water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

IMPLEMENTATION OF THE NWRCS AND DETERMINATION OF THE RQOs FOR THE INKOMATI CATCHMENT

Public Meeting 4 March 2015

Overview of the recommended Water Resource Classes

Terminology

NOTE:

Water Resource Classes (correct terminology)

commonly referred to as

Management Classes

How were the classes determined?

1: Delineate units of analysis and describe the status quo ✓

2: Stakeholder process and catchment visioning ✓

3: Quantify EWRs and changes in Ecosystem Services ✓

4: Identification and evaluation of scenarios within IWRM ✓

5: Draft Water Resource Classes ✓

6: Resource Quality Objectives ✓

7: Gazette class configuration ✓

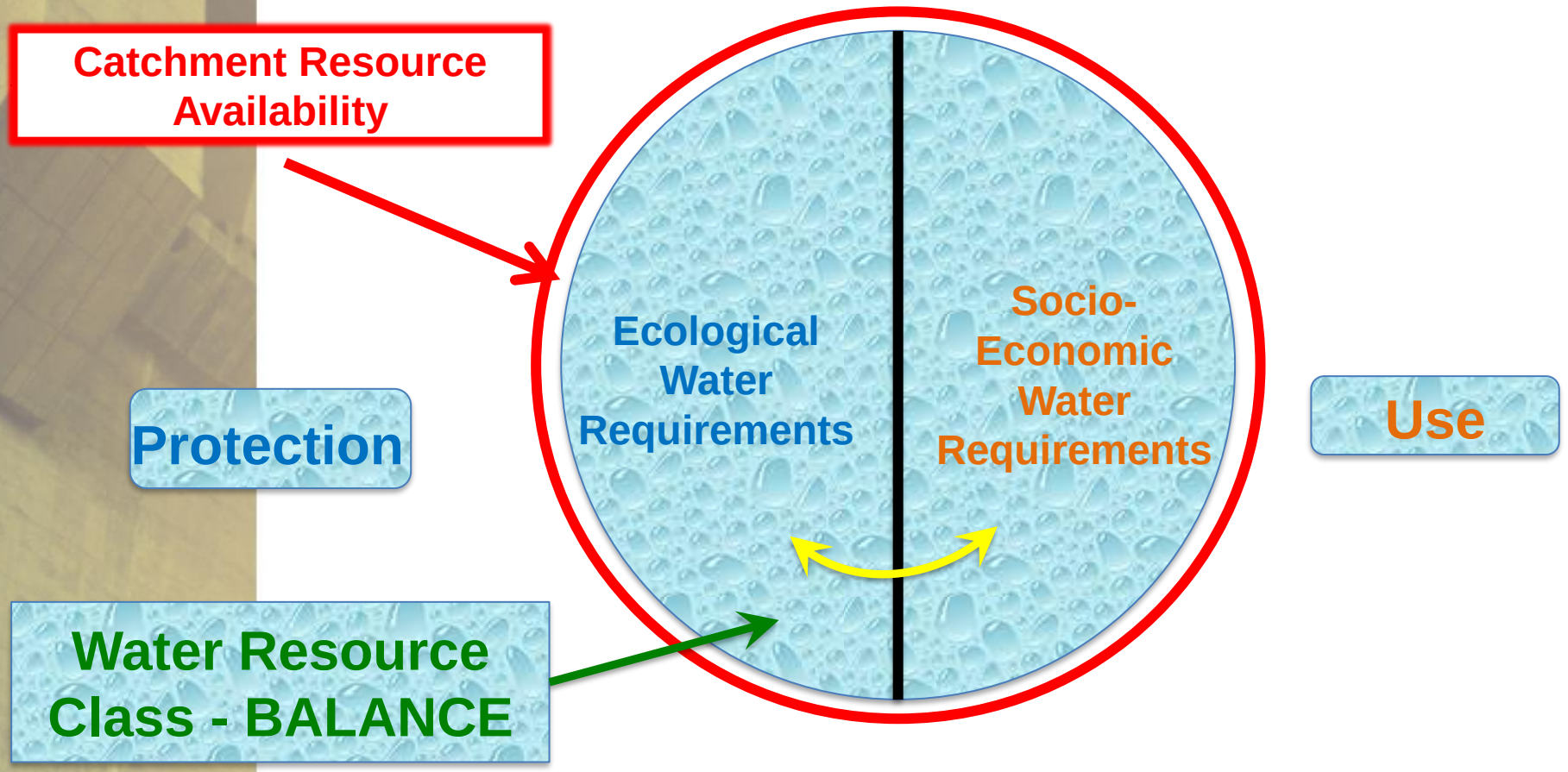
Contents of Presentation

- **Classification of the Inkomati Catchment water resources**
  - Catchment area, river system & sub divisions
  - Proposed Water Resource Classes and implications
- **Resource Quality Objectives**
  - Numerical and/or narrative statement of the conditions required to protect the water resource in accordance with the Water Resource Class (**Defines the management goals**).

Aspects considered in Class determination

- **Ecological Water Requirements**:
  - Detailed determination at 67 nodes of which 23 are EWR sites (key nodes).
  - Desktop determination at 120 nodes.
- **User water requirements (How much water is used?)**
  - Quantity and quality
- **Hydrological assessment (How much water is available?)**
  - Detailed study (gw - surface water interaction)
- **Socio-economic activities relying on water:**
  - GDP, Jobs (irrigation, urban, light industry, informal)
  - EcoSystem Services (use of water in the rivers)

Determination of the Class



What are scenarios? (1)

Scenarios, in 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 (System's context)

Different levels of water use and protection are evaluated with the aim to find a preferred scenario.

NWRC is the process to evaluate and recommend what that scenario entails.

What are scenarios? (2)

Scenarios can include:

- Maintaining the status quo
- Catering for future growth (domestic, irrigation, industrial etc)
- Development of new infrastructe

NB: Class recommendations do NOT imply acceptance or approval of the scenarios. Future scenarios are considered to ensure that Classes can accommodate the scenarios that provide a balance between protection and use. The NWRCS therefore tests whether a sufficient spread of scenarios has been investigated and that the work has been done to an acceptable standard.

Water Resource Class Selection Process

- Weighed up the level of ecological protection against the socio-economic benefits from water use.
- Scenario analysis (4 pillars):
  - **Ecological status/health** rating – relative to the desired ecological conditions
  - **Ecosystem Services**, rated relative to existing services
  - **Economic activity** (GDP in Rand)
  - **Employment** (number of jobs supported)

What are RQOs?

RQOs capture the **Water Resource Class** of the Classification System and the **ecological needs determined in the Reserve** into **measurable management goals** that give direction to resource managers as to how the resource needs to be managed.

*RQOs for a water resource are a numerical or narrative (descriptive) statement of the conditions which should be met in the receiving water resource, in terms of resource quality, in order to ensure that the **water resource is protected**.*

RQOs and Water Resource Classes

For which components/indicators are RQOs set?

- Quantity, pattern and timing of instream flow (**hydrology**) (time series, FDC). Defined by the recommended scenario
- **Water quality** (numerical values that define the fitness of use and/or ecological requirements for various variables)
- Characteristics and condition of **riparian habitat and biota** (% alien vegetation, cover, species)
- Characteristics and condition of **instream habitat and biota** (frequency of occurrence, species/taxa, abundance, habitat)

NOTE: Not all RQOs are set for all RUs – depends on priority and indicators selected.

Reminder: Reserve categories

Ecological Category	Description
A	Unmodified, natural.
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.
C	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.
F	Critically / Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In worst instances basic ecosystem functions have been destroyed irreversibly.

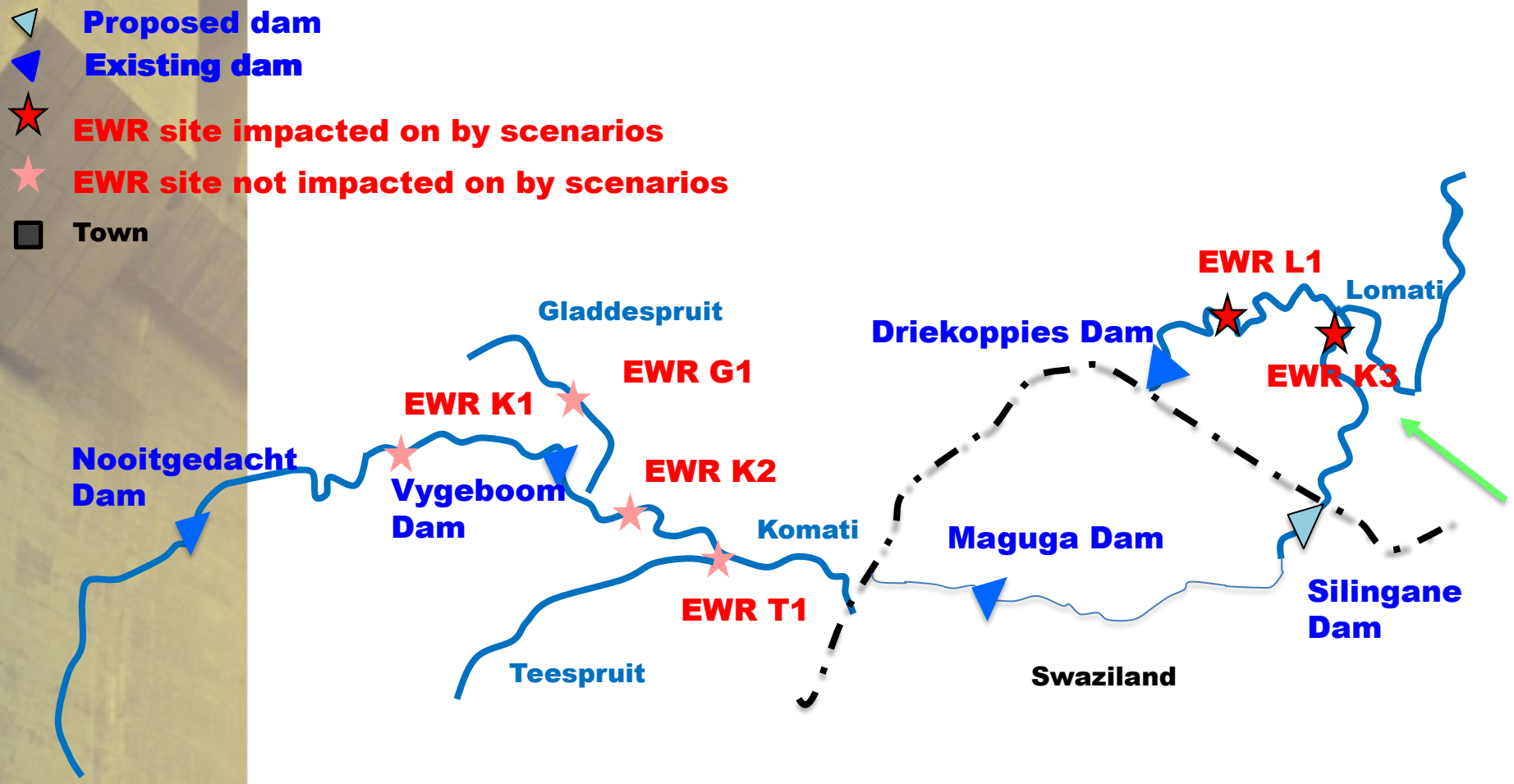
Water quality RQOs

- An integration of outputs was needed, i.e. **EcoSpecs** (as A-F categories) and **UserSpecs** (as Ideal – Unacceptable)

Categories A and A/B = Ideal; B, B/C and C = Acceptable; C/D and D = Tolerable

- Numerical & narrative ranges
  - Salts:
    - Ideal: up to 45 mS/m (A/B category)
    - Acceptable: > 45 – 85 mS/m (C category)
  - Nutrients:
    - Ideal: up to 0.01 mg/L PO_4-P and 0.48 mg/L TIN-N (A/B category)
    - Acceptable: > 0.01 – 0.025 mg/L PO_4-P and > 0.48 – 1 mg/L TIN-N (C category)

KOMATI SYSTEM: WRC



Komati Scenario variables

9 scenarios were considered that included combinations of the following variables:

- **Growth in water demands:**
  - Domestic growth projected up to 2030
  - An increase in irrigation of about 20 million m3/a when Swaziland take up their full allocation in terms of the Komati Basin Treaty

- **IIMA (Interim IncoMaputo Agreement):**
  This agreement allows for an increase of cross-border minimum flow from the current 1.1 m^3/s to 1.43 m^3/s.

Komati Scenario variables

- **DARDLA** (Depart of Agriculture & Rural Development) There is an estimated 14 million m^3/a of unused irrigation allocations in the upper Komati. The variable allows for reinstatement of this irrigation.

- **Silingane Dam**
  The most likely future dam development is the Silingane Dam on the Komati River downstream of the Maguga Dam. This dam will provide water for growth in domestic requirements, IIMA requirements and possibly increased irrigation.

Sc 42 consists of the starred variables and considered as the recommended future scenario that provides the 'best' balance.

X_1 Komati: Recommended Classes

Scenario immediately applicable:

- Maintain the current ecological state and operation of the Komati and Lomati Rivers.
- Institute measures (non flow-related) to achieve the REC in tributaries of the main rivers(relevant for future scenarios as well),

Implications: No implications to users. The REC in the Lomati River is not achieved under the current situation and the ecological status quo is maintained.

X_1 Komati: Recommended Classes

Long-term scenario / the scenario that may be applicable in future (Sc K42)

- Maintain the current ecological state,
- Provision of Interim IncoMaputo water use Agreement(IIMA)flows,
- Providing water for domestic growth up to the year 2030,
- Reinstatement of fallow irrigation as suggested by the Department of Rural Development and Land Affairs (DARDLA).

Implications: No negative economic implications as a whole but a reduction of the assurance of supply in irrigation downstream of Swaziland (other than the DARDLA irrigation).

X_1 Komati: Recommended Classes

IUA	PES	REC	Draft Classes
X1-1	III	III	III
X1-2	II	II	II
X1-3 (K1)	II	II	II
X1-4 (G1)	III	III	III
X1-5 (K2)	II	I	I
X1-6 (T6)	II	I	I
X1-7	II	I	II
X1-8 (L1)	III	II	III
X1-9 (K3)	III	III	III
X1-10	XXX	III	III

Note that the Classes do NOT change under Sc 42

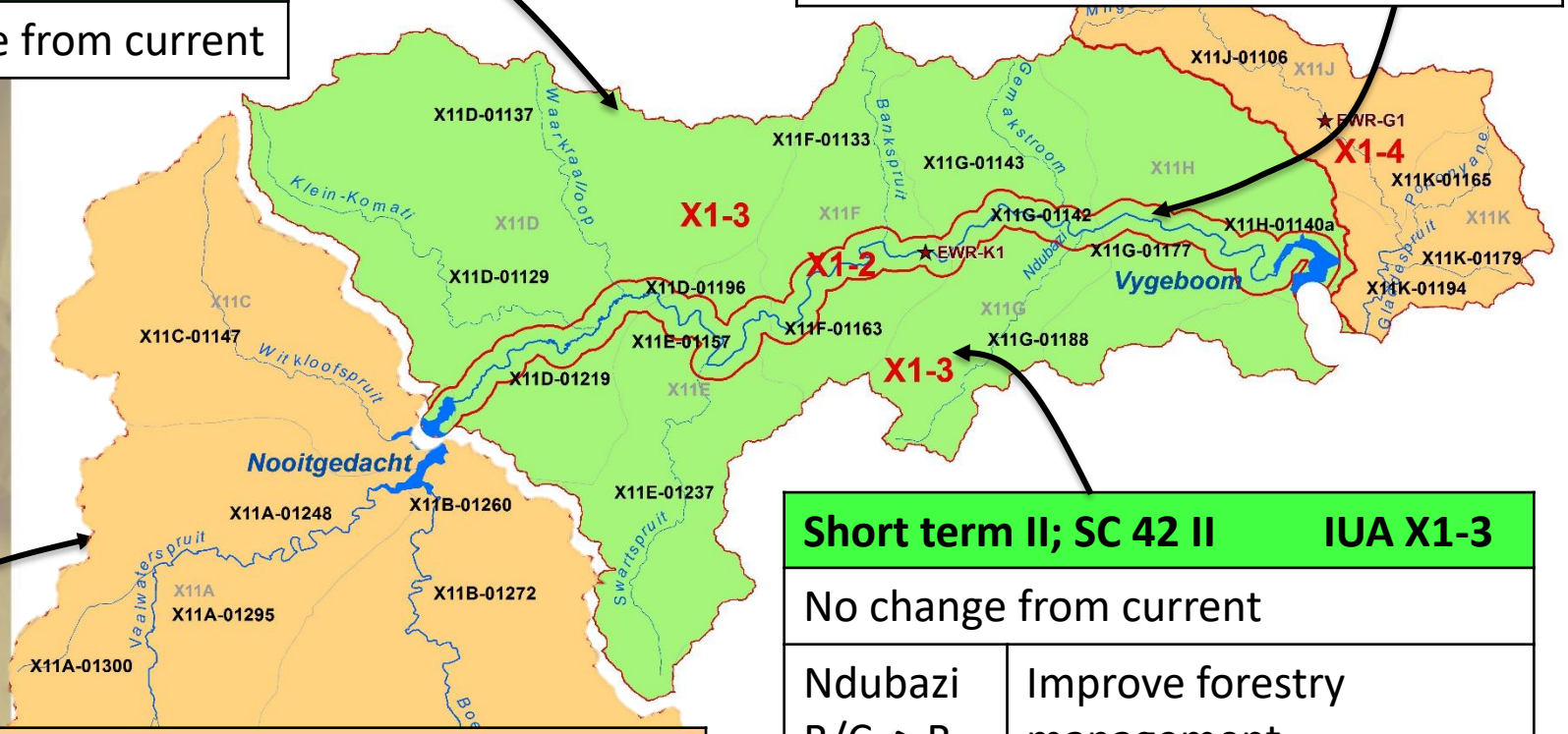
IMPLICATIONS OF DRAFT WRC: IUA X1-1, 2, 3 & 4

Short term II; SC 42 II
IUA X1-2 (Komati)

No change from current

Short term III; SC 42 III

No change from current



Short term II; SC 42 II **IUA X1-3**

No change from current	
Ndubazi B/C → B	Improve forestry management. Improve riparian buffer zone

Short term III; SC 42 III **IUA X1-1**

No change from current	
Boesmanspruit	Should improve, many variables required including flow. Very difficult – maintain PES

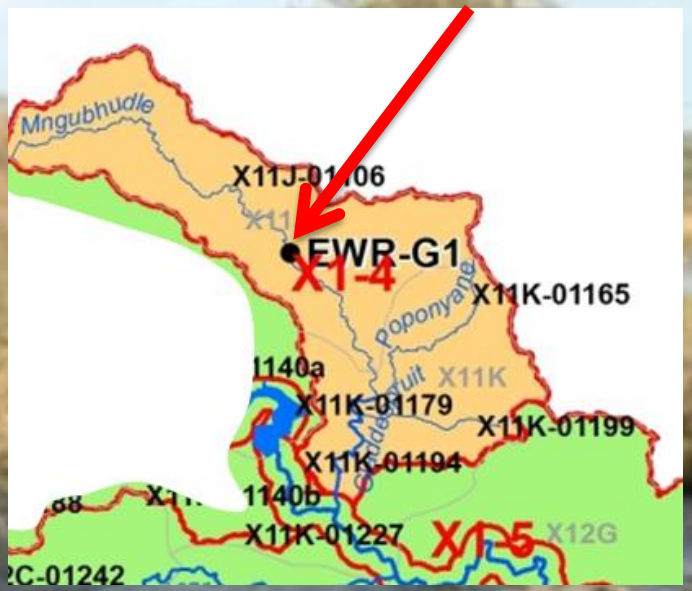
IMPLICATIONS OF WRC: RQOs at IUA X_{1-3}, EWR K_1

Hydrology & Groundwater	nMAR%	27.5
	Drought Oct	0.3 m^3/s
	Normal Oct	0.4 m^3/s
	GW level*	13 mbs
Water Quality	Nutrients (PO_4-P)	Acceptable
	Salts	Ideal
	Toxics	Ideal
Habitat & Biota	Geomorph	C
	Fish	C
	Inverts	B/C
	Veg	C

*These average groundwater levels represent the larger GRU and in some cases based on a limited number of measurements.

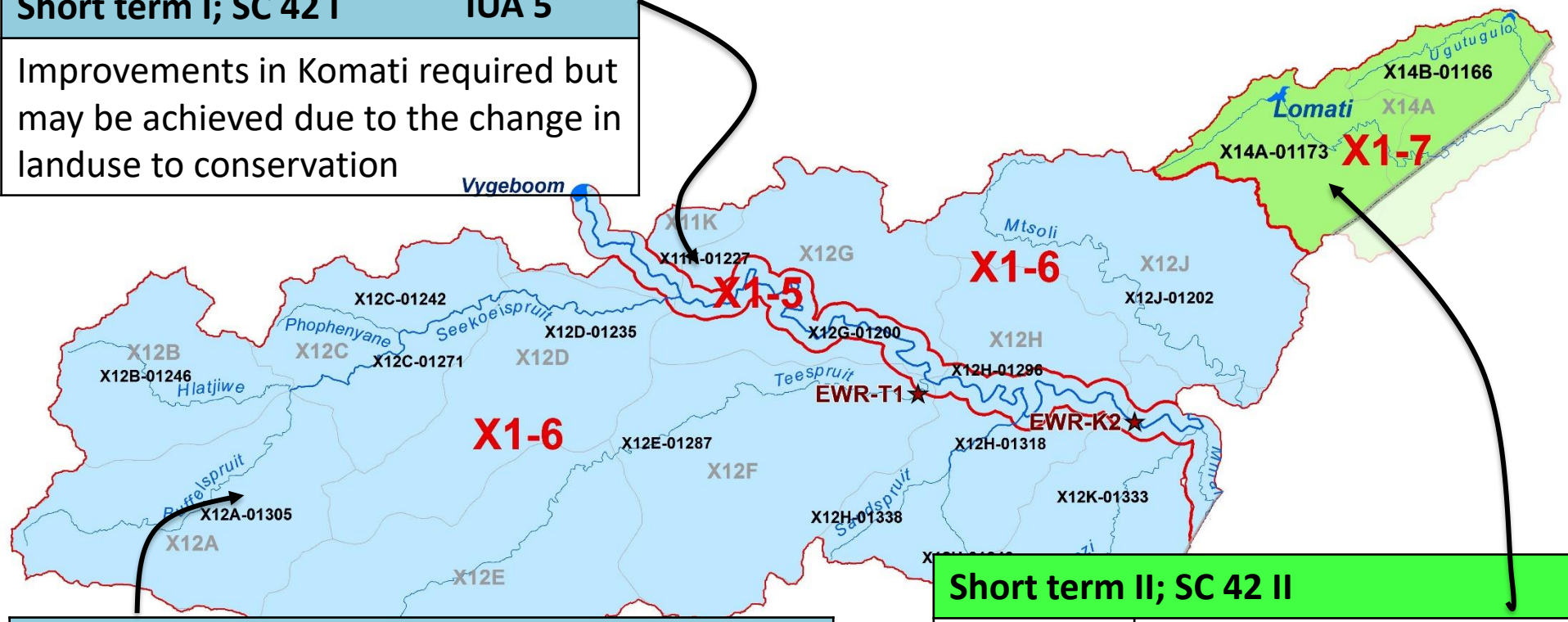
IMPLICATIONS OF WRC: RQOs at IUA X1-4, (EWR G1)

Hydrology	nMAR%	26.9
	Drought Oct	0.04 m^3/s
	Normal Oct	0.63 m^3/s
	GW level	14 mbs
Water Quality	Nutrients (PO_4-P)	Acceptable
	Turbidity	Acceptable
	Toxics	As + Cn: Ideal
Habitat & Biota	Geomorph	D
	Fish	D
	Inverts	D
	Veg	D



IMPLICATIONS OF DRAFT WRC: IUA X1-5, 6 & 7

Short term I; SC 42 I	IUA 5
Improvements in Komati required but may be achieved due to the change in landuse to conservation	



Short term I; SC 42 I	IUA 6
Buffelspruit C → B	Significantly improve riparian zone – reinstate buffer zone
Seekoeispruit C → B/C	Very difficult, catchment management, maintain PES
Mlondozi C → B/C	Improve wq & rip veg

Short term II; SC 42 II	
Ugutugulu	Improvements not possible (releases from dam) – maintain current state

IUA 7

IMPLICATIONS OF WRC: RQOs IUA X_{1-5}, EWR K_2

Hydrology	nMAR%	18.3
	Drought Oct	0.6 m^3/s
	Normal Oct	0.8 m^3/s
Water Quality	Nutrients (PO_4-P)	Acceptable
	Salts	Ideal
	Coliforms	Full contact use
	Turbidity	Acceptable
Habitat & Biota	Geomorph	C
	Fish	C
	Inverts	C
	Veg	C

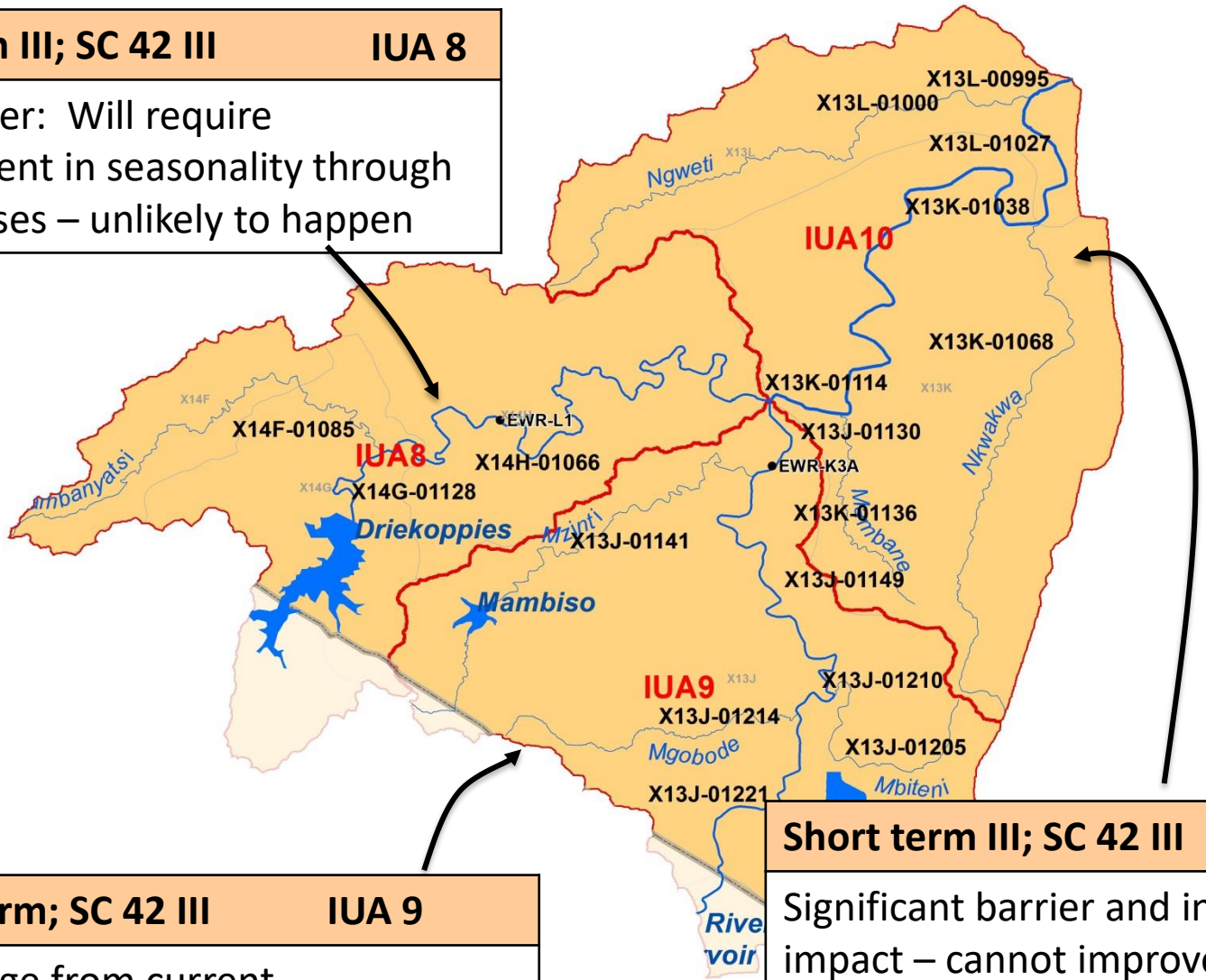
IMPLICATIONS OF WRC: RQOs IUA X1-6, EWR T1

Hydrology	nMAR%	35.3
	Drought Oct	0.21 m^3/s
	Normal Oct	0.27 m^3/s
	Gw level	13 mbs
Water Quality	Nutrients (PO_4-P)	Tolerable
	Turbidity	Acceptable
	Toxics	Full contact use
Habitat & Biota	Geomorph	C
	Fish	C
	Inverts	C
	Veg	C

IMPLICATIONS OF DRAFT WRC: IUA X1-8, 9 & 10

Short term III; SC 42 III **IUA 8**

Lomati River: Will require improvement in seasonality through dam releases – unlikely to happen



Short term; SC 42 III **IUA 9**

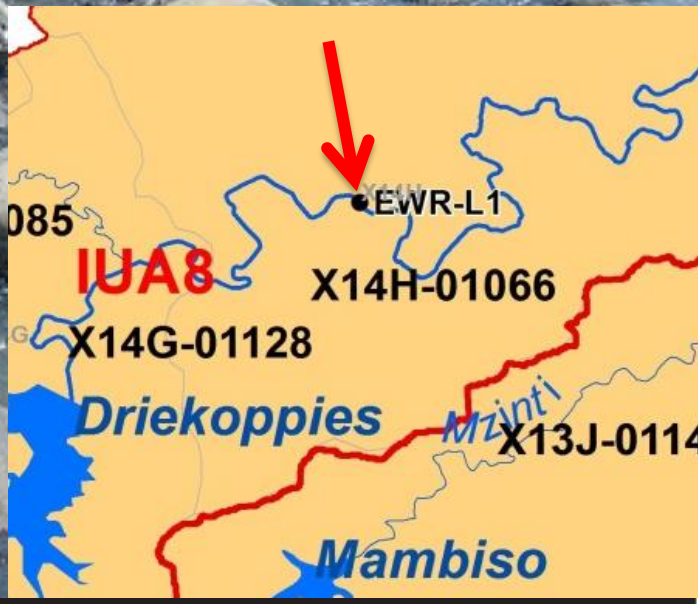
No change from current

Short term III; SC 42 III **IUA 10**

Significant barrier and inundation impact – cannot improve without removing dams (E). Two reaches in D – RQO must maintain these reaches.

IMPLICATIONS OF WRC: RQOs IUA X1-8, EWR L1

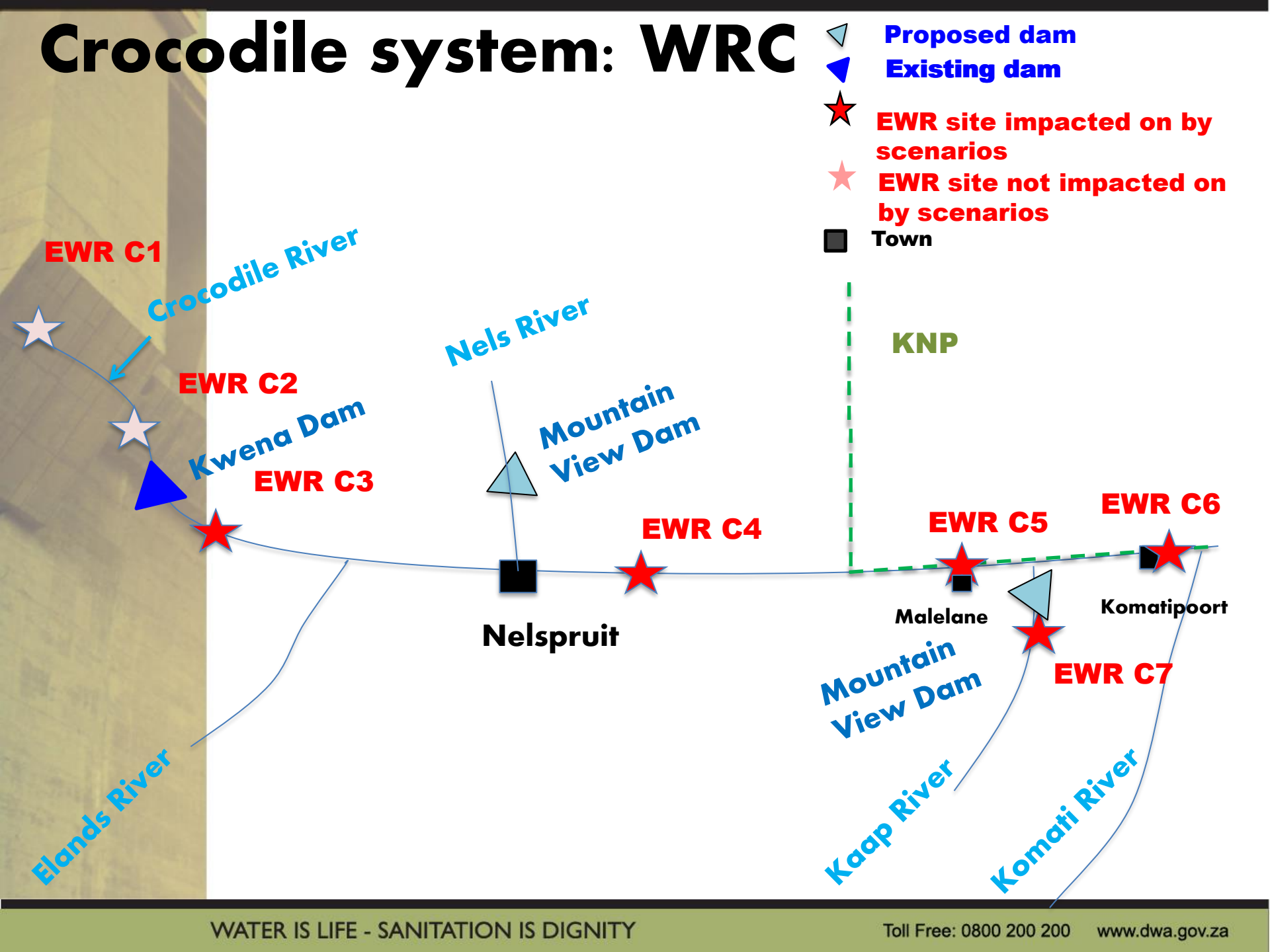
Hydrology & Groundwater	nMAR%	17.3
	Drought Oct	0.5 m^3/s
	Normal Oct	0.66 m^3/s
	Gw level	24.8 mbs
Water Quality	Nutrients	Tolerable (phosphate) Acceptable (TIN)
	Salts	Acceptable
	Turbidity	Acceptable
	Coliforms	Full contact use
	Toxics	Ideal
Habitat & Biota	Geomorph	D
	Fish	C
	Inverts	C
	Veg	B/C



IMPLICATIONS OF WRC: RQOs IUA X_{1-9}, EWR K_3

Hydrology & Groundwater	nMAR%	17.2
	Drought Oct	0.67 m^3/s
	Normal Oct	1.55 m^3/s
	Gw level	24.8 mbs
Water Quality	Nutrients	Tolerable (phosphate) Acceptable (TIN)
	Periphyton	Acceptable
	Salts	Tolerable
	Coliforms	Full contact use
	Toxics	Ideal
Habitat & Biota	Geomorph	D/E
	Fish	C/D
	Inverts	D
	Veg	D

Crocodile system: WRC



Crocodile Scenario variables

11 scenarios were considered that include combinations of the following variables:

- **Growth in water demands**
  Growth in domestic/industrial water requirements up to 2030.
  No growth in irrigation

- **IIMA** (Interim IncoMaputo Agreement)
  This agreement allows for an increase of cross-border minimum flow from the current 0.9 m^3/s to 1.17 m^3/s.

- **EWRs**
  Ranges from a minimised PES, PES, REC and no EWR

Crocodile Scenario variables

- **Mountain view Dam**

  The proposed Mountain View Dam in the Kaap River can make additional water available for growth in water requirements.

- **Boshjieskop Dam**

  The proposed Boshjieskop Dam in the Nels River can make additional water available for growth in water requirements.

Near future: Sc 3 consists of future growth, portion of PES EWR and IIMA – best balance in short term.

Far future: Sc 62 as for above with Mountain View Dam.

Far future (after Sc 62): Sc 81 as for above + Bosjieskop Dam

X_2 Crocodile: Recommended Classes

Scenario immediately applicable:

- The current situation which includes the release of a portion of the ecological flow requirements that were determined to maintain the Present Ecological State.
- Institute measures (non flow-related) to achieve the REC in tributaries of the main rivers (Elands, Crocodile and Kaap Rivers)(relevant for future scenarios as well),

Implications: No implications to users as this scenario represents the current baseline. The REC in the downstream Crocodile River will not be met and the scenario will in the long term possibly degrade the PES.

X_2 Crocodile: Recommended Classes

The scenario that may be applicable in the near future (medium term) (Sc C3)

- Allow for future domestic growth,
- Give effect to the IIMA,
- Supply the full flow requirements to maintain the Present Ecological State.

Implications: Some negative impact on GDP and jobs. The REC in the downstream Crocodile River will not be met. The ecological state may improve from Sc C1 but will likely still not achieve the Present Ecological State.

X_2 Crocodile: Recommended Classes

The scenario that may be applicable in the far future (long term) (Sc C62))

- Supply the full flow requirements to maintain the Present Ecological State,
- Allow for future domestic growth,
- Give effect to the IIMA,
- Mountain view Dam development in the Kaap River.

Implications: Job losses in the irrigation sector due to the provision of water for the domestic section (improvement from Sc C3). The ecological implications are the same as for Sc C3.

X_2 Crocodile: Recommended Classes

The scenario that may be applicable in the far future (next phase after Sc 62 has been implemented) (Sc C82))

Sc C82

- Dam developments in both the Kaap River (Mountain View) and the Nels(Boschjeskop) River,
- Supply the full flow requirements to maintain the Present Ecological State,
- Allow for future domestic growth,
- Give effect to the IIMA.

Implications: Jobs will increase from the baseline. The ecological implications are the same as for Sc C3.

X_2 Crocodile: Best balance future scenarios

- Near future: Sc 3 consists of future growth, portion of PES EWR and IIMA – best balance in short term.
- Far future: Sc 62 as for above with Mountain View Dam.
- Far future (after Sc 62): Sc 81 as for above + Bosjieskop Dam

X_2 Crocodile: Recommended Classes

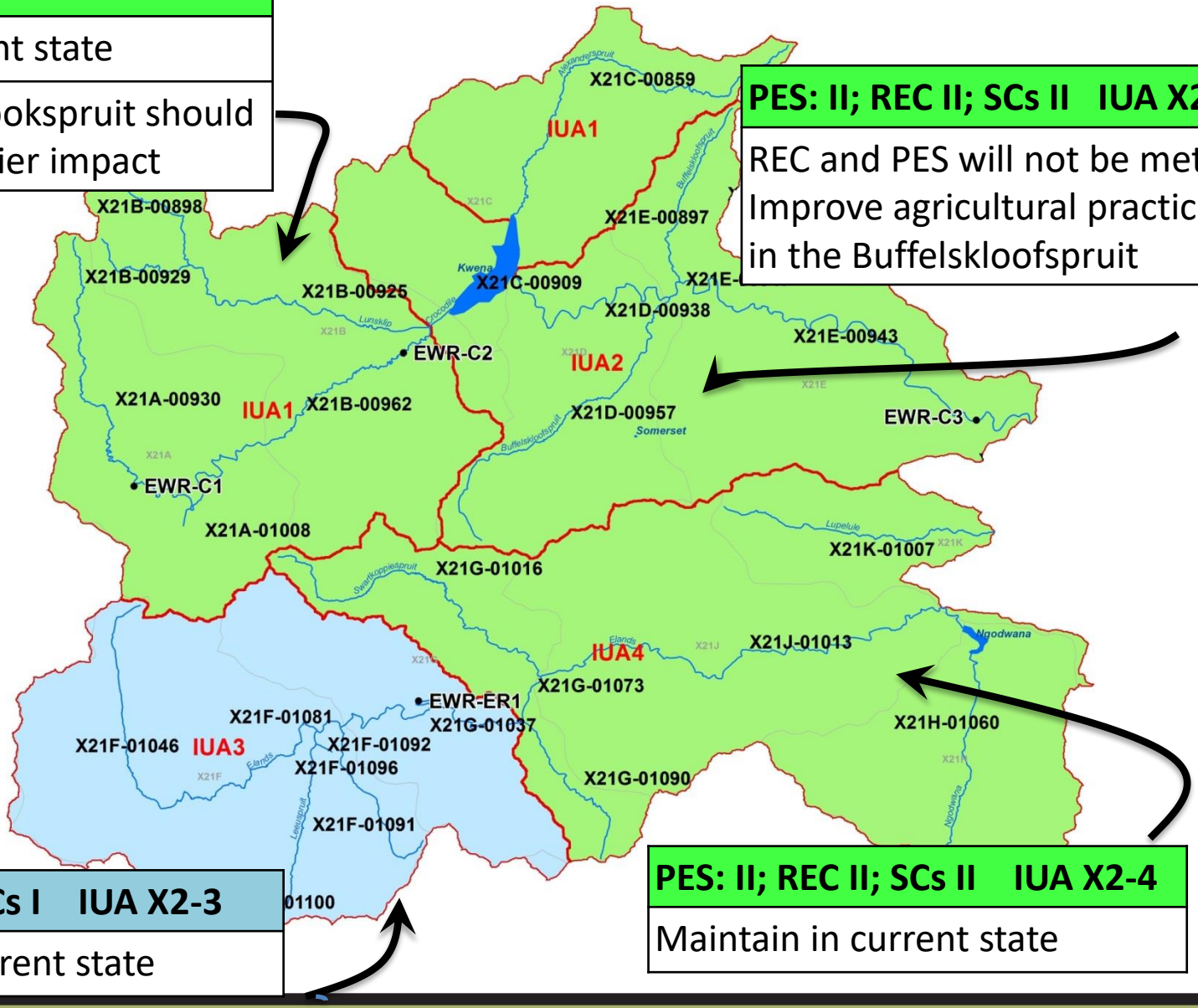
IUA	PES	REC	Draft Classes
X2-1	II	**II**	**II**
X2-2	II	**II**	**II**
X2-3	I	**I**	**I**
X2-4	II	**II**	**II**
X2-5	I	**I**	**I**
X2-6	**II**	I	**II**
X2-7	II	**I**	**I**
X2-8	XXX	**II**	**II**
X2-9	**II**	I	**II**
X2-10	II	**II**	**II**
X2-11	**II**	I	**II**
X2-12	II	**II**	**II**
X2-13	I	**I**	**I**

Note that the Classes do NOT change under Sc 3, 62 & 82

IMPLICATIONS OF DRAFT WRC: IUA X2-1, 2, 3 & 4

PES: II; REC !I; SCs II IUA X2-1
Maintain in current state
Lunsklip & Gemsbokspruit should improve, but barrier impact

PES: II; REC II; SCs II IUA X2-2
REC and PES will not be met. Improve agricultural practices in the Buffelskloofspruit



PES: I; REC I; SCs I IUA X2-3
Maintain in current state

PES: II; REC II; SCs II IUA X2-4
Maintain in current state

IMPLICATIONS OF WRC: RQOs IUA X_{2-1}, EWR C_1

Hydrology & Groundwater	nMAR%	30.9
	Drought Oct	0.03 m^3/s
	Normal Oct	0.06 m^3/s
	Gw level	24.1 mbs
Water Quality	Nutrients (PO_4-P)	Acceptable
	Salts	Ideal
	Coliforms	Full contact use
Habitat & Biota	Geomorph	B
	Fish	A
	Inverts	B
	Veg	A

IMPLICATIONS OF WRC: RQOs IUA X_{2-1}, EWR C_2

Hydrology & Groundwater	nMAR%	57
	Drought Oct	0.25 m^3/s
	Normal Oct	0.37 m^3/s
	Gw level	24.1 mbs
Water Quality	Nutrients (PO_4-P)	Acceptable
	Salts	Ideal
	Coliforms	Full contact use
Habitat & Biota	Geomorph	B
	Fish	B
	Inverts	B
	Veg	A/B

IMPLICATIONS OF WRC: RQOs IUA X_{2-2}, EWR C_3

Hydrology & Groundwater	nMAR%	82.7
	Drought Oct	0.9 m^3/s
	Normal Oct	1.3 m^3/s
	Gw level	18.3 mbs
Water Quality	Nutrients (PO_4-P)	Acceptable
	Salts	Ideal
	Toxics	Ideal
Habitat & Biota	Geomorph	C
	Fish	B
	Inverts	B
	Veg	B

IMPLICATIONS OF WRC: RQOs IUA X2-3, ER 1

Hydrology & Groundwater	nMAR%	47.1
	Drought Oct	0.1 m^3/s
	Normal Oct	0.18 m^3/s
	Gw level	16.2 mbs
Water Quality	Nutrients (PO_4-P)	Acceptable
	Salts	Ideal
	Coliforms	Full contact use
	pH	Ideal
	Toxics (Cr-VI + Mn)	Ideal
Habitat & Biota	Geomorph	B/C
	Fish	A/B
	Inverts	B
	Veg	B

IMPLICATIONS OF DRAFT WRC: IUA X2-5, 6, 7, 8, 9 & 10

(PES: II); REC I; SCs 1 IUA X2-7

Blystaanspruit & Houtbosloop Forestry & agriculture – improvement in riparian zone

(PES: XXX); REC II; SCs II IUA X2-8

Wit: Improve buffer zone – bring from D/E to D.

PES: II; (REC I) SCs II IUA X2-9

Maintain in current state. REC in Crocodile will not be achieved

PES: II; (REC I); SCs II IUA X2-6

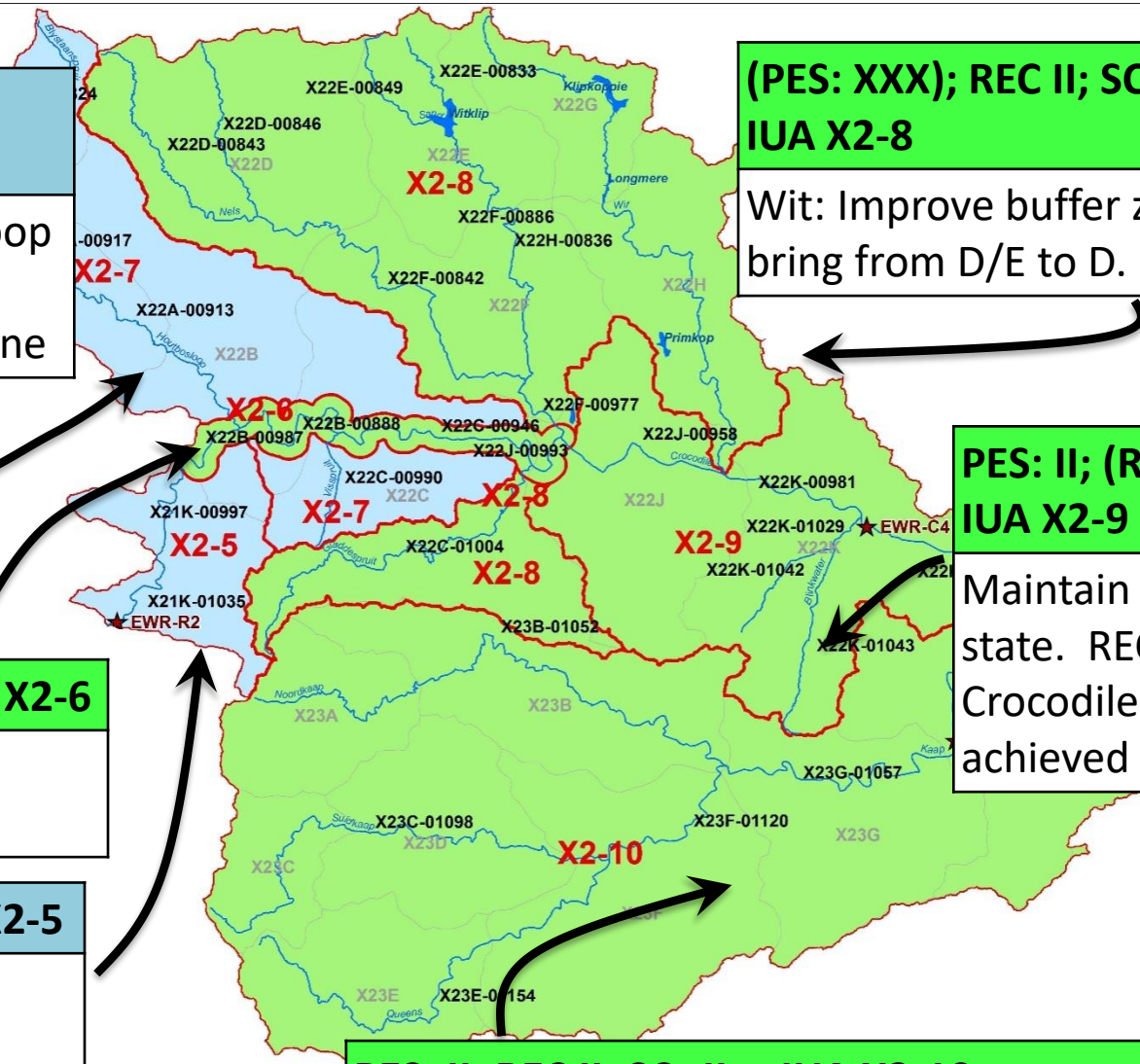
Maintain in current state. (Crocodile)

PES: I; REC I; SCs I IUA X2-5

Maintain in current state (Elands)

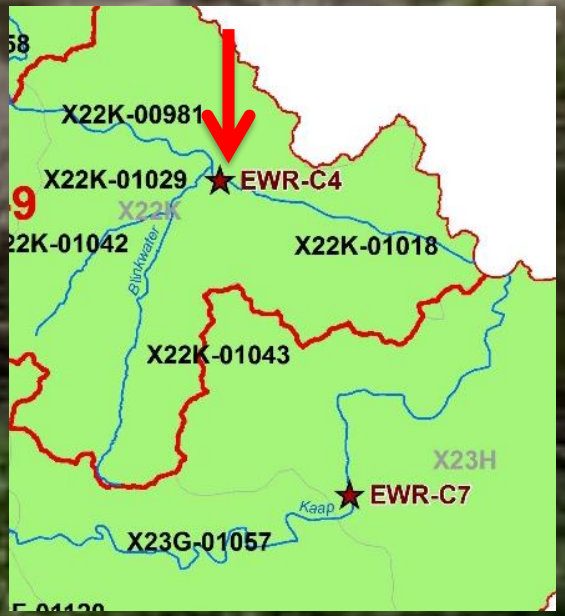
PES: II; REC II; SCs II IUA X2-10

Suid, Noord-Kaap & Queens; Riparian zone improvement, water quality, agriculture



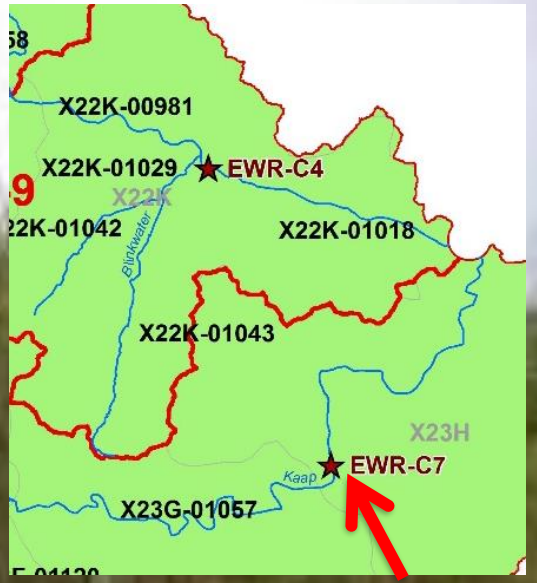
IMPLICATIONS OF WRC: RQOs IUA X2-9, EWR C4

Hydrology & Groundwater	nMAR%	31.9
	Drought Oct	0.77 m^3/s
	Normal Oct	1.43 m^3/s
	Gw level	23.8 mbs
Water Quality	Nutrients (PO_4-P)	Tolerable
	Salts	Acceptable
	Coliforms	Full contact use
	Toxics	Ideal
Habitat & Biota	Geomorph	B/C
	Fish	B
	Inverts	C
	Veg	C



IMPLICATIONS OF WRC: RQOs IUA X_{2-10}, EWR C_7

Hydrology & Groundwater	nMAR%	19.2
	Drought Oct	0.07 m^3/s
	Normal Oct	0.14 m^3/s
	Gw level	23.8 mbs
Water Quality	Nutrients	Tolerate (phosphate + TIN)
	Salts	Acceptable
	Toxics (As + Cn)	Ideal
Habitat & Biota	Geomorph	B
	Fish	B
	Inverts	B
	Veg	B/C



IMPLICATIONS OF WRC: RQOs IUA X2-5, ER 2

Hydrology & Groundwater	nMAR%	43.1
	Drought Oct	0.37 m^3/s
	Normal Oct	0.5 m^3/s
	Gw level	18.3 mbs
Water Quality	Nutrients (PO_4-P)	Acceptable
	Salts	Acceptable
	Turbidity	Acceptable
	Toxics	Ideal
Habitat & Biota	Geomorph	C
	Fish	A/B
	Inverts	B
	Veg	D

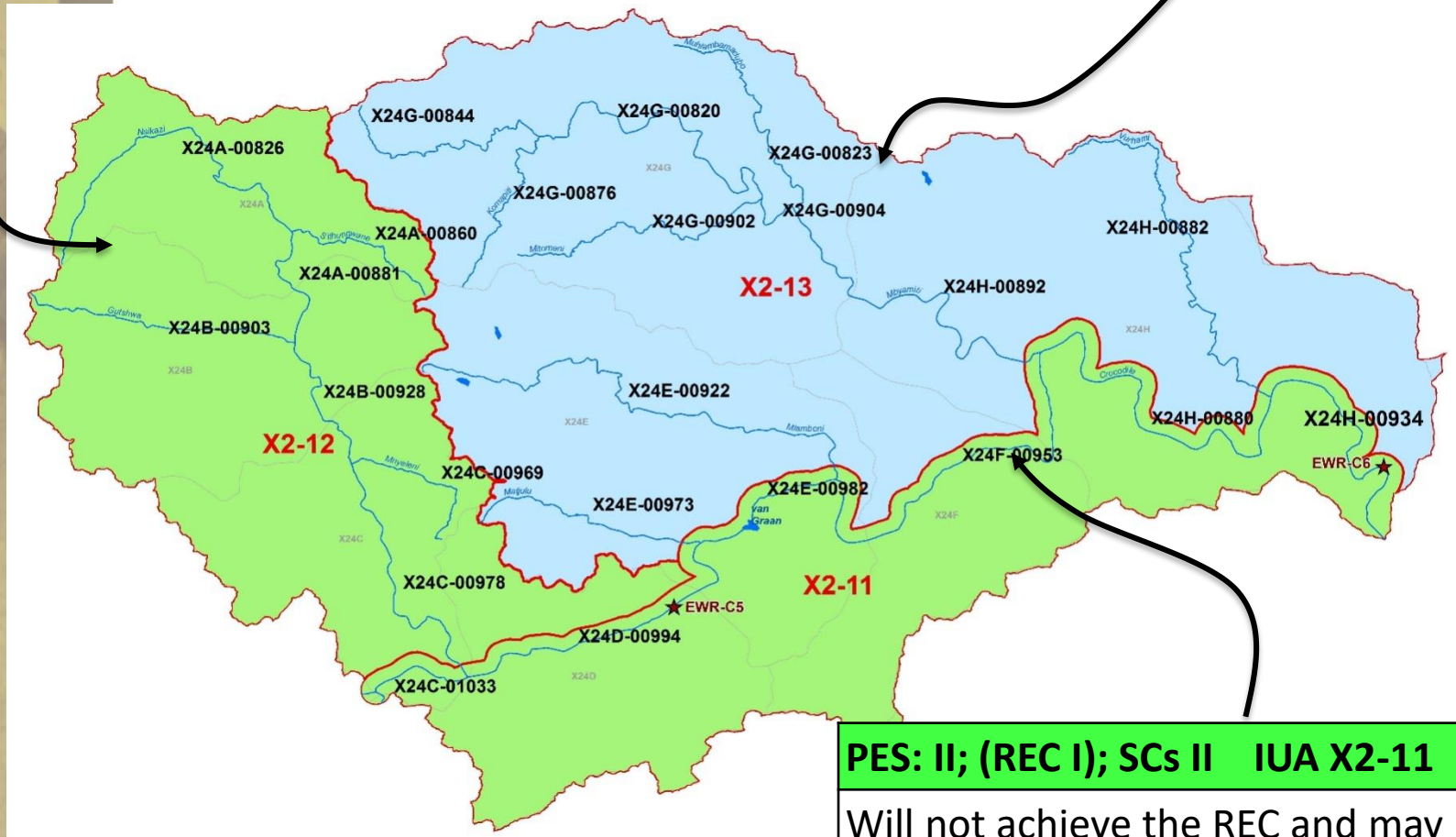
IMPLICATIONS OF DRAFT WRC: IUA X2-11, 12, & 13

PES: II; REC II; SCs II IUA X2-12

Maintain in current state. (KNP)

PES: I; REC I; SCs I IUA X2-13

Maintain in current state. (KNP)



PES: II; (REC I); SCs II IUA X2-11

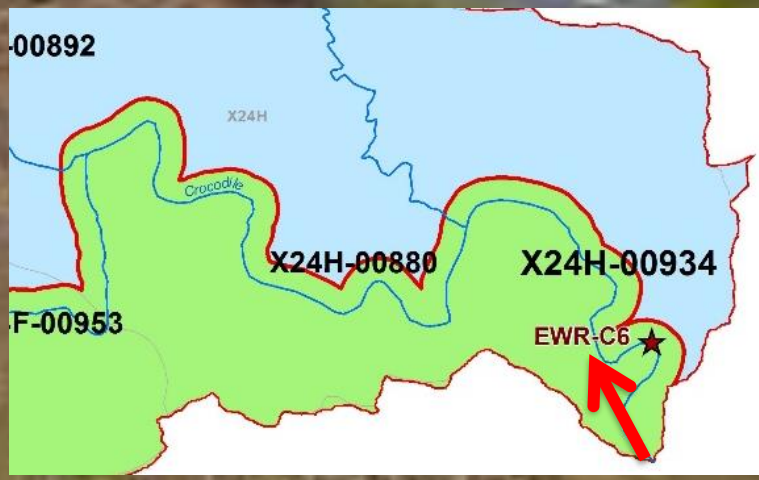
Will not achieve the REC and may be lower than the PES (Crocodile)

IMPLICATIONS OF WRC: RQOs IUA X_{2-11}, EWR C_5

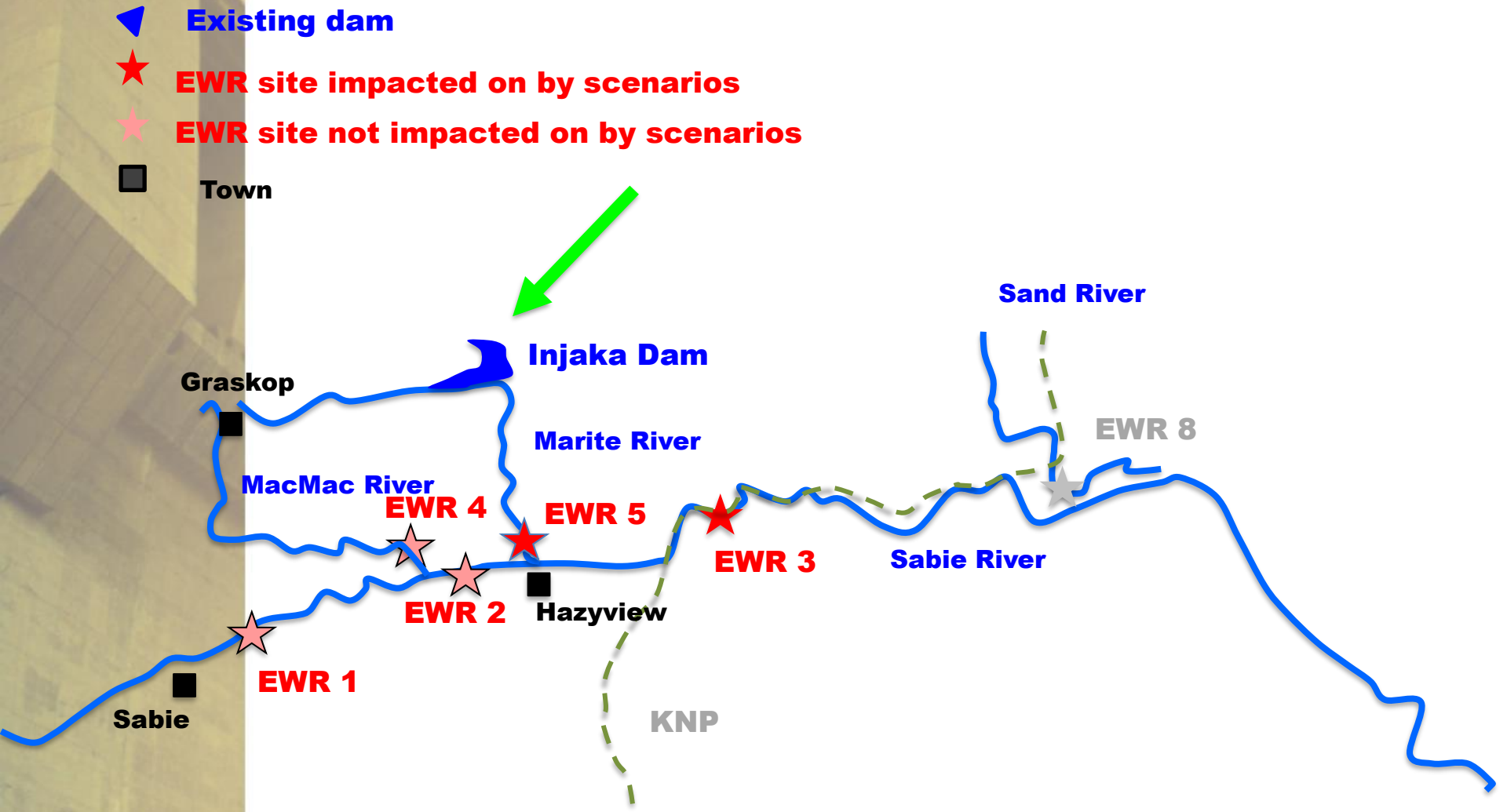
Hydrology & Groundwater	nMAR%	24
	Drought Oct	1.62 m^3/s
	Normal Oct	2.04 m^3/s
	Gw level	20.3 mbs
Water Quality	Nutrients (PO_4-P)	Tolerable
	Salts	Acceptable
	Turbidity	Acceptable
	Temperature	Acceptable
	Toxics	CEV limits
Habitat & Biota	Geomorph	C/D
	Fish	C
	Inverts	C
	Veg	C

IMPLICATIONS OF WRC: RQOs IUA X2-11, EWR C6

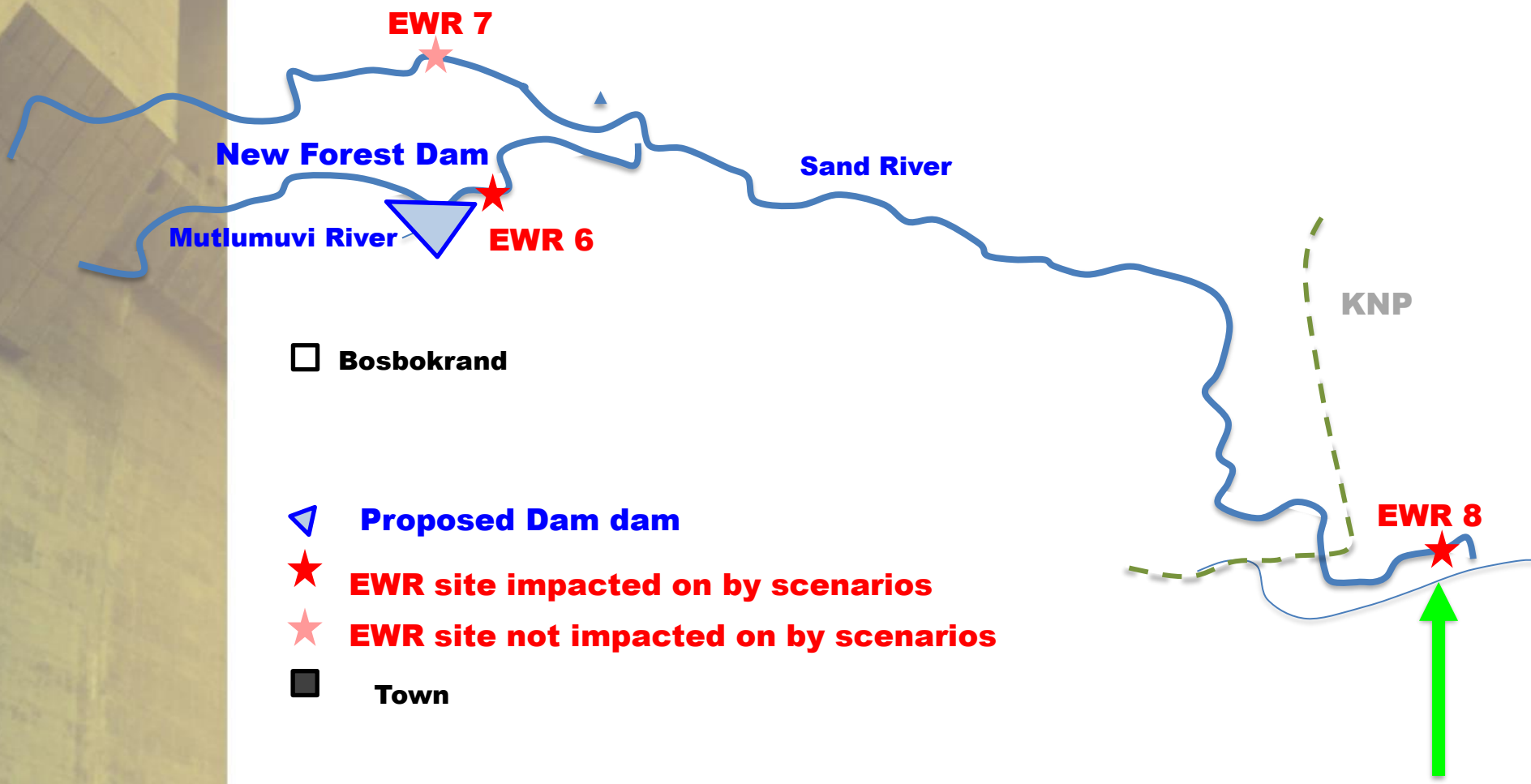
Hydrology & Groundwater	nMAR%	56.1
	Drought Oct	2.3 m^3/s
	Normal Oct	2.5 m^3/s
	Gw level	13 mbs
Water Quality	Nutrients (PO_4-P)	Tolerable
	Salts	Acceptable
	Turbidity	Acceptable
	Temperature	Acceptable
	Coliforms	Full contact use
	Toxics	CEV limits
Habitat & Biota	Geomorph	C
	Fish	C
	Inverts	C
	Veg	C



Sabie system: WRC



SAND RIVER: WRC



Sabie Sand Scenario variables

14 scenarios considered that includes combinations of the following variables:

- Growth in water demands (Sabie)
  - This includes growth in domestic water requirements within the Sabie up to 2030 and increased transfers to Mbombela.
  - No growth in irrigation
- Growth in water demands (Sand)
  - The projected rapid growth in domestic requirements has been allowed for up to 2030.
- EWR

Scenarios included either the PES EWR, the REC (where different than PES EWR), or no EWR.

Sabie Sand Scenario variables

- New Forest Dam (Mutlumuvi River)
  Will be required to meet the increasing domestic water requirements in the Sand River.

- 25% return flows
  This scenario assumes improved waste water treatment with increase water service delivery and hence increased return flows

- Reinstate forestry
  The Department of Agriculture and Forestry have expressed an interested in reinstating about 3000ha of forestry removed from the Sand River

Future: Sc 71 includes a new dam to cater for additional yield to allow growth and supply environmental flows

X_3 Sabie Sand: Recommended Classes

Scenario immediately applicable:

- Maintain the current ecological state and operation of the system,
- Institute measures (non flow-related) to achieve the REC in the Sabie River upstream of the KNP and various tributaries(relevant for future scenarios as well),
- May include the reinstatement of forestry in the Sand catchment.

Implications: No implications to users as this scenario represent the current baseline. This scenario will not however cater for an increase in domestic use in the Sabie River in the future. The REC in the Mutlumuvi River is not achieved under the current situation and the ecological status quo is maintained in this river.

X_3 Sabie Sand : Recommended Classes

Long-term scenario / the scenario that may be applicable in future (Sc S71)

- New dam development in the Mutlumuvi River,
- Supply of the environmental flows supporting the REC in the Mutlumuvi River and downstream Sand River,
- Assumed increase in return flows of 25% resulting from improved water supply to the Sand catchment,
- Decreased transfer from the Sabie.

Implications: Significant economic improvement in GDP and jobs in the Sand River. Water for increased domestic growth in the Sabie River will be available. The REC will be maintained in all rivers except for the Mutlumuvi River.

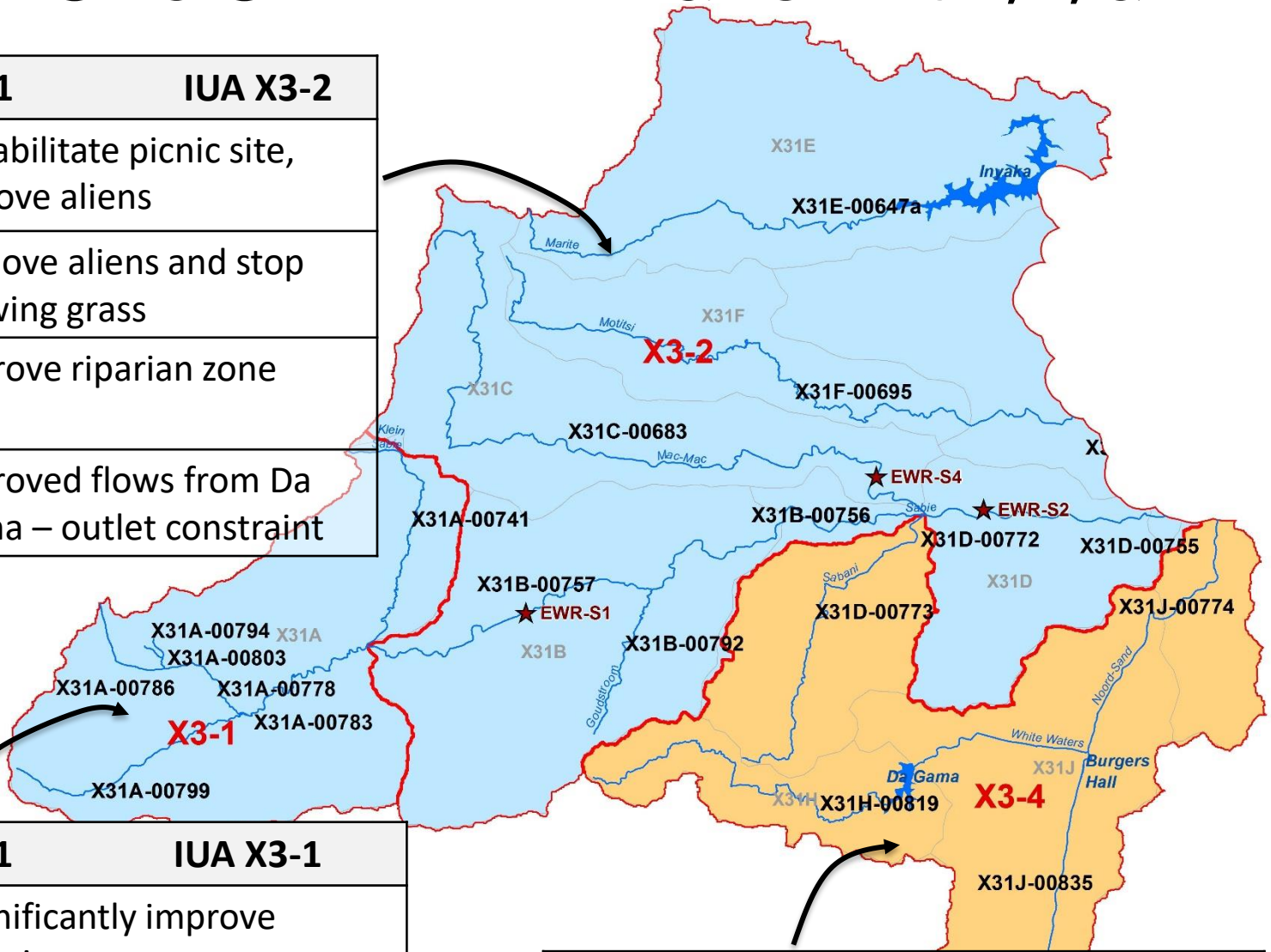
X3 Sabie Sand: Recommended Classes

IUA	Scenarios and Water Resource Class			
	Catchment	PES	REC	Draft Classes
X3-1	Sabie	II	**I**	**I**
X3-2	Sabie	II	**I**	**I**
X3-3	Sabie	I	**I**	**I**
X3-4	Sabie	III	**III**	**III**
X3-5	Sabie	I	**I**	**I**
X3-6	Sabie	I	**I**	**I**
X3-7	Sand	III	**III**	**III**
X3-8	Sand	II	**II**	**II**
X3-9	Sand	I	**I**	**I**

Note that the Classes do NOT change under Sc 72

IMPLICATIONS OF DRAFT WRC: IUA X3-1, 2, & 4

PES: II; REC I; SC71 1	IUA X3-2
EWR S1 (B/C – B)	Rehabilitate picnic site, remove aliens
EWR S2 (C – B)	Remove aliens and stop mowing grass
Marite (US dam) (B/C – B)	Improve riparian zone
Motitse	Improved flows from Da Gama – outlet constraint

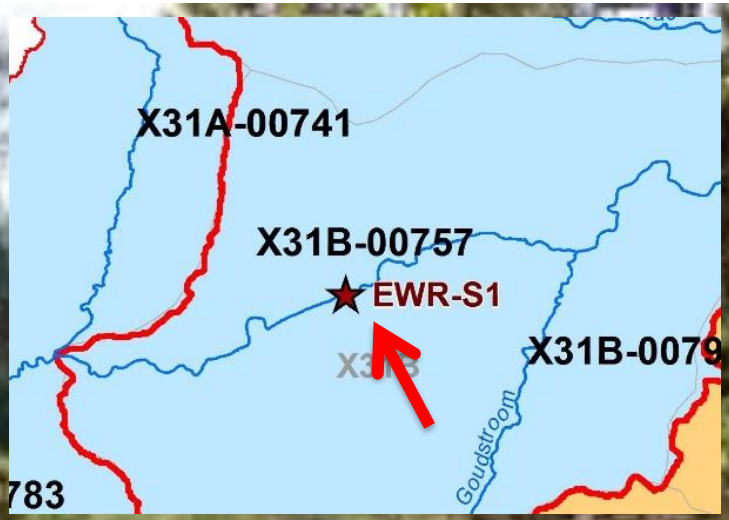


PES: II; REC I; SC 71 1	IUA X3-1
Klein Sabie B/C → B	Significantly improve riparian zone. (Also wq from Sabie – but difficult)

PES: III; REC III; SC71 III	IUA X3-4
Maintain in current state	

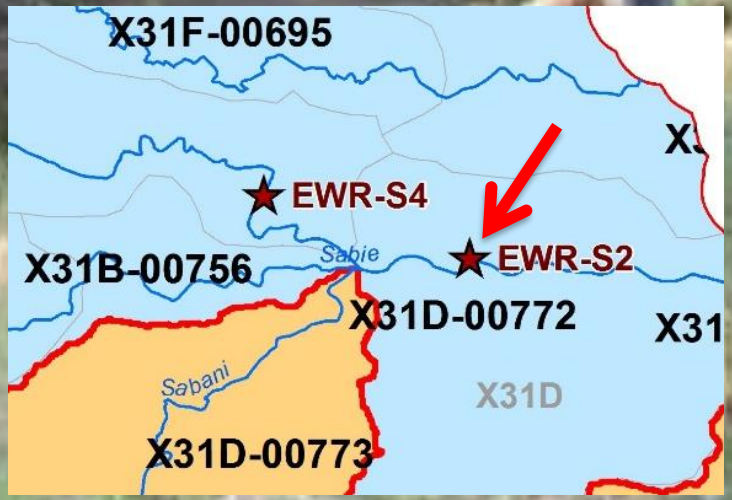
IMPLICATIONS OF WRC: RQOs IUA X_{3-2}, EWR S_1

Hydrology & Groundwater	nMAR%	53.3
	Drought Oct	0.2 m^3/s
	Normal Oct	0.38 m^3/s
	Gw level	18.7 mbs
Water Quality	Nutrients (PO_4-P)	Acceptable
	Salts	Ideal
	Coliforms	Full contact use
	Toxics	Ideal
Habitat & Biota	Geomorph	B
	Fish	B
	Inverts	A/B
	Veg	B



IMPLICATIONS OF WRC: RQOs IUA X_{3-2}, EWR S_2

Hydrology & Groundwater	nMAR%	36.1
	Drought, Oct	0.37 m^3/s
	Normal Oct	0.58 m^3/s
	Water level	12.6 mbs
Water Quality	Nutrients (PO_4-P)	Acceptable
	Salts	Ideal
	Coliforms	Full contact use
	Toxics	Ideal
Habitat & Biota	Geomorph	B
	Fish	B
	Inverts	B
	Veg	B



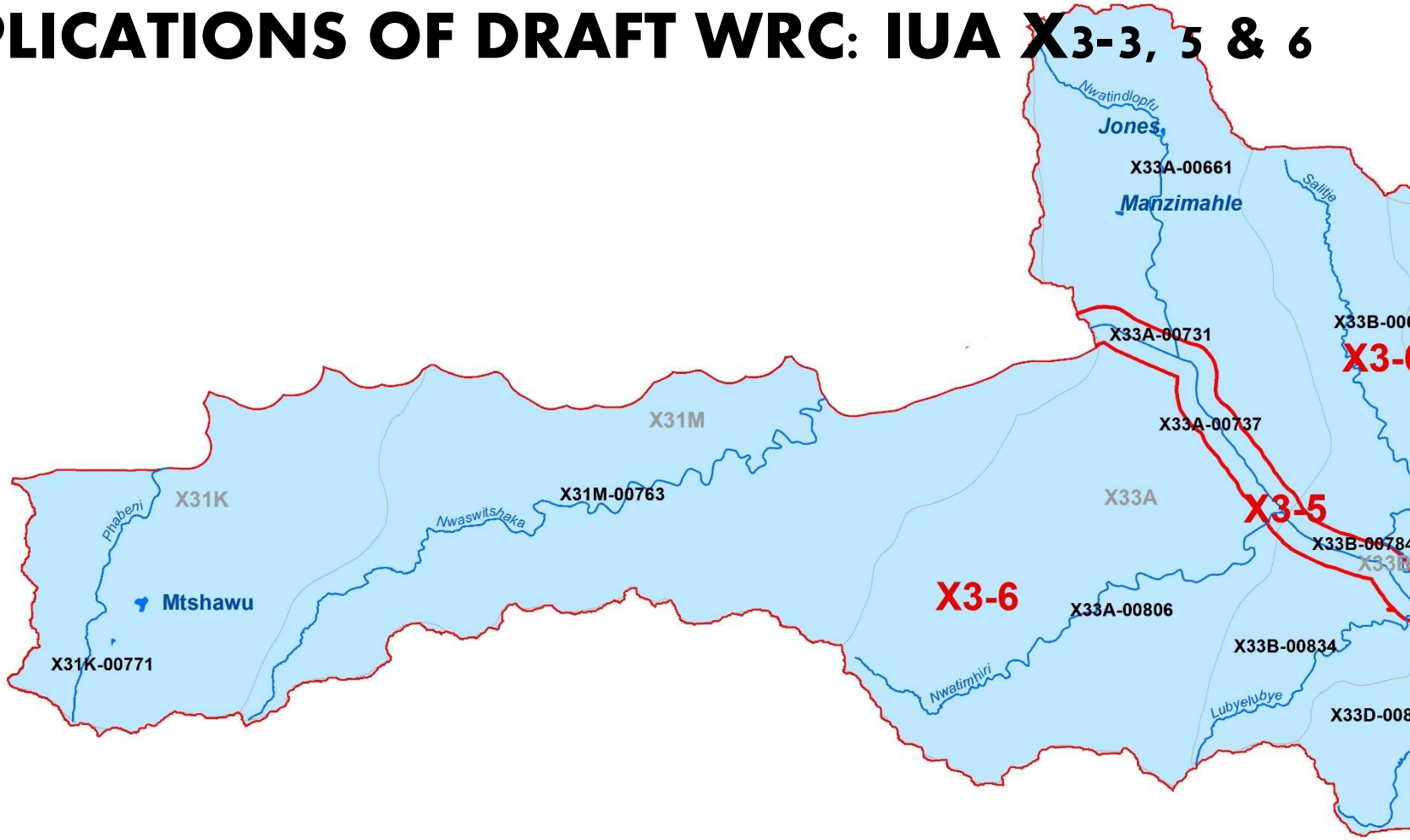
IMPLICATIONS OF WRC: RQOs IUA X3-3, EWR S3

Hydrology & Groundwater	nMAR%	37.9
	Drought Oct	0.6 m^3/s
	Normal Oct	1.0 m^3/s
	Gw level	12.6 mbs
Water Quality	Nutrients (PO_4-P)	Acceptable
	Salts	Ideal
	Turbidity	Acceptable
	Coliforms	Full contact use
	Toxics	Ideal
Habitat & Biota	Geomorph	B
	Fish	B
	Inverts	B
	Veg	A/B

IMPLICATIONS OF WRC: RQOs IUA X3-2, EWR S4

Hydrology & Groundwater	nMAR%	53.3
	Drought Oct	0.2 m^3/s
	Normal Oct	0.38 m^3/s
	Gw level	12.6 mbs
Water Quality	Turbidity	Acceptable
Habitat & Biota	Geomorph	A
	Fish	B
	Inverts	A/B
	Veg	A/B

IMPLICATIONS OF DRAFT WRC: IUA X3-3, 5 & 6



PES: I; REC I; SC71 I IUA X3-3, 5 & 6

Maintain in current state (Sabie & KNP tribs)

REC in Marite River (EWR 5) cannot be achieved due to too much water released from the dam.

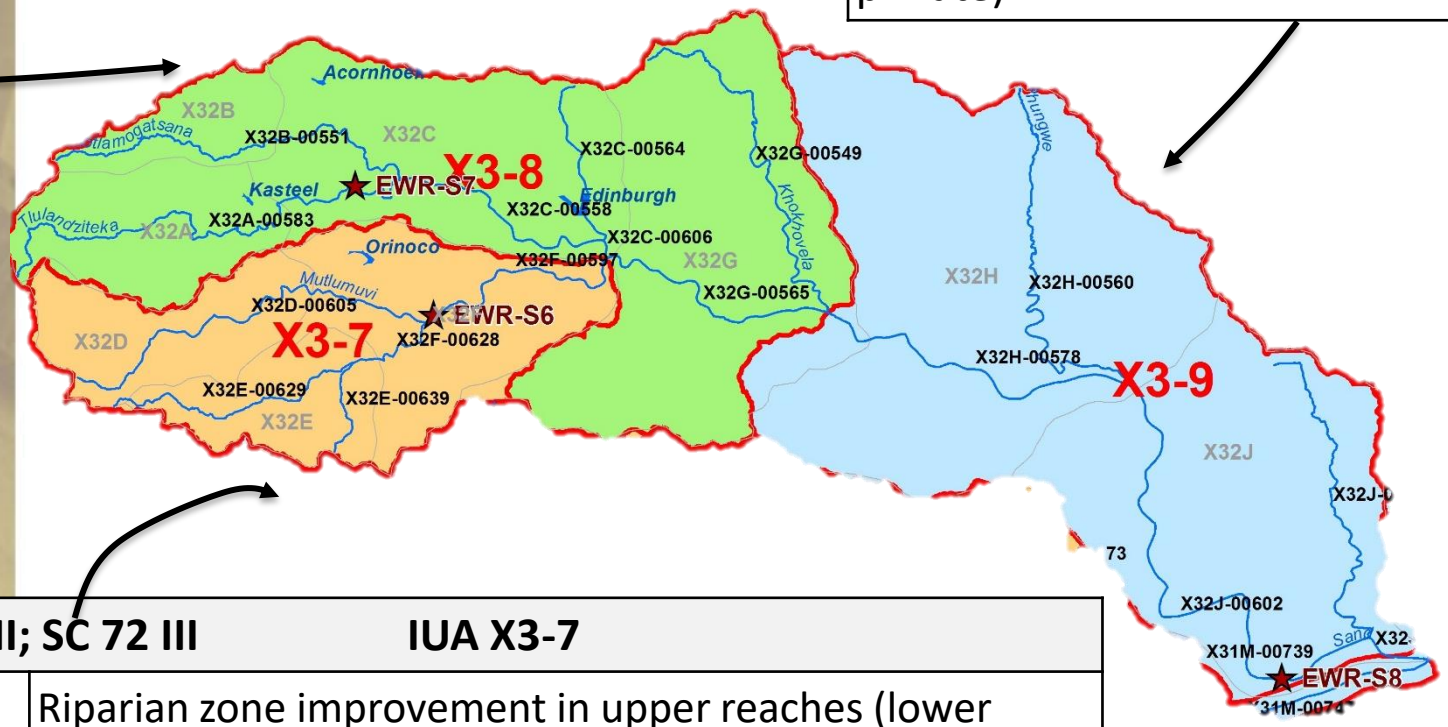
IMPLICATIONS OF WRC: RQOs IUA X_{3-3}, EWR S_5

Hydrology & Groundwater	nMAR%	63.9
	Drought Oct	0.68 m^3/s
	Normal Oct	0.88 m^3/s
	Gw level	12 mbs
Water Quality	Nutrients (PO_4-P)	Acceptable
	Salts	Ideal
	Coliforms	Full contact use
	Toxics	Ideal
Habitat & Biota	Geomorph	C
	Fish	B/C
	Inverts	B/C
	Veg	B/C

IMPLICATIONS OF DRAFT WRC: IUA X3-7, 8, & 9

PES:II; REC II; SC 72 II	IUA X3-8
Maintain in current state	

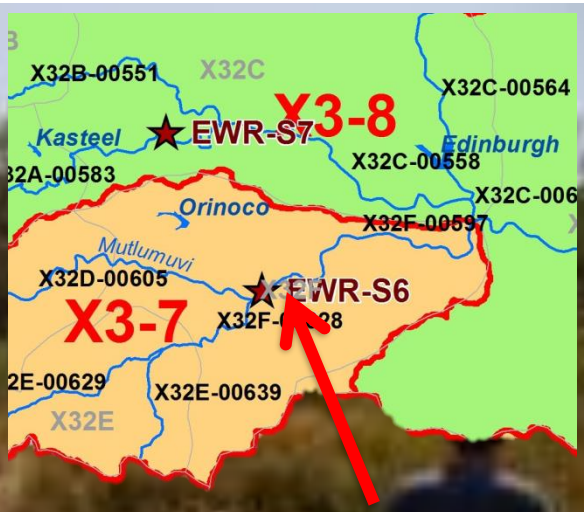
PES: I; REC I; SC 72 I	IUA X3-9
Maintain in current state (KNP & private)	



PES: III; REC III; SC 72 III	IUA X3-7
Nwarhele C/D → D	Riparian zone improvement in upper reaches (lower dense settlements – difficult)
Ndlebesuthu	D/E – very dense settlements, unlikely to improve
EWR 6	Cannot achieve REC – even with Dam in place.

IMPLICATIONS OF WRC: RQOs IUA X3-7, EWR S6

Hydrology & Groundwater	nMAR%	38.5
	Drought Oct	0.07 m^3/s
	Normal Oct	0.1 m^3/s
	Gw level	16 mbs
Water Quality	Nutrients (PO_4-P)	Tolerable
	Salts	Acceptable
	Turbidity	Acceptable
	Coliforms	Full contact use
	Toxics	CEV limits
Habitat & Biota	Geomorph	C
	Fish	C
	Inverts	B/C
	Veg	C



IMPLICATIONS OF WRC: RQOs IUA X_{3-9}, EWR S_8

Hydrology & Groundwater	nMAR%	24.7
	Drought Oct	0.03 m^3/s
	Normal Oct	0.09 m^3/s
Water Quality	Nutrients (PO_4-P)	Tolerable
	Coliforms	Full contact use
Habitat & Biota	Geomorph	C
	Fish	B
	Inverts	B
	Veg	B

SUMMARY RE WRC AND RQO IMPLEMENTATION

In all cases, the present state (maintaining status quo) has been selected as the WRCs which are ***IMMEDIATELY APPLICABLE*** except for some nodes that require non flow-related measures to improve. The WRC is therefore a combination of the PES and the REC. This will have no implications on the current economy or ecosystem services.

Future scenarios have been considered that provides the best balance between protection and use. These scenarios will not impact on the Classes but does impact on the catchment configuration in some cases in terms of Ecological Categories. There are some economic implications which have been stipulated in this presentation and in documentation and reports that are available.