeberg	C	B/C	B/C	C	B/C
EWR03	Augrabies	C	B/C	C	C	B/C
EWR04	Vioolsdrift	C	B/C	C/D	D	C/D
EWR05	Sendelingsdrift	B/C	B	C/D	D	C/D
Estuary		D	C	C/D	D	C

Water Supply Potential With EWRs (with reassessment of all sites)



Trade off for ecology and economy

REC at Violsdrift could not be fully met

Increase in flow volume of EWRs

Impacts reduce as developments are implemented over the medium and long term



CONSEQUENCES ASSESSMENT

Ecological and Economic

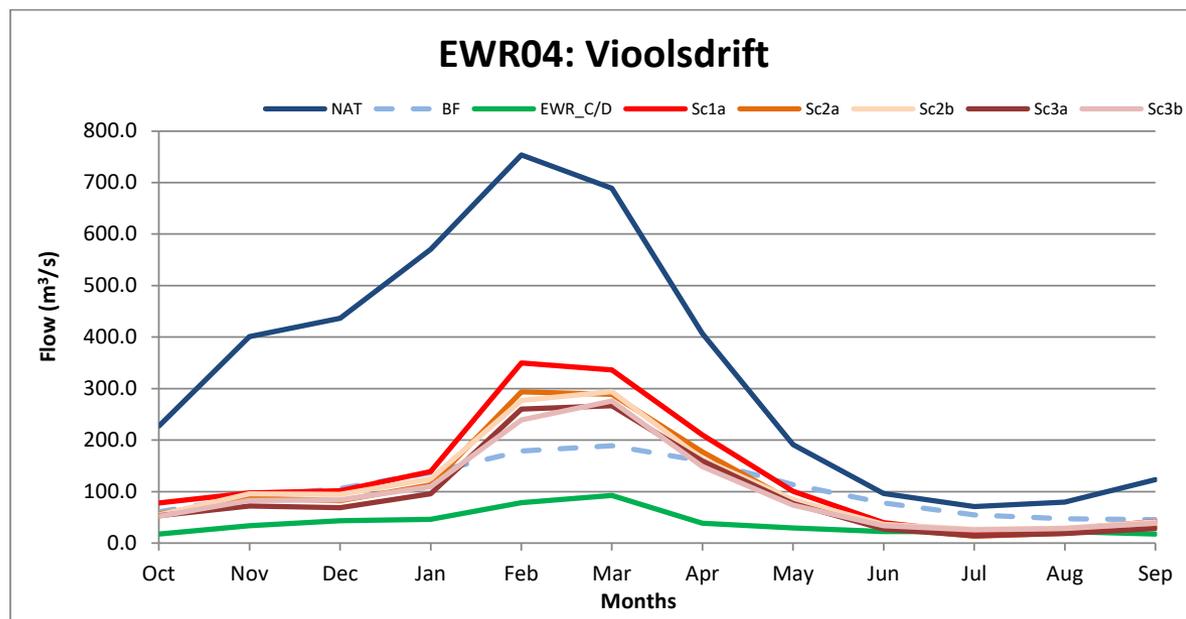
Ecological Consequences Assessment – Flows (1)

- To aid in the interpretation of the impacts due to hydrological changes, seasonal distribution and flow duration graphs were prepared for the operational scenarios for each scenario at each river EWR site).
- The scenario flows were assessed in terms of how the changes in hydrology for the various scenarios will impact on the level of ecological stress experienced in the system and the state of the various response variables.

Vioolsdrift EWR Site

Average Flows (1920-2004) – million m³

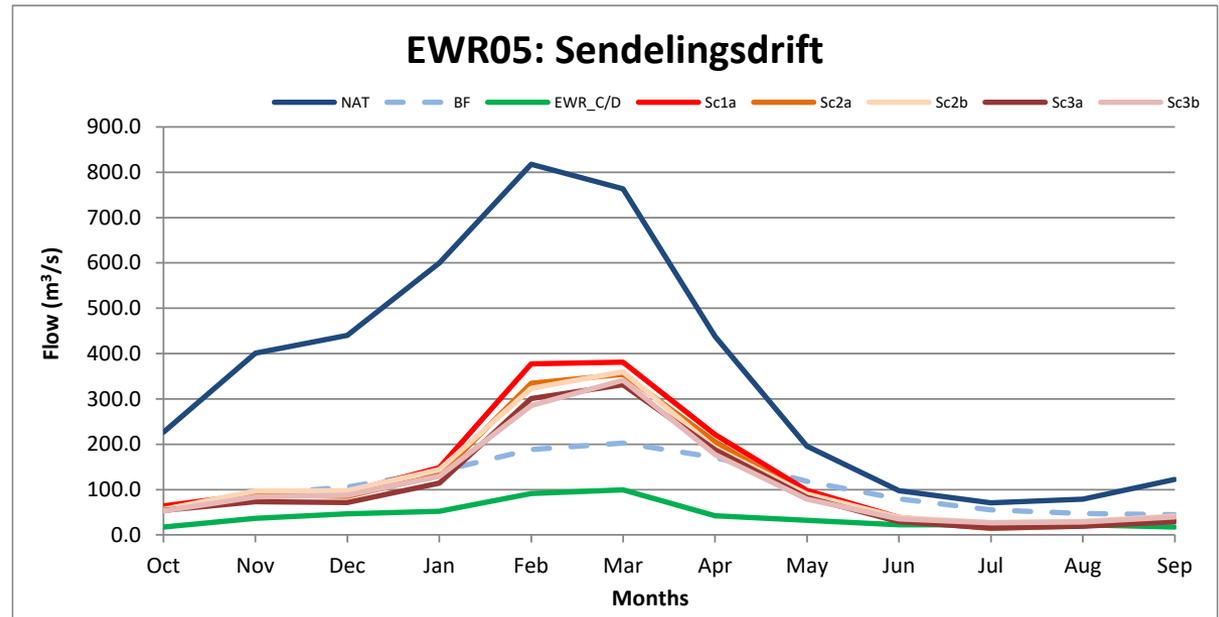
	LO_EWR04
nMAR	10570.5
Sc1a (PRS)	4017.3
Sc2a	3318.6
Sc2b	3449.9
Sc3a	2976.2
Sc3b	3113.9



Ecological Consequences Assessment – Flows (2)

Sendelingsdrift EWR Site

Average Flows (1920-2004) – million m ³	
	LO_EWR05
nMAR	11101.3
Sc1a (PRS)	4152.9
Sc2a	3750.3
Sc2b	3902.4
Sc3a	3404.8
Sc3b	3564.8



Ecological Consequences IUA 1 and 2

EWR02 at Boegeberg and EWR03 at Augrabies (March 2025)

Scenarios	Sc1a	Sc1b	Sc2a	Sc2b	Sc2.1a	Sc2.1b	Sc3a	Sc3b	Sc3.1a	Sc3.1b
	Without	With EWR	Without	With EWR	Without	With EWR	Without	With EWR	Without	With
	Present day		2040 with smaller NVD, LHWP2; Gariep Bloem		2040 with larger NVD, LHWP2; Gariep Bloem		2060 LHWP2-Polihali, Vioolsdrift (size option 2), Gariep to Bloem pipeline, with Verbeeldingskraal		2060 LHWP2-Polihali, Vioolsdrift (size option 2), Gariep to Bloem pipeline, with Verbeeldingskraal and Makhaleng	
IUA1: UO_EWR02_I (Boegeberg)_Wet/Dry: Feb/July_Indicators: BAEN/Tricorythidae B/C										
EWR REC: B/C										
Fish Wet	B/C	B	B/C	B	C	A/B	C	B/C	C	B/C
Fish Dry	B	A	C	B	C	A	C	B/C	C	B/C
Inverts Wet	A	A	A	A	A	A	A	A	A	A
InverTs Dry	B/C	A	C	A/B	C/D	A/B	C	C	C/D	C
IUA2: UO_EWR03_I (Blouputs)_Wet/Dry: Feb/July_Indicators: BAEN/Perlidae B/C										
EWR REC: B/C										
Fish Wet	B	B/C	C	A/B	C/D	A/B	C	A/B	C	A/B
Fish Dry	B/C	C	C/D	A/B	C/D	B	C	B/C	C/D	B
Inverts Wet	D	D	D/E	C	D/E	C	D/E	C	D/E	C
Invers Dry	C/D	C/D	D	B/C	D	C	D	C	D/E	C

With EWR (REC) met

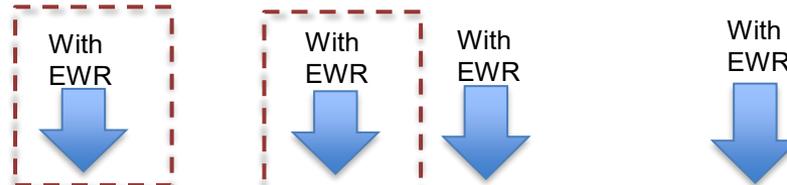
With EWR (REC) met for fish only, inverts – (a C category achieved)

Trade-off on the REC (ESBC) at EWR03

Orange	Half a category lower than the flows to meet the REC
Red	Full category or more lower than the flows to meet the REC
Blue	REC Flow requirements achieved

Ecological Consequences IUA 3 and 4

EWR04 at Violsdrift and EWR05 at Sendelingsdrift (Sept 2025)



	REC	Sc1a	Sc2a	Sc2b	Sc3a	Sc3b	Sc3b1	Sc3.1a	Sc3.1b	Sc3.1b1		
IUA3: EWR04 (Violsdrift)_Wet/Dry: Feb/Jul_Indicators: BAEN/Tricorythidae												
EWR REC: C/D											C/D	
Fish Wet	C/D	C/D	E	D	D/E	D	C	E/F	D	C/D		
Fish Dry	C	A/B	C/D	C	C/D	C	B	C/D	B	B		
Inverts Wet	C/D	E/F	E	D	E	D	E/F	F	D/E	E/F		
Invers Dry	C	C	D/E	C	D/E	C	C/D	E	C/D	D		
IUA4: EWR05 (Sendelingsdrift)_Wet/Dry: Feb/Jul_Indicators: BAEN/Tricorythid												
EWR REC: C/D											C/D	
Fish Wet	D	D/E	E	C/D	D/E	C/D	E	E	D	D/E		
Fish Dry	C/D	C	C/D	C	D	C	C/D	D	C	C/D		
Inverts Wet	D	D/E	E	C/D	D/E	C/D	D/E	E	D	D/E		
Invers Dry	C/D	C/D	D	C	D	C/D	C/D	D	C	C/D		

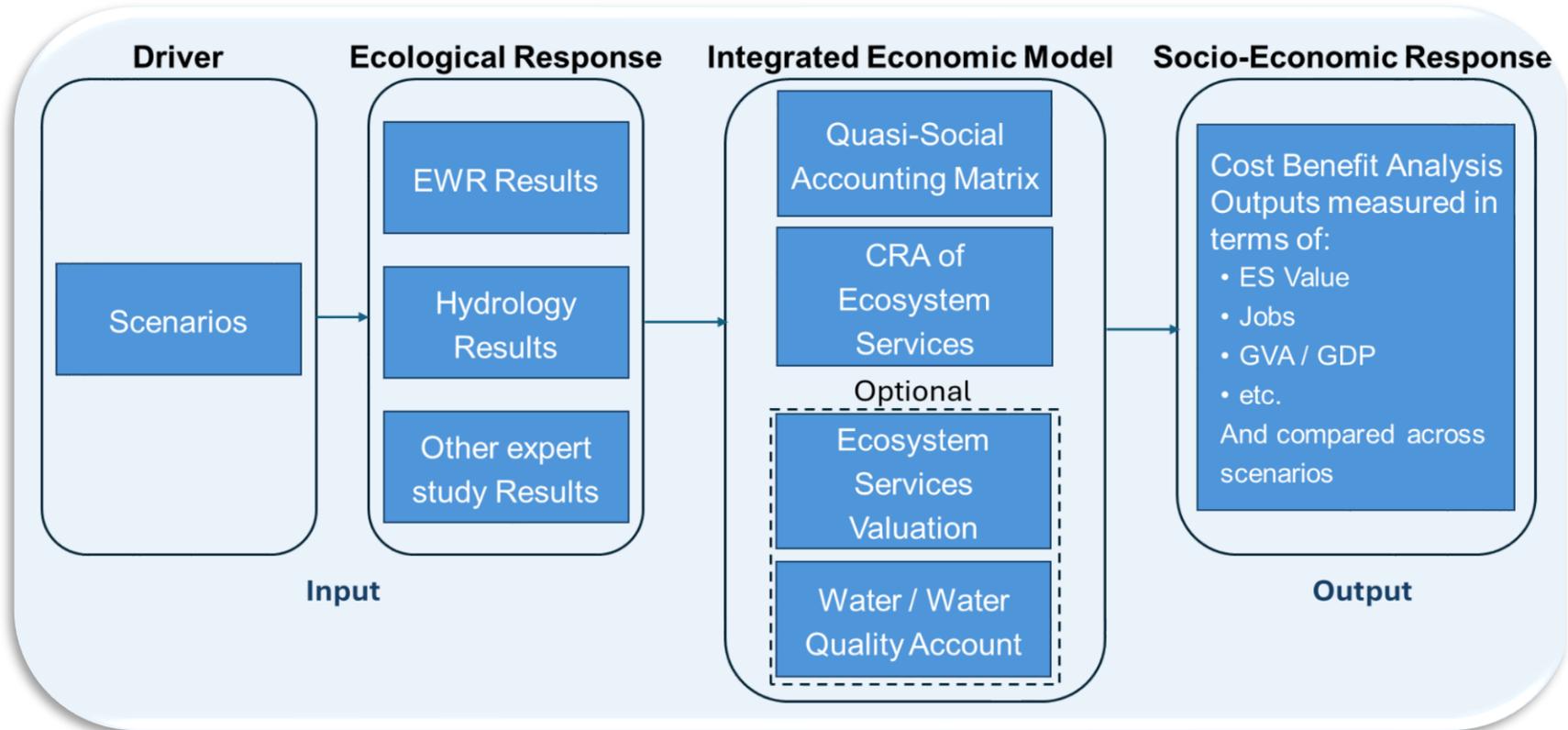
 With EWR (REC) ,met in dry season only. Wet season will result in some stress

 With EWR (REC) met

Green	Meets the REC of a C/D
Orange	Half a category lower than the flows to meet the REC
Red	Full category or more lower than the flows to meet the REC

Trade-off on the REC

Economic Consequence Assessment Integrated Economic Model



Economic Consequence Assessment (IUAs 1 to 4) (Orange River)

Impact of change in water supply with EWR implementation - revised

Deficits improve with system developments



Makhaleng Dam results in present day situation in 2060 UNFEASIBLE

IUA	Socio-economic indicator	Scenarios With EWRs							
		Present day	2040 with smaller NVD, LHWP2; Gariep Bloem			2040 with larger NVD, LHWP2; Gariep Bloem	2060 LHWP2-Polihali, Vioolsdrift (size option 2), Gariep to Bloem pipeline, Verbeedingskraal		2060 LHWP2-Polihali, Vioolsdrift (size option 2), Gariep to Bloem pipeline, Verbeedingskraal and Makhaleng
			Sc1	Sc2	Sc2 (revised)		Sc2.1	Sc3	
IUA_01 Orange from Vaal confluence to Augrabies Waterfall	Water Supply Deficit (Irrigation)	-40.48	-22.11	-24.60	-18.16	-23.73	-25.60	-39.10	
	GDP Economic Effect (Million R/a)	-651	-353	-388	-290	-379	-409	-624.8	
IUA_02 Downstream Augrabies to Pella	Water Supply Deficit (Irrigation)	-18.97	-9.98	-11.70	-8.14	-10.64	-11.50	-17.97	
	GDP Economic Effect (Million R/a)	-186	-97	-109	-79	-103.6	-112	-175.6	
IUA_03 Pella to Vioolsdrift weir	Water Supply Deficit (Irrigation)	-3.00	-2.50	-2.80	-1.79	-2.30	-2.55	-3.96	
	Economic Effect (Million R/a)	-29	-24	-27	-17	-22	-24.8	-38.6	
IUA_04 Downstream Vioolsdrift to Orange River Estuary	Water Supply Deficit (Irrigation)	-0.52	-0.30	-0.33	-0.25	-0.31	-0.34	-0.52	
	GDP Economic Effect (Million R/a)	-3	-2.9	-3.2	-2.5	-3	-3.3	-5	

X All scenarios result in water supply deficits impacting on irrigation supply

TRADE – OFF EVALUATION

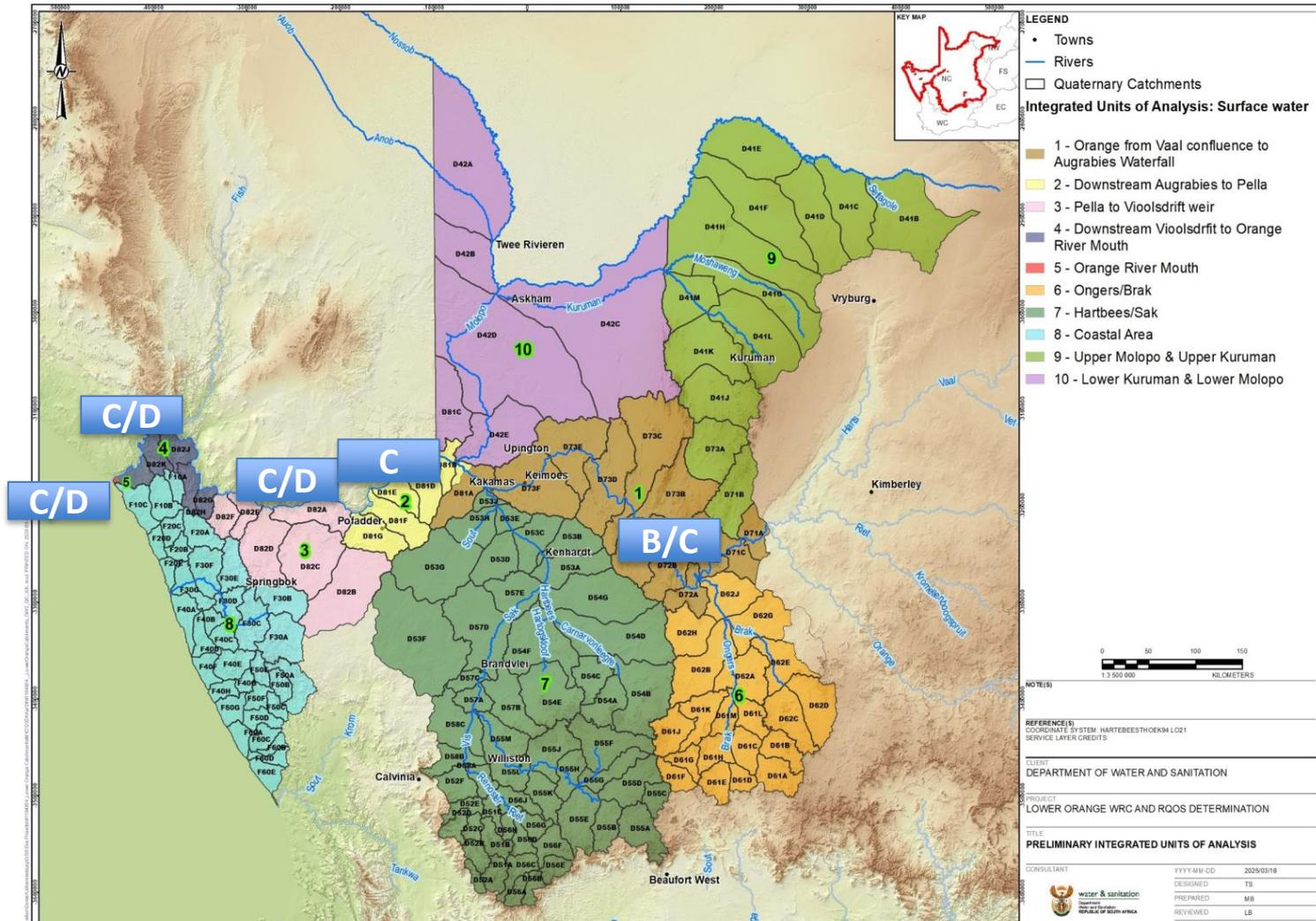


- Key driver is flow (regulated and/or reduced flow/ seasonality loss)
- Water resources of the Orange Catchment (Upper and Lower) are over utilised
- Ecological requirements cannot be met 100% of the time because of allocations to transfers, local and Upper Orange catchment and international demands
- Some economic impact to the irrigation supply (as the major user in the Orange catchment)
- ***There is not enough water in the Orange River Catchment TO SATISFY ALL USERS ALL OF THE TIME (effectively trade-offs during dry periods).***
- Trade off presents the most feasible option to achieve ecological sustainability with the least economic impact

SUMMARY OF THE SCENARIO EVALUATION ASSESSMENT AND RECOMMENDED TEC

IUA			Ecological Category			
IUA	EWR Site	River	PES	REC	TEC	
1	Orange from Vaal confluence to Augrabies Waterfall	LO_EWR02	Lower Orange	C	B/C	B/C
2	Downstream Augrabies to Pella	LO_EWR03	Lower Orange	C	B/C	C
3	Pella to Vioolsdrift weir	LO_EWR04	Lower Orange	D	C/D	C/D
4	Downstream Vioolsdrift to Orange River Estuary	LO_EWR05	Lower Orange	D	C/D	C/D
5	Orange River Estuary	Estuarine Functional Zone	Orange	D	C	C/D interim

RECOMMENDED MANAGEMENT CATEGORY (TEC) for IMPLEMENTATION



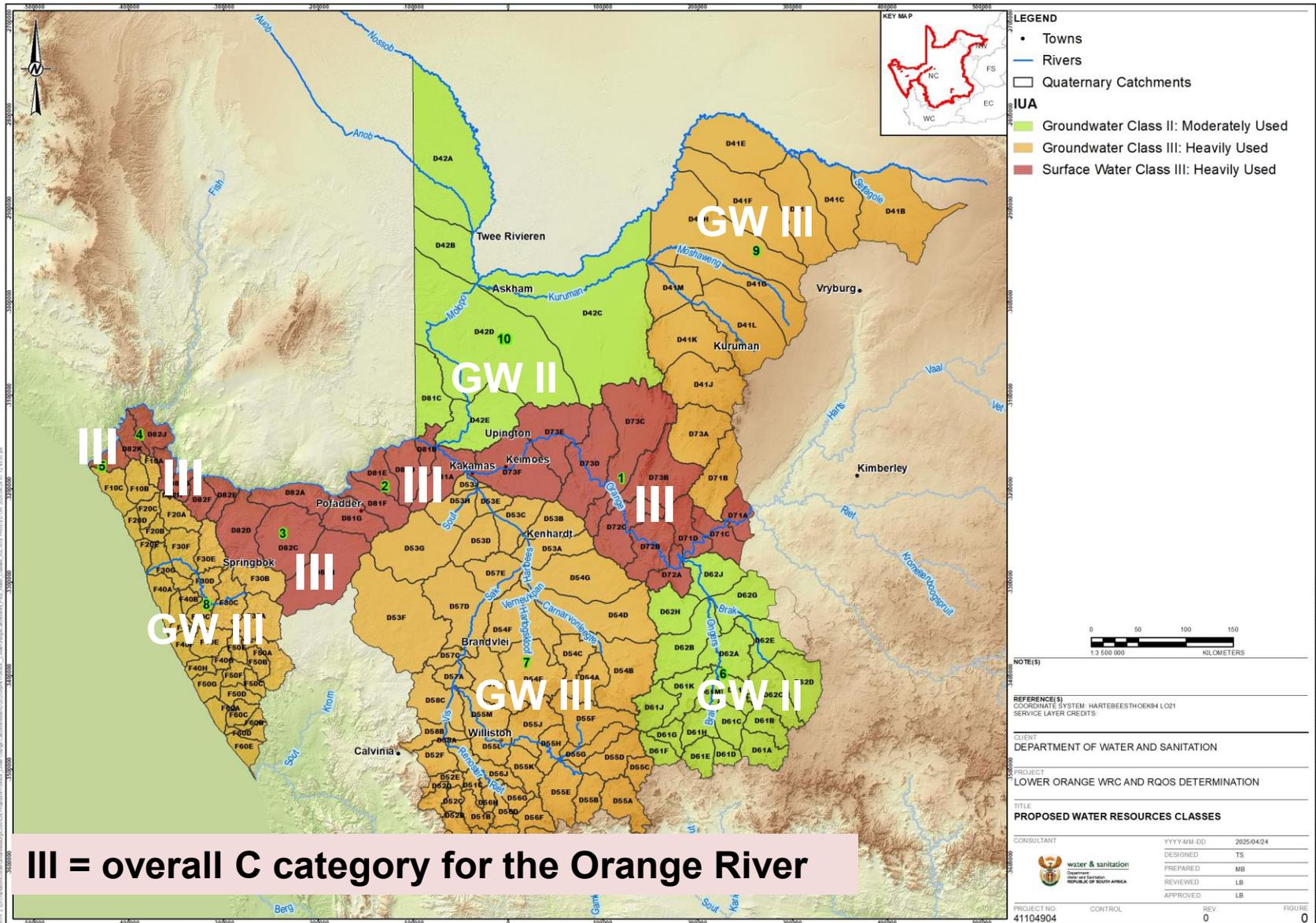
Ecological Categories are linked to flows that can be met. Categories do allow for improved requirements (EWRs) at Vioolsdrift and Sendelingsdrift



**DETERMINATION OF WATER RESOURCE CLASSES
AND ASSOCIATED RESOURCE QUALITY OBJECTIVES
IN THE LOWER ORANGE CATCHMENT, WP 11438**

Preliminary Water Resource Classes

Proposed Classes IUA Level



III = overall C category for the Orange River

CONCLUSION



- PES at EWR sites linked to flow (fluctuations) and non-flow impacts
- Non-flow: water quality, riparian vegetation (aliens); habitat loss; invaders; illegal fishing (gill netting); agricultural development in riparian zone; blackflies
- Proposed category C/D predominantly flow driven but will require non-flow interventions
- We are not proposing a downgrade in category – it is small improvement in flow
- Water Resource Class – Category III
- Water quality is set for a C category or higher category (not a downgrade and not accepting current violations, RQOs specified to maintain or improve)
- Water quality issues will need to be addressed (source interventions) – for all users (municipalities; agriculture, industry, mining). Address the increasing nutrients and trend in salinity



Thank you

Questions, Clarifications?

DWS Lower Orange Water Resource Classification Study: Agricultural Sector Meeting ORS Water Balance and IVRS Linkages

DATE: 14 OCTOBER 2025

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Purpose and Outline

Purpose

- Provide information on the water balance of the Orange River System and linkages with the Integrated Vaal River System.

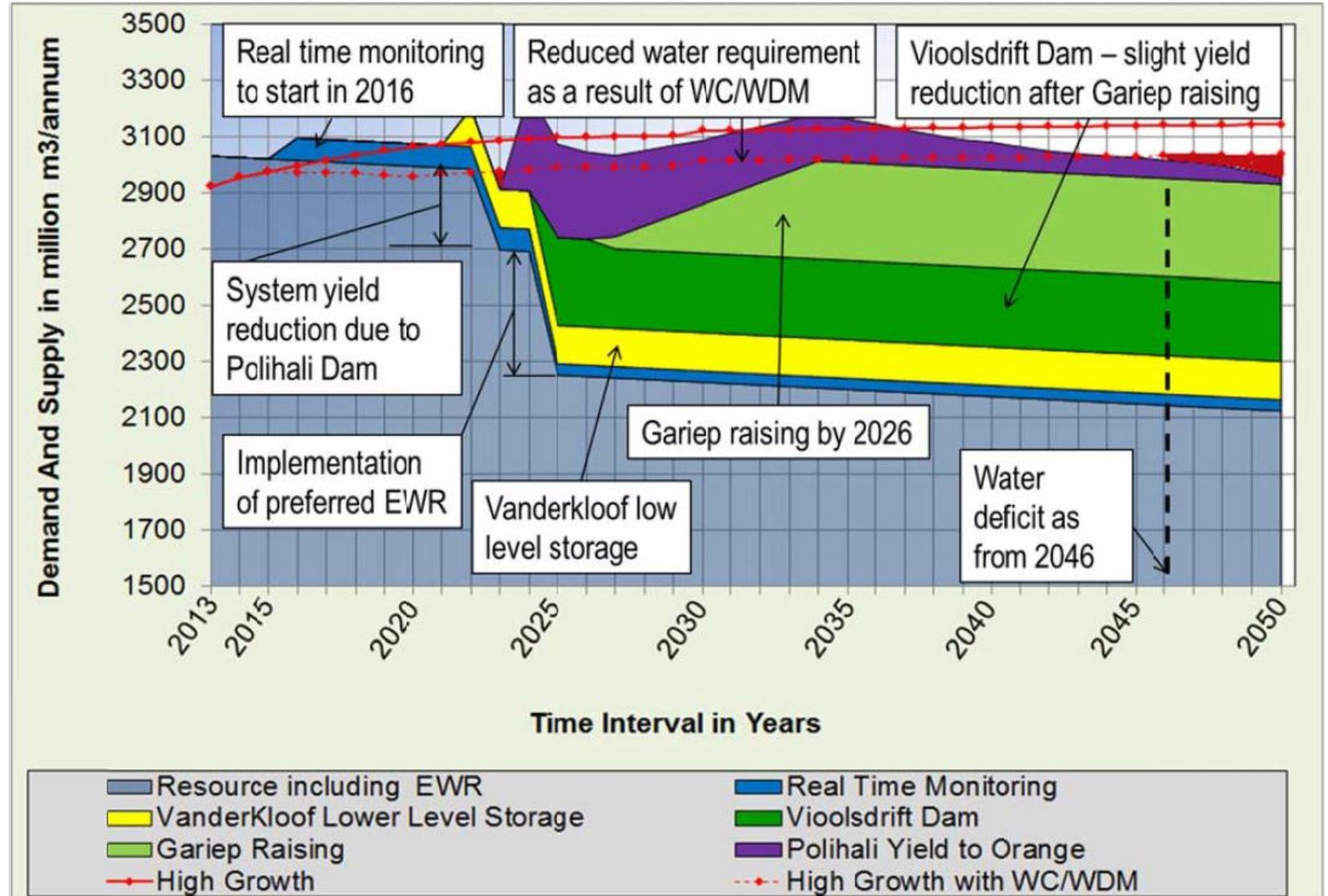
Outline

- ORS water balance scenarios (2015)
- IVRS – Proposed Major Infrastructure Augmentation Projects
- IVRS water balance
- Lesotho Highlands Water Project Phases
- Noordoewer / Vioolsdrift Dam (NVD)

2015 ORS Water Balance

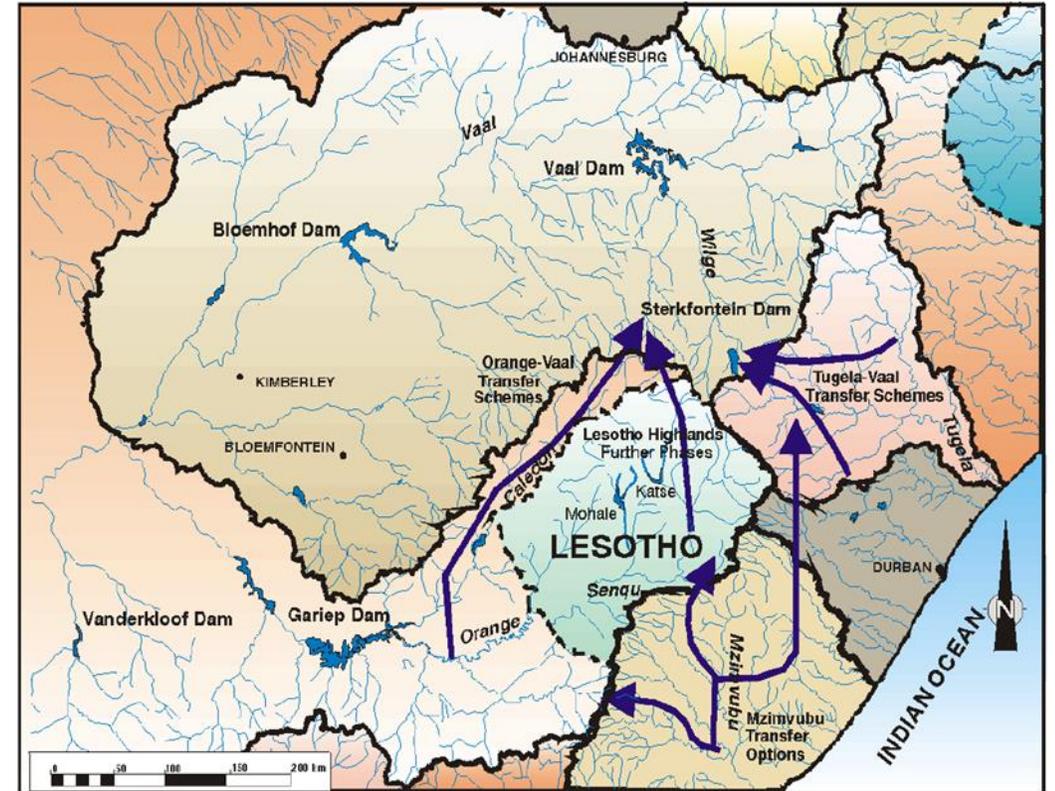
2015 ORS Reconciliation Strategy Water Balance.

Scenario 4:
Incl NVD & Raising of the
Gariep.



IVRS – Proposed Major Infrastructure Augmentation Projects

- **Transfer of water from Thukela River**
 - Build dams in the Thukela Catchment and transfer infrastructure
- **Transfer of water from Lesotho**
 - LHWP Phase I – Operational - Katse and Mohale Dams, Motsaku Weir, tunnels in South Africa and Lesotho, Muela Power Station
 - LHWP Phase II – under construction - Polihali Dam, transfer tunnel from Polihali to Katse Dam
 - Lesotho Highlands Water Project Phase III – to be analysed against TWP - Tsoelike Dam and transfer pump station and pipeline/tunnel
 - Lesotho Highlands Water Project Phase IV - Ntoahae Dam and transfer pump station
 - **N.B LHWP II and further phases require yield replacement in the Orange River System to make up for the lost yield due to transfers to the IVRS**
- **Transfer of water from Mzimvubu catchment**
 - Dams in Mzimvubu catchment with transfer routes via ORS, (Kraai River) Lesotho, TIVA or TWP
- **Transfer from Zambezi and other catchments in countries to the north of South Africa**



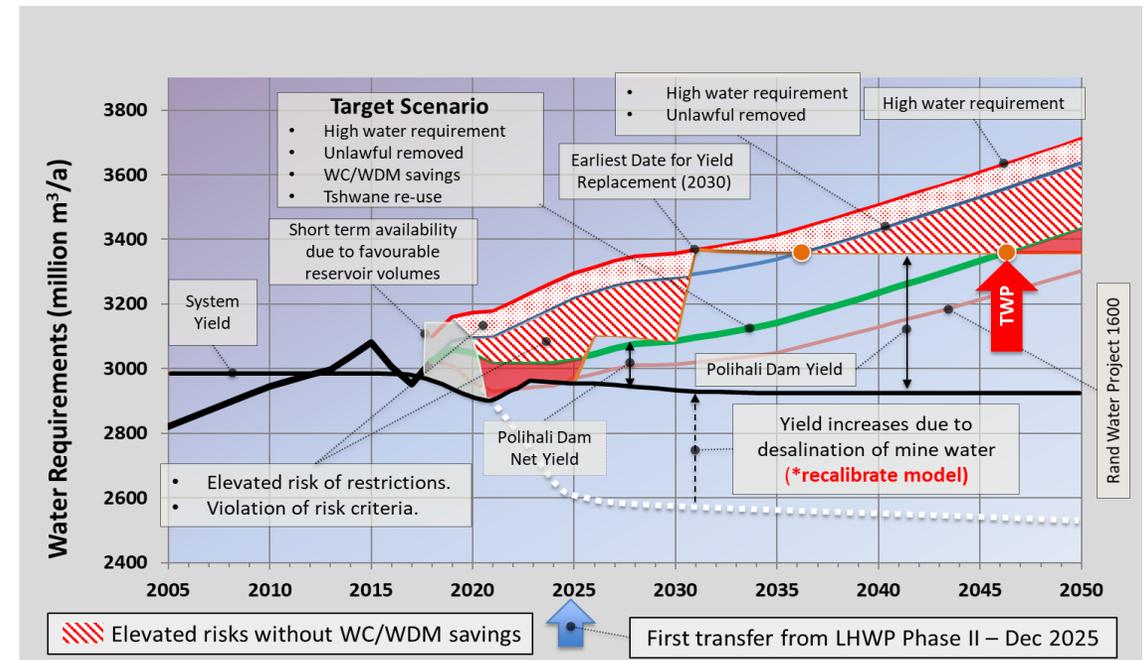
2019 Integrated Vaal River System Water Balance and Interventions

INTERVENTIONS

- Water Conservation and Demand Management to realise about **200 Million cubic metres/annum**
- Eradicate **75 million m³/a** unlawful irrigation water use
- Desalination and Re-use of Mine Water - Gain to maintain yield at about **3000 million m³/annum** with a gain of **+200 million m³/annum**
- Tshwane Re-use Project- **56 million m³/a**
- Reinstate full capacity of Thukela-Vaal transfer to prevent undesirable economic implications.
- **Major augmentation schemes**
 - Polihali Dam for - **437 m³ /annum by 2028 and 2032, in conjunction with;**
 - Noordoewer/Vioolsdrift Dam for Yield replacement in the lower Orange by **2030** to realise full benefit of Polihali Dam
 - Thukela Water Project – **290 million m³/annum by 2046**

2019 Water balance and Interventions

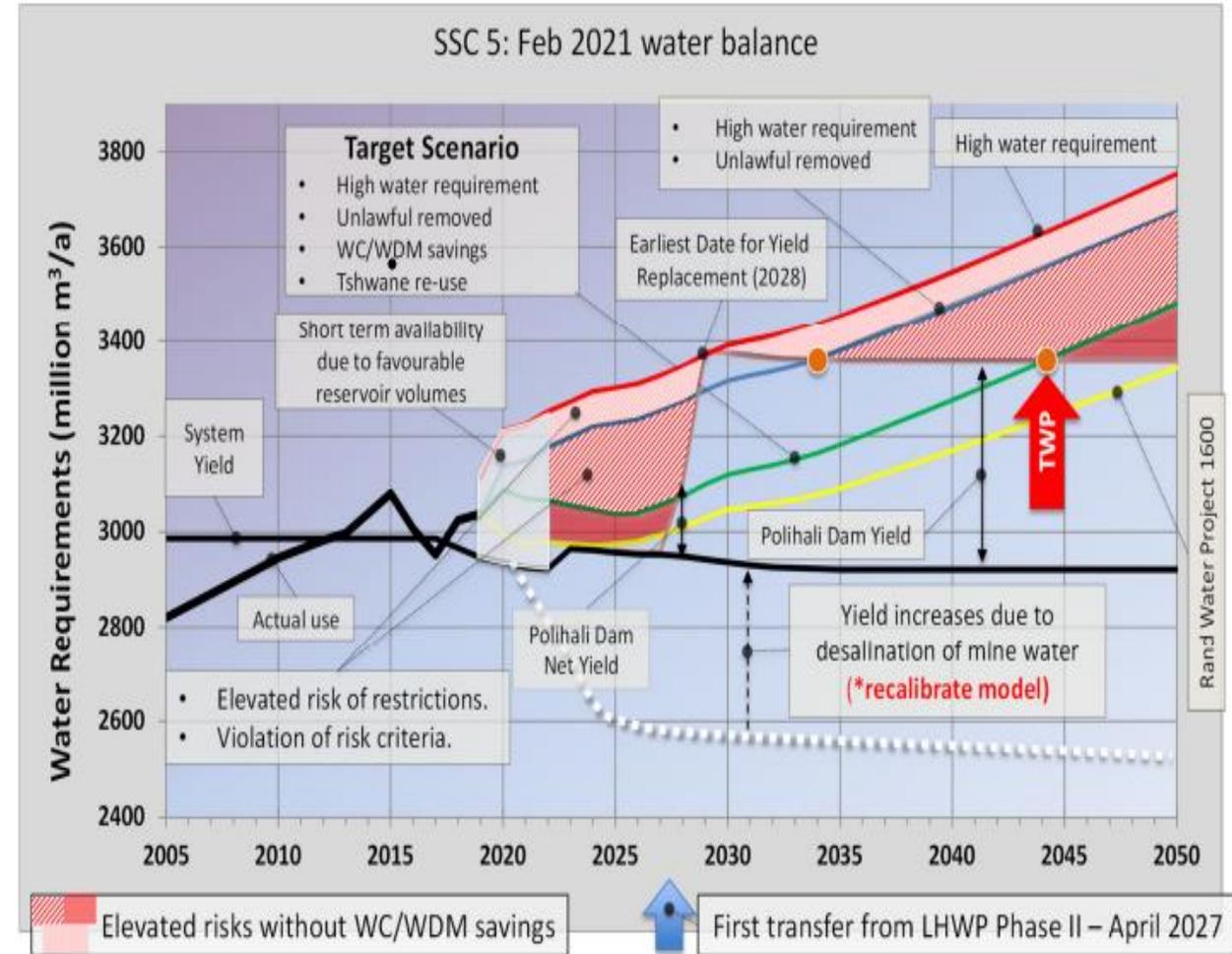
High with target WC/WDM	Desalination for urban use (from January 2022)	Unlawful removed	Re-use (Tshwane) (56 million m ³ /a)
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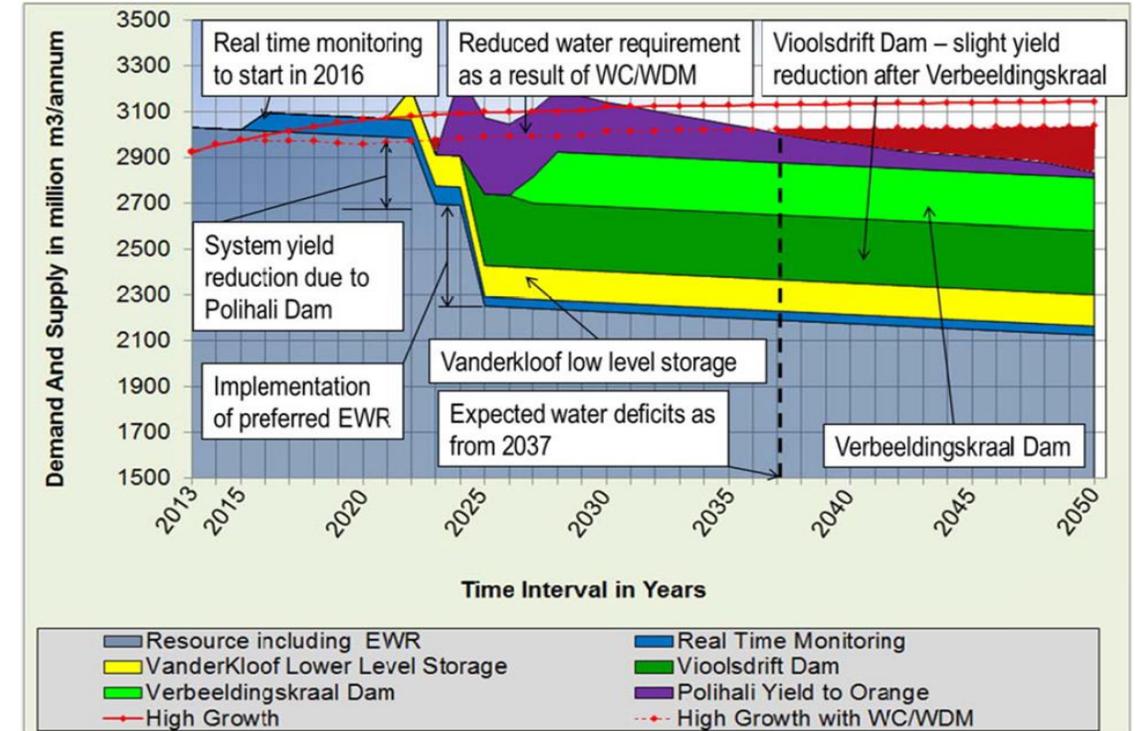
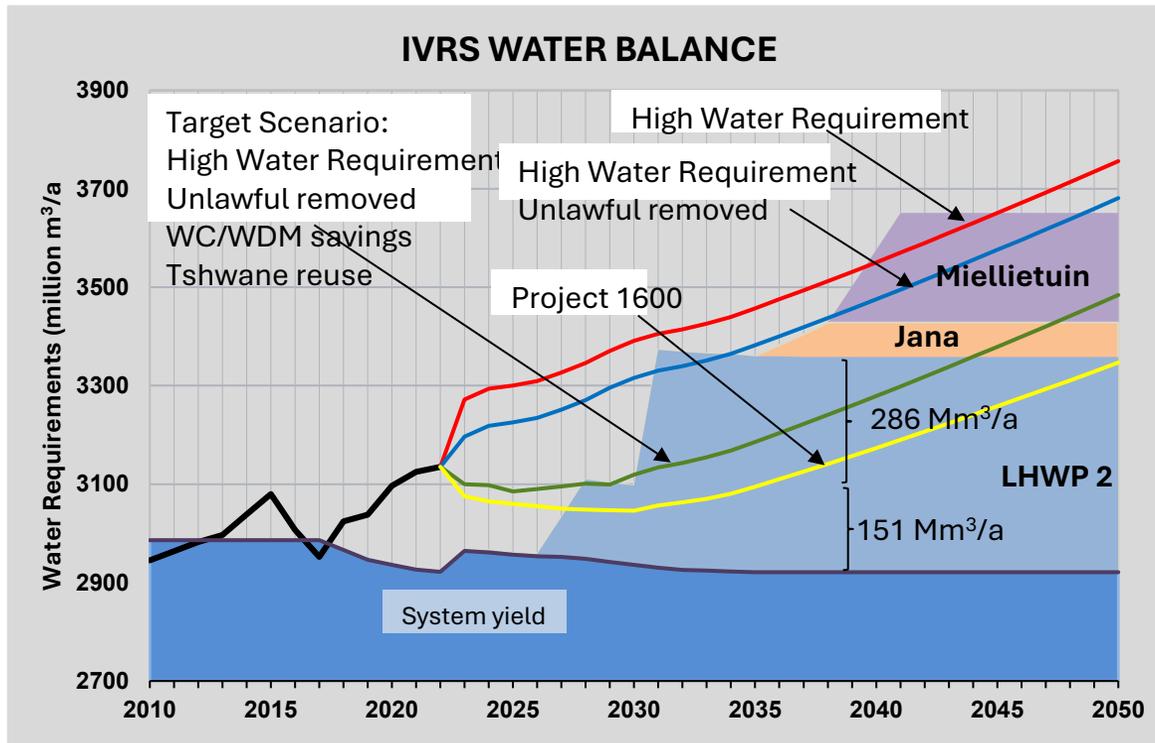
- Full yield utilisation was only possible if an alternative yield replacement solution is implemented in the ORS.

2021 IVRS Water Balance

- Thukela Water Project (TWP) is the recommended next scheme to augment the IVRS after the implementation of LHWP Phase II (IVRS Reconciliation update of 2021)
- The TWP is the preferred option for the following reasons
 - Expected higher capital costs for the Tsoelike Dam and associated transfer conveyances
 - LHWP Phase III may be subject to protracted negotiations due to the international nature of the project
- As per the water balance, depending on the water requirement growth trajectory, TWP will be required as early as 2034 or as late as 2044
- Earlier completion would lessen the risk of water restrictions in the IVRS



LHWP II – TRANSFERABLE YIELD FROM THE ORANGE RIVER SYSTEM (ORS)



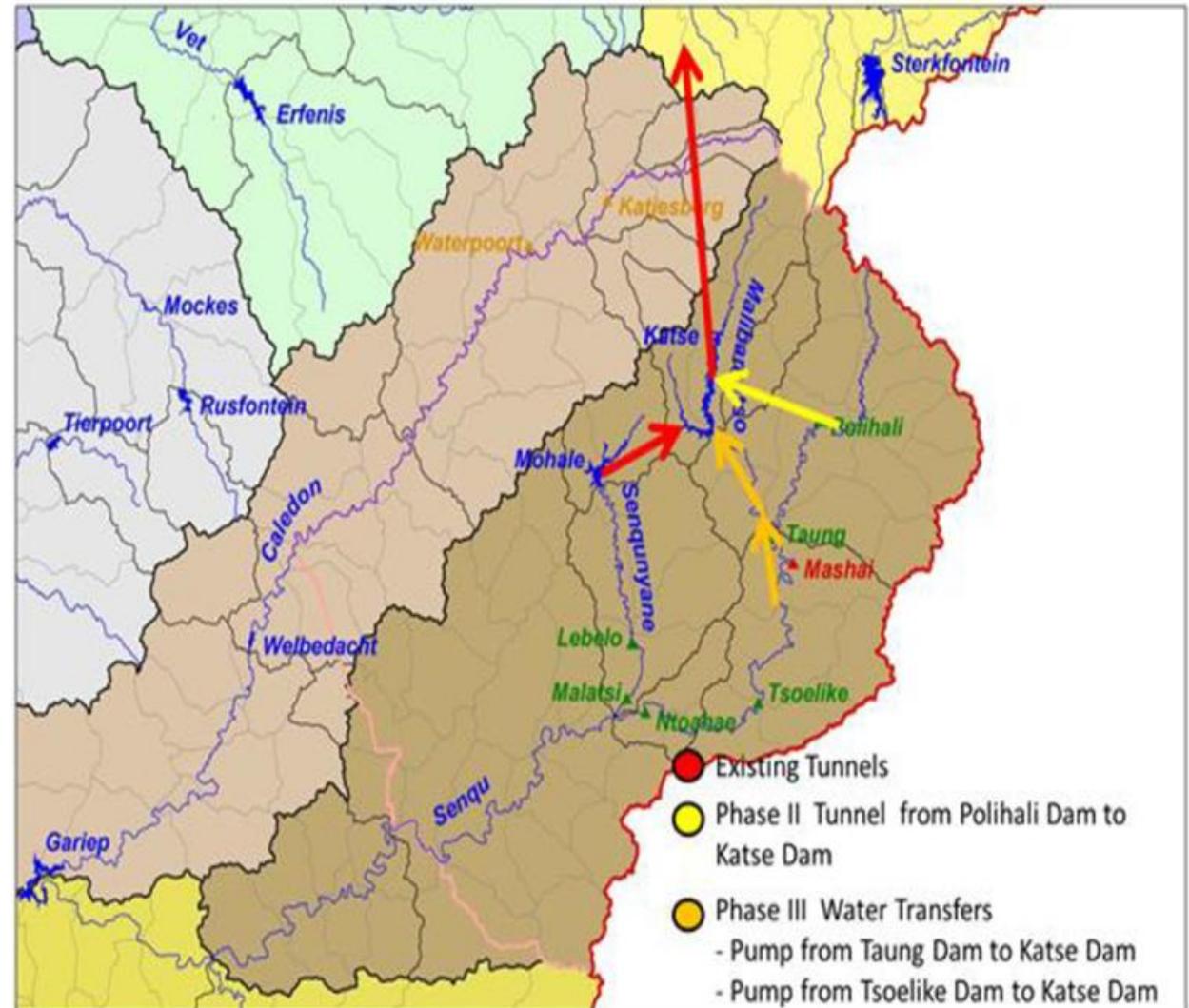
- By 2036, the IVRS will require the full LHWP yield transfer of 437 million m³/annum from the ORS.
- **Full yield utilisation is only possible if an alternative yield replacement solution is implemented in the ORS.**
- Prior to implementation of the yield replacement option, the incremental yield of 151 million m³/a will be available for transfer.
- The yield replacement solution will be achieved by a dam in Lower Orange (Noordoewer/ Violsdrift dam (NVD)) **or** a dam in Upper Orange River (Verbeedingskraal, Boskraai or raising of Gariep Dam)

Lesotho Highlands Water Project Phases

LHWP II currently under implementation. Earliest Water Delivery date – August 2028

The LHWP II needs to be completed by implementing the yield replacement intervention on the Orange River System (ORS) in order for the IVRS to get the full yield transfer from the ORS

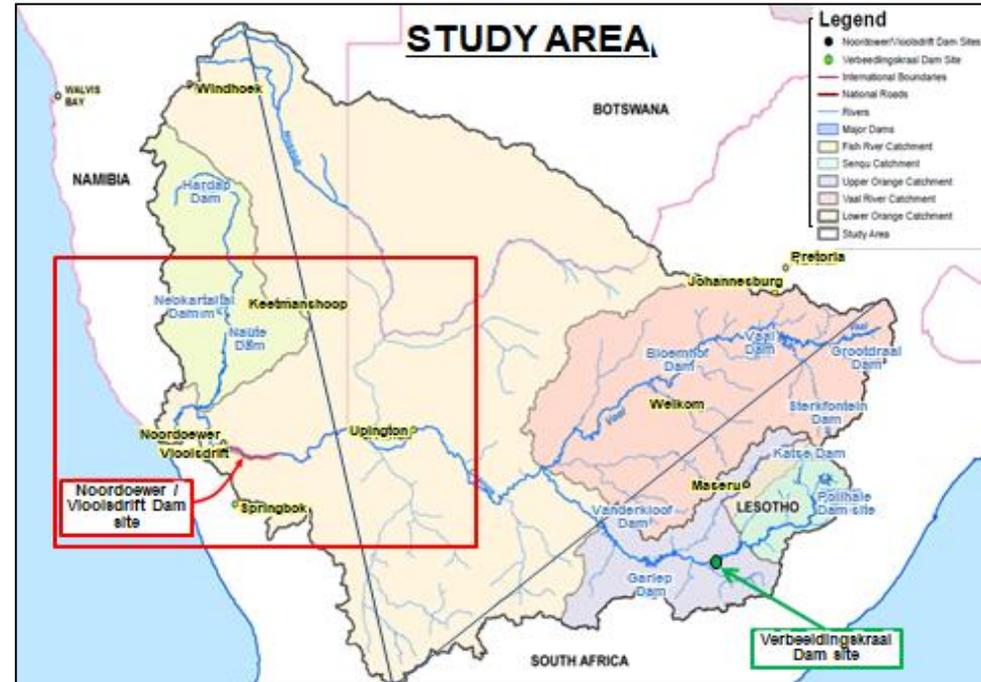
Further phases of the Lesotho Highlands remain as future augmentation options after the TWP. These will be analysed during the next update of the reconciliation study which is at procurement stage



Lower Orange River Project: Noordoewer / Vioolsdrift Dam (NVD)

PROJECT DESCRIPTION

- The proposed Noordoewer/Vioolsdrift Dam is required to replace the yield lost through LHWP II, to compensate for the impact from the implementation of the Reserve, to re-regulate flows to the estuary and to provide additional system yield.
- The proposed Dam is a re-regulating dam on the Lower Orange River on the common border with Namibia. Releases from the upstream Vanderkloof Dam travel a long distance to reach the river mouth. A significant volume of water is lost to transmission losses along the way.
- The project is a joint undertaking between RSA



PROGRESS TO DATE

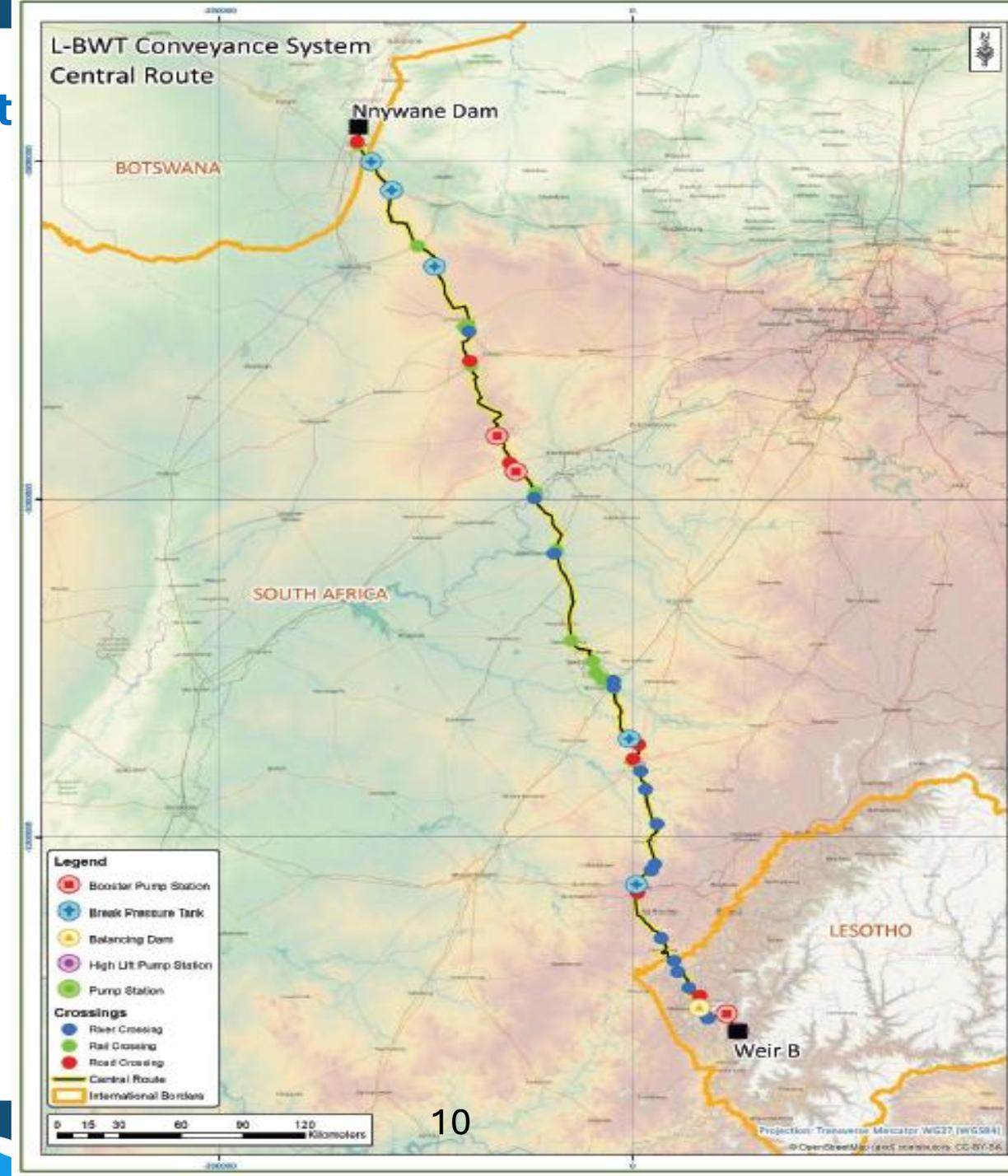
- Bridging Feasibility Study at tendering stage (October 2025)

Lesotho-Botswana Water Transfer Project

Proposed dam on the Makhaleng River in Lesotho and a 700km conveyance pipeline via South Africa to Lobatse in Botswana, supplying along the Mafeteng and Mochale Hoek Districts, City of Bloemfontein, the North West Province and ultimately Botswana, with hydropower generation at the dam and along the conveyance system.

As in the LHWP developments, a key condition to be met is that of no negative yield impacts to the downstream users.

Feasibility for the Dam was completed and that for the conveyance infrastructure is pending.



Thank you!

Agriculture Sector Meeting: Determination of Water Resource Classes and Resource Quality Objectives for the Lower Orange Catchment

Presented by : Mkhalihi S.
Compile by : Mazwi, Enele, Mkhalihi, Thandi & Makate
Event : Lower Orange Catchment Consultation
Date : 14 October 2025

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CONTENT

- 01** MONITORING OF RQO'S
- 02** COMPLIANCE MONITORING OF WASTE RELATED DISCHARGES
- 03** GREEN DROP PROGRAM
- 04** ENFORCEMENT
- 05** VAAL ANTIPOLLUTION
- 06** LEGISLATIVE REVIEW (WSA & REGS) - TO DEAL WITH WWTWs

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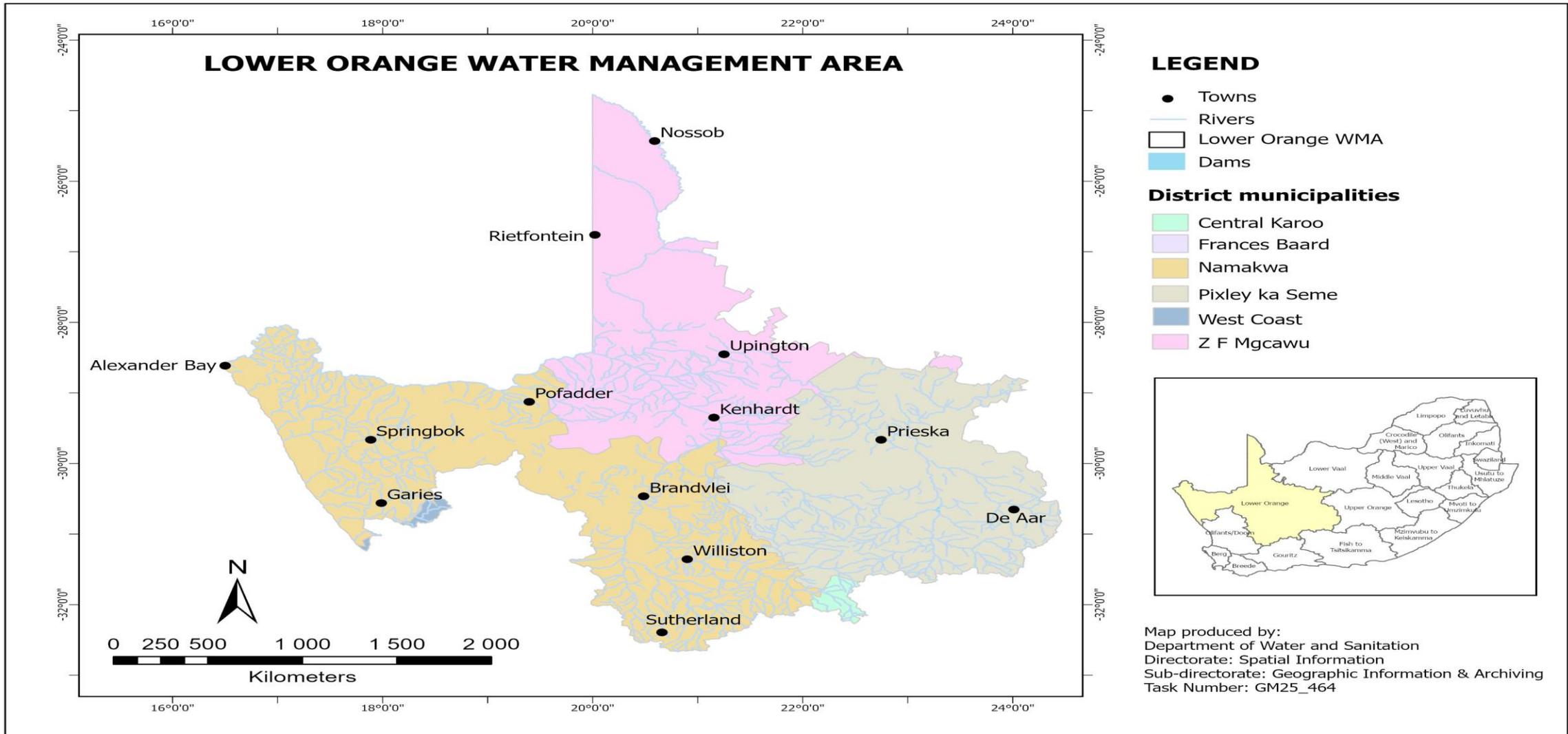


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INTRODUCTION - THE WMA



INTRODUCTION

- Dealing with pollution is a key strategic issue in South Africa and globally :

SDG	NWRS 3
Goal 6 Sub Goal 3: Improved WQ through reduced pollution	CH 9: Managing water and sanitation under a changing climate CH 11: Improving water quality
Goal 6 Sub Goal 6: Protect & restore ecosystems	CH 12: Protecting aquatic ecosystems & maintaining and restoring ecological infrastructure

- The 2025 Water Indaba recognized that *“Our water quality is also deteriorating due to pollution, particularly sewage pollution by municipalities, resulting in polluted rivers and damaged ecosystems, as well as sewage spillages directly into communities”*.
- Regulatory programs and initiatives dealing with pollution include: *Monitoring of ROQs, Compliance Monitoring (of waste-related discharges), Green Drop Program, Vaal River Antipollution Forum, & Legislative Review (WSA & Regulations)to deal with WWTWs.*

MONITORING OF RQOs (NM)

Upper Vaal: RQOs Compliance Monitoring Assessment FY 2024/25 - water quality compliance was 47%

💧 Nutrients

- Nitrites and Nitrates were compliant at the monitored sites while **Phosphates** were non-compliant across all monitored sites.

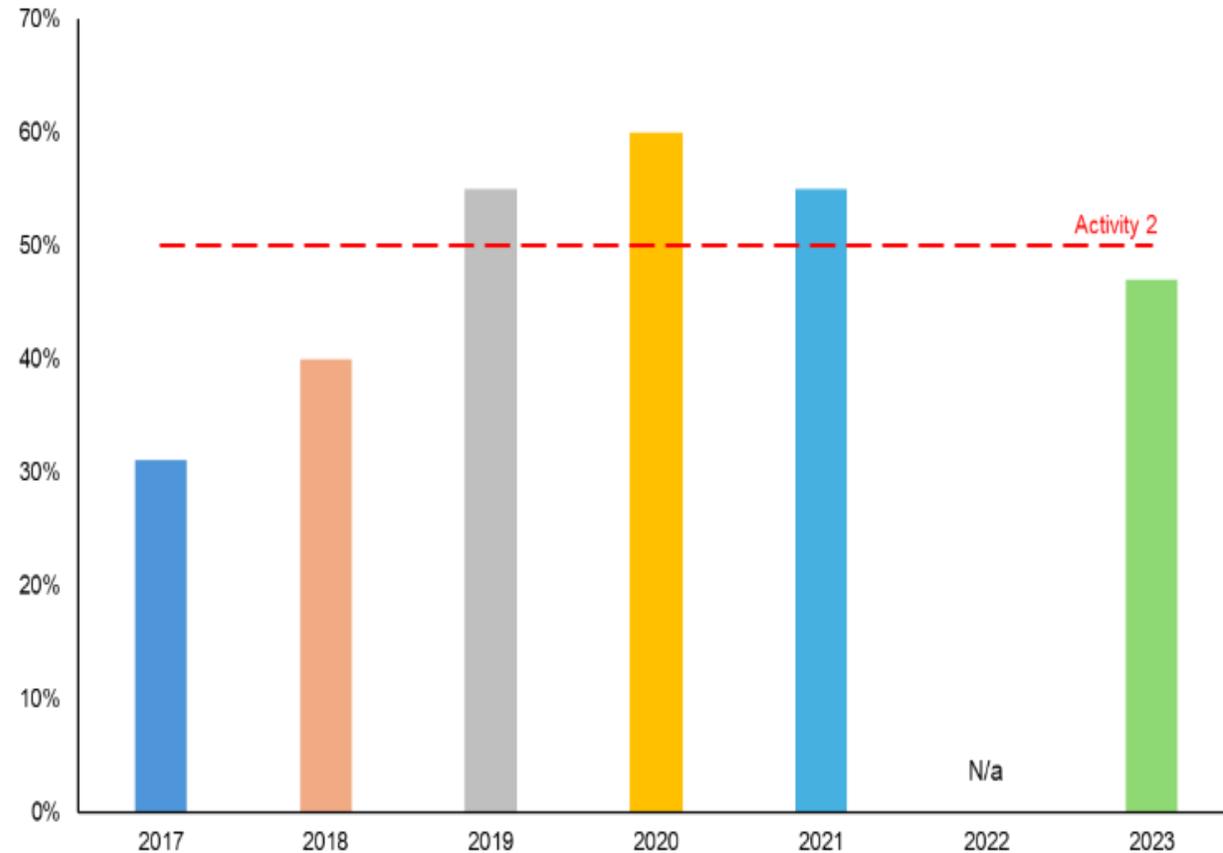
💧 Salts

- Electrical Conductivity was compliant in 6 of the 9 monitored sites.
- Sulphates complied with the RQOs limits at all gazetted sites.

💧 Toxics

- Only **Endosulfan and Uranium** were non-compliant to RQOs limits, all other gazetted toxics complied.

Average Compliance Percentage of Water Quality for Upper Vaal



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💧 Pathogens & sanitation

- **E. coli** was non-compliant

MONITORING OF RQOs (NM)

Middle Vaal: RQOs Compliance Monitoring Assessment FY 2024/25 - water quality compliance was 48% for rivers and 52.63% for dams

💧 Nutrients

- Nitrates complied with the set numerical limits.
- Nitrites, Phosphorus, and Chlorophyll-a showed exceedance to set numerical limits.

💧 Salts

- Sulphates, Electrical Conductivity, and Chloride showed exceedance to the set numerical limits in most sites.
- Magnesium and Total Dissolved Solids did not demonstrate an exceedance to the set numerical limits.

💧 Toxics

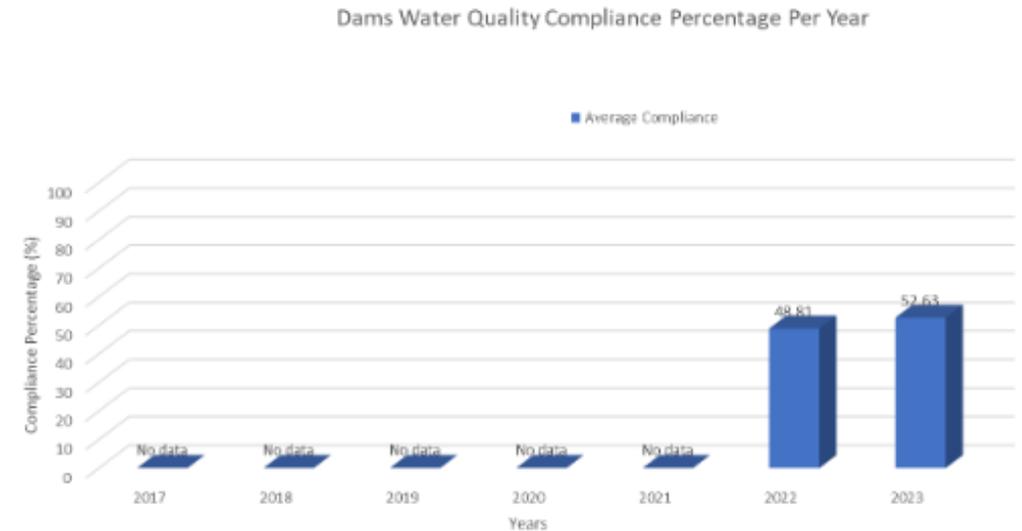
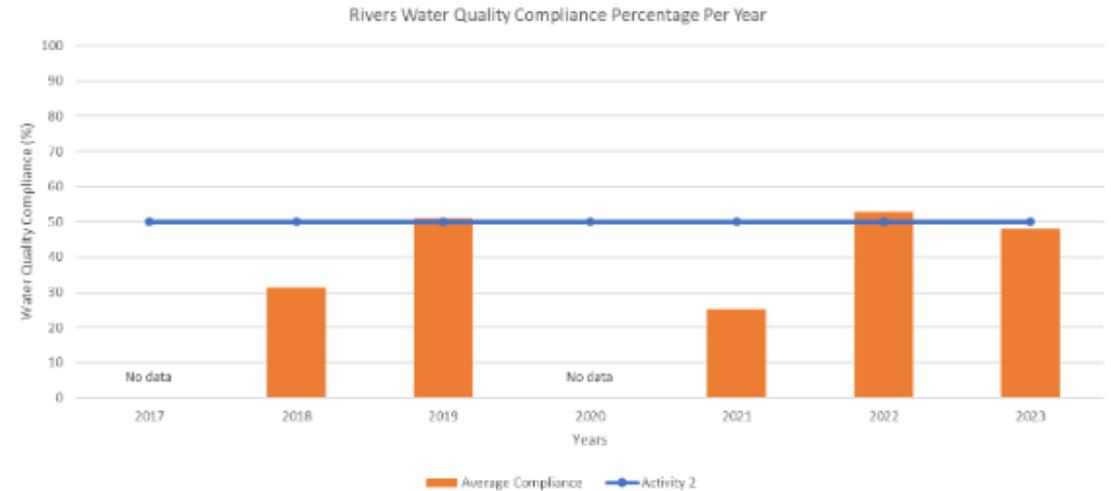
- Aluminium, Manganese, and Iron complied with the set numerical limits.
- Ammonia did not comply with the set numerical limits.

💧 System variables

- pH exceeded the set numerical limits

💧 Pathogens

- *E. coli* complied to the set numerical limits in nine of the monitored sites and showed exceedance in six sites.



MONITORING OF RQOs (NM)

Lower Vaal: RQOs Compliance Monitoring Assessment FY 2024/25 - water quality compliance was 25% for rivers and 63% for dams

💧 Nutrients

- Phosphates, Nitrates, and Ammonia did not comply to the set numerical limits.

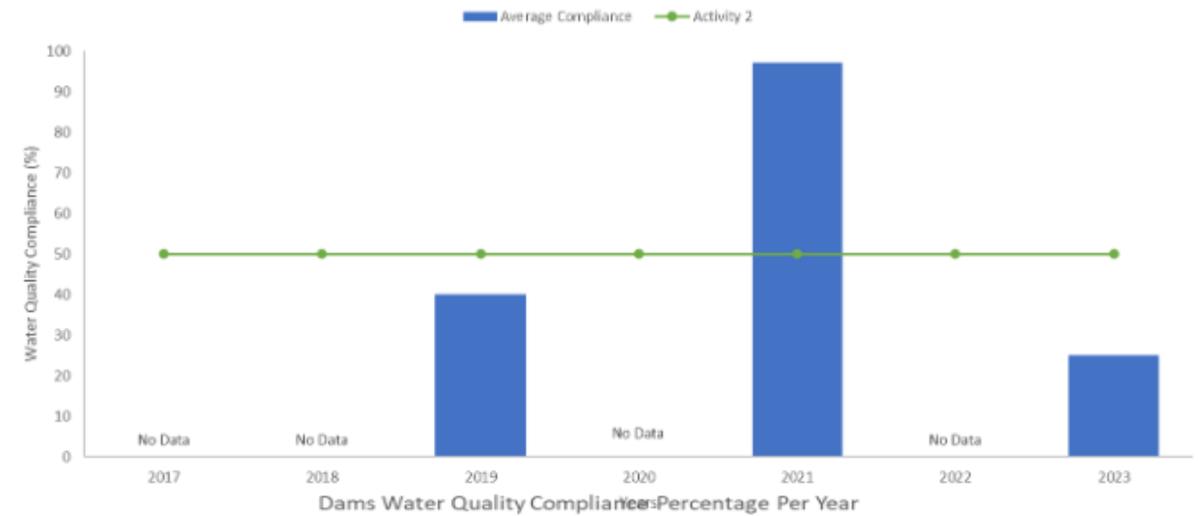
💧 Toxics

- Only two (Fluoride and Aluminium) of the fourteen toxics were monitored. Fluoride was compliant to set limits while **Aluminium** exceeded the RQOs limits.

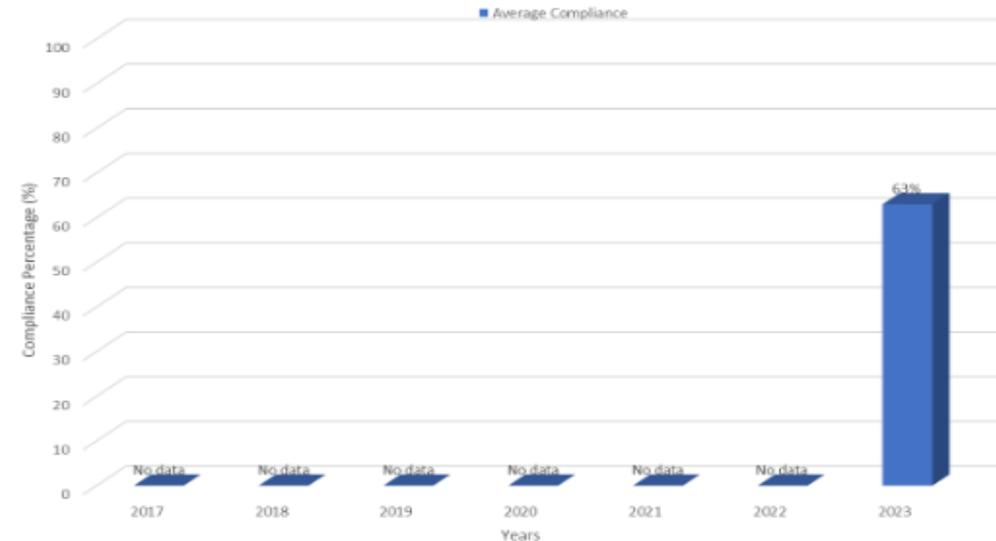
💧 Pathogens

- *E. coli* and Dissolved Oxygen did not have monitoring data.

Rivers Water Quality Compliance Percentage Per Year



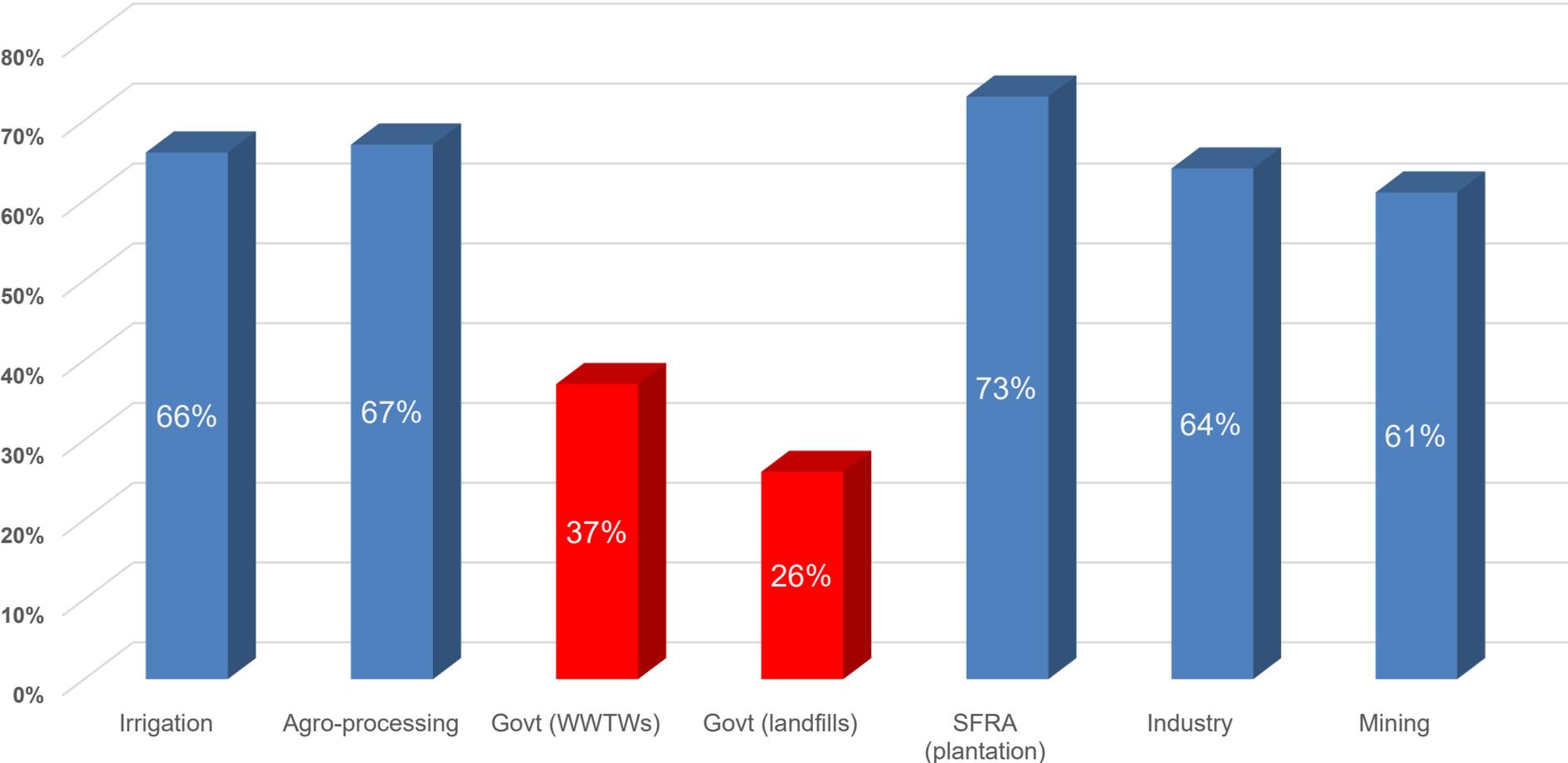
Dams Water Quality Compliance Percentage Per Year



COMPLIANCE MONITORING

- Compliance monitoring activities are increasingly informed by Resource Quality Monitoring to assist in achieving Resource Quality Objectives.
- Several water users across various sectors are targeted for monitoring compliance with the conditions of their water use authorizations.
- There are other requirements not prescribed in the water use entitlements, e.g., Water Metering Regulations of 2017.
- The targeting is based on the risk posed to water resources by the water users. Those with the greatest risk are flagged for compliance audits.
- The audits are conducted on all water use entitlements (Licenses, ELUs & GAs), except Schedule 1.
- DWS has “authorized persons” in terms of Section 124 of NWA to conduct inspections. Furthermore, these officials are trained and designated as Environmental Management Inspectors (EMIS), popularly known as Blue Scorpions.
- Blue Scorpions are peace officers, empowered to carry a docket and to effect arrests

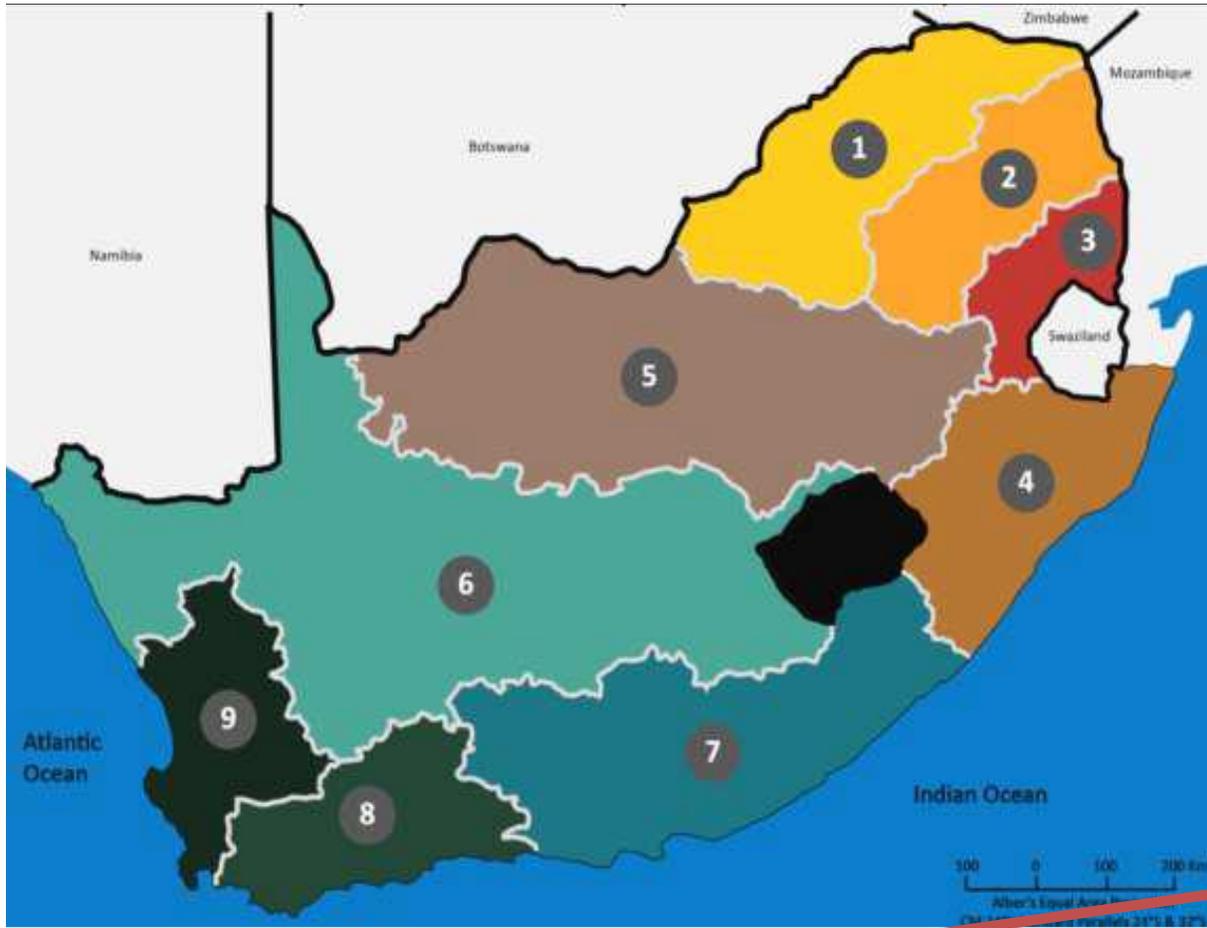
2023/24 LEVEL OF COMPLIANCE



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WATER USERS MONITORED VS. CAPACITY



6. Orange
8832 users- Major sector: Agric irrig

	CME POSTS	
	Posts	Filled
CM	207	63
ENF	117	43
TOTAL	324	106

PROVINCIAL DISTRIBUTION OF FILLED POSTS									
			LP	NW	FS	KZN	EC	NC	WC
HO	GP	MP							
61	18	10	13	5	11	16	14	7	7

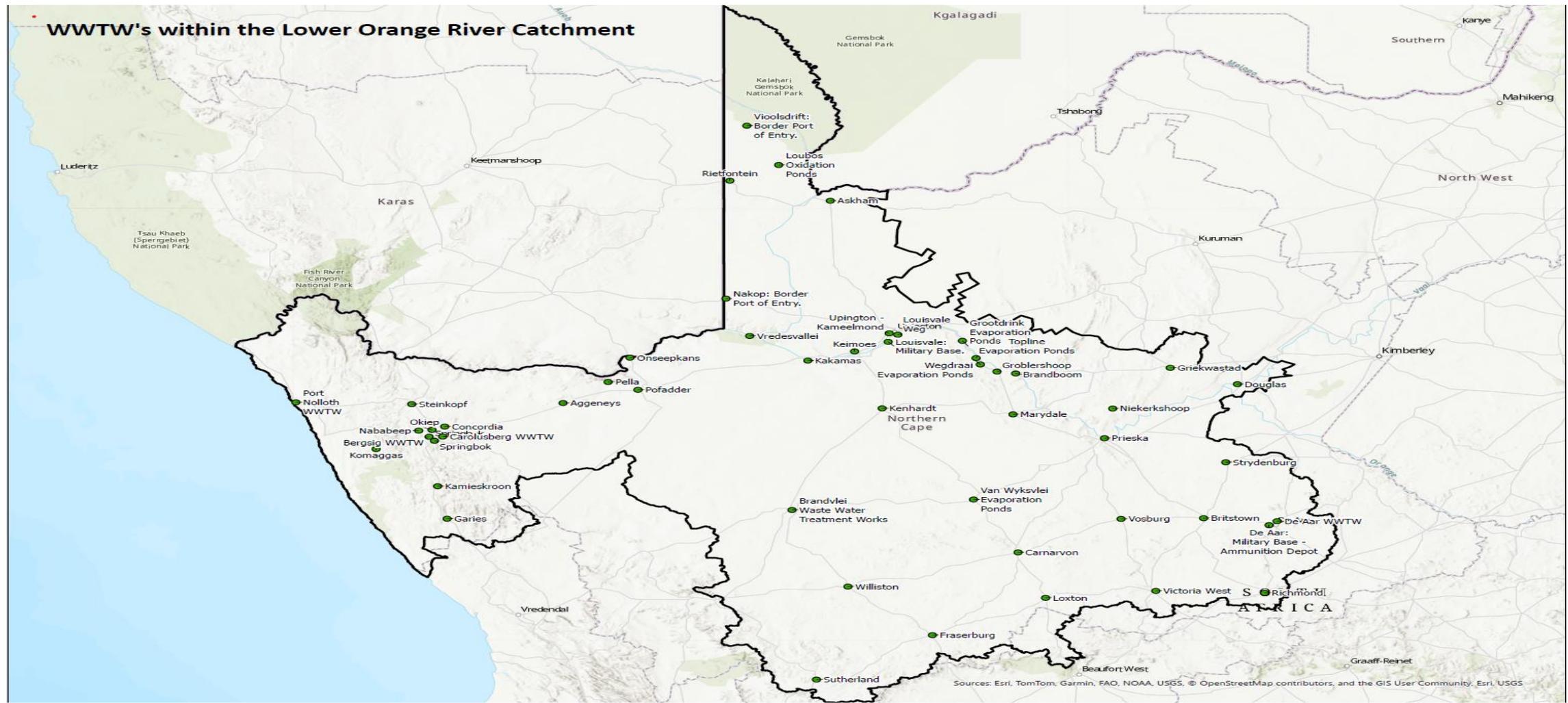
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GREEN DROP

- 51 Wastewater Treatment Works (WWTWs) identified in the Lower Orange Catchment
- 33% of WWTWs are discharging into a stream/ river within the Lower Orange Catchment
- 77% of WWTWs are basic systems with ponds, and there is no discharge
- All WWTWs with effluent discharge are not compliant with the standard. Only Microbiological compliance of 100% by Fraserburg WWTWs within the Karoo-Hoogland Local Municipality.
- No records for groundwater monitoring were provided for pond systems within the catchment
- Only 7% of WWTWs performed on average during the GD 2020/2021 assessment cycle
- 92% has WWTWs performing poorly or are a critical state

WASTEWATER TREATMENT WORKS WITHIN THE LOWER ORANGE



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Yellow: Average performance
No color: Poor or Critical

name_regic	name_insti	works_name
Northern Cape	!Kai! Garib Local Municipality	Kakamas
Northern Cape	!Kai! Garib Local Municipality	Keimoes
Northern Cape	!Kai! Garib Local Municipality	Kenhardt
Northern Cape	Public Works	Nakop: Border Port of Entry.
Northern Cape	!Kai! Garib Local Municipality	Vredesvallei
Northern Cape	!Kheis Local Municipality	Brandboom
Northern Cape	!Kheis Local Municipality	Grobbershoop
Northern Cape	!Kheis Local Municipality	Grootdrink Evaporation Ponds
Northern Cape	!Kheis Local Municipality	Topline Evaporation Ponds
Northern Cape	!Kheis Local Municipality	Wegdraai Evaporation Ponds
Northern Cape	Dawid Kruiper	Askham
Northern Cape	Dawid Kruiper	Loubos Oxidation Ponds
Northern Cape	Public Works	Louisvale Weg
Northern Cape	Dawid Kruiper	Louisvale: Military Base.
Northern Cape	Dawid Kruiper	Rietfontein
Northern Cape	Dawid Kruiper	Upington - Kameelmond
Northern Cape	Public Works	Violsdrift: Border Port of Entry.
Northern Cape	Emthanjeni Local Municipality	Britstown
Northern Cape	Emthanjeni Local Municipality	De Aar WWTW
Northern Cape	Emthanjeni Local Municipality	De Aar: Military Base - Ammunition Dep
Northern Cape	Hantam Local Municipality	Brandvlei Waste Water Treatment Work
Northern Cape	Kamiesberg Local Municipality	Garies
Northern Cape	Kamiesberg Local Municipality	Kamieskroon
Northern Cape	Kareeberg Local Municipality	Carnarvon
Northern Cape	Kareeberg Local Municipality	Van Wyksvlei Evaporation Ponds
Northern Cape	Kareeberg Local Municipality	Vosburg
Northern Cape	Karoo Hoogland Local Municipa	Fraserburg
Northern Cape	Karoo Hoogland Local Municipa	Sutherland
Northern Cape	Karoo Hoogland Local Municipa	Williston
Northern Cape	Khai-Ma Local Municipality	Aggeneys
Northern Cape	Khai-Ma Local Municipality	Onseepkans
Northern Cape	Khai-Ma Local Municipality	Pella
Northern Cape	Khai-Ma Local Municipality	Pofadder
Northern Cape	Nama Khoi Local Municipality	Bergsig WWTW
Northern Cape	Nama Khoi Local Municipality	Carolusberg WWTW
Northern Cape	Nama Khoi Local Municipality	Concordia
Northern Cape	Nama Khoi Local Municipality	Komaggas
Northern Cape	Nama Khoi Local Municipality	Nababeep
Northern Cape	Nama Khoi Local Municipality	Okiep
Northern Cape	Nama Khoi Local Municipality	Springbok
Northern Cape	Nama Khoi Local Municipality	Steinkopf
Northern Cape	Richtersveld Local Municipality	Port Nolloth WWTW
Northern Cape	Siyancuma Local Municipality	Douglas
Northern Cape	Siyancuma Local Municipality	Griekwastad
Northern Cape	Siyathemba Local Municipality	Marydale
Northern Cape	Siyathemba Local Municipality	Niekerkshoop
Northern Cape	Siyathemba Local Municipality	Prieska
Northern Cape	Thembelihle Local Municipality	Strydenburg
Northern Cape	Ubuntu Local Municipality	Loxton

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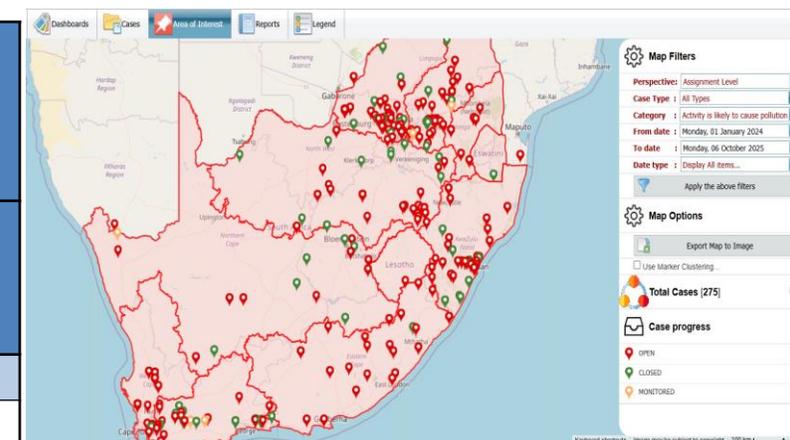
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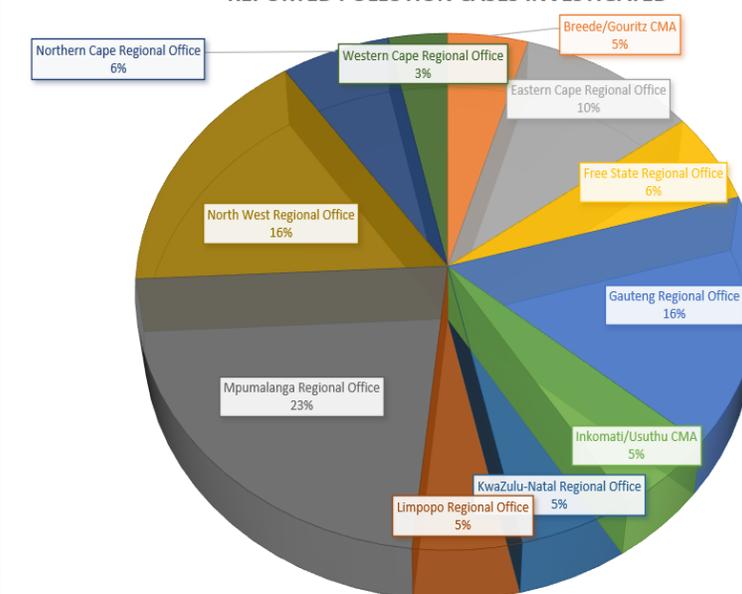
ENFORCEMENT: NATIONAL POLLUTION CASES

Enforcement actions taken against polluters since 1 January 2018 to date

Regional Office	Reported cases investigated	NWA Notices issued	NWA Directives Issued	Criminal Cases Opened	Cases Referred to NPA
Breede/Gouritz CMA	65	35	6	5	0
Eastern Cape Regional Office	145	71	44	4	3
Free State Regional Office	82	46	42	15	3
Gauteng Regional Office	223	79	40	21	10
Inkomati/Usuthu CMA	70	27	21	5	1
KwaZulu-Natal Regional Office	77	35	7	2	0
Limpopo Regional Office	73	51	35	8	1
Mpumalanga Regional Office	321	158	81	33	23
North West Regional Office	231	101	33	13	6
Northern Cape Regional Office	88	70	27	19	1
Western Cape Regional Office	48	19	2	0	0
Total	1423	692	338	125	48



REPORTED POLLUTION CASES INVESTIGATED

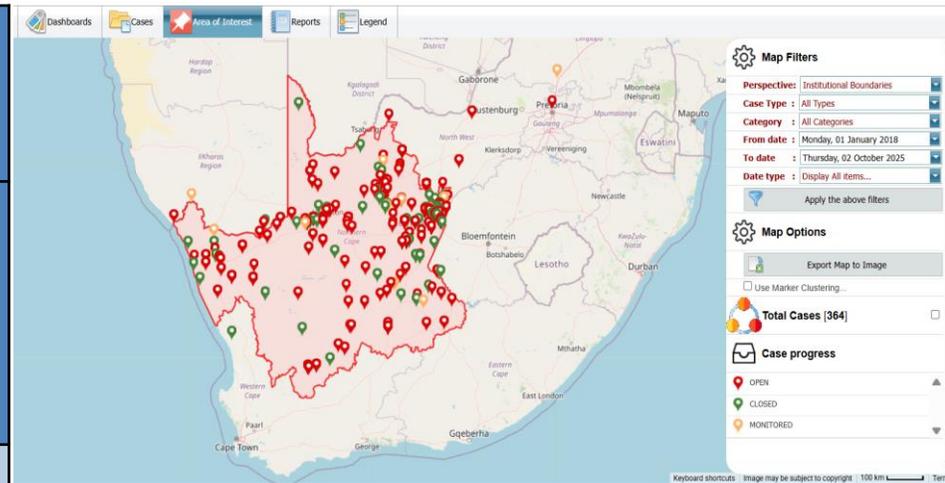


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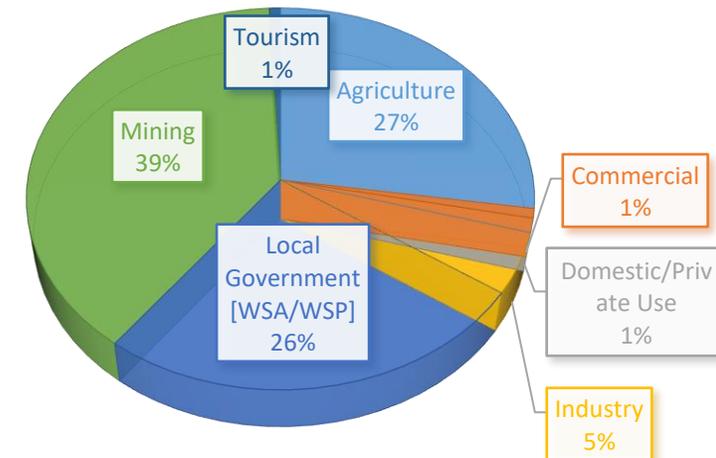
ENFORCEMENT: LOWER ORANGE

Enforcement actions taken in Lower Orange since January 2018 to date

Sector	Reported Cases Investigated	NWA Notices issued	NWA Directives Issued	Criminal Cases Opened	Application for Civil Action
Agriculture	69	47	7	0	2
Commercial	2	1	1	0	0
Domestic/Private Use	3	0	0	0	0
Industry	13	9	1	0	0
Local Government [WSA/WSP]	65	41	14	16	0
Mining	98	21	4	1	0
Tourism	2	2	1	0	0
Total	252	121	28	17	2



REPORTED CASES NON-COMPLIANCE CASES PER SECTOR



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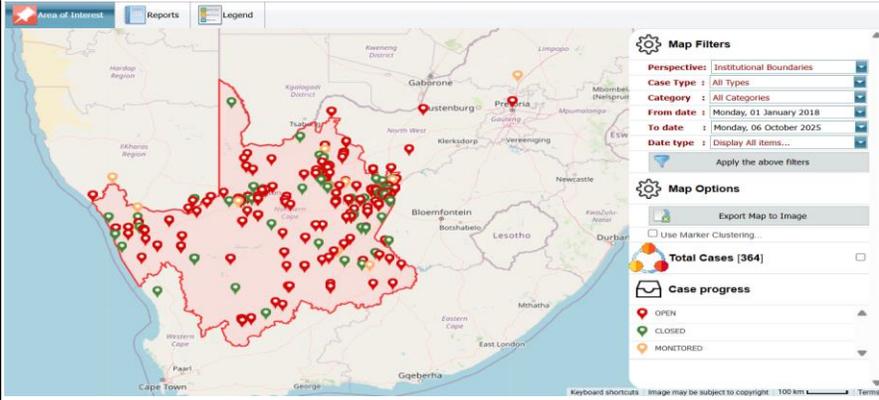


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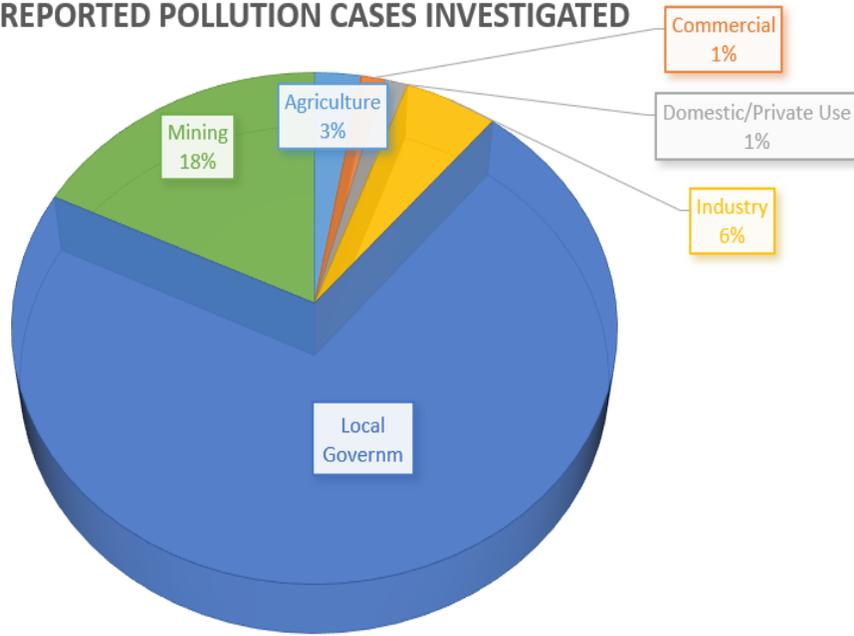
ENFORCEMENT: POLLUTION CASES IN LOWER ORANGE

Enforcement Action Taken against non-compliant water users and polluters in Lower Orange from 1 January 2018 to date

Sector	Reported Cases Investigated	NWA Notices Issued	NWA Directives Issued	Criminal Cases Opened	Cases Referred to NPA
Agriculture	3	4	0	0	0
Commercial	1	1	1	0	0
Domestic/Private Use	1	0	0	0	0
Government [National/Prov]	0	0	0	0	0
Industry	4	1	0	0	0
Local Government [WSA/WSP]	52	51	19	16	0
Mining	13	3	2	1	1
Tourism	1	1	0	0	0
Others	0	0	0	0	0
Total	75	61	22	17	1



REPORTED POLLUTION CASES INVESTIGATED



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Name of Accused	CASE TYPE	Action Taken	Province	JUDGEMENT
State vs Govan Mbeki Local Municipality	Criminal Case – Plead Guilty	CAS 23/09/2020	MP	Counts 1 to 6, are taken together for purposes of sentence and the Accused is fined to a sum of R200 000 000.00, (two hundred million Rand) of which R50 000 000.00 (fifty million Rand) is suspended for a period of 5 (five) years on the following conditions:
State vs Amathole District Municipality	Criminal	FRG29/2021	EC	The accused is fined an amount of R3 000 000-00 (three million rand), which is suspended for five (5) years on the following conditions: The accused is not convicted of any further offences in terms of the National Water Act, 36 of 1998, as amended.
State vs Msukaligwa Local Municipality	Civil Action – Court Order	CAS 192/11/2019 / ECMS 17132	MP	The first Respondent must immediately take corrective measures to stop discharge of poor-quality effluent to prevent further pollution of water resources.
State vs Han Merensky	Criminal Case – Judgement	RP 30/2019	LP	The Accused was convicted as charged. The accused is fined an amount of R5 000 000-00 (five million rand).
State vs Dipaleseng Local Municipality	Criminal Case – Judgement	RC 39/2023	MP	Case finalized, the court issued a court order and the Department is monitoring the implementation thereof. The Municipality was fined R160 Million
State vs Lekwa Local Municipality	Criminal Case – Plead Guilty	CAS 31/09/2019	MP	Counts 1 to 7 taken together for purposes of sentence and the Accused is to a sum of R70 000 000.00, (seventy million rands):
State vs Rand West Local Municipality	Criminal Case – Plead Guilty	Case Number: RC38/2020	GP	Plea and Sentencing Agreement finalised on 17 May 2022 and the Municipality was fined R10 Million of which R7 Million is suspended for a period of five years. The Department is currently monitoring implementation of the court order.
State vs Thaba Chweu Local Municipality	Criminal Case – Plead Guilty	CAS 131/03/2020	MP	Thaba Chweu Local Municipality pleaded guilty and on 22 June 2022 a Plea Sentencing Agreement was reached, and the Municipality was fined R10 Million of which R5 Million is suspended for a period of five years. The Department is currently monitoring implementation of the court order.
State vs Dr Ruth	Civil Action – Court Order	UM 72/2019	NW	The first Respondent must immediately take corrective measures to stop discharge of poor-quality effluent to prevent further pollution of water resources.
State vs Modimolle LM	Civil Action – Court Order	3234/2018	LP	The first Respondent must immediately take corrective measures to stop the discharge of poor-quality effluent to prevent further pollution of water resources.



VAAL RIVER ANTI-POLLUTION (NM)

- 💧 The Deputy Minister (DM) Seitholo launched the Vaal River Anti-Pollution Forum on 3 October 2024.
- 💧 Mr Marius Keet was appointed as the chairperson and Mr Mogale Matsiba as the deputy chairperson
- 💧 The objective of the Forum is to co-ordinate, improve, and integrate efforts to manage the Vaal River's water quality, with a strong focus on combating pollution.
- 💧 The Water Quality Management task team members have been nominated, and their purpose is to evaluate the current state of water quality in the Vaal River through comprehensive data collection and analysis.
- 💧 This will include identifying all monitoring points and discharging water users, assessing compliance with the Resource Quality Objectives (RQOs), and reviewing ongoing projects aimed at improving the river's water quality
- 💧 The date for the next meeting will be communicated in due course.

MINE WATER MANAGEMENT (STRATEGIES AND IMPLEMENTATION PLAN)

- ◆ The mitigation strategy for Upper Vaal was done for FY 2020/2021 and for Middle-Lower Vaal was done for FY 2024/2025 as part of the APP target.
- ◆ The objective of the strategy was to provide a holistic assessment of the current situation and likely future profile within the catchment (biophysical, social, economic, political and institutional), as related to water, to provide a sound basis for the development of appropriate and effective strategic direction.
- ◆ It aimed at critically evaluating the current impacts of mining on the state of water resources within various Water Management Areas
- ◆ The implementation plan for Upper Vaal was done for FY 2021/2022 and for Orange Water Management Area was done for FY 2022/2023 as part of the APP target.
- ◆ The implementation plan was driven by the outcomes set out in the mitigation Strategies.
- ◆ The Implementation Plan aims to address the mine water problems within the Water Management Area (WMA) by means of identifying key strategic interventions to achieve the set strategic objectives.

LEGISLATIVE REVIEW

1. Regulations on Protection and Management of Groundwater Resources

- Purpose: Identify and control certain activities related to the drilling of boreholes to ensure the protection of groundwater resources;
- Progress:
 - Draft regulations have been submitted to Chief state law advisor for quality checking. All inputs have been implemented
 - Initial SEIAS has been submitted and approved from presidency.
 - Draft regulations are ready for gazetting for public consultation.

2. Compulsory National Water and Sanitation Services Standards, 2024.

- Purpose: Set the national norms and standards for :
 - The provision of water and sanitation services,
 - Quality of discharged water into sanitation collection system or water resources
 - Efficient and Sustainable use of water
 - Construction and functioning of water services works and consumer installations
 - Operation and economic sustainability of water services
 - Prohibitions and offences
- Progress:
 - Compulsory Standards (Regulation 6292) was published on 6 June 2025
 - Provincial roll out and advocacy completed in September 2025

LEGISLATIVE REVIEW

3. Regulations on Unconventional Gas

💧 Purpose:

- to protect the water resource,
- to avoid and minimise detrimental and cumulative impacts on the water resource by the controlled activity.

💧 Progress:

-Regulation were published 22 Nov 2024 for public consultation for a period of 30days

-comments have been received from the public requiring:

(a) 60days commenting period

(b) Minimum Information Requirement (MIR) (agreement between DFFE and DWS required DFFE to publish the document) DFFE is yet to publish the document

(c) DFFE Regulations on fracking (DFFE is yet to publish its document)

-DWS waits for DFFE to publish the MIR and its regulations so it can republish for 60days

MANAGING DEMAND IN THE UPPER VAAL AND LOWER ORANGE CATCHMENT AREAS

Presented by: Z. Mboweni and L Sithole
Directorate: Water Use Efficiency

Date: 14 October 2025

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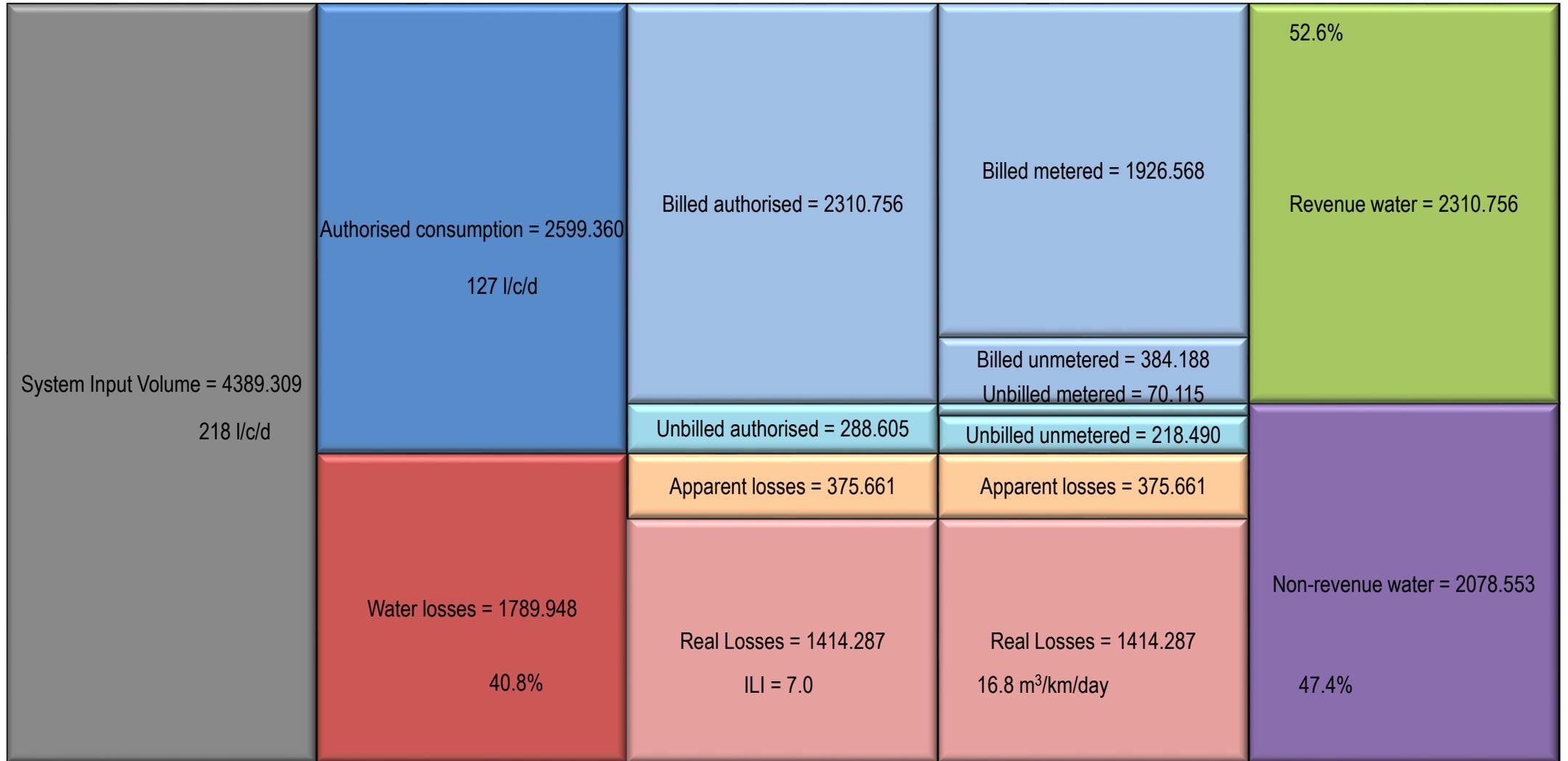


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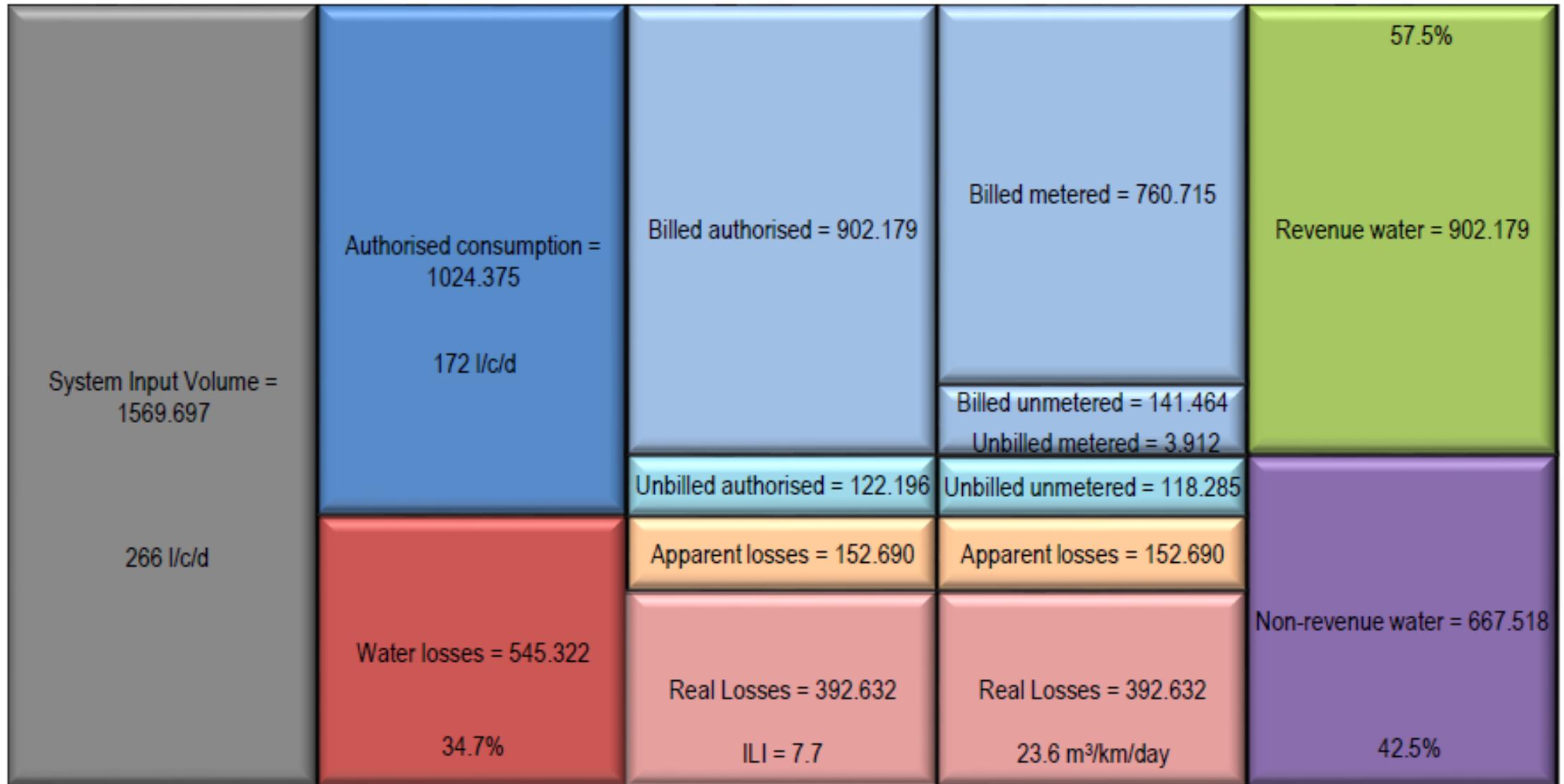


no drop
CERTIFICATION
water use efficiency
REGULATION

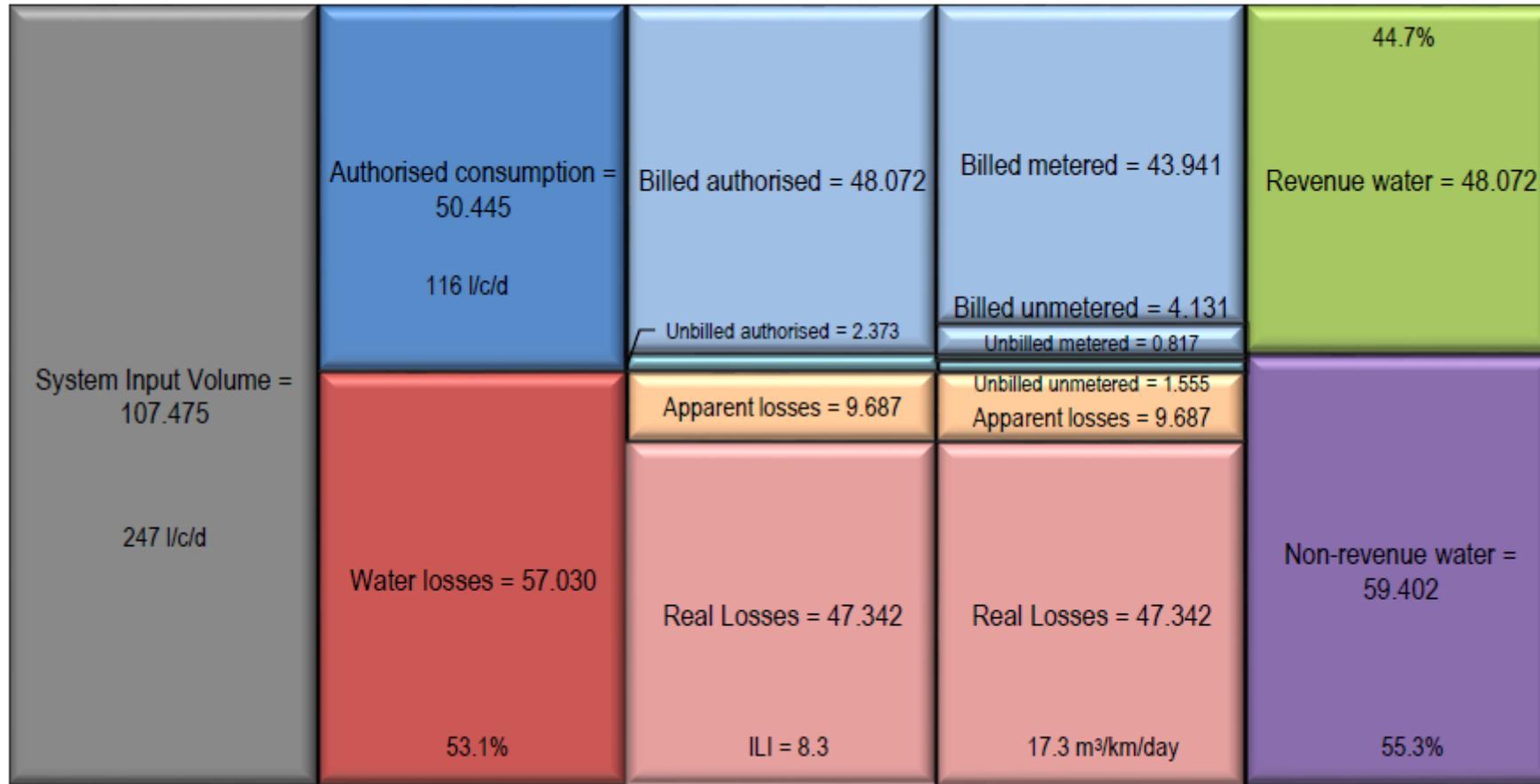
National Water Balance 2022/23 (million m³/annum)



June 2023 Water balance: Gauteng Province



June 2023 Water balance: Northern Cape Province



2023 No Drop Results

No Drop Score	Gauteng	Northern Cape
No Data	0	11
0-<31%	1	5
31-<50%	2	5
50-<80%	4	5
80-<90%	1	0
90-100%	1	0
Total	9	26

90-100%	Excellent
80-<90%	Good status
50-<80%	Average performance
31-<50%	Very poor performance
0-<31%	Critical state

Submission of Corrective Action Plans by GP WSAs

WSA	Submission
Rand West City LM	Submitted
Lesedi LM	Submitted
Mogale City LM	Submitted

Submission of Corrective Action Plans by NC WSAs

WSA	Submission
Dikgatlong LM	Not Submitted
Ga-Segonyana LM	Not Submitted
Gamagara LM	Not Submitted
Hantam LM	Not Submitted
Joe Morolong LM	Not Submitted
Kamiesberg LM	Not Submitted
Kareeberg LM	Not Submitted
Karoo Hoogland LM	Not Submitted
Kgatelopele LM	Not Submitted
Khai-Ma LM	Not Submitted
!Kai !Garib LM	Not Submitted
!Kheis LM	Not Submitted
Magareng LM	Not Submitted
Nama Khoi LM	Not Submitted
Phokwane LM	Not Submitted
Renosterberg LM	Not Submitted
Siyancuma LM	Not Submitted
Tsantsabane LM	Not Submitted
Ubuntu LM	
Umsobomvu LM	Not Submitted
Siyathemba LM	Not Submitted
Richtersveld LM	Not Submitted
Thembelihle LM	Not Submitted

Managing Demand in Gauteng

- Multi-stakeholder Platform for a Water Secure Gauteng (PWSG) was launched in June 2024 at the request of the Director General of the National Dept of Water and Sanitation (DWS) to address growing water insecurity in Gauteng.
- Supported by the World Bank and technical experts from local academia and professional organisations
- The mandate of the PWSG is to understand, promote and support efforts to ensure that all water users in Gauteng (residents and institutions, private and public) can meet their essential water requirements in an equitable, reliable and sustainable manner.



- The PWSG programme will have four work groups:
 - The Gauteng Water Security Dashboard (Water demand, water supply, water leakages, NRW and Water Loss Trends);
 - Communication and awareness campaigns for behavioural change
 - Action Projects (Working with WSAs to determine where to focus efforts)
 - Funding and finance (raising funds for the work)
- PWSG includes top leadership of DWS, Rand Water, the three Gauteng metros and all other water service authorities, National Treasury Cities Support Programme, organised business organisations, civil society as well as technical professionals and experts and remains open to newcomers
- Report released on a bi-monthly basis
- Dashboards will be hosted on DWS website and improved over time



- Forum for all municipalities supplied by Rand Water
- Tracks performance against targets set to meet the 1600ML/day Rand Water Licence
- WSAs present interventions at the forum



- NT initiative for the reforms of Metro Trading Services supported by the World Bank
- 3 Metros developed Water and Sanitation Trading Services Reform Turnaround Strategies which have been approved by NT (Institutional Roadmap and Business and Investment Plan)
- Main focus is on a single point of accountability for Water and Sanitation Services
- Developing Performance Improvement Action Plans for the strategies
- Progress is presented at the PWSG

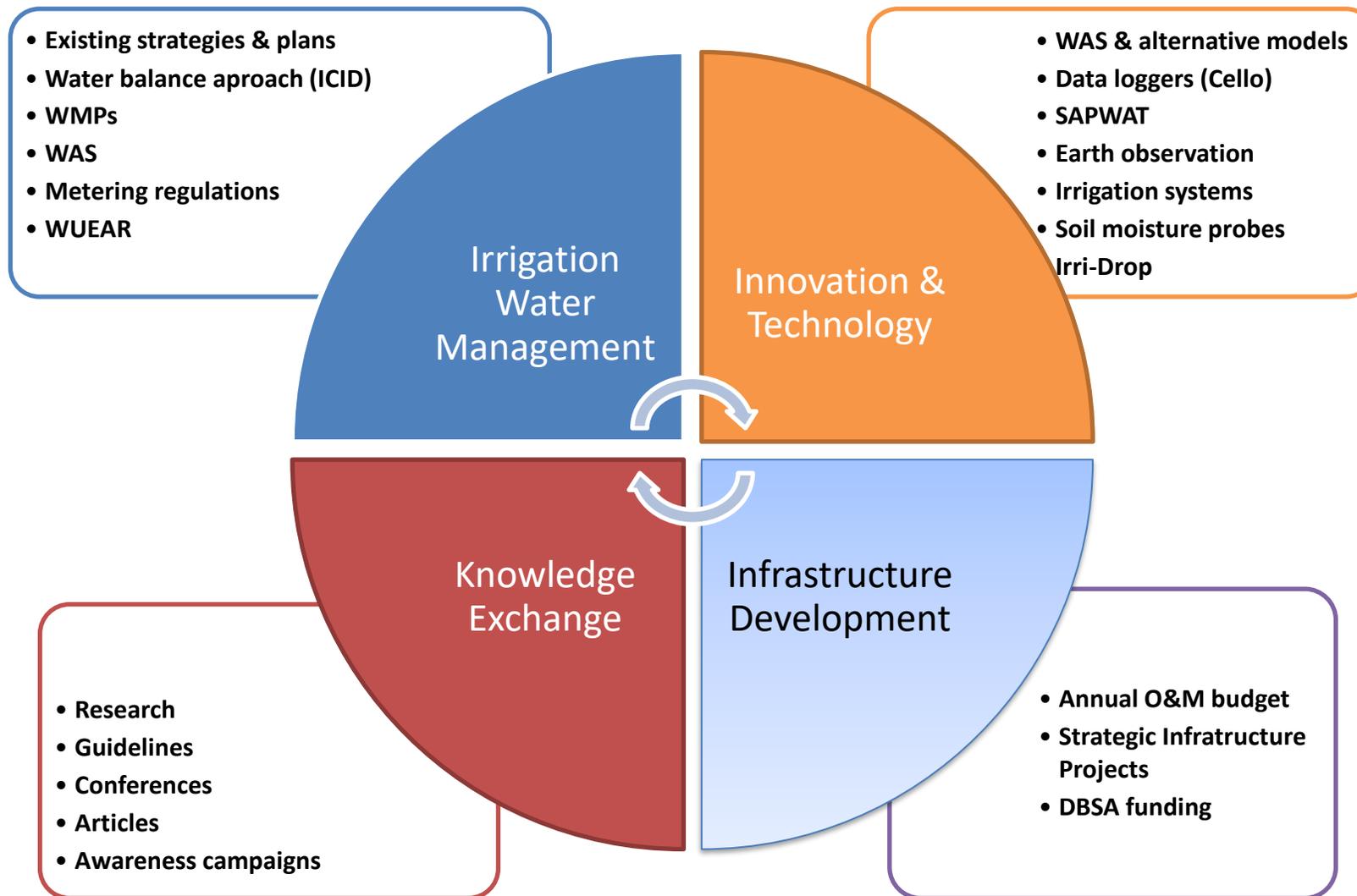


Programmes

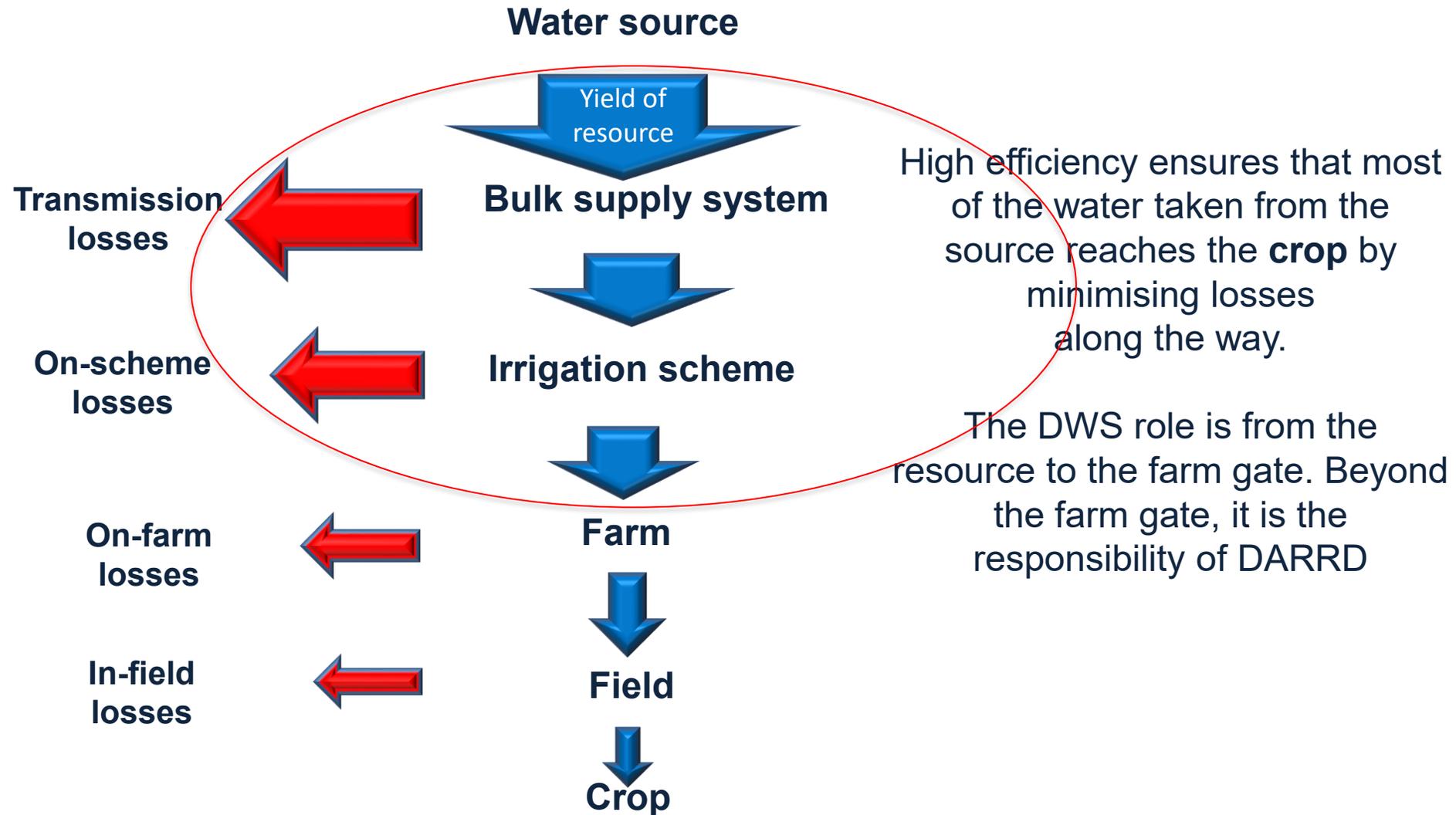
- Establishment of the Water Partnership Office (DBSA)- Develop programmes for private sector partnership and to support municipalities to prepare bankable projects as well as facilitate blended financing
- Implementation of the No Drop Programme to assess performance of WSAs on the implementation of WC/WDM objectives
- The department also undertakes benchmarking study with the intent of providing a status update of the levels of NRW, water losses and water use efficiencies in the country.
- Training WSAs on the development of IWA Water Balance Spreadsheet (Used to calculate water losses and NRW) and the development of WC/WDM Strategies and Business Plans
- Reviewing the Water and Sanitation Services Norms and Standards to strengthen the regulation of water services (Gazetted in June 2025)
- Practical training through the Non Revenue Water Training Programme
- Develop strategies and guidelines

Water Conservation and Water Demand Management in Agricultural Sector

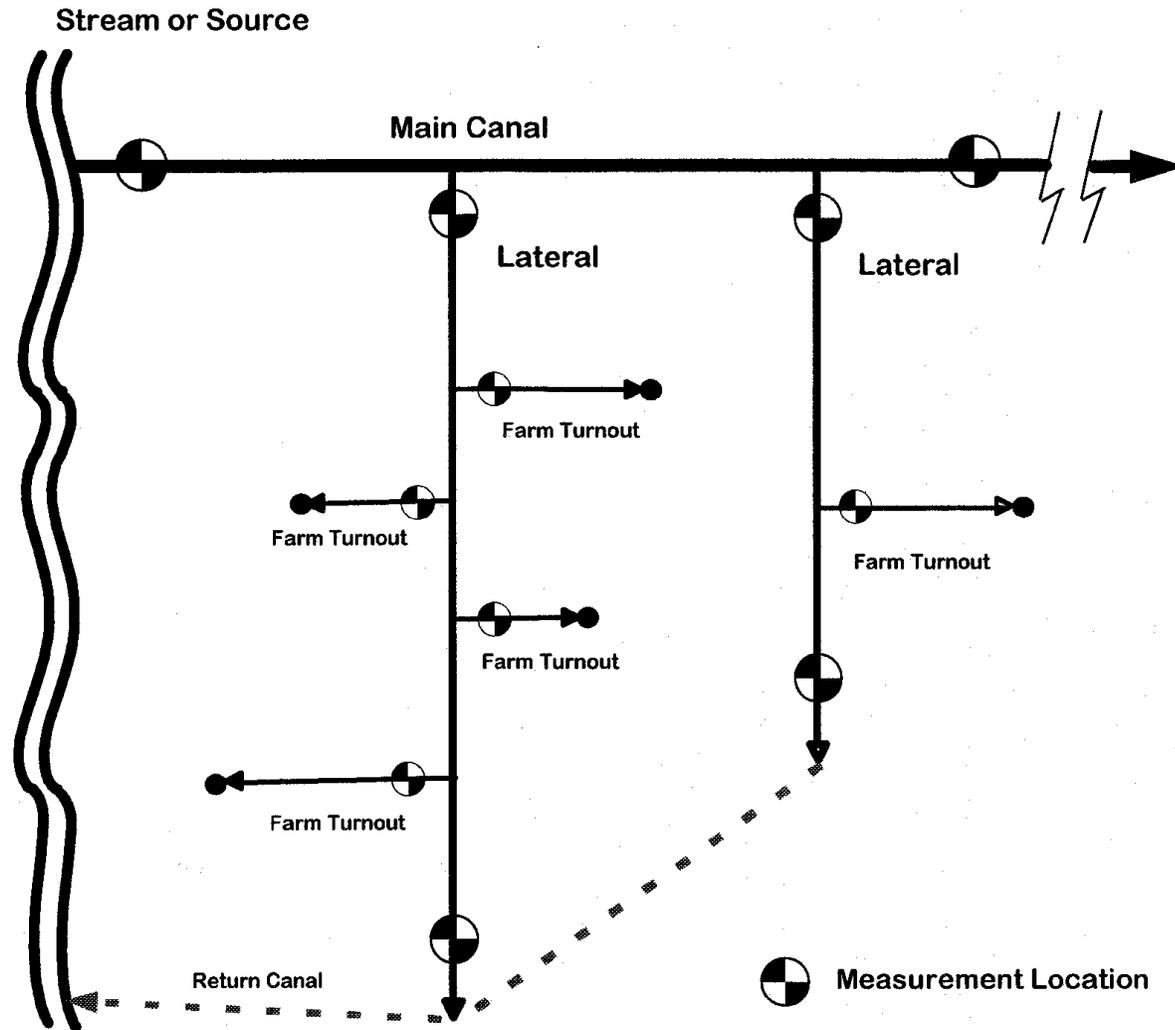
Existing WC/WDM Interventions



Irrigation water use efficiency value chain



Measurement critical



Water Management Plans

- Water loss targets for irrigation scheme are set through the development of the Water Management Plan (s 29 1 of NWA).
- Developing a WMP requires in depth water balance assessment by specialist and entails costs to the schemes (DWS developed 18 WMPs as templates for irrigation schemes)
- WMP is a living document aimed at reducing water losses and ensuring efficient use of water through the implementation of Best Management Practices (BMPs)
- WMP needs to be reviewed every five years to track progress and set new targets.

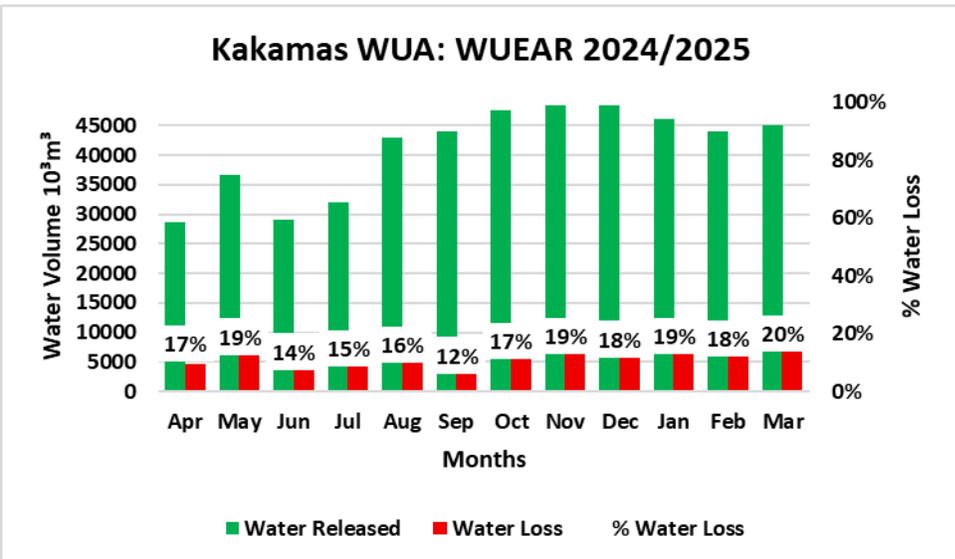
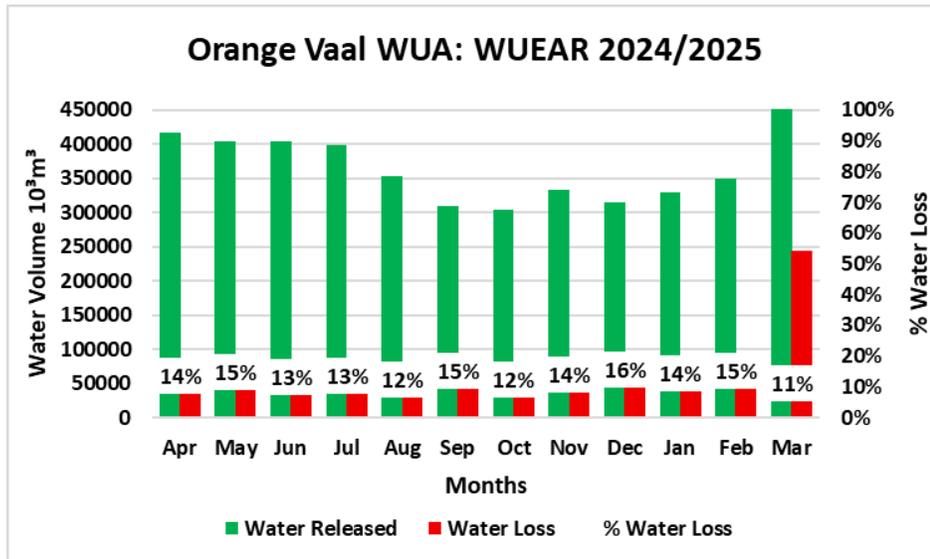
Water Use Efficiency Accounting Report

Water Use Efficiency Accounting Report: Weeks 1 to 49

Year	Mnth	Agriculture (x1000 m3)	Industrial (x1000 m3)	Municipality (x1000 m3)	Household (x1000 m3)	Down stream (x1000 m3)	Other (x1000 m3)	Total used (x1000 m3)	Released (x1000 m3)	Total loss (x1000 m3)	Loss (%)	Alloc used (x1000 m3)	Alloc avail (x1000 m3)	Used (%)	Avail (%)
2021	Apr	11 002	7	1 155	45	7 250	101	19 558	27 640	8 081	29.2	12 264	271 901	4.3	95.7
2021	May	3 764	8	1 060	36	3 865	58	8 790	11 205	2 415	21.6	17 154	267 011	6.0	94.0
2021	Jun	8 583	5	890	36	7 163	94	16 770	23 806	7 036	29.6	26 726	257 439	9.4	90.6
2021	Jul	8 679	4	1 117	45	7 138	58	17 041	24 180	7 140	29.5	36 584	247 581	12.9	87.1
2021	Aug	7 825	13	1 141	36	5 581	76	14 671	18 401	3 729	20.3	45 639	238 526	16.1	83.9
2021	Sep	26 553	20	1 091	45	10 876	140	38 724	49 767	11 043	22.2	73 442	210 723	25.8	74.2
2021	Oct	25 140	9	1 145	36	9 876	94	36 299	43 549	7 250	16.6	99 830	184 336	35.1	64.9
2021	Nov	19 297	9	1 012	36	8 580	101	29 034	35 356	6 322	17.9	120 248	163 917	42.3	57.7
2021	Dec	10 746	8	952	45	5 778	130	17 659	22 146	4 487	20.3	132 084	152 081	46.5	53.5
2022	Jan	14 115	5	1 064	36	4 651	79	19 949	22 402	2 452	10.9	147 346	136 819	51.9	48.1
2022	Feb	18 840	13	1 223	36	6 009	85	26 204	32 477	6 273	19.3	167 506	116 659	58.9	41.1
2022	Mar	4 163	0	0	9	1 477	11	5 660	7 412	1 752	23.6	171 680	112 485	60.4	39.6
		158 706	100	11 849	436	78 244	1 024	250 360	318 340	67 979	21.4	171 680	112 485	60.4	39.6

Water Use Efficiency Accounting Report

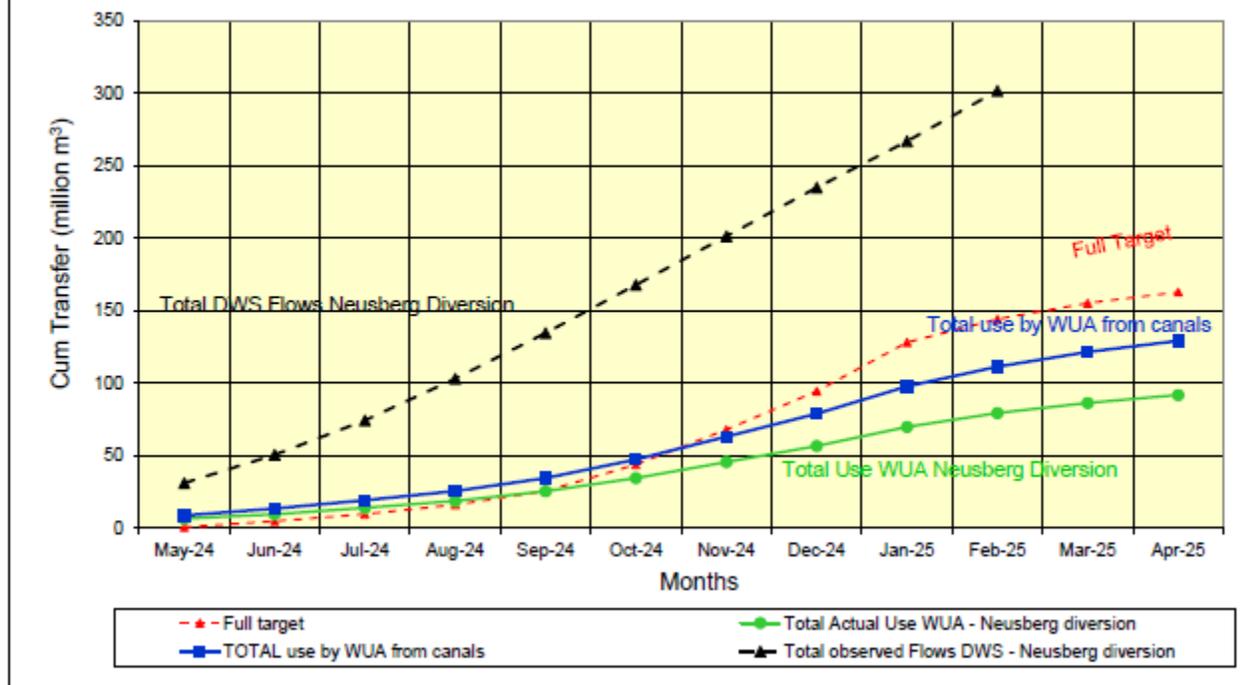
Scheme	Released (Million m ³ /a)	Used (Milliom m ³ /a)	Water Loss (Milliom m ³ /a)	Average % Water loss for 2024/25
Kakamas WUA	537.08	446.12	90.97	17%
Boegoeberg WUA	629.5	266.02	363.42	55%
Orange Vaal WUA	169.20	150.49	18.70	13%



DWS: Water Resource Management Planning

Description	Units	May-24 31	Jun-24 30	Jul-24 31	Aug-24 31	Sep-24 30	Oct-24 31	Nov-24 30	Dec-24 31	Jan-25 31	Feb-25 28	Mar-25 31	Apr-25 30	Transfer 365.25
Table E-11: Kakamas WUA (D7H016 & D7H015 - DWS RSA) Glepie van Nlekerk														
Full Target gross requirement	m ³ /s	0.30	1.60	1.83	2.41	3.61	6.85	9.33	9.87	12.58	6.60	4.12	2.90	5.16
	Irrigation (million m ³ /m)	0.57	3.93	4.68	6.24	9.15	18.12	23.96	26.22	33.49	16.89	10.81	7.31	160.36
	Urban (million m ³ /m)	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	2.60
	Total (million m ³ /m)	0.79	4.15	4.89	6.46	9.37	18.34	24.18	26.43	33.70	16.10	11.03	7.53	162.96
	Cumulative	0.79	4.94	9.83	16.29	25.66	43.99	68.17	94.60	128.31	144.41	155.44	162.96	
TOTAL use by WUA from canals	m ³ /s	3.32	1.82	2.16	2.35	3.46	4.78	6.10	5.89	7.04	5.55	3.84	2.93	4.10
	Million m ³ /m	8.88	4.73	5.78	6.31	8.98	12.61	15.82	15.77	18.85	13.56	10.28	7.60	129.39
	Cumulative	8.88	13.61	19.40	25.70	34.68	47.49	63.32	79.08	97.94	111.50	121.79	129.39	

Fig E-11: Diversion at Kakamas and estimated use by WUA



Water Administration System

Canal water management through WAS

- Ensure effective bulk water administration and management within irrigation schemes.
- Ensure significant water savings through better water loss control in rivers and canal system

Impact areas	Description of impacts
Improvement In Water Management and Utilization	<ul style="list-style-type: none"> • Reduced spillages • Improved monitoring of users exceeding allocated quotas • Improved management of water use entitlements
Minimization of Water Losses	<ul style="list-style-type: none"> • Accurate and real time collection of data regarding water levels, volumes and abstractions. • Accurate and timely identification of water losses in the system • Savings measured in terms of water volumes and costs
Improved Planning	<ul style="list-style-type: none"> • Knowledge of exact water allocations available to each farmer • Improved planning for future crop production • Better planning by farmers for expansion
Reduced Operating Costs and Improved Productivity	<ul style="list-style-type: none"> • Routine operations and calculations done using WAS, which saves time • Reallocation of labour skills to increase productivity • Cost and time savings
Improved Crop Yield	<ul style="list-style-type: none"> • Increased crop output due to improved water management distribution. • Increased revenue due to increased crop output
Improved Planning	<ul style="list-style-type: none"> • Improved transparency • Better overview and insight into debtor accounts

Rehabilitation of conveyance systems (ROCS)

- Rehabilitation of conveyance systems program is an on-going program of DWS whose key objective is to improve water use efficiency of the conveyance infrastructure.
- Department conducts conditional assessment of the infrastructure.

Canal Components	Schemes													
	Boegoeberg	Douglas	Kakamaas	Leeu River	Lindleyspoort	Mooi River	Orange Riet	Renoster River	Sand vet	Schoonspruit	Thaba Nchu	Uppington Islands	Vanderkloof	Riet River
1 - Very poor														
2 - Poor														
3 - Fair														
4 - Good														
5 - Very Good														
Canal Embankment	3	3	4	4	3	3	3	3	3	3	2	3	3	4
Canal Lining	3	2	4	3	5	3	3	3	3	3	2	4	4	3
Canal shoulders	3	3	4	2	5	3	4	3	3	2	1	3	3	3
Canal Joints	3	2	3	3	5	3	4	2	3	3	2	3	4	3
Canal Fence	3	1	2	4	2	2	4	1	2	2	1	1	4	4
Canal Berm	2	1	2	3	3	3	3	2	4	3	1	2	3	3
Canal Road	3	1	3	2	3	3	3	2	3	2	2	2	4	3
Avg Condition	3	2	3	3	4	3	3	2	3	3	2	3	4	3
Rehabilitation Cost (mil)	R 944	R 492	R 123	R 37	R 12	R 327	R 1 522	R 9	R 688	R 133	R 62	R 532	R 305	R 559
Total Cost (million)														R 5 745

Recent rehabilitation projects

Cluster	Project Number	Project Name	MTEF		
			2022/23	2023/24	2024/25
			R'000	R'000	R'000
Central	P/0972	Rebuilding Vkfontein	120 000	80 000	25 000
	P/0994	Boskop Canal(Refurbi	10 000	-	5 000
	P/1013	Vaalharts Taung Cana	12 000	30 000	60 000
	P/3844	Thukela-Vaal Canals	9 000	25 000	60 000
Northern	P/0517	Rehabilitation M/Let	20 000	35 000	15 000
	P/0533	Nzhelele canal rehab	70 000	3 000	-
	P/2326	Marico Bosveld canal	2 000	15 000	45 000
	P/2972	Pienaars River Gws-R	10 000	60 000	75 000
	P/2974	Hartbeespoort-Rehabi	10 000	50 000	50 000
	P/2975	Loskop -Rehabilitati	-	-	-
	P/3770	Heyshope pipeline re	5 000	-	-
	P/3775	Balmoral canal rehab	5 000	10 000	-
	P/3776	Refurbishment of Onverwacht Pipeline	10 000	12 000	15 000
	P/0789	Qamata Rehab of Ld13	4 000	-	-
Southern	P/0807	Rehab Of Ncora Dam (4 000	-	-
	P/0881	Qamata Irrigation Sc	20 000	55 000	70 000
	P/0886	Ncora Canal Rehabili	30 000	20 000	-
	P/0889	Elandsriver Canal Re	10 000	-	-
	P/0900	Rehabilitation Of Tripple Siphons	-	-	-
	P/1338	Rehab Of Kliphoek-On	-	-	30 000
	P/3462	Fish-Sundays Canal(p	20 000	-	-
	P/3522	Buffelshoek syphon r	20 000	20 000	5 000
	P/3523	Addo Canal	30 000	12 000	15 000
	P/3843	Mthata construct tem	37 000	-	-
	TOTAL		458 000	427 000	470 000

Development of Irri Drop Programme



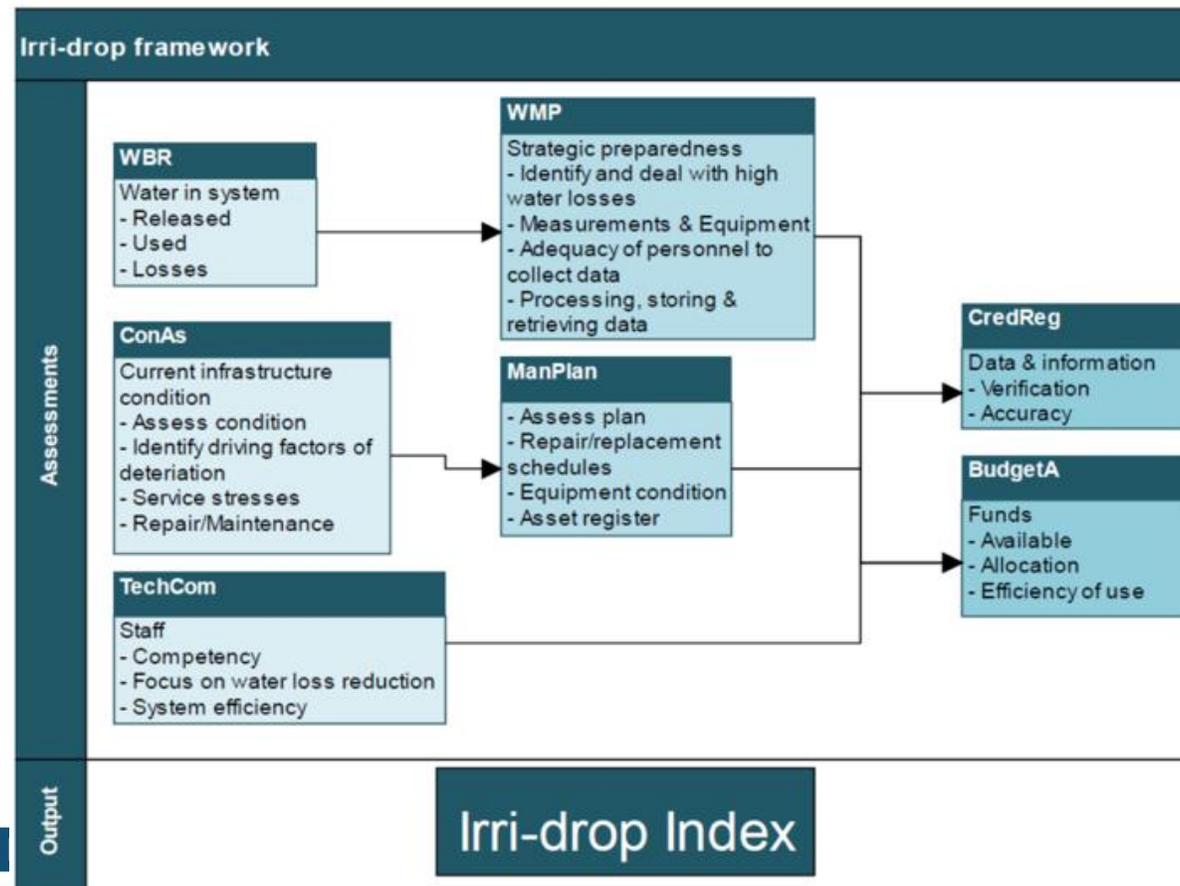
Project WRC K5/2970/4

Project Title: The state of irrigation water losses and measures to improve water use efficiency on selected irrigation schemes

Irri Drop Programme

- An audit tool used to assess and report on the water use efficiency of the irrigation schemes (an incentive based regulatory tool)

Proposed framework for Irri Drop System



Water Control Officers training

- The most of our water supply systems and dams are controlled by WCOs. Their task is to distribute water to our (DWS) clients and to improve water use efficiency in the Agricultural Sector.
- DWS offers Water Control Officers the following training courses to equip them for their responsibilities.
- As they need to ensure on-time delivery of irrigation water to water users at a certain flow rate with the minimum water loss, WCOs must be trained and capacitated subject including:
 - Water measurement
 - Water distribution
 - Dam control
 - Water resource management.

COURSE	PRE-REQUISITES
Introduction to Water Measurement	Grade 12, use of calculator , measuring tape , Working in field of Water Measurement and Distribution, Locally trained
Water measurement	Grade 12. 6 months exposure in Basic Water Measurement OR passed Introduction to Water Measurement.
Introduction to MS Word & Technical Report Writing	Basic Computer Literacy.
Water Distribution	Water Measurement Course. 3 months exposure in Water Distribution.
Test	Water Measurement & Water Distribution
Water Resource Management	Grade 12 or Test course
Dam Control Module 1	Grade 12 , 3 months exposure at Dam. Module 1 before Module 2
Dam Control Module 2	Passed module 1

THANK YOU