water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

2030 NDP

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

PUBLIC MEETING 1

Presented by:
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Golder Associates Africa (Pty) Ltd

Date: 26 and 27 February 2020

Study objective

- To determine appropriate water resource classes and Resource Quality Objectives (RQOs) for all significant water resources in the Thukela River catchment area that would facilitate sustainable use of the water resources while maintaining ecological integrity, specifically maintaining or improving the present ecological state of the water resources.

What does this mean?

IWRM FRAMEWORK

Fundamental Principles and Framework: Water Policy and the National Water Act

Resource Directed Measures

Key Approaches under NWA

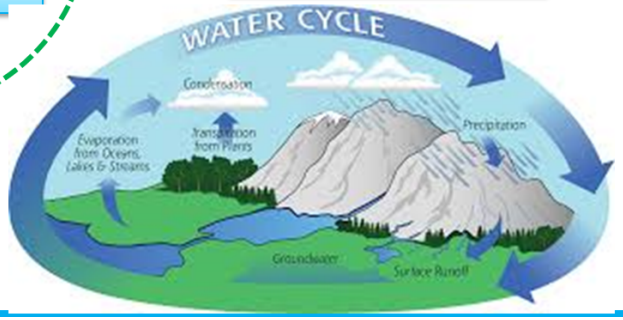
Source Directed Measures

- Protection
- Use
- Development
- Management
- Conservation
- Control

In its

WATER RESOURCES

Water courses, surface and groundwater, wetlands and estuaries



- Basic human needs of present and future generations
- Need to protect water resources
- Need to share water resources with other countries
- Need to promote socio-economic development through the use of water
- Establishment of suitable institutions

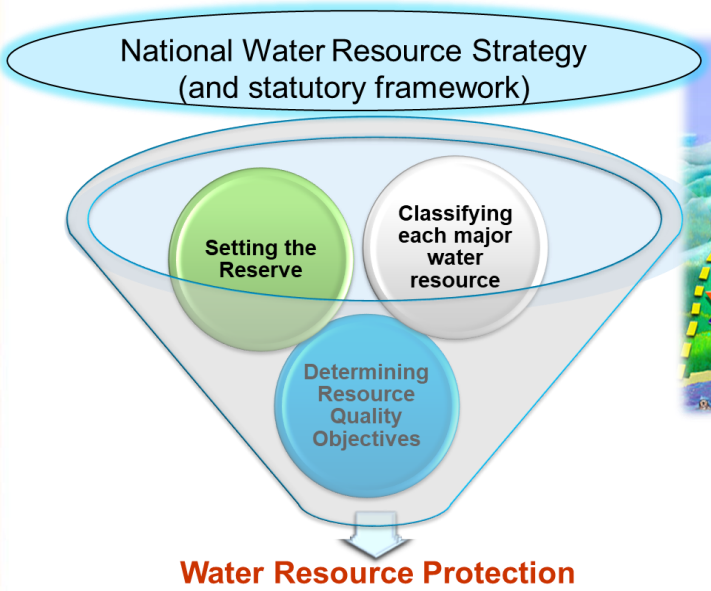
How does national government determine the level of protection required for a particular water resource?

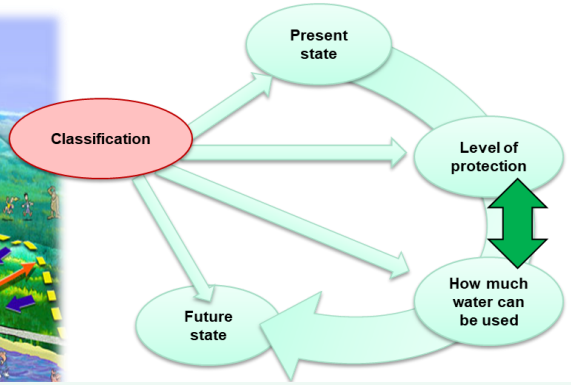
- Very few water sources that are in a natural state and therefore our water resources require protection.
- Water in SA: scarce and unevenly distributed throughout the country.
- Thus different water resources require different levels of protection.

Chapter 3 of the NWA specifies a series of resource directed measures (RDM) which together are intended to ensure the comprehensive protection of all water resources. These include:

- the classification of water resources,
- setting the Reserve, and
- establishing resource quality objectives.

Achieving integration

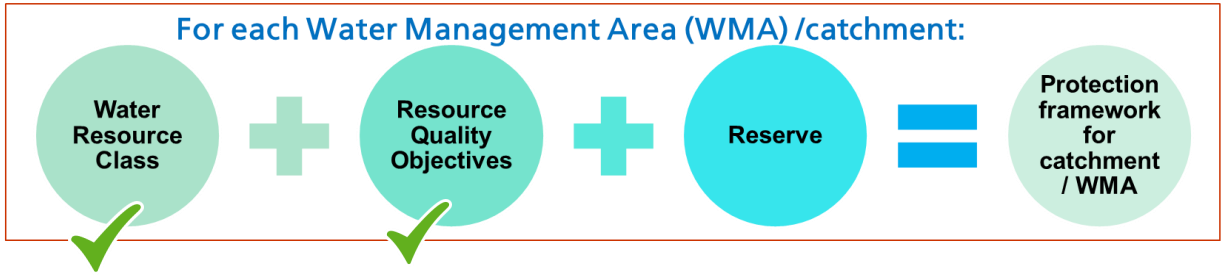




Classification is used in two ways:

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

The water resource class, RQOs and Reserve are developed for the instream condition of the water resource and implemented within the context of national water resource strategy and respective catchment management strategies.



Classifying each major resource

- Surface water,
- Groundwater;
- Wetlands and estuaries.

Each class represents:

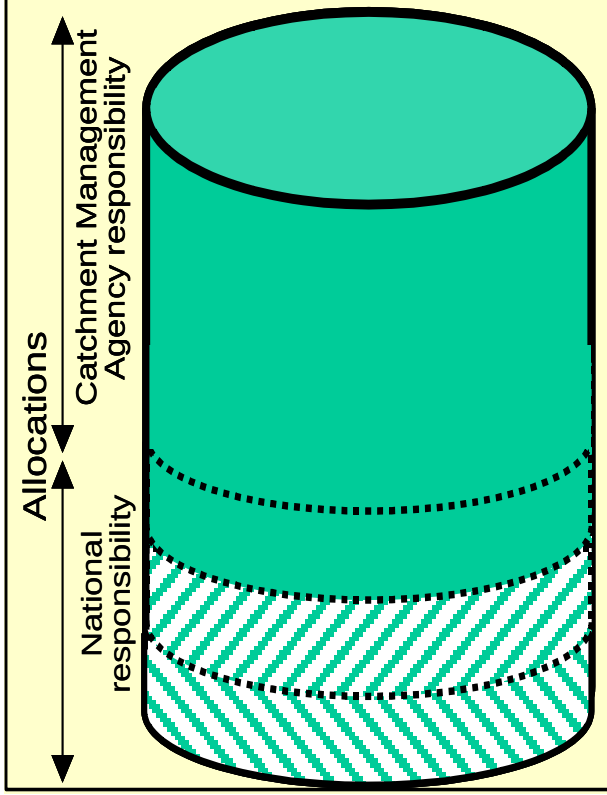
- A different level of protection that is required for the water resource, and
- The extent to which water can be used.

	Description of use	Ecological Category	Description of resource
Class I	Minimally used	A-B	Minimally altered
Class II	Moderately used	C	Moderately altered
Class III	Heavily used	D	Heavily altered

Setting the Reserve

Balancing equity with sustainability - the Reserve

If all the water in the country could be put into a bucket, the "Reserve" is the water that must always be left in the bucket for basic human needs and ecological needs.



All other uses authorised according to criteria of equitable allocations, beneficial use in the public interest, and environmental values

International obligations, interbasin transfers, strategic needs, future use

Basic human needs

Ecological needs

The Reserve - the only right to water in the National Water Act

Determining Resource Quality Objectives

Resource quality objectives provide statements about:

- what the quantity of water should be (water level, pattern, timing)
- what the water quality should be (physical, chemical, biological)
- what the condition of the instream and riparian (river bank) habitat should be
- what the condition of the aquatic (water) animal and plant life should be.

WE ALL LIVE DOWNSTREAM

In summary

- The RDM = sustainability indicators of the water resource
- Compliance = desired level of protection being achieved = sustainable water resource systems
- The water resource class and the RQOs form an integral component of IWRM and informs the current and future planning, use, development, management and control of the water resources in the catchment areas.
- Implementation and achievement extends across institutional, functional and operational levels of the DWS as well as other institutions, water users and stakeholders.
- Achievement of the protection measures are fundamental in ensuring sustainable water resources into the future.

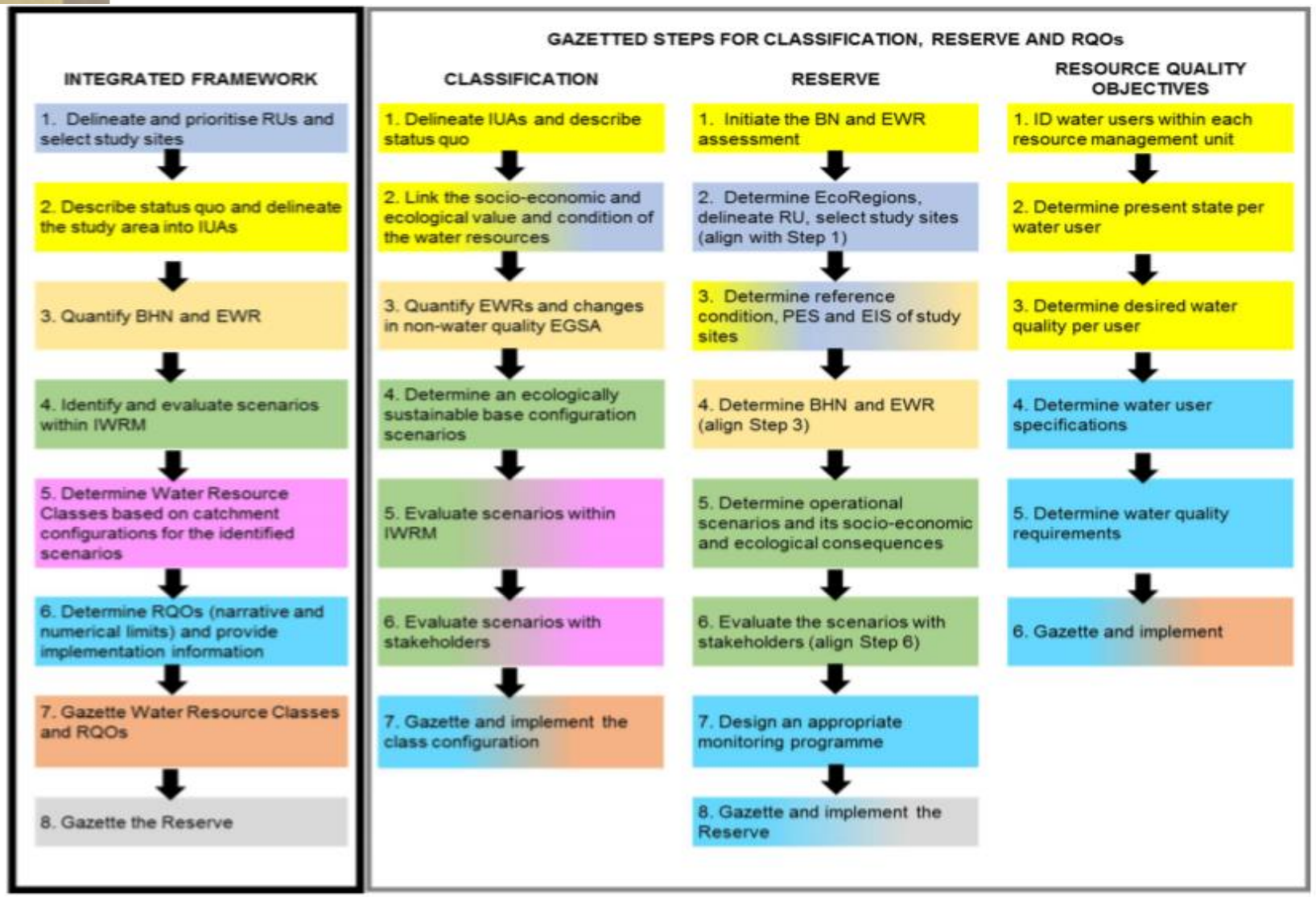
STUDY APPROACH AND SCOPE OF WORK

Key aims of this study

- co-ordinating the implementation of the Water Resource Classification System (WRCS); and
- undertaking the implementation of the RQO determination procedure (7 step process)

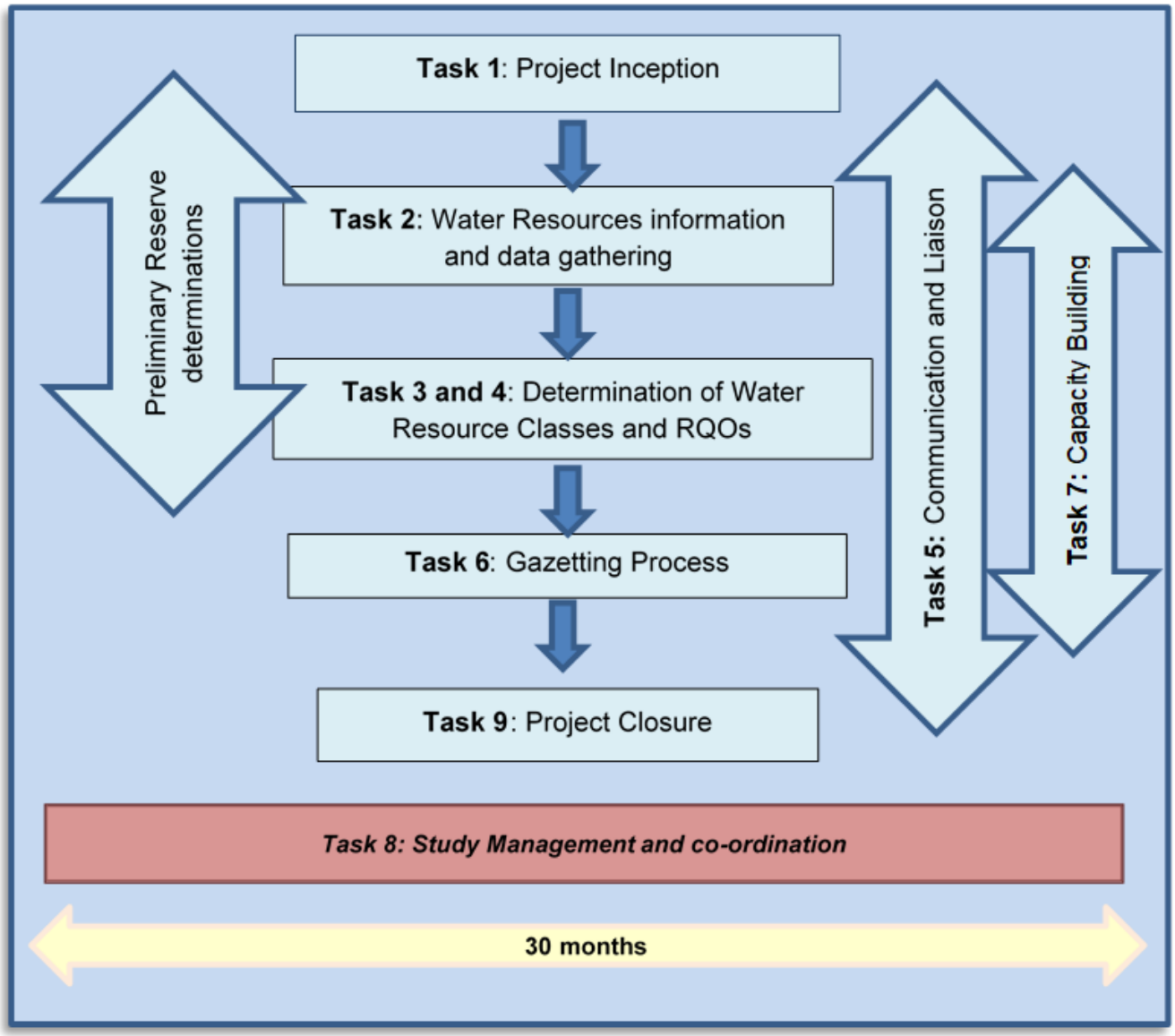
- It is noted that the study is linked to the previous Reserve determination studies and other water resource management initiatives.
- Where the preliminary Reserve is available and relevant, this information will be adopted and where needed, gaps will be filled.

Integrated Framework of the Gazetted steps for Classification, Reserve and RQO Determination (DWS)



Flow of the study tasks

- SPECIALISTS
- Groundwater
- Hydrology
- Hydraulics
- Wetlands
- Estuaries
- Socio-economics



High level programme

Task		Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22
Month		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Project Inception																														
2	Information and Data Gathering																														
3	Determination of Water Resource Classes																														
4	Determination of Resource Quality Objectives																														
5	Gazetting Process																														
6	Communication and Liaison																														
7	Capacity Building																														
8	Study Management																														

OVERVIEW STATUS OF THE CATCHMENT

Water Resource Components

This study focuses on the classification of significant water resources in the Thukela. This will include an identified network of significant resources comprising rivers, dams, wetlands, groundwater and the Thukela estuary through the catchment area.

- **Rivers**
- **Wetlands**
- **Groundwater**
- **Thukela estuary**

Study area

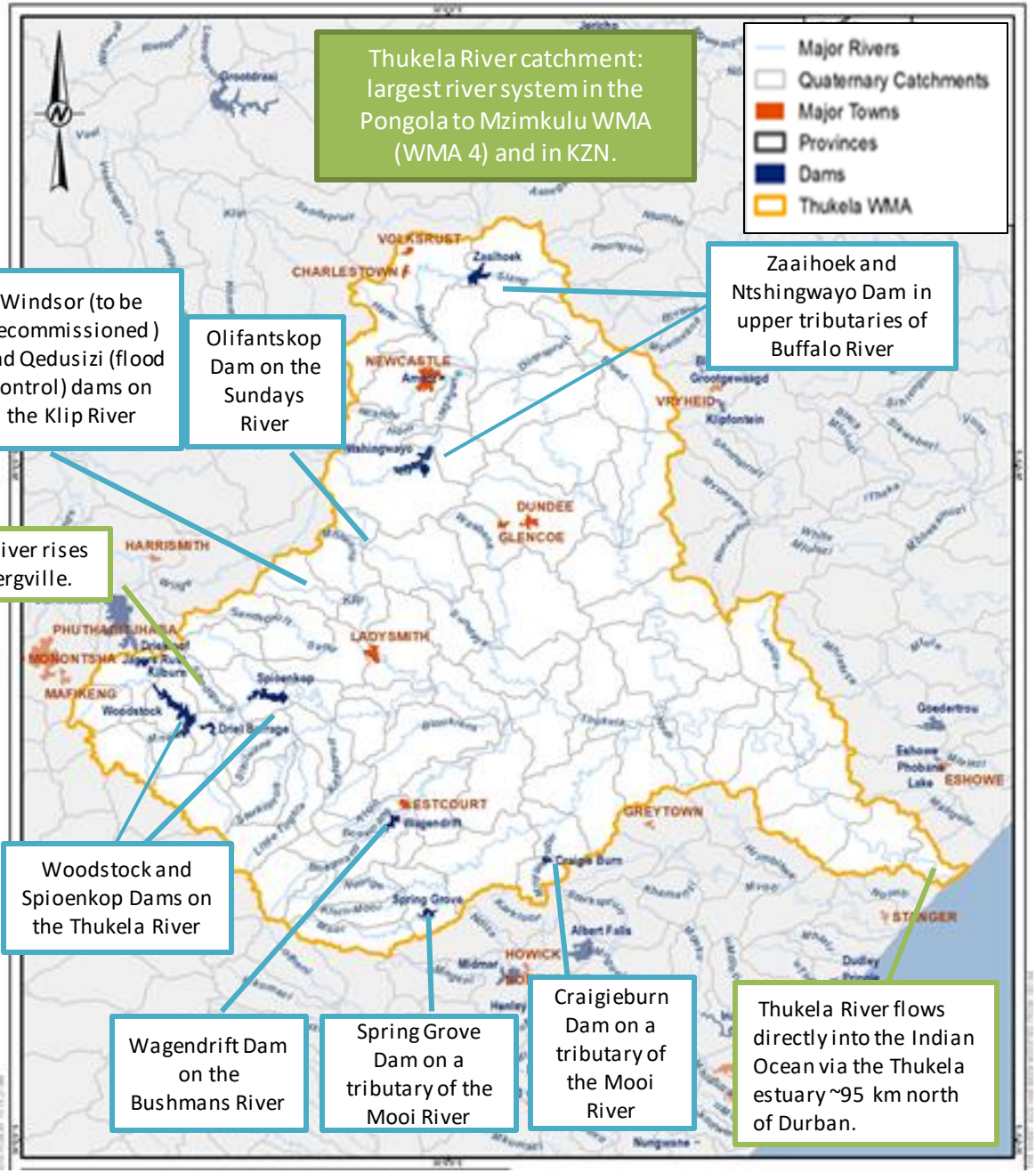
Major tributaries from the north:

- Klip River, which passes through Ladysmith,
- Sundays River,
- Buffalo River, which rises above Newcastle.

Major tributaries from the south:

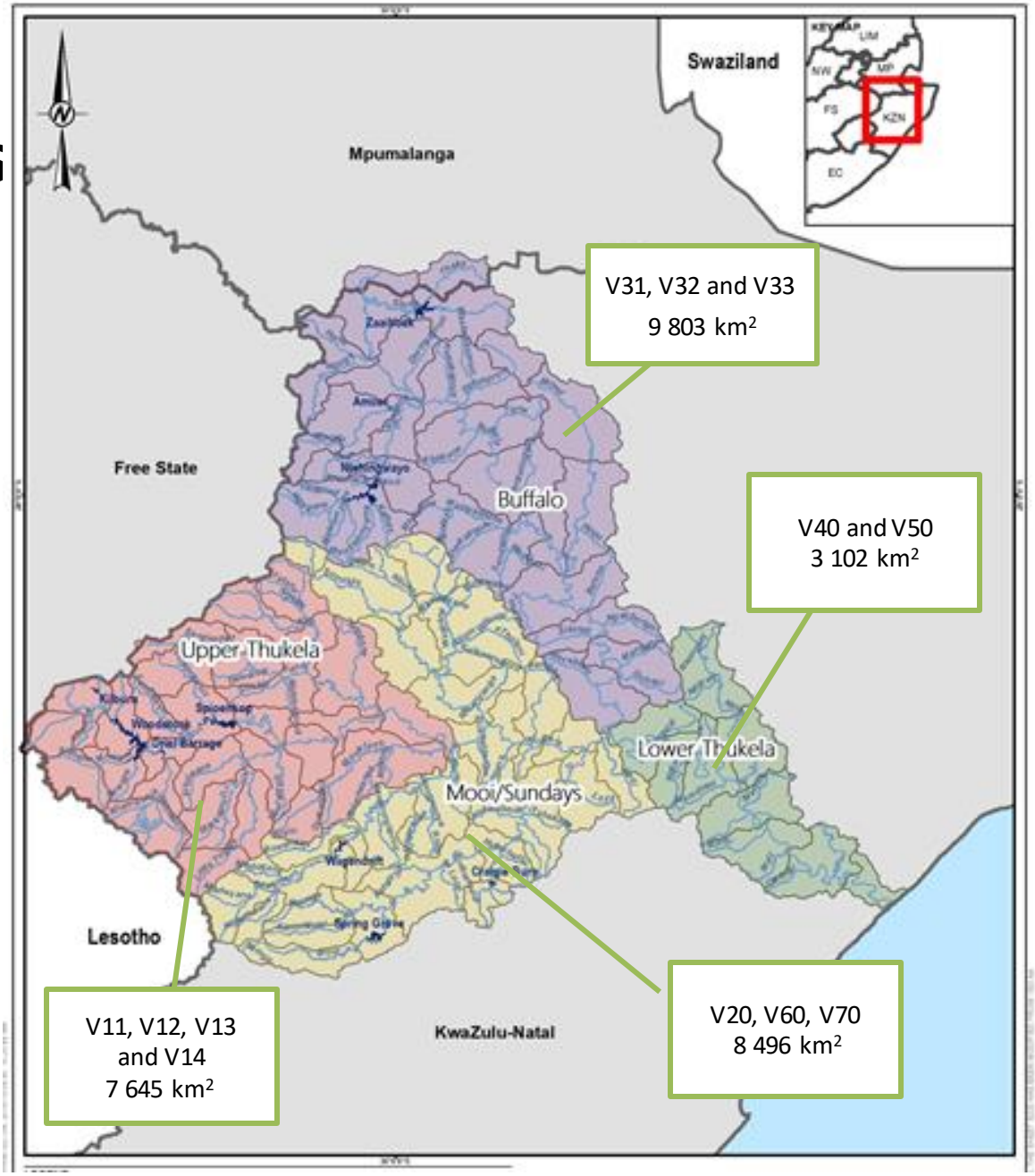
- Little Thukela River,
- Bloukrans River,
- Bushmans River passing though Estcourt, and
- Mooi River.

Dam name	QC	Purpose	Full supply capacity (million/m^3)
Woodstock	V11D, V11E	Domestic/ industrial	380.4
Driel Barrage	V11J	Domestic/ industrial	8.7
Spioenkop	V11L	Domestic/ irrigation	279.6
Qedusizi	V12F	Flood control	194
Zaaihoek	V31A	Strategic, Domestic /industrial	193.0
Ntshingwayo	V31E	Domestic/ Industrial	198.4
Wagendrift	V70C	Irrigation/ Domestic /industrial	58.4
Spring Grove	V20D	Domestic	139.5
Craigie Burn	V20F	Irrigation	23.4

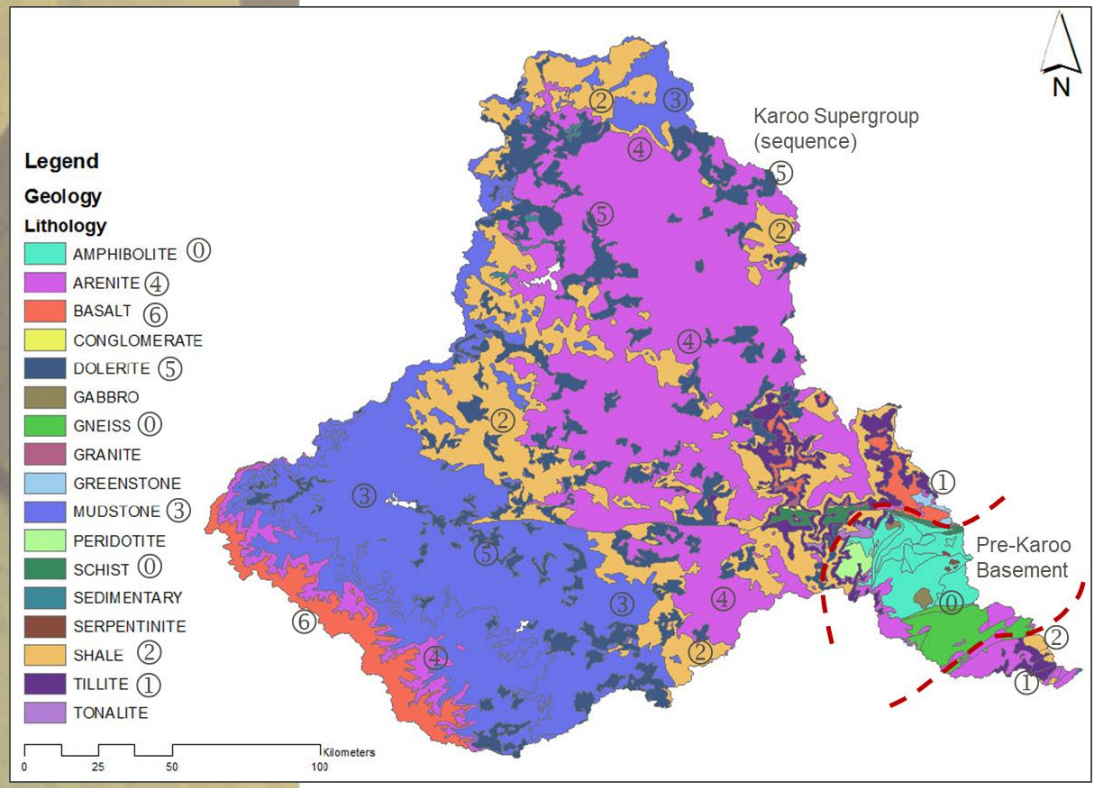


Sub-catchments

Sub-catchment	Description
Upper Thukela	The catchment of the Thukela River to just upstream of the confluence of the Bushmans River
Mooi/ Sundays	The catchment of the Mooi, Bushmans and Sundays River as well as of smaller tributaries, down to the confluence of the Buffalo River with the Thukela River.
Buffalo	The catchment of the Buffalo River
Lower Thukela	The catchment of the Thukela River between the confluence of the Buffalo River and the ocean



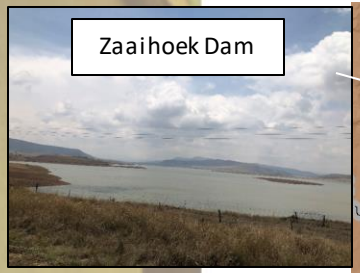
Geological map

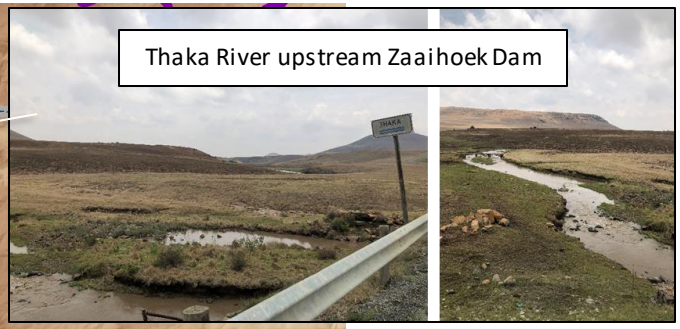


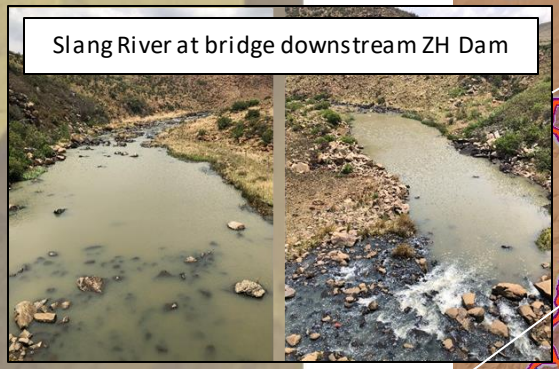
- **River Channel Alluvium** (young Quaternary unconsolidated clay, sand, conglomeratic horizons);
- **Undifferentiated** (younger) coastal and coastal plain deposits;
  - Consisting of unconsolidated to semi-consolidated sand, calcrete, aeolianite and conglomerate, etc.
- **Karoo Supergroup** (various sediments partially capped by magmatic extrusions):
  - Argillaceous rocks (shales, clay(stones), mudstone and siltstone);
  - Arenaceous rocks (sandstone, feldsphatic sandstone and arkose); and
  - Younger overlying extrusive volcanic rocks (basalt and andesite).
- **Post-Karoo Rocks**
  - Karoo-aged intrusive dolerite (dykes & sills).
- **Pre-Karoo Rocks and Secondary Geological Features**
  - Namaqua-Natal (Metamorphic) Province Group (shear-zoned meta-arenaceous rocks);
  - Barberton Sequence (mostly granites);and
  - Various degree of faulting and fracturing (Mokolian/Mesozoic Era).

SUB-CATCHMENT AREAS

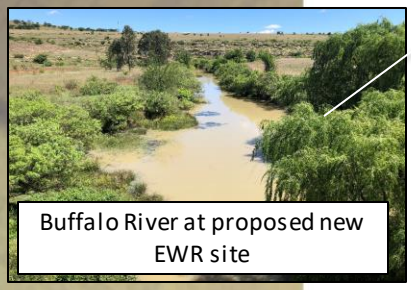
Buffalo River sub-catchment

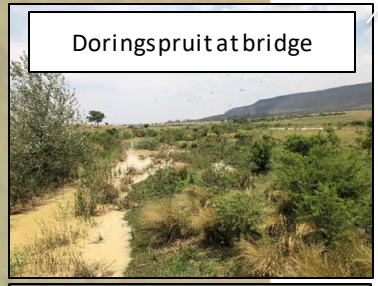

Zaaihoek Dam


Thaka River upstream Zaaihoek Dam


Slang River at bridge downstream ZH Dam


Blood River and extensive surrounding wetland areas

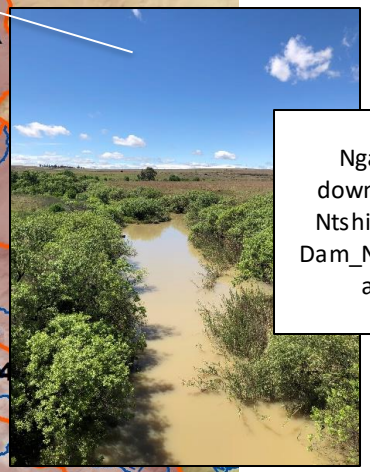

Buffalo River at proposed new EWR site

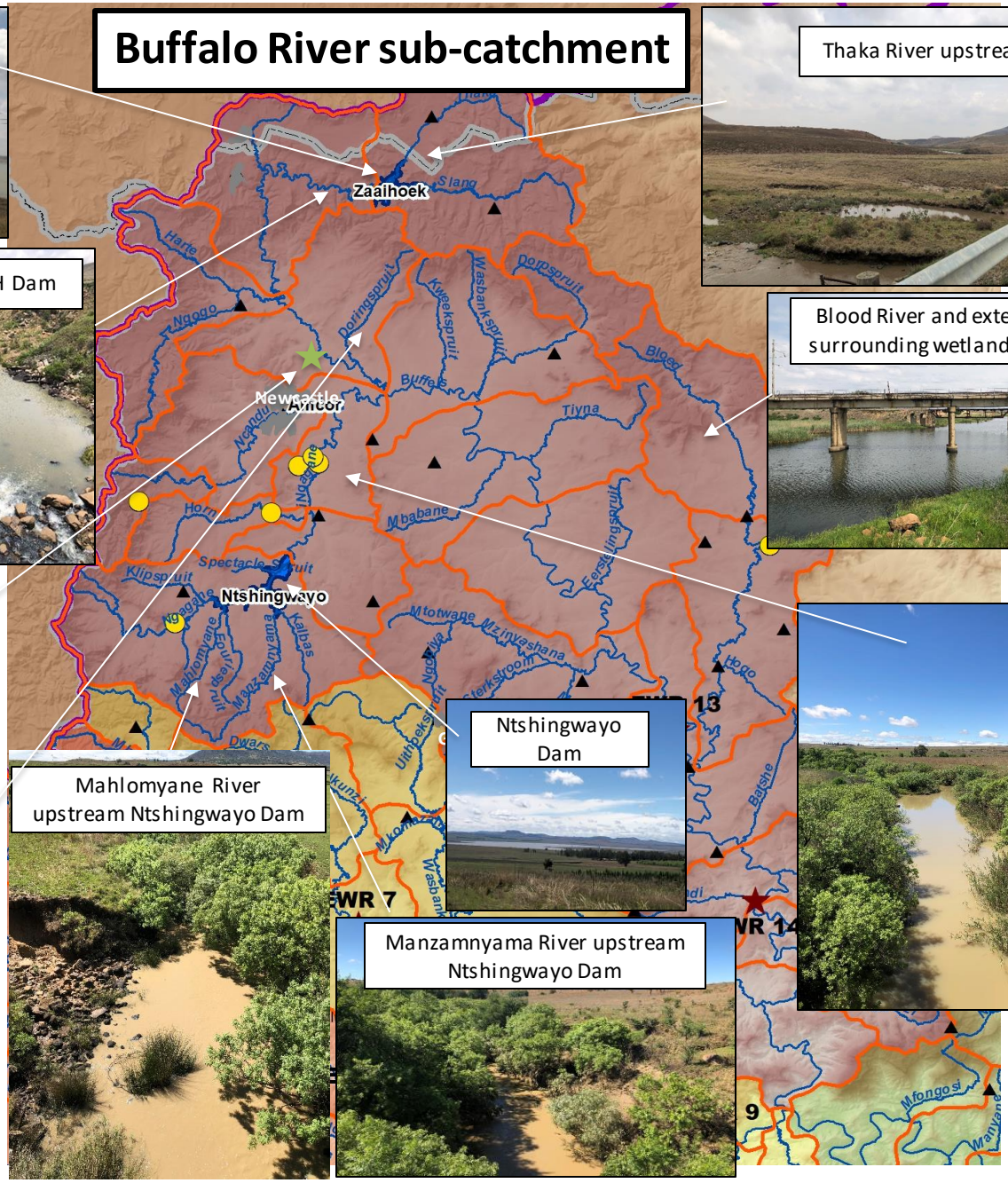

Doringspruit at bridge

Mahlomyane River upstream Ntshingwayo Dam

Ntshingwayo Dam

Manzamnyama River upstream Ntshingwayo Dam


Ngagane downstream Ntshingwayo Dam_Newcastle area



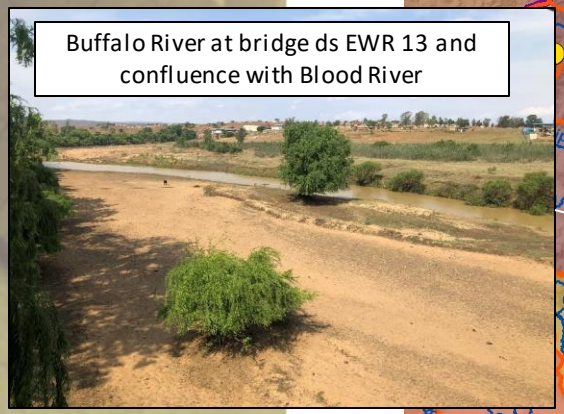
EWR sites

Proposed new EWR site

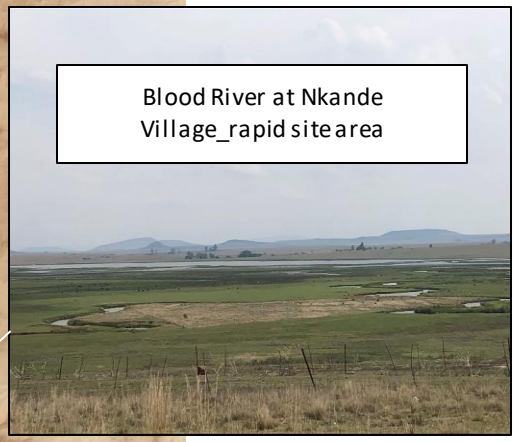
Rapid Reserve sites

Buffalo River sub-catchment

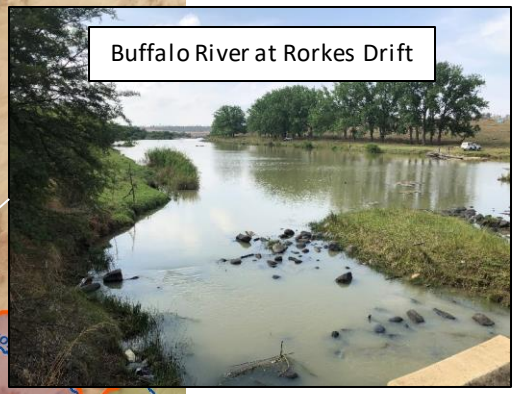
Blood River and extensive surrounding wetland areas



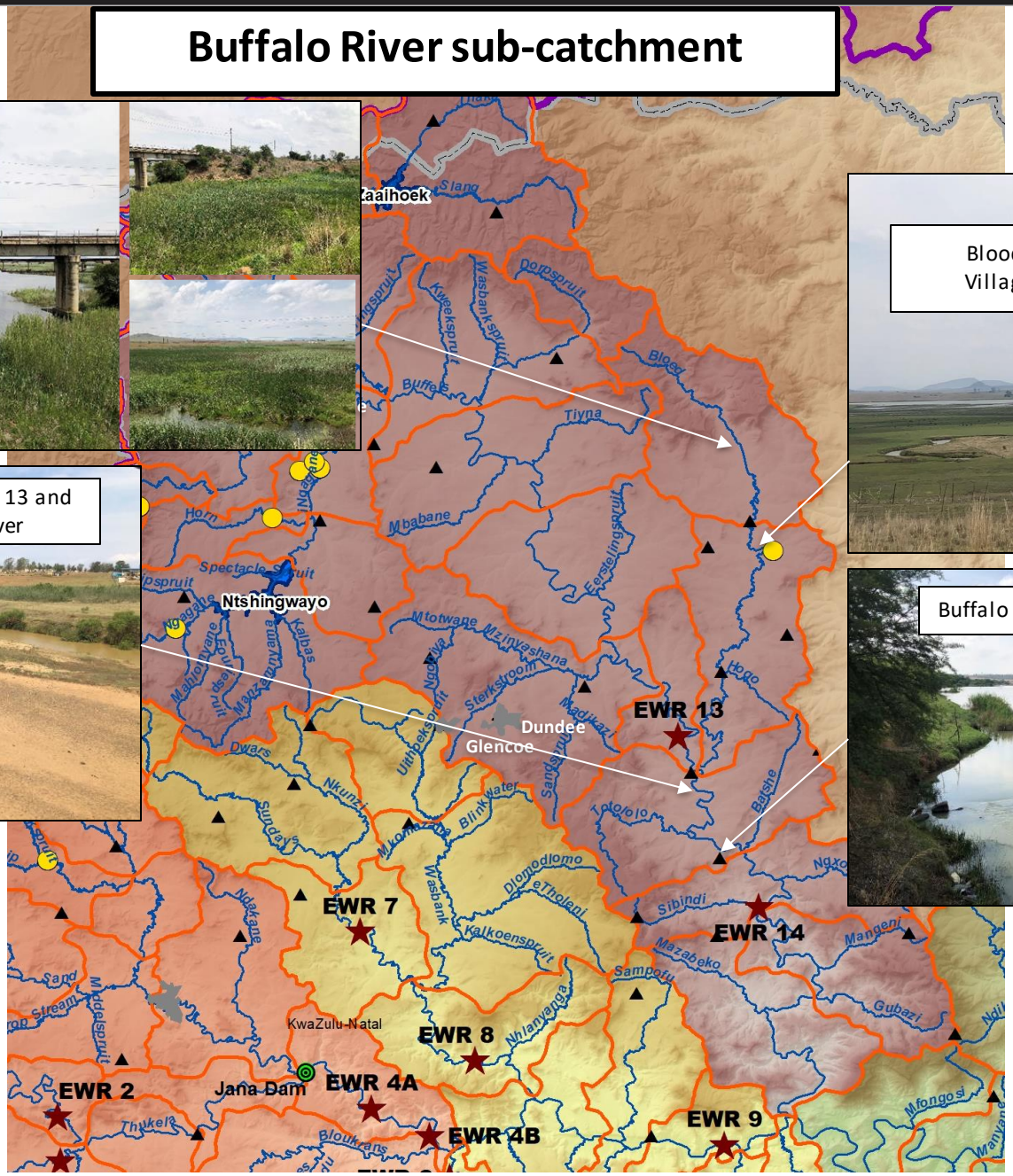
Buffalo River at bridge ds EWR 13 and confluence with Blood River



Blood River at Nkande Village_rapid site area



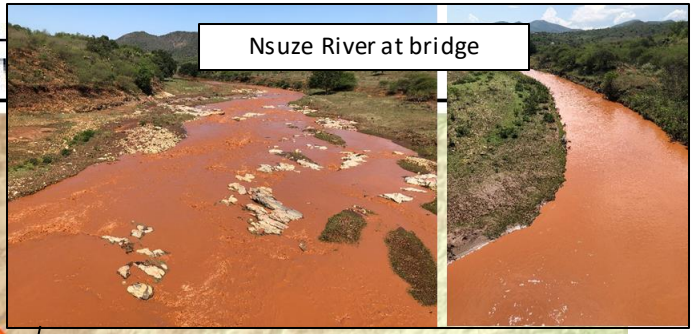
Buffalo River at Rorkes Drift



- EWR sites
- Proposed new EWR site
- Rapid Reserve sites

Lower Thukela sub-catchment

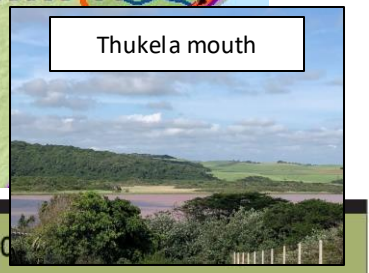

Thukela River upstream of Tugela Ferry


Nsuze River at bridge


Thukela at Middelkraal approximately 1km below abstraction/ transfer point


Thukela River at Umgeni pump station

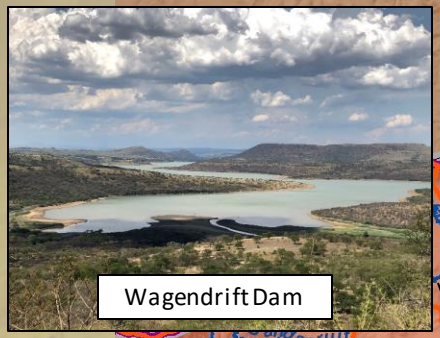

Umgeni abstraction works on Thukela River

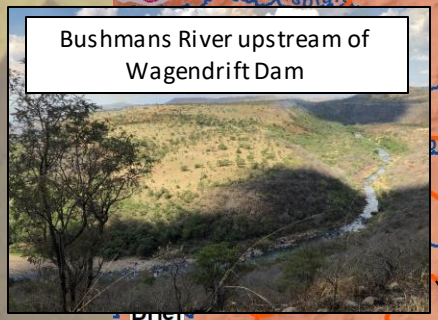

Thukela mouth

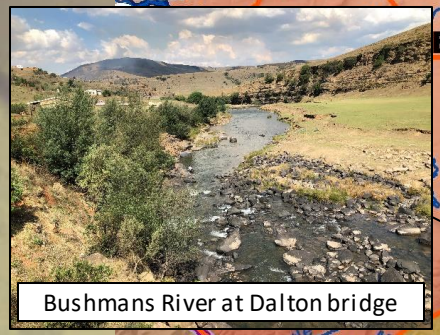
EWR 9
Tugela Ferry
EWR 15
EWR 16
EWR 17
EWR 18
Mfongosi
Manyane
Ngcaza
Mamdleni
Mambulu
Mpisi
Mati
Otimati
Thukela
Gubazi
Ndikwe
Nsuze
Mamba
Nadi

- EWR sites
- Proposed new EWR site
- Rapid Reserve sites

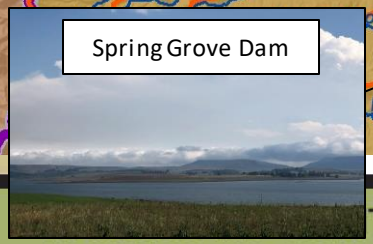
Mooi/ Sundays sub-catchment

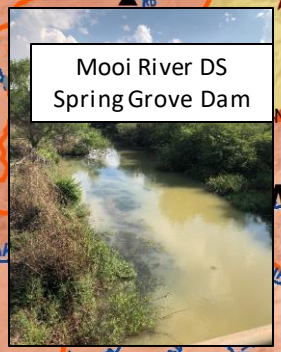

Wagendrift Dam


Bushmans River upstream of Wagendrift Dam


Bushmans River at Dalton bridge

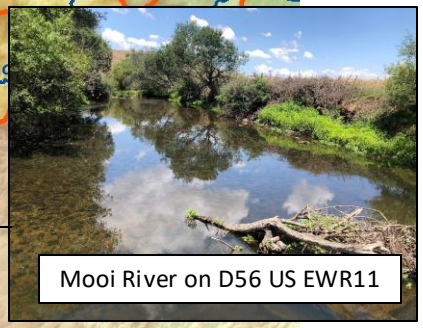

Little Mooi at proposed rapid site

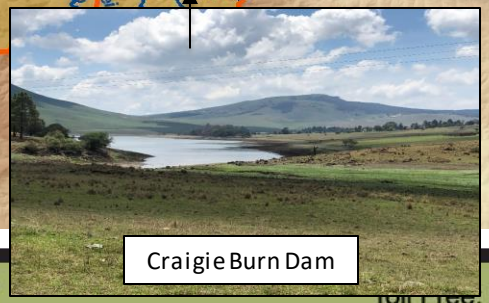

Spring Grove Dam


Mooi River DS Spring Grove Dam


Bushmans River at Weenen


Umgwenya River


Mooi River on D56 US EWR11

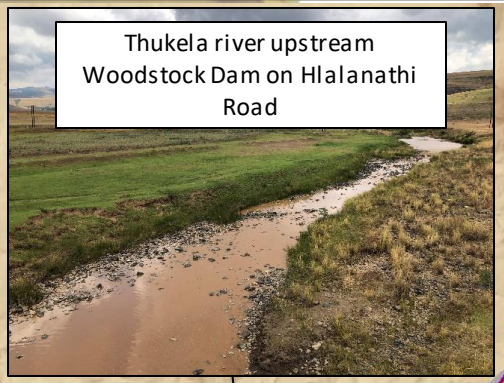

Craigie Burn Dam


Main feeder to Craigie Burn Dam

EWR 2
EWR 3
EWR 4A
EWR 4B
EWR 5
EWR 6
EWR 7
EWR 8
EWR 10
EWR 11
Mielietuin Dam
Weenen
Wagendrift
Craigie Burn

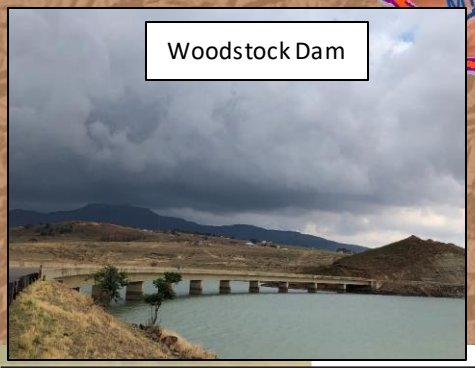
EWR sites
Proposed new EWR site
Rapid Reserve sites

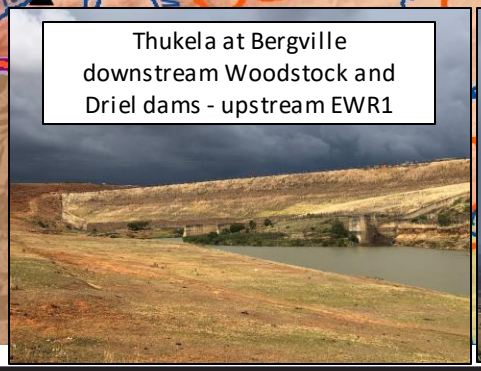
Upper Thukela sub-catchment

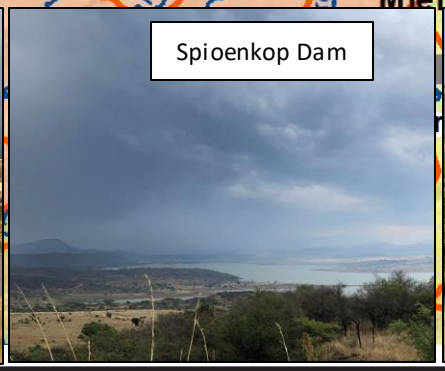

Thukela river upstream Woodstock Dam on Hlalanathi Road

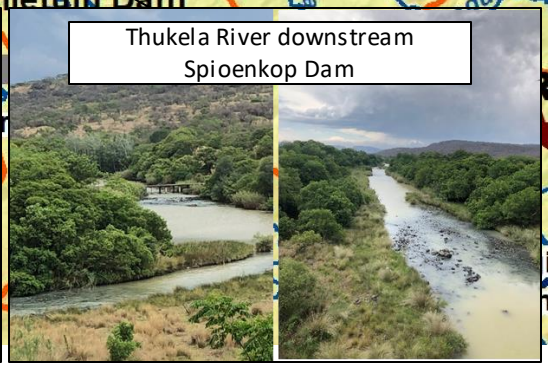

Sundays River downstream EWR7


Klip River on bridge in Ladysmith Industrial area_proposed EWR site


Woodstock Dam


Thukela at Bergville downstream Woodstock and Driel dams - upstream EWR1


Spioenkop Dam

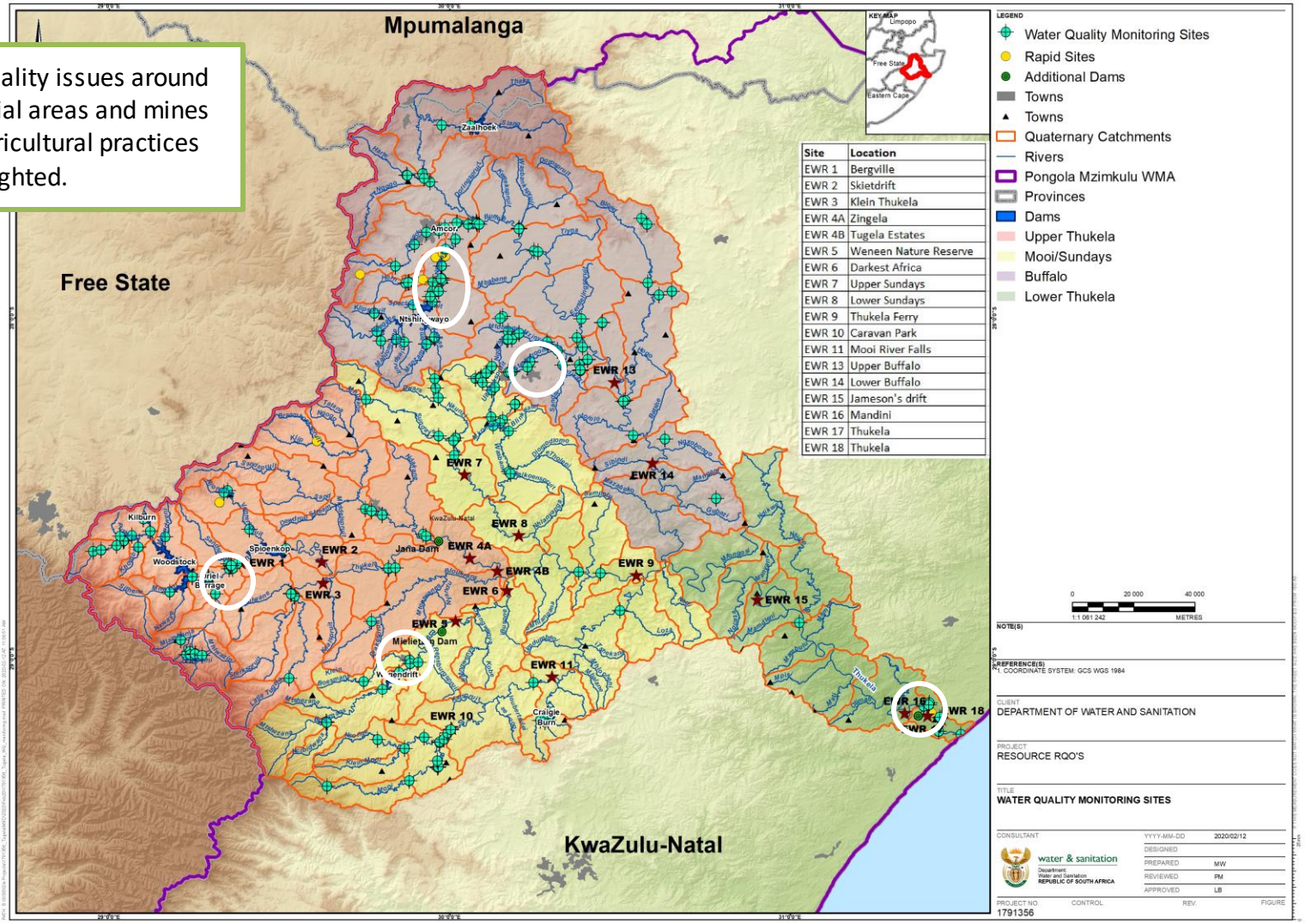

Thukela River downstream Spioenkop Dam

Kilburn
Woodstock
Bergville
Driel Barrage
Spioenkop
EWR 1
EWR 2
EWR 3
EWR 5
EWR 7
EWR 8
Ladysmith
KwaZulu-Natal
Mielietuin Dam
Jana
Tatana
Ngogo
Klip
Sandspruit
Ndakane
Sundays
Kalkoenspruit
Dewdrop Stream
Middelspruit
Thukela
Mnweni
Khomba
Sithene
Situlwane
Nxwaye
Mlambonja

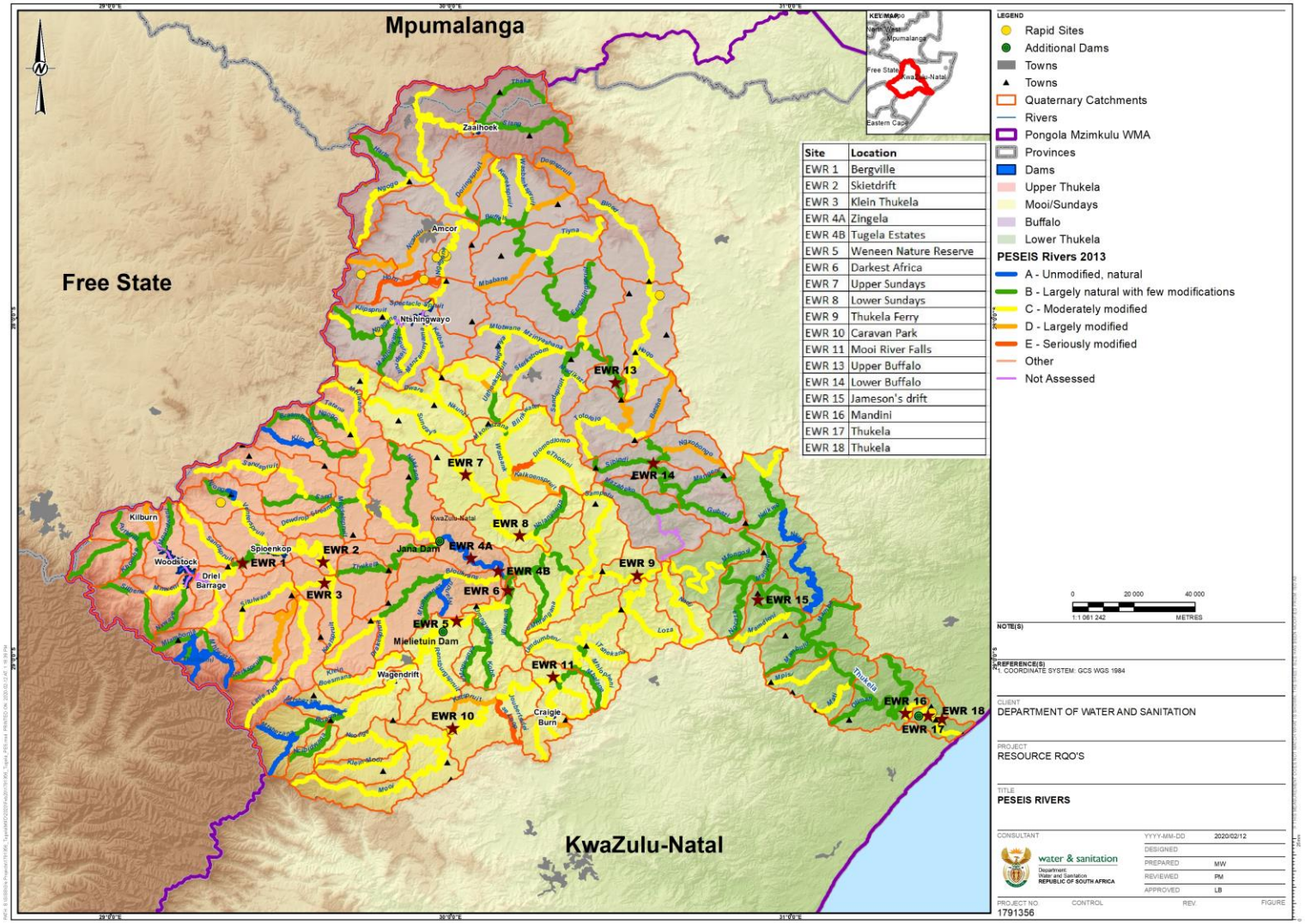
EWR sites
Proposed new EWR site
Rapid Reserve sites

Surface water quality – monitoring points

Localised water quality issues around the towns, industrial areas and mines and related to agricultural practices highlighted.



Present Ecological Status

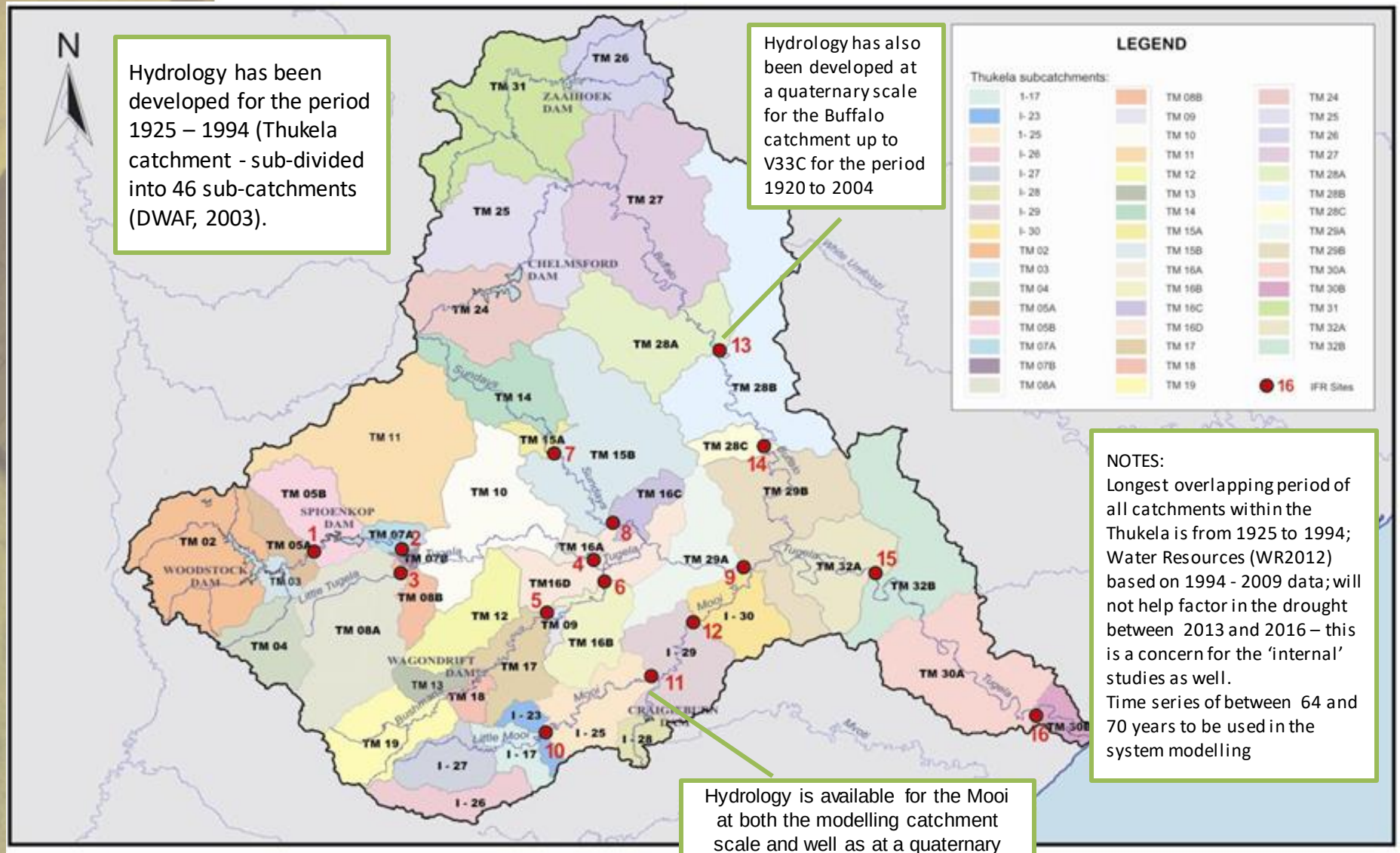


Water Resource Modelling

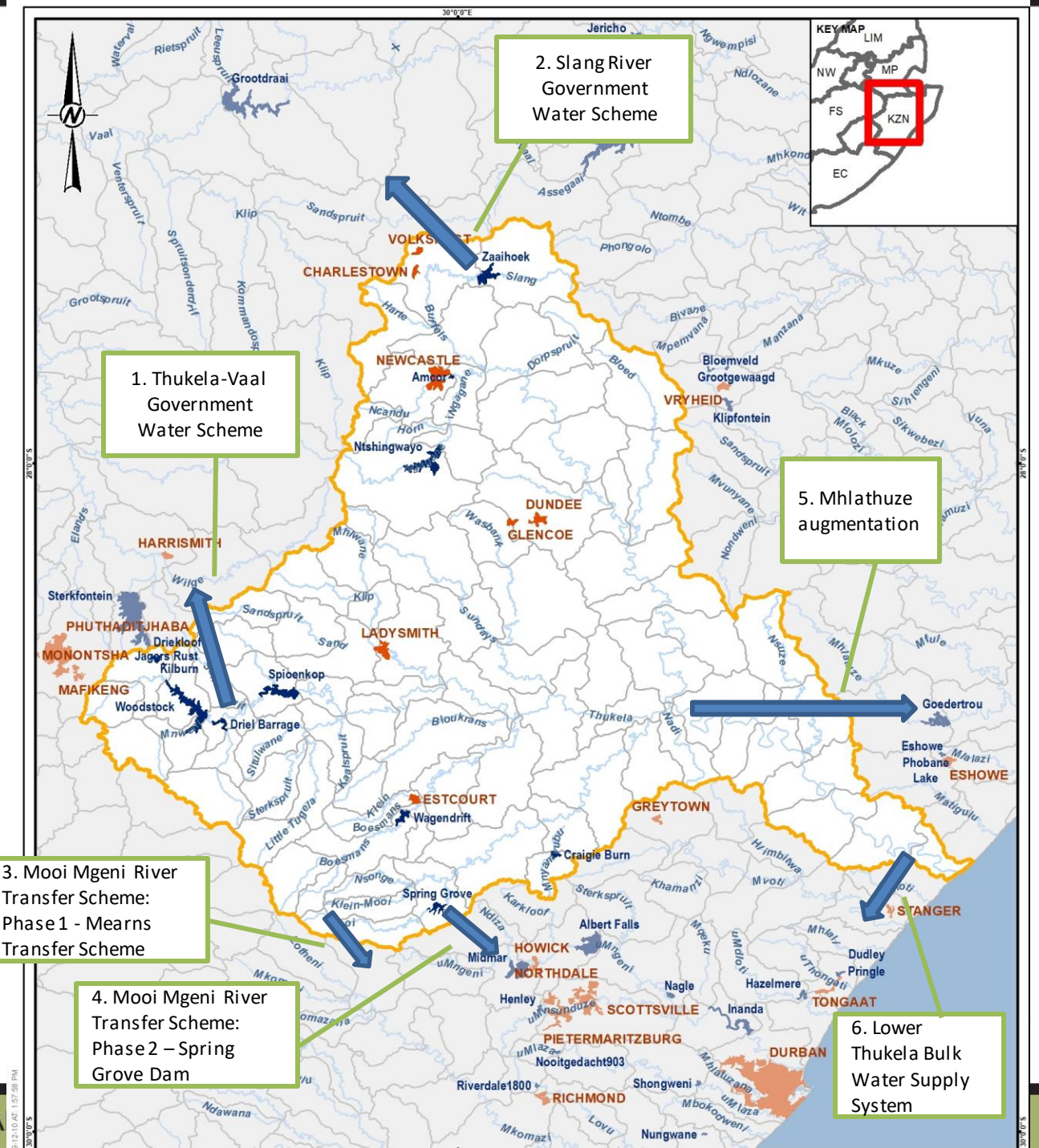
Thukela catchment has not been the focus of a single reconciliation strategy.
Portions of the Thukela catchment are linked to other systems through the various existing or proposed water transfers out of the Thukela, e.g. the Integrated Vaal, Richards Bay, and KZN Coastal Metropolitan areas reconciliation strategies.
There is not a current consolidated stand-alone system model for the Thukela.

No.	Study name	Date	Portion of Thukela	Model Configured	Hydrology period	Comment
Studies with System Models						
1	Vaal AOA	June 2011	Whole Thukela plus neighbouring Vaal, Usuthu, etc.	WRPM	1930 - 1993	Hydrology period limited by overlap of all catchments
2	TWP (Thukela Water Project)	April 2003	Whole Thukela	WRYM	1925 - 1994	
3	Mooi Mgeni Hydro Update	July 2019	Mooi River down to confluence	WRYM & WRPM	1925 - 2017	Recent study for Umgeni Water
4	Buffalo AOA	May 2019	Buffalo down to V33C	WRYM & WRPM	1920 - 2004	WRPM more updated. WRYM at 2013 level
Studies without System models						
5	All-Towns Recon Strategies	2011 and 2013	uMzinyathi, Amajuba & uThukela DMs – main towns and schemes	Method of assessment TBC	Method of assessment TBC	Local water balances at towns were the focus.
6	Thukela ISP	2004	What Catchment	N/A	N/A	Study on main attributes & water balance of system.
7	Water Resources 2012 (by WRC)	2012	Whole Thukela	WRSM2000	1920 - 2009	National study with possible limitations in detail possible in Thukela.

Hydrological data

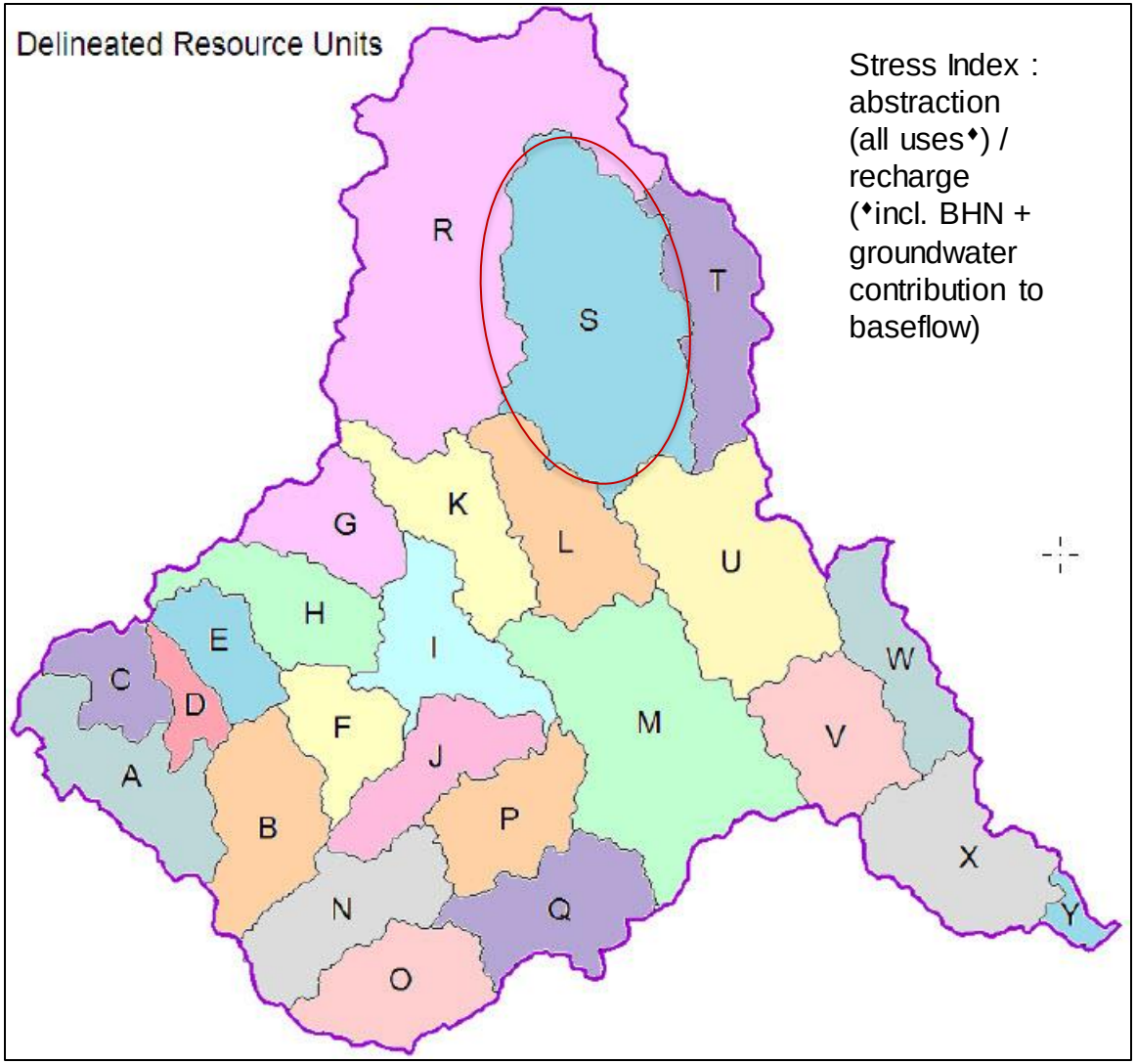


Thukela Inter-basin transfers

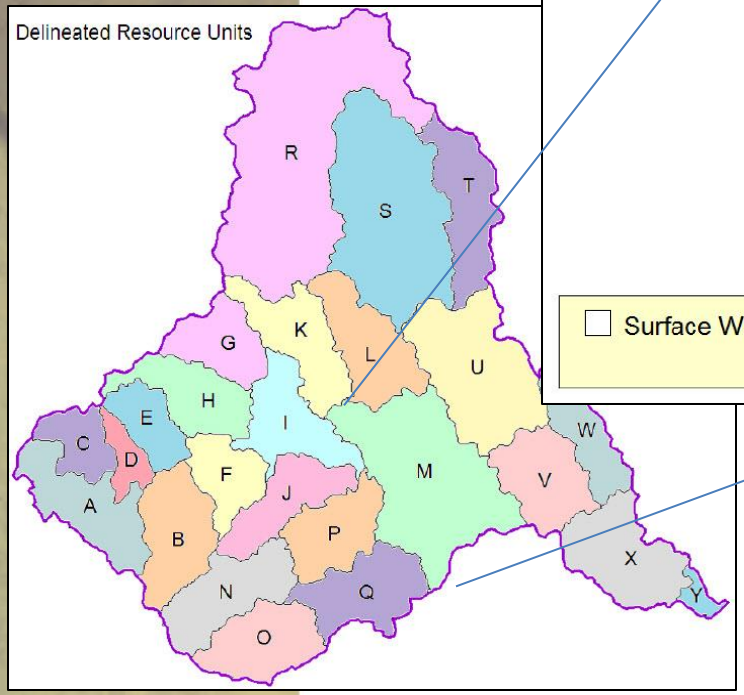


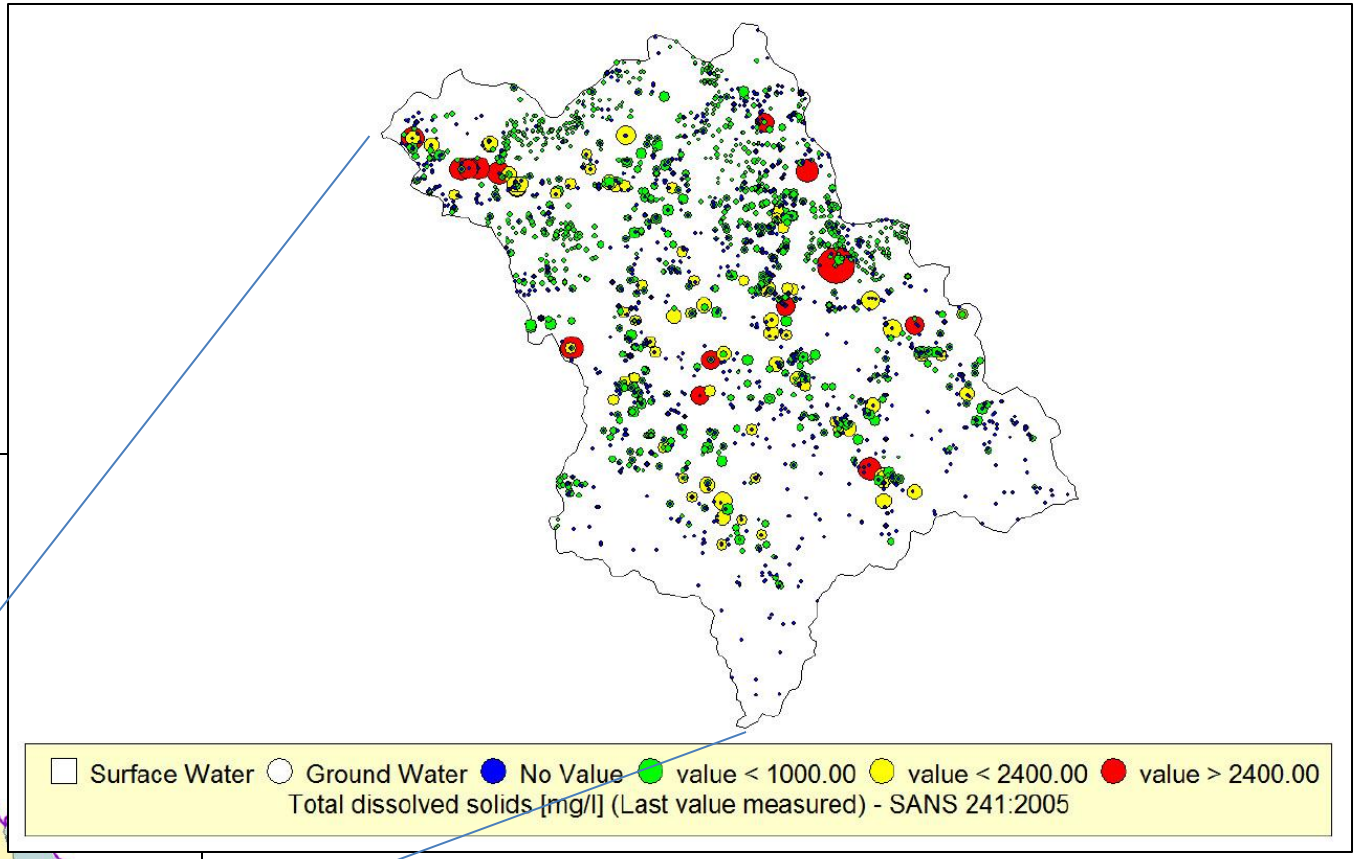
Groundwater

Resource Unit	Present Status Category	Resource Category	*Stress Index
TRU-A	B/C	Good/Fair	6.0
TRU-B	C	Fair	42.5
TRU-C	C	Good/Fair	29.6
TRU-D	B/C	Good/Fair	61.5
TRU-E	B/C	Good/Fair	59.4
TRU-F	B/C	Good/Fair	69.8
TRU-G	C	Fair	21.8
TRU-H	B/C	Good/Fair	54.1
TRU-I	C	Fair	28.8
TRU-J	B/C	Good/Fair	27.0
TRU-K	B/C	Good/Fair	41.1
TRU-L	B/C	Good/Fair	40.0
TRU-M	C	Fair	0.3
TRU-N	B/C	Good/Fair	17.8
TRU-O	B/C	Good/Fair	43.6
TRU-P	B/C	Good/Fair	7.7
TRU-Q	C	Fair	40.5
TRU-R	C/D	Fair	28.3
TRU-S	D	Fair	74.1
TRU-T	C	Fair	49.9
TRU-U	B/C	Good/Fair	0.3
TRU-V	B/C	Good/Fair	0.6
TRU-W	B/C	Good/Fair	2.0
TRU-X	B/C	Good/Fair	5.0
TRU-Y	C	Fair	33.1



Groundwater quality





Specific groundwater aspects

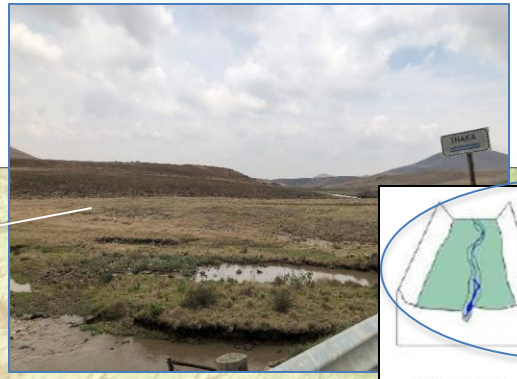
- Water-related problems caused by mining (for example coal mines), power stations and heavy industry.
- Agriculture (including forestry, sugarcane, stock and game farming) consumes large quantities of water and contaminates groundwater resources in some locations.
- Localized pollution (e.g. sanitation, mining and agriculture).
- Quantification of surface water–groundwater interaction and the impacts thereof on aquatic ecosystems.
- Groundwater resources within the non-protected Drakensberg Mountain Range areas are affected by subsistence agriculture practices due to shallow soil conditions – impacting on recharge potential/ groundwater quality.
- The wetlands and sponges in the upper and middle Drakensberg resources need to be preserved as far as possible due to their critical role in supplying baseflows in all the rivers.

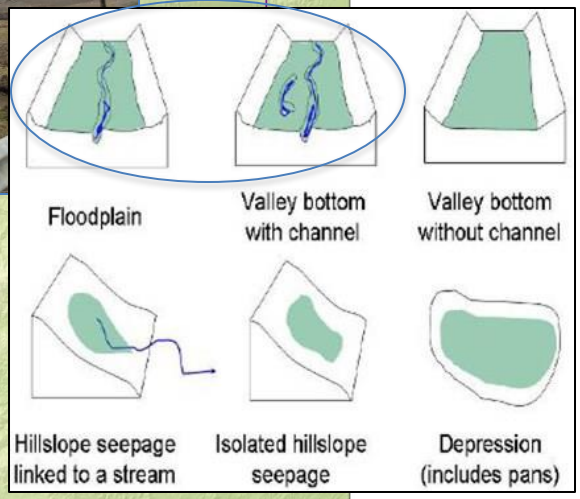
Wetlands

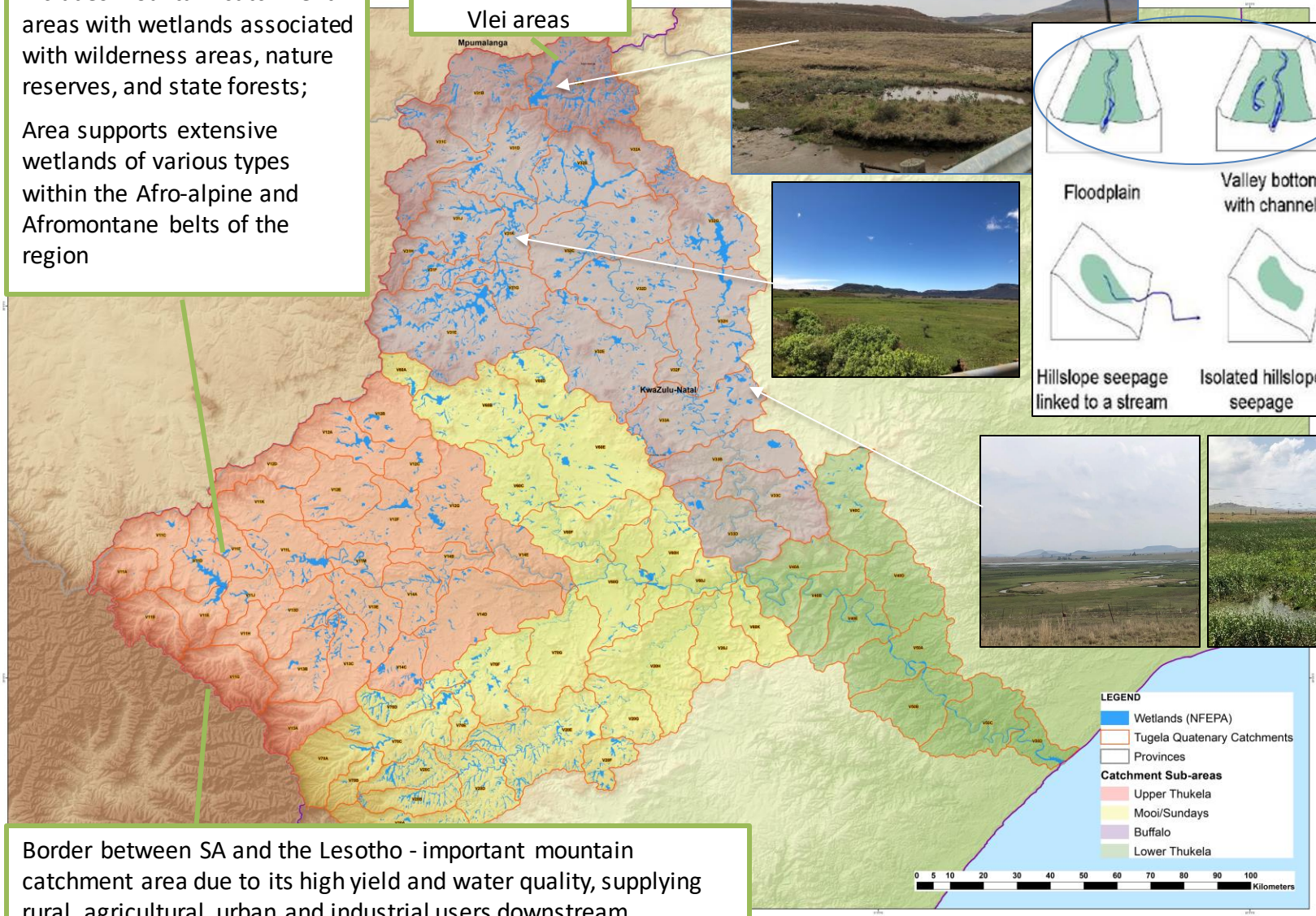
Part of the Natal Drakensberg Park Ramsar Site which includes mountain catchment areas with wetlands associated with wilderness areas, nature reserves, and state forests;

Area supports extensive wetlands of various types within the Afro-alpine and Afromontane belts of the region

Wakkerstroom Vlei areas

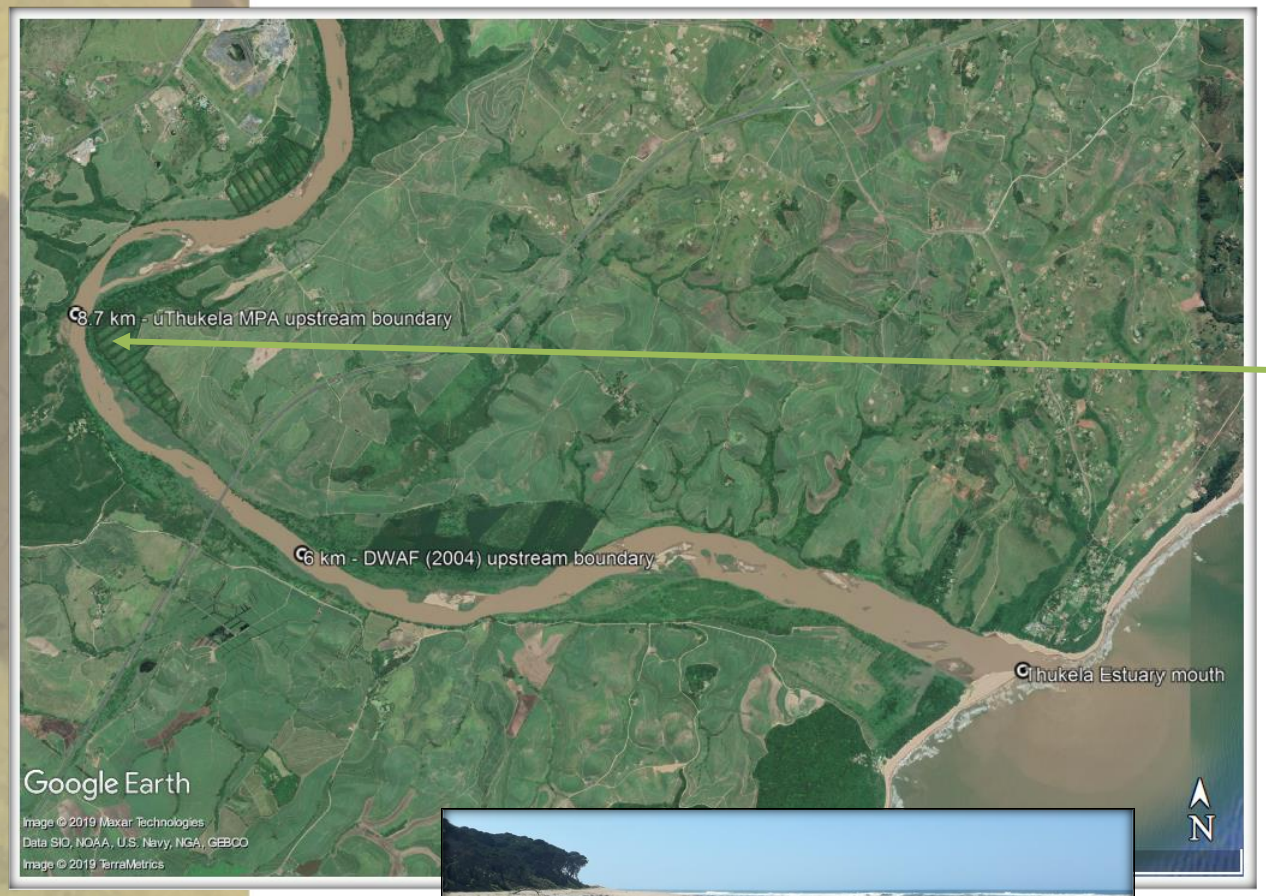




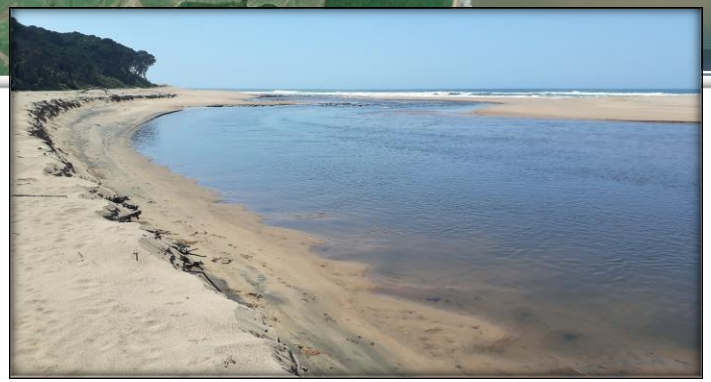


Border between SA and the Lesotho - important mountain catchment area due to its high yield and water quality, supplying rural, agricultural, urban and industrial users downstream

Thukela Estuary

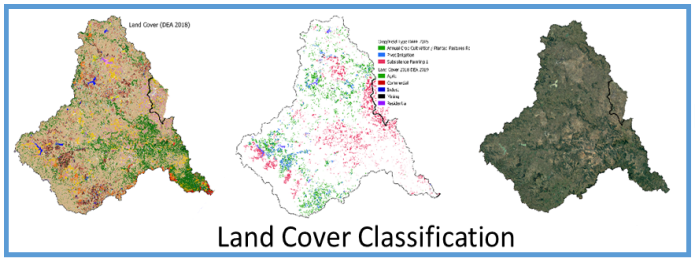


- The Thukela Estuary is located within the Pongola-Mtamvuna WMA ~ 100 km north of Durban in the KZN Province.
- Falls within the recently declared uThukela Marine Protected Area (MPA) that includes the adjacent marine and coastal zones outside the estuary mouth and up to a point ~ 8.5 km from the estuary mouth (Government Gazette No. 42478, 2019).
- Classified as an <u>open river mouth</u> and falls within the sub-tropical biogeographical coastal region of South Africa's east coast.
- Estimated to have the 2nd highest MAR (after the Orange/Gariep River) of 3754 x 10^6 m^3/a; 9.9% of South Africa's total runoff.



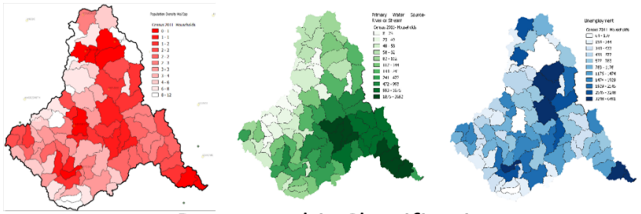
Mouth of the Thukela Estuary during low flow period with well-developed sand berm to the right-hand side of the image (photo taken 18-10-2019)

Classification of Socio-Economic Zone (SEZ)



Land Cover Classification

Municipal Profiling



Demographic Classification

Land Use

Economic Drivers

Social Characteristics

SEZ

Preliminary Socio-Economic Zone (SEZ)

Mixed Use Zone

Economic Drivers

- Mining/Industry
- Manufacturing
- Tourism
- Commercial and Subsistence Agriculture
- Irrigation schemes

Social Characteristics

- Higher Density
- Higher infrastructure development
- Higher access to services

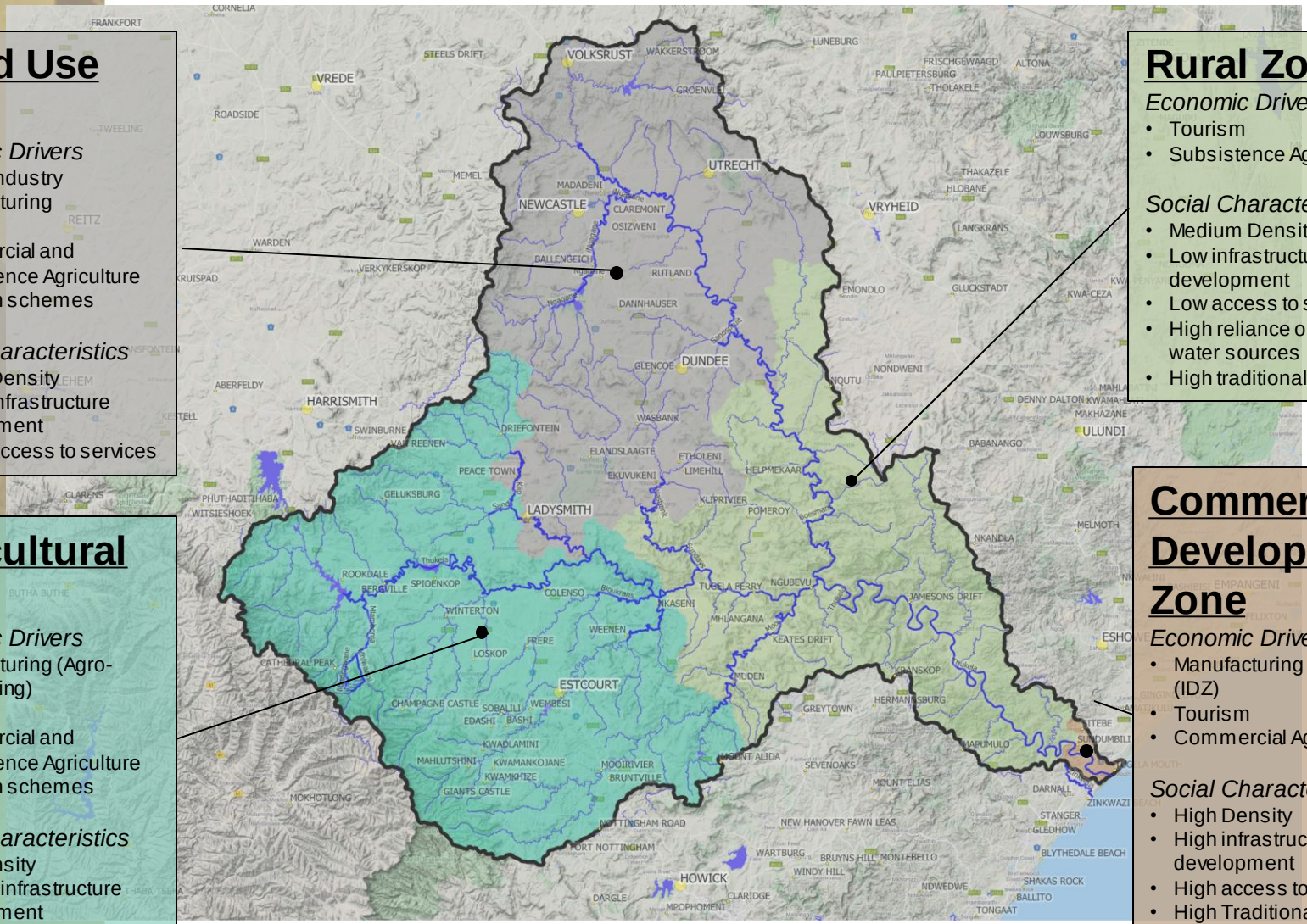
Agricultural Zone

Economic Drivers

- Manufacturing (Agro-processing)
- Tourism
- Commercial and Subsistence Agriculture
- Irrigation schemes

Social Characteristics

- Low Density
- Medium infrastructure development
- Mixed access to services



Rural Zone

Economic Drivers

- Tourism
- Subsistence Agriculture

Social Characteristics

- Medium Density
- Low infrastructure development
- Low access to services
- High reliance on natural water sources
- High traditional livelihoods

Commercial Development Zone

Economic Drivers

- Manufacturing / Industry (IDZ)
- Tourism
- Commercial Agriculture

Social Characteristics

- High Density
- High infrastructure development
- High access to services
- High Traditional Livelihoods

PROGRESS TO DATE

Task	Component	Timeframe	Deliverable
1	Project Inception	3 months	• Study Inception Report • Integrated Work Programme • Capacity Building programme • Stakeholder engagement plan
2	Information and data gathering	5 months	• Report on water resources information gap analysis and recommendations to address gaps • Inventory of water resource models and their applicability
3	Determination of Water Resource Classes	14 months	• Status Quo Report and delineation of RUs and IUAs – May 2020 • Socio-economic evaluation report • Ecological Water Requirements Report • Scenarios Report • Water resource classes gazette
4	RQO Determination Process	7 months	• Preliminary RU Report (Selection and Prioritisation) • RU prioritization, Sub-component prioritisation and indicator selection Report • Draft RQOs and Numerical limits; • Stakeholder consultation report on agreed RQOs • Gazette template of RQOs per resource unit • Plan for implementation/operationalisation of water resource classes and RQOs
5	Communication and liaison	27 months (over course of project)	• Stakeholder database; • Meeting documentation • Record of stakeholder comment/issues and responses;
6	Gazetting Process	5 months	• Gazetting template populated with recommended water resource classes per IUA and associated RQOs • Support with addressing of comments for water resource class and associated RQOs received over public comment period
7	Capacity Building (Skills Transfer)	24 months (over course of study)	• Detailed capacity building report
8	Study Management and Co-ordination	30 months (over course of project)	• Project management committee meeting and minutes • Progress reports during study execution record of decisions • Invoicing and progress reports
9	Project Closure	2 months	• Technical interim milestone reports • Progress reports on study execution and administration • Electronic information and data • Project close out report

INTEGRATED UNITS OF ANALYSIS

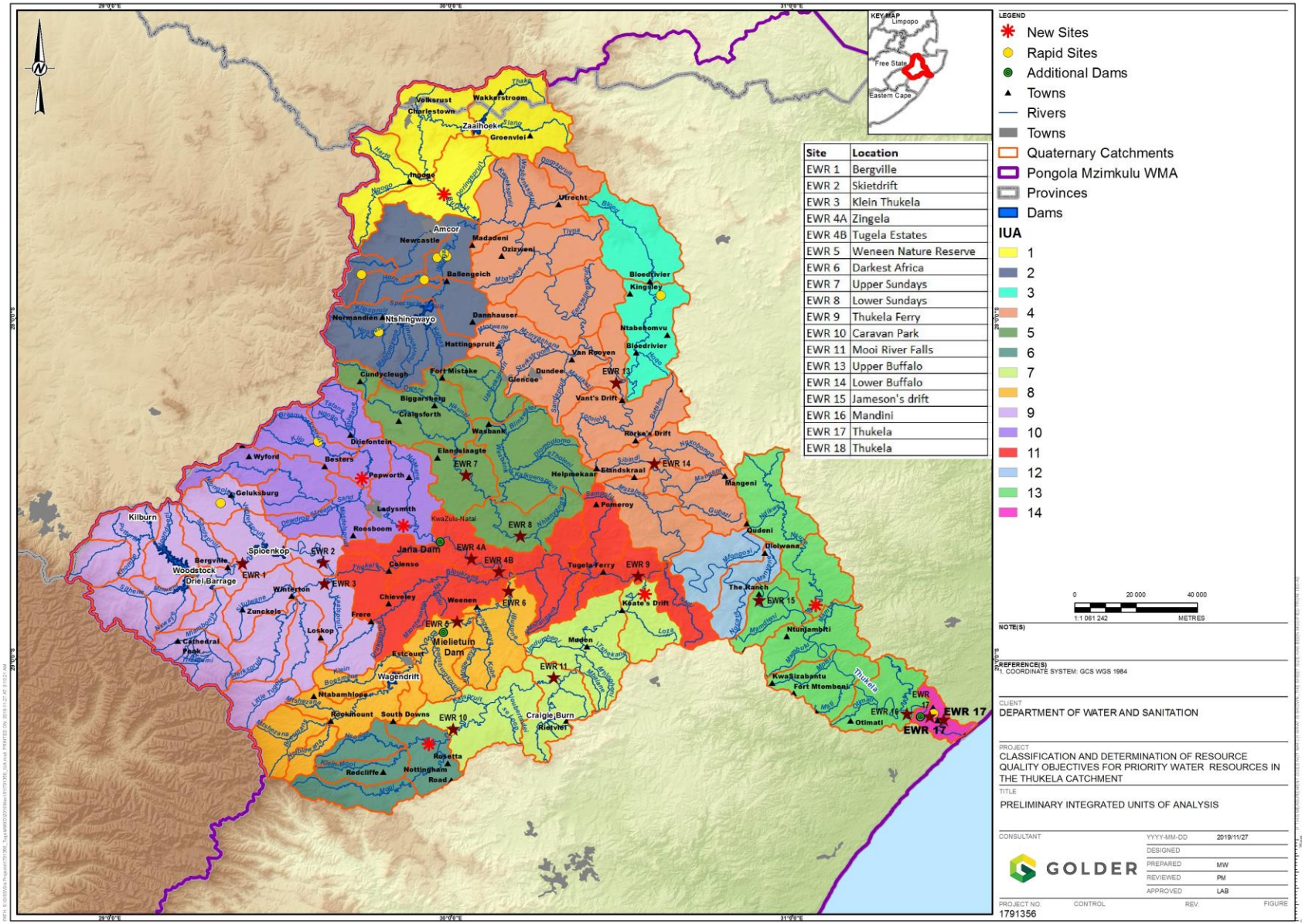
Integrated Units of Analysis (IUA)

- Broader scale spatial units that are defined as significant water resources
- Basic unit of assessment for the classification of water resources
- Incorporates socio-economic zones
- Includes ecological conditions at a sub-catchment scale

Criteria for delineation of IUAs

- Catchment areas (drainage regions and water resource systems)
- Similar land use characteristics/land based activities
- Ecological Water Requirement sites
- Ecological Importance and sensitivity (EIS) of the water resources
- Similar socio-economic zones (SEZs)
- Present status of water resources (flow and quality)

Preliminary IUAs



THANK YOU