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Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

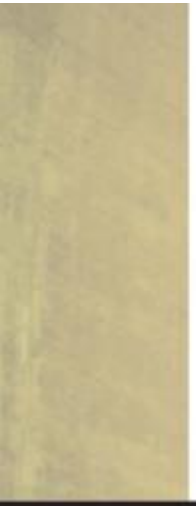
IMPLEMENTATION AND MAINTENANCE OF THE WATER RECONCILIATION STRATEGY FOR RICHARDS BAY AND SURROUNDING TOWNS

Strategy Steering Committee Meeting (StraSC) 3

Wednesday, 4 September 2019

AGENDA

Venue	StraSC Meeting 3: Ulwazi Meeting Room, Mhlathuze Water, (Corner South Central Arterial and Battery Bank. Alton Industrial Area, Richards Bay)	
9:30	**1a. WELCOME** **1b. INTRODUCTIONS**	DWS: KZN Head Chair
9:35	**2. ATTENDANCE AND APOLOGIES**	Chair
9:40	**3. ACCEPTANCE OF AGENDA**	Chair
9:45	**4. PURPOSE OF THE MEETING & BACKGROUND**	K Mandaza
9:55	**5. APPROVAL OF THE MINUTES** (StraSC 2 – 4 December 2018)	Chair
10:00	**6. MATTERS ARISING FROM StraSC 2: See Action List**	Chair
10:15	**7. STATUS OF THE STRATEGY INTERVENTIONS**	Chair
10:20	**7.1 Infrastructure (Thukela, Goedertrouw, Umfolozi)**	K Bester
10:25	**7.2 Land Care (Aliens, Afforestation)**	DWS Regional
10:30	**7.3 Seawater Desalination**	Mhlathuze Water
10:35	**7.4 WCWDM & Use of Treated Effluent**	CoMLM
10:40	**7.5 Billing of Irrigators**	DWS Regional
10:45	**7.6 Operational**	DWS Regional
10:50	**Tea 7 Break (15 minutes)**	



11:05	**8. OVERVIEW OF STUDY ACTIVITIES & COMPLETED TASKS**	PSP
11:10	**9. CURRENT PROGRESS**	PSP
	9.1 Task 5: Groundwater / Lake Assessment	
	9.2 Task 7: Water Resources	
	9.3 Task 8: Infrastructure and Cost Assessment	
12:10	**10. DISCUSSION AND COMMENTS**	Chair
12:30	**11. COMMUNICATION**	PSP
12:35	**12. DATE OF NEXT MEETING**	Chair
12:45	**13. CLOSURE**	Chair
12:45	**LUNCH**	

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Item 4: Purpose of the Meeting

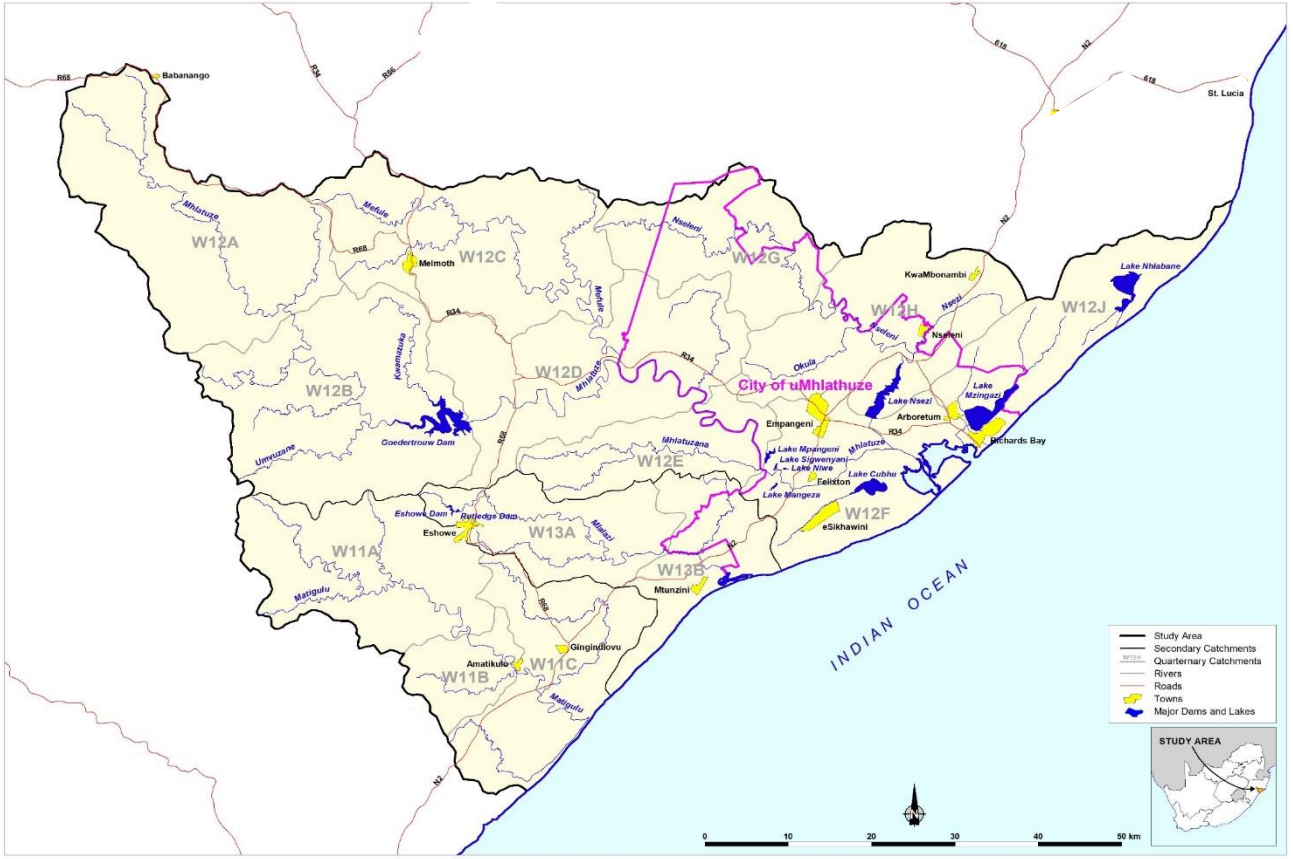
ROLE OF THE STRATEGY STEERING COMMITTEE

As members of the StraSC your responsibility is to:

- Drive processes assigned to your organization relating to Strategy Interventions
- Provide feedback to Committee on progress of Actions
- Disseminate information into the relevant departments / organisations
- Incorporate strategies' recommendations into development plans

BACKGROUND TO THIS ASSIGNMENT

- Reconciliation Strategy for the Richards Bay area was developed (2015)
- Recommends sequence of management and infrastructural interventions required to maintain acceptable assurances of supply to the users.



OUTCOMES OF PREVIOUS ASSIGNMENT

Options for reconciling increasing water requirements with the current supply in the Mhlathuze Catchment included:

- Water Conservation and Demand Management (WC/WDM)
- Removal of Invasive Alien Plants (IAPs) and unlawful afforestation
- Infrastructure: Raising Goedertrouw, Transfers: Thukela & Umfolozi, Nseleni Dam
- Improvement of System Operation
- Seawater Desalination
- Reuse of treated effluent
- Improved billing of irrigators

Please visit: http://www6.dwa.gov.za/iwrp/projects.aspx for all project related information

Why Continuation of a Strategy? (This Study)

- Water balances need to be continuously monitored / investigated and the strategy regularly updated to remain technically relevant.
- Ensures that intervention planning can be implemented taking into account any changes that may impact on the projected water balance.
- **Study Objective:** In-depth review, systematically update and improve the water resource reconciliation strategy so that it remains **relevant, technically sound, economically viable, socially acceptable and sustainable** and thus **enabling the implementation of the strategy by the relevant authorities**.

Purpose of the Meeting

- Overview of study activities since StraSC Meeting 2 (4 Dec 2018)
- Feedback on Strategy interventions

Matters Arising: Action list

Item	Description	Organ-isation	Respons-ibility
1	Upload StraSC minutes to the website	DWS	SM
2	Provide maps outlining the extent of unlawful forests in the catchment around the Coastal Lakes to the KZN Regional Office (Gibson Gumede: GumedeG@dws.gov.za)	WWF	CW
3	Draft a response of behalf of Mhlathuze Water to DWS relating to the DWS letter requesting Mhlathuze Water to further investigate the feasibility of seawater desalination	MW	SN
4	Produce a proposal (concept note) to DWS outlining the potential benefits and possible savings that could be made if the irrigation sector was to be billed on actual use	Irrig	JR
5	Discuss the option of initiating a study to widen the investigation of potential water augmentation options with the Board of Mhlathuze Water	MW	SB
6	Provide electronic copies of the water requirements report to those that requested it for further review	PSP	CS
7	Provide a map including the delineation of quaternary catchments in the study area to DWS KZN	PSP	CS
8	Provide the PSP with contact details to further engage with the TNPA:TPT on potential additional future water requirements	ZCCI	CvdW
9	Engage with the TNPA:TPT on possible future expansion and additional water requirements	PSP	CS

Matters Arising: Action list

10	Provide a copy of the resident water bill including the tariff structure currently being charged to the PSP (caryns@wrp.co.za)	ZCCI	CvdW ✓
11	Draft a letter to the Municipal Manager highlighting the importance of the Municipality's attendance at the meeting	PSP	CS/KM ✓
12	Provide the relevant contact details to which to send the drafted letter	MW	SB ✓
13	Extend the invite for the next formal training session to the Municipalities	DWS	SM

2

14	Draft and distribute minutes	PSP	CS ✓
15	Upload minutes and other completed study documentation to study website	DWS	SM ✓

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Item 7: Status of Strategy (2015) Interventions

7.1 INFRASTRUCTURE

Action	Responsibility	Comment
Thukela Initiate a comparison pre-feasibility study • Increased capacity of Thuk-Mhlat Transfer scheme (Middledrift) • Coastal transfer pipe at Mandini	DWS: D: OA	To be reported on under item 9.3
Umfolozi • Initiate a study including hydrology update, assessment of water requirements, system modelling etc. • Initiate a comparison pre-feasibility study to compare Mfolozi transfer scheme with others	DWS: D: OA	
Goedertrouw Raising Initiate a full feasibility study to evaluate Goedertrouw raising	DWS: D: OA	

7.2 LANDCARE

Action	Responsibility	Timing
Actively support clearing programmes for alien invasive plants	All Stakeholders	Ongoing High
Investigate the reduction of illegal / commercial afforestation in immediate vicinity of coastal lakes	DWS	High

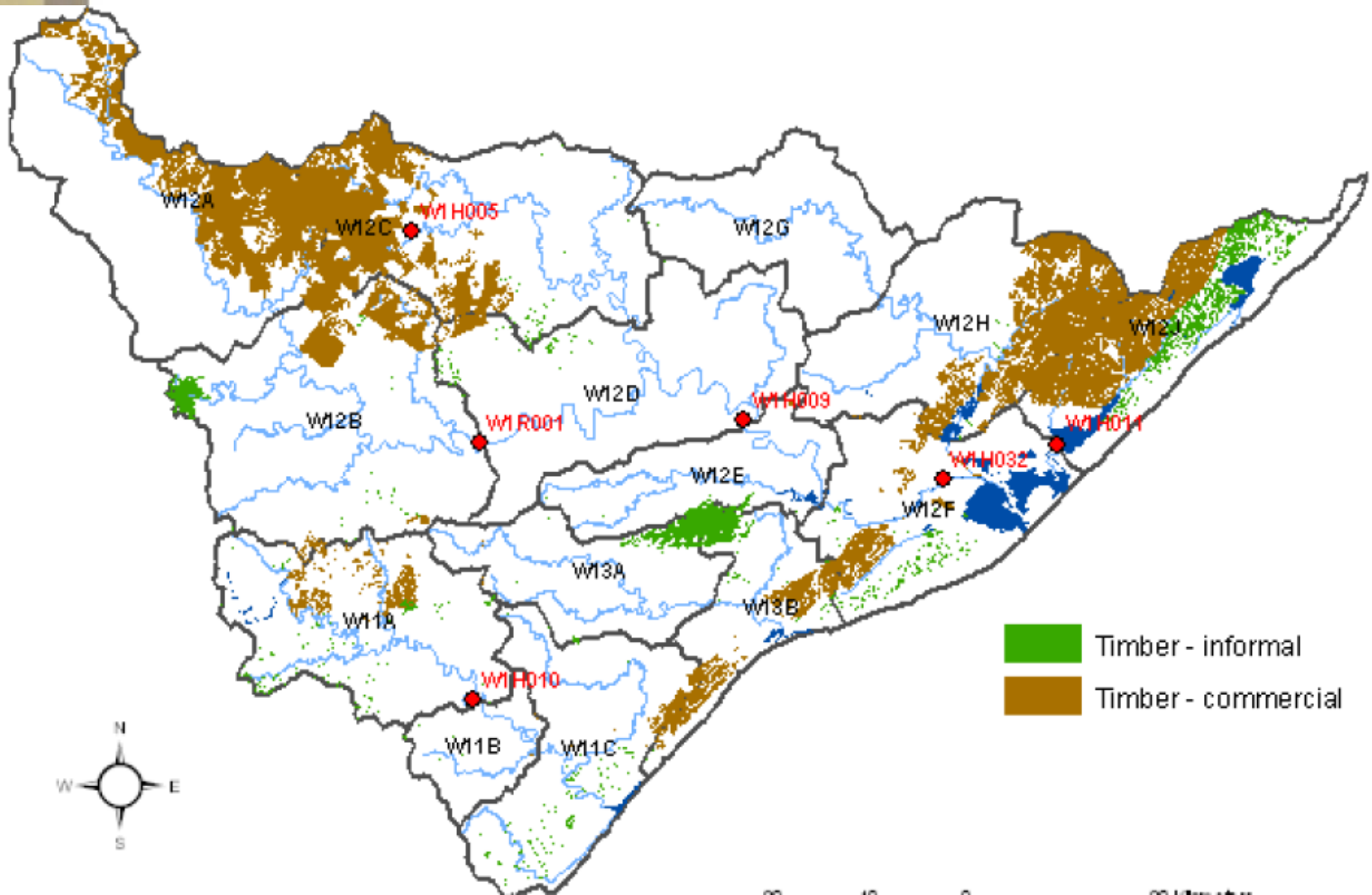
Afforestation Review

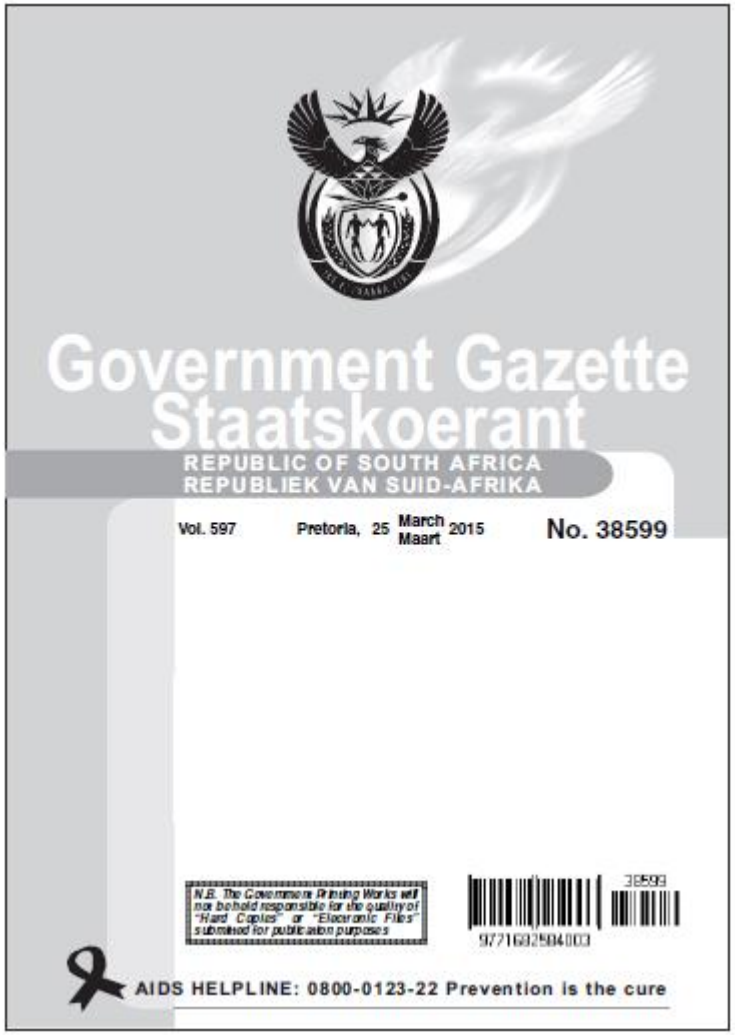
- Background:
  - 2015 Strategy Intervention: Investigate the reduction of illegal / commercial afforestation in immediate vicinity of coastal lakes
  - 2018 StraSC meeting feedback by DWS KZN: “Not aware of any illegal afforestation remaining in the Study area, asked that item be removed”
  - Action C Webb to send details to G Gumede, sent map of afforestation from MWAAS (2009) and statement “Having spent some time in the catchment we have seen that the extent of informal forestry (red areas on the map) around the coastal lakes has increased since this report was published.
- Objective: To obtain all info on afforestation and provide perspective on legality status

History

- MWAAS: 2006-2009
  - Info to be based on WARMS/Validation
  - Appeared to be only commercial users in database
  - Carried out aerial photograph assessment
- Validation Study (2005): 61 192ha planted
- Aerial photography:
  - 62 717 ha commercial plantations
  - 4994 ha informal timber
  - Total: 67 711 ha

MWAAS Afforestation (aerial photographs)





Gazetted:
55 971 + 420 = 56 391 ha

A) Existing Licenses

Sector	Total Volume (million cubic metres per annum)
Industry	0.00
Irrigation	4.18
Mines	0.0
SFRA	420 (Hectares)
Storage	5.0
Urban	0.0

B) Volume of Water Set Aside

Category	Total Volume (million cubic metres per annum)	Percentage (Total WSA)
Future Allocation	6.2	58%
Government Departments	2.5	23%
Community Cooperatives	1.4	13%
Traditional Authorities	0.6	6%
TOTAL	**10.7**	**100%**

C) Summary of Total Volume of Water Allocated per Sector

Sector	Total Volume (million cubic metres per annum)
Industry	5.74
Commercial/ Domestic	0.18
Municipal	58.73
Mhlathuze water Board	94.48
Mines	14.02
Irrigation	124.41
SFRA (hectares)	55 971
Storage	7.93

STREAM FLOW REDUCTION - FINAL SCHEDULE

A) EXISTING LAWFUL WATER USES

CATEGORY	APPLICANT	PROPERTY DESCRIPTION	ALLOCATED HECTARES (HA)
1) SAPPI	SAPPI MANUFACTURING PTY LTD	ALTENBURG NO. 6105	287.2
1) SAPPI	SAPPI MANUFACTURING PTY LTD	ERF 11494 PTN 1 RICHARDS BAY	274.8
1) SAPPI	SAPPI MANUFACTURING PTY LTD	ERF 11471 RICHARDS BAY	455.8
1) SAPPI	SAPPI MANUFACTURING PTY LTD	ERF 11497 PTN 2 RICHARDS BAY	297.7
1) SAPPI	SAPPI MANUFACTURING PTY LTD	FORTRESS NO. 11847	457.2
1) SAPPI	SAPPI MANUFACTURING PTY LTD	LOT K 16 KWAMBONAMBI NO. 12758	732
1) SAPPI	SAPPI MANUFACTURING PTY LTD	LOT K 19 KWAMBONAMBI NO. 12176	223
1) SAPPI	SAPPI MANUFACTURING PTY LTD	LOT K 20 KWAMBONAMBI NO. 12424	193
1) SAPPI	SAPPI MANUFACTURING PTY LTD	LOT K 37 NO. 13201	542.3
1) SAPPI	SAPPI MANUFACTURING PTY LTD	LOT K 51 NO. 12789	521.3
1) SAPPI	SAPPI MANUFACTURING PTY LTD	LOT K NO. 12555	542.9
1) SAPPI	SAPPI MANUFACTURING PTY LTD	MOOIPLAATS NO. 6102	886
1) SAPPI	SAPPI MANUFACTURING PTY LTD	ESTANCIA 11644 PTN 2	193.1
1) SAPPI	SAPPI MANUFACTURING PTY LTD	PTN 1 OF DIEPKLOOF NO. 6118	87
1) SAPPI	SAPPI MANUFACTURING PTY LTD	PTN 1 OF NAAUWKLOOF NO. 6099	209.2
1) SAPPI	SAPPI MANUFACTURING PTY LTD	PTN 1 OF VRISCHGEWAAGD NO. 6133	55.5
1) SAPPI	SAPPI MANUFACTURING PTY LTD	PTN 1 OF WATERTON NO. 12236	1
1) SAPPI	SAPPI MANUFACTURING PTY LTD	PTN 2 OF 1 OF NINIVE NO. 6100	123.4
1) SAPPI	SAPPI MANUFACTURING PTY LTD	PTN 2 OF DIEPKLOOF NO. 6118	
1) SAPPI	SAPPI MANUFACTURING PTY LTD	PTN 2 OF LOT K 17 KWAMBONAMBI NO. 15731	
1) SAPPI	SAPPI MANUFACTURING PTY LTD	PTN 3 OF 2 OF VRISCHGEWAAGD NO. 6133	
1) SAPPI	SAPPI MANUFACTURING PTY LTD	PTN 3 OF ESTANCIA NO. 11644	
1) SAPPI	SAPPI MANUFACTURING PTY LTD	PTN 3 OF NINIVE NO. 6100	
1) SAPPI	SAPPI MANUFACTURING PTY LTD	PTN 7 OF 6 OF NINIVE NO. 6100	

Final Allocation schedules
Total of 496 individual entries: 57 029 ha

Assume this is lawful

STREAM FLOW REDUCTION - FINAL SCHEDULE

C) EXISTING LICENCES UNDER NWA

CATEGORY	APPLICANT	PROPERTY DESCRIPTION	LICENSED HECTARES (HA)
2) MONDI	MONDI LTD	PTN 1 OF PENALGIE NO. 11235	13.96
2) MONDI	MONDI LTD	REM OF PTN 34 OF 31 OF SAXONY NO. 6149	95.6
2) MONDI	MONDI LTD	REM OF PTN 32 OF 31 OF SAXONY NO. 6149	18.6
2) MONDI	MONDI LTD	REM OF VERGELEGEN NO. 6139	31.54
2) MONDI	MONDI LTD	REM OF VERGELEGEN NO. 6139	26.7
2) MONDI	MONDI LTD	REM OF DEANE NO. 6140	23.74
2) MONDI	MONDI LTD	PTN 1 NO. 6158 GOLDEN REEF	273.86
		REM OF PTN 33 OF 31 OF SAXONY NO. 6149	30
		PTN 3 OF 1 OF VERGELEGEN NO. 6139	5.29
		PTN 4 OF THE FARM HARTSKAMP NO. 160	39.05
		PTN 5 OF THE FARM HARTSKAMP NO. 160	10.19
		PTN 2 OF THE FARM DE WAAL NO. 522	11.29
		PTN 2 OF THE FARM ROOIPOORT NO. 60	29.9

STREAM FLOW REDUCTION - FINAL SCHEDULE

B) NEW APPLICATIONS

CATEGORY	APPLICANT	PROPERTY DESCRIPTION	ALLOCATED HECTARES (HA)
2) MONDI	MONDI LTD	0/11536 RICHARDS BAY	9.90
2) MONDI	MONDI LTD	0/6724 RICHARDS BAY	28.91
2) MONDI	MONDI LTD	1/12453 OF LOT K 26	88.64
2) MONDI	MONDI LTD	ERF 11433 RICHARDS BAY	18.46
2) MONDI	MONDI LTD	ERF 11439 RICHARDS BAY	4.93
2) MONDI	MONDI LTD	ERF 11451 RICHARDS BAY	9.56
2) MONDI	MONDI LTD	ERF 11472 RICHARDS BAY	5.21
2) MONDI	MONDI LTD	LOT K 15 KWAMBONAMBI NO. 12603	7.95
2) MONDI	MONDI LTD	LOT K 5 KWAMBONAMBI NO. 10247	7.42
2) MONDI	MONDI LTD	PTN 1 OF PENALGIE NO. 11235	13.96
2) MONDI	MONDI LTD	PTN 1 OF RUSTVERWACHT NO. 6159	12.85
2) MONDI	MONDI LTD	PTN 1 OF VLAKBLUT NO. 6148	2.99
2) MONDI	MONDI LTD	PTN 1 OF PROSPECT NO. 6117	105.02
2) MONDI	MONDI LTD	PTN 3 OF EIKENDAL NO. 6134	3.45
2) MONDI	MONDI LTD	REM OF DEANE NO. 6140	23.74
2) MONDI	MONDI LTD	REM OF EIKENDAL NO. 6134	9.42
2) MONDI	MONDI LTD	REM OF HOMELEIGH NO. 11575	3.56
2) MONDI	MONDI LTD	REM OF LOT K 26 NO. 12453	3.20
2) MONDI	MONDI LTD	REM OF OAKLANDS NO. 11577	22.45
2) MONDI	MONDI LTD	REM OF PTN 32 OF 31 OF SAXONY NO. 6149	18.60

Question?

- The MWAAS aerial photograph assessment indicated 67 711ha
- BUT final allocation schedule said 57 029ha
- What happened to difference of 10 682ha if the Regional Office states there is no unlawful afforestation in the catchment ?
- Were there errors or was it removed?
- Spot checks carried out

Result

- Overlaid shape file polygons determined in MWAAS in Google Earth
- Differences clearly evident now (2019) vs then (2001)
- According to the final allocation schedule: 179 properties, 712 ha are allocated to tribal areas/ individual applicants, MWAAS had 4994 ha informal timber, **main difference**

Eg. Around Lake Nhlabane

2001 aerial photo vs 2019 Google Earth

Recommendation

- Plot the locations of the 712ha lawful individual growers in GIS and pull into Google Earth
- Determine the extent of informal timber falling outside these boundaries
- Target removal of informal growers that are not registered, especially in a buffer zone around the Coastal Lakes.

7.3 OTHER

Action	Responsibility	Comments
Desalination Initiate a pre-feasibility Study to evaluate the desalination of seawater	TBD	To be reported on under item 9.3
Implement seawater quality monitoring for 2 years to provide baseline data for plant process design	TBD	
Reuse of treated effluent Initiate a feasibility Study to evaluate aspects Indirect effluent reuse from Lake Mzingazi Potential uptake of treated effluent by bulk industrial users clos to Arboretum macerator	CoU LM	

7.3 OTHER (….CONT)

Action	Responsibility	Timing
Reinstate the billing of irrigators for actual water use	DWS: NWRI	High
Determine sustainable yields of coastal lakes	DWS: NWRP	Very High
RBM: artificial recharge of Lake Nhlabane from Mfolozi River	RBM	Sokhulu by 2019
Establish additional reliable flow monitoring between Goedertrouw and Mhlathuze weir	DWS: Hydrology	High

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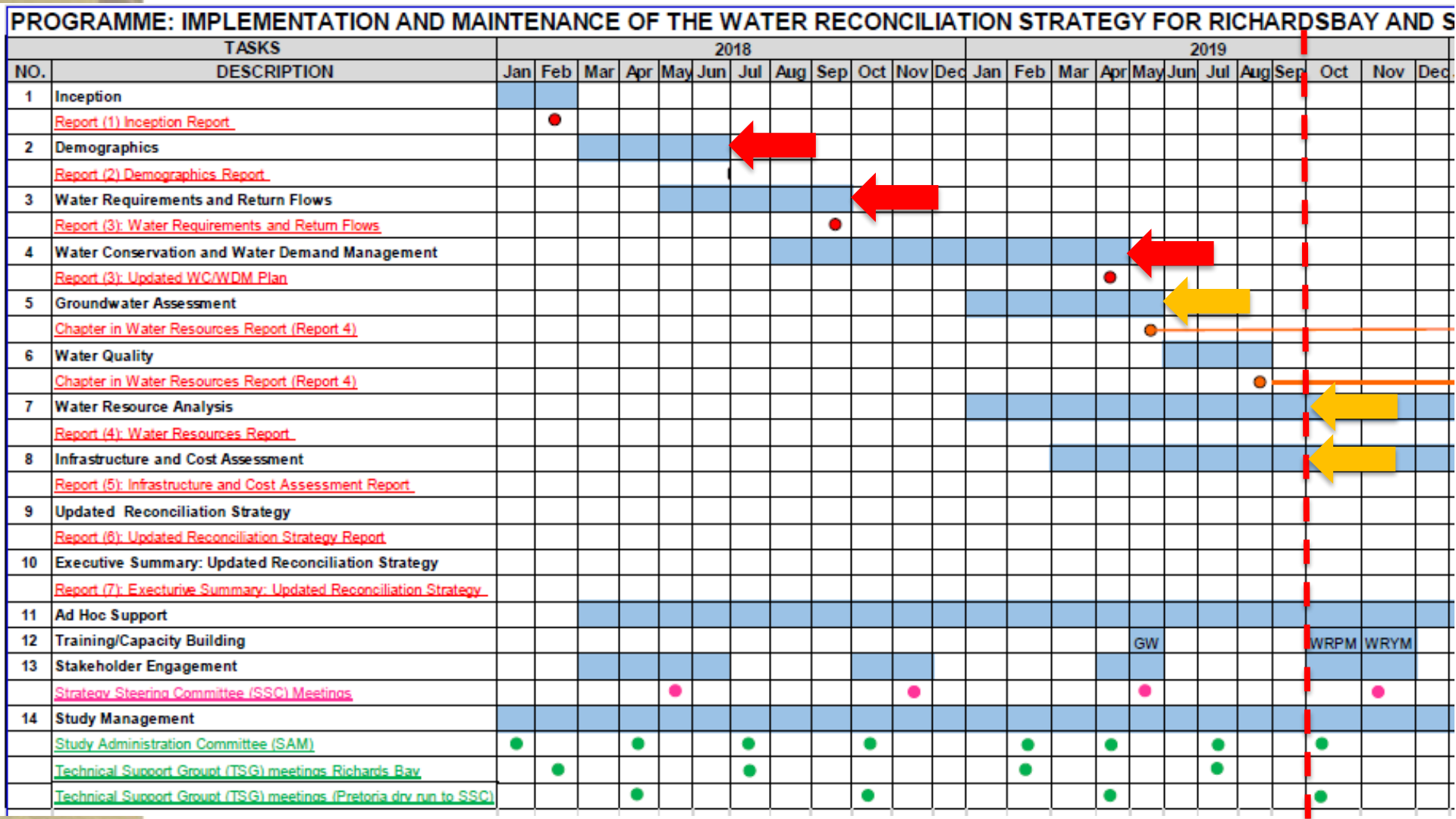
Item 8: Overview of Study Activities

STUDY PROGRAMME



TASK 2: Demographics & Socio-Economics

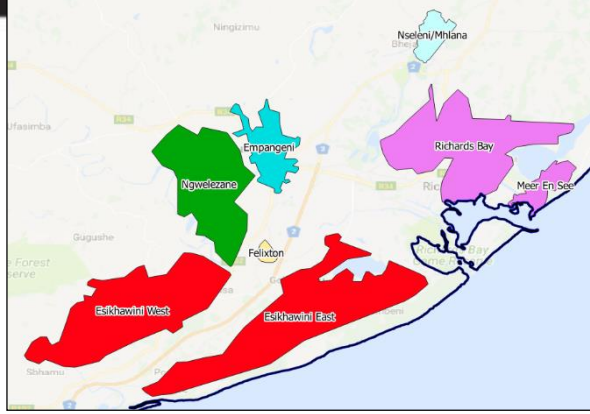


Table 3.1: High population projections

Urban Centre	2016	2020	2025	2030	2035	2040	2045
Richards Bay	57 672	63 259	71 067	79 737	89 430	100 417	112 715
Esikhaweni	164 563	178 670	197 902	218 995	242 052	267 165	295 544
Felixton	1 099	1 164	1 247	1 335	1 430	1 532	1 642
Empangeni	24 181	26 945	30 829	35 249	40 276	45 990	52 581
Ngwelezane	61 245	67 586	75 981	84 924	94 608	105 058	117 558
Nseleni	42 500	47 267	53 386	59 683	66 099	72 579	81 139
Total	**351 260**	**384 891**	**430 412**	**479 923**	**533 895**	**592 741**	**661 179**

Table 4-7: Projected Population Figures for the Realistic Population Growth Scenario within the Broader Study Area

Area/Town	Population Figures						
	2016	2018	2020	2025	2030	2035	2040
Other Towns in the Broader Study Area							
Eshowe Town	9 386	9 593	9 804	10 353	10 933	11 546	12 192
Gingindlovu Town	1 153	1 171	1 189	1 236	1 284	1 335	1 387
Mtunzini Town	2 266	2 307	2 349	2 456	2 568	2 686	2 808
Melmoth Town	8 252	8 434	8 620	9 102	9 612	10 151	10 719
Amatikulu Town	536	545	553	576	600	624	650
Totals Towns	**21 593**	**22 050**	**22 515**	**23 723**	**24 997**	**26 342**	**27 756**

Title: Economic Growth and Demographic Analysis Report
Authors: Russell Aird and Nepia Zivanai
Project Name: Implementation and Maintenance of the Water Reconciliation Strategy for Richards Bay and Surrounding Towns
DWS No: P WMA 04/W100/00/9218
Status of Report: Final
First Issue: August 2018

Consultants: BJE/iX/WRP Joint Venture
Approved for the Consultants by:

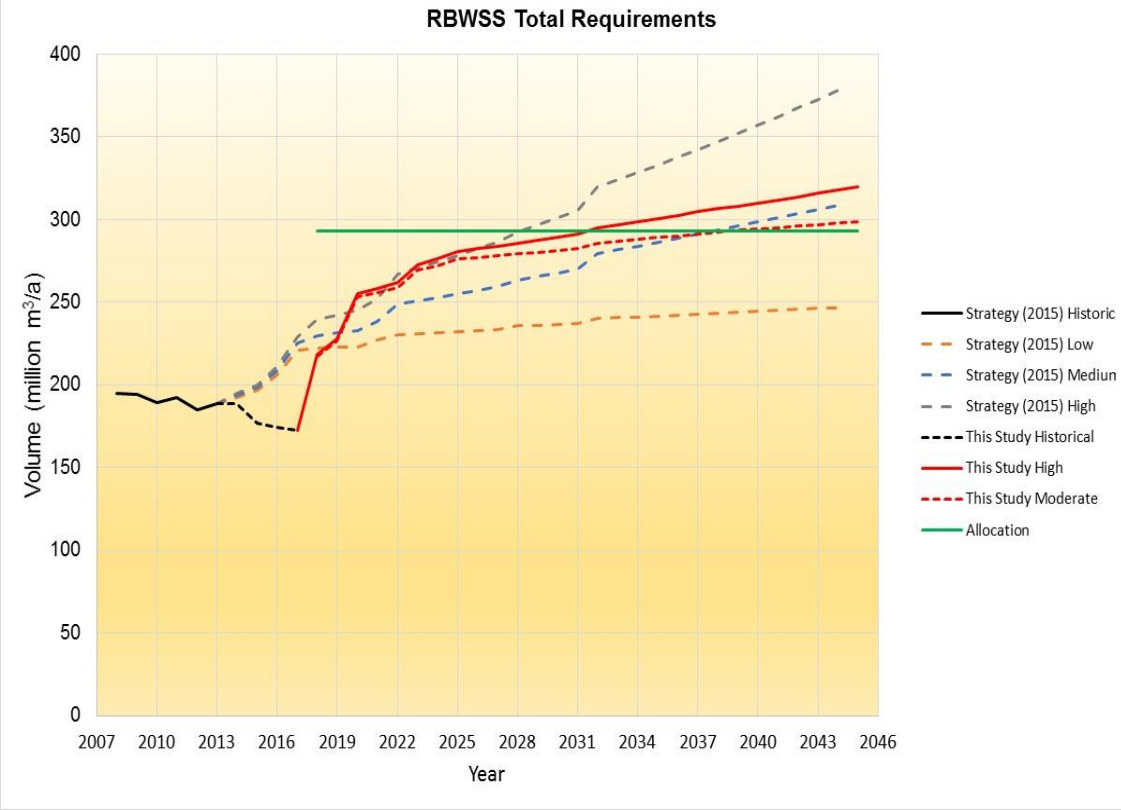
L Louw
Study Leader

DEPARTMENT OF WATER AND SANITATION
Directorate National Water Resource Planning
Approved for the Department of Water and Sanitation by:

K Mandaza
Project Manager: National Water Resource Planning (East)

P Mlilo
Director: National Water Resource Planning

TASK 3: Water Requirements & Return Flows



Title:	**Water Requirements and Return Flows Report**
Authors:	**Study Team**
Project Name:	**Implementation and Maintenance of the Water Reconciliation Strategy for Richards Bay and Surrounding Towns**
DWS No:	**P WMA 04/W100/00/9318**
Status of Report:	**Final Report**
First Issue:	**September 2018**

Consultants: **BJE/IX/WRP Joint Venture**

Approved for the Consultants by:

L Louw

Study Leader

DEPARTMENT OF WATER AND SANITATION

Directorate National Water Resource Planning

Approved for the Department of Water and Sanitation by:

K Mandaza

Project Manager: National Water Resource Planning (East)

P Milo

Director: National Water Resource Planning

TASK 4: WC/WDM

Title:	Water Conservation Water Demand Management Plan
Authors:	Nsika Zondo, Willem Wegelin
Project Name:	Implementation and Maintenance of the Water Reconciliation Strategy for Richards Bay and Surrounding Towns
DWS No:	PWMA 04/W100/00/9218/4
Status of Report:	Final Report
First Issue:	July 2019
Consultants:	BJE/IX/WRP Joint Venture

Approved for the Consultants by:

L Louw

Study Leader

DEPARTMENT OF WATER AND SANITATION

Directorate National Water Resource Planning

Approved for the Department of Water and Sanitation by:

K Mandaza

Production Engineer: National Water Resource Planning (East)

P Milo

Director: National Water Resource Planning

Target IWA Water Balance Diagram (million m^3/annum)

<table>
<tr><td rowspan="5">System Input Volume = 36.180</td><td rowspan="4">Authorised consumption = 32.546</td><td>Billed authorised = 25.262</td><td>Billed metered = 25.240</td><td>Revenue water = 25.262</td></tr>
<tr><td rowspan="3">Unbilled authorised = 7.284</td><td>Unbilled metered = 1.706</td><td rowspan="3">Non-revenue water = 10.918</td></tr>
<tr><td rowspan="2">Unbilled unmetered = 5.578</td></tr>
<tr><td rowspan="2">Water losses = 3.634</td><td>Apparent losses = 0.908</td><td>Apparent losses = 0.908</td></tr>
<tr><td>Real Losses = 2.725</td><td>Real Losses = 2.725</td></tr>
<tr><td colspan="5">Reduced Input Volume = 2.973</td></tr>
</table>

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Item 9: Current Progress

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Item 9.1: Groundwater-Lake Assessment

Background

- The WAA (MWAAS) Study identified a need to incorporate groundwater features from the groundwater lake module into WRYM
- WAA of Mhlathuze did incorporate groundwater inflow to lakes at a coarse level with limited calibration based on existing reports and developed a lake module for Pitman Model
- Recon Strategy (2015) stated “groundwater contribution to lake yields has not been taken into account in the WAA modelling, hence likely that the modelled lake yields are too low or incorrect. Groundwater contributions to the lakes could not be quantified with an acceptable level of confidence” reference from MORFP not MWAAS

New Tasks – This study

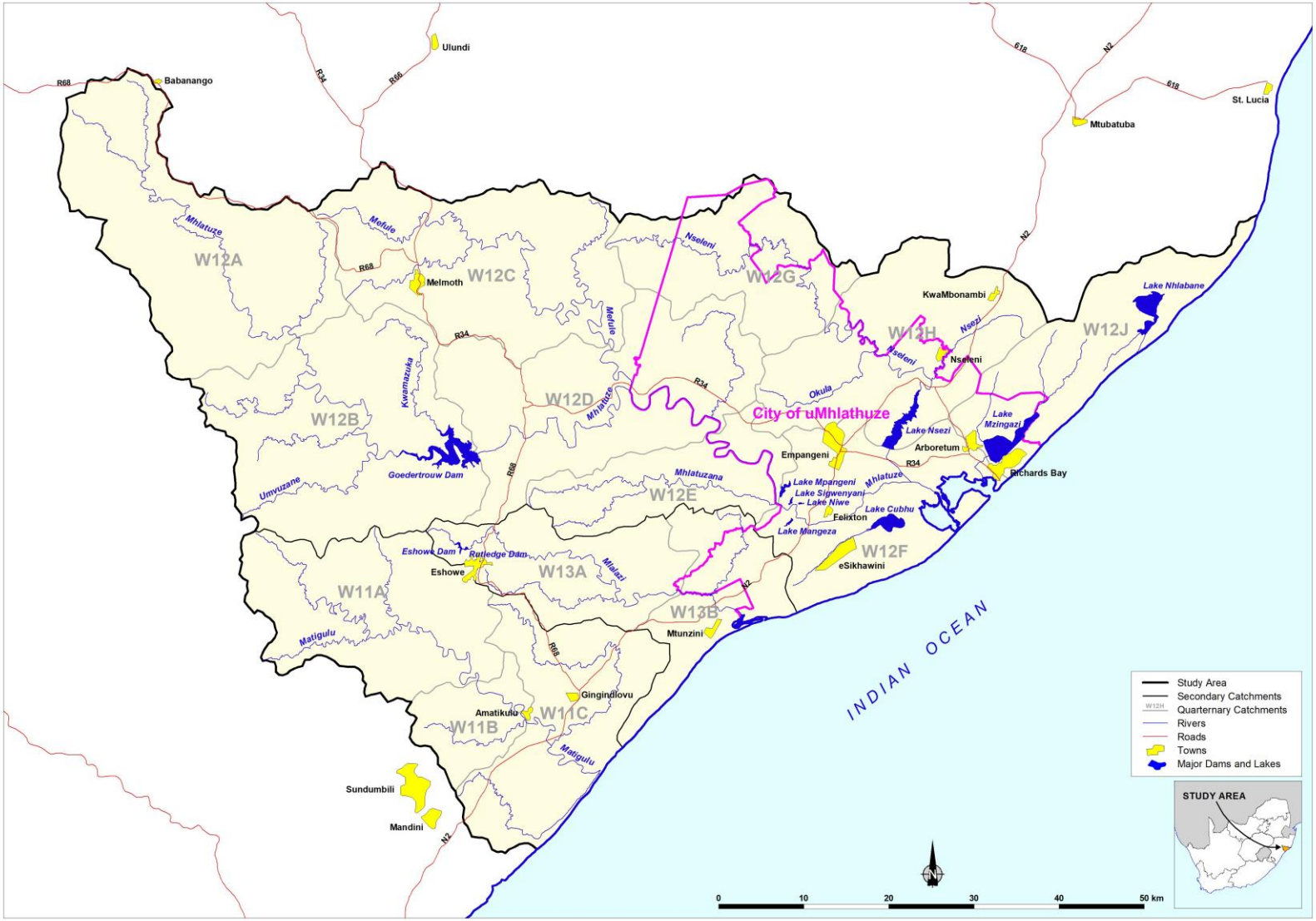
Calibrate lake hydrology based on:

- Revised afforestation in lake catchments
- Separation of lake catchments into Quinary
- Recalibration of Pitman model in lake catchments
- Utilisation of DWS data on lake levels and discharges in calibration
- Derivation of lake surface water inflow, groundwater inflow and outflow time series 1920-2003

Justification

- 3 of the coastal lakes (Mzingazi, Nhlabane and Cubhu) have significant groundwater inflows and outflows and cannot be simulated using Pitman model without taking groundwater into account
- A method is required to calculate groundwater contributions in a manner compatible with Pitman Model (90+ year monthly time series)
- Changing rainfall-runoff and recharge relationship due to afforestation
- Calibration of lake level and discharge where data exists
- Output compatible with WRYM/WRPM
- Model must incorporate changing weir elevation and area-storage relationships

Coastal Lakes



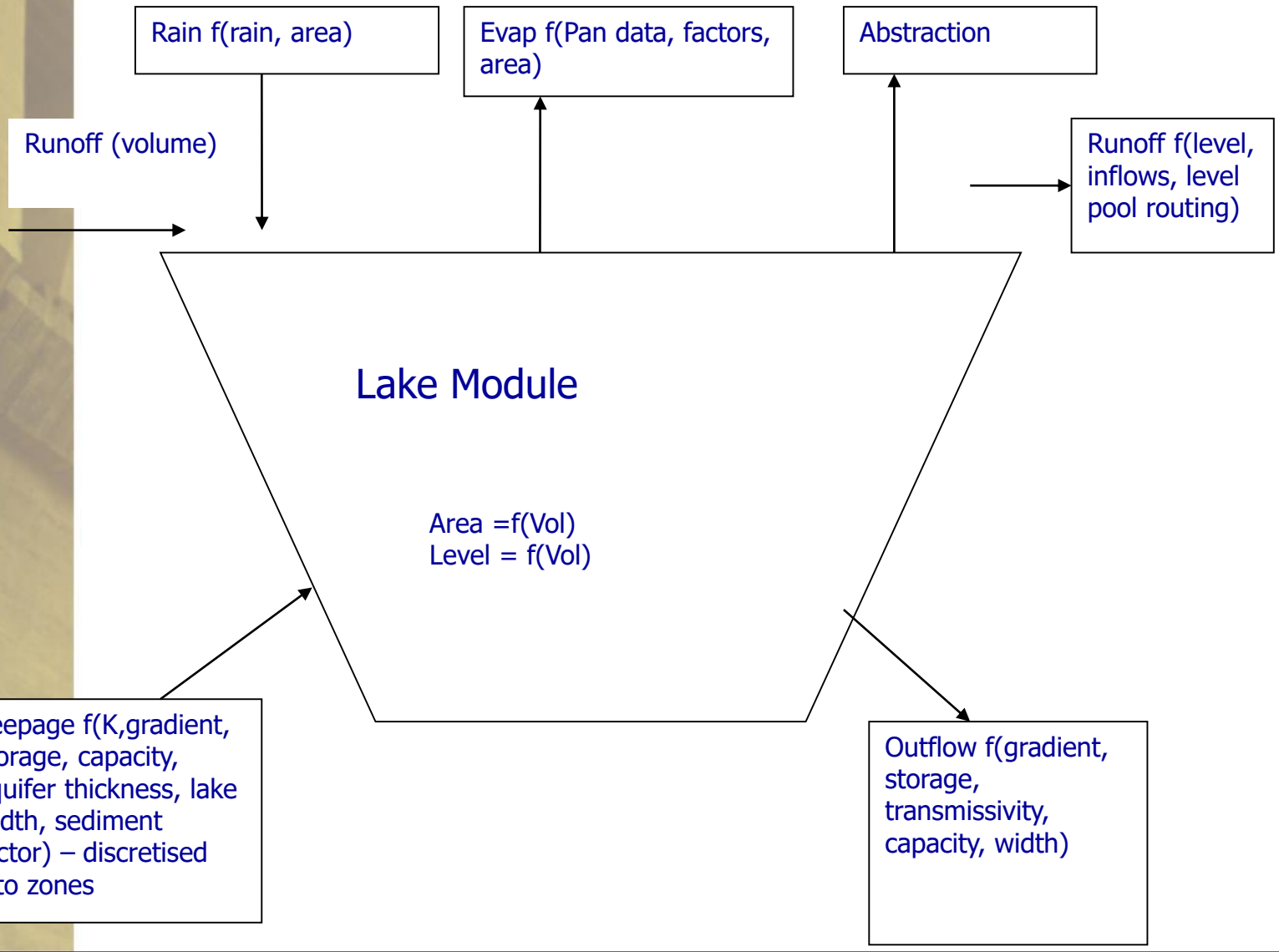
Coastal Lakes - Cubhu, Mzingazi and Nhlabane

- Fed by rainfall interception, surface runoff from riparian zones, stream baseflow, direct groundwater seepage
- Runoff is largest component of water balance, hence accurate SW-GW modelling is critical
- Throughflow characteristics, with groundwater entering and discharging from the lakes
- Seepage greatest near shoreline, decreasing exponentially with distance underneath the lake.

Approach

- Lake catchments subdivided by groundwater basin (area contributing groundwater to the lake)
- Pitman Model applied to generate surface water runoff to lakes (with growth of afforestation)
- SW-GW interaction module in Pitman model (Sami module) applied to quinary feeding the lake to generate an aquifer storage time series with change in recharge dynamics due to afforestation
- Aquifer storage, abstraction and surface water runoff input into lake module
- Model calibrated against lake level and discharge data
- Model naturalised to generate a lake surface water inflow, groundwater inflow and outflow time series

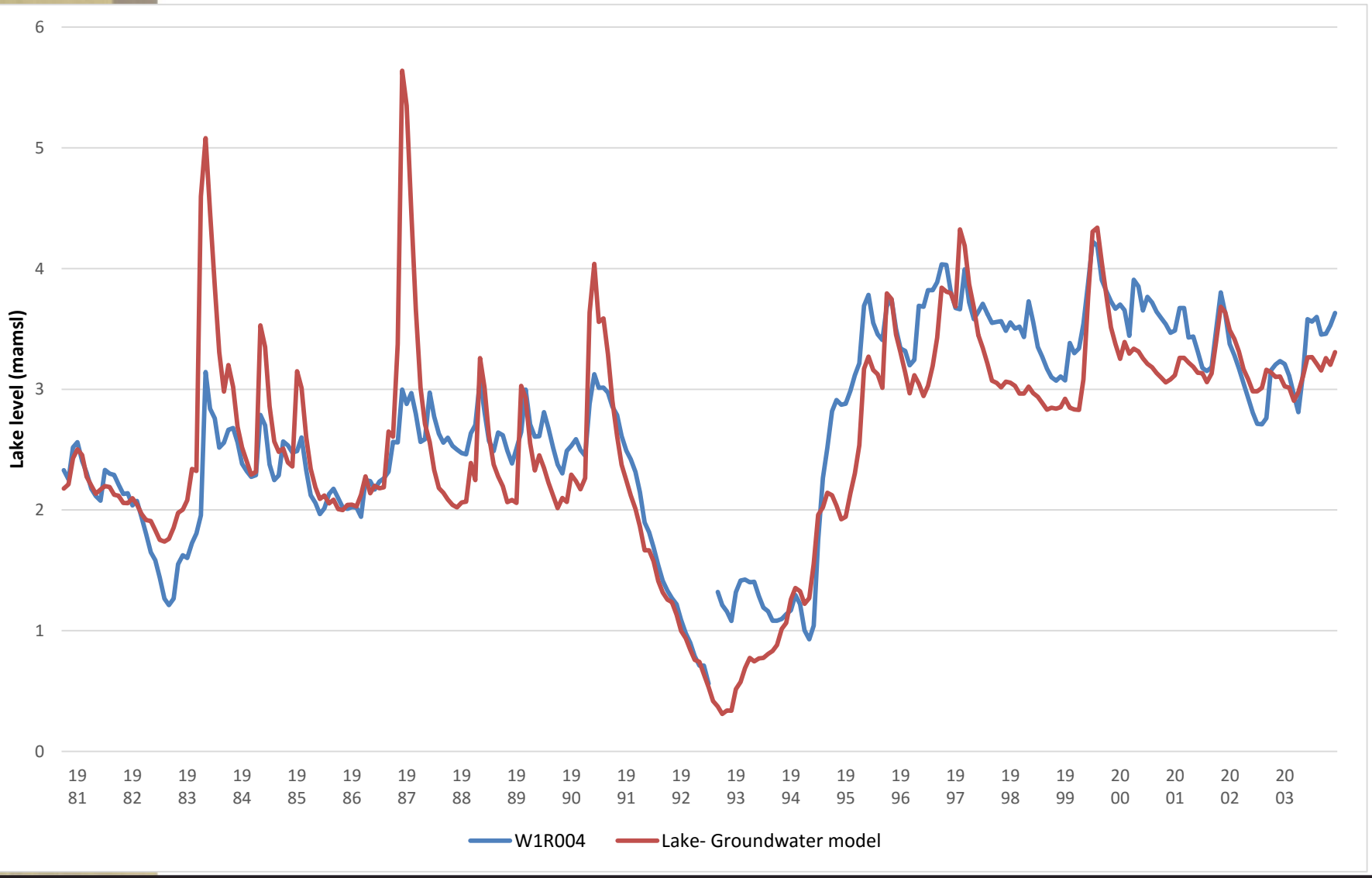
Structure of Lake Module



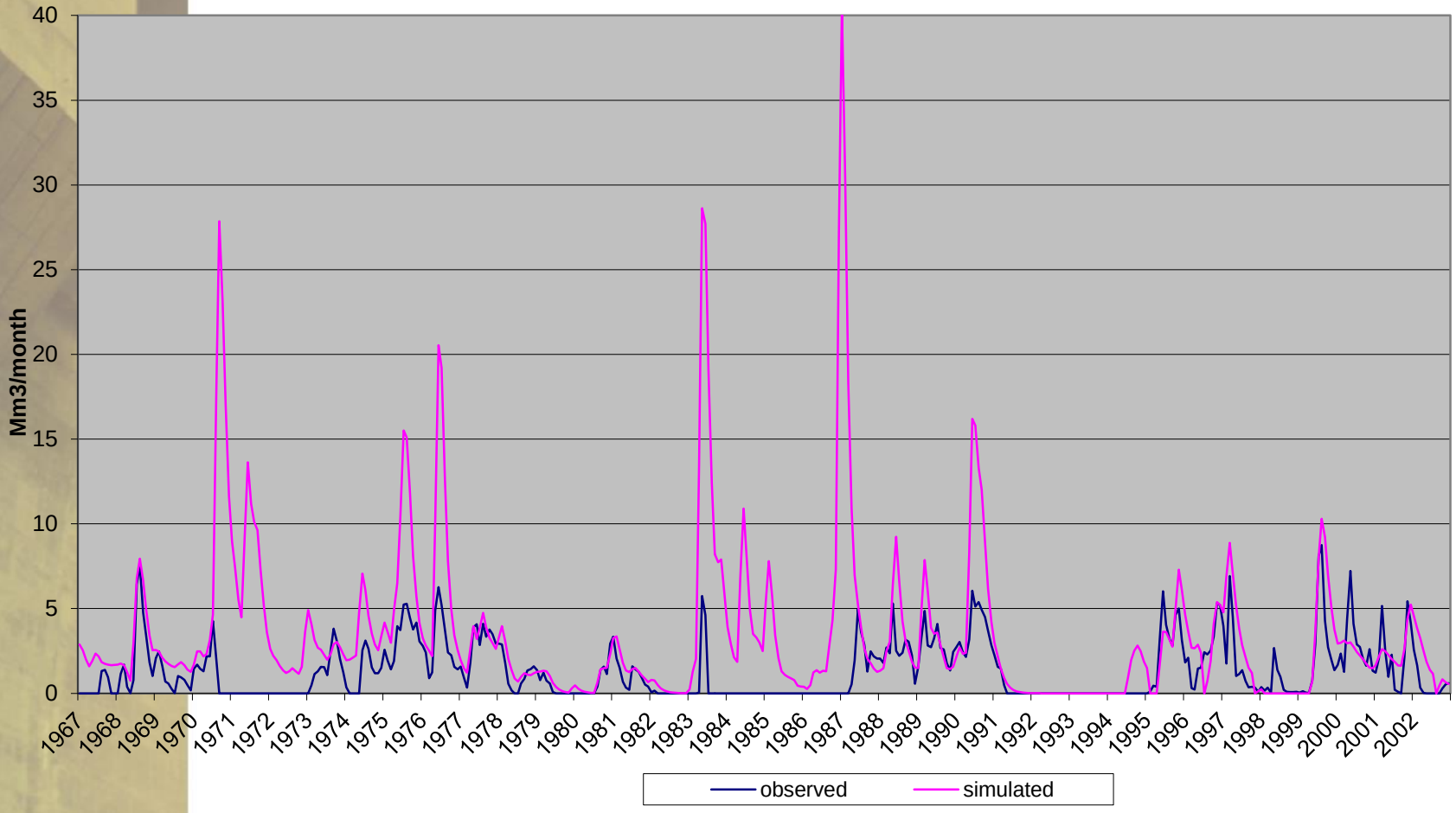
Lake Module

- Area and level fluctuate as function of volume
- Uses surface Inflows from Pitman model
- Runoff routed using level pool routing as a function of level
- GW inflow fluctuates with GW storage and is function of lake width/aquifer thickness ratio
- Based on parameters already available

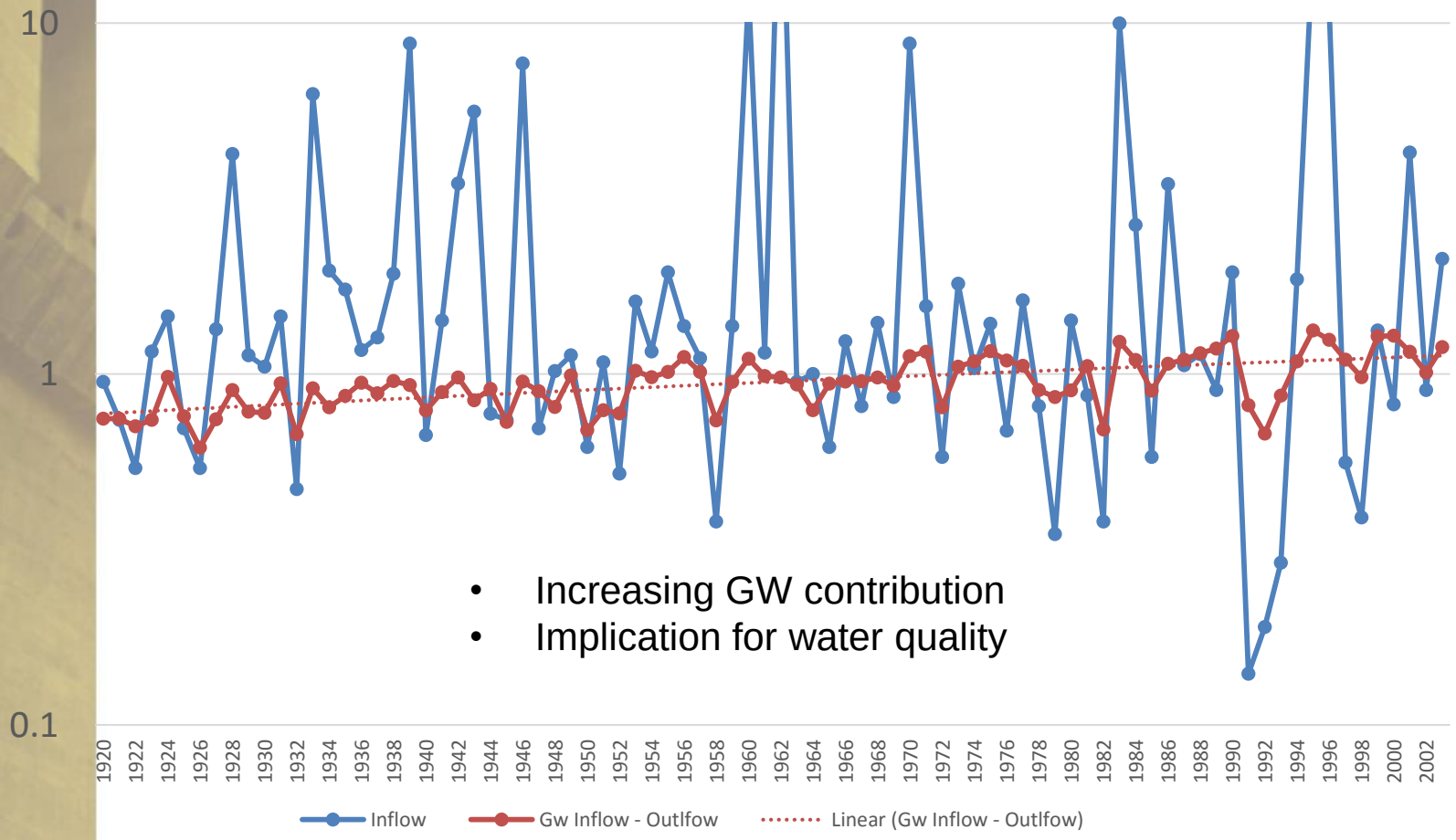
Lake Mzingazi Level



Lake Mzingazi Discharge simulated vs Outlet weir



Lake Mzingazi July Inflows
Dry Season GW contribution



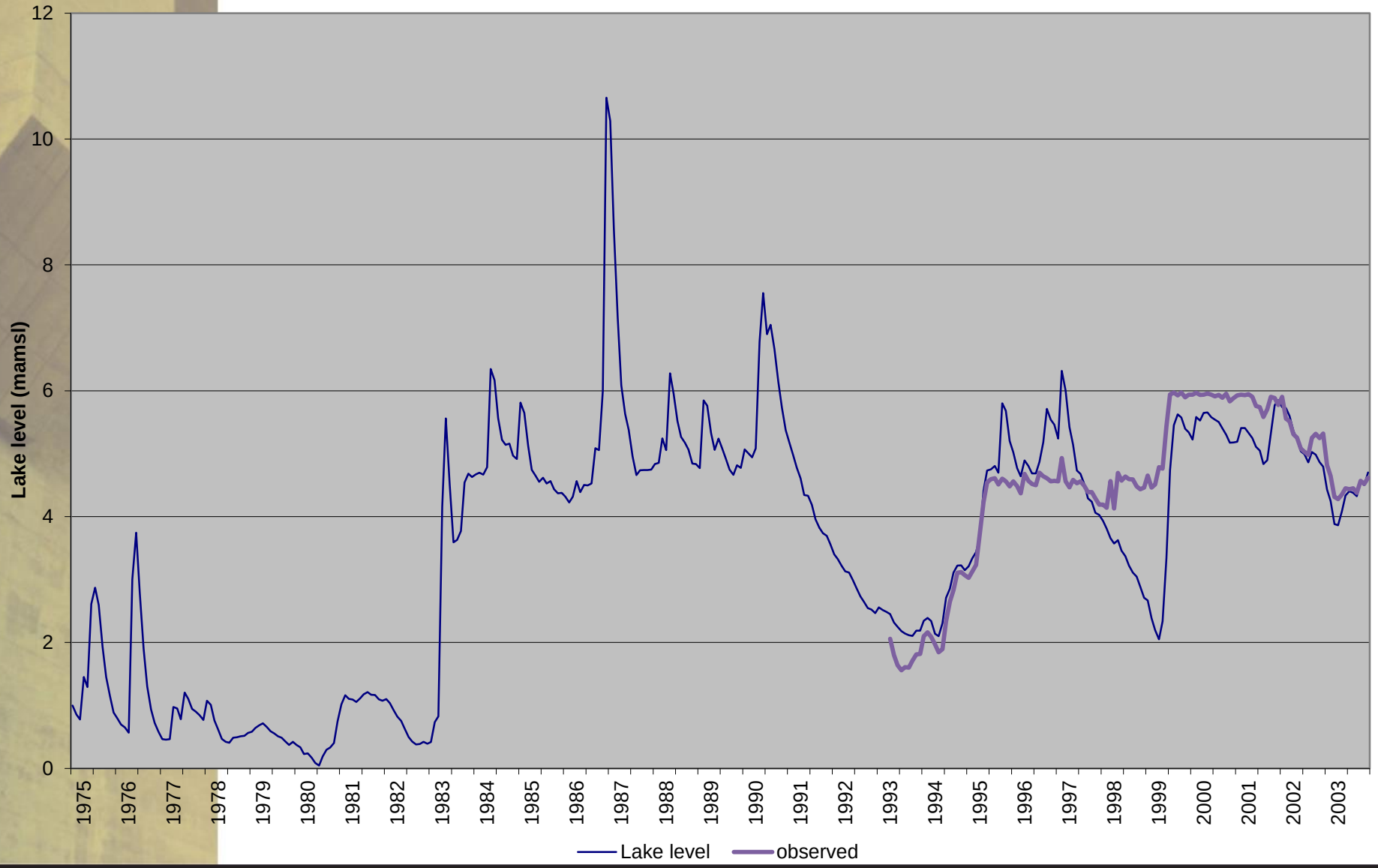
- Increasing GW contribution
- Implication for water quality

Water Balance Post 1995

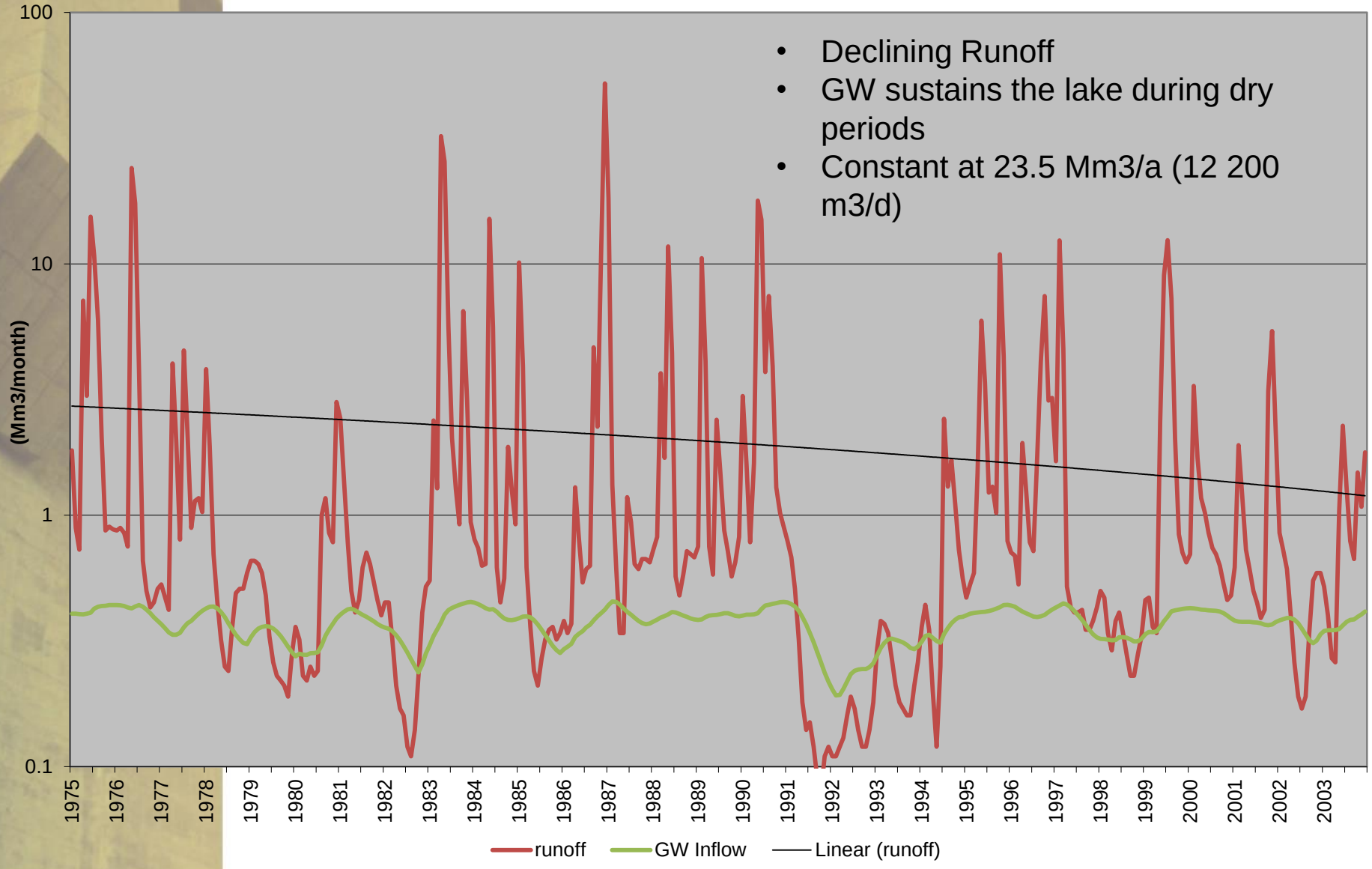
Inflows (Mm^3/a)		Outflows (Mm^3/a)	
Rainfall	14.79	Evaporation	13.64
Surface Inflow	28.52	Abstraction	13.35
GW Inflow	14.78	Surface water outflow	28.31
Lake Storage	2.21	Groundwater water outflow	0.58

- Surface inflow is 2/3 of contribution (includes baseflow)
- GW Inflow 1/3 but most important in dry periods

Lake Nhlabane water level



Lake Nhablane – Runoff and GW Inflows



- Declining Runoff
- GW sustains the lake during dry periods
- Constant at 23.5 Mm3/a (12 200 m3/d)

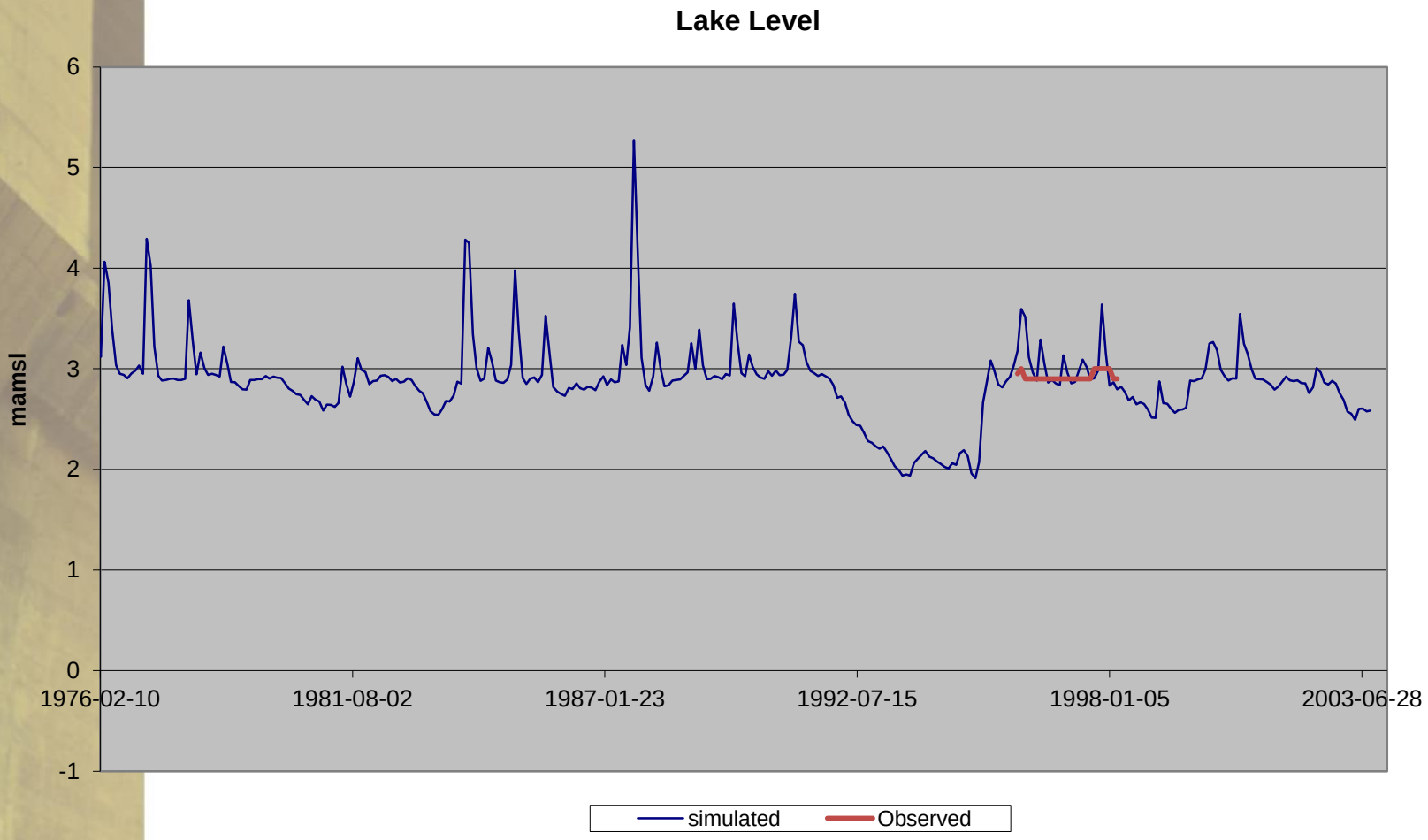
Lake Nhlablane – Water Balance 1975-2005

Inflow		Outflow	
Rainfall Mm^3/a	13.11	Evaporation Mm^3/a	12.29
Surface Runoff Mm^3/a	23.48	Abstraction Mm^3/a	10.94
Gwater inflow Mm^3/a	4.45	Runoff Mm^3/a	16.26
Lake Storage Mm^3/a	1.05	Gwater outflow Mm^3/a	0.50
TOTAL	41.04	TOTAL	39.99

1920-1975

Inflow		Outflow	
Rainfall Mm^3/a	9.21	Evaporation Mm^3/a	8.47
Surface Runoff Mm^3/a	23.72	Abstraction Mm^3/a	0.00
GWater Inflow Mm^3/a	4.50	Runoff Mm^3/a	28.38
Storage Mm^3/a	0.07	Gwater outflow Mm^3/a	0.51
TOTAL	37.43	TOTAL	37.36

Lake Cubhu


Lake Level
6
5
4
3
2
1
0
-1
mamsl
1976-02-10
1981-08-02
1987-01-23
1992-07-15
1998-01-05
2003-06-28
simulated
Observed

Way Forward

- Naturalise by removing afforestation and keeping outlet weirs at present level to generate T/S of surface and groundwater inflow and outflow
- Hydrology has slight variations to WAA hydrology for the lake catchments. Does it affect yield?
- Recommendations for incorporation of revised lake hydrology into Yield Model

QUESTIONS FOR CLARIFICATION

water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

IMPLEMENTATION AND MAINTENANCE OF THE WATER RECONCILIATION STRATEGY FOR RICHARDS BAY AND SURROUNDING TOWNS

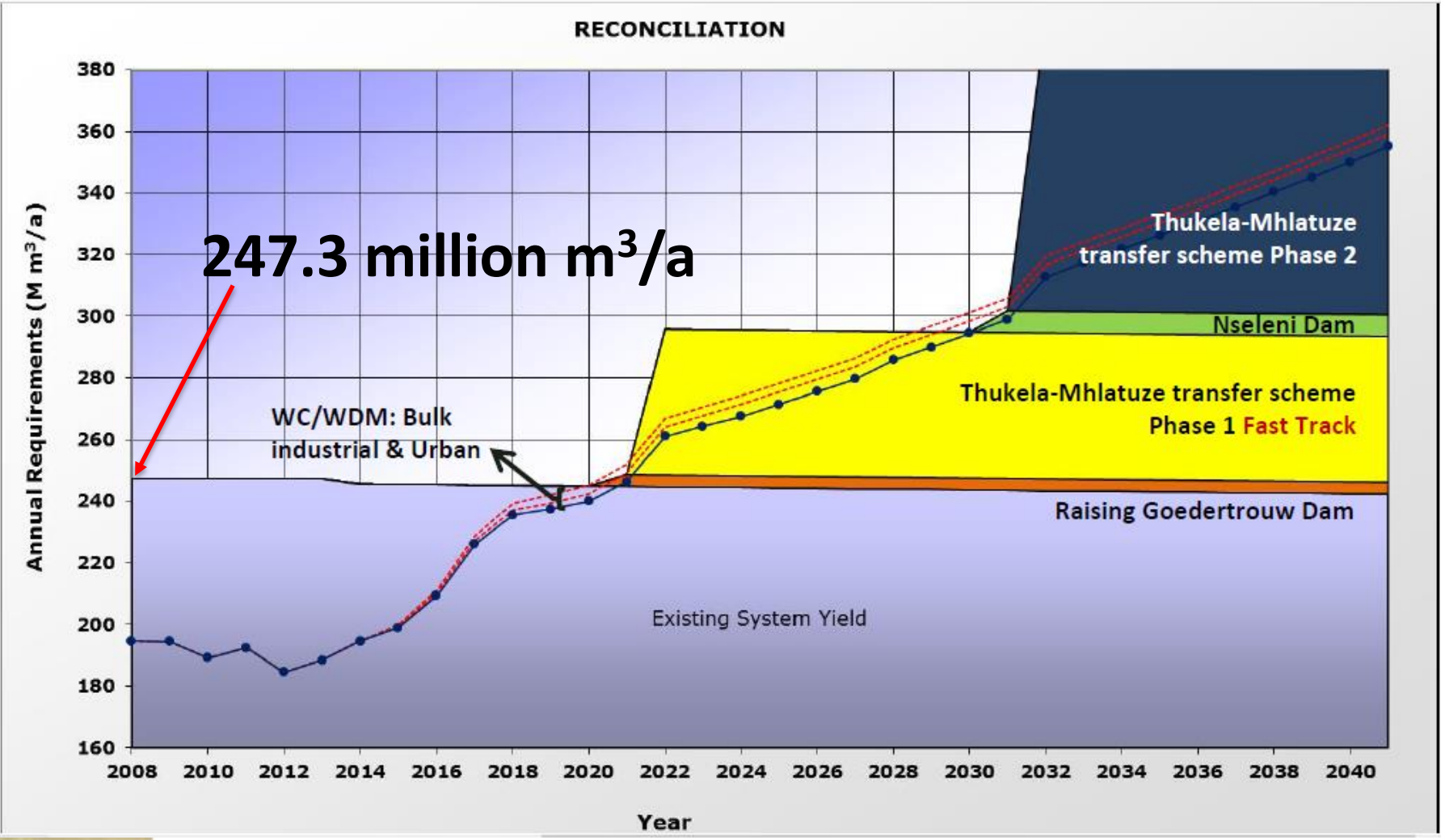
Strategy Steering Committee Meeting (StraSC) 3

Item 9.2: Water Resources Assessment

TASK 7: Water Resources

- Hydrology, system yields, water resource model configuration, groundwater (subtask 5)
- Previous Water Resources Studies:
  - Mhlathuze Operating Rules and Future Phasing (2001)
  - Mhlathuze Water Availability Assessment (2009)
  - Modelling Support for Licensing Scenarios (2012)
  - Stand Alone Dams (Rutledge & Eshlazi) (2015)
  - Goedertrouw AOA (2017 & 2019)
- Water Resources Summary, Recon Strategy (2015)

Recon (2015) Final Strategy Report



- Demands to exceed existing yield: 2021
- High growth projection system demand to reach 355 million in 2040

Components to configure water resources model

- Hydrology, (rainfall, streamflow) MWAAS 1920-2004
- Infrastructure
  - Existing dams and transfers
  - Future options
- Water requirement projections
  - Individual users per sector
  - Scenario options
- Environmental requirements
- Operating Rules

Environmental Requirements

2.3.1.2 EWRs established in 2012

According to DWA (2015b), DWS RDM produced a new set of River Quantity ecological water requirements (EWRs) in 2012 which superseded all previous EWRs that had been used. This preliminary Reserve has been approved by DWS and therefore has a legal status. From this report it is not certain at what level of confidence the new set of EWRs

PRELIMINARY DETERMINATION OF THE RESERVE AND RESOURCE CLASS IN TERMS OF SECTION 14(1) (b) AND 17 (1) (b) OF THE NATIONAL WATER ACT, 1998 (ACT NO. 36 OF 1998)

I, **NDILEKA MOHAPI**, in my capacity as Chief Director: Water Ecosystems, and duly authorised in terms of section 63 of the National Water Act, 1998 (Act No. 36 of 1998), do hereby declare the preliminary determination of the Reserve and preliminary resource class as contained below.

CHIEF DIRECTOR: WATER ECOSYSTEMS

DATE: 2012 -05- 15

1. Description of Water Resource

River(s) : Mhlatuze, Mfuli & Nseleni Rivers
Drainage Region : W12A-H
Water Management Area : 6 – Usuthu to Mhlatuze

2. Preliminary determination of the Reserve for Water Quantity in terms of section 17(1) (a)

Quaternary Catchment	Water Resource	Ecological Reserve (%) NMAR	Ecological Reserve Volume (MCM)	Basic Human Needs (%NMAR)	*Total Reserve (%)	NMAR (MCM)
W12A	***Mhlatuze River: Estimated from IFR site 1	38.1	24.7	0.40	38.5	64.8
W12B	**Mhlatuze River: IFR Site1	30.5	54.3	0.06	30.6	156.7
W12C	***Mfuli River: Estimated from IFR Site 2	26.3	13.4	0.16	26.4	50.8
W12D	**Mhlatuze River: IFR Site 2	26.3	70.8	0.14	26.4	195.2
W12D	**Mhlatuze River: IFR Site 3	26.6	81.8	0.10	26.7	265.8
W12E	**Mhlatuze River: IFR Site 4	11.4	40.3	0.11	11.5	278.1

RESERVE DETERMINATION STUDIES FOR SELECTED SURFACE WATER, GROUNDWATER, ESTUARIES AND WETLANDS IN THE USUTU/MHLATUZE WATER MANAGEMENT AREA
WP 10544

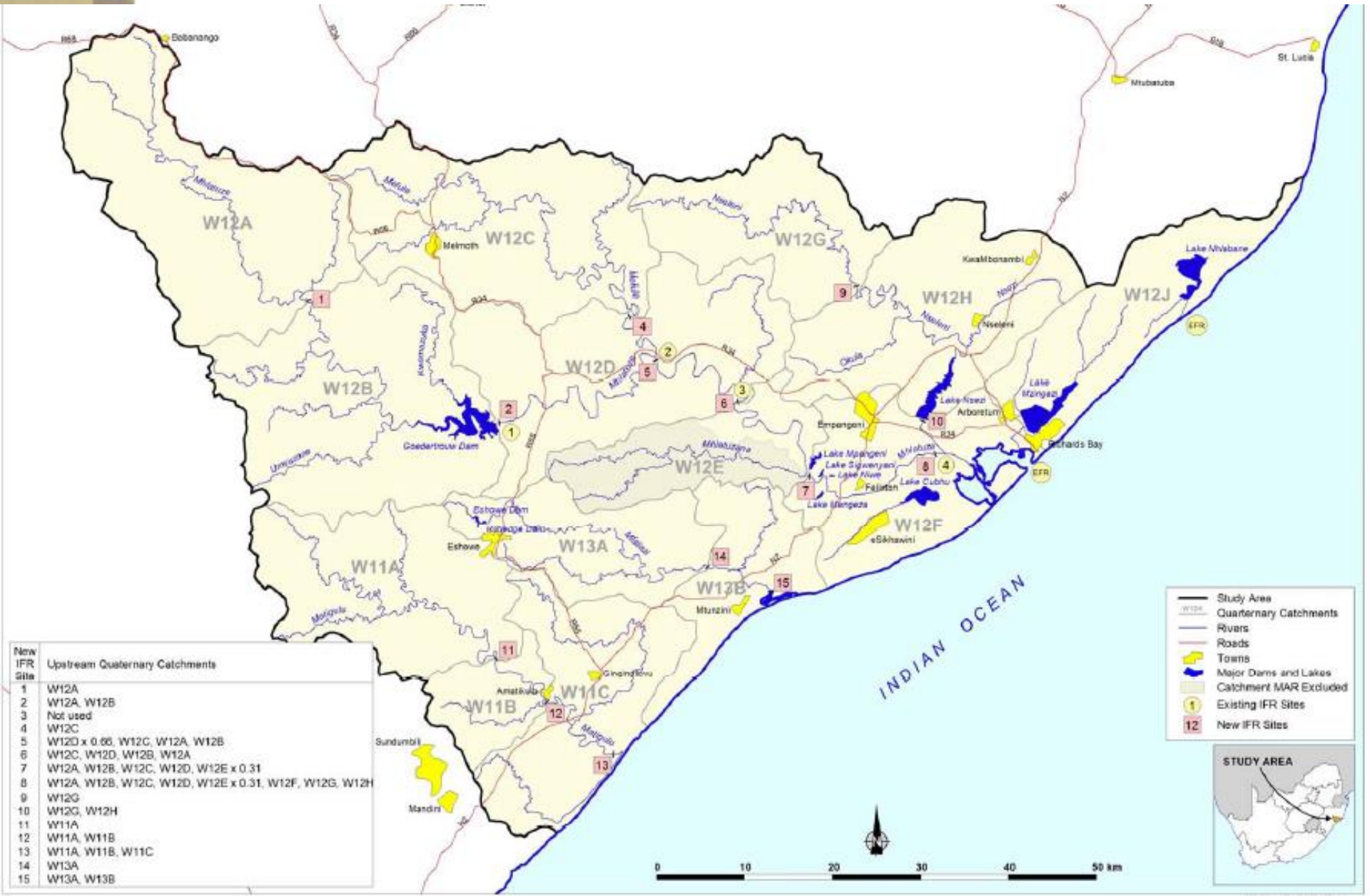
SUMMARY OF RELEVANT EWR INFORMATION FOR MHLATUZE AND NHLABANE ESTUARIES

FINAL

AUGUST 2015
Report No. RDM/WMA6/CON/COMP/2013

GNITY

EWR Site Locations



New IFR Site	Upstream Quaternary Catchments
1	W12A
2	W12A, W12B
3	Not used
4	W12C
5	W12D x 0.66, W12C, W12A, W12B
6	W12C, W12D, W12B, W12A
7	W12A, W12B, W12C, W12D, W12E x 0.31
8	W12A, W12B, W12C, W12D, W12E x 0.31, W12F, W12G, W12H
9	W12G
10	W12G, W12H
11	W11A
12	W11A, W11B
13	W11A, W11B, W11C
14	W13A
15	W13A, W13B

Operating Rules

- Thukela transfer (pumping) only until Goedertrouw full (current 1.2 m^3/s increased to 2.4 m^3/s, less 10%)
- Lake minimum maintenance levels applicable
- Secondary supply from Mhlathuze weir to Esikhaweni WTW, to be used when Lake Cubhu drops below maintenance level
- Secondary supply from Nsezi WTW to Richards Bay, to be used when Lake Mzingazi drops below maintenance level and Mzingazi WTW shuts down
- RBM
  - Smelter priority Lake Nhlabane, 2nd Lake Nsezi
  - Ponds, priority Umfolozi, 2nd Lake Nhlabane, 3rd Lake Nsezi

Modelling Approach

- Multiple Stochastic flow projected sequences used, ie. results not just based on single historical sequence
- Impose growing demands on system, allow restrictions based on yield capability of resources
- System “deficit” occurs when the risk of user restrictions exceeds allowable risk as stipulated in priority classification table

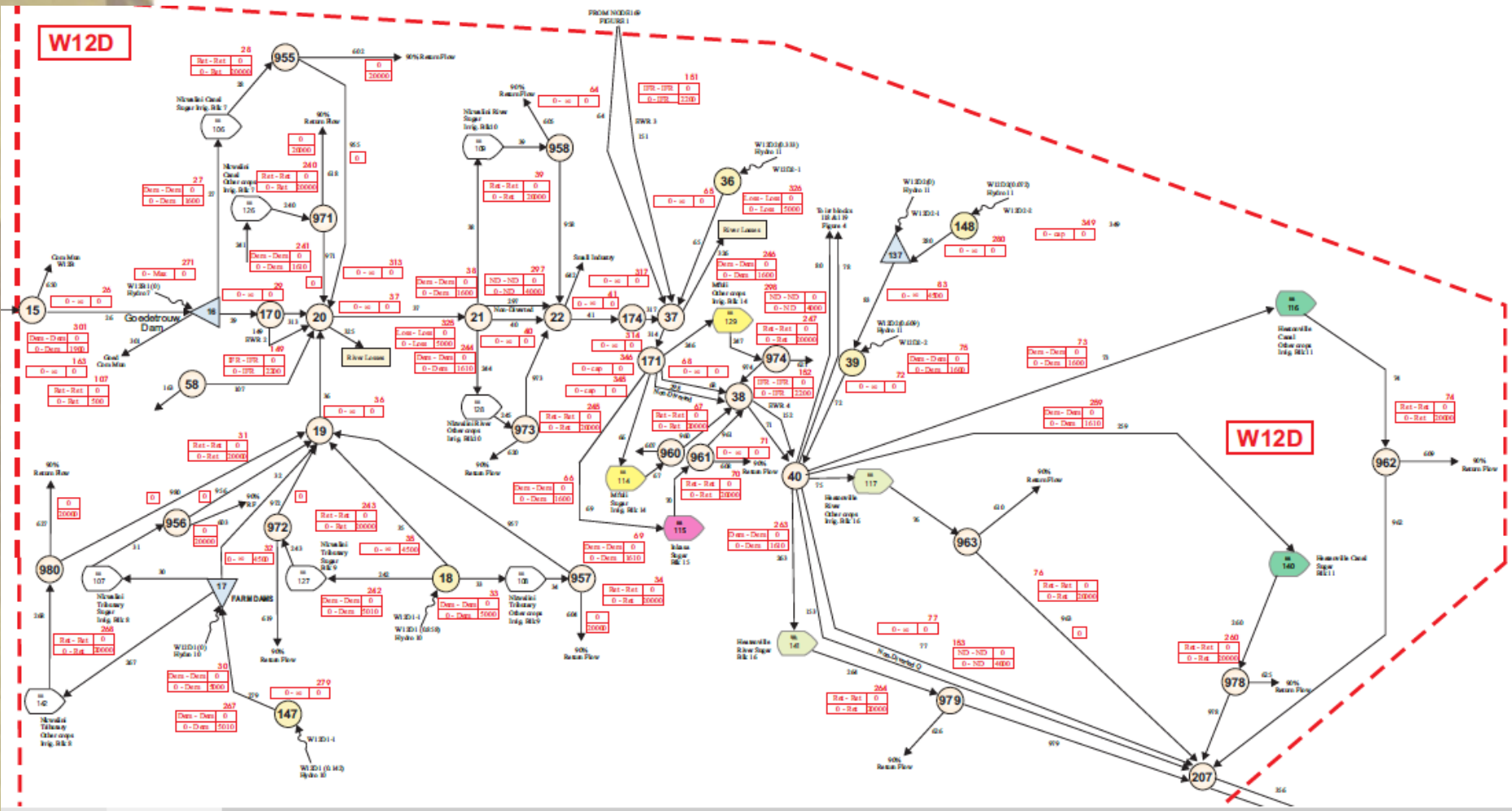
User Sector Priority Classification Table

- NB: has direct impact on yield available from system

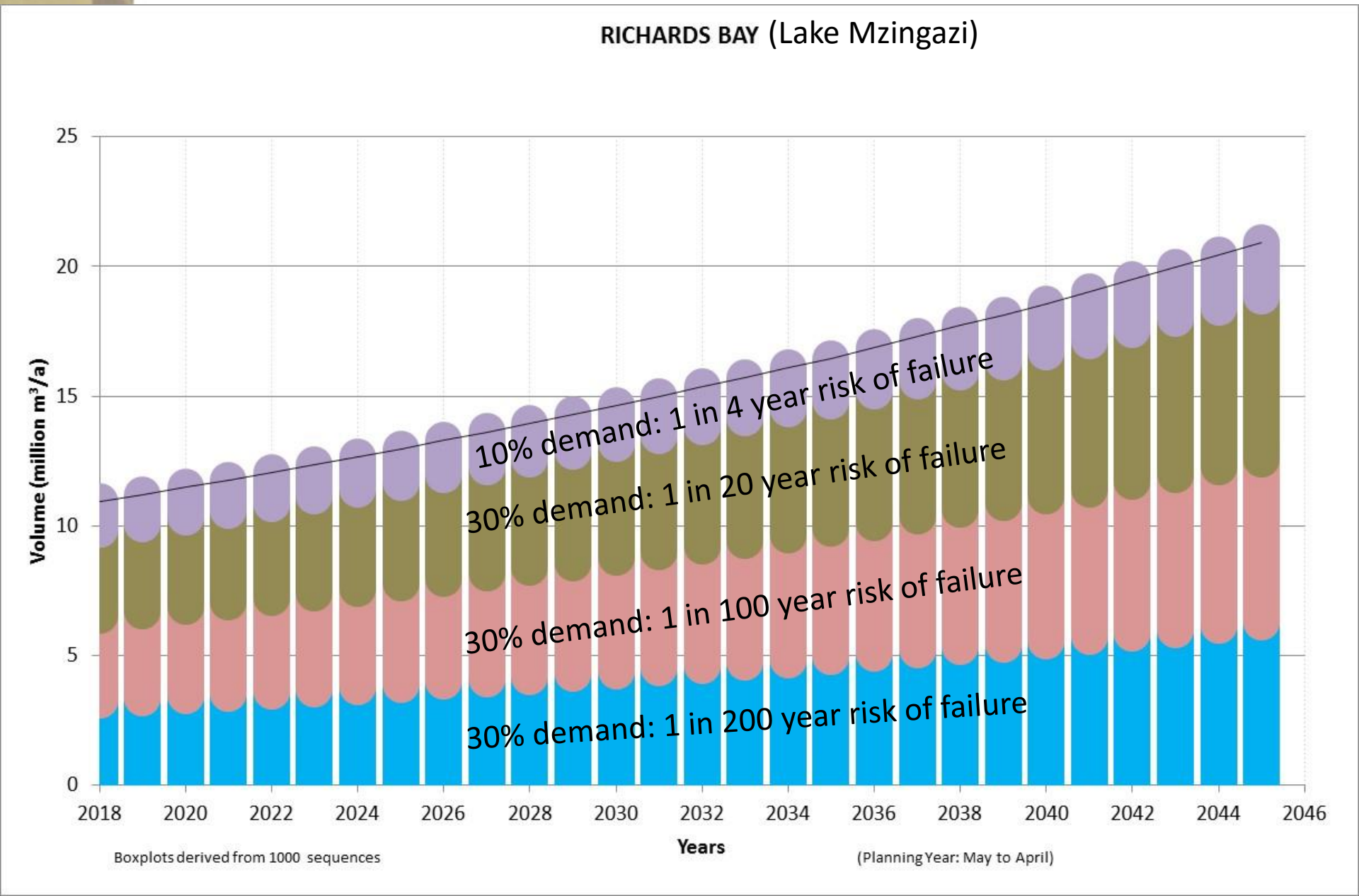
Risk of Non Supply	Assurance (failure recurrence)	Irrigation	Domestic	Industry
Very Low	1:200		30%	70%
Low	1:100		30%	20%
Medium	1:50	50%		
High	1:20		30%	10%
Very High	1:4	50%	10%	

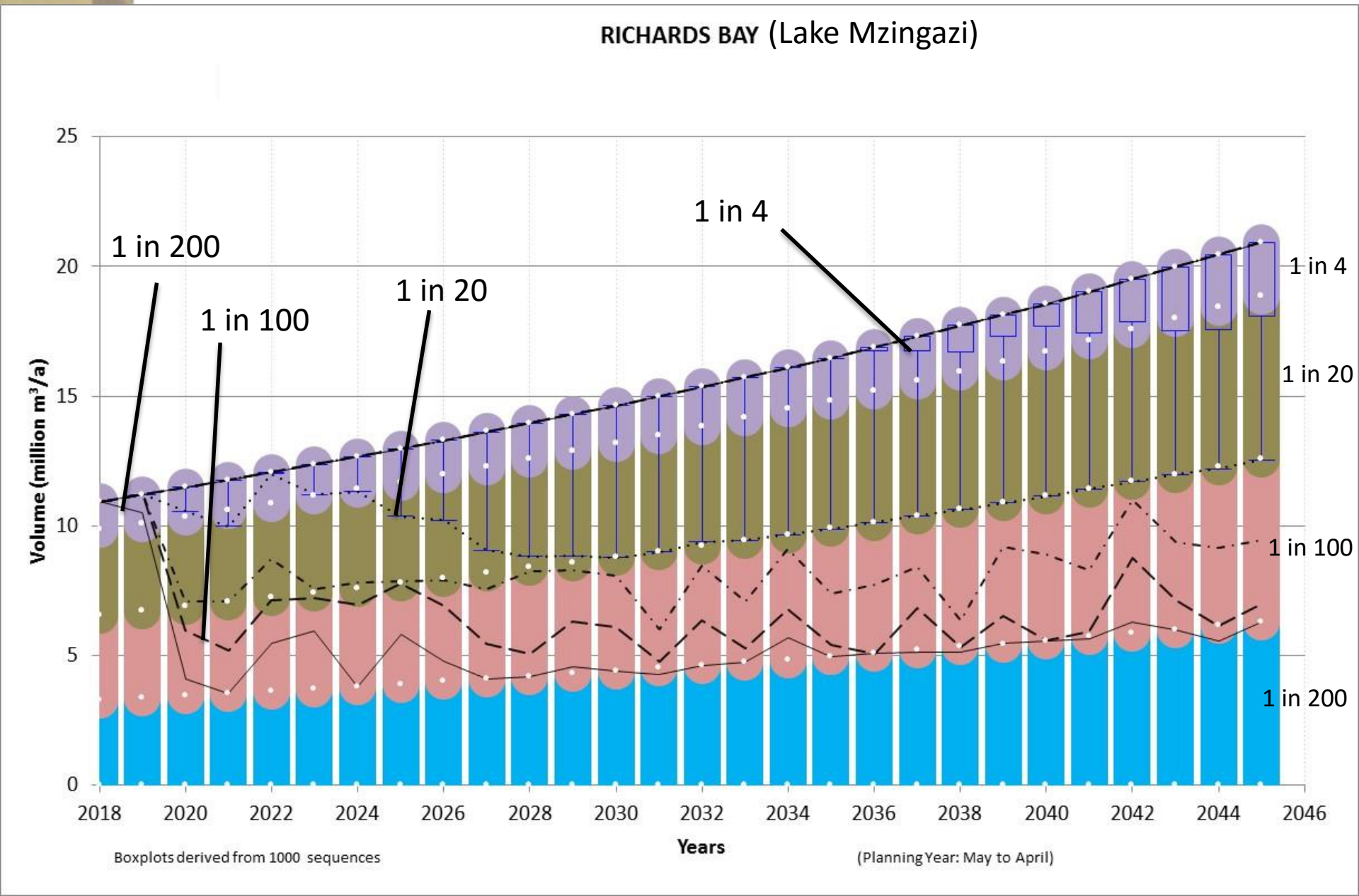
Risk of Non Supply	Assurance (failure recurrence)	Irrigation	Domestic	Industry
Very Low	1:200		30%	70%
Low	1:100	20%	30%	20%
Medium	1:50	40%		
High	1:20		30%	10%
Very High	1:4	40%	10%	
Total		100%	100%	100%

Eg. Of Network Diagram

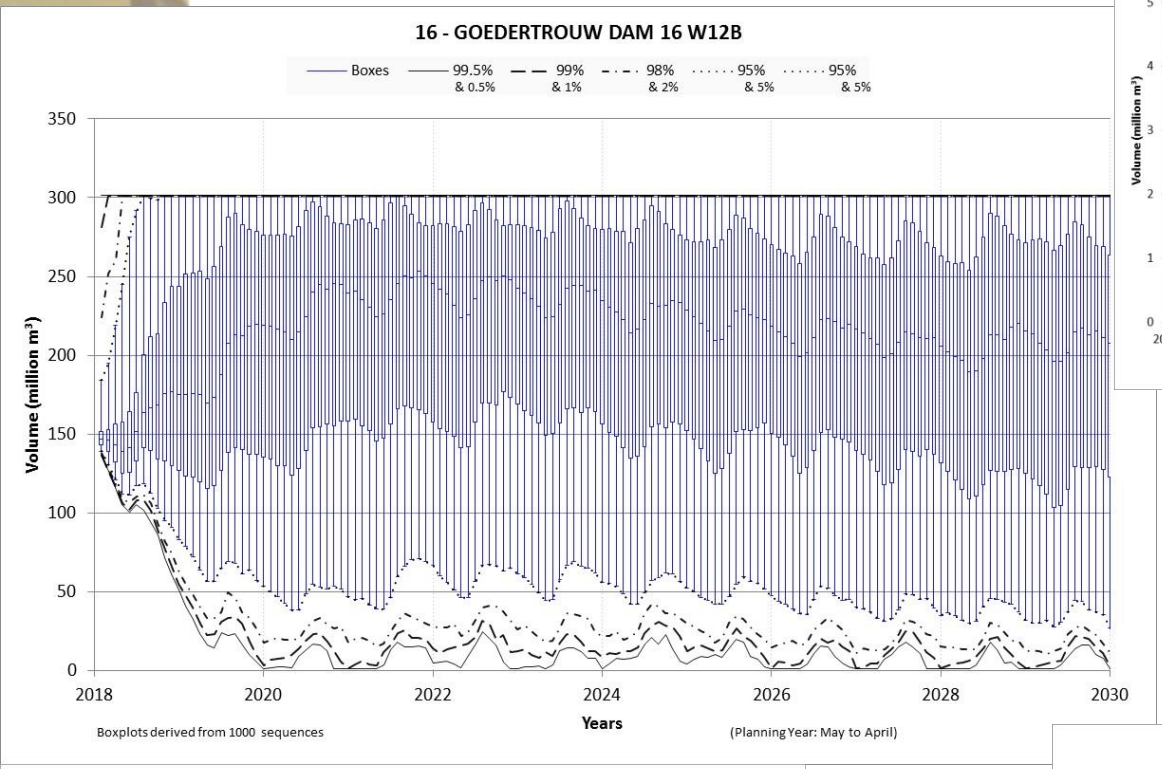


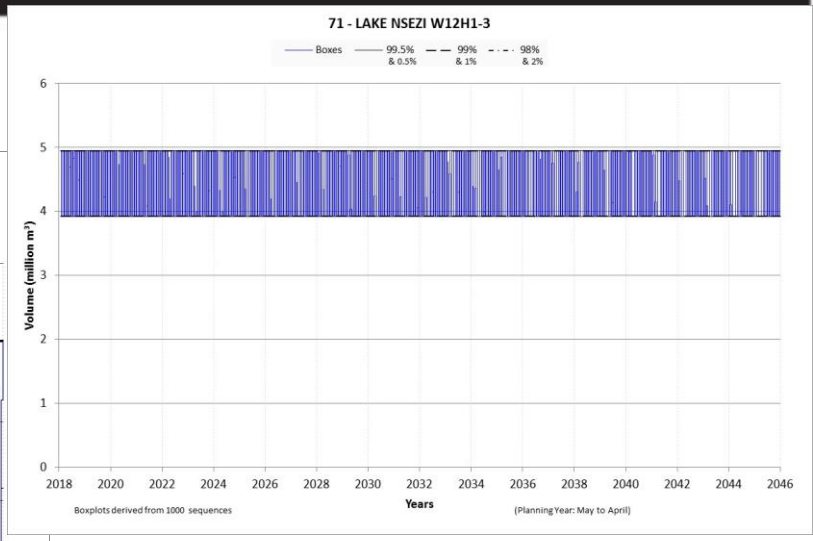
Typical Model results

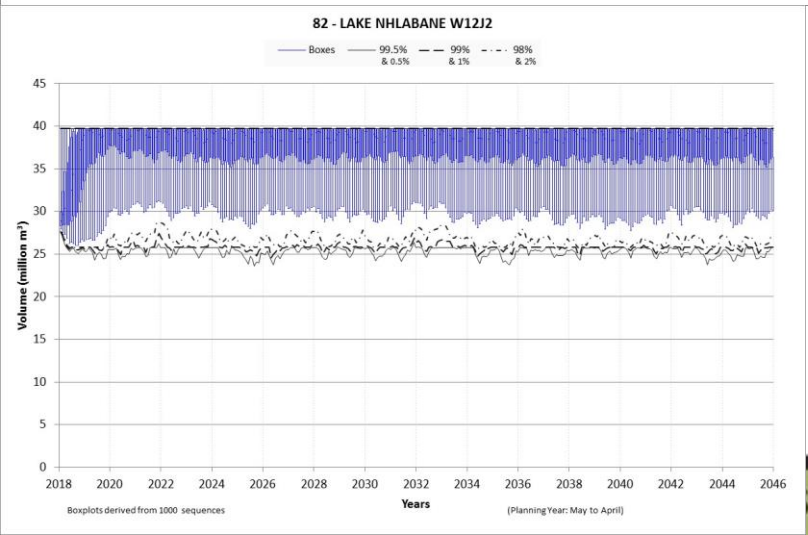


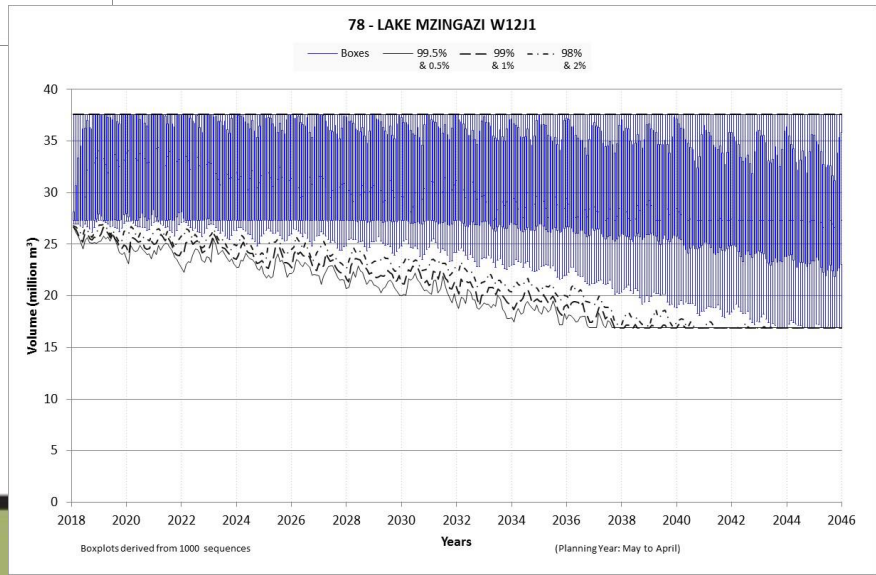

RICHARDS BAY (Lake Mzingazi)
1 in 200
1 in 100
1 in 20
1 in 4
1 in 4
1 in 20
1 in 100
1 in 200
Volume (million m³/a)
0
5
10
15
20
25
2018
2020
2022
2024
2026
2028
2030
2032
2034
2036
2038
2040
2042
2044
2046
Years
Boxplots derived from 1000 sequences
(Planning Year: May to April)

Model results



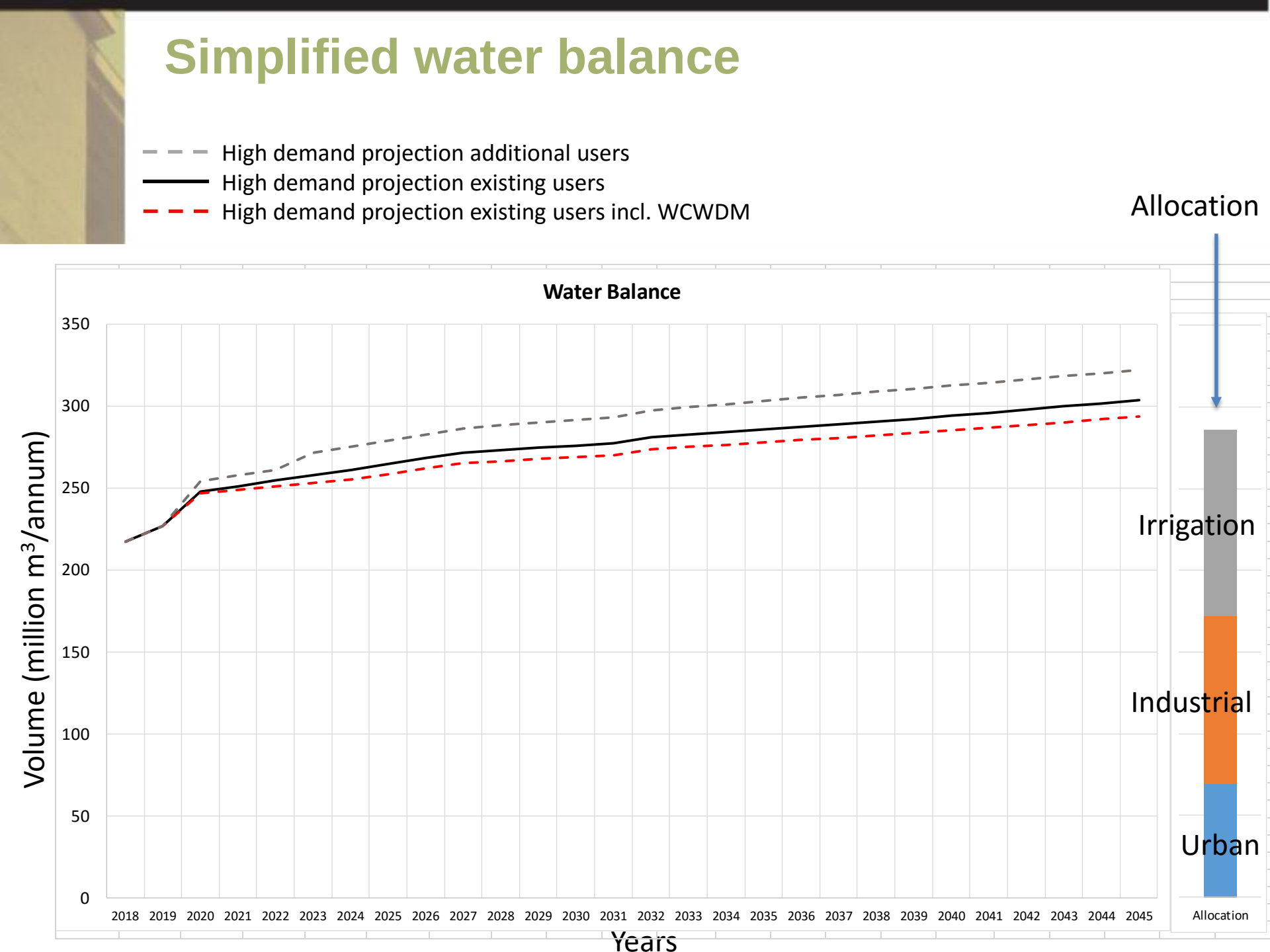






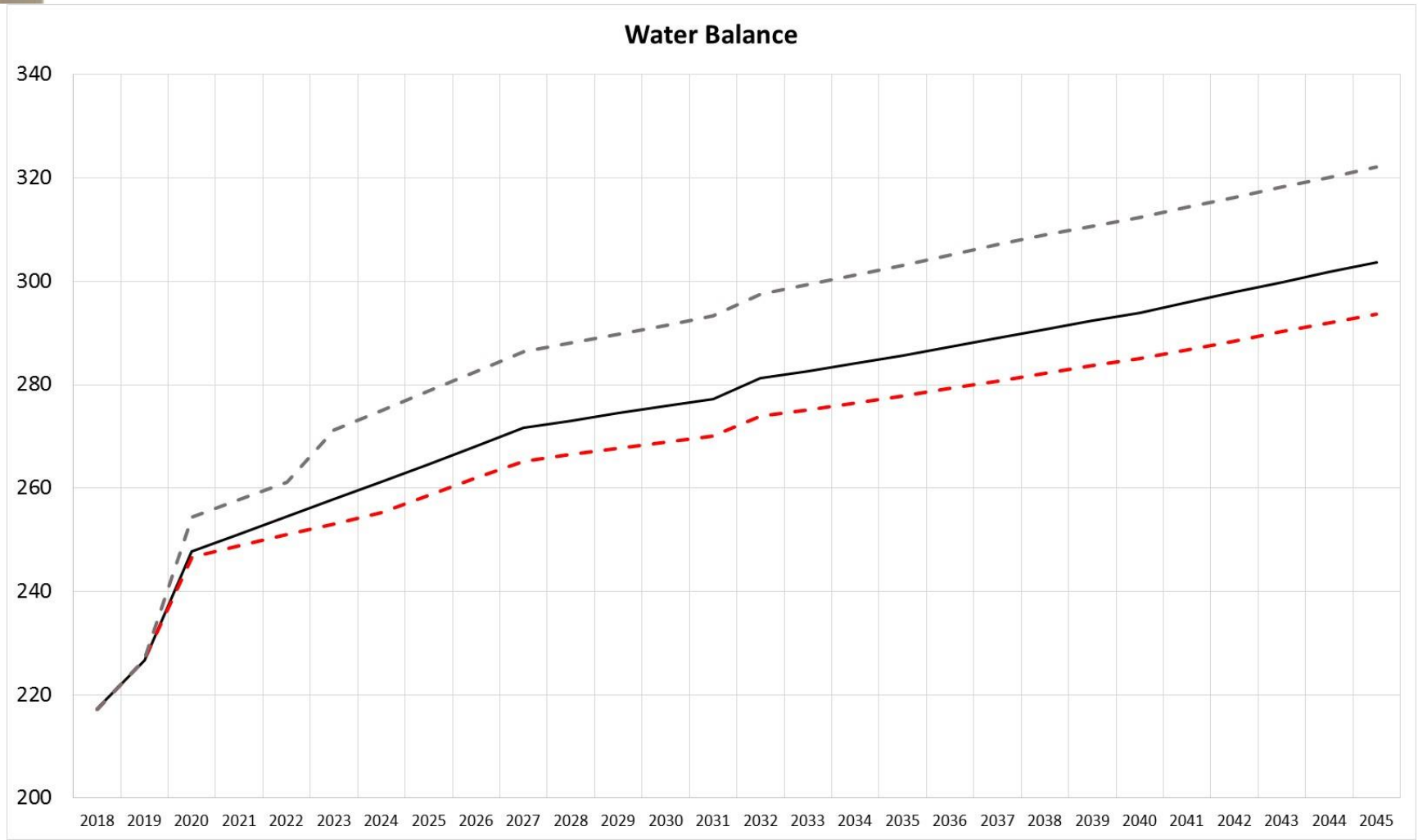
DIGNITY

Simplified water balance

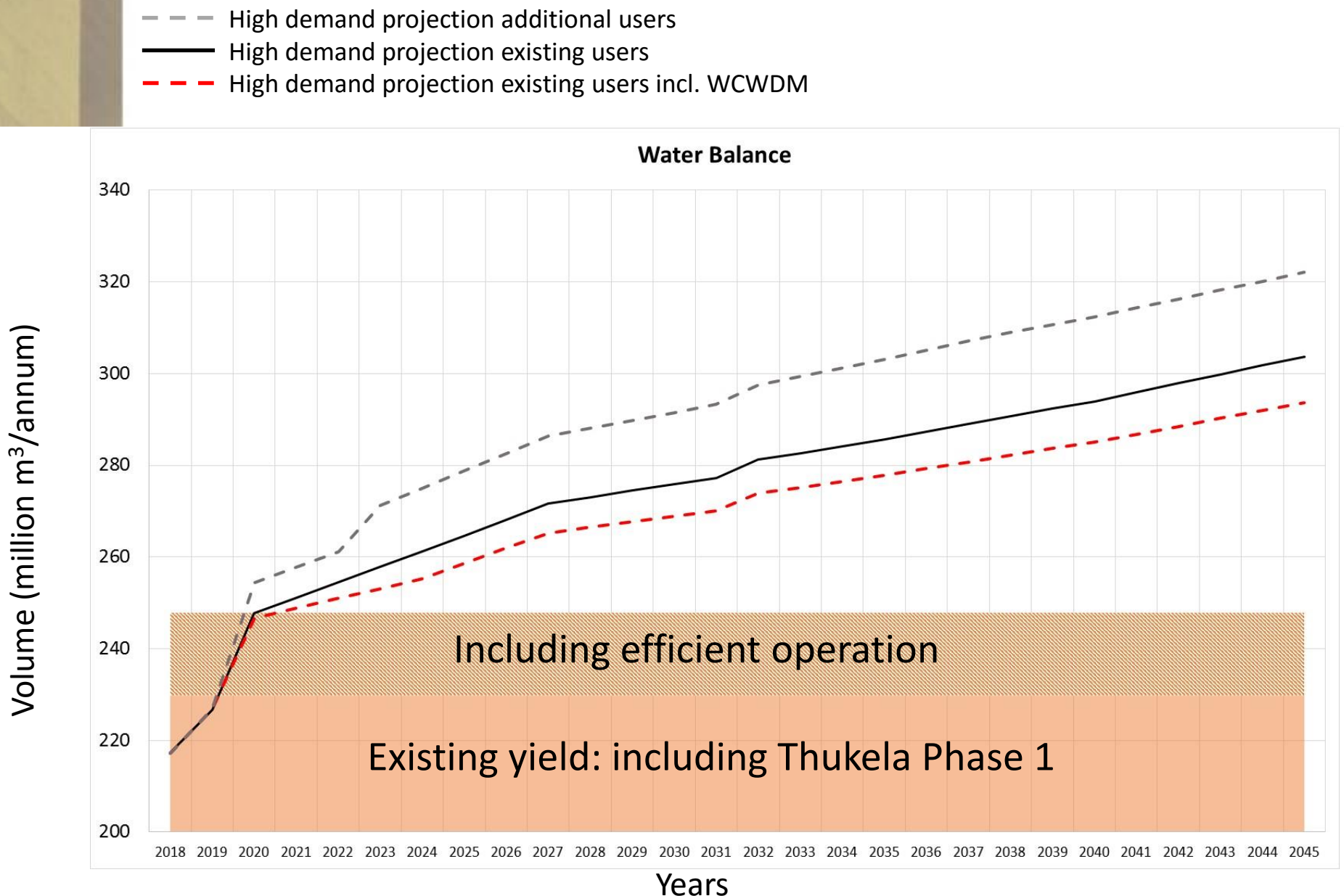


Adjusted scale

High demand projection additional users
High demand projection existing users
High demand projection existing users incl. WCWDM

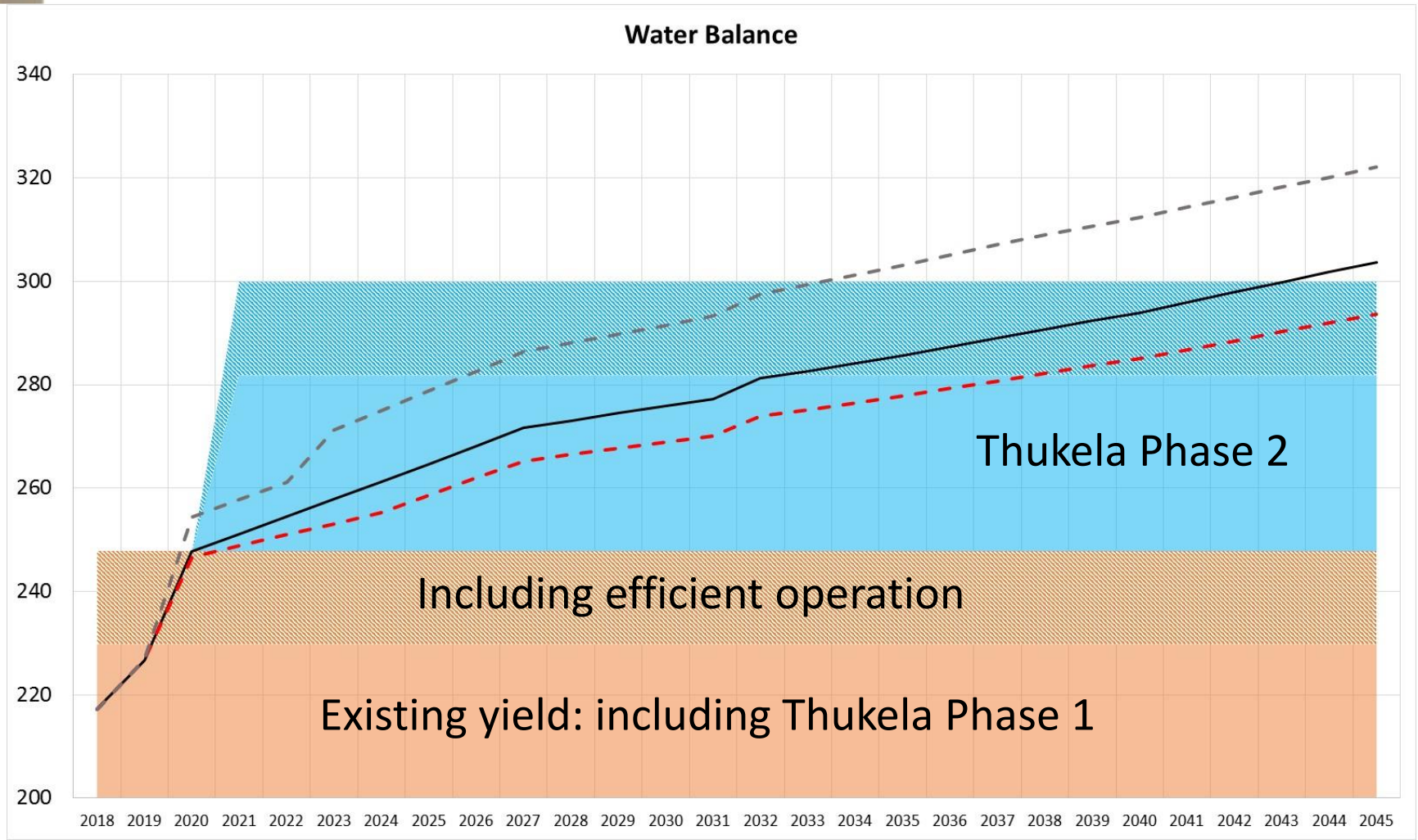


Simplified water balance



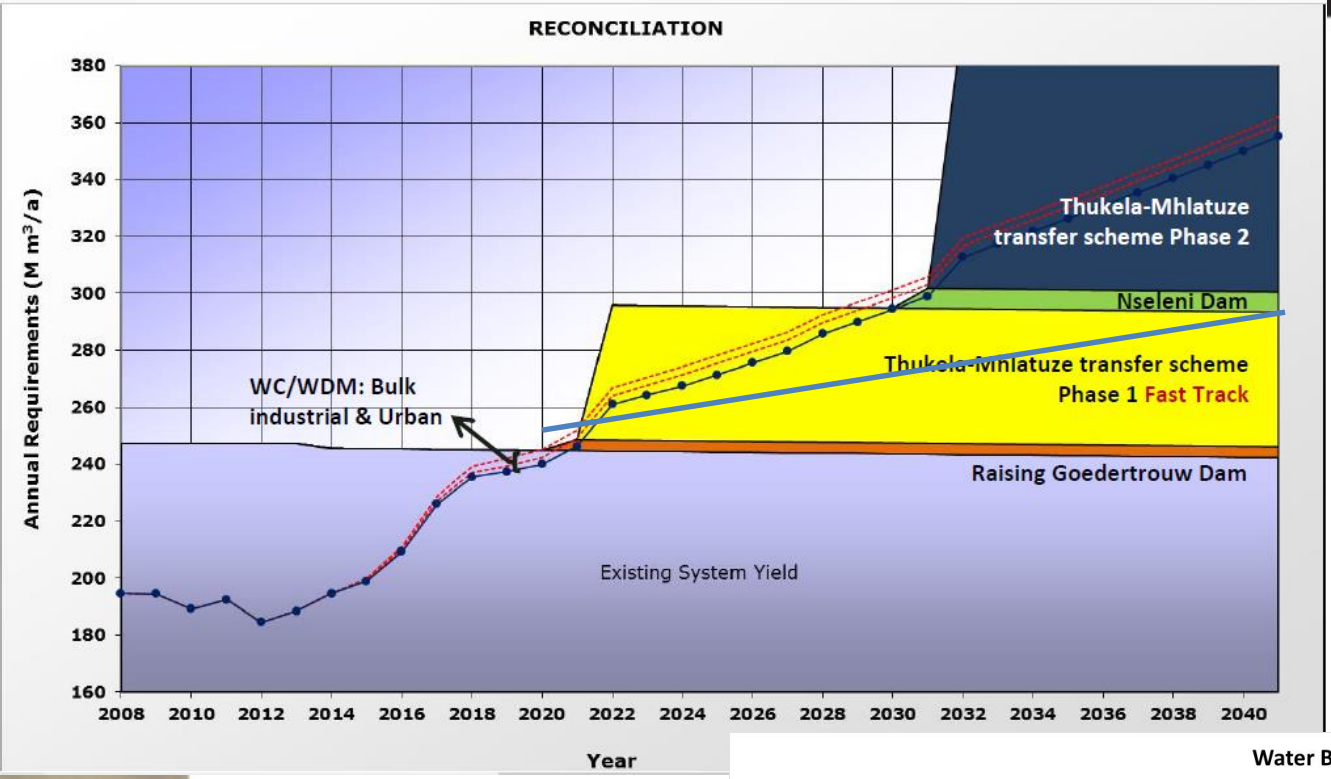
Simplified water balance

High demand projection additional users
High demand projection existing users
High demand projection existing users incl. WCWDM

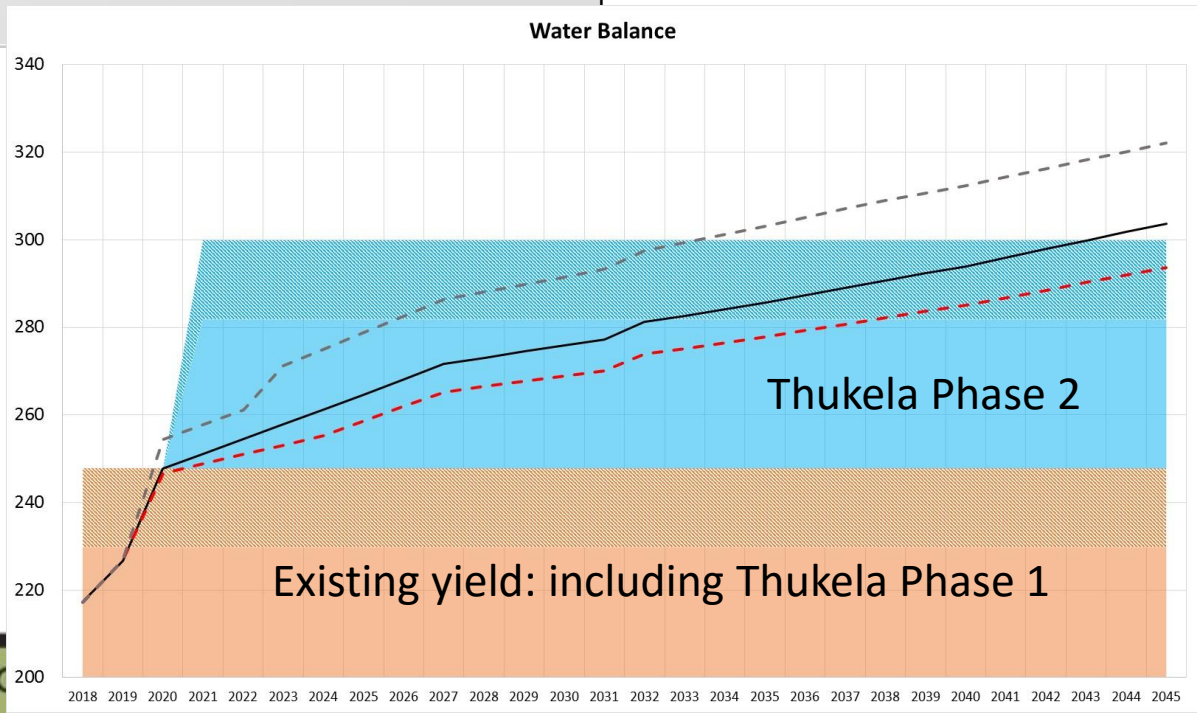


Deficit summary

Demand projection	Existing incl Thukela ph 1 efficient operation	Thukela ph 2 & efficient operation
High existing users	2020	2043
High additional users	2020	2033
High existing with WCWDM	2021	>2045



Recon (2015)
vs
Current update



WATER IS LIFE - SANITATIO

Scenarios to be analysed & way forward

- Assess individual users' supply profiles
- Additional augmentation/intervention options
- Climate change impacts
- Results from Lake assessment
- Surrounding town's water balances

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IMPLEMENTATION AND MAINTENANCE OF THE WATER RECONCILIATION STRATEGY FOR RICHARDS BAY AND SURROUNDING TOWNS

Strategy Steering Committee Meeting (StraSC) 3

Item 9.3: Infrastructure & Cost Assessment

TASK 8: INFRASTRUCTURE AND COST ASSESSMENT

Task 8 relates to the **infrastructure** of the **intervention options** identified during the previous Reconciliation Strategy, including the **related financial implications**.

The Task has been divided into three subtasks with deliverables:

Task No.	Deliverables
8	Infrastructure and Cost Assessment Report (Report No. 6)
8.1	**Infrastructure/Intervention Status Quo Assessment Module** Chapter in Infrastructure and Cost Assessment Report (Report No. 6)
8.2	**Development Options Module** Chapter in Infrastructure and Cost Assessment Report (Report No. 6)
8.3	**Socio-Economic Assessment Module** Chapter in Infrastructure and Cost Assessment Report (Report No. 6)

Deliverable 8.1: Infrastructure / Intervention Status Quo Assessment Module

Potential interventions were identified in the Previous Richards Bay Reconciliation Strategy, which could contribute to meeting the future water requirements of the Richards Bay WSS.

This module addresses the findings of the **status quo assessment** carried out for the **intervention options** identified in the Richards Bay and Surrounding Towns Study Area.

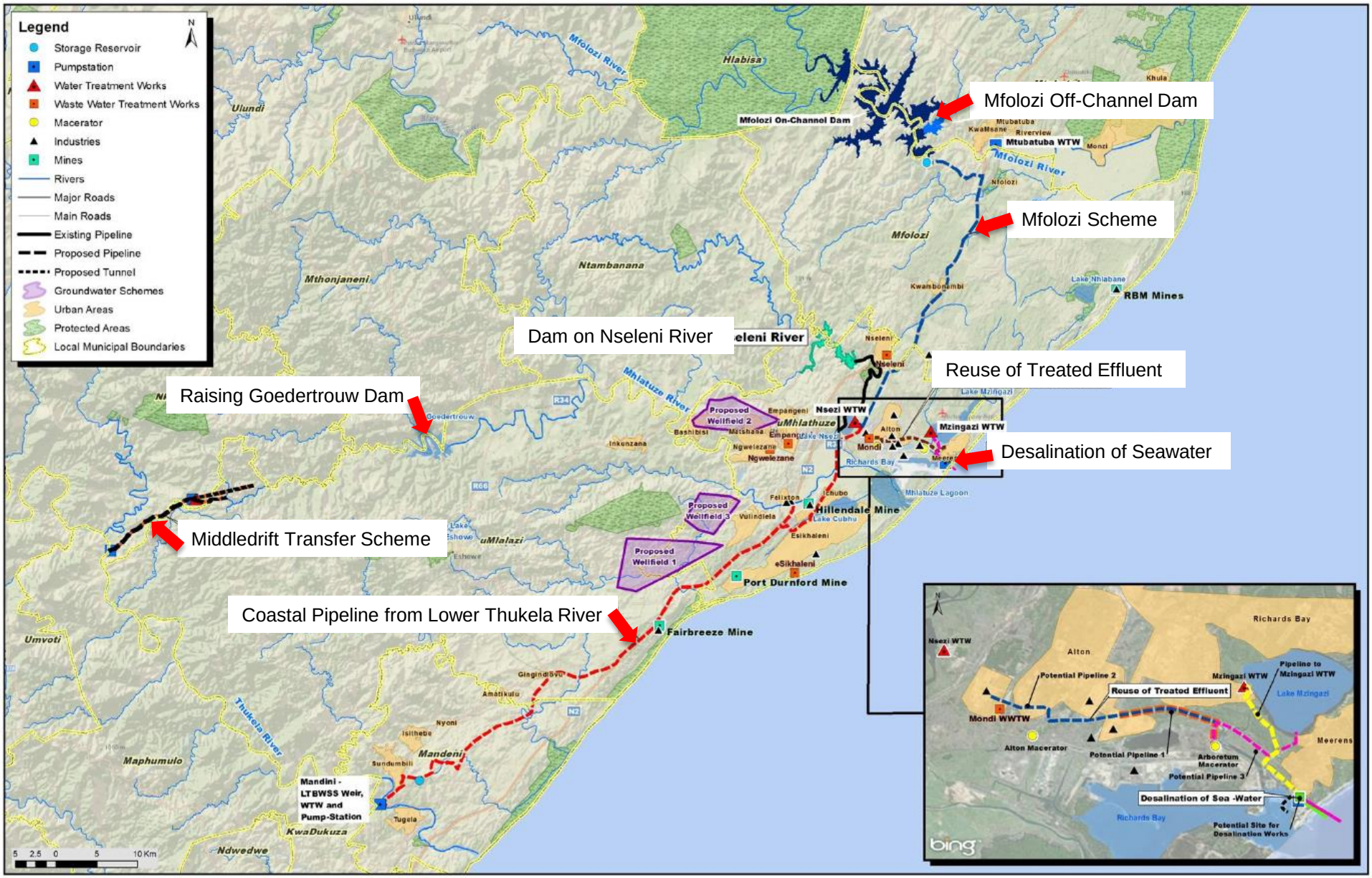
Interventions

An intervention can be any measure that could potentially make additional water available i.e. that improves the water balance of the Richards Bay WSS.

It can therefore be demand-side (lowering water requirements) or supply side (increasing the water supply) focused.

The following **potential augmentation options** have been selected during the previous study for further evaluation:

- Raising Goedertrouw Dam
- Dam on the Nseleni River
- Bulk industrial and Urban water conservation and water demand management
- Increased capacity of the Thukela-Mhlathuze Transfer Scheme (Middledrift Transfer Scheme)
- Coastal pipeline from the lower Thukela River
- Off-channel transfer scheme/s from the Mfolozi River
- Desalination of seawater, and
- Arboretum Effluent Reuse Scheme.



Locality Plan – All Schemes

Baseline Interventions

Four small attractive options have been identified that can provide **smaller yields** to **increase** the **water availability** of the region. These so-called baseline interventions, which are **recommended** for all **water balance scenarios** are:

- **Raising of Goedertrouw Dam:**

Seems very promising as it can be implemented fairly quickly, apart from being very cost effective.

- **New Dam on the Lower Nseleni River**

Beneficial from a cost perspective. It could further offer operational benefits, but could likely not be implemented quickly.

- **Bulk Industrial and Urban WC/WDM**

Initiatives should continue and water efficiency should be improved.

Status Quo: Baseline Interventions

Intervention	Status Quo of Intervention (August 2019)
Raising of Goedertrouw Dam	DWS completed Prefeasibility Investigation Report. Currently no funds are available to implement a Feasibility Study.
New Dam on the Lower Nseleni River	Mhlathuze Water indicated that the Feasibility Study should commence within the next 3 months.
Bulk Industrial & Urban WCWDM	The City of uMhlathuze LM has 5-year Strategic Management Plan for the implementation of WCWDM with a target of **±19%** NRW. • There are no formalised/dedicated WCWDM teams in place for all demand centres. • Water losses are due to the leakages on the networks and in some cases at the reservoirs. • Limited infrastructure maintenance and planning. • In most cases Reactive Maintenance instead of Preventative Maintenance is taking place. **The key performance indicators of NRW and Water Losses indicate that there is significant potential for the implementation of WCWDM measures.**

Key Interventions

Three significant schemes (that would make **large quantities** of **water available**) have been identified to meet the future water requirements of the Richards Bay WSS.

- Thukela-Mhlathuze Transfer Scheme (Middledrift Transfer Scheme)
- Lower Thukela 55Mℓ/d Coastal Pipeline
- A transfer scheme from an off-channel dam situated close to the Mfolozi River
- Desalination of seawater

A medium-sized scheme that seems promising and should be compared with the three schemes is the **Arboretum Effluent Reuse Scheme.**

Status Quo: Key Interventions (1 of 2)

Intervention	Status Quo of Intervention (August 2019)
Increased capacity of the Thukela-Mhlathuze Transfer Scheme *(commonly known as the Middledrift or Thukela Goedertrouw Transfer Scheme)*	1995 - Phase 1: 1.2 m^3/s (Emergency Scheme) 2017 – Phase 2: 1.2 m^3/s **Total 2.4 m^3/s** **DWS implemented the Construction of Phase 2:** Commencement Date: April 2017 Planned Completion Date: 31 March 2019 Project is currently on hold due to the Main sub-contractor undergoing business rescue.
Coastal pipeline from the lower Thukela River	Umgeni Water implemented the project. **The project was successfully commissioned in June 2017.** The WTW was constructed to a capacity of 55 Mℓ/d and abstraction and supply pipelines were constructed to the ultimate supply capacity of the scheme; namely 110 Mℓ/d. The first phase of the scheme was developed to supply south only. Umgeni Water is currently designing a pipeline and command reservoir which will be approximately 7km north of the Lower Thukela WTW so that water can then be gravity fed further north from this point if possible.

Status Quo: Key Interventions (2 of 2)

Intervention	Status Quo of Intervention (August 2019)
Mfolozi Off-Channel Storage Dam	DWS prepared a TOR to appoint a PSP to undertake the hydrology to detailed feasibility but there is a lack of funding to proceed. DWS recommended an off-channel dam in the Mfolozi river and Mhlathuze Water indicated that this will probably take place in 2020/2021.
Desalination of Seawater	DWS implemented a 10 Mℓ/day Desalination Plant in Richards Bay. The plant is not operational because there is **adequate raw water** in the natural system that is much **cheaper** to use than the **desalinated water**. It will only operate during emergency conditions (drought). Mhlathuze Water advertised for a PSP to conduct a detailed feasibility study, but this did not proceed. DWS has written to Mhalthuze Water asking them to proceed with the detailed feasibility. Future feasibility studies have been scheduled, but only 3 years from now.
Arboretum Effluent Reuse Scheme	The City of Mhalthuze is busy with a PPP for a 75 Mℓ/day re-use plant. RFQ ready to go market. Planned Implementation dates of the project have not been determined - currently in the process of extending the contract with the Transaction Advisor. The plant will provide treated waste water to 5 Off Takers (industry).

Questions?

water & sanitation

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Water and Sanitation
REPUBLIC OF SOUTH AFRICA

IMPLEMENTATION AND MAINTENANCE OF THE WATER RECONCILIATION STRATEGY FOR RICHARDS BAY AND SURROUNDING TOWNS

Technical Support Group Meeting (TSG) 6

Item 10: Discussion and Comments