



The uMkhomazi Water Project Phase 1:

- **Module 1: Technical Feasibility Study: Raw Water**
- **Module 2: Environmental Impact Assessment**
- **Module 3: Technical Feasibility Study: Potable Water**

**Project Steering Committee (PSC)
20 March 2013**



AECOM



Knight Piésold
CONSULTING

uMkhomazi catchment @ Impendle Dam site



uMkhomazi River



uMkhomazi catchment @ Smithfield Dam site



Agenda

1. Welcome
2. Attendance & apologies
3. Approval of agenda
4. Objective of this meeting
5. Minutes of previous meeting
6. Progress: Module 1
7. Progress: Module 2
8. Progress: Module 3
9. UW report back on developments
10. Key issues to date
11. Work programme
12. uMWP Web page
13. General
14. Next meeting
15. Closure



The uMkhomazi Water Project Phase 1: Module 1: Technical Feasibility Study: Raw Water (uMWP1-1/RW)

**Item 6: PRESENTATION AND DISCUSSION ON
PROGRESS OF THE UMWP-1: MODULE 1: TECHNICAL
FEASIBILITY STUDY: RAW WATER**



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#2 in Hazardous Waste



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An AECOM Company

1 November 2012



Project components

Module 1: Raw water

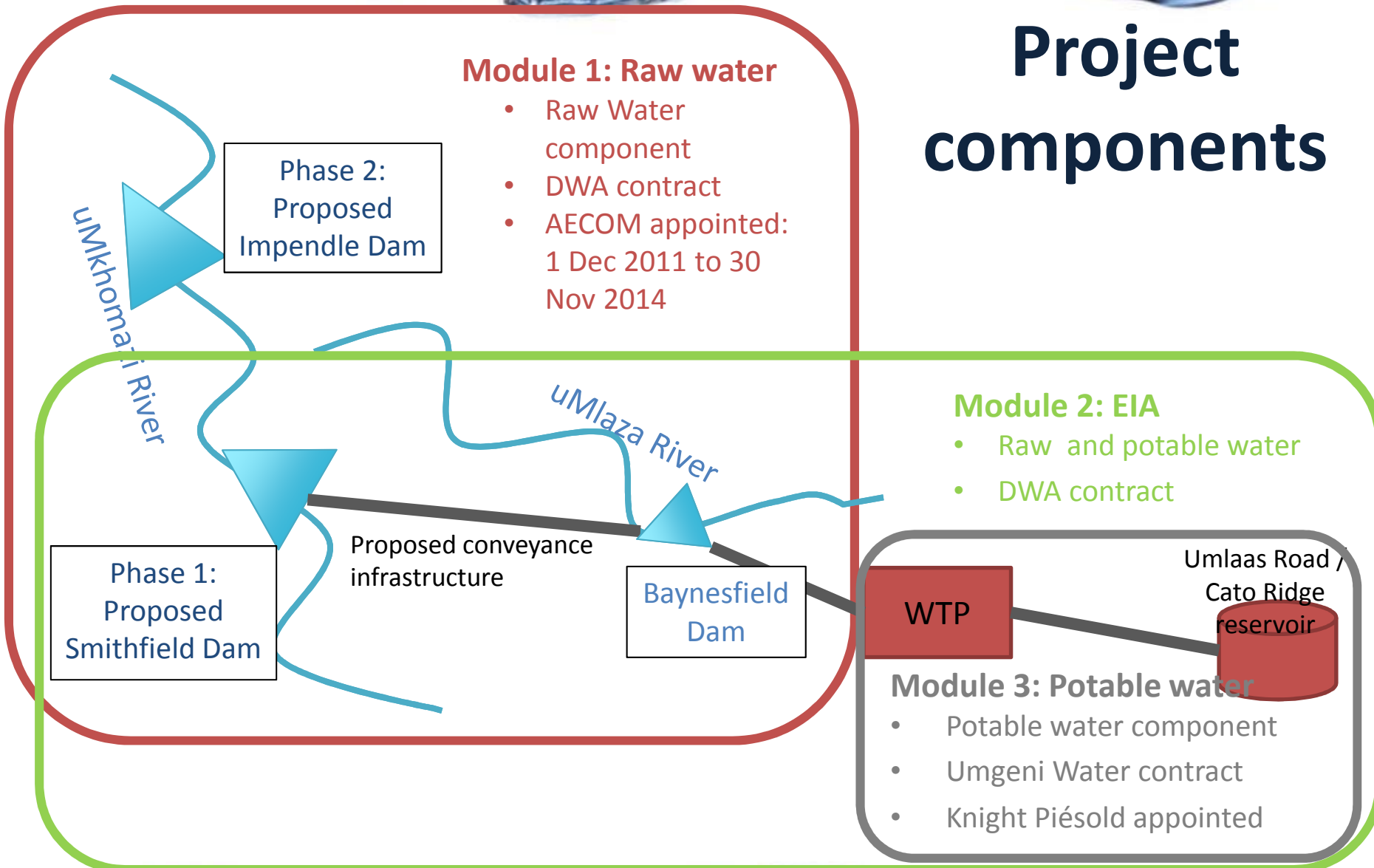
- Raw Water component
- DWA contract
- AECOM appointed: 1 Dec 2011 to 30 Nov 2014

Module 2: EIA

- Raw and potable water
- DWA contract

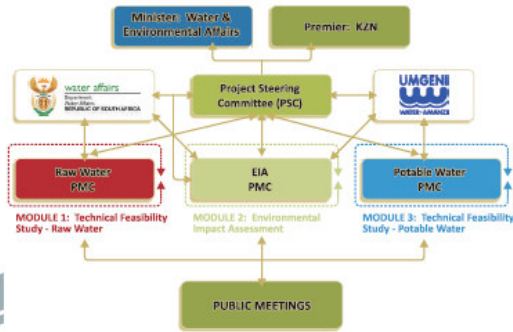
Module 3: Potable water

- Potable water component
- Umgeni Water contract
- Knight Piésold appointed



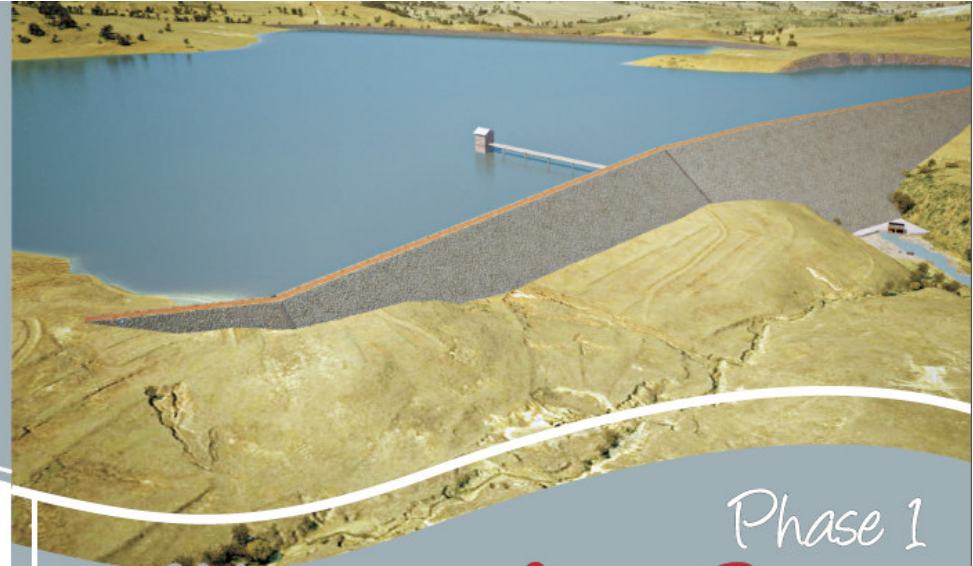
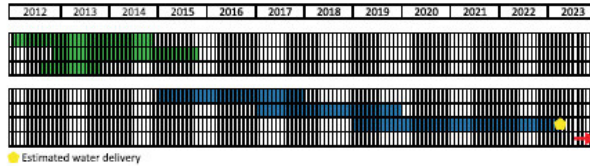
Governance

Because the project aims to augment water supply to the Mgeni system, an area that is managed by Umgeni Water with users mainly from eThekweni Municipality, this study requires participation from the three spheres of government, as well as from key stakeholders in the water sector. An extensive public participation process will be followed as part of the EIA (Module 2).

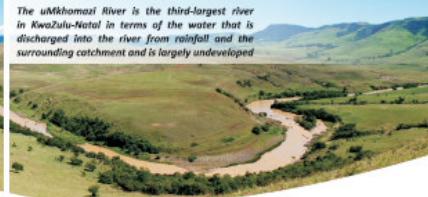


Project Programme

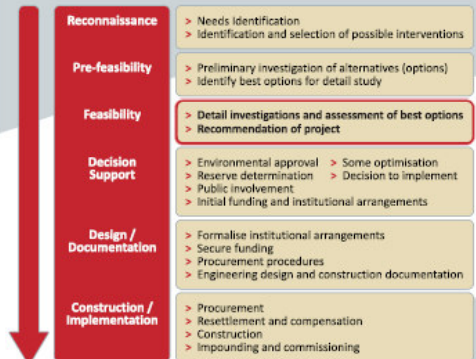
- Feasibility Studies
 - Module 1: Technical (Raw Water)
 - Module 2: Environmental Impact Assessment (EIA)
 - Module 3: Technical (Potable Water)
- Implementation
 - Decision Support Phase
 - Design / Documentation Phase
 - Phase 1: Construction : Smithfield Dam and Tunnel
 - Phase 2: Construction: Impendle Dam (> 9 years)



Phase 1 uMkhomazi Water Project



The uMkhomazi River is the third-largest river in KwaZulu-Natal in terms of the water that is discharged into the river from rainfall and the surrounding catchment and is largely undeveloped



The Department of Water Affairs (DWA) is exploring options to meet the long-term water requirements of the almost five million domestic and industrial water users in the Durban and Pietermaritzburg regions of KwaZulu-Natal. To this end, it is currently implementing a **Technical Feasibility Study** as part of the uMkhomazi Water Project (uMWP), which aims to explore the preferred options for supplying water to meet the long-term requirements of water users in eThekweni Municipality's area of jurisdiction.

The uMWP will harness and transfer water from the uMkhomazi River to the existing Mgeni System, thereby developing the uMkhomazi River, augmenting the Mgeni System's water supplies to downstream users and ensuring that the area's long-term water requirements can be met. The project area focuses on the uMkhomazi, uMlaza and uMgeni River catchments.

By developing the uMkhomazi River and using its supplies to augment current systems, the DWA's long-term vision for reliable, efficient and sustainable water supplies for the hub of KwaZulu-Natal is being realised. In a water-scarce country such as

South Africa, the DWA is taking careful steps to optimise our current water resources to ensure sustainable supplies to support our developing economy.

Once completely developed, phase 1 and 2 of the uMWP will be the largest water transfer scheme in South Africa, comparable to the Lesotho Highlands Water Project in terms of water volume and tunnel lengths and diameters.

Contact Details



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MODULE 3: Technical Feasibility Study - Potable Water

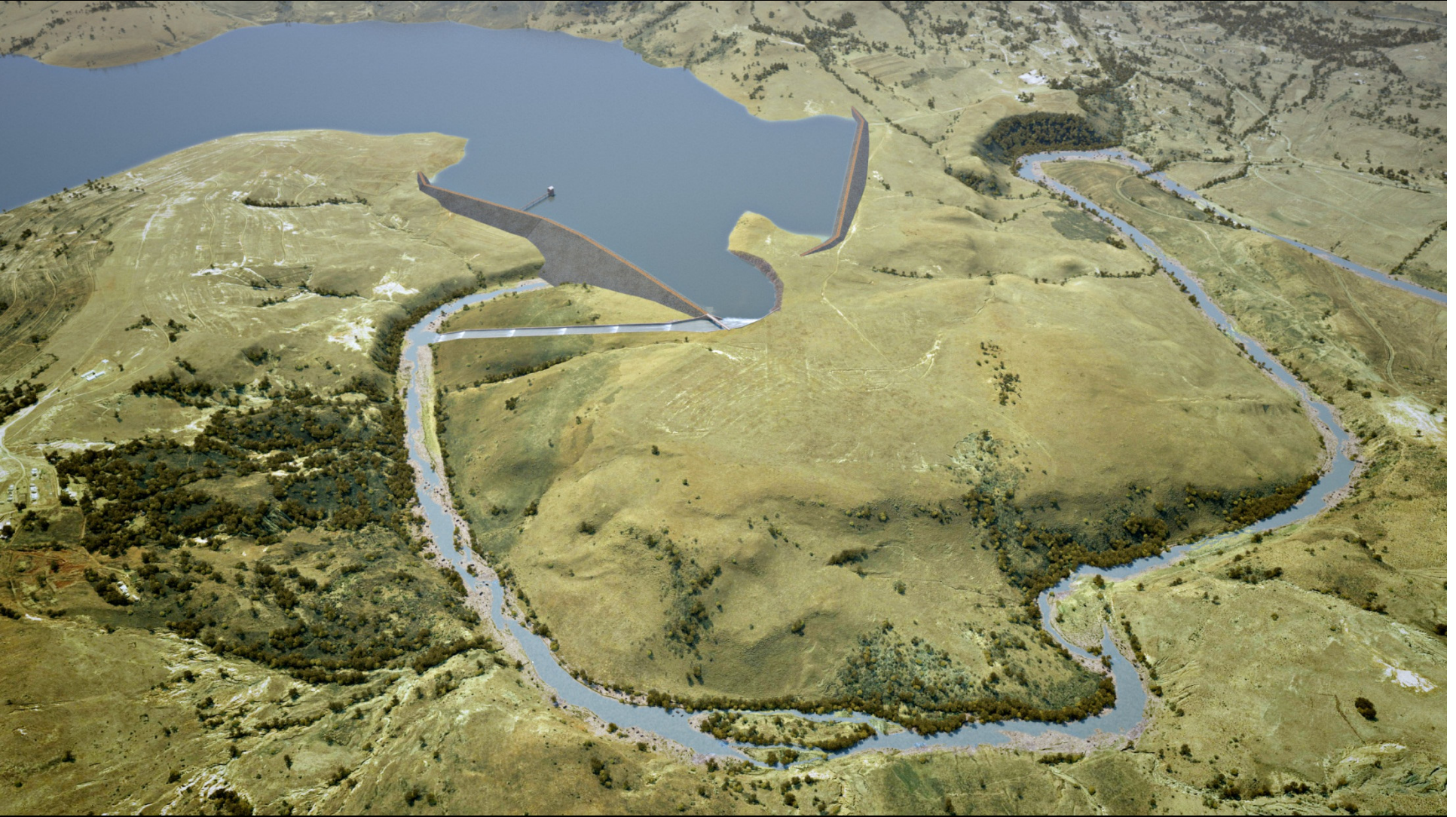
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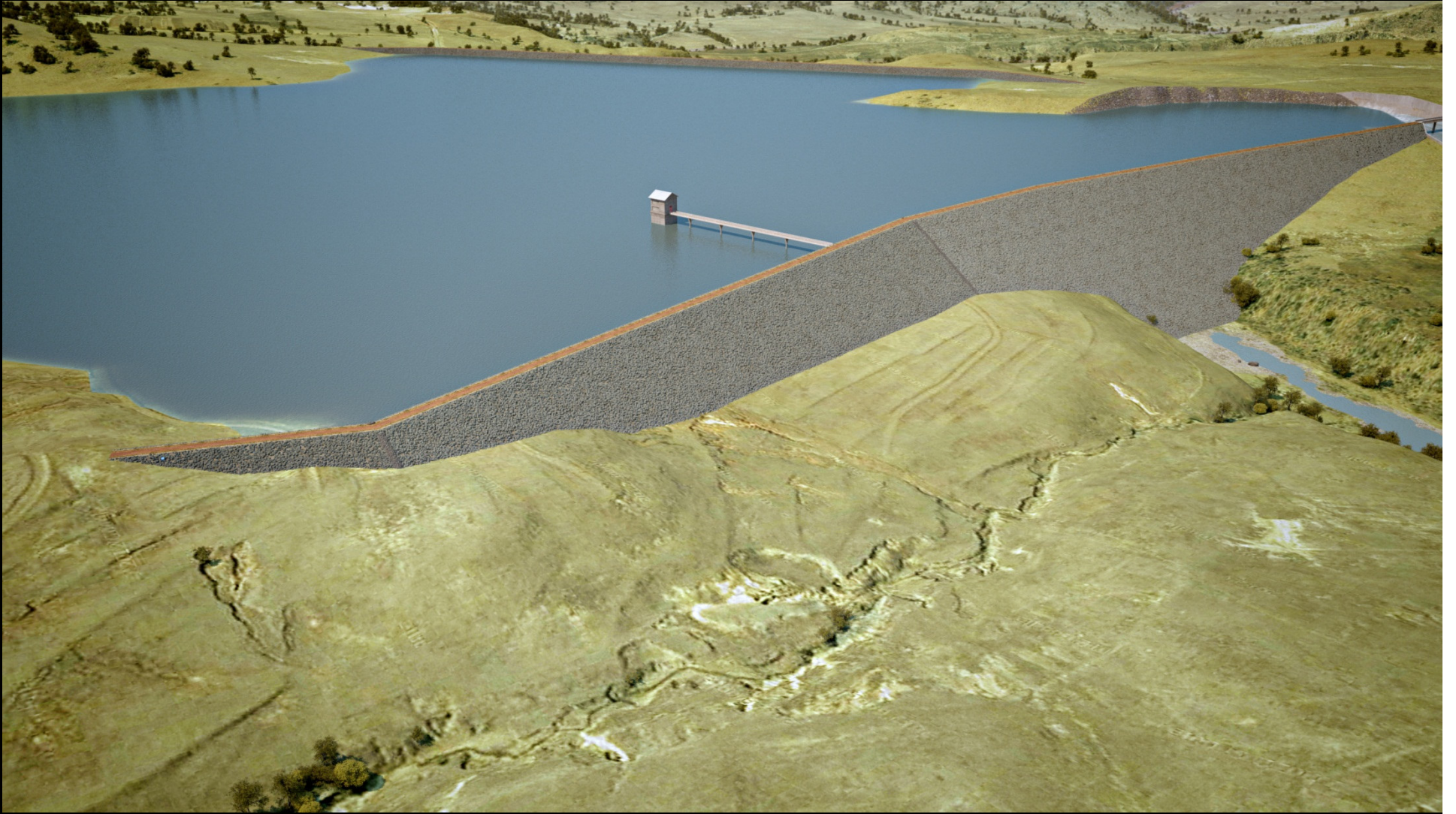
Draft artist impression (1)



Draft artist impression (2)



Draft artist impression (3)



Web page (& final reports)

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Home Project Overview EIA Process Stakeholder Engagement Documents and Reports Newsletter Contacts

Introduction to the uMkhomazi Water Project, Phase 1 (uMWP1)

The uMWP1 is a feasibility study for the transfer of water from the undeveloped uMkhomazi River to the existing Mgeni system to further augment water supply to the Durban and Pietermaritzburg areas. It is a multi-disciplinary project, undertaken conjunctively by the Department of Water Affairs (DWA) and Umgeni Water (UW).

Phase 1 of the uMkhomazi Water Project (uMWP1) comprises three modules: a raw water module developing the resource and the transfer infrastructure (module 1), a treated water module (module 3) and an environmental impact assessment module (module 2).

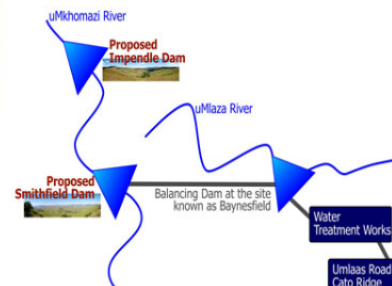
The modules have been and will be assigned to professional services providers to address the following aspects related to a major water development:

- Water resources: uMkhomazi, uMlaza and uMgeni River catchments;

Announcements
In December 2011, the DWA appointed BKS (Pty) Ltd in association with three sub-consultants Africa Geo-Environmental Services, MM&A and Urban-Econ to undertake

<http://www.dwa.gov.za/Projects/uMkhomazi/default.aspx>

If the scheme is deemed feasible, in relation to other options, it may be implemented by 2025.
Once complete, the uMkhomazi water transfer scheme will be the largest water transfer scheme in South Africa, comparable to the Lesotho Highlands Water Project in terms of water volume and tunnel lengths and diameters.



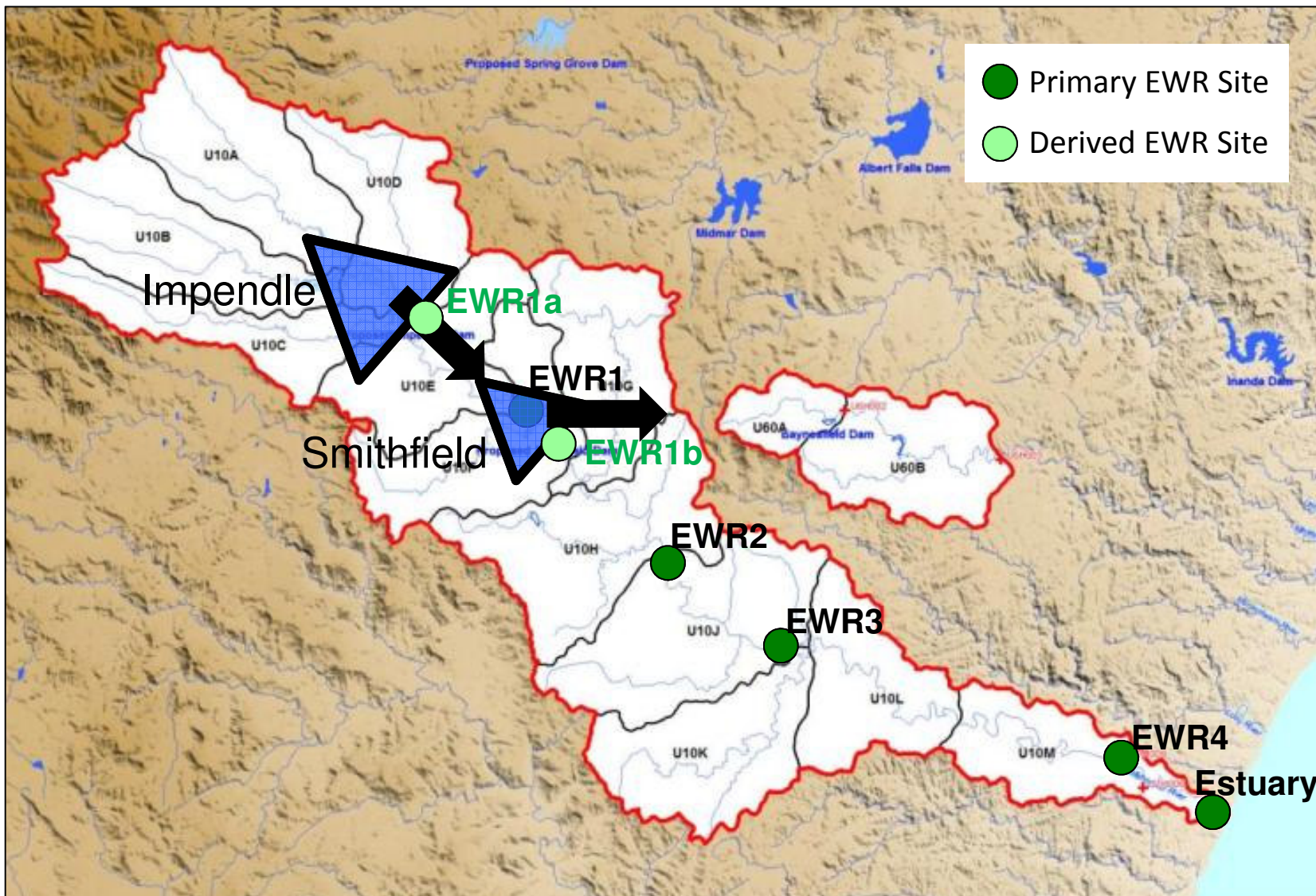
- Task 4.1: Groundwater resources of the uMkhomazi catchment and interaction with surface water
- Task 4.12 & 5.15: Interim investigation for hydropower potential at Impendle Dam and Smithfield Dam transfer system
- Task 5.1: Optimisation of conveyance system
- Task 5.2: Dam position
- Task 5.12: Sediment yield
- Task 8(a): Baseline socio-economic assessment



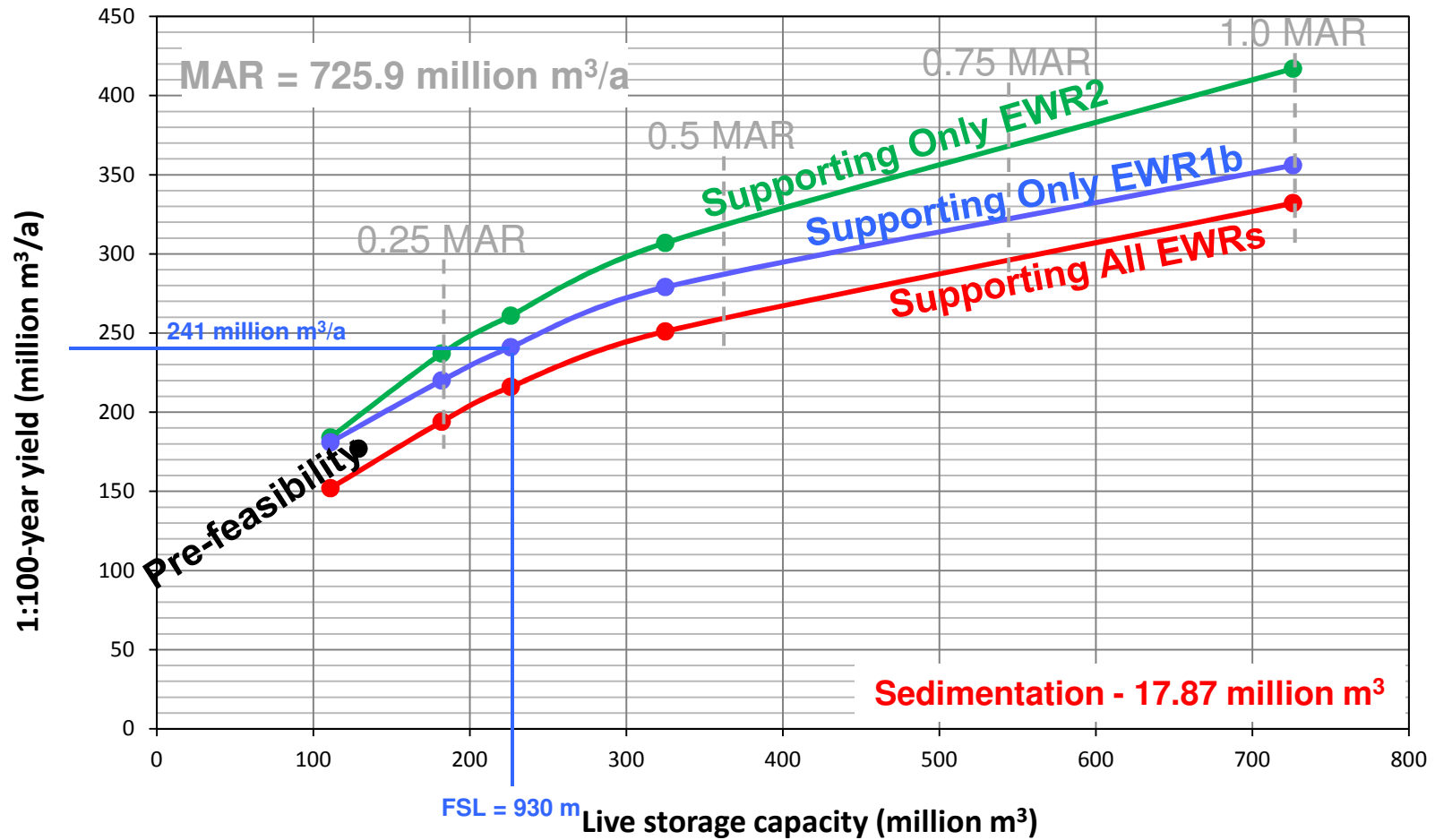
Water resources

(overview of yield)



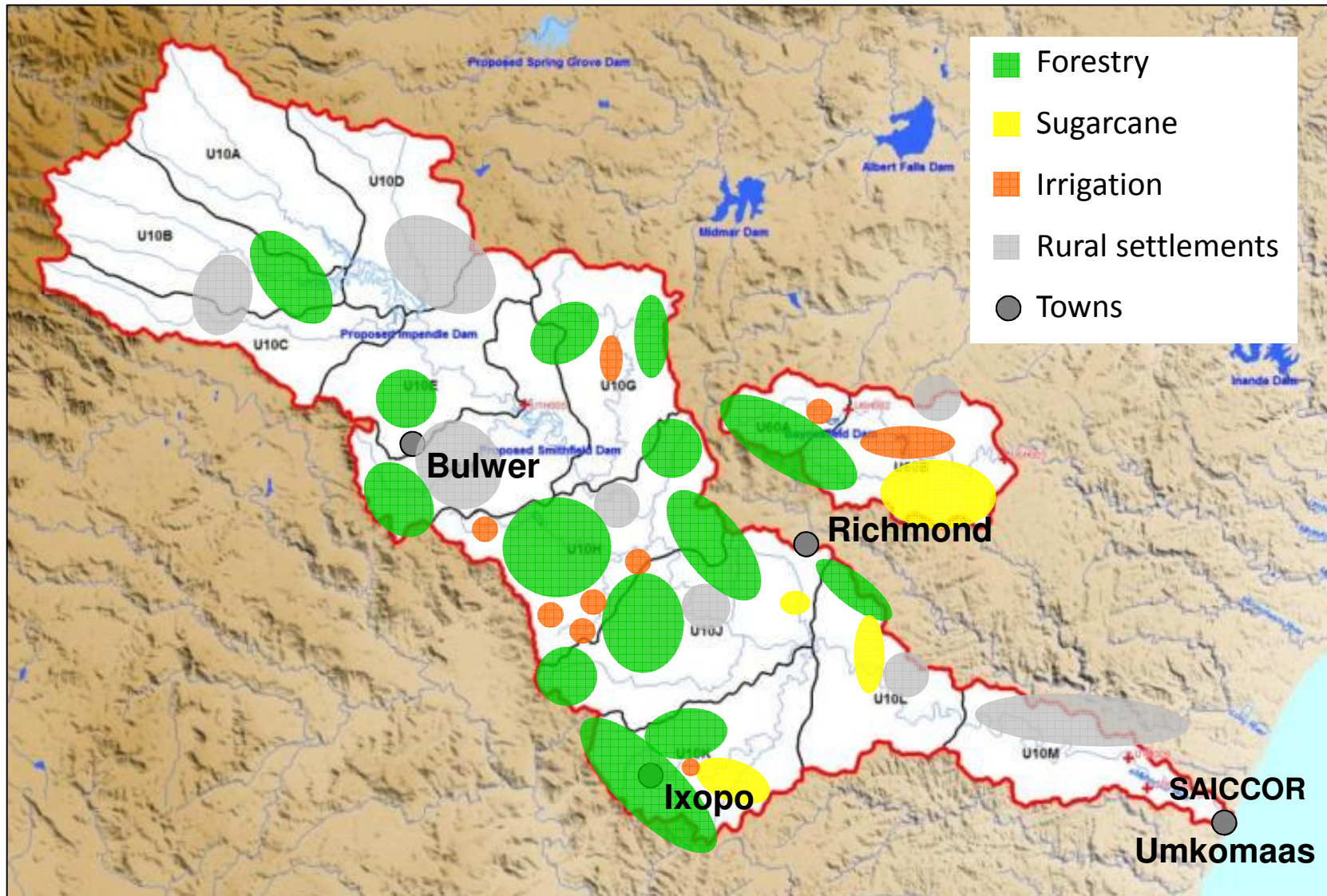


Smithfield Dam yield results

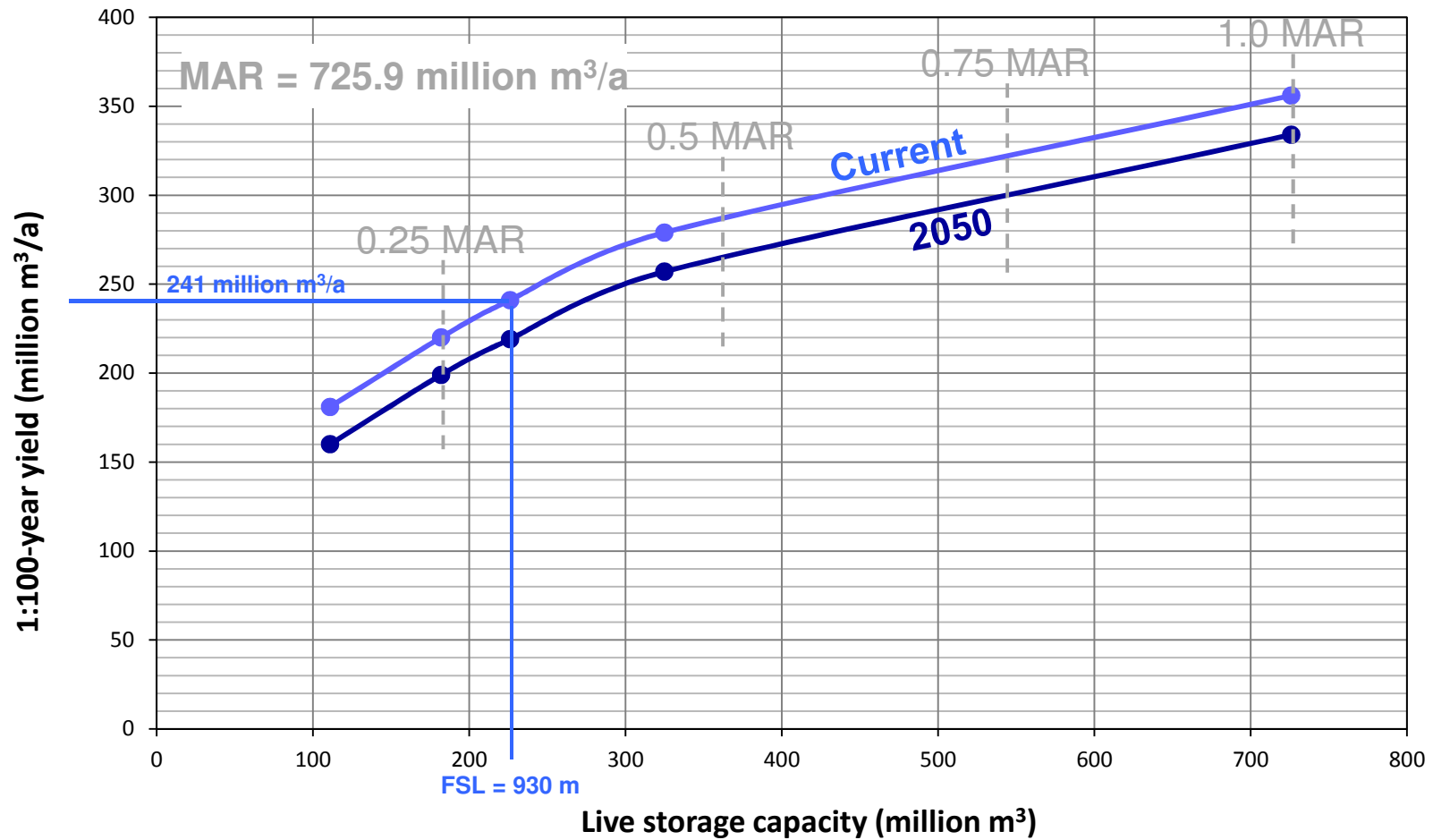


(1) EWRs based on *Pre-feasibility* (IWR, 1998)

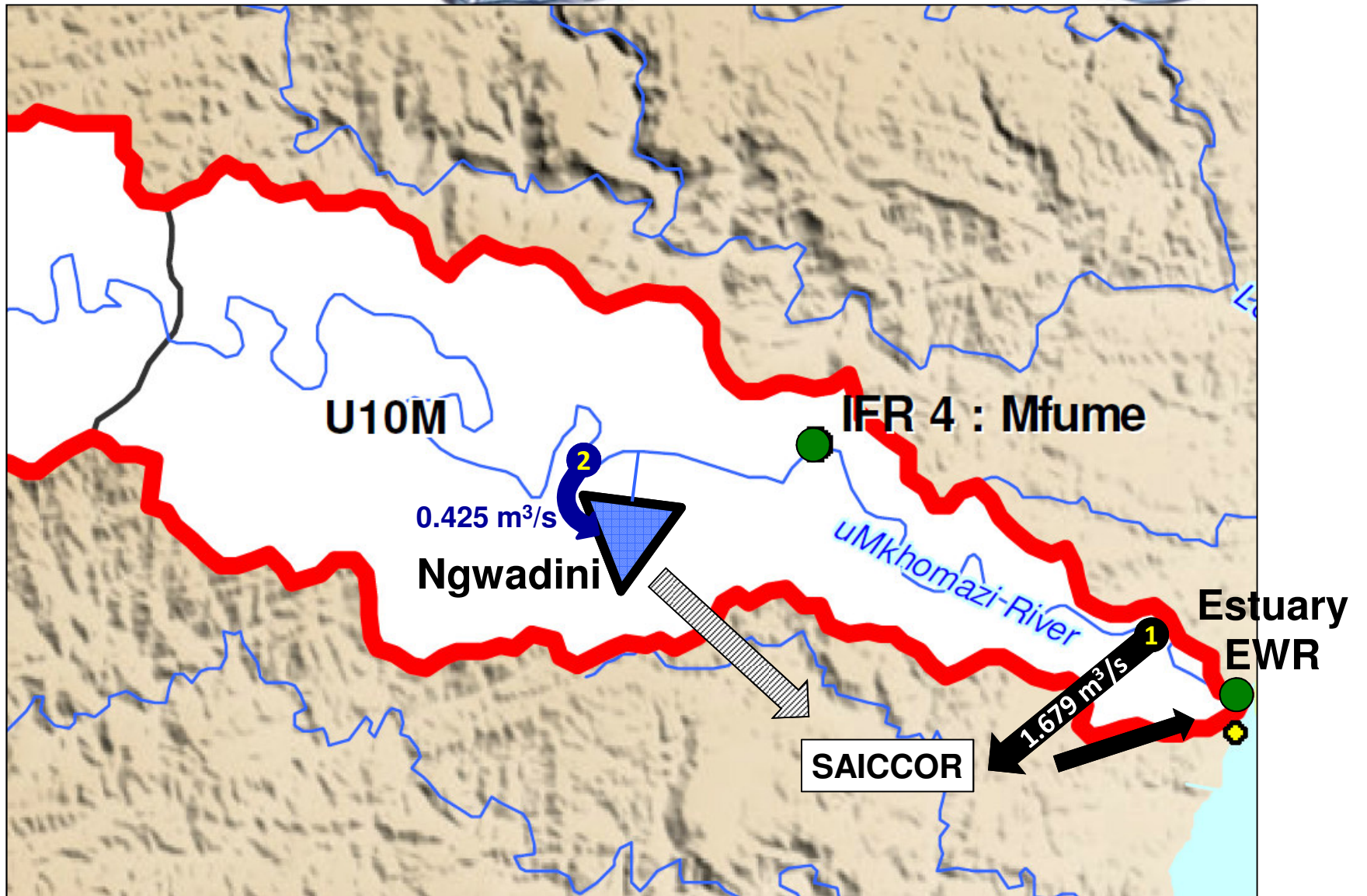
Land use



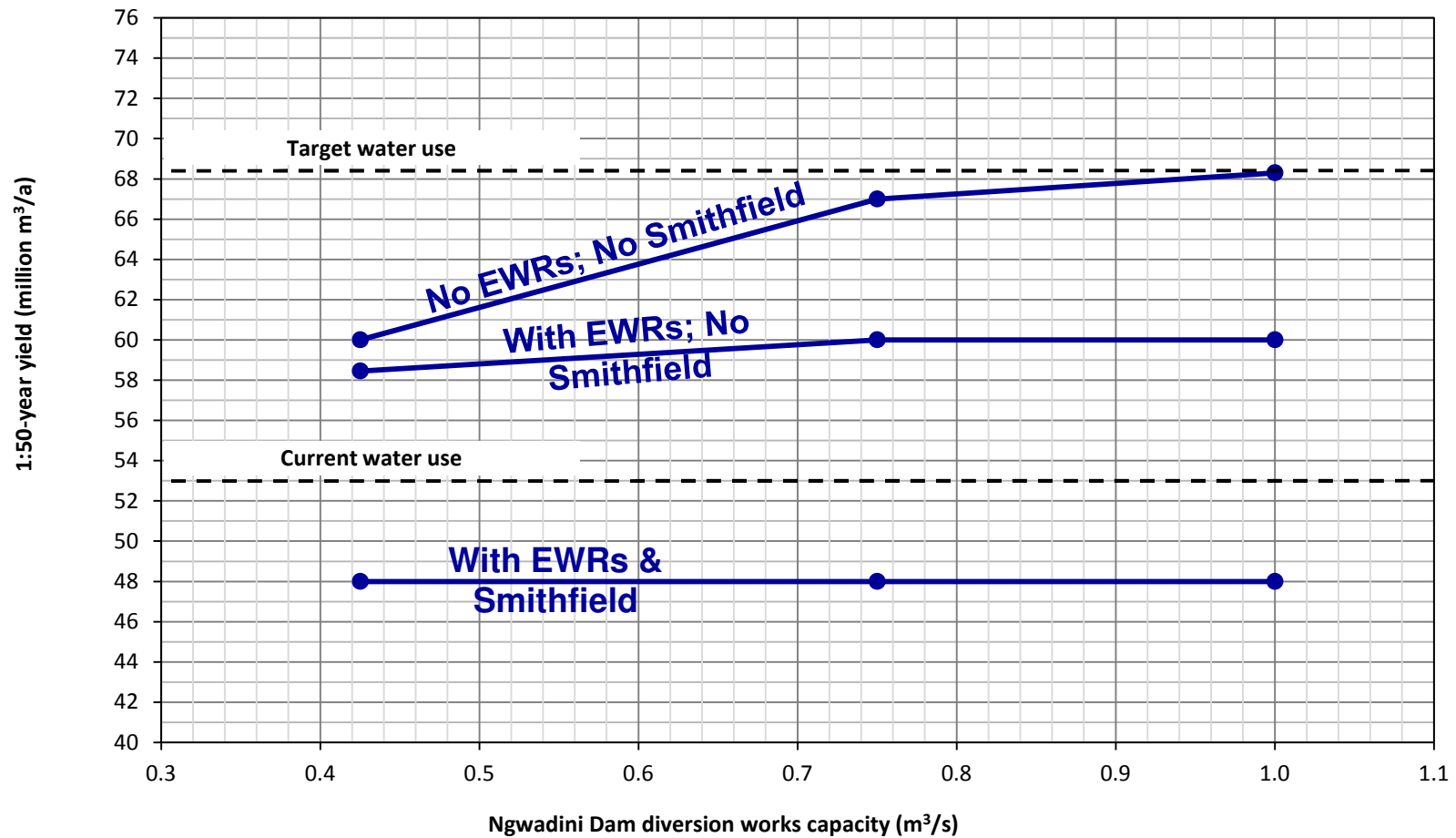
Smithfield Dam yield results



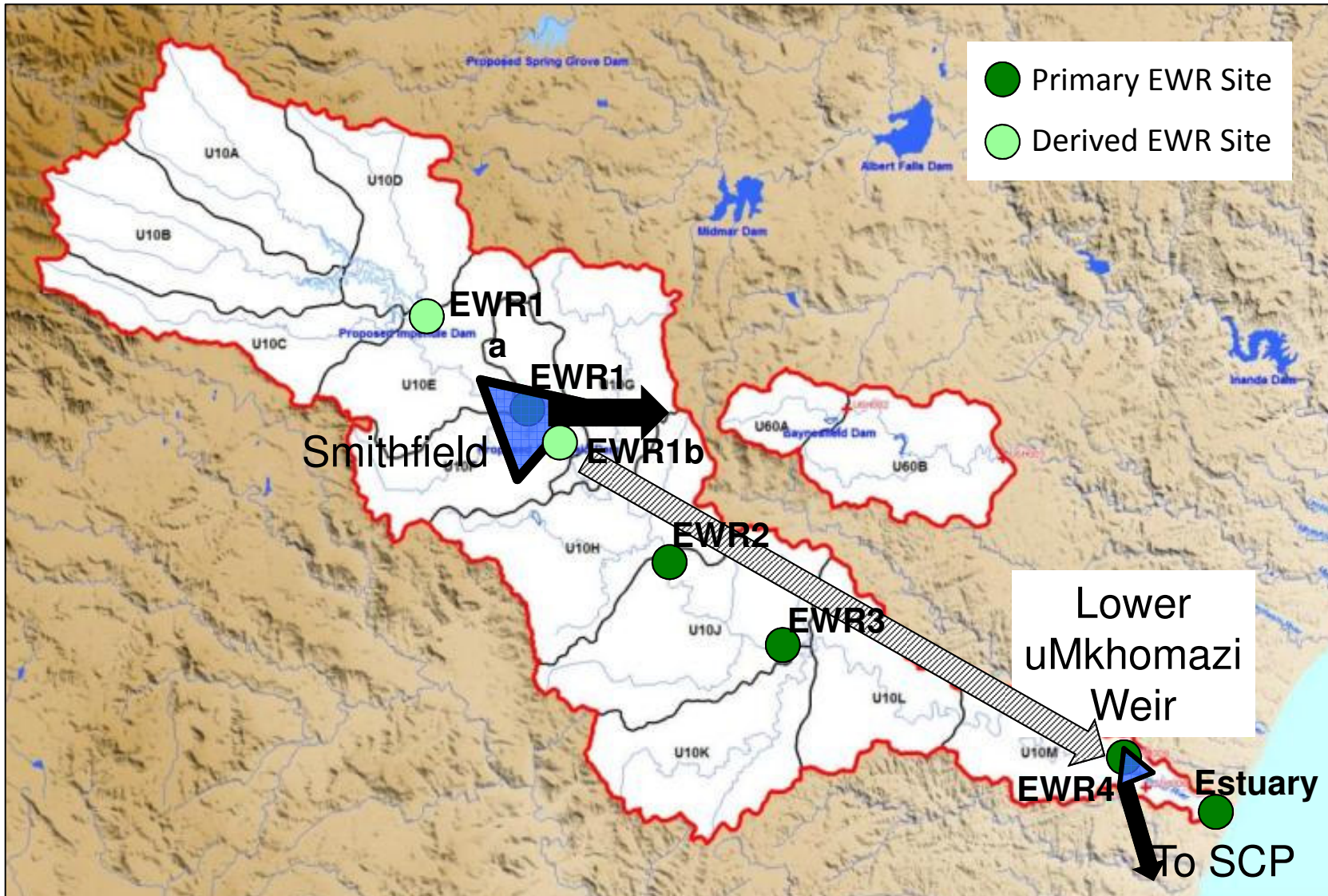
(1) EWRs based on *Pre-feasibility* (IWR, 1998)



SAICCOR/Ngwadini Scheme yield results

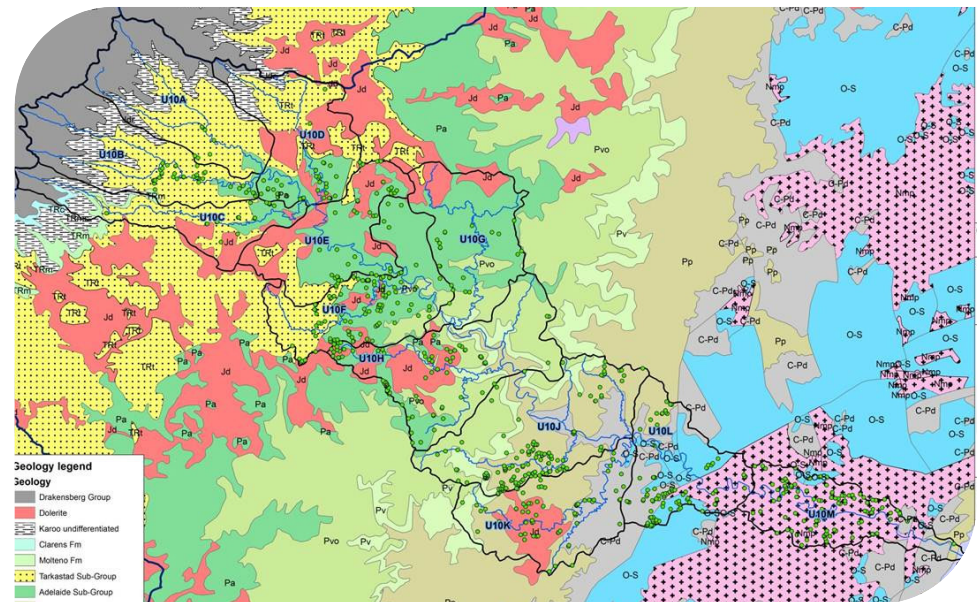


[1] Combined yield of SAICCOR diversion and Ngwadini Dam
[2] EWRs based on *Pre-feasibility Study* (IWR, 1998)





Groundwater

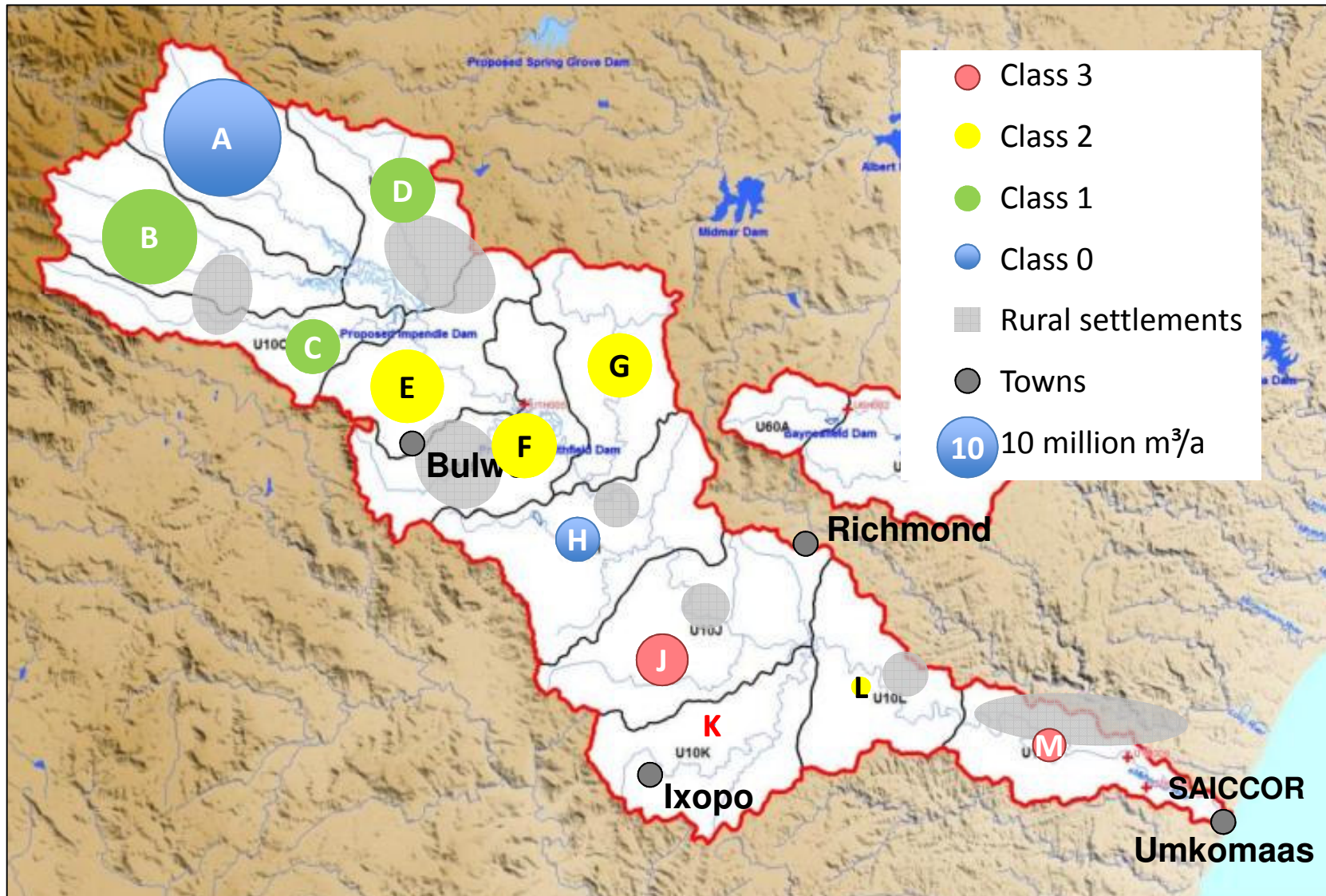


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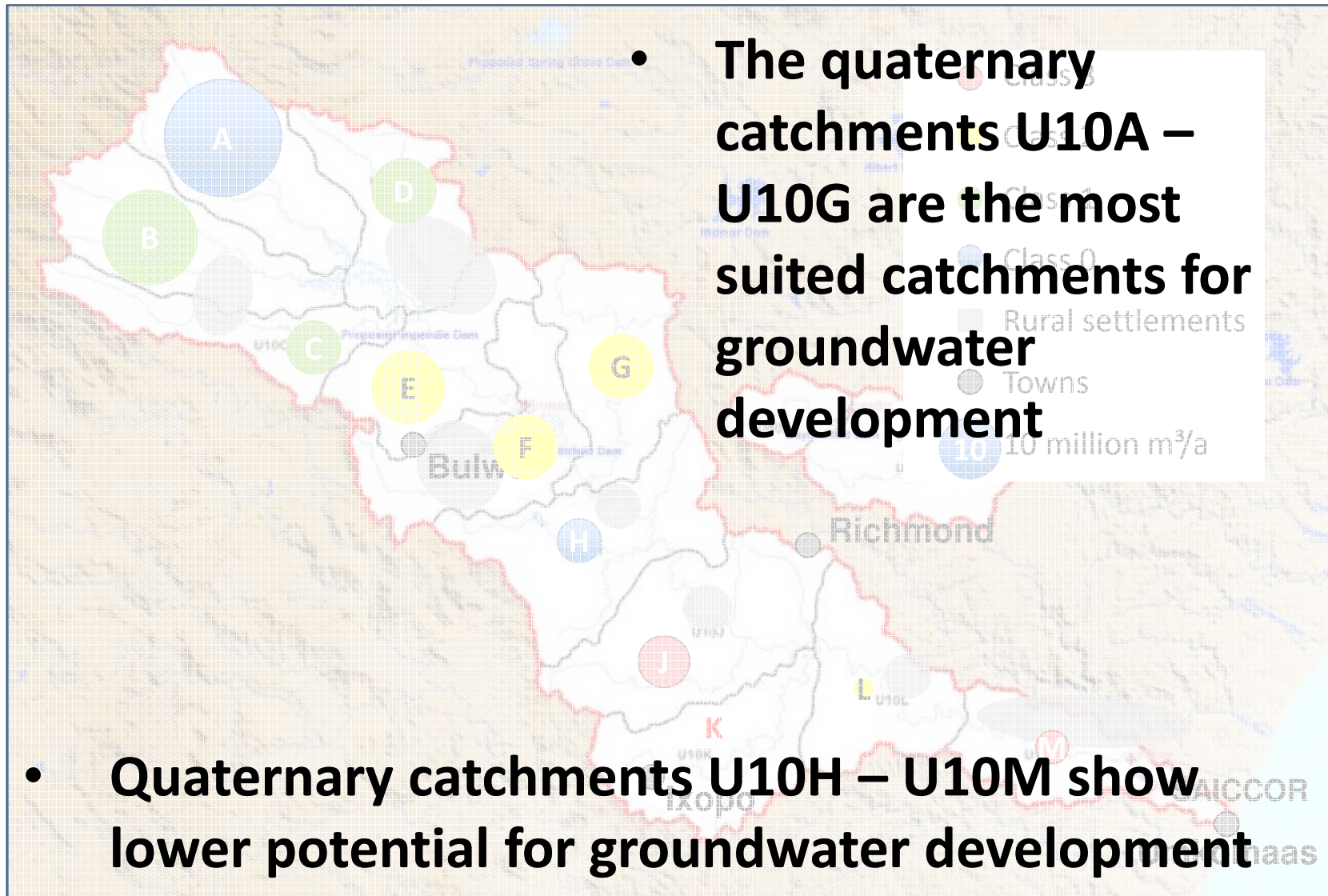
Groundwater

- Objectives:
 - Determine the groundwater resources of the uMkhomazi catchment
 - Groundwater interaction with surface water
- Methodology
 - GYMR flow balance model – to assess groundwater volumes available
 - Compared with
 - Average Groundwater Exploitation Potential (AGEP)
 - Utilisable Groundwater Exploitation Potential (UGEP)

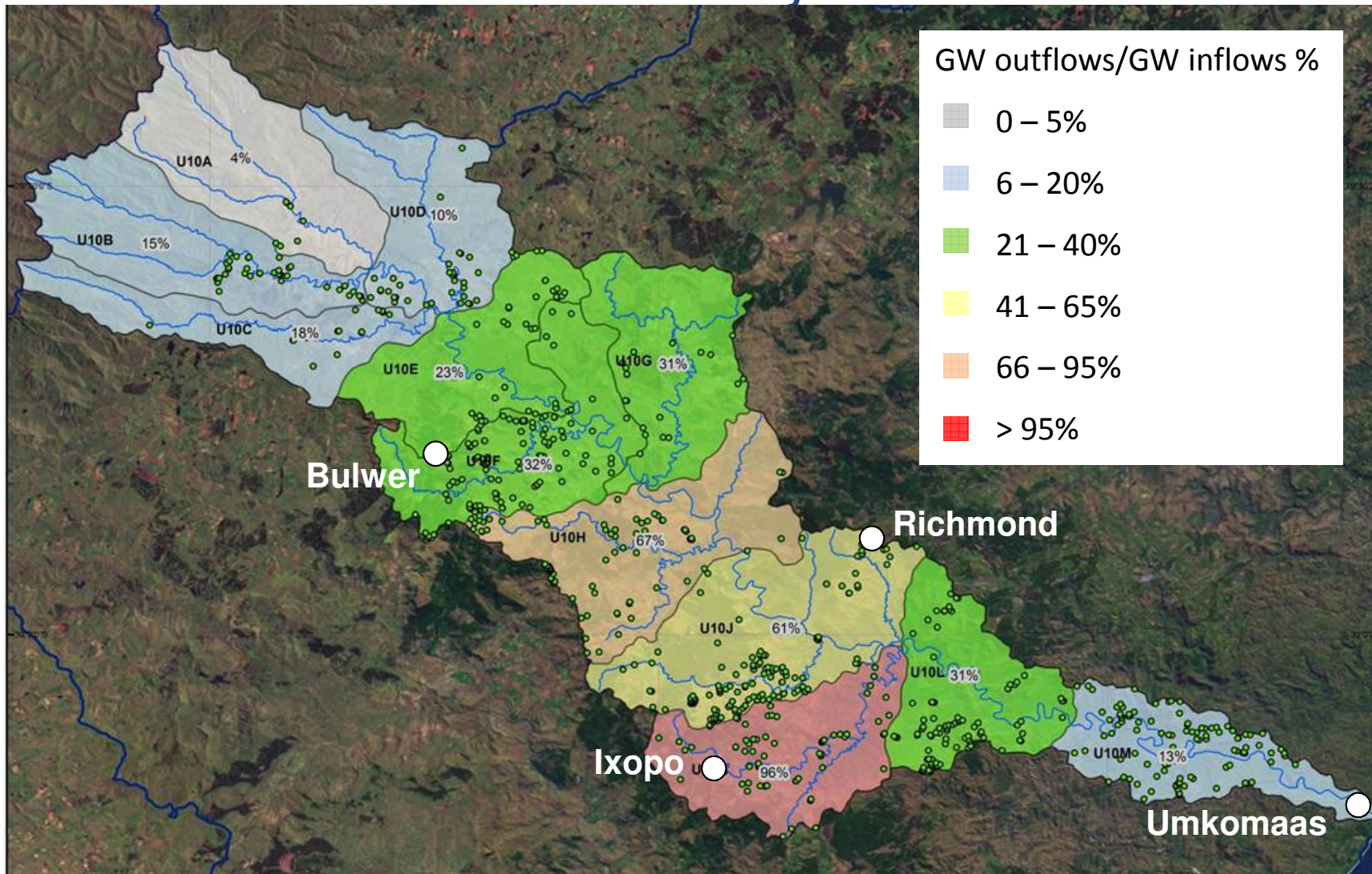
Utilisable groundwater per catchment



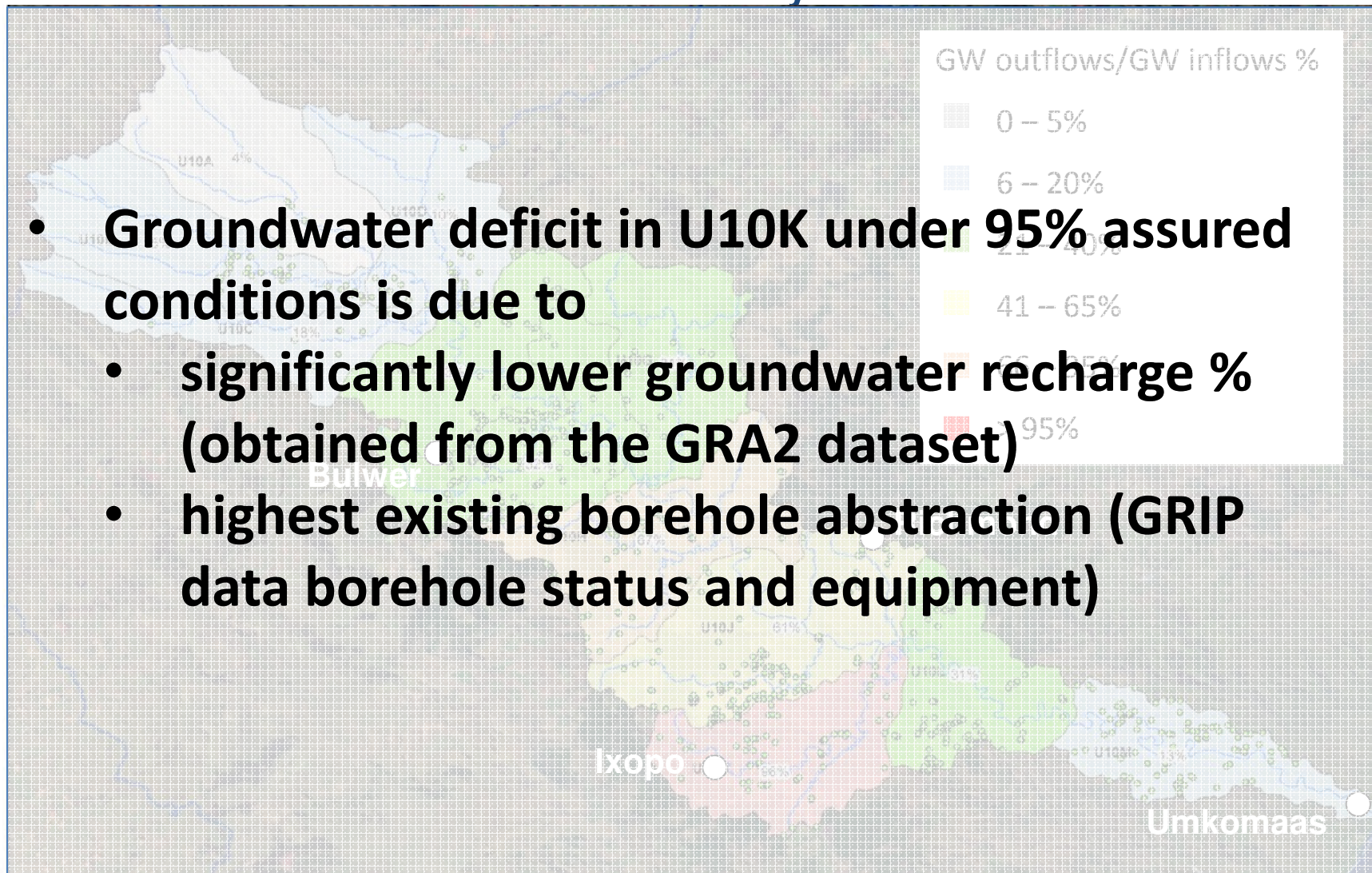
Utilisable groundwater per catchment



GYMR steady-state results: GW outflow divided by GW inflow



GYMR steady-state results: GW outflow divided by GW inflow



- **Groundwater deficit in U10K under 95% assured conditions is due to**
 - **significantly lower groundwater recharge % (obtained from the GRA2 dataset)**
 - **highest existing borehole abstraction (GRIP data borehole status and equipment)**

RECOMMENDATIONS

- Spring protection measures to be implemented in the upper catchments due to the high number of spring occurrences there
 - These springs already supply water for domestic use
 - Spring protection measures to ensure sustainability & quality
- If large scale groundwater development is considered for catchments U10H, U10J, U10K, U10L:
 - A thorough evaluation of the groundwater inflow and outflow components for these areas should be performed

RECOMMENDATIONS

- Groundwater investigations to add more data on water quality
- Spring outflows are expected to be higher in the upper quaternary catchments (U10A – U10G) associated with the Karoo Supergroup layering of argillaceous and arenaceous rocks.
 - Springs surveyed during the GRIP hydrocensus are limited and not perceived as representative of the actual number of springs in the catchments
 - Recommended that a satellite imagery spring count be done and confirmed



Engineering investigation



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Status at last PSC Meeting

- Reports 5.1 and 5.2 were completed concluding that a pressure tunnel and an ECR Smithfield Dam at site B must be investigated further.

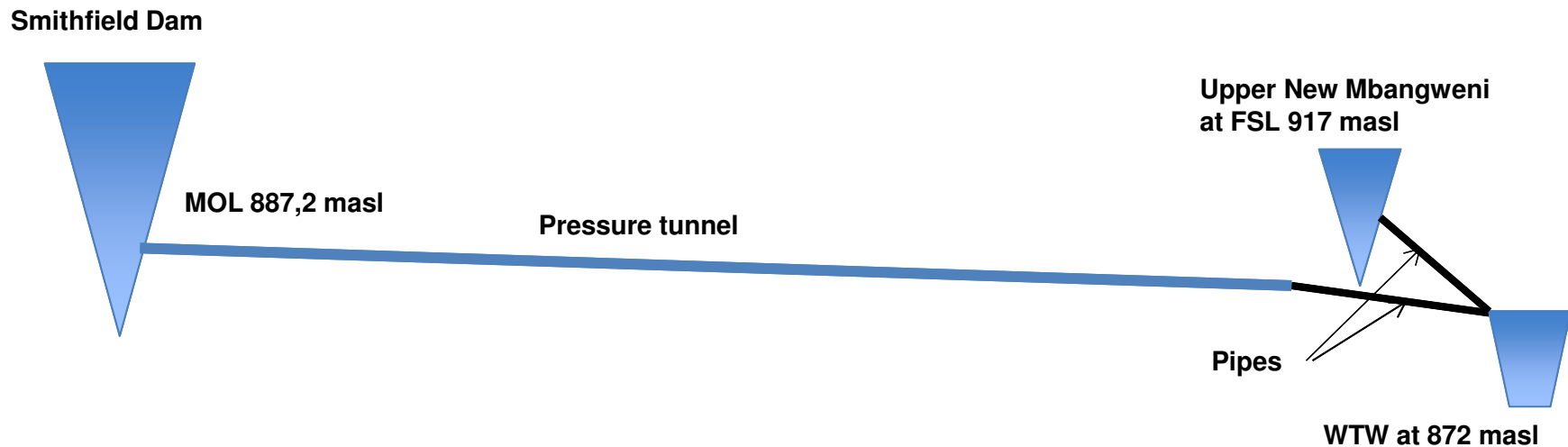


Conveyance Options

- Option 1: Gravitation: Balancing dam at Baynesfield
- Option 2: Gravitation: No Balancing Dam ✓
- Option 3: Gravitation: Balancing Dam and WTW at Umlaas Road
- Option 4: Lower Balancing dam and Pump Station at Baynesfield
- Option 5: Upper New Mbangweni Dam ✓

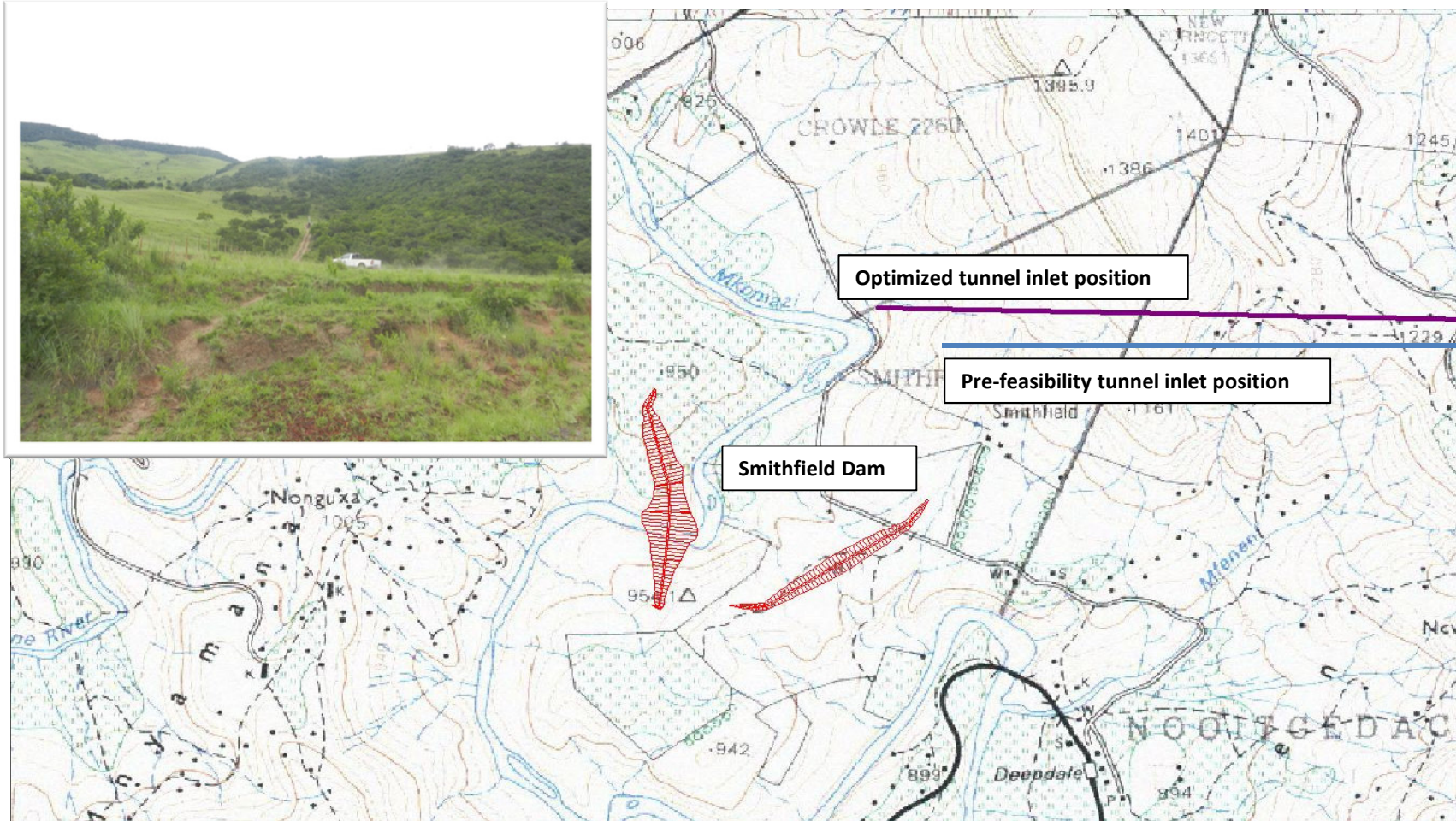
Reports 5.1 and 5.2

Scheme vertical alignment

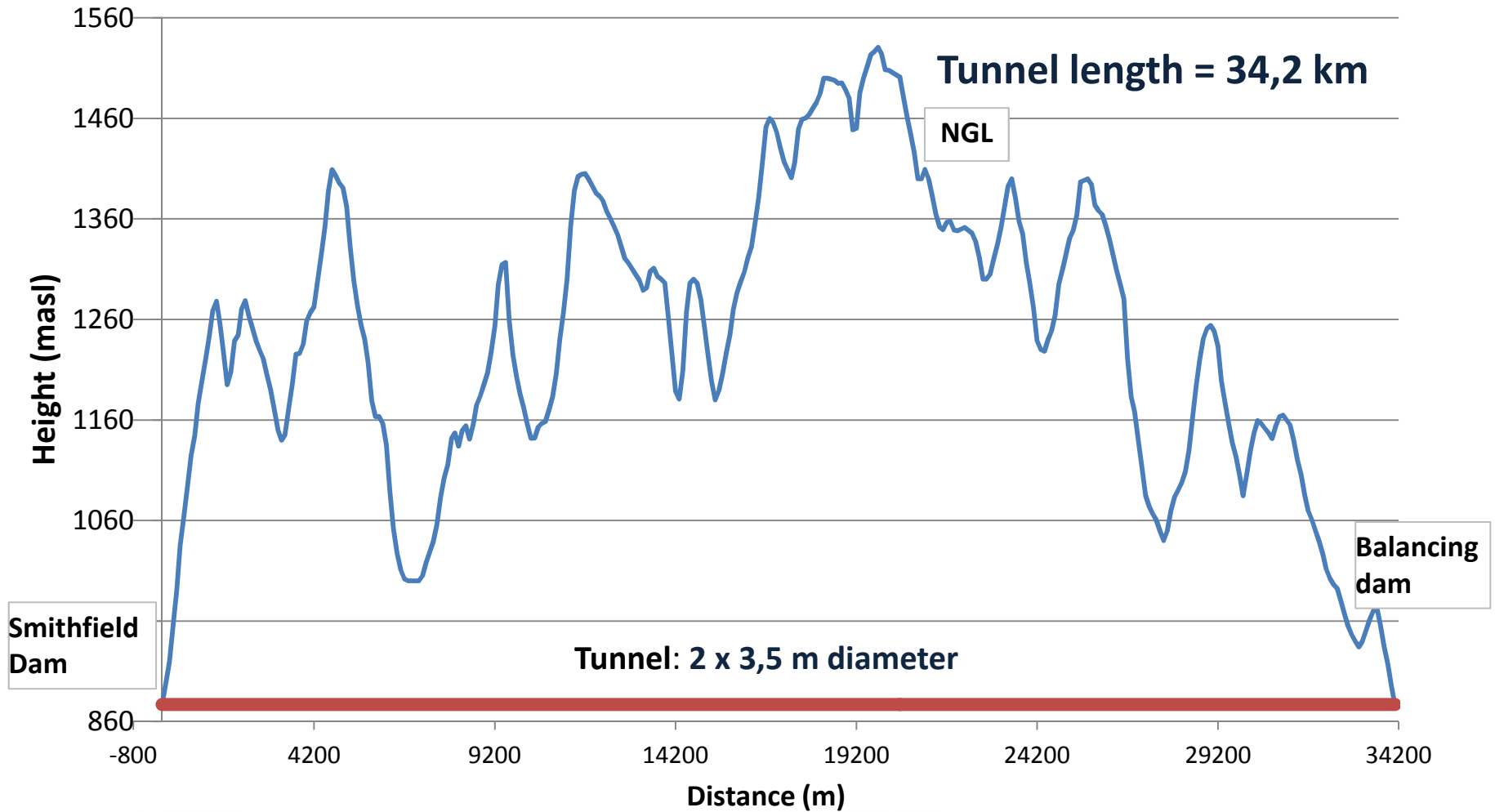


Optimization of Tunnel Route and Pipeline Route to WTW

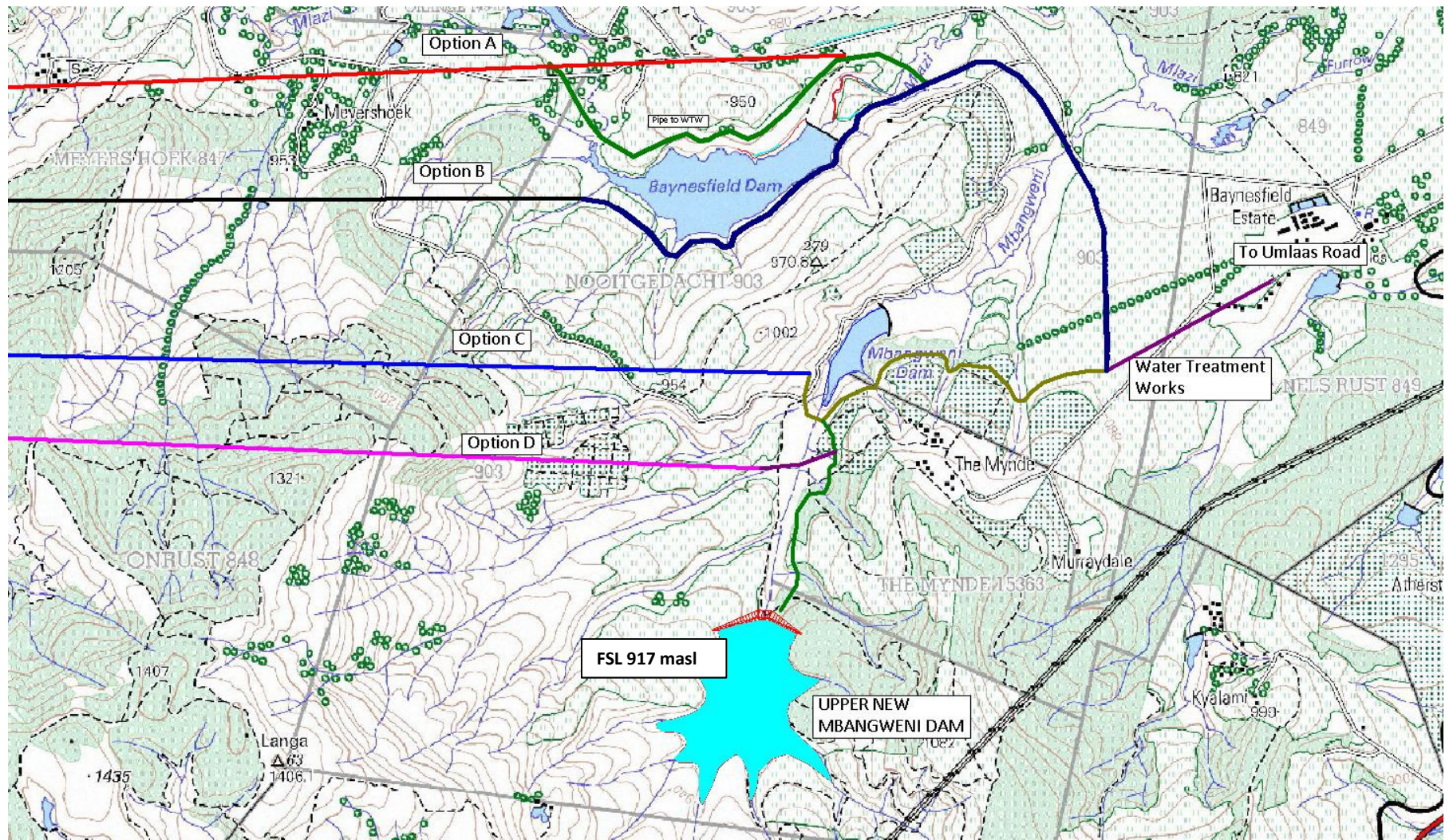
Tunnel inlet



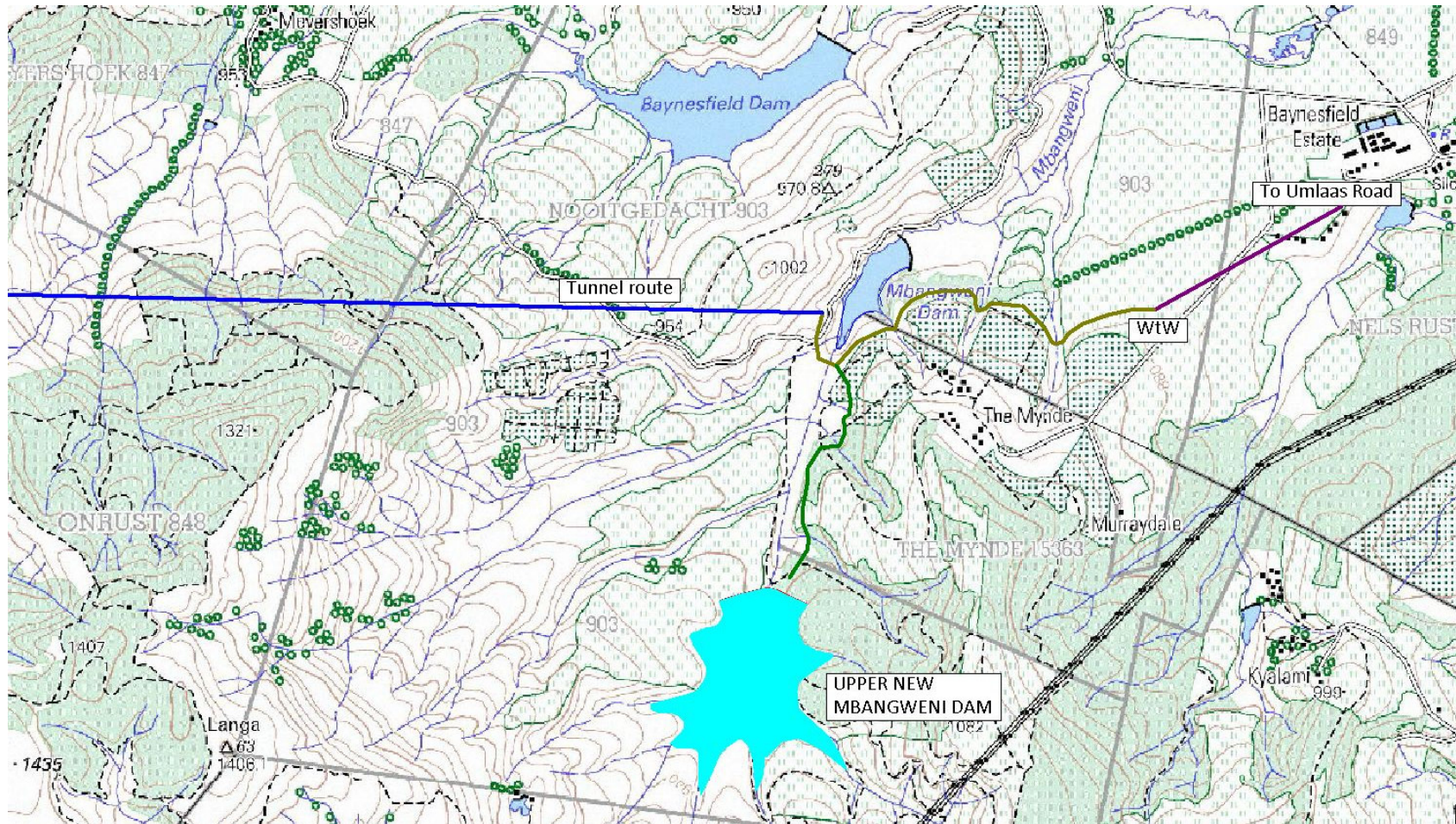
Tunnel optimisation



Tunnel horizontal alignment



Preferred alignment



Optimization of Smithfield Dam Size

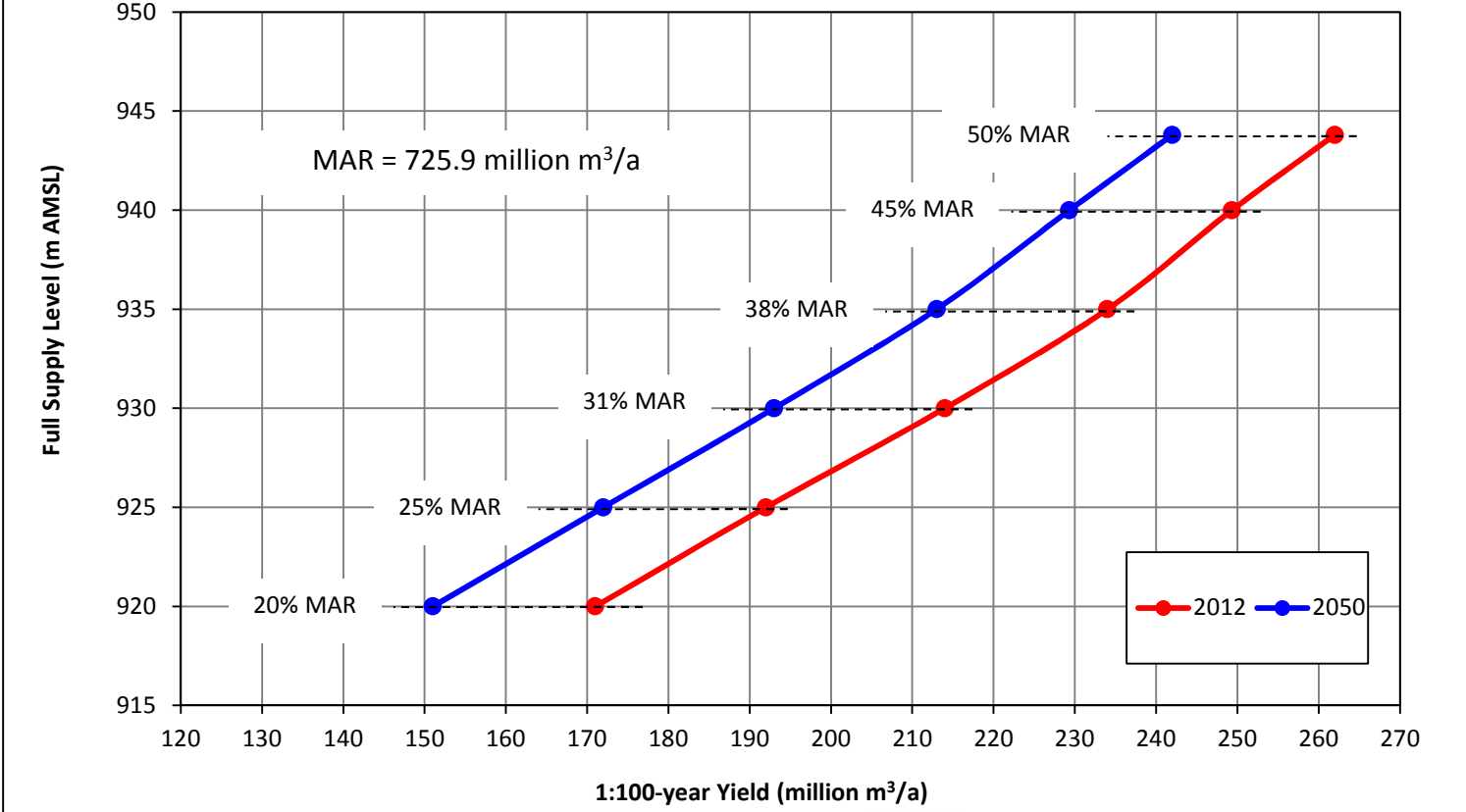
Smithfield Dam size

- Yield analyses
- Cost determination
- Unit Reference Values





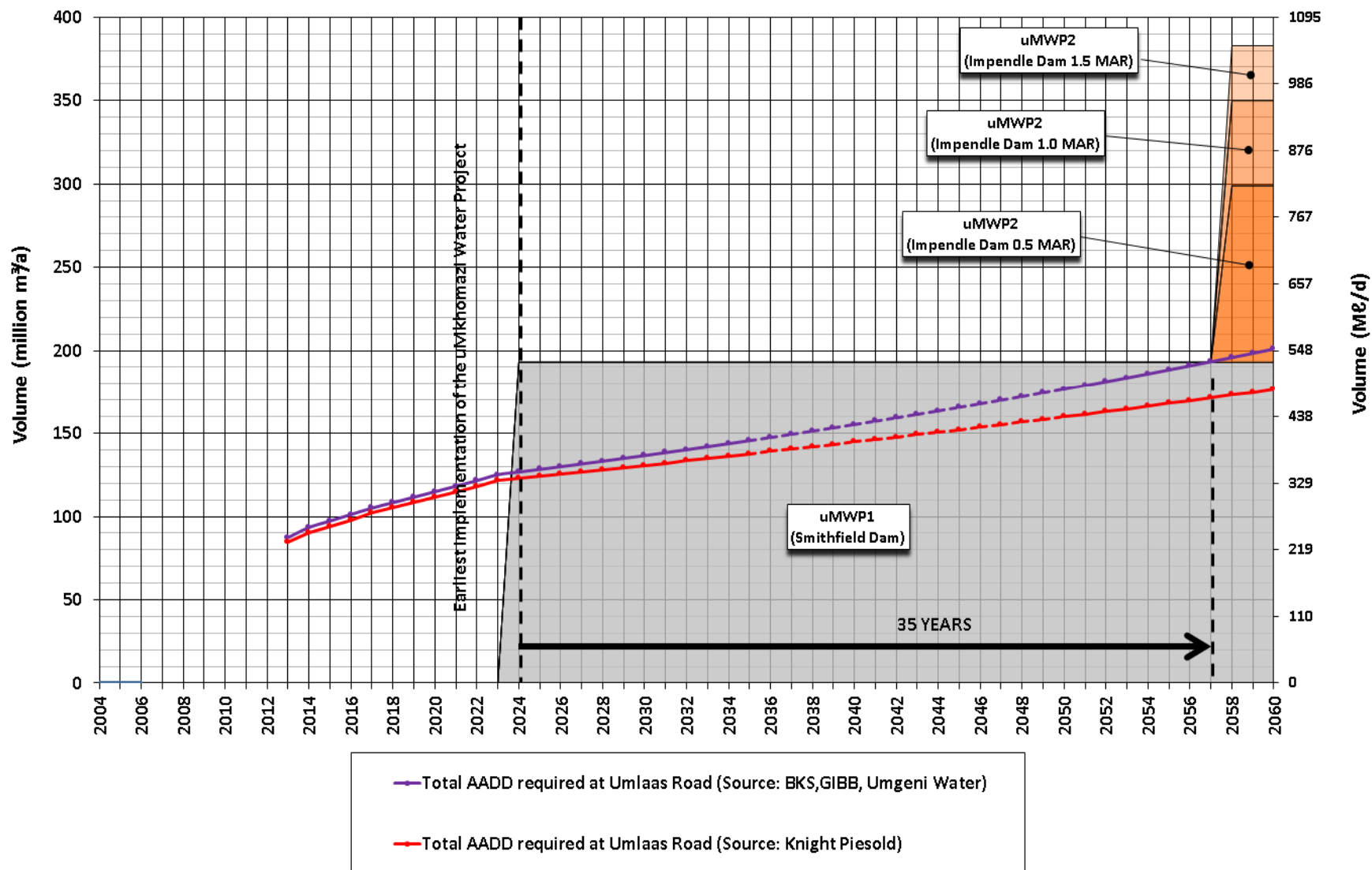
Smithfield Dam Yield results⁽¹⁾



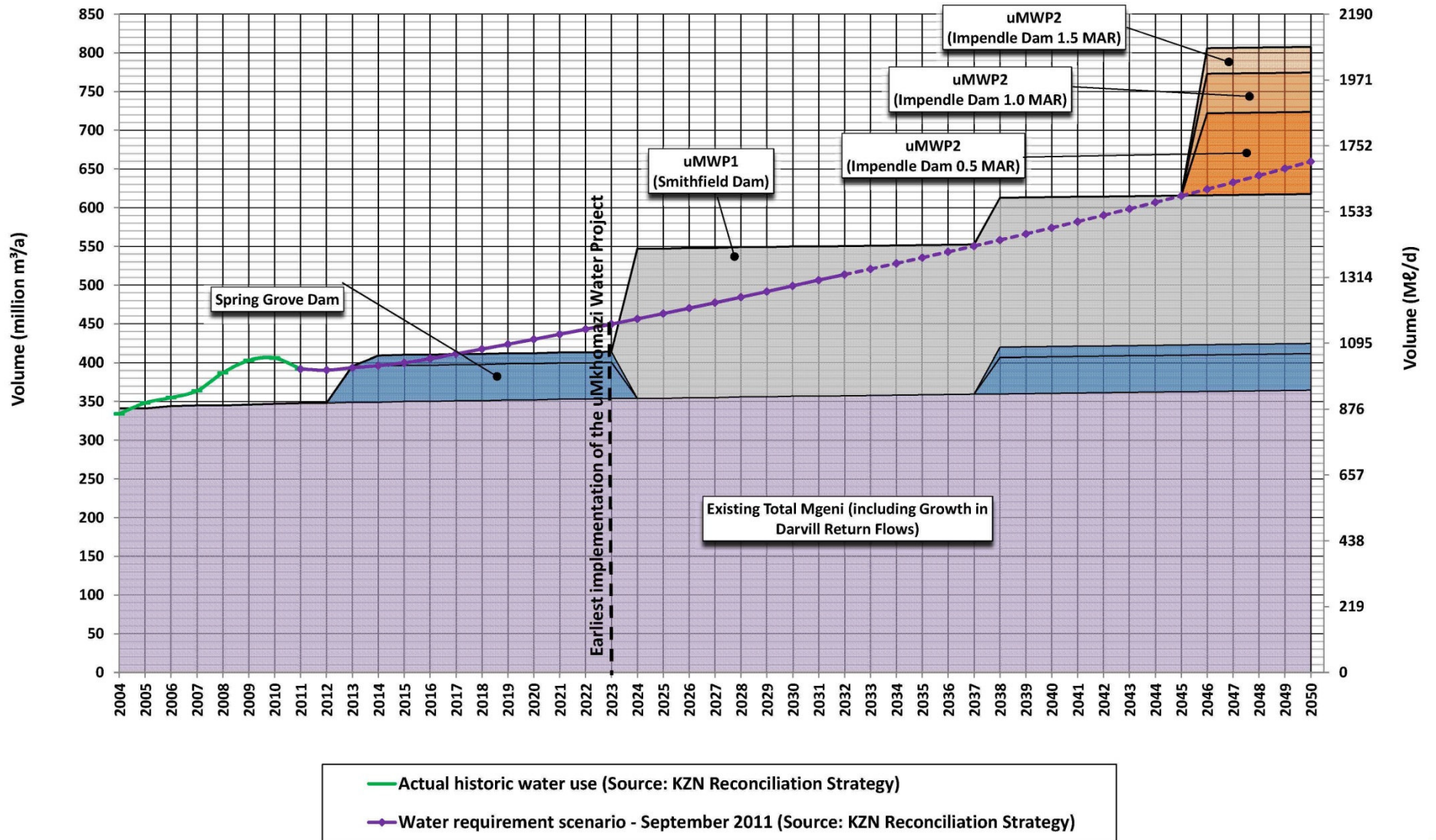
(1) All with EWRs based on Pre-feasibility (IWR, 1998)



Water requirement projections for the proposed uMkhomazi-Mgeni Transfer Scheme from Smithfield Dam via the Western Aqueduct

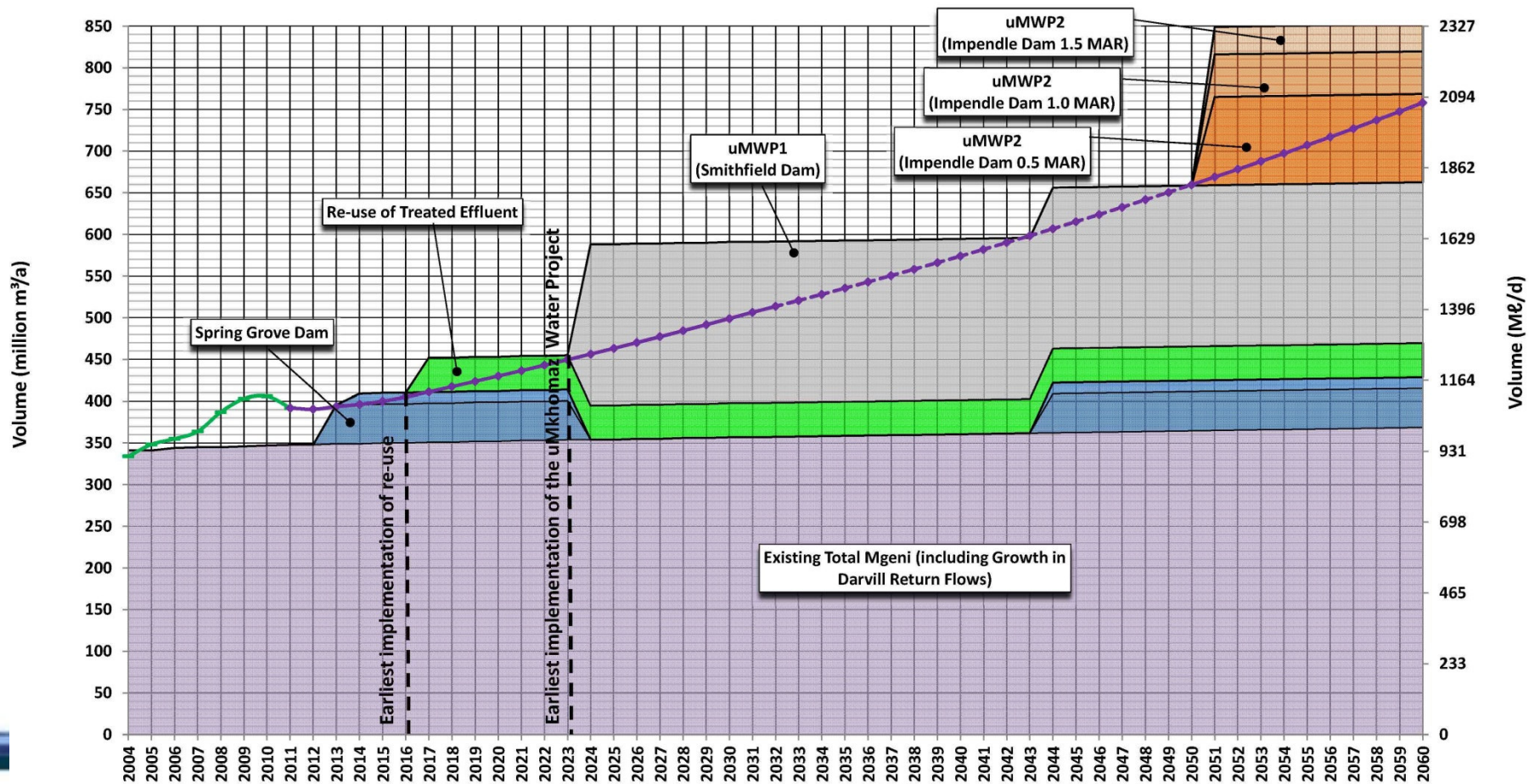


Water requirement projection for the integrated Mooi-Mgeni System





Water requirement projection for the integrated Mooi-Mgeni System



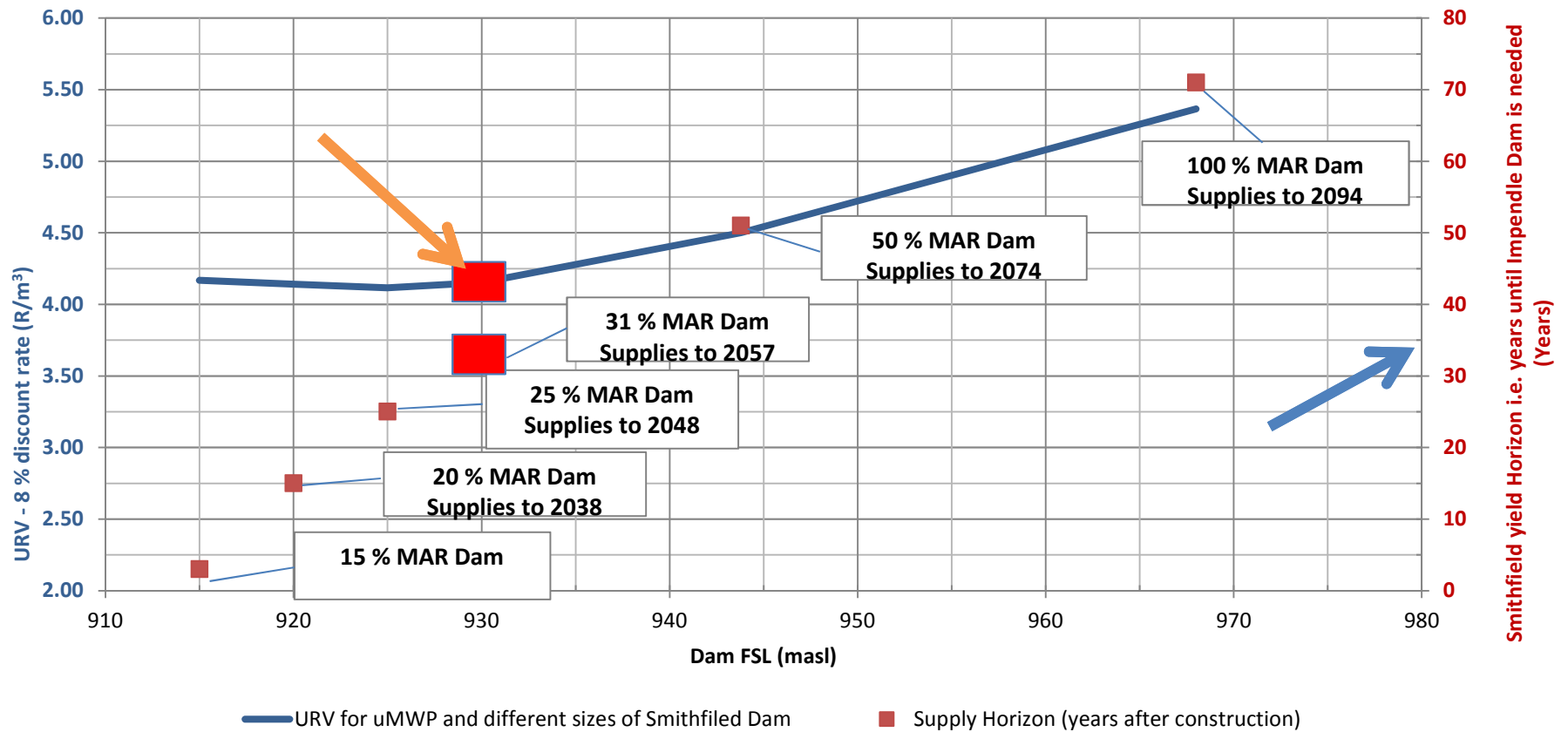
- Actual historic water use (Source: KZN Reconciliation Strategy)
- ◆— Water requirement scenario - September 2011 (Source: KZN Reconciliation Strategy)

Dam size-cost analysis

- Smithfield Dam sizes of 15%, 20%, 25%, 31%, 50%, 100% and 200% of MAR considered;
- Conveyance system: Two phased \varnothing 3,5 m pressure tunnel, two phased pipe line from tunnel outlet to WTW. Phased WTW and two phased pipeline to Umlaas Road (as per Umgeni Water Report);
- Escalated Impendle Dam's Pre-feasibility cost was used;
- Available demands for supply area below Umlaas Road were utilised to determine the phases and required construction date of Impendle Dam incorporating the Smithfield Dam yield

Dam size – URV results

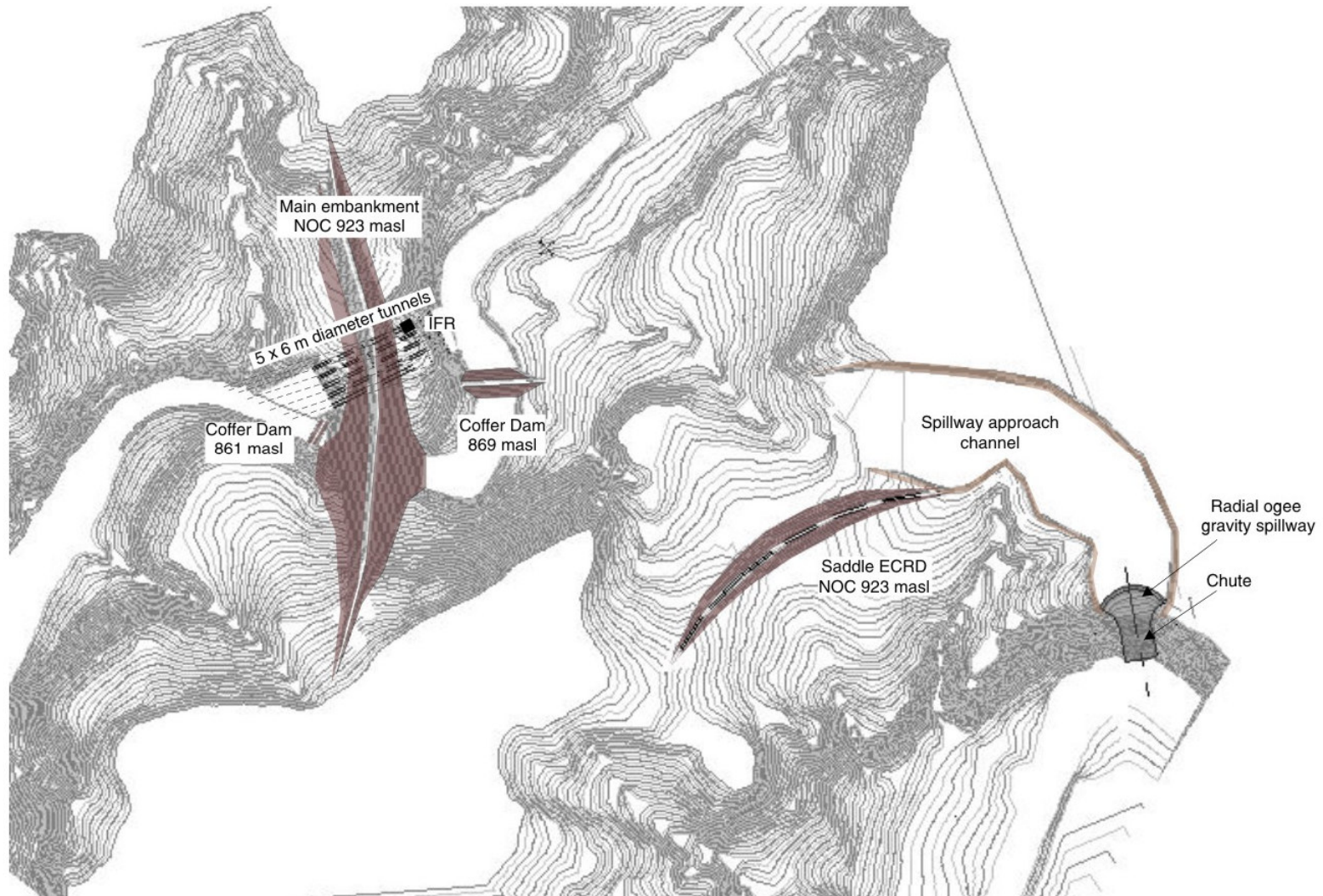
uMkhomazi Water Project - URVs for different size Smithfield Dams



Dam size – Proposal

- Smithfield Dam with a FSL at 930 masl is the most viable in terms of the lowest Unit Reference Value and services period until the following Dam and Transfer Tunnel is required

Smithfield Dam size – Initial layout



Smithfield Dam – New layout



FSL 930 masl dam – Consequences

- Spillway layout must be located higher
- Higher quantity of embankment/dam wall materials required
- R617 road deviations – significant
- Require more dolerite quarries
- **REQUIRE ADDITIONAL GEOTECHNICAL INVESTIGATIONS**

Additional URV calculations required

1. Current layout of scheme
 2. Complete Umgeni system
 3. Various combinations of Smithfield and Impendle dams
- Full and staged approach
(decision to be made)

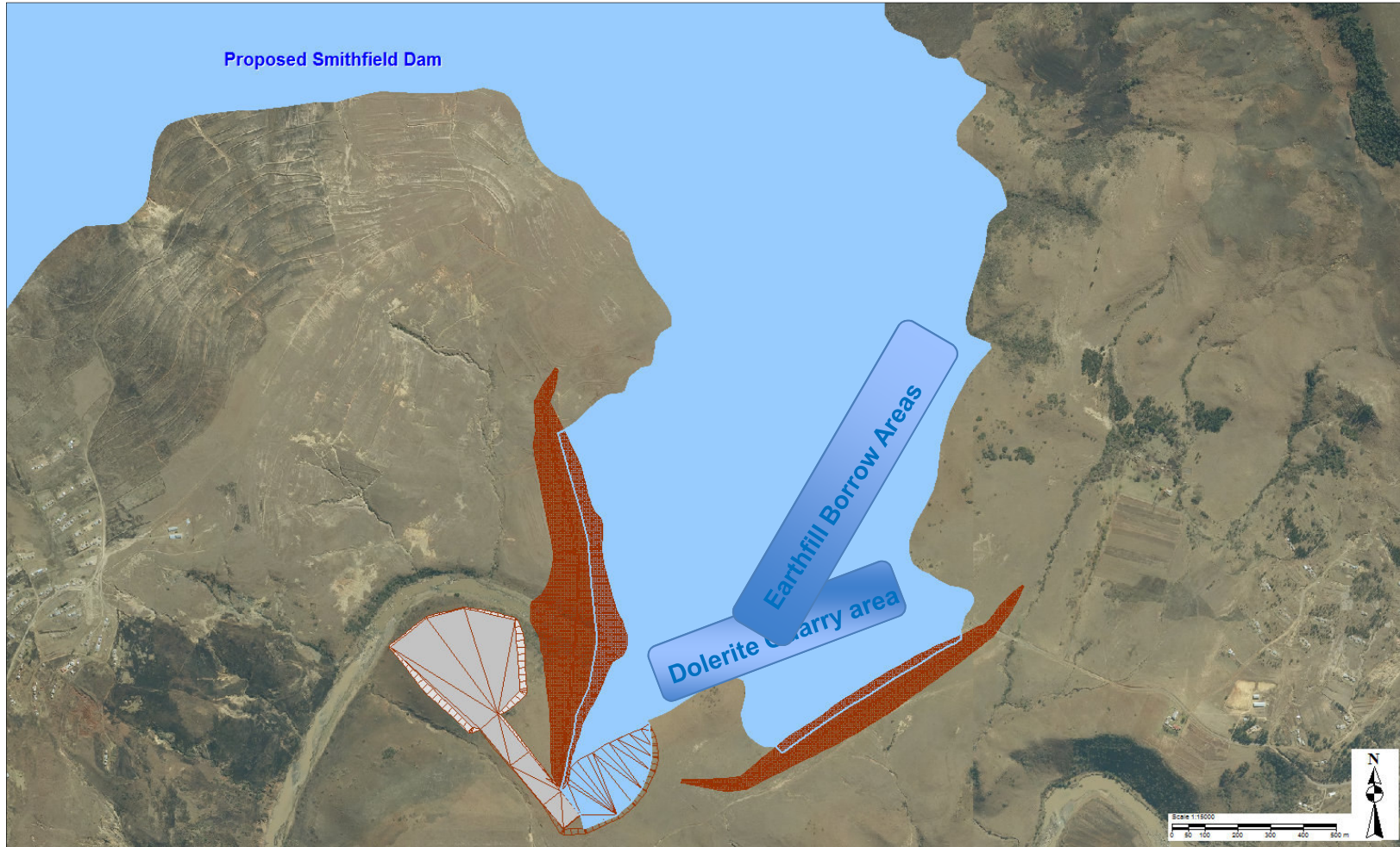
Progress with Geotechnical Investigations



Progress

- Geomechanics Africa appointed in November 2012
- Geophysical investigations completed in mid January 2013
- Drilling and trenching commenced in January 2013
- Authorities (DEA) Meeting in February
- End February status:
 - 1 982 m of a planned 2 423 m drilled
 - 16 Test pits excavated and soils being tested

Quarry and borrow areas





Environmental: Geotechnical investigation

Environmental Management Programme (EMPr)

- Included in Geotechnical investigation tenders
- WUL: DWA exempt drilling activities under the General Authorisation of 2009

Drilling for the geotechnical investigation started in January 2013

- 1st ECO report received end January identifying potential environmental issues

DEA visited the site for the EIA Authorities meeting on 14 February 2013

- Potential environmental issues were discussed










Environmental

- Follow up meeting held at DEA on 20 February 2013, key outcomes:
 - DEA is satisfied that we have complied with the spirit of the requirements set out in Section 28 of NEMA with regards to Duty of Care;
 - They are happy with the EMPr and the weekly visit of ECO;
 - They are satisfied with the rehabilitation programme we have in place;
 - They are satisfied that we are complying with Amafa requirements for Heritage;
- DEA instructed
 - if any listed activity is triggered in the future - have to apply for it through a Basic Assessment.
- Issue of the damming and road in a stream
 - DEA to discuss with their director because this could be Section 24G.
 - But, DEA cannot serve a Section 24 on the DWA.
- Probable action: DEA will serve a Letter of Non-compliance and will issue remediation actions which would have already be done.

Summary of actions / Conclusions

- Optimization has motivated for further investigation
 - Tunnel route C, WTW at 872masl
 - Smithfield Dam, FSL 930m
- Information required from Umgeni Water / Module 3
 - Water requirement projection - (1) full and (2) staged approach
 - Balancing capability from existing sources to accommodate inspection and maintenance of tunnel (await cost estimates for comparison)
 - Update and report of costing of pipelines to Umlaas Road and WTW
- Information required from DWA
 - Compare URV of scheme with options for desalination and re-use (Peter Ramsden)

Implementation programme

| ID | Task Name | 2012 | | 2013 | | | | 2014 | | | | 2015 | | | | 2016 | | | | 2017 | | | | 2018 | | | | 2019 | | | | 2020 | | | | 2021 | | | | 2022 | | | |
|----|--|---|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|--|--|--|
| | | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | | | | |
| 1 | Feasibility Studies | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Module 1: Technical (raw water) |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Module 2: EIA |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Module 3: Technical (potable water) |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | Implementation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | Decision Support Phase |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Design/Documentation Phase |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | Phase 1: Smithfield Dam & tunnel, etc |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | Phase 2: Construction – Impendle Dam (> 9 yrs) |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



Thank you



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The uMkhomazi Water Project Phase 1: PIMS Training





Project Management: Information Management - PIMS

- DWA required:
 - System to keep track of decisions made;
 - Electronic data base of emails, letters, reports, etc
 - Electronic linkages between DWA, Umgeni Water, PSP, also for progress reports
 - Project Webpage, to keep the public informed
 - Publish project related information

Solution:



**DWA
webpage**



Working of the PIMS

CRM 2011

- Project information
- Contacts/project members
- Locality plan
- Shared calendar
- Project message board
- Action items
- Financial management:
 - ✓ Graph 1: Cash flow over time
 - ✓ Graph 2: Expenditure per task
- Time management
 - ✓ Work programme

SharePoint

Document library for
management of
documents

Microsoft Outlook



Information Management - PIMS

Financial management

Project information

Locality plan

Action items

This screenshot displays the PIMS interface with three main components highlighted. On the left, a bar chart titled 'Cash flow over time - Actual vs Budget' shows financial data. In the center, a navigation pane lists project information. On the right, a map titled 'Locality plan' shows a geographical area with red and blue boundaries. Below the map, a list of action items is visible.

Documents

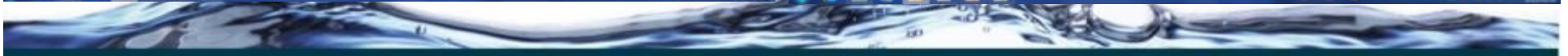
Work programme

Project message board

Contacts / project members

Shared calendar

This screenshot displays the PIMS interface with four main components highlighted. On the left, a list of documents is shown. In the center, a navigation pane lists project information. On the right, a Gantt chart titled 'Work programme' shows project tasks and timelines. Below the Gantt chart, a 'Project message board' displays a message about risk assessment. At the bottom, a 'Shared calendar' is visible.





Thank you



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