UNIVERSAL ACCESS PLAN PHASE III – PROGRESSIVE DEVELOPMENT OF A REGIONAL CONCEPT SECONDARY BULK WATER MASTER PLAN FOR THE HARRY GWALA DISTRICT MUNICIPALITY

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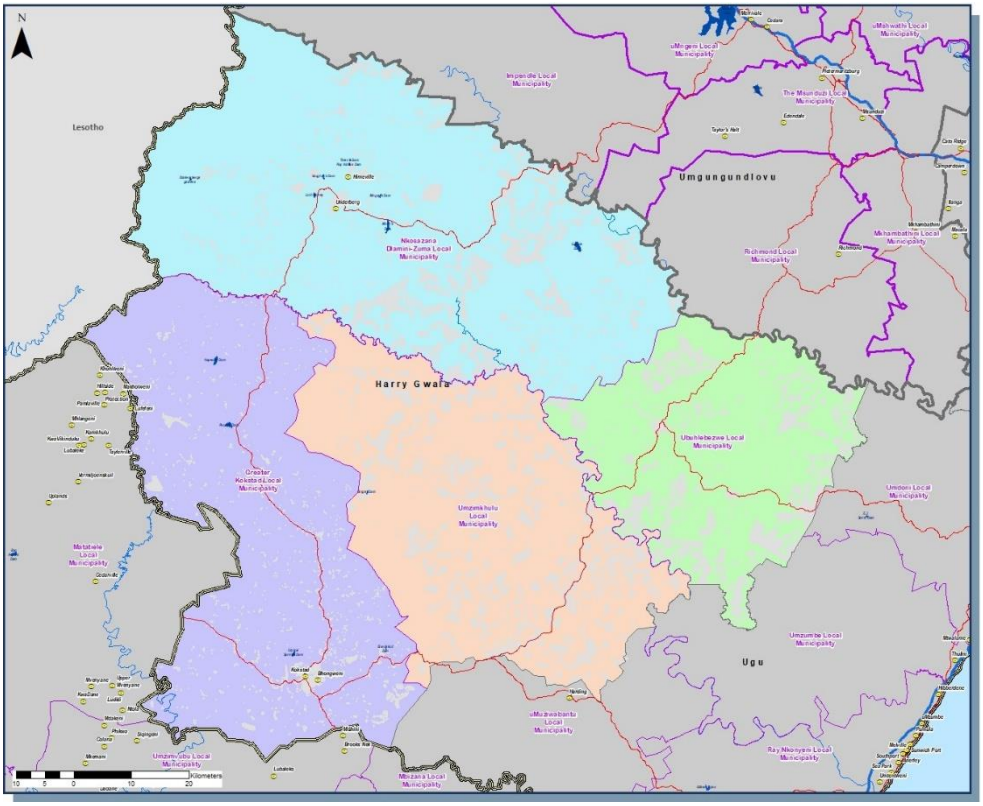

Reconnaissance Report

January 2021

Prepared for:

UMGENI WATER•AMANZI

Name : Umgeni Water
Phone : 033-341 1232 / 082 852 9308
Email : vernon.perumal@umgeni.co.za
Contact Person: Vernon Perumal
Address: 310 Burger Street
Pietermaritzburg
3201

Prepared by:

MARISWE JTN CONSULTING

Name : Mariswe (Pty) Ltd
Phone : +27 (0)12-424-9707
Email : sandram@mariswe.com
Contact Person: Sandra Munnik
Address: P O Box 25549
Monument Park
0181

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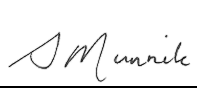
Authorised by:	S Munnik	Executive Manager		2021/01/27

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EXECUTIVE SUMMARY

A. Introduction

Phase III follows on the Phase II study for the Development of a Universal Access Plan (UAP) for Water Supply in the KwaZulu-Natal Province which was completed in June 2016 by various Professional Service Providers (PSP's) that were appointed by Umgeni Water.

The deliverables for UAP Phase II were divided in two phases where Phase 1 included the information review and development of a High Level Status Quo Assessment and Phase 2 included the development of a demand model and needs development plan, culminating in a Reconnaissance Study report for each Water Services Authority (WSA) on bulk water supply. Water Supply Intervention Areas (WSIAs) were identified during UAP Phase II and were based on areas that could be served either by existing schemes or through planned scheme developments (planned projects).

However, the level of detail within the final outcome of UAP Phase II varied between the various PSP's and the magnitude of the cost requirement resulted in Umgeni Water to revisit the process and the need for UAP Phase III was initiated. The main objective of Phase III will be to further develop the conceptual bulk water master plan that would clearly distinguish between primary and secondary bulk.

B. Demographics

The Harry Gwala District Municipality (HGDM) is located in the south-western region of the Kwazulu-Natal Province in South Africa. The HGDM consists of the following Local Municipalities:

- ✓ Dr Nkosazana Dlamini-Zuma Local Municipality (KZN436);
- ✓ Umzimkhulu Local Municipality (KZN435);
- ✓ Greater Kokstad Local Municipality (KZN433); and
- ✓ Ubuhlebezwe Local Municipality (KZN434);

HGDM recorded a total population of 533 022 people within 162 614 households, resulting in an average of 3.28 persons per household.

Table B-1: HGDM Population and Households per Local Municipalities

LM Name	No of Households	No of Population	People per Household
Umzimkhulu Local Municipality	64 164	205 810	3.21
Ubuhlebezwe Local Municipality	28 016	123 282	4.40
Greater Kokstad Local Municipality	25 600	80 447	3.14
Dr. Nkosazana Dlamini-Zuma Local Municipality	44 834	123 483	2.75
Harry Gwala	**162 614**	**533 022**	**3.2**

Source: DWS Reference Framework, April 2019

Population growth was determined until 2050 that resulted in the projected number of people residing within Harry Gwala will be approximately 668 000 people. The projected population per Municipality is tabled within Table B-2 below.

Table B-2: Project Population per Local Municipality until 2050

Municipality	DWS RF Pop 2019	Population						
		2020	2025	2030	2035	2040	2045	2050
Umzimkhulu	205 810	213 489	221 333	231 042	240 911	251 203	261 933	273 122
Ubuhlebezwe	123 282	120 424	124 849	130 325	135 892	141 697	147 750	154 062
Greater Kokstad	80 447	77 535	80 384	83 910	87 494	91 232	95 129	99 193
Dr. Nkosazana Dlamini-Zuma	123 483	110 377	114 432	119 452	124 555	129 875	135 423	141 208
Total	**533 022**	**521 825**	**540 998**	**564 729**	**588 853**	**614 007**	**640 236**	**667 585**

C. Service Levels

C.1 Water

The main source for 28% of households within HGDM is communal stand at a distance below 200m. The HGDM exhibits a water backlog of approximately 44%.

C.2 Sanitation

Approximately 35% of households within HGDM use a pit latrine/toilet with a ventilation pipe. The current sanitation backlog within HGDM is at approximately 18%.

D. Water Resources

Key rivers (part of the Pongola-Mtamvuna and the Mzimvubu-Tsitsikamma Water Management Areas) which flow through the district include the Umgeni, Mvoti, uMkhomazi, Umzimkhulu and Umzimvubu Rivers.

Dams within the HGDM include the Comrie Dam, Crystal Springs Dam, Elandskuil Dam, Hopewell Dam, Minay's Dam, Mingay's Dam, Poortjie Dam, Roy Aldus Dam, Vaughan's Dam, Kempdale Dam and the Ixopo Dam. Apart from bulk purchases in Ixopo from Umgeni Water, water is abstracted from boreholes and surface abstraction works.

E. Existing Water Supply Schemes and Water Requirements

The existing regional water supply schemes within the HGDM are as follows:

Table E-2: Existing Water Supply Schemes

Greater Bulwer/Donnybrook Scheme	Underberg - Himeville Scheme
Mahhehle - Ncakubane Scheme	Greater Summerfield Scheme
Greater Mhlabashane Scheme	St. Barnabas - Cabhane Scheme
Mkhunya Regional Scheme	Greater Njunga Scheme
Nokweja Scheme	Greater Riverside Scheme
Centocow Scheme	Ibisi - Machunwini Scheme
Greater Kilimon Scheme	Lourdes - Ndzombane Scheme
Kukhulela Scheme	Mnqumeni Scheme
Umzimkhulu Town Scheme	Kokstad Town Scheme
Nsingizi - Mkhangala Scheme	Pakkies - Willowdale Scheme
Franklin Scheme	Wynesberg Scheme

The projected water requirements as per the demand model generated for the HGDM up to 2050 amounts to 133.27 Mℓ/d.

Table E-2: Water Requirements (Mℓ/d), Per Local Municipality

LM	2020 Population	2050 Population	2020 (Mℓ/d)	2050 (Mℓ/d)
Umzimkhulu	213 489	273 122	38.26	51.09
Ubuhlebezwe	120 424	154 062	22.39	29.72
Greater Kokstad	77 535	99 193	20.14	26.32
Dr Nkosazana Dlamini-Zuma	110 377	141 208	19.67	26.14
Harry Gwala DM	**521 825**	**667 585**	**100.46**	**133.27**

F. Existing Sanitation Supply Schemes

There are thirteen sanitation schemes and ten wastewater treatment plants, of which nine are currently in operation, within HGDM as per DWS. All of them are in need of refurbishment and improved operations and maintenance.

G. Planned and Implementation Projects

The existing regional bulk projects were considered and evaluated to identify potential gaps within the existing project footprints to the extent that a total “wall-to-wall” bulk water services needs perspective is visualised and realised. This was done in the context to improve access to basic services but at the same time support economic growth and development and ensure sustainable services.

The funding streams available for infrastructure development over the next three years within HGDM amount to approximately R953 735 000. Only one regional bulk infrastructure project receives funding from the Regional Bulk Infrastructure Grant (RBIG), namely the Greater Bulwer Donnybrook Water Scheme Regional Bulk Scheme.

H. Bulk Water Supply Interventions Considered

This study aims to ensure that the HGDM can make provision for and plan to supply all consumers within its area of jurisdiction with at least basic water supply services. Not all consumers are currently supplied with formal schemes and part of the objectives of this study were to determine where these consumers are, what their water requirements are and the options that could be considered to ensure universal access to water supply up to 2050

Water Supply Intervention Areas (WSIA's) were identified during this process based on areas that can be served either by linkage to existing schemes or through planned scheme developments (planned projects). These WSIA's, number of applicable households, population and their water requirements are illustrated within **Table H-1.**

Table H-1 Conceptual Scheme Areas, Households and Water Requirements

WSIA No	WSIA Name	Population 2020	Population 2050	Water Demand 2020 (Mℓ/day)	Water Demand 2050 (Ml/day)
HG001	**Greater Bulwer/Donnybrook**	89 892	115 001	17.83	23.60
HG002	**Greater Kilimon**	29 773	38 091	5.01	6.73
HG003	**Nokweja**	10 451	13 370	1.70	2.30
HG004	**Greater Mhlabashane**	22 909	29 309	3.90	5.25
HG005	**Mkhunya**	21 424	27 409	3.61	4.81
HG006	**Centocow**	13 147	16 820	2.30	3.20
HG007	**Kukhulela**	3 375	4 318	0.60	0.70
HG008	**Underberg-Himeville**	4 977	6 368	1.30	1.80
HG009	**Greater Summerfield**	23 249	29 745	3.80	5.10
HG010	**St. Barnabas-Chabane**	11 346	14 518	1.94	2.70
HG011	**Greater Njunga**	22 237	28 449	3.90	5.15
HG012	**Greater Riverside**	14 446	18 481	2.55	3.46
HG013	**Ibisi-Machunwini**	20 803	26 615	3.60	4.90
HG014	**Lourdes-Ndzombane**	15 971	20 433	2.82	3.80
HG015	**Mnqumeni**	13 945	17 841	2.34	3.12
HG016	**Umzimkhulu Town**	18 477	23 638	3.94	5.24
HG017	**Nsingizi-Mkhangala**	16 043	20 524	2.88	3.85
HG018	**Franklin**	3 965	5 073	0.90	1.17
HG019	**Kokstad Town**	59 957	76 705	16.36	21.36
HG020	**Pakkies-Willowdale**	2 589	3 313	0.45	0.61
HG021	**New Biggen Bulk Regional Water Supply Scheme**	-	-	-	246.00
HGDM		**418 976**	**536 021**	**81.73**	**108.85**

The Greater Bulwer/Donnybrook WSIA and the Kokstad Town WSIA has the highest water demand of approximately 22% and 20% respectively. These WSIAs are also the biggest two (2) supply areas within the HGDM and would be serving close to 36% of the HGDM population.

The total volume of water required is compared to the existing proposed water supply interventions and tabled within Table H2 below:

Table H2: Water Resources Required vs proposed WSI

WSIA	WSIA Name	Population (2050)	2050 Demand (Mℓ/day)	2050 Demand (Mm^3/a)	Existing Resources (Mm^3/a)	Proposed Additional under UAP Phase 3 (Mm^3/a)	Total (Mm^3/a)	Balance (Mm^3/a)
HG001	Greater Bulwer/Donnybrook	115 001	23.6	8.61	3.65	5.11	8.76	0.15
HG002	Greater Kilimon	38 091	6.73	2.46	1.28	1.28	2.56	0.10
HG003	Nokweja	13 370	2.3	0.84	3.65	0.00	3.65	2.81
HG004	Greater Mhlabashane	29 309	5.25	1.92	2.81	0.00	2.81	0.89
HG005	Mkhunya	27 409	4.81	1.76	1.83	0.00	1.83	0.07
HG006	Centocow	16 820	3.2	1.17	0.91	0.91	1.83	0.66
HG007	Kukhulela	4 318	0.7	0.26	0.91	0.00	0.91	0.66
HG008	Underberg-Himeville	6 368	1.8	0.66	1.83	0.00	1.83	1.17
HG009	Greater Summerfield	29 745	5.1	1.86	1.10	1.10	2.19	0.33
HG010	St. Barnabas-Chabane	14 518	2.7	0.99	1.10	0.00	1.10	0.11
HG011	Greater Njunga	28 449	5.15	1.88	1.10	1.10	2.19	0.31
HG012	Greater Riverside	18 481	3.46	1.26	1.46	0.00	1.46	0.20
HG013	Ibisi-Machunwini	26 615	4.9	1.79	1.83	0.00	1.83	0.04
HG014	Lourdes-Ndzombane	20 433	3.8	1.39	1.83	0.00	1.83	0.44
HG015	Mnqumeni	17 841	3.12	1.14	0.00	1.46	1.46	0.32
HG016	Umzimkhulu Town	23 638	5.24	1.91	5.11	0.00	5.11	3.20
HG017	Nsingizi-Mkhangala	20 524	3.85	1.41	0.00	3.65	3.65	2.24
HG018	Franklin	5 073	1.17	0.43	0.08	3.57	3.65	3.22
HG019	Kokstad Town	76 705	21.36	7.80	6.57	1.46	8.03	0.23
HG020	Pakkies-Willowdale	3 313	0.61	0.22	0.00	8.03	8.03	7.81
HG021*	New Biggen Bulk Regional Water Supply Scheme	-	246	89.79				
TOTAL		**536 021**	**108.85**	**39.73**	**37.02**	**27.66**	**64.68**	**24.95**
*** The New Biggen BRWSS is not included in the final totals as it is proposed as an intervention to supply the entire DM.**								

From the table above, it is noted all the schemes will have adequate raw water resources after upgrades/interventions to meet the 2050 demand requirements. The feasibility studies for the proposed resources and, in addition, the implementation of the New Biggen Bulk Regional Water Supply Scheme should be prioritised.

A total estimate of approximately R 15.85 billion is required to address the total bulk water supply requirement by 2050. The total cost requirement per WSIA is tabled within Table H-3

H-3: Total Cost requirement

WSIA	WSIA Name	Total Cost Requirement				
		Primary	Secondary	Tertiary	10% Contingencies	Total Cost (excl VAT)
HG001	Greater Bulwer/Donnybrook	R52 203 000	R67 713 297	R4 843 349	R12 475 965	R137 235 611
HG002	Greater Kilimon	R41 114 000	R154 455 886	R65 511 728	R26 108 161	R287 189 776
HG003	Nokweja	R61 526 979	R87 673 956	R7 896 605	R15 709 754	R172 807 294
HG004	Greater Mhlabashane	R7 250 000	R163 447 510	R27 159 492	R19 785 700	R217 642 702
HG005	Mkhunya	R35 397 000	R70 580 171	R35 391 249	R14 136 842	R155 505 262
HG006	Centocow	R33 405 000	R3 000 000	R1 717 683	R3 812 268	R41 934 951
HG007	Kukhulela	R14 600 000	R21 206 415	R5 107 549	R4 091 396	R45 005 360
HG008	Underberg-Himeville	-	-	-	-	-
HG009	Greater Summerfield	R35 742 000	R94 244 653	R30 025 663	R16 001 232	R176 013 547
HG010	St. Barnabas-Chabane	R26 339 000	R64 337 541	R23 888 026	R11 456 457	R126 021 024
HG011	Greater Njunga	-	R5 194 693	-	R519 469	R5 714 163
HG012	Greater Riverside	-	-	-	-	-
HG013	Ibisi-Machunwini	-	-	-	-	-
HG014	Lourdes-Ndzombane (1)	R27 590 737	R109 460 413	-	R13 705 115	R150 756 266
	Lourdes-Ndzombane (2)		R121 539 915	R84 368 780	R12 153 992	R133 693 907
HG015	Mnqumeni	R28 730 000	R79 368 026	R33 739 345	R14 183 737	R156 021 108
HG016	Umzimkhulu Town		R19 523 622	R4 180 978	R1 952 362	R21 475 984
HG017	Nsingizi-Mkhangala	R73 422 320	R108 067 923	R49 337 931	R23 082 817	R253 910 991
HG018	Franklin	R42 494 000	R15 321 863	R13 543 335	R7 135 920	R78 495 117
HG019	Kokstad Town	R2 329 694 587			R232 969 459	R2 562 664 045
HG020	Pakkies-Willowdale	R8 100 000	R28 572 188	R6 873 095	R4 354 528	R47 899 811
HG021	New Biggen Bulk Regional Water Supply Scheme	R9 355 128 046	R701 806 757	R14 225 661	R1 007 116 046	R11 078 276 511
Total		R12 172 736 669	R1 915 514 830	R407 810 468	R1 440 751 220	R15 848 263 430

I. Conclusions and Recommendations.

The HGDM still faces a backlog in water supply – not only in providing all consumers within its area of jurisdiction with access to water supply according to its WSA duties, but also in ensuring sustainable water services of existing supply. Furthermore, there are areas where the existing water supply infrastructure as well as water source, are insufficient to meet current and projected future water requirements. New developments and urbanisation put further strain on existing supplies and resources.

The HGDM relies mainly on grant funding programmes to fund their water supply projects. These funding programmes are mainly MIG, WSIG and RBIG. Based on all the current funding streams available to the District Municipality over the MTEF period, it will take a minimum of fifteen years for the HGDM to address their bulk water supply requirements.

The implementation programme will depend on the availability of funds from National Treasury as well as the capacity of the Municipality to implement projects. All twenty-one area interventions would be an implementation priority for the DM but the order would most likely be determined by the availability of funds or intervention programmes.

The provision of water services remains the responsibility of the HGDM as the WSA. The HGDM should ensure that they meet all the requirements to take these interventions to implementation readiness. These planning studies are in various stages of readiness to lobby for grant funding and Umgeni Water could consider as a Regional Utility to assist the HGDM to take this process further.

The twenty-one (21) proposed water supply intervention areas (WSIAs) are the appropriate solutions for bulk water supply development within HGDM and are as follows:

- ✓ HG001 WSIA: Greater Bulwer/Donnybrook
- ✓ HG002 WSIA: Greater Kilimon
- ✓ HG003 WSIA: Nokweja
- ✓ HG004 WSIA: Greater Mhlabashane
- ✓ HG005 WSIA: Mkhunya
- ✓ HG006 WSIA: Centocow
- ✓ HG007 WSIA: Kukhulela
- ✓ HG008 WSIA: Underberg-Himeville
- ✓ HG009 WSIA: Greater Summerfield
- ✓ HG010 WSIA: St. Barnabas-Chabane
- ✓ HG011 WSIA: Greater Njunga
- ✓ HG012 WSIA: Greater Riverside
- ✓ HG013 WSIA: Ibisi-Machunwini
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- ✓ HG016 WSIA: Umzimkhulu Town
- ✓ HG017 WSIA: Nsingizi-Mkhangala
- ✓ HG018 WSIA: Franklin

- ✓ HG019 WSIA: Kokstad Town
- ✓ HG020 WSIA: Pakkies-Willowdale
- ✓ HG021 WSIA: New Biggen Bulk Regional Water Supply Scheme

The implementation programme will depend on the availability of funds from National Treasury as well as the capacity of the Municipality to implement projects. Although all twenty-one (21) area interventions would be an implementation priority for the DM, it is proposed to consider the following three (3) priorities detailed within **Table I-1**. It is also proposed to follow a phased approach for implementation for e.g. initiate only the upgrade to the WTP at first and then when funding permits, can the bulk conveyance and storage be extended, upgraded or constructed.

However, the order would most likely be determined by the availability of funds or intervention programmes and should be confirmed with the WSA.

I-1: Proposed Implementation Order (Phased Approach)

Proposed Priorities (Phased Approach)	WSIA No and Name		Proposed Project Name	Proposed Estimated Project Value
1	HG021	New Biggen Bulk Regional Water Supply Scheme	Dam development	R11 078 276 511
2	HG019	Kokstad Town	Dam development	R2 562 664 045
3	HG001	Greater Bulwer/Donnybrook	Raw water transfer to augment Stephen Dlamini Dam from the proposed Polela Dam, Smithfield Dam and New Biggen Dam	R137 235 611

The detailed feasibility study of the proposed New Biggen Dam has been completed. The configuration of the planned and existing schemes are such that this dam could provide a secure source of water to many of these schemes. Consideration should therefore be given to implement the New Biggen Dam instead of the Stephen Dlamini Dam for a water source for not only the Greater Bulwer/Donnybrook scheme but also many other schemes in the HGDM as detailed in this report.

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LIST OF ABBREVIATIONS

CoGTA	Department of Cooperative Governance and Traditional Affairs
CR	Command Reservoir
EMF	Environmental Management Framework
DM	District Municipality
DWS	Department of Water and Sanitation
GIS	Geographical Information System
HGDM	Harry Gwala District Municipality
IRDP	Integrated Residential Development Programme
IDP	Integrated Development Plan
KZN	KwaZulu-Natal
ℓ/c/d	Liters per capita per day
LED	Local Economic Development Programme
LM	Local Municipality
LoS	Level of Service
m^3	Cubic meter
Mm^3	Million Cubic meter
MIG	Municipal Infrastructure Grant
Mm^3	Million Cubic Meters
Mm^3/a	Million Cubic Meters per annum
Mℓ/day	Mega liter per day
MPNRW	Management Plan to Reduce Non-Revenue Water
NRW	Non-Revenue Water
PSP	Professional Service Provider
R ‘000	Rand Thousands
RBIG	Regional Bulk Infrastructure Grant
RDP	Reconstruction and Development Plan
Res	Reservoir
RF	Reference Framework
RWSS	Regional Water Supply Scheme
SDF	Spatial Development Programme
SIV	System Input Volume
UAP	Universal Access Plan
VAT	Value Added Tax

WMA	Water Management Area
WSA	Water Services Authority
WSDP	Water Services Development Plan
WSI	Water Supply Intervention
WSIA	Water Supply Intervention Area
WSIG	Water Services Infrastructure Grant
WSP	Water Service Provider
WSS	Water Supply Scheme
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

1. OBJECTIVES AND METHODOLOGY

This report is the Bulk Water Master Plan for the study titled "Universal Access Plan Phase III – Progressive Development of a Regional Concept Secondary Bulk Water Master Plan for the Harry Gwala District Municipality (HGDM)" – in this instance also the Water Services Authority (WSA).

This section provides the background of the study, an introduction and description of the study objectives.

1.1 BACKGROUND AND INTRODUCTION

This study follows on the Phase II study for the Development of a Universal Access Plan (UAP) for Water Supply in the KwaZulu-Natal Province which was completed in June 2016 by various Professional Service Providers (PSP's) that were appointed by Umgeni Water.

However, the level of detail within the final outcome of UAP Phase II varied between the various PSP's and the magnitude of the cost requirement resulted in Umgeni Water to revisit the process and the need for UAP Phase III was initiated. The main objective of Phase III will be to further develop the conceptual bulk water master plan that would clearly distinguish between primary and secondary bulk.

Umgeni Water appointed Mariswe (Pty) Limited (previously UWP Consulting), in association with JTN Consulting in November 2018 to review the UAP Phase II process by the developing of UAP Phase III for the whole of the KwaZulu-Natal province. The areas are as follows:

- ✓ Amajuba District Municipality (ADM);
- ✓ City of uMhlathuze Local Municipality (CouM);
- ✓ Harry Gwala District Municipality (HGDM);
- ✓ Ilembe District Municipality (IDM);
- ✓ King Cetshwayo District Municipality (KCDM);
- ✓ Newcastle Local Municipality (NLM);
- ✓ The Msunduzi Local Municipality (TMLM);
- ✓ Ugu District Municipality (Ugu);
- ✓ Umgungundlovu District Municipality (UMDM)
- ✓ Umkhanyakude District Municipality (UKDM);
- ✓ uMzinyathi District Municipality (UZDM);
- ✓ uThukela District Municipality (UTDM); and
- ✓ Zululand District Municipality (ZDM).

The abovementioned municipalities were allocated WSA status for their respective areas of jurisdiction. Amajuba, King Cetshwayo and Umgungundlovu's responsibilities as WSA excludes the areas covered by the

Newcastle, City of uMhlathuze, and The Msunduzi Local Municipalities which themselves are WSA's. UAP Phase III reports are developed per WSA, i.e. 13 reports are prepared.

1.2 Purpose of the Report

This report is the second deliverable of the study, namely the Reconnaissance Study that outlines the conceptual master plan of primary and bulk regional schemes per WSA.

The UAP Phase III aims to review and update the UAP Phase II study reports in order to clearly distinguish between primary and secondary bulk water requirements. The implementation of the UAP Phase III study will be executed in two phases and are as follows:

Phase	Description	Deliverables
Phase 1	Due diligence of the conceptual Regional Bulk Scheme Reports from UAP Phase II	High Level Water Services Intervention Areas (WSIA) due diligence report outlining the viability and sustainability of the already proposed regional schemes
Phase 2	Reconnaissance into the Proposed Regional Primary and Secondary Bulk Schemes per Water Services Authority	Reconnaissance Study that outlines the conceptual master plan of primary and bulk regional schemes

Phase 1 includes the information review and conducting a due diligence of the conceptual regional bulk schemes proposed during UAP Phase II.

Phase 2 includes the development of a demand model up to 2050 and needs development plan, culminating in a Reconnaissance Study report on primary and secondary bulk water supply.

The Report would also provide status quo information on sanitation level of service per WSA inclusive of sanitation bulk scheme components. The sanitation status quo information was collected, verified and validated during the Municipal visits and incorporated within the geo database.

The UAP Phase III study information would be used to update the DWS Reference Framework (RF) geodatabase where possible.

1.3 Information Sources

Information used in this study was obtained from current and existing reports and inputs from knowledgeable municipal officials. The following reports were reviewed to contribute to this report:

- ✓ StatsSA Community Survey, 2016;
- ✓ Umgeni Water, Infrastructure Masterplan Volume 3, 2020;
- ✓ UAP Phase II, Harry Gwala District Municipality, 2016;
- ✓ Umzimkhulu Bulk Regional Water Supply Scheme - Detailed Feasibility Study - EVN Africa, 2018;

- ✓ Water Requirements and Return Flows Report - The uMkhomazi Water Project Phase 1: Module 1: Technical Feasibility Study Raw Water - AECOM, 2015;
- ✓ Harry Gwala District Municipality Water Services Development Plan – Summary Report, 2018;
- ✓ Harry Gwala District Municipality Final Draft Integrated Development Plan, 2019 – 2020; and
- ✓ Monthly water balance reports as submitted by DWS (KZN) for each WSA.

Meetings were held with managers and technical staff of the HGDM to obtain their input and to ensure the latest available specifications and information is used for the purpose of this study.

Existing spatial and non-spatial data sets were used as reference such as the 2016 Community Survey, UAP Phase II Study, 2016, the Department of Water and Sanitation (DWS) Reference Framework geodatabase as well as spatial data received from the WSA itself.

1.4 STAKEHOLDER ENGAGEMENT

The PSP engaged each WSA individually during inception meetings to introduce the study, its objectives and detailed approach.

The first deliverable was a Due Diligence Report on demographics, water services levels, existing bulk water supply infrastructure, water resources, water requirements, current and planned bulk infrastructure projects and viability of water supply intervention areas. The Due Diligence also reported on a preliminary gap analysis that was conducted utilising the outcome from the proposed WSIA from UAP II and the HGDM Water Services Development Plan that is currently being updated. Following the gap analysis, specific recommendations were made when determining the 2050 water demands suggested for the UAP Phase III study. Follow-up meetings were arranged with the WSAs to share the information that are presented in the Due Diligence Report and these reports were submitted to Umgeni Water.

The Due Diligence Report has now been followed by the development of a water requirements model for 2050. Further individual engagements were held with each WSA.

This resulted in the development of a Reconciliation Report, which presents the alignment of water requirements with existing and planned bulk infrastructure and available water sources for all areas within the WSA.

The Draft Reconciliation Report was presented to each WSA to obtain comments and inputs, which were considered for the final study report submitted to Umgeni Water, DWS and COGTA.

1.5 WATER REQUIREMENTS MODEL METHODOLOGY

A report outlining the methodology, design criteria and assumptions to be used to develop the water demand model for this study, UAP Phase III was approved by the Client. The approved water demand model was then applied to determine the demands for all areas included in the study, at least at a town level. The water demands are required to inform the concept design for a design horizon period up to 2050, with the minimum level of service a yard connections at 100ℓ capita per day.

1.5.1 Total Water Demand Calculations

This section provides information on the base data used for the modelling, assumptions made and outputs of the water demand model, based on a pilot Water Services Authority area.

1.5.1.1 Base Data

The base data used for this study includes the following:

- ✓ 2011 Census: Spatial data for the Main Places, Sub-Places and Small Areas Layer. Main Places are similar to the level of towns, Sub-Places are similar to the level of suburbs and the Small Areas Layer are of a smaller level of detail than Sub-Places, encompassing a number of enumerated census areas;
- ✓ 2011 Census: alpha-numeric data, linking to the spatial data, for household income categories, combined with water Level of Service (LoS). The derived household income and LoS information was combined into categories as follows:
    - Category 1 (Very High Income): Households with a house connection and an income more than R 1 228 000 per year;
    - Category 2 (Upper Middle Income): Households with a house connection and an income between R 153 601 and R 1 228 000 per year;
    - Category 3 (Average Middle Income): Households with a house connection and an income of between R 38 401 and R 153 600 per year;
    - Category 4 (Low Middle Income): Households with a house connection and an income of between R 9 601 and R 38 400 per year;
    - Category 5 (Low Income): Households with a house connection and an income between R1 and R 9 600 per year;
    - Category 6 (Yard Connections): all Households with a Yard Connection;
    - Category 7 Households with access to interim services and
    - Category 8 Households with access to below interim services.
- ✓ 2011 Census: categorisation of Main Places – similar to town level data, based on best-known characteristics of the Main Place. The types of Towns/Centre categories include:
    - Category 1: Long Established Metropolitan Centres (M): Large conurbation of a number of largely independent local authorities generally functioning as an entity;

- Category 2: City (c): Substantial authority functioning as a single entity isolated or part of a regional conurbation;
- Category 3: Town: Industrial (Ti): A town serving as a centre for predominantly industrial activities;
- Category 4: Town: Isolated (Tis): A town functioning generally as a regional centre of essentially minor regional activities;
- Category 5: Town: Special (Ts): A town having significant regular variations of population consequent on special functions. (Universities, holiday resorts, etc.);
- Category 6: Town: Country (Tc): A small town serving essentially as a local centre supporting only limited local activities.
- Category 7: Contiguous (Nc): A separate statutory authority or a number of authorities adjacent to, or close to, a metropolis or city and functioning as a component part of the whole conurbation;
- Category 8: Isolated (Nis): A substantial authority or group of contiguous authorities not adjacent to an established metropolis or authority;
- Category 9: Minor (Nm): Smaller centres with identifiable new or older established centres not constituting centres of significant commercial or industrial activity;
- Category 10: Rural (Nr): All other areas not having significant centres.

✓ Population Growth: Population numbers per Small Areas Layer as provided by Umgeni Water that developed with Statistics South Africa the population growth for the following years:

- 2016; 2020; 2025; 2030; 2035; 2040; 2045 and 2050.

✓ 2019 Updated Levels of Service as provided by Water Services Authorities. The 2019 LoS may be recorded in different formats and at different spatial levels (settlement / town, ward, other). The following categories were applicable the pilot WSA, based on wards and spatially allocated to the Small Areas Layer:

- Below: Assumed for the purposes of this study to include all areas below the standpipe level of service in 2019;
- At: All areas at standpipe level of service in 2019 and
- Above: All areas above the standpipe level of service in 2019.

1.5.1.2 Assumptions

The following assumptions were made in order to calculate the demands per Small Area:

✓ That the ratio of population within each income category in the House Connection LoS category has not changed since 2011. The assumption is that the individuals in each category may be earning more since 2011, but that the categories themselves should have also then moved upwards by the same average quantum. The ratio of population in each category may then be assumed to have stayed more or less the same, even though the actual income values may have changed. This will not influence the demand allocated to each category.

✓ That the categorisation of Centres has not changed since the 2011 Census. The categorisation of Main Places may be reviewed if necessary

- ✓ The projected population growth numbers as provided by Umgeni Water was used without any further analyses.
- ✓ The 2019 updated Level of Service as provided for the pilot WSA was used, which also indicated potential future levels of service. However, it was found that some areas are marked as below standpipe level when the 2011 Census recorded these areas as above RDP level. We assumed that these areas may have been marked as below standpipe level subsequent to the Census due to factors such as water availability / reliability or other factors. It was decided, in these cases, that the infrastructure probably still exists in these areas as recorded during the Census and that it would be prudent, for water demand modelling purposes, to assume the Census RDP levels still apply. In cases where the WSA indicated areas to be in higher categories than recorded in the Census, the WSA for Level of Service was used, since it is assumed that these areas have since been upgraded to a higher level of service. No area was therefore downgraded from the Census data, but some areas were upgraded to a higher LoS with the new 2019 data.
- ✓ Average of the Annual Average Daily Demand (AADD) values (Direct Demands) were assumed, as shown in Table 1-1. These were informed by the previous UAP Phase II study.
- ✓ Indirect demands, as a ratio of AADD, were assumed, as summarised in Table 1-2 per Centre category.

Table 1-1: Assumed average AADD per person per combined income and LoS category

Category	Description of consumer category	Household Annual Income range	Average AADD (l/c/d)
1	House Connections: Very High Income	>R1 228 000	410
2	House Connections: Upper middle income	R 153 601 – R 1 228 000	295
3	House Connections: Average Middle Income	R 38 401 – R 153 600	228
4	House Connections: Low middle Income	R 9 601– R 38 400	170
5	House Connections: Low income	R 1 – R 9600	100
6	Yard Connections		100
7	Households with access to interim services		70
8	Households with access to below interim services		12

Table 1-2 Indirect demands, as a ratio of direct demands per Centre classification

				Indirect demands as a ratio of direct demands			
Classification	**Type of Centre**	**Description**	**Typical CSIR / SACN Settlement Typology**	**Commercial**	**Industrial**	**Institutional**	**Municipal**
1	Long established Metropolitan centres (M)	Large conurbation of a number of largely independent local authorities generally functioning as an entity.	City Region	0.2	0.3	0.15	0.08
2	City (c)	Substantial authority functioning as a single entity isolated or part of a regional conurbation.	City / Regional Centre 1 / Regional Centre 2				
3	Town: Industrial (Ti)	A town serving as a centre for predominantly industrial activities.	Regional Centre 1 / Regional Centre 2				
4	Town: Isolated (Tis)	A town functioning generally as a regional centre of essentially minor regional activities	Service Town				
5	Town: Special (Ts)	A town having significant regular variations of population consequent on special functions. (Universities, holiday resorts, etc.)	Service Town / Local or Niche Town	0.3	0.15	0.08	0.03
6	Town: Country (Tc)	A small town serving essentially as a local centre supporting only limited local activities	Local or Niche Town	0.1	0.15	0.03	0.1
7	Contiguous (Nc)	A separate statutory authority or a number of authorities adjacent to, or close to, a metropolis or city and functioning as a component part of the whole conurbation.	Regional Centre 2	0.15	0.08	0.08	0.08
8	Isolated (Nis)	A substantial authority or group of contiguous authorities not adjacent to an established metropolis or authority.	High Density Rural				
9	Minor (Nm)	Smaller centres with identifiable new or older established centres not constituting centres of significant commercial or industrial activity.	Local or Niche Town				
10	Rural (Nr)	All other areas not having significant centres.	Rest of South Africa				

✓ The phased upgrading of Level of Service up to 2050 was assumed as summarised in **Table 1-3**.

Table 1-3 Level of Service Upgrade

Dwelling Type	LoS Upgrade
House Connections: Very High Income	Grows with Population growth
House Connections: Upper middle income	Grows with Population growth
House Connections: Average Middle Income	Grows with population growth + additional 2.5% increase from Low Middle Income by between 2019 and 2030 + additional 5% increase from Low Middle Income between 2031 and 2050
House Connections: Low middle Income	Grows with population growth + additional 5% increase from Low Income by between 2019 and 2030 + additional 10% increase from Low Income between 2031 and 2050
House Connections: Low income	Grows with population growth + additional 7.5% increase from Yard Connections by between 2019 and 2030 + additional 15% increase from Yard Connections between 2031 and 2050
Yard Connections	Grows with Population growth + minimum LOS by 2030
Households with access to interim services	Reduce to 0 by 2030
Households with access to below interim services	Reduce to 0 by 2030

✓ Finally, an additional 10 % and 15% were added to the total water demand (Sum of Direct and Indirect Demands) for water treatment losses and distribution losses respectively.

1.5.1.3 Output of the Water Demand Model

The output of the water demand model is a total water demand (including direct demands, indirect demands and acceptable losses) for 2019; 2020; 2025; 2030; 2035; 2040; 2045 and 2050 per Small Area, in Million Cubic Meters per annum (Mm^3/a). This water demand will be compared to available supply demands if possible and an opinion on potential discrepancies will be given.

As the output is based on the Census Small Areas Layer and coded accordingly, it can be used in a GIS environment for further analysis.

1.6 DWS Reference Framework Geodatabase

The DWS Directorate: Water Services – Planning and Information – maintains a national database for water services planning. It is a spatial database, in a GIS format, that includes layers for settlements, water supply infrastructure, sanitation supply infrastructure, water resources and projects.

This study aims to update the service levels for settlements based on feedback from each WSA. Furthermore, where possible, the bulk and reticulation infrastructure components in the geodatabase were also updated to include not only the latest existing, but also planned water supply infrastructure.

1.7 RECONNAISSANCE REPORT

The final deliverable of this study is a Reconnaissance Report – this report – to reconcile the water requirements, with available water sources, for all areas in a WSA. This includes the evaluation of existing capacities of infrastructure, potential extensions to new areas, or scheme development options for areas where linkage to existing schemes are not feasible.

The potential costs for scheme development and timeframes were investigated and are presented in this report. Umgeni Water provided unit reference costs for infrastructure components that have been applied where possible.

Information on available water sources were mainly obtained from existing DWS Reconciliation Strategies (larger systems and from the All Towns Studies). Where available, project-specific studies or technical reports were consulted to verify information on available water sources. Information on groundwater availability and quality is however not readily available to a sufficient level of detail.

2. STUDY AREA

This section provides an overview of the study area, setting the scene and discusses the institutional arrangements for water supply. It also provides a brief overview of the demographics in the area and the development opportunities.

2.1 CONTEXT

The Harry Gwala District Municipality (DC43) is located in the south western region of the KwaZulu-Natal Province and it covers an area of approximately 10,547 km². HGDM is surrounded by Umgungundlovu DM to the north-east, Ugu DM to the south-east, OR Tambo DM to the south, Alfred Nzo DM to the south-west, the Kingdom of Lesotho to the north-west and uThukela DM to the north. It is also bordered by the Drakensberg Mountains in the north, which form a 200km-long World Heritage Site.

HGDM comprises of the following four Local Municipalities:

- ✓ Dr Nkosazana Dlamini-Zuma Local Municipality (KZN436);
- ✓ Umzimkhulu Local Municipality (KZN435);
- ✓ Greater Kokstad Local Municipality (KZN433); and
- ✓ Ubuhlebezwe Local Municipality (KZN434);

HGDM is predominantly rural and characterized by small urban centres with larger agricultural, plantation, natural vegetation and traditional authority land. These small urban centres serve as economic hubs for these sub-regions and as administrative areas. These urban centres comprise the main towns of Kokstad, Umzimkhulu, Ixopo (the seat of HGDM) and Underberg/Himeville which serve as the sub-regional economy of the District.

The DM is well known for high agro-ecological potential due to an abundance of high quality soils, high altitude and abundant water. Commercial farms and, to a large extent, commercial plantations form the bedrock of the economy of the region. Climatic extremes make the area suitable for a variety of products including crops, vegetables, livestock and sugar cane around the Ixopo/Highflats area.

The study area and locality of HGDM is illustrated in **Figure 2-1** overleaf.

N

Lesotho

Impendle Local Municipality

uMngeni Local Municipality

uMshwathi Local Municipality

Merrivale

Cedara

Pietermaritzburg

The Msunduzi Local Municipality

Msunduzi

Edendale

Taylor's Halt

Cato Ridge

Camperdown

Umgungundlovu

Ilanga

Mkhambathini

Macala

Mkhambathini Local Municipality

Richmond

Richmond Local Municipality

Himeville

Underberg

Nkosazana Dlamini-Zuma Local Municipality

Harry Gwala

Ubuhlebezwe Local Municipality

Khohlweni

Hillside

Makholweni

Protection

Pamlaville

Lufefeni

Mhlangeni

Komkhulu

KwaVikinduku

Lubaleke

Taylerville

Vermiljoenskuil

Uplands

Greater Kokstad Local Municipality

Umzimkhulu Local Municipality

Umdoni Local Municipality

Matatiele Local Municipality

Cedarville

Kokstad

Bhongweni

Upper Mvenyane

Mvenyane

Ludidi

KwaDane

Ntola

Mdakeni

Phikwa

Siqingeni

Colana

Mkemani

Umzimvubu Local Municipality

Lubaleko

Mishini

Brooks Nek

Harding

uMuziwabantu Local Municipality

Umzumbe Local Municipality

Ugu

Ray Nkonyeni Local Municipality

Mbizana Local Municipality

Mtwalume

Thulini

Hibberdene

uMzumbe

Pumula

Melville

Sunwich Port

Southport

Anerley

Sea Park

Umtentweni

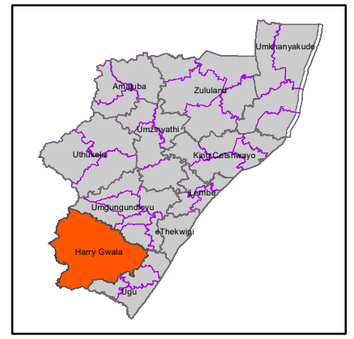
Kilometers

10 5 0 10 20

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- National Roads (N1)
- Main Roads
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns (Hilton)

LOCALITY:



CLIENT:

UMGENI WATER • AMANZI

MUNICIPALITY:

HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

MARISWE

JTN CONSULTING

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Locality Map

Harry Gwala District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 43 Figure 2-1

2.2 PHYSICAL CHARACTERISTICS OF THE STUDY AREA

The HGDM is traversed by a network of roads that includes the R56, R617 and R612. A portion of the N2 traverses through the southern region of the Greater Kokstad LM. These routes play a fundamental role in terms of providing linkage between the DM and other neighbouring municipalities thus facilitating strong cross border economic opportunities within the municipal area.

The Harry Gwala DM has three main catchments, namely the Mkomazi in the north, the central Mzimkhulu and the Mzimvubu catchment in the south, as well as the headwaters of the Mpambanyoni, Mtwalume and Mzumbe catchments located in the north east.

The greater part of the land within the HGDM is covered by commercial agricultural land (grazing, crop farming and sugar cane) planation, and natural vegetation and traditional human settlement areas.

Umzimkhulu has the largest area that is covered by traditional areas in the district, followed by Dr Nkosazana Dlamini-Zuma and then Ubuhlebezwe. Greater Kokstad does not have any traditional areas within its jurisdiction.

2.2.1 Dr Nkosazana Dlamini Zuma Local Municipality

The Dr Nkosazana Dlamini Zuma LM was established by the amalgamation of Ingwe LM and Kwasani LM. The area of the LM is approximately 3 602 km^2 in area and is the largest LM in the district, accounting for just over a third of its geographical area. The municipality fulfils the role of being the administrative and commercial centre for the district. The rest of the municipal area consists of tribal lands, which dominate the area. The main towns in the municipality include Creighton, Himeville and Underberg. The municipality is also known for the World Heritage Site of Ukhahlamba.

2.2.2 Umzimkhulu Local Municipality

The Umzimkhulu LM is approximately 2 435 km^2 in area and is the most populated of all the municipalities within HGDM. Umzimkhulu Town (and the adjoining Clydesdale peri-urban area) is regarded as the primary node, both administrative and economic, in the municipal area. Rietvlei, Riversdale and Ibisi are regarded as secondary nodes, fulfilling the role of rural service centres. The Umzimkhulu LM located in the centre of the district has a high density of subsistence farming with plantations occurring along the western border. The towns of Creighton and Franklin are accessible to the north-western part of the municipal area and Harding is accessible to the southern part. These towns are recognized as economic service centres within the DM.

2.2.3 *Greater Kokstad Local Municipality*

The Greater Kokstad LM is approximately 2 680 km^2 in area. The town of Kokstad serves as the service centre and commercial hub for most of East Griqualand and nearby parts of the Eastern Cape. The LM borders the Eastern Cape. In general, the Greater Kokstad LM, located in the south-west of the DM, is predominantly and scattered subsistence farming, with a high density settlement around Kokstad town.

2.2.4 *Ubuhlebezwe Local Municipality*

The Ubuhlebezwe LM is approximately 1 604km^2 in area and the main administrative centre of the municipality is the town of Ixopo, which is also the seat of the HGDM. It is strategically located at the intersection of four major provincial routes leading to Pietermaritzburg, the Drakensberg, the Eastern Cape and the South Coast. The secondary and tertiary development nodes within the LM include Highflats, Hlutankungu (previously Stuartsville), Jolivet, KwaBhidla, Emgodi and Hlokozi. The Ubuhlebezwe LM, located in the north-east of the DM, predominantly has plantations with scattered agricultural lands and subsistence farming.

2.3 CLIMATE AND CLIMATE CHANGE

The climate of Harry Gwala DM is influenced by the cool Drakensberg Mountains to the west. Temperatures vary with altitude, with warm and humid conditions at sea level, contrasting with very hot and often dry in the bushveld, to very cold at 2000-3000 m above sea level in the Drakensberg. The highest rainfall areas are in the Drakensburg and in winter, spring and early summer most of the rain is caused by cold fronts, moving in from the south-west. These are often preceded by hot, desiccating, dry “Berg” winds from the north and north-west.

Snowfalls are common mainly in the Drakensberg, where snow usually melts within a few days. Heavy snowfalls can blanket the summit for weeks. Many species of plants are adapted to the harsh conditions and thrive in areas prone to frost and snow.

The Harry Gwala DM falls within a summer rainfall area with a mean annual rainfall ranging from 900 to over 1 400 mm. The temperatures within the District vary, driven by the varying altitudes which range from 3500 m along the Drakensberg to 600 m in the south east of the District.

The Ubuhlebezwe and Umzimkhulu LM’s in the south east of the District has warm summers and mild winters, with a mean annual temperature of approximately 18°C. Heavy mists, particularly associated with spring and summer, frequently occur. Early summer and spring are also associated with unpredictable weather conditions due to the Berg winds and cold fronts.

The Greater Kokstad LM in the south west has an annual mean temperature of 14°C, with severe frosts being common in winter and occasional snowfalls occurring in the areas of higher altitude.

The Dr Nkosazana Dlamini Zuma LM which is located closer to the Drakensberg has a wider temperature range, with temperatures up to mid 30°C in summer. In winter, the western portion often drops below 0°C with the eastern portion being slightly warmer and seldom dropping below 5°C. In winter severe frost and snowfalls can occur. (Ezemvelo KZN Wildlife, 2014)

The climatic conditions measured in HGDM are summarised per LM in **Table 2-1**.

Table 2-1: Climate variables of HGDM per LM

	Local Municipalities				HGDM
	Greater Kokstad	Dr Nkosazana Dlamini Zuma	Ubuhlebezwe	Umzimkhulu	
Precipitation (mm)					
Annual min	620	750	600	800	±600
Annual max	1 265	1 230	1 400	1 280	±1 400
Temperature (°C)					
Annual mean	14.2	15	18	17	≈16.3

Source: Ezemvelo KZN Wildlife, 2014

Within HGDM, climate change is an issue and effects are evident in unpredictable weather patterns, extreme climate events and associated disasters. Climate change projections indicate that extreme weather events such as floods and droughts are likely to become more frequent and intense, and that poor and marginalised groups will be most vulnerable to the risks presented by climate change. This affects both agriculture and tourism, which are important economic sectors within the DM.

Climate hazards in HGDM include occasional droughts, usually of short duration, occasional hail, frost that varies from slight to severe, and excessive cloudiness during the summer growing season. The presence of a large number of rivers and high volumes of water implies that safety of communities also needs to be considered by locating them outside possible flood areas. However, these climatic extremes make the area suitable for a variety of products including crops and vegetables, livestock and sugar cane around the Ixopo/Highflats area. (NEMAI, 2018)

During the drafting of the 2019/2020 IDP, HGDM has noted the need to develop a Climate Response Strategy that will assist in unpacking the impact of climate change within the DM. The Climate Response Strategy will focus on the economic impacts of climate change on the agricultural sector, tourism and the environment as well asdisaster management and engineering infrastructure standards.

This Response Strategy is expected to yield proposed adaptations and mitigation strategies in order to minimise the negative impact of climate change and also change in behaviour to minimise human contribution towards climate change. However, the HGDM has identified that are considered prone to flooding and other sectors that are affected by climate change. (IDP, 2019)

2.4 Topography, Geology and Soils

The highly variable topography characteristic of the DM creates biophysical habitat and micro climatic conditions which support a range of biodiversity. The highest elevations in the DM is found in Greater Kokstad and Dr Nkosazana Dlamini Zuma LM towards the Drakensberg Mountain Range. The eastern side of the DM has the lowest elevation. Elevations across the HGDM range from 600 m above sea level in the south east, extending to a height of approximately 3 500 m at the Drakensberg plateau along the western border of the Dr Nkosazana Dlamini Zuma LM.

In the north of the DM, the former Kwasani and Ingwe LM's (now Dr Nkosazana Dlamini Zuma) have rolling topography with much of the western area covered by mountainous terrain. The Ingwe LM's altitude ranges from 2 080 m above mean sea level in the north western portion of the municipality (Amahwaqa Peak) to a low of approximately 450 m at the bottom of the Mzimkhulu River valley in the south. Ingwe LM comprises of gently undulating to steeply undulating land. Much of the flatter land is restricted to small "plateaus" which are primarily found in the western highlands areas of the municipality. The elevation in Kwasani LM declines in an easterly direction away from the Drakensberg. The mean elevation ranges from 1706–3448 m in the western parts of the municipality, 1171–1706 m in the central and eastern parts of the municipality, to 953–1171 m in the north eastern point at Mqatsheni.

Further to the east of the DM, the Ubuhlebezwe LM has hilly topography with numerous river valleys creating steep topography with gently sloping valley bottoms. The landscape is highly complex and agitated with interlocking systems of ridge-lines and valleys of different hierarchical order.

In the centre of the DM, the Umzimkhulu LM topography ranges from flat to gentle rolling slope to hilly and ragged terrain. The terrain is undulating with distinct mountain ridges with broad and deep valleys. The mountainous area in the west and the north are part of the Drakensberg Mountain range. The mountain ridges are made up of flattish plateaus with mountain slopes ranging from vertical rock cliffs to steep grassy slopes to gentle gradients extending down into the valley bottoms. The highest mountain peak is situated at 1685m and the lowest point in the town of Umzimkhulu is situated at 740m.

In the south of the DM, the Greater Kokstad LM has gentle to moderately rolling topography moving to mountainous terrain in the south west. High mountains in the west overlook the irregular undulating hills with low mountains in the south formed by very thick dolerite sheets. There are various hills and ridges found

throughout the municipality. These high slopes impact negatively on development and restricts much of the development in the municipality.

There are many open spaces located throughout the DM which could be considered for agricultural purposes. However, the topography of most of the area is unfavourable for commercial agriculture production. Most of the areas have excessively steep slopes and shallow soils, even though pockets of good deep soil may occur. Unless costly efforts are made to prevent soil erosion, cultivation of these areas has the potential to induce degradation through soil erosion. In addition, the rugged nature of the landscape in relation to dispersed settlement patterns and location also poses a major challenge to service provision. (NEMAI, 2018)

The varied topography and geology have created a variety of soils within the District, and these are briefly described below per LM

- ✓ **Dr Nkosazana Dlamini Zuma LM -** Sedimentary derived soils are found on the east of Underberg and Himeville and tend to be shallow and dry or poorly drained. The soils are generally considered to be of low fertility and most of the soils of the Ingwe area are highly erodible.
- ✓ **Umzimkhulu LM -** Soils are moderately deep to deep red and yellow structure-less with moderate agricultural potential.
- ✓ **Ubuhlebezwe LM -** Around the Ixopo area soils are leached and of low inherent nutrient status with problems with Phosphorus fixation and aluminium toxicity, they have low agricultural potential. East of Ixopo soils on hillsides are shallow of the Mispah and Glenrosa. In the valley bottoms pockets of deep alluvial soils are found. Areas of calcareous duplex soils are also found east of Ixopo, these soils are highly erodible. Around the edges of Ubuhlebezwe LM soils are of the Table Mountain Sandstone plateau, with rugged low potential soils in the north of the LM. On the eastern boundary of the LM the soils are acid and leached. They consist of shallow sandy soils derived from the Table Mountain series with heavier soils are derived from dolerite and Dwyka Tillite. Small pockets of high potential soils do occur within the LM however erosion on the steep slopes is problematic in these areas.
- ✓ **Greater Kokstad LM -** The soils are highly variable ranging from deep, highly leached, strongly acid soils to shallow badly drained soils. Where soils are shallow fertility is low but such soils have good physical properties.

2.5 ENVIRONMENTAL

The highly variable topography characteristic of the HGDM creates biophysical habitat and micro climatic conditions which support a range of biodiversity. The Harry Gwala DM traverses five biomes, namely: Forest, Fynbos, Grassland, Savanna and Wetland and contains 28 vegetation types. These biomes provide the basic template for defining the extent of species-specific habitat that potentially supports a wide variety of biodiversity.

The National Department of Environmental Affairs (DEA) has published a list of threatened terrestrial ecosystems, which classifies all threatened or protected ecosystems in South Africa in terms of four categories: Critically Endangered (CR), Endangered (EN), Vulnerable (VU), or Protected. The purpose of categorising these ecosystems was to prioritise conservation areas, to reduce the rates of ecosystem and species extinction, as well as to prevent further degradation and loss of structure, function and composition of these ecosystems.

Within the Harry Gwala DM the DEA has identified 25 threatened ecosystems, this includes one (1) Critically Endangered, seven (7) Endangered and seventeen (17) Vulnerable ecosystems.

The Savanna biome is categorized as being Endangered and Critically Endangered; The Forest biome in the District is Near Threatened; the Grassland biomes are Near Threatened with the Midlands Mistbelt Grassland being Critically Endangered and the Southern KwaZulu Natal Moist Grassland having an Endangered status. The area is known to support a number of endangered and vulnerable floral (88 species) as well as faunal (95 species) species that are classified by the International Union for Conservation of Nature (IUCN) as species at risk of extinction and need to be protected. (IDP, 2019)

The Harry Gwala DM has several formally protected areas and other conservation areas, including the UKhahlamba Drakensberg Park World Heritage Site and several forest reserves.

The DM has several large wetland systems including: the Pholela, Ngwangwane and Ndawana systems in the north western section of the district in the foothills of the Drakensberg; The Kromrivier and Mzintlanga systems in the southern area of the district, which includes the Franklin Vlei; to the north the Ntsikeni Nature Reserve and its extensive wetland system ; and to the north east the Upper and little Bisi system; as well as several wetlands in remaining municipalities.

Important areas of environmental significance need to be identified to protect and preserve valued ecosystems, natural habitats and special case areas in order to minimise negative impacts. In terms of land use management, the specific ecosystems and vegetation communities that require environmental management are wetlands, grasslands, and indigenous forests that contain the habitats of important species. It should be noted that environmental management need not be limited to the protection/preservation but also areas may be identified for opportunities that a particular environment may provide such as the rehabilitation of wetlands, eco-tourism opportunities etc.

2.6 INSTITUTIONAL ARRANGEMENTS FOR WATER SUPPLY

The HGDM is the water service authority (WSA) and water service provider (WSP) to its four local municipalities, namely:

- ✓ Dr Nkosazana Dlamini-Zuma Local Municipality (KZN436);
- ✓ Umzimkhulu Local Municipality (KZN435);
- ✓ Greater Kokstad Local Municipality (KZN433); and
- ✓ Ubuhlebezwe Local Municipality (KZN434);

The HGDM is mandated by the Water Services Act to progressively ensure efficient, affordable, economical and sustainable access to water services for all consumers and potential consumers within its area of jurisdiction.

Ms Adelaide Momnandi Dlamini is the Municipal Manager of HGDM and Mr Dumisani Sanele Gqiba is the Executive Director for Water Services.

Umgeni Water supplies bulk water to the town of Ixopo and a small portion of the southern Ubuhlebezwe Local Municipality (that was formerly a part of the Umzumbe Local Municipality in Ugu DM). Potable water is sold by Umgeni Water “at the fence” of the WTP to the Harry Gwala District Municipality from where the DM is responsible for reticulation within the town of Ixopo and the adjacent peri-urban areas within Ubuhlebezwe Local Municipality.

3. DEMOGRAPHICS

3.1 EXISTING POPULATION DISTRIBUTION

The HGDM is in the process to review and update their WSDP and has updated their demographics accordingly in the 2018 Water Services Development Plan (WSDP) Summary Report.

For the purposes of this study, a decision was made in consultation with the WSA that UAP Phase III will adopt the figures reflected by the DWS Reference Framework (2019).

There is currently 533 022 people within 162 614 households residing within 399 communities within HGDM. The average household size is 3.28 persons per household. The Umzimkhulu LM, notably, hosts 39% of the population of the DM. The population distribution of HGDM is illustrated in **Figure 3-1** overleaf.

The population and household figures per Local Municipality are tabled in **Table 3-1** below.

Table 3-1: Population & Household Figures for HGDM

Municipality	No of Population	No of Households	People per Household
Greater Kokstad	80 447	25 600	3.14
Dr. Nkosazana Dlamini-Zuma	123 483	44 834	2.75
Ubuhlebezwe	123 282	28 016	4.40
Umzimkhulu	205 810	64 164	3.21
Total	**533 022**	**162 614**	**3.28**

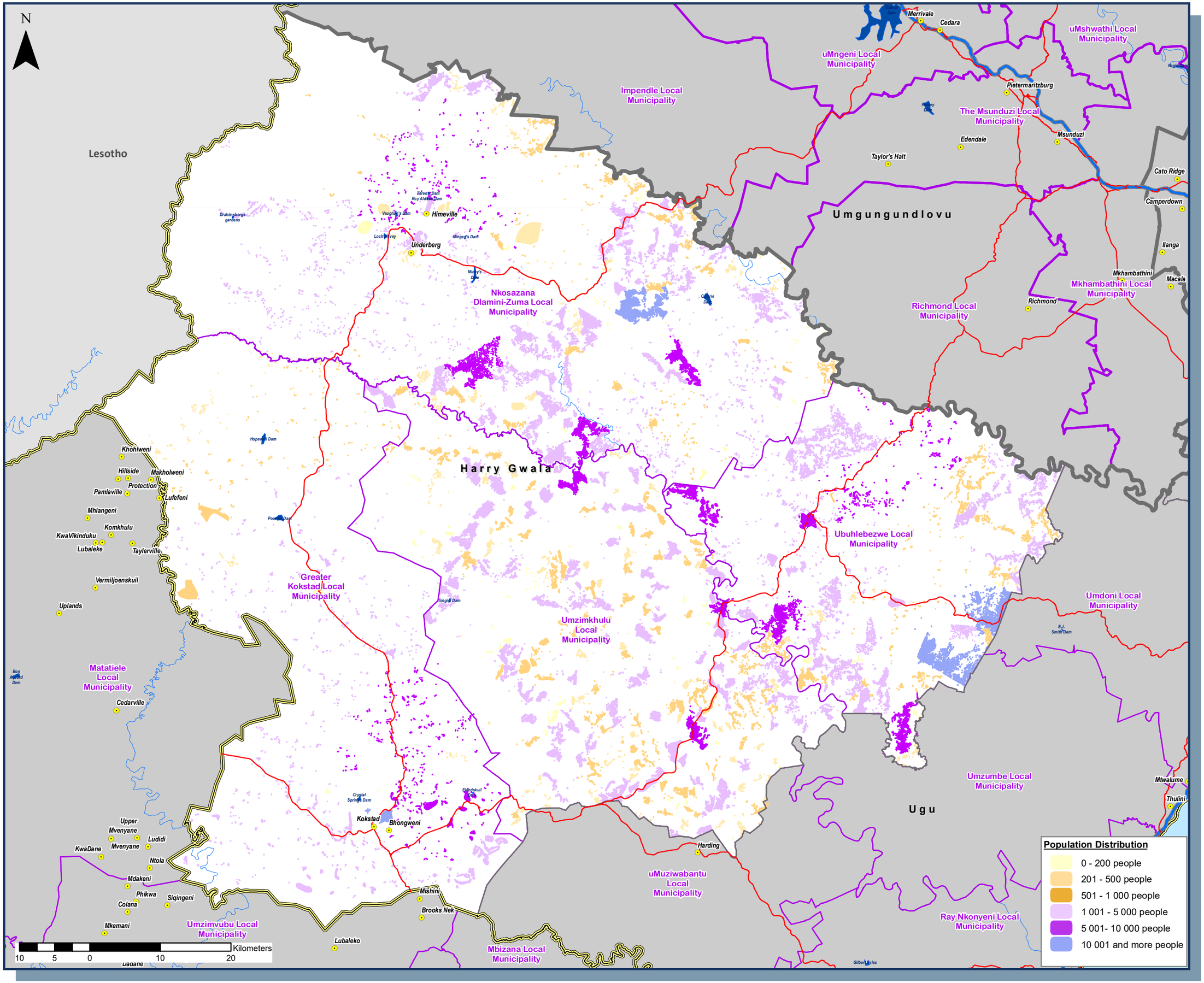
Source: DWS Reference Framework, April 2019

The Community Survey 2016 yielded a growth rate of 2.03% for the HGDM from 2011 to 2016. The Greater Kokstad LM recorded the largest growth rate within this period and is presented in **Table 3-2** below.

Table 3-2: Population and Growth Rate: 2011 - 2016

Municipality	Population 2011	Population 2016	Population Growth	Growth Rate
Greater Kokstad	65 982	76 753	10 771	3.44
Dr. Nkosazana Dlamini-Zuma	113 448	118 480	5 032	1.67
Ubuhlebezwe	101 691	118 346	16 655	1.47
Umzimkhulu	180 302	197 286	16 984	2.05
Total	**461 423**	**510 865**	49 442	**2.03**

Source: StatsSA, Community Survey 2016



Legend

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- District Municipality Boundaries
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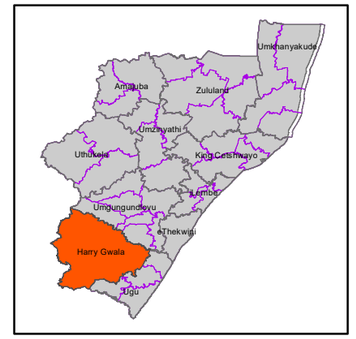


CLIENT:

UMGENI WATER • AMANZI

MUNICIPALITY:

HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Population Distribution

Harry Gwala District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 43 Figure 3-1

3.2 SOCIAL AND ECONOMIC INDICATORS

The HGDM constitutes 11% of the area and ±5% of the population of KZN. In terms of the KwaZulu-Natal Provincial Economy. Despite being a minor player at present concerning their economic contribution, the DM has recorded a significant growth and is ranked fifth out of the Provincial Districts in terms of GDP. Agriculture and Agribusiness, Tourism, Public Sector services and retail trade are identified as the main drivers of the DM's economy. Currently the economic growth is relatively stagnant due to a number of constraints inherent to certain sectors that hamper potential growth. (IDP, 2019)

Some of the best agricultural land in the country is located in HGDM. HGDM is primarily a rural district. The key economic opportunities in this largely rural district (viz. tourism and agriculture) are thus directly linked to the environment. Water, climate, soil, bio-diversity and scenic beauty are especially relevant. There is extensive commercial and subsistence farming in the DM with the notable exception being uMzimkhulu. The main agriculture outputs are livestock, maize, potatoes and deciduous fruit.

The Greater Kokstad area however has significant subsistence agriculture potential and portions of the district form part of the Maloti Drakensberg Trans frontier Project. This is a programme aimed at preserving unique and fragile ecosystems in Lesotho and South Africa.

The main transport routes within the DM include a portion of the N2 that runs from Port Shepstone to Mthatha in the Eastern Cape. In addition to this the R617 runs north from Kokstad to Underberg linking Msunduzi to Bulwer. This route also offers a lot of tourism potential due to the relatively high volumes of traffic on the route. Sani Pass is the only formal route into Lesotho and provides tourists with the opportunity to explore the Mountain Kingdom. (IDP, 2019)

HGDM is characterized by the socio-economic indicators such as low revenue base, poor and ageing infrastructure especially water and sanitation infrastructure, limited access to services and low economic base. High levels of poverty, unemployment, skills shortage, lack of resources and low level of education; under-developed land and settlement patterns also make it difficult to plan for effective service delivery.

Development challenges facing the district include urbanization and a rise in the emergence of associated informal settlements. and a general lack of investment in the rural areas particularly traditional council areas. These challenges further attributes to an upswing in poverty, service backlogs, land issues as well as the lack of infrastructure investment (bulk infrastructure).

The total Gross Value Added (GVA) of Harry Gwala DM in 2016 was estimated at R9.1 billion. The tertiary sector was and still remains the greatest contributor to the GVA output of the District, mainly comprising General Government. Other dominant sectors include Agriculture, Forestry and Fishing and Wholesale and Retail Trade, Catering and Accommodation. (IDP, 2019)

The tertiary sector is now the main driver of economic growth, with good finance and business services sub-sector rising the sharpest, followed by transport and general government. Community service is a critical component of the economy of the DM and is the main sector within the DM. It plays a role in both facilitating growth through its activities as well as being an active employer and thus an income contributor. However, the issue of developing and retaining skills as well as the capacity of the public sector in the DM needs to be addressed to ensure future growth. (IDP, 2019)

Table 3-3 below illustrates Harry Gwala DM's GVA contribution per sector as reflected in the IDP.

Table 3-3: HGDM GVA per economic sector

Sector	% Contribution
Agriculture, forestry and fishing	15.2%
Mining and quarrying	0.3%
Manufacturing	9.0%
Electricity, gas and water	5.1%
Construction	4.1%
Wholesale and retail trade, catering and accommodation	20.6%
Transport, storage and communication	8.5%
Finance, insurance, real estate and business services	7.7%
Community, social and personal services	29.5%

Source: HGDM IDP, 2019/2020

Employment (formal and informal) in Harry Gwala DM has shown some growth following the sharp drop in 2008. However, the slow but steady rise in employment is not keeping track with a sharp increase in the working age population (15-24yrs). (IDP, 2019).

Community Services, Trade, Agriculture and Tourism are the largest employment sectors in the DM. Agricultural employment opportunities has shown the most dramatic decline over the past 10 years compared to employment in Trade and Tourism, Business Services, Community and Government that have shown the most positive growth. The overall effect of the poor performance of agriculture and forestry on employment creation has resulted in very modest growth in job creation overall. (IDP, 2019).

Agriculture still contributes proportionately more to employment opportunities within the rural areas of HGDM when compared to the rest of South Africa. Moreover, a discrepancy between actual and potential production indicates a significant percentage of farmland has not been developed to its fullest potential that could be exploited by the DM in future.

Table 3-4 below shows the official unemployment rate in HGDM compared to KwaZulu-Natal as at 2016.

Table 3-4: Official unemployment rate in KZN and Harry Gwala, 2016

Area	Percentage Unemployment
KwaZulu-Natal	21.9%
Harry Gwala	25.4%
Greater Kokstad	18.7%
Ubuhlebezwe	25.2%
Umzimkhulu	34.9%
Dr Nkosazana Dlamini Zuma	22.6%

Source: HGDM IDP, 2019/2020

Rural communities have limited access to economic opportunity and therefore are dependent on the land for income and food. The Harry Gwala Development Agency has a strategic mandate to help promote economic development and create jobs in HGDM. This enjoins this agency to play a leadership role in the efforts aimed at creating work and real economic growth. (IDP, 2019)

3.3 Population Growth Scenarios

Population and economic growth rates are used to determine future developmental requirements within the HGDM. This determines the required increase or decrease in water services. Non-domestic consumer unit growth, particularly commercial, industrial and agricultural growth, also gives an indication of the expected increase in water demand and associated wastewater flow discharges. Factors that affect population growth rate include:

- ✓ Immigration due to displaced farm labour, land restitution and declining job opportunities in neighbouring provinces;
- ✓ Emigration to urban centres or outward migration from the region in search of job opportunities; and
- ✓ The HIV/AIDS epidemic that is predicted to seriously affect economically active persons (18-45 years). Full-blown AIDS sufferers who are unable to continue working may return home to the rural areas. This may be an internal urban/rural shift, or migration from urban areas outside the DM. With the prevalence of HIV/AIDS, especially in KZN, it is important to ensure adequate water services provision in the rural areas.

3.4 Main Development Nodes

The importance of development nodes is a reflection of an area's economic development potential and the range of service that should be provided.

Table 3-5 summarises the hierarchy of primary, secondary, tertiary, rural service, and tourism/recreational nodes for the HGDM.

Table 3-5: Official unemployment rate in KZN and Harry Gwala, 2016

Nodes	Node Description	Location and Rationale
Primary Nodes	The sphere of influence for these primary nodes range from 10-15 km. These nodes serve the sub-regional economy of the district and are currently in need of a detailed master-planning for infrastructural and services requirements for expansion. Services that are expected in these centres include agri industrial development, large scale tourism projects, housing development, shopping centres, wide range of retail services, police services, primary, secondary and tertiary high level of education centres, hospitals, clinics, government departments, satellite offices (especially for land affairs, social welfare).	Urban centres of: ✓ Kokstad ✓ Umzimkhulu ✓ Ixopo ✓ Underberg/Himeville These areas have potential for significant economic development, growth and expansion. Their sphere of influence ranges from 10-15km.
Secondary Nodes	The typical services expected at these nodes include police stations, low level retail services and housing development (less than 1000 lots), small scale tourism, education facilities (primary and secondary), clinics, pension payout points, community halls etc.	Urban centres of: ✓ Franklin ✓ Creighton ✓ Donnybrook ✓ Bulwer (treated as a primary node due to potential posed by its strategic location) ✓ Highflats These areas are said to comprise of sufficient levels of economic development.
Tertiary Nodes	These areas are said to have lower potential for providing economic services to local communities. Appropriate formalisation in terms of planning and development control is required in these areas to enhance their development potential. Common services that can be expected in these areas include low level retail services, police stations, primary and secondary education, clinics, pension payout points, community halls, and taxi ranks.	Urban areas of: ✓ Swartberg ✓ Riverside ✓ Ibis ✓ Rietvlei These areas are described as having low levels for economic potential. The aim of these tertiary nodes is primarily to serve local communities.

Nodes	Node Description	Location and Rationale
Rural Service Nodes	Rural service nodes represent the lowest order of locality, where a range of service and economic activities could be concentrated in a sustainable way. These are the most accessible locations within an acceptable distance of communities. The levels of service found at these nodes are clinics, mobile services, post boxes shops, primary and secondary school, pension payout point, taxi rank, and Traditional Authority Court.	In areas which comprise of minimal economic potential such as: ✓ Ntsikeni ✓ Lourdes ✓ GowanLea ✓ Centacow ✓ Kilmon ✓ Ncwadi ✓ Stepmore ✓ Ntwasahlobo ✓ Makhoba ✓ Nokweja ✓ Jolivet
Tourism & Recreation Nodes	These nodes are situated in areas that are attractive and have the potential for resource orientated activities. The areas have easy access to the wilderness/ natural areas through controlled points.	These nodes are located on private land such as: ✓ In Kokstad on the N2 ✓ Ntsekeni Nature Reserve ✓ Ophepheni ✓ Indlovu Clan (Ubuhlebezwe to west R56) Qunu falls

Source: HGDM EMF, 2018

4. WATER REQUIREMENTS

This section provides an overview of the water requirements as calculated using the demand model developed for the purpose of this study. A summary is provided firstly for the District and then for each of the Local Municipalities. The total number of households (HH) as obtained from the 2011 Census and the number of households below RDP standards are also provided. (Households below RDP standards include all households having water supply – any form – further than 200m from the household).

4.1 WATER SUPPLY SERVICE LEVEL

Service levels currently differ across the HGDM, predominantly based on a rural/urban split. In general urban areas are associated with higher levels of water supply and many rural areas have either no water services or these services do not meet, the compulsory national standards determined by the Minister of Water & Sanitation in terms of Section 9(1)(a) of the Water Services Act, 1997 (Table 4a).

The Municipality is a Water Services Authority and provides free basic services, that are part of the municipality's mandate to its registered indigents. The indigent register was developed only for the urban communities. Free basic water services at RDP level are supplied to the rural communities but are not included in the indigent register.

The number of qualifying indigent applicants reflecting on the indigent register as at February 2018 was 1 559. The cost to provide 6kl of free water to qualifying indigent households resulted in a revenue loss of R910 331.28 in the 2018/19 financial year.

The municipality aims to annually review and adopt its indigent policy together with budget related policies. This assists in ensuring that the municipality provides basic services to those residents who cannot afford to pay for water services, provided they are registered as indigent. (IDP, 2019)

The HGDM WSDP Summary Report 2018 reports that the current water backlog for the District is as follows:

Table 4-1: Water Backlogs within Harry Gwala District Municipality

Direct Backlogs	Totals
Direct settlement backlog water households. Total household of settlement with a water need (irrelevant the type of need)	59 597
Direct settlement backlog water population. Total population of settlement with a water need (irrelevant the type of need)	253 217

Source: HGDM WSDP, 2018

According to the DWS reference framework database, the main source for the majority of households within HGDM is a source at a distance below 200m, flowing stream or river and piped (tap) water inside the yard of households (approximately 28%, 23% and 22% respectively). (DWS, 2019)

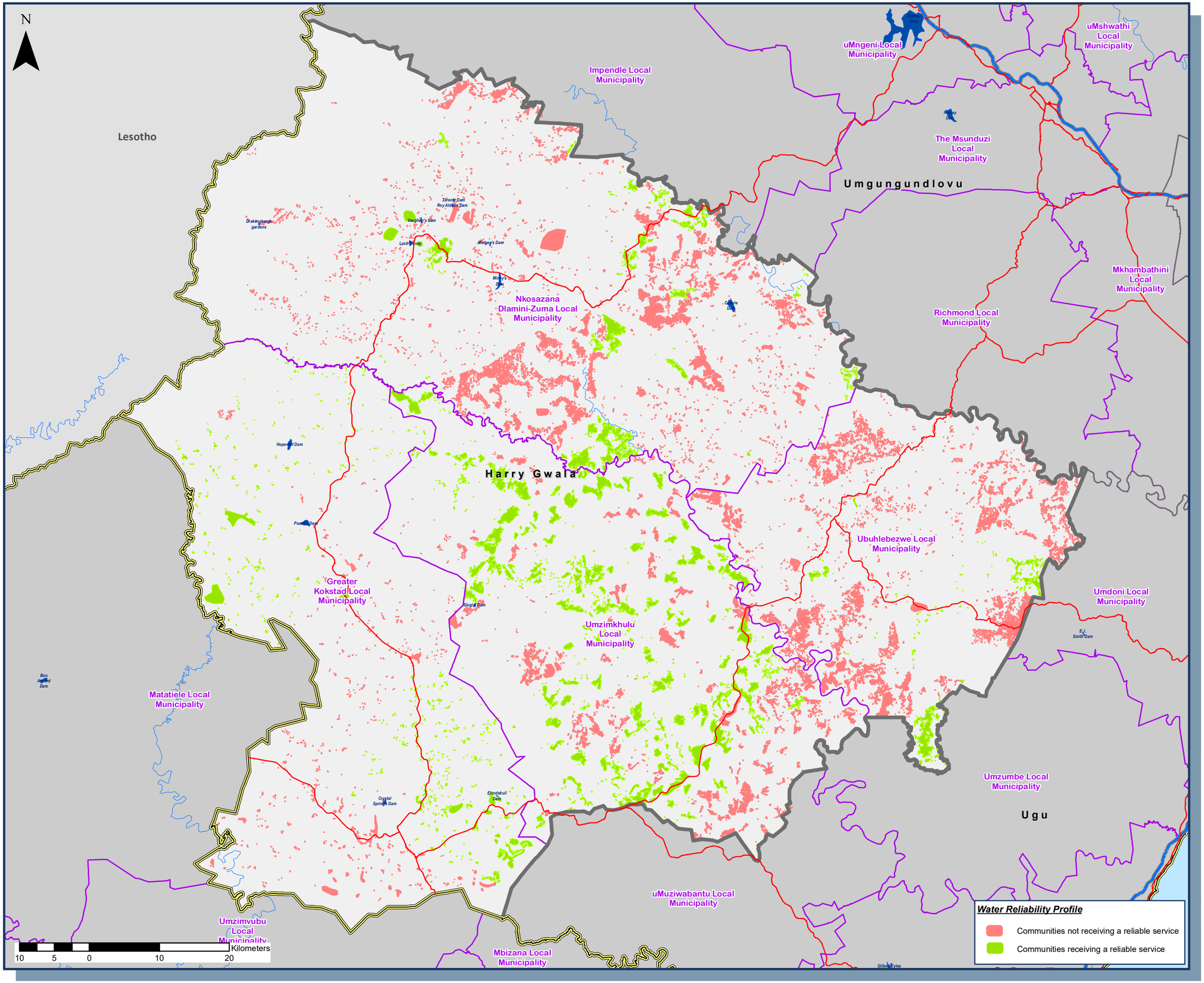
Table 4-2 below presents the distribution of households by main source of water for drinking.

Table 4-2: Distribution of households by main source of water for drinking, DWS RF 2019

LM Name	Piped (tap) water inside the dwelling/house	Piped (tap) water inside yard	Distance below 200m	Distance greater than 200m	Borehole	Spring	Rain-water tank	Dam/pool/stagnant water	River/stream	Water vendor	Other	Total
Greater Kokstad	6 959	15 000	2 955	271	85	8	186	0	205	0	0	25 600
Dr. Nkosazana Dlamini-Zuma	2 857	9 314	10 424	5 533	1 666	810	0	512	11 892	1 819	11	44 834
Ubuhlebezwe	1 924	5 022	8 661	1 099	3 120	214	274	15	6 950	643	90	28 016
Umzimkhulu	3 461	6 348	24 002	5 675	2 889	1 373	2 002	0	18 083	332	0	64 164
Total	**15 201**	**35 684**	**46 042**	**12 578**	**7 760**	**2 405**	**2 462**	**527**	**37 130**	**2 794**	**101**	**162 614**

Source: DWS Reference Framework, April 2019

The service levels for HGDM is depicted in **Figure 4-1** overleaf.



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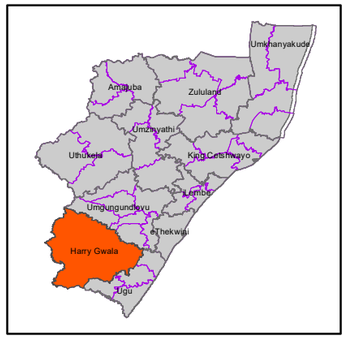

CLIENT:

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MUNICIPALITY:

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CONSULTANTS

Project No.: 27814

MARISWE

JTN CONSULTING

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Water Supply Reliability Profile

Harry Gwala District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 43 Figure 4-1

4.2 WATER LOSSES AND DEMAND MANAGEMENT[1]

According to the HGDM Management Plan to Reduce Non-Revenue Water (MPNRW), the municipality has not been actively implementing a NRW/Water Loss Reduction Programme in recent years. The only exception is the domestic metering that has been partially carried out using smart meters.

As part of ongoing system operations and maintenance, it is unclear if infrastructure that has exceeded its design service life is being replaced or directed through the establishment of an Asset Management program. Most of the pipe replacements, system maintenance and NRW reduction activities have been conducted on a reactive manner. (HGDM MPNRW, 2018).

The best-case scenario, minimum practical achievable NRW by volume for the entire HGDM area of supply has been set at 30.3% of the SIV.

As per the MPNRW, there are a number of interventions which don't have a direct water savings impact, but are vital for the success of any WC/WDM implementation plan, namely, bulk meter installations, system monitoring, NRW reduction teams and logging equipment, training and awareness campaigns, etc.

The activities that should be prioritized for NRW Reduction are:

- ✓ Pressure Management: PRV Maintenance and Additional Pressure Management Zones (Advance Pressure Management - only certain areas);
- ✓ Leak Detection and Repair;
- ✓ New Metered Connections;
- ✓ Billing data base and data collection improvements and
- ✓ Metering of all SIV meters for all the systems such that reasonably accurate water balances can be calculated.

4.3 WATER BALANCE

The WSA prepares monthly water balances, in the IWA format, on a local municipality level, for submission to the DWS. These water balances help provide a greater understanding of each of the supply systems/waterworks and also assist in the preparation of specific intervention strategies and cost/benefit calculations.

The latest available water balance for the WSA is presented in **Table 4-3**.

[1] Sourced from the HGDM Management Plan to Reduce Non-Revenue Water, 2018

Table 4-3: HGDM Water Balance, December 2018

Total System Input Volume 14.96 Mℓ/d	Authorised Consumption 11.07 Mℓ/d Percentage of SIV = 74.0%	Billed Authorised Consumption 7.40 Mℓ/d Percentage of SIV = 49.5%	Billed Metered Consumption-Domestic - Mℓ/d Percentage of SIV =	Revenue Water 7.40 Mℓ/d Percentage of SIV = 49.5%
			Billed Metered Consumption-Commercial - Mℓ/d Percentage of SIV =	
			Export Volume - Mℓ/d Percentage of SIV =	
			Billed Unmetered Consumption - Mℓ/d Percentage of SIV =	
		Unbilled Authorised Consumption 3.67 Mℓ/d Percentage of SIV = 24.5%	Unbilled Metered Consumption 1.10 Mℓ/d Percentage of SIV = 7.4%	Non-Revenue Water 7.56 Mℓ/d Percentage of SIV = 50.5%
			Unbilled Unmetered Consumption 2.57 Mℓ/d Percentage of SIV = 17.2%	
	Water Losses 3.89 Mℓ/d Percentage of SIV = 26.0%	Apparent Losses 1.08 Mℓ/d Percentage of SIV = 7.2%	Unauthorised Consumption 0.91 Mℓ/d Percentage of SIV = 6.1%	
			Metering Inaccuracies 0.17 Mℓ/d Percentage of SIV = 1.1%	
		Real Losses 2.81 Mℓ/d Percentage of SIV = 19%	Mains and Dsitribution Leaks - Mℓ/d Percentage of SIV =	
			Reservoir Overflows - Mℓ/d Percentage of SIV =	
			Service Connection Leaks - Mℓ/d Percentage of SIV =	

Source: HGDM WSDP, 2020

The non-revenue water for the DM in 2018 was at 7.56 Mℓ/d. If using a rate of R6.00/kℓ, this amounts to a loss of R45 360 per day. Only 7.40 Mℓ/d of the SIV of 14.96 Mℓ/d can be billed and be accounted for.

4.4 WATER DEMAND MODEL

This section provides an overview of the water requirements as calculated using the demand model developed for the purpose of this study. As mentioned in Section 1.5 of this report, the water demand model, approved by Umgeni Water, for this study was applied to determine the demands for all areas included in the study, at least at a town level. The water demands were modelled in five year increments up to 2050, with the minimum level of service as yard connections at 100ℓ capita per day. The base data used for the modelling is explained in Section 1.6.

The water demands for HGDM is presented below per LM and per supply scheme area. It must be noted that the Water Supply Scheme (WSS) boundaries do not necessarily coincide with municipal boundaries. There

are supply areas that traverse more than one LM. The water requirements reported on are per LM and if a WSS is split by a LM, the water requirements are reported based on this split.

4.4.1 Water Demand for Harry Gwala District Municipality

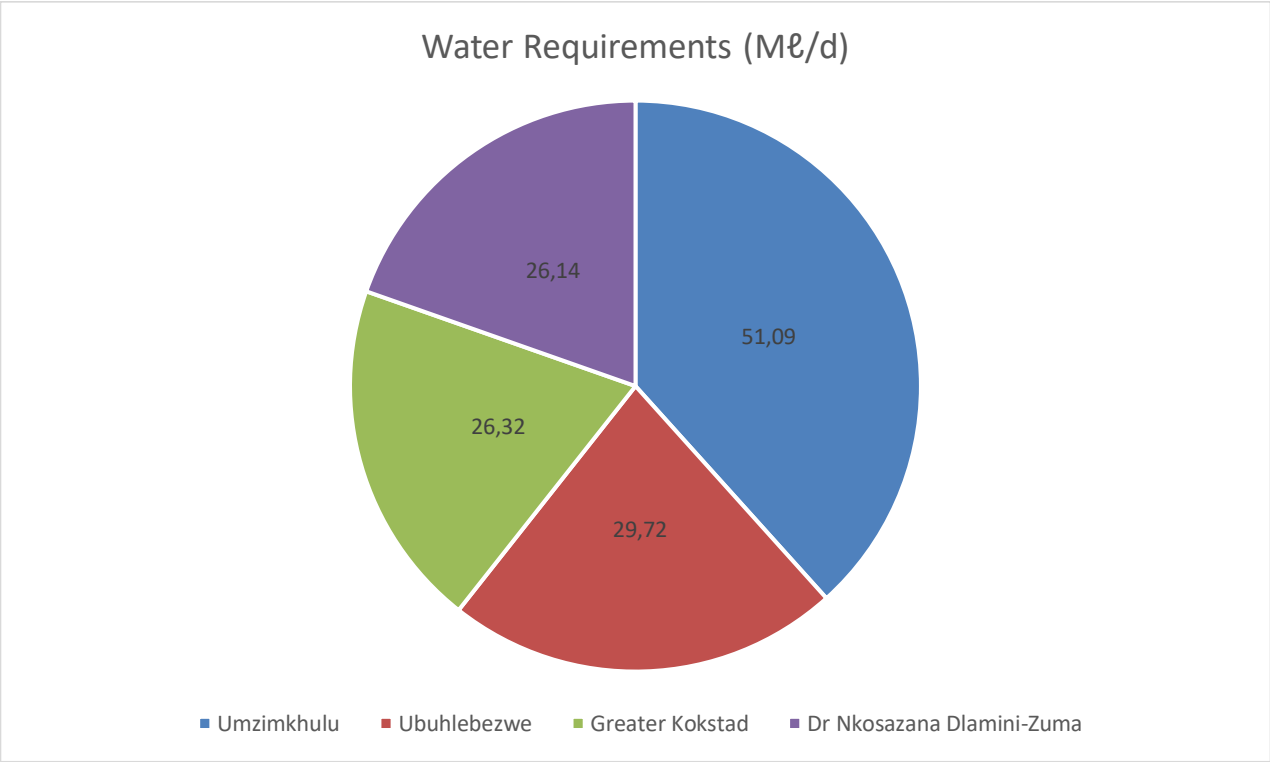
The water requirements (in Mℓ/d) for HGDM are presented per Local Municipality within **Table 4-4**. These water requirements were calculated for consumers having formal water supply schemes and for consumers not yet supplied from a formal water supply scheme. Section 1.5 Water Demand Methodology in this report explains the approach for the calculations to determine the theoretical water requirements and adjusted for water losses. The HGDM would require 133.27 Mℓ/day by the year 2050.

The 2050 water requirements per LM are presented below in **Figure 4-2** in the form of a pie chart, illustrating that the Umzimkhulu LM will be the largest water consumer in the HGDM requiring 38% of all water followed by the Ubuhlebezwe LM with 22%.

Table 4-4: Water Requirements (Mℓ/d), per Local Municipality

LM	2050 Population	2020 (Mℓ/d)	2025 (Mℓ/d)	2030 (Mℓ/d)	2040 (Mℓ/d)	2045 (Mℓ/d)	2050 (Mℓ/d)
Umzimkhulu	273 122	38.26	39.90	41.92	46.22	48.58	51.09
Ubuhlebezwe	154 062	22.39	23.33	24.48	26.94	28.29	29.72
Greater Kokstad	99 193	20.14	20.94	21.92	23.99	25.12	26.32
Dr Nkosazana Dlamini-Zuma	141 208	19.67	20.49	21.51	23.68	24.87	26.14
Harry Gwala DM	**667 585**	**100.46**	**104.66**	**109.83**	**120.83**	**126.86**	**133.27**

Figure 4-2: 2050 Water Demand in Mℓ/day per LM



4.4.2 Demand per Water Scheme

The water demands for the Water Supply Schemes (WSS) within HGDM is presented below and overleaf in **Table 4-5.**

Table 4-5: HGDM Water supply scheme demands

LM	WSS	2050 Population	2020 (Mℓ/d)	2025 (Mℓ/d)	2030 (Mℓ/d)	2040 (Mℓ/d)	2045 (Mℓ/d)	2050 (Mℓ/d)
Dr Nkosazana Dlamini-Zuma	Bulwer Scheme	2 003	0.37	0.38	0.40	0.44	0.46	0.48
	Centocow / St Apollinaris/Makholweni Scheme	16 820	2.38	2.48	2.60	2.87	3.02	3.17
	Creighton Water Scheme	1 362	0.27	0.28	0.30	0.33	0.34	0.36
	Bulwer-Nkelabantwana Nkumba (Future)	9 258	1.31	1.36	1.43	1.57	1.65	1.74
	Donnybrook / Gala Water Scheme	7 877	1.10	1.15	1.21	1.34	1.41	1.48
	Ixopo Bulk (Future)	2 524	0.33	0.35	0.36	0.40	0.42	0.44
	Greater Mbulweleni (Future)	23 824	3.35	3.49	3.66	4.03	4.24	4.45
	Hlanganani/Polela Scheme	3 182	0.46	0.48	0.51	0.56	0.59	0.62
	Kilimon Water Scheme (Future)	23 555	3.10	3.23	3.39	3.74	3.93	4.13
	Bulwer Bulk (Future)	108 034	15.25	15.89	16.68	18.36	19.28	20.26
	Mbhulelo Scheme	2 691	0.36	0.37	0.39	0.43	0.45	0.47
	Bulwer Nkelabantwana Water Scheme	6 858	0.94	0.98	1.03	1.13	1.19	1.25
	Donnybrook Scheme	521	0.09	0.09	0.09	0.10	0.11	0.12
	Esicedeni/Qulashe Area Scheme	3 362	0.44	0.46	0.48	0.53	0.55	0.58
	Esikheshini Scheme	956	0.13	0.14	0.15	0.16	0.17	0.18
	Kwasokhela Scheme	951	0.16	0.16	0.17	0.19	0.20	0.21
	Luwambeni Scheme	3 594	0.46	0.48	0.51	0.56	0.59	0.62
	Macabazini Water Scheme	685	0.09	0.09	0.10	0.11	0.11	0.12
	Mangwaneni Water Scheme	1 335	0.18	0.19	0.20	0.21	0.23	0.24
	Masamani Khukhulela Water Scheme	4 318	0.55	0.57	0.60	0.66	0.69	0.72
	Masamani Water Scheme	4 203	0.58	0.60	0.63	0.69	0.73	0.76
	Mbulelweni Water Scheme	2 395	0.35	0.36	0.38	0.42	0.44	0.47
	Mnqundekweni Water Scheme	1 853	0.24	0.25	0.26	0.28	0.30	0.31
	Mnywaneni Water Scheme	923	0.12	0.12	0.13	0.14	0.15	0.16
	Mphithini Water Scheme	671	0.09	0.10	0.10	0.11	0.12	0.13
	Nkwezela Water Scheme	8 414	1.13	1.17	1.23	1.36	1.42	1.50
	Nomandlovu Scheme	3 474	0.49	0.51	0.53	0.59	0.62	0.65
	Ntakama Scheme	2 524	0.33	0.35	0.36	0.40	0.42	0.44
	Okhetheni Water Scheme	832	0.11	0.12	0.12	0.14	0.14	0.15
	Oqaqeni Water Scheme	1 401	0.18	0.19	0.20	0.22	0.23	0.24

LM	WSS	2050 Population	2020 (Mℓ/d)	2025 (Mℓ/d)	2030 (Mℓ/d)	2040 (Mℓ/d)	2045 (Mℓ/d)	2050 (Mℓ/d)
Dr Nkosazana Dlamini-Zuma	Sandanezwe Water Scheme	3 898	0.54	0.56	0.59	0.66	0.69	0.73
	Tarsvalley Water Scheme	1 335	0.17	0.18	0.19	0.21	0.22	0.23
	Voyizana Water Scheme	944	0.12	0.13	0.14	0.15	0.16	0.16
	Bulwer Bulk (Future)	867	0.15	0.15	0.16	0.18	0.19	0.19
	Underberg Scheme	3 797	0.81	0.84	0.88	0.96	1.01	1.06
	Enhlanhleni/Emakholweni Scheme	957	0.12	0.13	0.13	0.15	0.15	0.16
	Himeville Scheme	2 571	0.57	0.59	0.62	0.68	0.71	0.74
	Mqatsheni/Maguzwana-Stepmore	2 900	0.38	0.39	0.41	0.45	0.48	0.50
	Pitela Scheme	671	0.09	0.10	0.10	0.11	0.12	0.12
	Stepmore	306	0.04	0.04	0.04	0.05	0.05	0.05
Greater Kokstad	Franklin Water Scheme	3 057	0.60	0.62	0.65	0.72	0.75	0.79
	Kokstad Water Scheme	76 705	16.36	17.00	17.80	19.48	20.40	21.36
	Kraansdraai / Glen Edward Water Scheme	650	0.09	0.09	0.10	0.11	0.11	0.12
	Maraiskop	1 367	0.19	0.20	0.21	0.23	0.24	0.25
	Pakkies Water Scheme	1 965	0.27	0.28	0.30	0.33	0.35	0.36
	Thuthukane Water Scheme	1 348	0.18	0.19	0.20	0.22	0.24	0.25
Ubuhlebezwe	Ufafa (Future)	5 159	0.67	0.70	0.73	0.81	0.85	0.89
	Chibini (Future)	8 684	1.14	1.18	1.24	1.37	1.44	1.51
	Ixopo Bulk (Future)	33 182	5.99	6.24	6.54	7.18	7.53	7.91
	Esiqandulweni Water Supply Scheme	2 173	0.30	0.31	0.33	0.37	0.38	0.41
	Greater Mkhunya (Future)	19 385	2.59	2.71	2.84	3.13	3.29	3.47
	Highflats	821	0.12	0.12	0.13	0.14	0.15	0.16
	Ncakubana (Future)	2 397	0.33	0.34	0.36	0.40	0.42	0.44
	Ixopo Water Supply Scheme	16 199	3.66	3.81	3.99	4.38	4.58	4.80
	Jolivet/Vulamehlo Water Supply Scheme - Cross Border	25 090	3.34	3.48	3.65	4.02	4.22	4.43
	Bulwer Bulk (Future)	8 228	1.10	1.15	1.21	1.34	1.40	1.48
	Nokweja Water Supply Scheme	13 370	1.74	1.82	1.91	2.10	2.21	2.32
	Hlokozi Water Supply Scheme	17 844	2.34	2.44	2.56	2.82	2.96	3.12
	Ebovini / Emazabekweni Water Supply Scheme 3	11 070	1.45	1.52	1.59	1.75	1.84	1.94
	Erith Trust/Ebhayi/Kwathathane Scheme	4 925	0.64	0.67	0.70	0.78	0.81	0.86
	Hlokozi Scheme	14 937	1.96	2.04	2.14	2.36	2.48	2.61
	Hopewell/Carrisbrooke Supply Scheme	2 473	0.42	0.44	0.47	0.51	0.54	0.57
	Mahhehle Water Supply Scheme	5 784	0.81	0.85	0.89	0.98	1.03	1.09
	Mambatheni Water Scheme	874	0.11	0.12	0.12	0.14	0.14	0.15

LM	WSS	2050 Population	2020 (Mℓ/d)	2025 (Mℓ/d)	2030 (Mℓ/d)	2040 (Mℓ/d)	2045 (Mℓ/d)	2050 (Mℓ/d)
Ubuhlebezwe	Mariathal Water Scheme	668	0.09	0.10	0.10	0.11	0.12	0.13
	Mgodi/Skei Water Supply Scheme	2 456	0.32	0.33	0.35	0.39	0.41	0.43
	Mkhunya	2 319	0.31	0.32	0.34	0.38	0.40	0.42
	Mpofini Water Scheme	961	0.13	0.13	0.14	0.15	0.16	0.17
	Mziki-Agri Village	623	0.08	0.08	0.09	0.10	0.10	0.11
	Springvale Water Supply Scheme	6 701	0.88	0.91	0.96	1.06	1.11	1.17
Umzimkhulu	Highlands/Waschbank Scheme	10 326	1.42	1.48	1.56	1.72	1.81	1.91
	Mnqumeni (Future)	15 797	2.05	2.14	2.25	2.48	2.60	2.74
	Ibisi/Mfundweni Water Scheme	9 063	1.24	1.29	1.36	1.50	1.57	1.65
	Bulwer Bulk (Future)	1 117	0.15	0.16	0.17	0.18	0.19	0.20
	Greater Paninkhuku Scheme	2 236	0.29	0.30	0.32	0.35	0.37	0.39
	Greater Summerfield Scheme	12 296	1.63	1.70	1.78	1.96	2.07	2.17
	Riverside Scheme	1 038	0.16	0.16	0.17	0.19	0.20	0.21
	Umzimkhulu Scheme	13 246	2.51	2.61	2.73	2.99	3.13	3.28
	Ibisi Scheme	4 125	0.56	0.58	0.61	0.68	0.71	0.75
	Kwajames Scheme	5 210	0.72	0.76	0.80	0.88	0.92	0.97
	Antioch Scheme	2 012	0.28	0.29	0.30	0.34	0.35	0.37
	Bombo Scheme	4 004	0.54	0.57	0.60	0.66	0.69	0.73
	Sikhulu Scheme	2 339	0.30	0.32	0.33	0.37	0.39	0.41
	Borndrand Scheme	779	0.11	0.11	0.12	0.13	0.14	0.14
	Clydesdale Scheme	9 282	1.29	1.35	1.42	1.56	1.65	1.73
	Commonville/Hopevale Scheme	892	0.12	0.13	0.14	0.15	0.16	0.17
	Corinth Scheme	6 175	0.86	0.90	0.95	1.05	1.10	1.16
	Delamzi Scheme	3 242	0.45	0.47	0.49	0.54	0.57	0.60
	Diphini/Dumisa Scheme	7 039	0.98	1.02	1.08	1.19	1.25	1.32
	Eastlands Scheme	879	0.12	0.13	0.13	0.15	0.16	0.16
	Ebutha - Water Tanker	42	0.01	0.01	0.01	0.01	0.01	0.01
	Edgerton Scheme	741	0.10	0.11	0.11	0.12	0.13	0.14
	Emaus Scheme	1 462	0.20	0.20	0.21	0.24	0.25	0.26
	Emvubukazi / Kwabala Scheme	744	0.10	0.11	0.11	0.12	0.13	0.14
	Engwaqa	1 285	0.17	0.18	0.19	0.21	0.22	0.23
	Esizingeni	3 285	0.46	0.48	0.50	0.56	0.59	0.62
	Fountains/Mathathanescheme	2 106	0.29	0.30	0.32	0.35	0.37	0.39
	Gudlingdaba Scheme	1 054	0.14	0.14	0.15	0.16	0.17	0.18
	Gugwini & Sihlonhlweni Scheme	1 945	0.27	0.28	0.30	0.33	0.34	0.36
	Hopewell/Kwadayi Supply Scheme	2 900	0.40	0.42	0.44	0.49	0.51	0.54
	Indawana Scheme	5 934	0.82	0.86	0.91	1.00	1.05	1.11

LM	WSS	2050 Population	2020 (Mℓ/d)	2025 (Mℓ/d)	2030 (Mℓ/d)	2040 (Mℓ/d)	2045 (Mℓ/d)	2050 (Mℓ/d)
Umzimkhulu	Jabula/Ndzimankulu Scheme	2 532	0.35	0.37	0.38	0.43	0.45	0.47
	Klipspruit Scheme	288	0.04	0.04	0.04	0.05	0.05	0.05
	Kokshill RA Scheme	4 825	0.67	0.70	0.74	0.81	0.85	0.90
	Kokshill RB Scheme	1 700	0.24	0.25	0.26	0.29	0.30	0.32
	Kromhoek Scheme	1 161	0.15	0.16	0.17	0.18	0.19	0.20
	Kwabase/Pikinini Scheme	803	0.11	0.12	0.12	0.13	0.14	0.15
	Kwafili / Rustfontein Scheme	342	0.05	0.05	0.05	0.06	0.06	0.06
	Kwasenti Water Scheme	1 644	0.22	0.23	0.25	0.27	0.29	0.30
	Lukhanyeni/Mdeni Water Scheme	1 244	0.17	0.18	0.19	0.21	0.22	0.23
	Lukhasini Water Scheme	1 068	0.14	0.14	0.15	0.17	0.17	0.18
	Lusiznin Scheme	1 103	0.15	0.16	0.16	0.18	0.19	0.20
	Machunweni Scheme	3 412	0.47	0.49	0.52	0.57	0.60	0.63
	Magqagqeni Scheme	1 571	0.22	0.23	0.24	0.26	0.28	0.29
	Magqorholweni Water Scheme	921	0.13	0.13	0.14	0.15	0.16	0.17
	Mahewini Water Scheme	3 366	0.47	0.49	0.51	0.56	0.59	0.62
	Makholweni Scheme	1 627	0.22	0.23	0.25	0.27	0.29	0.30
	Malenge Scheme	2 170	0.30	0.31	0.33	0.36	0.38	0.40
	Mawusi Scheme	2 056	0.28	0.29	0.31	0.34	0.36	0.38
	Mdeni Scheme	511	0.07	0.07	0.08	0.09	0.09	0.09
	Mfulamhle Scheme	6 472	0.89	0.93	0.98	1.08	1.14	1.20
	Mnkangala Scheme	4 442	0.62	0.64	0.68	0.75	0.78	0.83
	Motyeni/Small Mahobe Scheme	1 151	0.16	0.17	0.17	0.19	0.20	0.21
	Mphola/Gaybrook Scheme	1 201	0.16	0.17	0.18	0.20	0.21	0.22
	Mqhokweni Scheme	723	0.09	0.10	0.10	0.11	0.12	0.13
	Narazeth Scheme	4 403	0.61	0.64	0.67	0.74	0.77	0.81
	Ncambele/Bloemfontein Scheme	2 073	0.29	0.30	0.31	0.35	0.37	0.38
	Ndabayilali Scheme	2 213	0.31	0.32	0.34	0.37	0.39	0.41
	Ndawana Scheme	3 465	0.48	0.50	0.52	0.58	0.61	0.64
	Ndzombane Scheme	648	0.09	0.09	0.10	0.11	0.11	0.12
	Ngqokozweni Scheme	864	0.12	0.12	0.13	0.14	0.15	0.16
	Ngqumareni Scheme	1 210	0.17	0.17	0.18	0.20	0.21	0.22
	Ngwanqa Scheme	2 795	0.38	0.40	0.42	0.47	0.49	0.52
	Ngwinjini Water Scheme	4 136	0.54	0.56	0.59	0.65	0.68	0.72
	Njunga and Rhalodi Scheme	4 341	0.60	0.63	0.66	0.73	0.76	0.80
	Nongidi Scheme	1 018	0.14	0.15	0.15	0.17	0.18	0.19
	Ntlambamasoka Scheme	1 068	0.15	0.15	0.16	0.18	0.19	0.20
	Ntsikeni Scheme	4 581	0.63	0.66	0.69	0.76	0.79	0.83

LM	WSS	2050 Population	2020 (Mℓ/d)	2025 (Mℓ/d)	2030 (Mℓ/d)	2040 (Mℓ/d)	2045 (Mℓ/d)	2050 (Mℓ/d)
Umzimkhulu	Nxaphanxapheni Scheme	1 545	0.22	0.22	0.24	0.26	0.27	0.29
	Nyanisweni	215	0.03	0.03	0.03	0.04	0.04	0.04
	Nyanisweni Water Scheme – UMZ	3 219	0.45	0.47	0.49	0.54	0.57	0.60
	Nyembe Scheme	1 326	0.18	0.19	0.20	0.22	0.23	0.25
	Nzimankulu Scheme	2 780	0.38	0.40	0.42	0.47	0.49	0.52
	Riesdale Scheme	1 280	0.18	0.18	0.19	0.21	0.23	0.24
	Rietflei Scheme	6 431	1.05	1.09	1.15	1.27	1.33	1.40
	Rocky Mount Scheme	889	0.12	0.13	0.14	0.15	0.16	0.17
	Sdadeni Water Scheme	694	0.09	0.09	0.10	0.11	0.11	0.12
	Singisi Factory Scheme	1 109	0.20	0.20	0.21	0.23	0.25	0.26
	St Barnabas Scheme	3 372	0.43	0.45	0.47	0.51	0.54	0.57
	St Paul Scheme	2 127	0.30	0.31	0.33	0.36	0.38	0.40
	Strangers Rest Scheme	957	0.13	0.14	0.14	0.16	0.17	0.18
	Tsawule Scheme	2 591	0.36	0.37	0.39	0.44	0.46	0.48
	Vierkant Water Scheme	2 745	0.38	0.40	0.42	0.46	0.49	0.51
	Vuka Water Scheme (Not Operational)	976	0.13	0.14	0.15	0.16	0.17	0.18
	Waterfall/Ntlangwini Scheme	1 945	0.27	0.28	0.30	0.33	0.34	0.36
	Ziqalabeni Scheme	829	0.11	0.12	0.12	0.14	0.15	0.15

5. EXISTING WATER SUPPLY INFRASTRUCTURE

This section provides an overview of the available water resources as well as the current surface water supplied schemes and the larger groundwater schemes (not for individual consumption).

5.1 WATER RESOURCE AVAILABILITY

5.1.1 Surface Water

The Harry Gwala District Municipality falls within both the Pongola-Mtamvuna and the Mzimvubu-Tsitsikamma Water Management Areas, two of the nine WMAs that divide the large catchment areas of South Africa. The Pongola Mtamvuna WMA covers the whole of the KZN province, except a small part in the south, that falls within the Mzimvubu Tsitsikamma WMA (South-western portion of HGDM). HGDM comprises of the following quartenary catchments: U10, U80 and T50. (UW IMP, 2020)

Key rivers which flow through the District include the Umgeni, Mvoti, uMkhomazi, Umzimkhulu and Umzimvubu Rivers. The water demand on these rivers during drought seasons is significant as surrounding communities rely on their water supply for domestic and industrial use. The uMkhomazi and Umzimkhulu Rivers originate in the Drakensberg Mountains at approximately 3000 m above sea level and flows in a south-easterly direction towards the Indian Ocean. The uMkhomazi River enters the Indian Ocean about 40 km south of Durban near the town of Umkomaas in the Ugu District Municipality, while the Umzimkhulu River enters the ocean near the town of Port Shepstone. The uMkhomazi River forms the northern boundary of the Ubuhlebezwe LM and has tributaries including the Loteni, Nzinga, Mkomazane, Elands and Xobho rivers. The Umzimkhulu River forms the boundary between the uMzimkhulu and Ubuhlebezwe LM's. The Ngwangwane, Nkonzo, Pholela and Bisi Rivers form tributaries which flow into the Umzimkhulu River. (NEMAI, 2018)

The Umzimvubu River originates within the mountainous area of Greater Kokstad LM flows in a southern direction into the Eastern Cape Province. The Krom, Riet, Mzintlava and Droëwig Rivers that drain into the Umzimvubu River, form part of ten quaternary catchments in Greater Kokstad LM. The Greater Kokstad area is drained by several tributaries including the Gungununu, Mzintlava, Ndawana, Mfelamadoda, Krom, and Riet Rivers.

The uMkhomazi and Umzimkhulu Rivers flow through the Dr Nkosazana Dlamini Zuma LM and are responsible for a large part of the Municipality's water supply. Primary water demands on the Umzimkhulu River include agriculture and afforestation, representing 31% and 41% of total water use, respectively. The remaining demands are rural and urban demands (10%), dryland sugar cane and stock watering (3% and 1% respectively), and invasive alien vegetation (14%). The agricultural demands are primarily supplied through direct abstractions from rivers and streams, as well as from farm dams within the catchment. (UW IMP, 2020)

The following rivers flow through the Ubuhlebezwe LM: Lufafa, uMkhomazi, Umzimkhulu, Lovu and Mpambanyoni. The uMzimkhulu LM is located in the Umzimkhulu catchment. The main river system within the catchment is the Umzimkhulu River. Water quality and availability within the catchment is threatened due to impacts resulting from afforestation and agricultural practices. Eight rivers occur within the Municipality, namely: Bisi, Cabane, Gungununu, Little Bisi, Umzimkhulu, Ndawana, Ngwangane and Upper Bisi.

Dams within HGDM include Comrie Dam, Crystal Springs Dam, Elandskuil Dam, Hopewell Dam, Minay's Dam, Mingay's Dam, Poortjie Dam, Roy Aldus Dam and Vaughan's Dam. However, the most noteworthy dam is the Ixopo Dam. (NEMAI, 2018) Other dams within the DM include the likes of St. Isidore Dam, Nsingizi Dam and Kempdale Dam.

Apart from UW bulk purchases (mainly in Ixopo), water is abstracted from boreholes and surface abstraction works and is not monitored in the majority of the schemes within the DM. There is a water quality monitoring plan in place, but no monitoring of the groundwater and surface water levels or abstraction volumes is conducted. Water quality monitoring is done by UW as there is no specific department at HGDM for water quality monitoring, especially at the treatment, works. Limited to no information was available regarding the water use and effluent release of large industries.

The available water source monitoring and the existing abstraction volumes should be monitored regularly. A proper water quality and water use monitoring program needs to be put in place for both the abstraction and groundwater sources as well as the influent and effluent of Industrial users. (WSDP, 2018)

The IMP and All Town Reconciliation strategies as well as other reports and feasibility studies further describe the status of the water sources found within the Municipality as follows:

5.1.2 Greater Kokstad LM[2]

Kokstad Town, the major water demand node in the municipality receives its water from two main sources. The first source of raw water is supplied from the Crystal Springs Dam which has a total storage capacity of 2.1 million m^3. The dam has a catchment area of 15 km^2 and is also fed from springs. The firm yield of the dam is 1.6 Mm^3/a (4.5 Mℓ/d). The registered water use from the Crystal Springs Dam according to WARMS is 2.1 Mm^3/a and exceeds the current firm yield of the dam.

The second source of supply is from the Mzintlava River. Kempdale Dam was constructed in the Mzintlava River and has an estimated storage capacity of 400 000 m^3. Water is then released from the dam to the abstraction weir where water is pumped to the Kokstad WTP. During winter months, extensive irrigation is

[2] Sourced from the All Town Reconciliation Studies and Umgeni Water IMP, 2020

taking place upstream of Kokstad that reduces the flow of the Mzintlava River. The dam was designed to be raised to increase the storage capacity to 750 000 m^3. The current registered and licensed water use for Kokstad from the Mzintlava River is 1.8 Mm^3/a (5 Mℓ/day). The Mzintlava River also supplies the town of Franklin upstream of Kokstad town via a river abstraction works.

5.1.3 Nkosazana Dlamini-Zuma LM[3]

The main sources of water supply in many parts of the Nkosazana Dlamini-Zuma LM are boreholes and abstraction from springs. There are however surface water abstractions from local rivers together with conventional and package water treatment plants in some water scheme areas

Bulwer Town water supply is from a local spring and an abstraction on the Mkobeni River. Water is treated at the Bulwer WTP. The peak hydraulic design capacity of the WTP is 0.5 Mℓ/day or 0.18 Mm^3/a. The average annual flow rate of the treatment works is estimated to be 0.33 Mℓ/d or 0.12 Mm^3/a based on a peak factor of 1.5.

In addition, water supply to Bulwer Town is augmented from a weir on the Luhane River together with a 1,5 Mℓ/d Package Plant that was constructed in 2011. Apart from Bulwer Town, the Luhane River Weir will be used as an interim source for water supply to some areas the Nkosazana Dlamini-Zuma LM, until the proposed Stephen Dlamini Dam is constructed.

The proposed Stephen Dlamini Dam is situated upstream of the Luhane River Weir and will provide a potable water supply to the Greater Bulwer, Gala, Chibini, Nkwazela and Donnybrook areas via a scheme named the Greater Bulwer/Donnybrook Water Supply Scheme. The Stephen Dlamini Dam is currently at Inception Stage and will be implemented by Umgeni Water. (UW IMP, 2020)

The towns of Underberg and nearby Himeville are supplied from an abstraction at a weir on the Mzimkhulu River. Water gravitates to a pump station approximately 0.4 km from the weir. It is then pumped from the raw water pumping station to the 5 Mℓ/day Underberg-Himeville WTP.

The remainder of the areas in the Nkosazana Dlamini-Zuma LM rely on groundwater and springs as a water source.

[3] Sourced from the All Town Reconciliation Studies and Umgeni Water IMP, 2020

5.1.4 Ubuhlebezwe LM[4]

Surface water supply to schemes in the Ubuhlebezwe LM water are from the Mkhomazi River, Mzimkhulu River, Ixopo Dam, St Isidore Dam and Comrie Dam

The town of Ixopo is supplied from the Ixopo Dam (Home Farm Dam) as well as a borehole situated on the Ixopo Golf Course. Ixopo Dam has a full supply capacity of 0.55 Mm^3 and a yield of 2.7 Mℓ/d. The borehole has a yield of 400 kℓ/day using a pump cycle of 16 hours/day at a rate of 25 kℓ/hour. The two water sources therefore have a combined yield of 3.1 Mℓ/d available for the Ixopo water supply system. The Ixopo Water Works has a capacity of 4.1 Mℓ/d. (UW IMP, 2020).

St. Isidore Dam, situated on the outskirts of Ixopo, is a significant water resource in close proximity to the WTP that can be used to augment the system. In 2012 the DM and the Ixopo Irrigation Board signed an agreement, whereby the Board agreed to supply 255 500 m^3/annum (0.7 Mℓ/d) of water from the dam to the Municipality Additional long-term water resource requirements will thus have to be sourced from further afield.

The Harry Gwala District Municipality plans to use the proposed Stephen Dlamini Dam as well as the existing Comrie Dam to supply bulk water to the Greater Ixopo area. The Comrie Dam was raised by 2m in 2017. There is a possibility to raise the Comrie Dam by a further 2m and that option will be investigated further to confirm the feasibility thereof as well as the yield.

5.1.5 Umzimkhulu LM[5]

The Umzimkhulu town depends on the raw water supply from the Mzimkhulu River. Water gravitates to a pump station near the Mzimkhulu River. It is then pumped from the raw water pumping station to the Umzimkhulu town WTP which is located near the town where it is treated to potable standards. The Umzimkhulu WTP is the only treatment works that supplies the town and surrounding areas. The peak hydraulic design capacity of the water treatment works is 1.0 Mℓ/d or 0.4 Mm^3/a. The average annual flow rate of the treatment works is estimated to be 0.67 Mℓ/d or 0.3 Mm^3/a based on a peak factor of 1.5.

Umgeni Water has completed a pre-feasibility and detailed feasibility for a regional scheme that will supply bulk water to the Umzimkhulu Local Municipality from the proposed New Biggen Dam on the Umzimkhulu River . (EVN Africa, 2018)

The water resources of HGDM is illustrated in **Figure 5-1** overleaf.

[4] Sourced from the All Town Reconciliation Studies and Umgeni Water IMP, 2020
[5] Sourced from the All Town Reconciliation Studies and Umgeni Water IMP, 2020

N

U10A U10B U10C U10D U10E U10F U10G U10H U10J U10K U10L
U20A U20C U20E U20G U20H U20J
U60A U60B
U70A U70B
U80A U80B U80C U80E U80G U80J
T51A T51B T51C T51D T51E T51F T51G T51H T51J
T52A T52B T52C T52D T52E T52F T52G T52H T52J T52K T52L T52M
T31A T31B T31C T31D T31E T31F T31G T31H T31J
T32A T32B T32C T32D T32E
T33A T33F
T40A T40B

Midmar Dam
Henley Dam
Titren's Dam
Roy Aldous Dam
Vaughan's Dam
Drakensbergs gardens
Loch Mcvey
Mingay's Dam
Mingay's Dam
Camrie Dam
Hopewell Dam
Pootjie Dam
Spigisi Dam
Bon Accord Dam
Mountain Dam
Crystal Springs Dam
Elandskuil Dam
E.J. Smith Dam

Nkosazana Dlamini-Zuma Local Municipality
Ubuhlebezwe Local Municipality
Umzimkhulu Local Municipality
Greater Kokstad Local Municipality

Pongola Mtamvuna
Mzimvubu Tsitsikamma

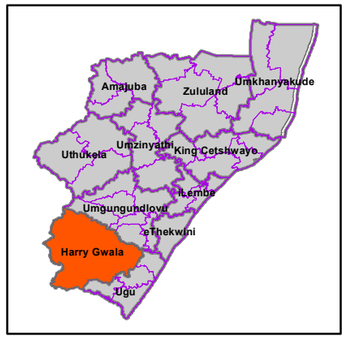
Nkowarigwa
Mkomazi
Mzimkhulu
Mzimvubu

Kilometers
10 5 0 10 20

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Water Management Area
- Quaternary Boundaries & Numbers (W13A)

LOCALITY:



CLIENT:

UMGENI WATER • AMANZI

MUNICIPALITY:

HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Water Resources

Harry Gwala District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 43 Figure 5-1

5.2 PHYSICAL INFRASTRUCTURE

As per the 2021 financial year WSDP Water Sector Input Report, HGDM has over 150 water schemes. There are several small borehole or spring schemes, and only a few regional bulk schemes making operation and maintenance a challenge. It is also noted that most of these small schemes incur problems due to water resource over-use and run dry. There is thus a need for more sustainable water supply in HGDM via regional bulk schemes, predominantly from surface water abstractions.

A summary of the current water infrastructure is shown in **Table 5-1** below.

Table 5-1: HGDM Water Infrastructure

Item	Quantity	Total Capacity
Boreholes	1988	-
Abstraction works	184	-
WTP's	23	37.67 Mℓ/d
Water pump stations	73	-
Water bulk pipelines	787.8 km	-
Water reticulation pipes	1 401.2 km	-
Reservoirs	713	69 Mℓ

Source: HGDM WSDP Water Sector Input Report, 2021 FY

There is little to no information regarding the capacities of the pump stations and abstraction works. A proper infrastructure survey needs to be conducted on the existing infrastructure regarding their condition, replacement needs, replacement/refurbishment costs, lifespan etc. It is understood, from consultations with the municipality, that asset verification studies are being undertaken by COGTA.

As part of the UAP Phase II study, the DM was broken down into supply zones taking into consideration topography, settlement densities and footprints of existing water supply schemes. Existing infrastructure was reported on per supply zone. During UAP Phase III (this study), consultations with representatives and reports sourced from the DM provided more information on the existing bulk schemes together with their respective resources and infrastructure within the DM. These scheme areas were thus adopted in this study.

The existing bulk scheme areas of Harry Gwala District Municipality are summarised hereunder and depicted in **Figure 5-2** overleaf. The planned infrastructure for these scheme areas are discussed further in Chapters 7, 8 and 9.

N

Kilometers
7 3,5 0 7 14

Merrivale
Pietermaritzburg
Edendale
Msunduzi
Taylor's Halt
Umgungundlovu
Umgungundlovu
Mkhambathini
Richmond

Lesotho

Greater Mhlangeni WSS
Greater Mhlangeni WSS
UNDERBERG - HIMEVILLE
UNDERBERG - HIMEVILLE
Himeville
UNDERBERG - HIMEVILLE
Underberg
Nkosazana Dlamini-Zuma Local Municipality

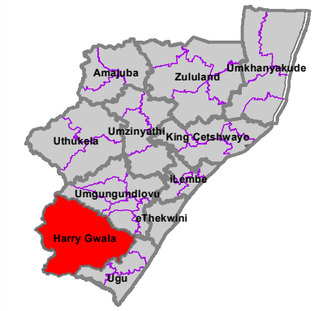
Gala
Gala
Greater Bulwer/Donnybrook
Greater Bulwer/Donnybrook
Kukhulela
Kukhulela
Greater Kilimon
Centocow
Centocow
Greater Kilimon
Harry Gwala
Ufafa WSS
Ufafa WSS
Ufafa WSS
Greater Riverside
Greater Riverside
Mahhehle-Ncakubane
Mahhehle-Ncakubane
Ixopo Town
Ixopo Town
Chibini WSS
Chibini WSS
Mkhunya Regional Scheme
Mkhunya Regional Scheme
Ubuhlebezwe Local Municipality
Hopewell - Carriesbrook
St.Barnabas - Cabhane Scheme
St.Barnabas - Cabhane Scheme
Nsingizi - Mkhangala
Nsingizi - Mkhangala
Lourdes - Ndzombane
Lourdes - Ndzombane
Nokweja WSS
Nokweja WSS
Umzimkhulu Town
Greater Mhlabashane
Greater Mhlabashane
Umzimkhulu Local Municipality
GREATER SUMMERFIELD
GREATER SUMMERFIELD
IBISI - MACHUNWINI
IBISI - MACHUNWINI
Mnqumeni
Mnqumeni
Ugu
Ugu
Harding
uMzumbe
Pumula
Melville
Sunwich Port
Anerley

Wynesberg
Wynesberg
Khohlweni
Hillside
Makholweni
Protection
Pamlaville
Lufefeni
Mhlangeni
Komkhulu
KwaVikinduku
Lubaleke
Taylerville
Greater Kokstad Local Municipality
Vermiljoenskuil
Uplands
Alfred Nzo
Alfred Nzo
Cedarville
Franklin
Franklin
Greater Njunga
Greater Njunga
Kokstad Town
Kokstad Town
Bhongweni
Pakkies - Willowdale
Pakkies - Willowdale
Upper Mvenyane
Mvenyane
KwaDane
Ludidi
Ntola
Mdakeni
Phikwa
Siqingeni
Colana
Mishini
Alfred Nzo
Brooks Nek

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns

LOCALITY:



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HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

MARISWE

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

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Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Water Scheme Areas

Harry Gwala District Municipality

DATE COMPLETED:

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MAP NO.:

DC 43 Figure 5-2

Greater Bulwer/Donnybrook Scheme Area – The Greater Bulwer/Donnybrook Scheme, which is currently under construction, covers a portion of the eastern section of the Nkosazana Dlamini-Zuma LM and the western section of the Ubuhlebezwe LM. A few bulk schemes and small localized schemes will eventually be incorporated into the Greater Bulwer/Donnybrook Scheme Area and are as follows:-

- ✓ Hopewell-Carriesbrook Scheme;
- ✓ Ixopo Town Scheme;
- ✓ Mahehle-Ncakubane;
- ✓ Chibini Scheme;
    - Mariathal Scheme
- ✓ Ufafa Scheme; and
- ✓ Gala Scheme.
    - Qulashe
    - Okhetheni

Other smaller schemes within the Greater Bulwer/Donnybrook Scheme Area are:

- ✓ Nkelabantwana;
- ✓ Mangwaneni;
- ✓ Hlanganani-Polela;
- ✓ Mkholwa;
- ✓ Kwamdayane;
- ✓ Sandaneze;
- ✓ Greater Mbulweleni;
- ✓ Bulwer;
- ✓ Masameni;
- ✓ Mnyaneni;
- ✓ Greater Nomandlovu;
- ✓ Creighton; and
- ✓ Eskesheni.

These scheme areas are currently not served with an assured source of potable water and are augmented by rivers, boreholes, rainwater tanks and springs.in parts of these scheme areas.

The Chibini, Mariathal and Ufafa schemes are supplied by the St. Isidore Dam via a 1 Mℓ/day WTP and Ixopo Town is supplied via Homefarm Dam along with the 4.4 Mℓ/day Ixopo WTP (2 Mℓ/day main plant + 2 Mℓ/day

package plant + 0.4Mℓ/day borehole). A number of the smaller schemes within the Greater Bulwer/Donnybrook Scheme are supplied via package plants and water tankers.

Greater Mhlabashane Scheme Area – This scheme area covers the southern section of the Ubuhlebezwe LM and consists of the Hlokozi, Ebhayi, Mgodi and Highflats Schemes. These schemes are supplied via springs and boreholes.

Mkhunya Regional Scheme Area - This scheme area covers the eastern most section of the DM and consists of the Vulamehlo, Esiqandwuleni, Mziki Agri Village and Springvale Schemes. These schemes are supplied via a 1.5 Mℓ/day abstraction facility on the Mkhomazi River.

Nokweja Scheme Area - This scheme area consists of the Ebovini/Emazabekweni and Nokweja Schemes. The schemes are supplied via the existing 1.8 Mℓ/day Nokweja WTP. The WTP comprises of the raw water supply from the Mzimkhulu River, a 6.5m^3 floc pre-fabricated column, 2 x GR50 Clarifiers (50m^3/hr each), 5 x GR15 Pressure filters (18m^3/hr each), chemical dosing room with Sodium Hypochlorite, Soda Ash & Flocculant dosing, 2 x High lift pumps, 100kℓ Clear water reservoir and 2 x Sludge dams.

Centocow Scheme Area - This scheme area consists of the Makholweni, Centocow/St. Apollinaris and Ehlane Schemes. The schemes are supplied via the existing 1.5 Mℓ/day WTP that abstracts surface water from the Mzimkhulu River. The WTP comprises of a raw water supply from the Mzimkhulu river, a raw water balancing tank, clarifier, clarified water holding tank, 2 x pressure filters, chemical dosing room and filter pumps as well as 3 x clear water reservoirs.

Greater Kilimon Scheme Area - This scheme consists of the Kilimon, Ndawana, Delamuzi and Edgerton Schemes. These schemes are supplied via rainwater tanks, springs, boreholes and abstraction works on the Ngwagwane River.

Kukhulela Scheme Area – This scheme area is currently supplied via springs, boreholes and an abstraction works on the Ngwangwane River.

Underberg - Himeville Scheme Area - This scheme area consists of the Underberg and Himeville Schemes. These schemes are supplied from an existing 2.5 Mℓ/day WTP that has since been upgraded to 5 Mℓ/day. The existing water infrastructure comprises of a weir and intake chamber, a ø 315 mm gravity inlet line, a pump station (three centrifugal pumps of varying capacities; 17 ℓ/s, 21 ℓ/s and 28 ℓ/s), a rising main of approximately 1.54 km (ø 150, 200 and 160 mm steel and uPVC pipes), a chlorination system, two automatic backwash sand gravity filters and reservoir storage capacity of 2.13 Mℓ. The storage capacity is made up of 1 x 1 Mℓ reinforced concrete reservoir with a concrete roof and 2 x 250 kℓ and 3 x 210 kℓ brick reservoirs with galvanized iron roofs.

Greater Summerfield Scheme Area - This scheme area consists of the Highlands/Waschbank, Bombo, Kromhoek, Stranger's Rest, Hopewell/KwaDayi and Fountains/Mathathane Schemes. The scheme area is currently supplied via springs and boreholes but will be supplied in the near future by the almost complete Summerfield 3 Mℓ/day package plant.

St. Barnabas - Cabhane Scheme Area - This scheme area consists of the Nongidi, Nyembe, St. Barnabas, Nkoqozweni, Nazareth, Nyanisweni, Mfulamhle, Lusizini, Emvubukazi/Kwabala Ntlambamasoka and a portion of the Emmaus Schemes. These schemes are supplied via springs and boreholes.

Greater Njunga Scheme Area - This scheme area consists of the Bloemfontein, Ntlangwini and Pikinini Schemes. These schemes are currently supplied via springs and boreholes. The Njunga Village within the scheme is supplied by a package treatment plant with unknown capacity.

Greater Riverside Scheme Area - This scheme area consists of the Enyanisweni, Corinth, Mdeni, Antioch, Ngwaqa, Malenge and Riverside Schemes. These schemes are supplied via springs, boreholes and the existing 0.7 Mℓ/day Riverside WTP. The WTP comprises of a raw water pump station with flocculation dosing, 1 x 10 000ℓ Jojo raw water holding tank, 6 x plastic pre-fabricated clarifiers, 6 x 700mm diameter pressure filters with two filter pumps, 2 x Hypochlorite dosing pumps and 2 x 11kW High lift pumps.

Ibisi - Machunwini Scheme Area - This scheme area consists of the Koks Hill, Rauka Village, Eastlands, Nxaphanxapheni, Rietvlei, Mbuzweni, Machunwini, Spitzkop, Sihlontlweni, Ibisi and Mfundweni Schemes. These schemes are supplied via springs and boreholes as well as the 2 Mℓ/day package plant. The original works comprises of an abstraction weir and raw water pump station, chemical dosing room, 3 x pre-fabricated clarifiers, 2 x prefabricated filters, chemical dosing room and high lift pump station.

Lourdes - Ndzombane Scheme Area - This scheme area consists of the St. Paul, Lourdes, Emmaus, Dumisa, Nzombane, Mashawini, Jabula, Ndzimankulu and Lusizini Schemes. These schemes are currently supplied via springs and boreholes.

Mnqumeni Scheme Area - This scheme area consists of the Mnqumeni, Gugwini, Mahobe and Hopevale Schemes. These schemes are currently supplied via springs and boreholes.

Umzimkhulu Town Scheme Area - This scheme area consists of the Ebutha, Ntlambamasoka, Umzimkhulu Town and Clydesdale Schemes. These schemes are supplied via springs, boreholes and the existing 5 Mℓ/day Mzimkhulu WTP. The WTP comprises of a chemical dosing room with raw water inlet and rapid mixing chamber, flocculation channel and clarifier, 3 x balancing tanks, clarified water reservoir (±450kℓ), 2 x pressure filters, clear water reservoir, chlorine dosing room, high lift pump station, sludge dams and return pump station.

Nsingizi - Mkhangala Scheme Area - This scheme area is currently supplied via springs and boreholes. No further information could be sourced regarding the infrastructure and its capacities.

Franklin Scheme Area - This scheme area is currently supplied via the Franklin WTP that has a capacity of 0.22 Mℓ/day and abstracts water from the upper Mzintlava River. The plant comprises of an abstraction chamber and raw water pump station, 1.8km raw water pipeline, flocculant dosing and mixing house, 1 x 52kℓ Clarifier, 2 x Settling tanks (400kℓ each), filter, chlorine dosing and pump house and a 10m high elevated pressed steel tank (85kℓ).

Kokstad Town Scheme Area - This scheme area is currently supplied via the Crystal Springs Dam and the Mzintlava River that feeds the WTP. The Mzintlava River can drop to very low levels during the winter months, making it impossible to extract water. The off-channel Quarry Dam uses water from the Kempdale Dam/Weir to store water for times of low flow. This can be pumped back into the river upstream of the weir.

The Crystal Springs Dam relies heavily on supply from springs in the area and is water table dependant. During the winter months the flow from the springs is reduced and this is even more prevalent during a drought period as experienced in 2015.

The existing Kokstad WTP has a capacity of 18 Mℓ/day. The WTP comprises of the raw water supply system, inlet chamber and chemical dosing room, 4 x clarifiers and flocculation channels, 6 x old rapid gravity sand filters, 3 x new rapid gravity sand filters, 2 x clear water reservoirs (±10Mℓ each), lime dosing building, chlorine dosing room and a high lift pump station.

Pakkies - Willowdale Scheme Area - This scheme area is currently supplied via springs and boreholes. No further information could be sourced regarding the infrastructure and its capacities.

The various possible options to either upgrade or augment the above schemes to allow for the 2050 water demand to be supplied are detailed in section 9 of this study

Figure 5-3 presents the existing infrastructure of the DM and then per LM within **Figures 5-4** to **5-7**.

N

Howick
Merrivale
Cedara
Pietermaritzburg
Msunduzi
Edendale
Taylor's Halt
Richmond

Lesotho

Umgungundlovu
Umgungundlovu

MQATSHENI WTP
Greater Mhlangeni WSS
UNDERBERG - HIMEVILLE
UNDERBERG - HIMEVILLE
Himeville
UNDERBERG WTP
Underberg
Nkosazana Dlamini-Zuma Local Municipality
HLANGANANI/POLELA WTP (PACKAGE PLANT)
BULWER WTP
BULWER TOWN WTP
DONNYBROOK WTP
Gala
Greater Bulwer/Donnybrook
NGWANGWANE WTP (FUTURE)
Kukhulela
ST APOLLINARIS/CENTOCOW WTP
GREIGHTON WTP
Centocow
Ufafa WSS
Ufafa WSS
ESIQANDULWENI WTP
Greater Kilimon
Harry Gwala
RIVERSIDE WTP
Greater Riverside
Mahhehle-Ncakubane
IXOPO WTP (UW)
Ixopo Town
Chibini WSS
Mkhunya Regional Scheme
Ubuhlebezwe Local Municipality
Nsingizi - Mkhangala
St.Barnabas - Cabhane Scheme
Hopewell - Carriesbrook
Greater Kokstad Local Municipality
Lourdes - Ndzombane
UMZIMKHULU TOWN WTP
Umzimkhulu Town
Umzimkhulu Local Municipality
Nokweja WSS
NOKWEJA WTP (PACKAGE PLANT)
HIGHFLATS WTP
Greater Mhlabashane
Wynesberg
Khohlweni
Hillside
Makholweni
Protection
Pamlaville
Lufefeni
Mhlangeni
Komkhulu
KwaVikinduku
Lubaleke
Taylerville
Vermiljoenskuil
Tsitsong
Uplands
Saint Bernards
Malubelube
Alfred Nzo
Matatiele
Cedarville
Alfred Nzo
Franklin
FRANKLIN WTP
KWANJUNGA WTP (PACKAGE PLANT)
Greater Njunga
VIERKANT WTP (PACKAGE PLANT)
HIGHLANDS/WASHBANK WTP (PACKAGE PLANT)
GREATER SUMMERFIELD
ISIBI WTP
IBISI - MACHUNWINI
MACHUNWINI WTP (PACKAGE PLANT)
MNQUMENI (FUTURE)
Mnqumeni
Harding
Ugu
Ugu
Kokstad Town
KOKSTAD WTP
Kokstad
Bhongweni
Pakkies - Willowdale
Upper
Ludidi
Ntola
Phikwa
Siqingeni
Mishini
Brooks Nek
Lubaleko

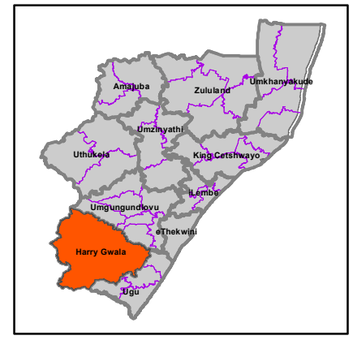
Water Infrastructure
- Existing Reservoirs
- Existing Water Pumpstations
- Existing Water Treatment Plants
- Existing Regional Bulk Pipelines
- Water Scheme Areas & Names

Bulwer

10 5 0 10 20 Kilometers

Legend
- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

MUNICIPALITY:

HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

MARISWE

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Existing Scheme Areas & Infrastructure Components

Harry Gwala District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 43 Figure 5-3

N

Nkosazana Dlamini-Zuma Local Municipality

Richmond Local Municipality

Umgungundlovu

RIVERSIDE WTP

Greater Riverside

Harry Gwala

Nsingizi - Mkhangala

St.Barnabas - Cabhane Scheme

Lourdes - Ndzombane

Ubuhlebezwe Local Municipality

UMZIMKHULU TOWN WTP

Umzimkhulu Town

Umzimkhulu Town

Umzimkhulu Local Municipality

KWANJUNGA WTP (PACKAGE PLANT)

HIGHLANDS/WASHBANK WTP (PACKAGE PLANT)

VIERKANT WTP (PACKAGE PLANT)

GREATER SUMMERFIELD

Greater Njunga

ISIBI WTP

MNQUMENI (FUTURE)

IBISI - MACHUNWINI

MACHUNWINI WTP (PACKAGE PLANT)

Mnqumeni

Umzumbe Local Municipality

Ugu

Eastern Cape

Matatiele Local Municipality

Kokstad

Bhongweni

uMuziwabantu Local Municipality

Harding

Eastern Cape

Kilometers

5 2,5 0 5 10

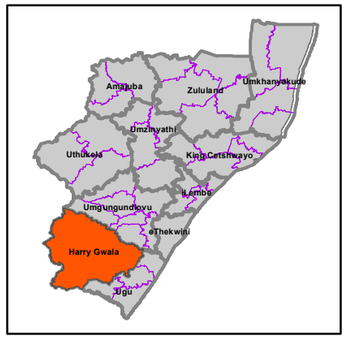
Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns

Water Infrastructure

- Existing Reservoirs
- Existing Water Pumpstations
- Existing Water Treatment Plants
- Existing Regional Bulk Pipelines
- Water Scheme Areas & Names

LOCALITY:



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CONSULTANTS

Project No.: 27814

MARISWE

JTN CONSULTING

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Umzimkhulu

Harry Gwala District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 43 Figure 5-4

N

Nkosazana Dlamini-Zuma Local Municipality

Mkhambathini Local Municipality

Umgungundlovu

Richmond Local Municipality

Umdoni Local Municipality

Ugu

Umzimkhulu Local Municipality

Umzumbe Local Municipality

Ufafa WSS

Chibini WSS

Mahhehle-Ncakubane

Ixopo Town

IXOPO WTP (UW)

Ubuhlebezwe Local Municipality

Hopewell - Carriesbrook

Harry Gwala

Mkhunya Regional Scheme

ESIQANDULWENI WTP

Nokweja WSS

NOKWEJA WTP (PACKAGE PLANT)

HIGHFLATS WTP

Greater Mhlabashane

Water Infrastructure

- Existing Reservoirs
- Existing Water Pumpstations
- Existing Water Treatment Plants
- Existing Regional Bulk Pipelines
- Water Scheme Areas & Names

Bulwer

5 2,5 0 5 10 Kilometers

Legend

- Provinical Boundaries
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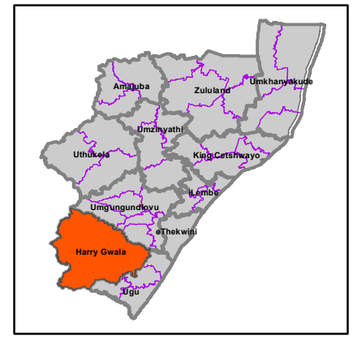
LOCALITY:



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HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

MARISWE

JTN CONSULTING

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Ubuhlebezwe

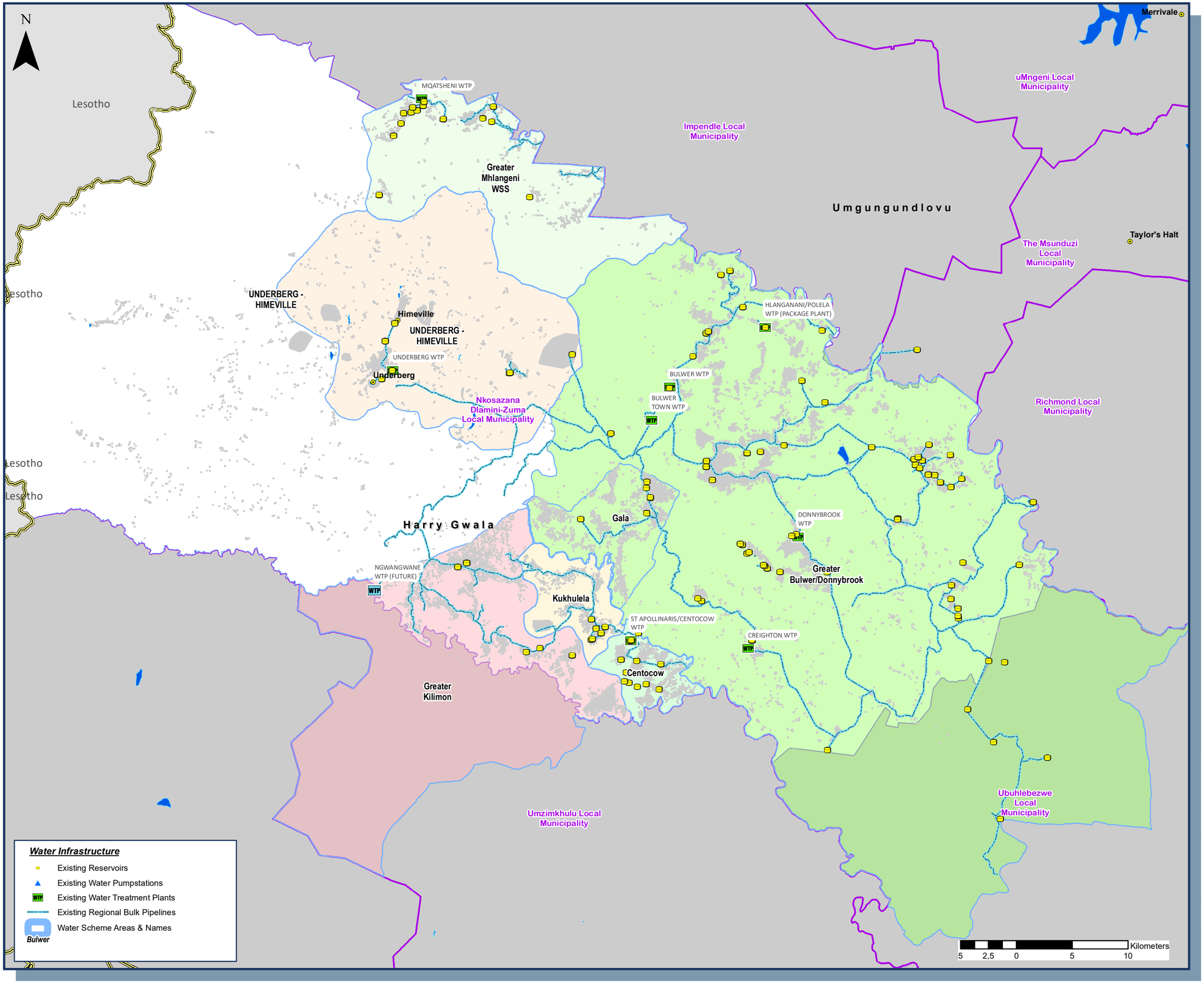
Harry Gwala District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

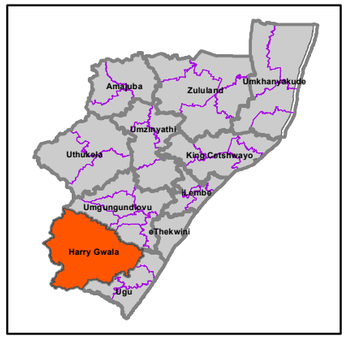
DC 43 Figure 5-5



Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

MUNICIPALITY:

HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

MARISWE

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

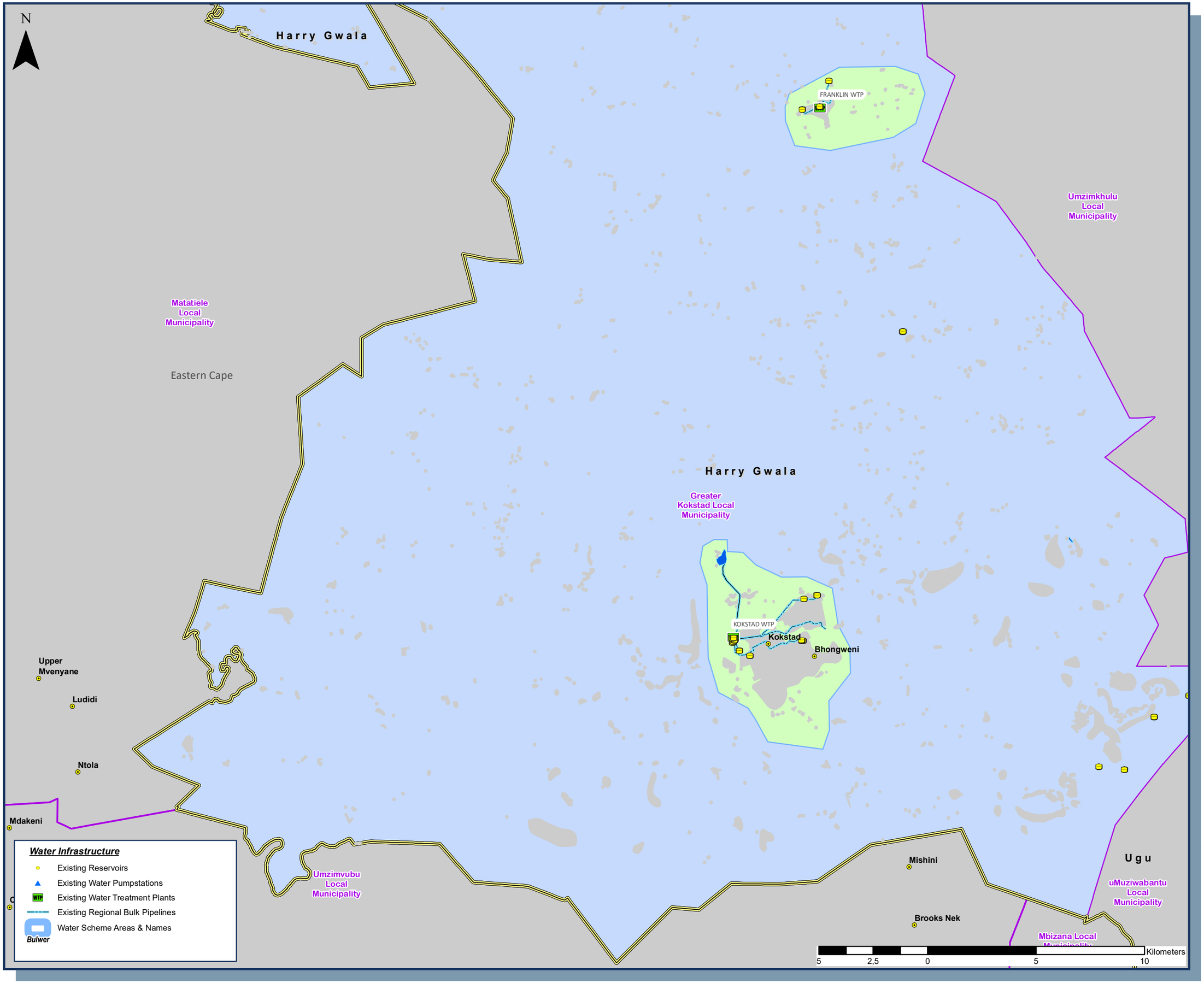
Existing Scheme Areas & Infrastructure Components - Nkosazana Dlamini-Zuma
Harry Gwala District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 43 Figure 5-6



Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- National Roads
- Main Roads
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- Rivers
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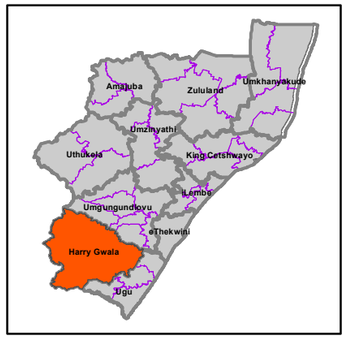
- Major Towns (Hilton)

LOCALITY:



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HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

MARISWE
JTN CONSULTING

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Greater Kokstad

Harry Gwala District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 43 Figure 5-7

6. EXISTING SANITATION BULK INFRASTRUCTURE

6.1 SANITATION SERVICE LEVEL

The National Water and Sanitation Master Plan (NW&SMP), prepared in 2018 for South Africa, puts an emphasis on the reliability of water services (water and sanitation). The NW&SMP reported that "In the 27 priority district municipalities the water reliability is only 42%, with the worst 10 WSA's below 30% reliability" and that "Approximately 56% of the over 1 150 WWTP and approximately 44% of the 962 WTPs are in poor or critical condition and in need of urgent rehabilitation."

Reliability of services are affected by aging infrastructure, operation and maintenance, reliability of electricity supply, stormwater ingress into sewer systems, vandalism and theft, or extreme weather events. All these then affect sanitation security to consumers and may have negative impacts on the environment.

The DWS Reference Framework database yields that majority of households within HGDM use a pit latrine/toilet with a ventilation pipe (approximately 35%).

Table 6-1 below presents the distribution of households by type of toilet facility as per the DWS Reference Framework database as at 2019.

Table 6-1: Distribution of households by type of toilet facility, DWS RF 2019

LM Name	Flush toilet connected to a public sewerage system	Flush toilet connected to a septic tank or conservancy tank	Chemical toilet	Pit latrine/toilet with ventilation pipe	Pit latrine/toilet without ventilation pipe	Ecological toilet (e.g. urine diversion; enviroloo; etc.)	Bucket toilet (collected by municipality) – Bucket toilet (emptied by household)	Other	None	Total
Greater Kokstad	19 965	186	1 608	3 386	0	-	108	-	351	**25 600**
Dr. Nkosazana Dlamini-Zuma	1 990	1 414	1 891	24 134	13 132	-	572	-	1 550	**44 834**
Ubuhlebezwe	1 890	85	6 917	13 495	3 791	-	-	-	1 829	**28 016**
Umzimkhulu	4 070	294	2 070	16 087	38 307	-	4	-	3 183	**64 164**
Total	**27 915**	**1 979**	**12 486**	**57 102**	**55 230**	**-**	**684**	**-**	**6 913**	**162 614**

Source: DWS Reference Framework, April 2019

The current sanitation backlog is at approximately 17% as illustrated in the WSDP Summary Report and in **Table 6-2** below. However, settlements are continuously expanding, and household growth will result in increasing the sanitation backlog in future.

The HGDM 2018 WSDP Summary Report reports that the current sanitation backlog for the District is as follows:

Table 6-2: Sanitation Backlogs within Harry Gwala District Municipality

Direct Backlogs	Totals
Direct settlement backlog sanitation households. Total household of settlement with a sanitation need (irrelevant the type of need)	23 364
Direct settlement backlog sanitation population. Total population of settlement with a sanitation need (irrelevant the type of need)	99 334

Source: HGDM WSDP, 2018

6.2 EXISTING SANITATION BULK INFRASTRUCTURE

A summary of the current sanitation infrastructure is shown in **Table 6-3** below.

Table 6-3: HGDM Sanitation Infrastructure

Item	Quantity	Total Capacity
Sewer pump stations	4	-
Sewer bulk pipelines	-	-
Sewer reticulation pipes	103.8 km	-
WWTP's	13	11.68 Mℓ/d

Source: HGDM WSDP, 2018

According to the DWS Reference Framework, the following thirteen sanitation schemes are currently operating within HGDM:

- ✓ Underberg RDP (Package Plant);
- ✓ Bulwer;
- ✓ Franklin;
- ✓ Umzimkhulu;
- ✓ Creighton;
- ✓ Himeville (Package Plant);
- ✓ Hlanganani/Polela;
- ✓ Ixopo;
- ✓ Rietvlei;

- ✓ Underberg;
- ✓ Kokstad;
- ✓ Riverside; and
- ✓ St Apollinaris/Centocow.

As mentioned previously in this report, a proper infrastructure survey needs to be conducted on the existing infrastructure regarding their: condition, replacement needs, replacement/refurbishment costs, lifespan etc. An infrastructure and asset management programme needs to be put in place by HGDM to improve the management of their infrastructure.

It should be noted that HGDM also does not currently have a VIP register. A study should be done to determine the location and condition of all VIP's within the HGDM

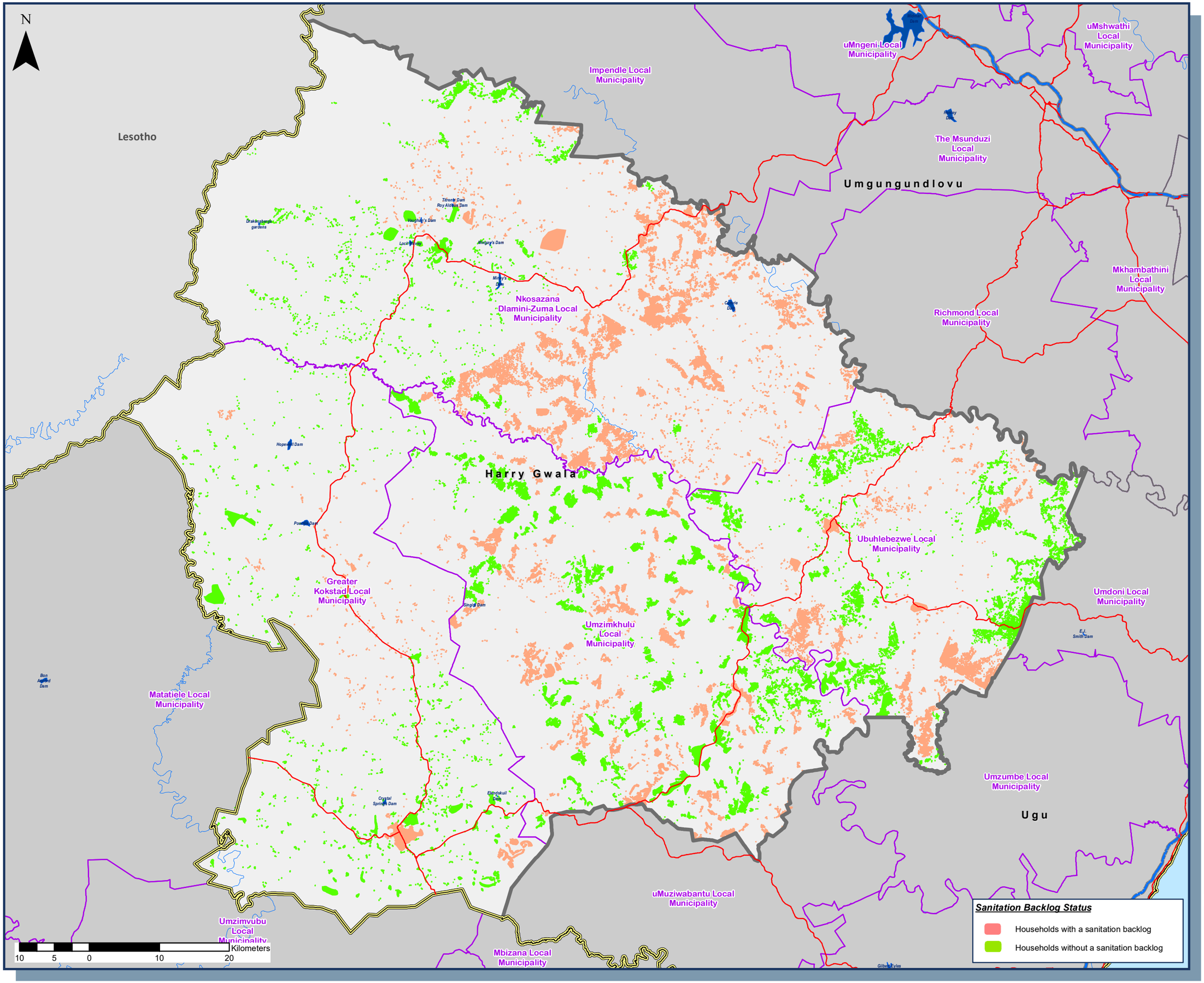
The HGDM has ten (10) wastewater treatment plants of which nine (9) are operational. The WWTP's are listed in **Table 6-4** below.

Table 6-4: List of Wastewater Treatment Plants

WWTP	Description	Owner	Class	Capacity Sufficient	ADWF Capacity (Mℓ/day)	People Served	Operational	Critical Refurbishment	Cost Estimate
Ixopo	Activated Sludge	Umgeni Water	C	Y	0.95		Y	Sludge pumps	R314 000
Kokstad	Activated Sludge	HGDM	C	Y	6.4	22500	Y	Aerators, Clarifiers	R2 106 000
Underberg	Package Plant	HGDM	D	N	0.1	125	Y	Aerators	R960 000
Bulwer	Package Plant	HGDM	C	Y	0.08	125	Y	Chlorinator	R615 000
Franklin	Oxidation Ponds	HGDM	D	Y	0.1	125	Y	Aerators	R949 000
Hlanganani/ Polela	Bio-filter	HGDM	D	Y	0.22	313	N	Bio-filter	R1 572 000
Riverside	Oxidation Ponds	HGDM	E	Y	0.36	500	Y	Pump station	R614 000
St Apollinaris/ Centocow	Oxidation Ponds	HGDM	D	Y	0.09	125	Y	Aerators	R590 000
Umzimkhulu	Oxidation Ponds	HGDM	C	Y	0.56	750	Y	Inlet works	R872 000
Rietvlei	Package Plant	HGDM	D	Y	Unknown	625	Y	None	R1 037 000
Ixopo	Activated Sludge	Umgeni Water	C	Y	0.95		Y	Sludge pumps	R314 000

Source: UW IMP, 2020

The sanitation reliability profile and existing infrastructure are presented in **Figure 6-1** and **Figure 6-2** overleaf.



Legend

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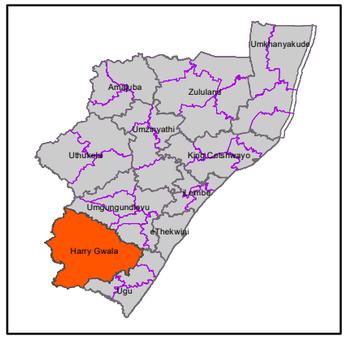

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MUNICIPALITY:

HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

MARISWE

JTN CONSULTING

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Sanitation Reliability Profile

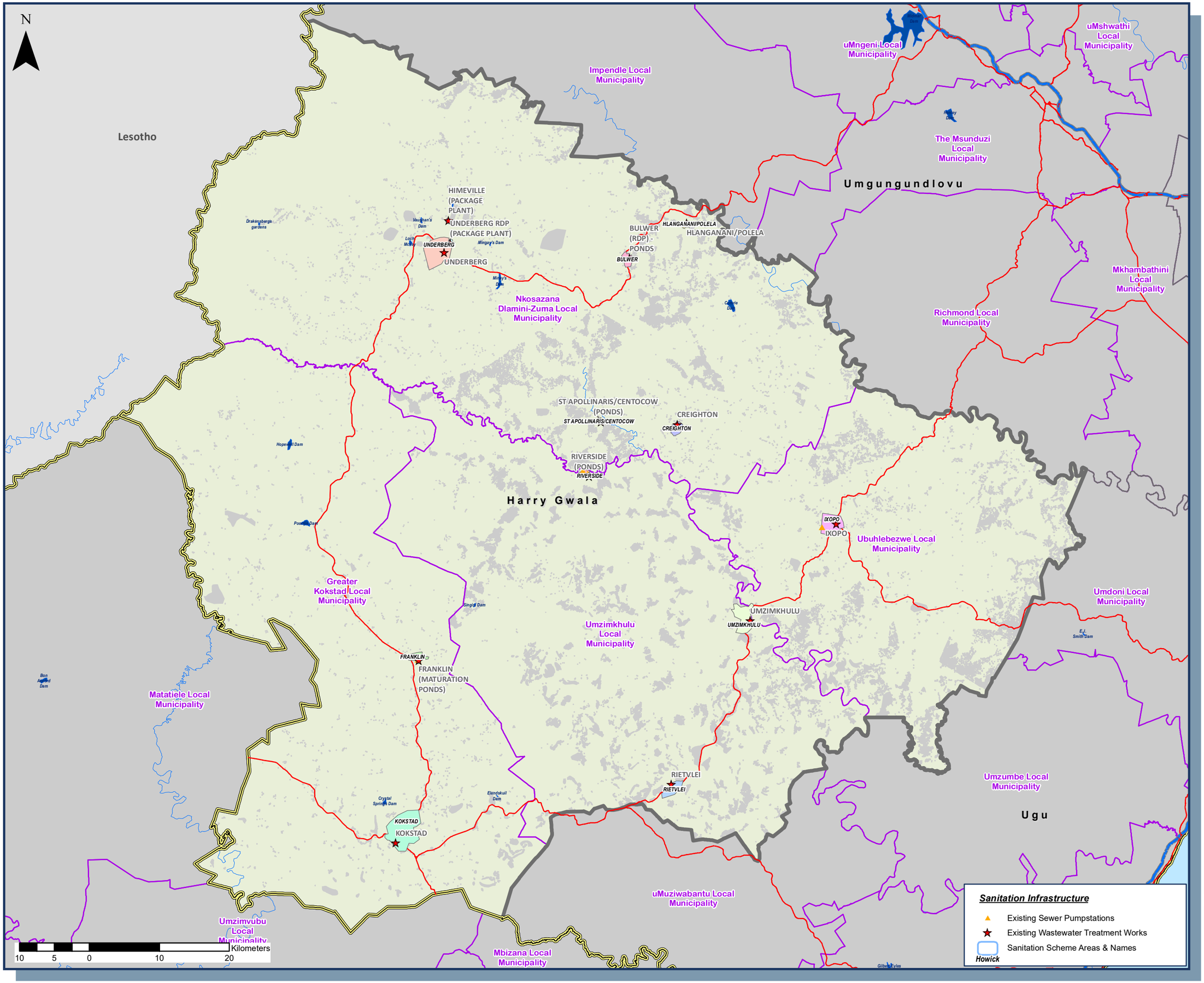
Harry Gwala District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 43 Figure 6-1



Legend

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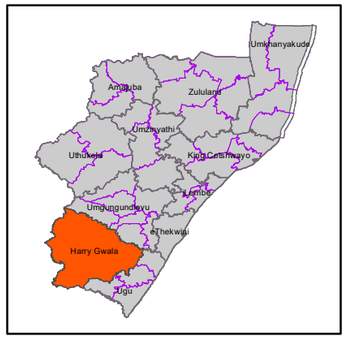

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MUNICIPALITY:

HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Existing Sanitation Infrastructure

Harry Gwala District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 43 Figure 6-2

7. BULK WATER SUPPLY PROJECTS CURRENTLY IN PLANNING

The existing funding grants for the municipal capital projects and operating subsidies for water services are mainly funded by the Municipal Infrastructure Grant (MIG) followed by the Regional Bulk Infrastructure Grant (RBIG) and the Water Services infrastructure Grant (WSIG). The main objective of MIG is to assist WSAs by providing grant funding in removing the backlog concerning basic municipal services to poor households. RBIG focusses on the infrastructure required to connect or augment the water resource on a macro[6] or sub regional [7] scale (over vast distances [8]), with internal bulk and reticulation systems or any bulk supply infrastructure that may have a significant impact on water resources in terms of quantity and quality. The bulk infrastructure that would have a "significant impact on water resources" includes:

- ✓ Any bulk scheme that is designed for maximum demand of 5Mℓ/day or more;
- ✓ Any wastewater treatment plant that discharges into a freshwater resource system; and
- ✓ Any water treatment plant that is designed for a maximum demand of more than 2Mℓ/day.

For the purpose of this study, the existing regional bulk projects were considered and evaluated to identify potential gaps within the existing project footprints to the extent that a total "wall-to-wall" bulk water services needs perspective is visualised and realised. This must be done in the context to improve access to basic services but at the same time support economic growth and development and ensure sustainable services.

This chapter provides a brief overview of existing and planned bulk water infrastructure projects sourced from the HGDM 2018 WSDP Summary Report.

7.1 REGIONAL BULK WATER PROJECTS IN PLANNING

The HGDM mainly receives their funding from MIG and WSIG. Only one regional bulk infrastructure project receives funding from RBIG.

The funding streams for infrastructure development over the next three years are tabled in **Table 7-1** overleaf.

[6] "Macro" is defined as infrastructure serving extensive areas across multi-municipal boundaries

[7] "Sub-regional" is defined as large regional bulk infrastructure serving numerous communities over a large area normally within a specific district or local municipal area

[8] Over "vast distances" is considered as any distances greater than 5km

Table 7-1: Grant Funding Streams

Grant Funding Programme	2019/2020 (R '000)	2020/2021 (R '000)	2021/2022 (R '000)	Total Funding over Next 3 Financial Years
Municipal Infrastructure Grant (MIG)	R200 860	R212 681	R229 688	**R643 229**
Water Services Infrastructure Grant (WSIG)	R60 000	R70 000	R75 000	**R205 000**
Regional Bulk Infrastructure Grant (RBIG)	R20 000	R25 506	R60 000	**R105 506**
Total: Harry Gwala District Municipality	**R280 860**	**R308 187**	**R364 688**	**R953 735**

Source: Division of Revenue Bill Schedule (DORA), 2019/2020

Table 7-2 indicates the RBIG funding allocated for the next three financial years to one bulk project within HGDM.

Table 7-2: RBIG Funding in terms of DORA for HGDM

Local Municipality	Project Name	2019/2020 (R '000)	2020/2021 (R '000)	2021/2022 (R '000)
Dr Nkosazana Dlamini Zuma Ubuhlebezwe	Greater Bulwer Donnybrook Water Scheme	R20 000	R25 506	R60 000
Total Harry Gwala District Municipality		**R20 000**	**R25 506**	**R60 000**

Source: Division of Revenue Bill Schedule (DORA), 2019/2020

The funding allocations for HGDM, as presented in DORA, is presented in **Table 7-3** below.

Table 7-3: Three-Year Medium-Term Expenditure Framework (MTEF) for HGDM

WSA	Municipal Infrastructure Grant (MIG)			Water Services Infrastructure Grant (WSIG)		
	2019/2020 (R '000)	2020/2021 (R '000)	2021/2022 (R '000)	2019/2020 (R '000)	2020/2021 (R '000)	2021/2022 (R '000)
Harry Gwala District Municipality	R200 860	R212 681	R229 688	R60 000	R70 000	R75 000

Source: Division of Revenue Bill Schedule (DORA), 2019/2020

The following list of water services projects are presented within the WSDP for the 2021 financial year.

Table 7-4: Implementation Activity of current MTEF Projects in HGDM

Project Name	Type	Amount (R '000)
KwaMay-Theekloof Water Supply Project (Ward 11,13 and 14)	Water – MIG	R33 198
Santombe Water Supply - Phase 3	Water – MIG	R83 698
Umkhunya Water Supply Schemes (AFA) MIS 224801	Water – MIG	R158 301
Greater Mbhulelweni Water Supply Project	Water – MIG	R20 573
Underberg Bulk Water Supply Upgrade Phase 2 (AFA) MIS 180557	Water – MIG	R29 919
Chibini Water Supply Project	Water – MIG	R28 254
Greater Summerfield Water Project	Water – MIG	R6 042
Gala Donnybrook Phase 1 Water	Water – MIG	R972
Greater Kilimon Water Supply Project	Water – MIG	R556 364
Hopewell	Water – MIG	R9 318
Highflats Town Bulk Water Supply Scheme	Water – MIG	R157 185
Centocow Community Water Supply (AFA) MIS 183977	Water – MIG	R65 363
Bulwer- Nkelabantwana- Nkumba Water Supply Project	Water – MIG	R65 363
Ncakubana Water Supply Scheme - Phase 2	Water – MIG	R21 148
Khukhulela Water Supply	Water – MIG	R24 420
Creighton Water Supply	Water – MIG	R30 174
Bulwer Dam Emergency Intervention - Water Supply Scheme	Water – MIG	R38 294
Greater Nomandlovu Water Supply Project Phase 2	Water – MIG	R104 347

Source: HGDM WSDP, 2020

These planning initiatives will be considered together with proposed interventions to meet the 2050 water demand and are discussed further in Section 9 of this report.

8. SYNOPSIS OF EXISTING AND COMMITTED SCHEMES

A gap analysis has been undertaken for the water schemes in the Harry Gwala DM. The purpose of the gap analysis is to check the adequacy of infrastructure to allow the 2050 water demand to be supplied, and where necessary identify upgrades to infrastructure.

The gap analysis has taken into account current planning interventions by the WSA. The interventions required to meet the 2050 water demand inclusive of infrastructure planning and recommended water resource investigations is discussed in Chapter 9 of this study.

The entire HGDM has been demarcated into regional water schemes in line with short and long-term plans by the WSA. These regional schemes have been identified, in Chapter 5, and are as follows:

- ✓ HG001 WSIA: Greater Bulwer/Donnybrook
- ✓ HG002 WSIA: Greater Kilimon
- ✓ HG003 WSIA: Nokweja Scheme
- ✓ HG004 WSIA: Greater Mhlabashane Scheme
- ✓ HG005 WSIA: Mkhunya Scheme
- ✓ HG006 WSIA: Centocow Scheme
- ✓ HG007 WSIA: Kukhulela Scheme
- ✓ HG008 WSIA: Underberg-Himeville Scheme
- ✓ HG009 WSIA: Greater Summerfield Scheme
- ✓ HG010 WSIA: St. Barnabas-Chabane Scheme
- ✓ HG011 WSIA: Greater Njunga Scheme
- ✓ HG012 WSIA: Greater Riverside Scheme
- ✓ HG013 WSIA: Ibisi-Machunwini Scheme
- ✓ HG014 WSIA: Lourdes-Ndzombane Scheme
- ✓ HG015 WSIA: Mnqumeni Scheme
- ✓ HG016 WSIA: Umzimkhulu Town Scheme
- ✓ HG017 WSIA: Nsingizi-Mkhangala Scheme
- ✓ HG018 WSIA: Franklin Scheme
- ✓ HG019 WSIA: Kokstad Town Scheme
- ✓ HG020 WSIA: Pakkies-Willowdale Scheme

8.1 HG001 WSIA: GREATER BULWER/DONNYBROOK SCHEME

The current and planned resources (including the planned Stephen Dlamini Dam) of the Bulwer/Donnybrook BWSS will not be able to supply the water requirements for all the communities in 2050. Thus, the feasibility of other sources, such as sourcing water from the Polela River (Polela Dam), the Mkhomazi River (Smithfield Dam) and the Umzimkhulu River (New Biggen Dam) was explored.

Feasibility of Water Supply from Polela River Regional WSS[9]

Raw water can be abstracted from the Polela River and treated close to the source. Potable water would then be pumped in an easterly direction along the R617 to a command reservoir. From this command reservoir the town of Bulwer as well as areas north can be supplied under gravity. A second rising main would tee off between Bulwer and the service reservoir in a southerly direction and pumped towards a high point in the Gala region.

From the bulk reservoir in Gala, potable water would be conveyed in three directions that are as follows:

- ✓ In the southerly direction to Tarrs Valley and Creighton under gravity
- ✓ In a south easterly direction to Donnybrook and easterly to Mnywaneni and Sandanezwe
- ✓ In a north easterly direction where potable water would be pumped to a bulk reservoir in the Ntandela area and would supply the Qadi, Bethlehem and lower lying areas under gravity. This however would require crossing the Mkhomazi Valley/River. Abstraction from the Mkhomazi River to supply the Qadi area has a high level of assurance but considered unviable due to high pumping heads and very low demands compared to gravitation as described above. Supply from local rivers was not considered due to an assumed low level of assurance of supply.

In addition, a detailed hydrological study to investigate the safe yield of the Polela River needs to be conducted as well as the size and requirements of the dam, if required.

Feasibility of Water Supply from Smithfield Dam-Comrie Dam Regional WSS[10]

Five (5) water supply options were considered to augment the current Greater Bulwer/Donnybrook BWSS from the Smithfield Dam and/or Comrie Dam. The five (5) options are listed below:

- ✓ Option 1: Smithfield Dam via Comrie Dam (excluding Comrie Dam's yield).

[9] Sourced from UAP Phase II, 2016; and Greater Mbulelweni Water Supply: Technical Feasibility Study, 2010

[10] Sourced from Umkhomazi Water Project: Technical Feasibility Study, 2010

- ✓ Option 2: Smithfield Dam to the villages Sizanenjane and Nkelabantwana.
- ✓ Option 3: Smithfield Dam to the villages Bethlehem and Ncwadi.
- ✓ Option 4: Smithfield Dam supplementing Comrie Dam's shortfall; and
- ✓ Option 5: Raising of Comrie Dam.

Option 1 - Alternative 1 is located adjacent to an existing road and follows the layout of the road for most of the system. Alternative 2 follows the shortest practical route from Smithfield Dam to Comrie Dam but requires an additional head of 111 m to overcome the topography constraints to convey water to the Comrie Dam. The proposed two (2) alternatives require water treatment plants (WTP) downstream of Comrie Dam. A pump station is required to pump potable water to a high reservoir and distribute to the communities. The yield of Comrie Dam will not be used in this option; Comrie Dam only serves as a medium transporting the water to the point of abstraction.

Option 2 - Two pipeline routes, Alternative 1 and Alternative 2 were selected to transfer bulk potable water from the Proposed Smithfield Dam to the two desired destinations. These destinations are reservoirs in Nkelabantwana and Sizanenjane communities. These reservoirs are situated on the highest elevations that can gravity feed the rest of the communities within the local supply area. A WTP will be located just downstream of the Proposed Smithfield Dam before water is pumped from a pump station.

Option 3 - Two pipeline routes were selected to transfer bulk water from the proposed Smithfield Dam to two desired destinations. These destinations are reservoirs in Bethlehem and Ncwadi communities. Bethlehem and Ncwadi are situated on the highest elevations in the surroundings that can gravity feed the communities within the supply area. A water treatment plant will be located downstream of the Proposed Smithfield Dam from where potable water will be pumped and distributed to the reservoirs at the two (2) communities.

Option 4 - This option will only be viable if Comrie Dam is a guaranteed resource to be used by the HGDM. Smithfield Dam will supplement Comrie Dam with 0.15 Mm^3/a since Comrie Dam has a yield of 0.85 Mm^3/a after environmental releases. Option 1 and Option 4 follow the same routes from the proposed Smithfield Dam to Comrie Dam. The water will be treated downstream of Comrie Dam and will be pumped to the Comrie reservoir from where it will be distributed.

Option 5 - This option will only be viable if Comrie Dam is a guaranteed resource to be used by the HGDM. The yield of Comrie Dam will increase from 0.85 Mm^3/a to 1.36 Mm^3/a by raising the dam by 4 m from 12 m to 16 m. The water will be treated and pumped to the Comrie reservoir and distributed accordingly.

Feasibility of Water Supply from Proposed New Biggen Bulk Regional WSS
This scheme is discussed in detail in Section 9.21.

The existing and planned infrastructure capacity for the Greater Bulwer/Donnybrook Water Supply Scheme is compared with the projected 2050 demand. This comparison is provided in **Table 8-1** below.

Table 8-1: Greater Bulwer/Donnybrook Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	1.5	9.5	10	23.6	13.6
Storage (Mℓ)	-	20	20	23.6	3.6
Bulk conveyance - Raw Water (Mℓ/d)	-	11	11	23.6	12.6
Bulk conveyance - Clear Water (Mℓ/d)	-	-	-	23.6	23.6

Nine MIG projects (Greater Mbhulelweni Water Supply Project, Chibini Water Supply Project, Gala Donnybrook Phase 1 Water Project, Hopewell Water Project, Bulwer- Nkelabantwana- Nkumba Water Supply Project, Ncakubana Water Supply Scheme - Phase 2, Creighton Water Supply, Bulwer Dam Emergency Intervention - Water Supply Scheme and the Greater Nomandlovu Water Supply Project Phase 2) were identified to upgrade the existing distribution networks within the Greater Bulwer/Donnybrook Scheme to the value of approximately R 318.44 million and will cover the entire Bulwer/Donnybrook Scheme detailed in Section 5.2.

Based on the capacities of existing and planned infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the capacity of existing WTP, the bulk pipelines and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.2 HG002 WSIA: GREATER KILIMON SCHEME

The Greater Kilimon Water Supply Scheme currently in the planning phase, involves the abstraction of raw water from the Ngwangwane River and then to be treated at a WTP close to the river. Potable water will then be pumped from the proposed 3.5 Mℓ/d WTP to a command reservoir at the highpoint near the Thonsini settlement. (Baboloki Geohub, 2020) Other infrastructure details within the scheme are unknown.

The existing and planned infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-2** overleaf.

Table 8-2: Greater Kilimon Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	-	3.5	3.5	6.73	3.23
Storage (Mℓ)	-	-	-	6.73	6.73
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	6.73	6.73
Bulk conveyance - Clear Water (Mℓ/d)	-	-	-	6.73	6.73

A MIG project was identified to upgrade the existing distribution networks within the Greater Kilimon Scheme to the value of approximately R 556.36 million.

Based on the capacities of existing and planned infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the capacity of existing WTP, the bulk pipelines and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.3 HG003 WSIA: NOKWEJA SCHEME

The Nokweja Supply Scheme involves the abstraction of raw water from the Mzimkhulu River. Potable water is pumped from the planned 10 Mℓ/d WTP to three command reservoirs with unknown capacities, within the scheme area. (Makhaotse, Narasimulu & Associates, 2016)

The existing and planned infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-3** below.

Table 8-3: Nokweja Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	1.8	8.2	10	2.3	N/A
Storage (Mℓ)	-	-	-	2.3	2.3
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	2.3	2.3
Bulk conveyance - Clear Water (Mℓ/d)	-	-	-	2.3	2.3

Based on the capacities of existing and planned infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the bulk pipelines and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.4 HG004 WSIA: Greater Mhlabashane Scheme

The Greater Mhlabashane Water Supply Scheme is earmarked to receive potable water from the planned 10 Mℓ/d WTP at Nokweja. Other infrastructure details within the scheme are unknown.

The existing and planned infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-4** below.

Table 8-4: Greater Mhlabashane Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	-	10	7.7	5.25	N/A
Storage (Mℓ)	-	-	-	5.25	5.25
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	5.25	5.25
Bulk conveyance - Clear Water (Mℓ/d)	-	-	-	5.25	5.25

A MIG project was identified to upgrade the existing distribution networks within the Greater Mhlabashane Scheme to the value of approximately R 157.2 million but would leave the remainder of the communities within the scheme to be excluded. The latter should be considered when planning the bulk infrastructure requirements.

Based on the capacities of existing and planned infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the bulk pipelines and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.5 HG005 WSIA: Mkhunya Scheme

The Mkhunya Water Supply Scheme receives its raw water from an abstraction point on the Mkhomazi River and is treated at a WTP close to the river. Potable water is then pumped to a command reservoir, by two pumpstations, to the highpoint near the Kweletsheni settlement. The 1.5 Mℓ/d WTP is being upgraded to 5 Mℓ/d but construction is currently placed on hold due to unresolved land issues. (Ulozolo Engineers, 2014)

The existing and planned infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-5** below.

Table 8-5: Mkhunya Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	1.5	3.5	5	4.81	N/A
Storage (Mℓ)	-	-	-	4.81	4.81
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	4.81	4.81
Bulk conveyance - Clear Water (Mℓ/d)	-	-	-	4.81	4.81

A MIG project was identified to upgrade the existing distribution networks within the Mkhunya Scheme to the value of approximately R 158.3 million but would leave the remainder of the communities within the scheme to be excluded. The latter should be considered when planning the bulk infrastructure requirements.

Based on the capacities of existing and planned infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the bulk pipelines and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.6 HG006 WSIA: CENTOCOW SCHEME

The Centocow Water Supply Scheme involves the abstraction of raw water from the Mzimkhulu River and then treatment close to the river at the 0.77 Mℓ/d WTP. The WTP will be upgraded to 2.5 Mℓ/d in future. Potable water will then be pumped from the WTP to a command reservoir of unknown capacity. (Emzansi Engineers, 2016)

The existing and planned infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-6**.

Table 8-6: Centocow Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	0.77	1.73	2.5	3.2	0.7
Storage (Mℓ)	-	-	-	3.2	3.2
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	3.2	3.2
Bulk conveyance - Clear Water (Mℓ/d)	-	-	-	3.2	3.2

A MIG project was identified to upgrade the existing distribution networks within the Centocow Scheme to the value of approximately R 65.36 million but would leave the remainder of the communities within the scheme to be excluded. The latter should be considered when planning the bulk infrastructure requirements.

Based on the capacities of existing and planned infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the capacity of existing WTP, the bulk pipelines and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.7 HG007 WSIA: KUKHULELA SCHEME

The Kukhulela Water Supply Scheme is earmarked to receive potable water from the planned 2.5 Mℓ/d WTP that forms part of the Centocow Water Supply Scheme. Other infrastructure details within the scheme are unknown. (Phakathi & Shabane Consulting , 2020)

The existing and planned infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-7**.

Table 8-7: Kukhulela Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	-	2.5	2.5	0.7	N/A
Storage (Mℓ)	-	-	-	0.7	0.7
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	0.7	0.7
Bulk conveyance - Clear Water (Mℓ/d)	-	-	-	0.7	0.7

A MIG project was identified to upgrade the existing distribution networks within the Kukhulela Scheme to the value of approximately R 24.42 million but would leave the remainder of the communities within the scheme to be excluded. The latter should be considered when planning the bulk infrastructure requirements.

Based on the capacities of existing and planned infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the bulk pipelines and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.8 HG008 WSIA: UNDERBERG-HIMEVILLE SCHEME

The Underberg-Himeville Scheme receive its water from the 1.5m high weir on the Mzimkhulu River via the Underberg WTP that has been upgraded to 5 Mℓ/d. The raw water is conveyed to the WTP via a steel and uPVC pipeline that varies from ø 160mm to ø 200mm. Potable water is then conveyed the scheme area via two ø 160mm pipelines and a ø 200mm pipeline. (Zimile Consulting Engineers , Underberg Bulk Water Supply Pump Station and Rising Main: Technical Report - Revised, 2020)

The existing and planned infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-8** below.

Table 8-8: Underberg-Himeville Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	5.0	-	5.0	1.8	N/A
Storage (Mℓ)	4.15	-	4.15	1.8	N/A
Bulk conveyance - Raw Water (Mℓ/d)	3.05	-	3.05	1.8	N/A
Bulk conveyance - Clear Water (Mℓ/d)	9.29	-	9.29	1.8	N/A

A MIG project was identified to upgrade the existing distribution networks within the Underberg-Himeville Scheme to the value of approximately R 29.9 million but would leave the remainder of the communities within the scheme to be excluded. The latter should be considered when planning the bulk infrastructure requirements.

Based on the capacities of existing and planned infrastructure will meet the projected 2050 demand.

8.9 HG009 WSIA: GREATER SUMMERFIELD SCHEME

The Greater Summerfield Water Supply Scheme involves the abstraction of raw water from the Mzimkhulu River and then to a 3 Mℓ/day package plant that is currently under construction located at the Old Prison site.

Other information on the infrastructure within the scheme is unknown. (Sisonke District Municipality, Greater Summerfield Water Supply Project: Design Report, 2013)

The existing and planned infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-9** below.

Table 8-9: Greater Summerfield Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	-	3.0	3.0	5.1	2.1
Storage (Mℓ)	-	-	-	5.1	5.1
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	5.1	5.1
Bulk conveyance - Clear Water (Mℓ/d)	-	-	-	5.1	5.1

A MIG project was identified to upgrade the existing distribution networks within the Greater Summerfield Scheme to the value of approximately R 6 million but would leave the remainder of the communities within the scheme to be excluded. The latter should be considered when planning the bulk infrastructure requirements.

Based on the capacities of existing and planned infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the capacity of existing WTP, the bulk pipelines and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.10 HG010 WSIA: St. Barnabas-Chabane Scheme

The St. Barnabas-Chabane Water Supply Scheme receives water via the abstraction of raw water from the Chabane River and a proposed 3 Mℓ/d WTP close to the river. Other information on the infrastructure within the scheme is unknown. (Ubambiswano Projects , 2016)

The existing and planned infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-10**.

Table 8-10: St. Barnabas-Chabane Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	-	3.0	3.0	2.7	N/A
Storage (Mℓ)	-	-	-	2.7	2.7
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	2.7	2.7
Bulk conveyance - Clear Water (Mℓ/d)	-	-	-	2.7	2.7

Based on the capacities of existing and planned infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the bulk pipelines and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.11 HG011 WSIA: GREATER NJUNGA SCHEME

The Greater Njunga Water Supply Scheme involves the abstraction of raw water from the Little Ibisi River and then conveyed to the proposed 3 Mℓ/day WTP that is planned as part of the Greater Njunga Water Supply Scheme Project. Other information on the infrastructure within the scheme is unknown. (Zimile Consulting Engineers , Greater Njunga Water Supply Scheme: Technical Feasibility Report - Revision 2 , 2020)

The existing and planned infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-11**.

Table 8-11: Greater Njunga Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	-	3.0	3.0	5.15	2.15
Storage (Mℓ)	-	-	-	5.15	5.15
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	5.15	5.15
Bulk conveyance - Clear Water (Mℓ/d)	-	-	-	5.15	5.15

Based on the capacities of existing and planned infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the capacity of existing WTP, the bulk pipelines and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.12 HG012 WSIA: GREATER RIVERSIDE SCHEME

The Greater Riverside Water Supply Scheme involves the abstraction of raw water from the Ngwangwane River from where the water is treated at the 0.7 Mℓ/d WTP that will be upgraded to 4 Mℓ/d. Potable water will then be pumped from the WTP to a command reservoir of unknown capacity. (Zimile Consulting Engineers, Greater Riverside Supply Scheme: Technical Feasibility Report - Revision 0, 2020)

The existing and planned infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-12** below.

Table 8-12: Greater Riverside Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	0.7	3.3	4.0	3.46	N/A
Storage (Mℓ)	-	-	5.0	3.46	N/A
Bulk conveyance - Raw Water (Mℓ/d)	-	-	5.75	3.46	N/A
Bulk conveyance - Clear Water (Mℓ/d)	-	-	5.75	3.46	N/A

Based on the capacities of existing and planned infrastructure, there are no gaps within the water supply requirements for the projected 2050 demand.

8.13 HG013 WSIA: IBISI-MACHUNWINI SCHEME

The Ibisi-Kokshill Water Supply Project involves the abstraction of raw water from the Ibisi River and then treatment close to the river. Potable water will then be pumped from the proposed 5 Mℓ/d WTP to a command reservoir of unknown existing capacity. (Zimile Consulting Engineers, Ibisi-Kokshill Water Supply Scheme: Technical Feasibility Report, 2020)

The existing and planned infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-13** overleaf.

Table 8-13: Ibisi-Machunwini Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	2.0	3.0	5.0	4.9	N/A
Storage (Mℓ)	-	8.0	8.0	4.9	N/A
Bulk conveyance - Raw Water (Mℓ/d)	-	5.0	5.0	4.9	N/A
Bulk conveyance - Clear Water (Mℓ/d)	-	5.0	5.0	4.9	N/A

A MIG project was identified to upgrade the existing distribution networks within the Ibisi-Machunwini Scheme to the value of approximately R 33.2 million but would leave the remainder of the communities within the scheme to be excluded. The latter should be considered when planning the bulk infrastructure requirements.

Based on the capacities of existing and planned infrastructure, there are no gaps within the water supply requirements for the projected 2050 demand.

8.14 HG014 WSIA: LOURDES-NDZOMBANE SCHEME

The Lourdes-Ndzomabane Water Supply Scheme involves the abstraction of raw water from a weironthe Upper Ibisi River and then treatment close to the river. Potable water will then be pumped from the proposed 5 Mℓ/d WTP to a command reservoir that will feed distribution reservoirs within the scheme area. Other information on the infrastructure within the scheme is unknown.

The existing and planned infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-14**.

Table 8-14: Lourdes-Ndzomabane Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	-	5.0	5.0	3.8	N/A
Storage (Mℓ)	-	9.3	9.3	3.8	N/A
Bulk conveyance - Raw Water (Mℓ/d)	-	9.1	9.1	3.8	N/A
Bulk conveyance - Clear Water (Mℓ/d)	-	5.0	5.0	3.8	N/A

Based on the capacities of existing and planned infrastructure, there are no gaps within the water supply requirements for the projected 2050 demand.

8.15 HG015 WSIA: MNQUMENI SCHEME

The planned Santombe Water Supply Scheme involves the transfer of potable water to the scheme via the Weza WTP to eliminate the schemes reliability on springs and boreholes. The construction of the reticulation and storage reservoirs for the scheme area was completed. The Weza WTP and Ugu DM can no longer meet the demand for this scheme. (Umpisi Engineers, 2011)

The existing and planned infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-15** below.

Table 8-15: Mnqumeni Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	-	-	-	3.12	3.12
Storage (Mℓ)	-	-	-	3.12	3.12
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	3.12	3.12
Bulk conveyance - Clear Water (Mℓ/d)	-	-	-	3.12	3.12

A MIG project was identified to upgrade the existing distribution networks within the Mnqumeni Scheme to the value of approximately R 83.7 million but would leave the remainder of the communities within the scheme to be excluded. The latter should be considered when planning the bulk infrastructure requirements.

Based on the capacities of existing and planned infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the capacity of existing WTP, the bulk pipelines and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.16 HG016 WSIA: UMZIMKHULU TOWN SCHEME

The Umzimkhulu Town Water Supply Scheme involves the abstraction of raw water from the Mzimkhulu River and the Ntlambamasoka Stream. Potable water will be pumped to the proposed 14 Mℓ/d WTP. From the WTP, potable water is distributed into the reticulation networks supplying the town and surrounding areas. (UW IMP, 2020)

The existing and planned infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-16** below.

Table 8-16: Umzimkhulu Town Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	5.0	9.0	14.0	5.24	N/A
Storage (Mℓ)	1.25	-	1.25	5.24	3.99
Bulk conveyance - Raw Water (Mℓ/d)	7.12	-	7.12	5.24	N/A
Bulk conveyance - Clear Water (Mℓ/d)	5.22	-	5.22	5.24	0.02

Based on the capacities of existing and planned infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the bulk pipelines and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.17 HG017 WSIA: NSINGIZI-MKHANGALA SCHEME

No information could be sourced for planned interventions for the Nsingizi-Mkhangala Supply Scheme.

The planned infrastructure capacities will then be designed to meet the projected 2050 demand and provided in **Table 8-17**.

Table 8-17: Nsingizi-Mkhangala Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	-	-	-	3.85	3.85
Storage (Mℓ)	-	-	-	3.85	3.85
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	3.85	3.85
Bulk conveyance - Clear Water (Mℓ/d)	-	-	-	3.85	3.85

8.18 HG018 WSIA: FRANKLIN SCHEME

The Franklin Water Supply Scheme involves the abstraction of raw water from both the Upper Mzintlava River and a borehole and is then treated at the 0.22 Mℓ/day Franklin WTP. (UW IMP, 2020)

The existing and planned infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in **Table 8-18** below.

Table 8-18: Franklin Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	0.22	-	0.22	1.17	0.95
Storage (Mℓ)	-	-	-	1.17	1.17
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	1.17	1.17
Bulk conveyance - Clear Water (Mℓ/d)	-	-	-	1.17	1.17

Based on the capacities of existing and planned infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the capacity of existing WTP, the bulk pipelines and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.19 HG019 WSIA: KOKSTAD TOWN SCHEME

The Kokstad Water Supply Scheme involves the abstraction of raw water from both the Mzintlava River and Crystal Springs Dam and is then treated at the 18 Mℓ/d WTP. From the WTP, potable water is ditrubuted to the Prison Reservoir, the Main Reservoir, Shayamoya Reservoir and the Galaxy Tank which supplies the town and its surrounding areas. (UW IMP, 2020)

The planned infrastructure capacities will then be designed to meet the projected 2050 demand and provided in **Table 8-19** below.

Table 8-19: Kokstad Town Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	18.0	-	18.0	21.36	3.36
Storage (Mℓ)	14.8	-	14.8	21.36	6.56
Bulk conveyance - Raw Water (Mℓ/d)	38.26	-	38.26	21.36	N/A
Bulk conveyance - Clear Water (Mℓ/d)	56.0	-	56.0	21.36	N/A

Based on the capacities of existing and planned infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the capacity of the existing WTP and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.20 HG020 WSIA: PAKKIES-WILLOWDALE SCHEME

No information could be sourced for planned interventions for the Pakkies-Willowdale Supply Scheme.

The planned infrastructure capacities will then be designed to meet the projected 2050 demand and provided in **Table 8-20** overleaf.

Table 8-20: Pakkies-Willowdale Scheme Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	-	-	-	0.61	0.61
Storage (Mℓ)	-	-	-	0.61	0.61
Bulk conveyance - Raw Water (Mℓ/d)	-	-	-	0.61	0.61
Bulk conveyance - Clear Water (Mℓ/d)	-	-	-	0.61	0.61

Based on the capacities of existing and planned infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and interventions to meet the demand of 2050 will need to be proposed.

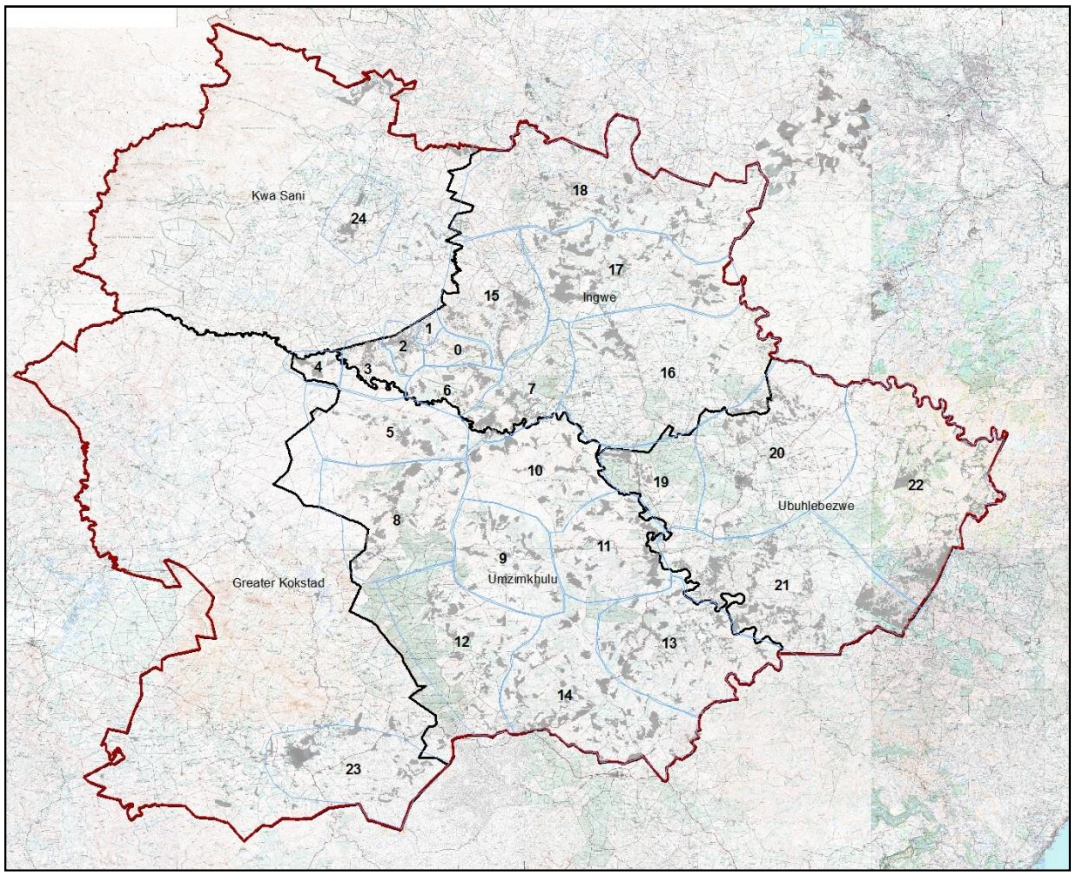
9. PROPOSED BULK WATER SUPPLY INTERVENTIONS (WSI)

This section details the water supply reconciliation options for bulk water services within the Harry Gwala DM – considering existing use and future supplies and water sources, per scheme area. It must be noted that the Water Supply Intervention Areas (WSIA's) were demarcated based on all the existing planning initiatives that are currently underway within the WSA. However, the demand model that was proposed to be used within this project will be used to determine the proposed bulk infrastructure requirements and would be sized accordingly to meet the demand of 2050.

It is recommended that the predominantly farmland, stand-alone areas not covered by schemes, be supplied by localised schemes (boreholes etc.) due to the sparse population and the proximity of the area in relation to the other regional schemes.

During the UAP Phase II study, the Harry Gwala DM was divided into 25 Supply Zones based on existing & proposed schemes, topography, physical boundaries (rivers, mountains etc.) and settlement patterns which are depicted in **Figure 9-1** below.

Figure 9-1: HGDM Supply Zones (UAP Phase II, 2016)



The following recommendations were taken from the UAP Phase II study:

- ✓ *The Greater Bulwer-Donnybrook Regional Water Supply Scheme is currently in construction and is due to be completed in 2021. This scheme intends using both the Bulwer and Comrie dams as water sources. The Bulwer Dam situated on the Luhane River will yield 8.4 Mℓ/day and Comrie Dam 3.73 Mℓ/day (full use after raising of the dam wall). The combination of these two dams is not sufficient for the current scheme footprint. It is recommended that a raw water transfer scheme from the Pholela River be investigated in detail to augment this scheme.*
- ✓ *A dam on the Ngwangwane River, at co-ordinates -30.0340 S; 29.6317 E will allow supply to the Umzimkhulu LM as well as the southern part of Ingwe LM. Preliminary investigations indicate that the yield at this site with a storage capacity of 25 Mcm will yield 111 Mℓ/day. This will be adequate to supply Zones 0 to 19 as well as 16, & 19 to 22.*
- ✓ *An impoundment on the Mzimkhulu River, at co-ordinates -29.900 S; 29.6070 E, known as the New Biggen Dam will allow supply to Umzimkhulu LM. Preliminary investigations indicate that the yield at this site with a storage capacity of 76.74 Mcm will yield 347.7 Mℓ/day. This will be also adequate to supply Zones 0 to 19 as well as 16 & 19 to 22.*
- ✓ *It is recommended that a detailed feasibility study be undertaken to compare the Ngwangwane and New Biggen options, including bulk scheme configurations from each site, financial, economic, social, environmental and technical matters to determine which option or combination of options are more feasible for implementation.*
- ✓ *It is recommended that a detailed water resources assessment of the catchment above Kokstad on the Mzintlava River be undertaken to confirm existing water use. Preliminary investigations show that a dam, at co-ordinates -30.4585 S; 29.4817 E, on the Mzintlava River will allow additional raw water yield of 31 Mℓ/day for Kokstad Town.*

Since the completion of the UAP Phase II study, Umgeni Water has completed the Umzimkhulu Bulk Regional Water Supply Scheme which includes the proposed New Biggen Dam on the Mzimkhulu River. This scheme will provide bulk water to the whole of the Umzimkhulu LM. The water resource assessment on the Mzintlava River and study for the proposed Dam to supply Kokstad has not yet been undertaken.

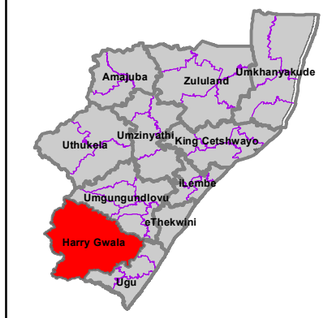
As highlighted in Chapter 5 of this study, consultation with the DM revealed that the entire HGDM was divided into bulk supply scheme areas that included some of the proposed UAP Phase II interventions. It was decided that UAP III will build on the proposed planning intervention areas of the HGDM hereafter referred to as Water Service Intervention Areas (WSIA's).

The details of each proposed upgrade and future additional requirements/interventions are provided per WSIA within the sections and paragraphs hereafter and illustrated for the entire WSA within **Figure 9-2**.

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

MUNICIPALITY:

HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

MARISWE

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions

Harry Gwala District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 43 Figure 9-2

9.1 HG001 WSIA: GREATER BULWER/DONNYBROOK BULK WATER SUPPLY SCHEME

9.1.1 Demand Model Intervention

9.1.1.1 Water Demand

The water demand for the Greater Bulwer/Donnybrook Bulk Water Supply Scheme was determined for 2020 and 2050 and included within **Table 9-1** below.

Table 9-1: Population and Water demand 2020 and 2050 for the Greater Bulwer/Donnybrook BWSS

Population	**Population 2020**	**Population 2050**
	89 892	115 001
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	17.83	23.60

9.1.1.2 Water Resource Consideration

Note: The paragraphs below are taken from the Umgeni Water Infrastructure Masterplan 2020 that mentions that the Greater Bulwer/Donnybrook Scheme is now known as the HGDM Regional Bulk Water Supply Scheme. After consultations with the DM, it was found that the Greater Bulwer/Donnybrook Water Supply Scheme is the registered name of the project with DWS. The planning in this report will therefore make mention of the Greater Bulwer/Donnybrook Water Supply Scheme at the request of the DM.

The Greater Bulwer/Donnybrook Water Supply Scheme will be supplied from the planned Stephen Dlamini Dam on the Luhane River as well as the Comrie Dam. The detailed feasibility study for the proposed Stephen Dlamini Dam (former Bulwer Dam) was undertaken in 2009. The vast network of bulk potable water pipelines of the Greater Bulwer/Donnybrook Bulk Water Supply Scheme will link into a series of standalone schemes that have previously been reliant on small-localized water sources such as boreholes and springs, in order to supply the projected 2040 water requirement of 11 Mℓ/d from the Greater Bulwer/Donnybrook Bulk Water Supply Scheme. (UW IMP, 2020) The Greater Bulwer/Donnybrook Bulk Water Supply Scheme comprises of the Stephen Dlamini Dam as the main raw water supply source, a 10 Mℓ/day Water Treatment Plant (WTP), a 20 Mℓ command reservoir, various storage reservoirs and a network of potable water supply pipelines.

The UW IMP 2020 further discusses that prior to the construction of the scheme an emergency intervention was implemented and is detailed below.

Emergency Intervention (completed)

In 2011, due to the unlikeliness of the construction of the dam it was found that the regional project would only address the medium to long-term needs of the people of Bulwer Town which created a gap in assured

water supply. Possible solutions to supply Bulwer in the interim, such as linkages to the Luhane River, was investigated until such time as the Greater Bulwer/Donnybrook Bulk Water Supply Scheme is implemented.

The source of water for the Emergency Intervention scheme is the Luhane River that is located close to the town of Bulwer. Water is to be abstracted from a newly constructed weir on the river, treated by means of a package treatment plant and pumped from a new high lift pump station to a new reservoir at Bulwer Town and to a blank flange at the Gala demand position.

Possible options for Water Resource augmentations to meet future demand.

- ✓ Polela River (Polela Dam)
  - A possible option to augment the Stephen Dlamini Dam was investigated within the UAP Phase II study which involved a dam and raw water transfer from the Pholela River to Stephen Dlamini Dam. From hydrological investigations, it was determined that a 2.04 Mm^3 storage (35m high wall) on the Pholela River would yield 12.7 Mℓ/day.
- ✓ Mkhomazi River (Smithfield Dam)
  - Another possible option to augment the Stephen Dlamini Dam was investigated within the UAP Phase II study which involved a raw water transfer from the proposed Smithfield Dam to Stephen Dlamini Dam. A hydraulic profile in the "Community Supply from Smithfield-Comrie Dam: Pre-feasibility study" shows that approximately 400m of static pumping head will be required to convey raw water to the Comrie Dam.
- ✓ Umzimkhulu River (New Biggen Dam) (discussed further in Section 9.21)

9.1.2 Water Supply Infrastructure

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Greater Bulwer/Donnybrook Bulk Water Supply Scheme and is illustrated within **Figure 9-3** followed by the schematic layout of the WSIA within **Figure 9-4**.

9.1.2.1 Bulk conveyance and Storage

Supply to Greater Mbulelweni, Masameni, Kwasawoti, Esikhesheni, Ixopo, Hopewell and surrounding areas.

Potable water will be pumped from the planned Stephen Dlamini WTP (1486 m) to the planned Stephen Dlamini Command Reservoir (1 660 m) and will then gravitate to the SAPPI reservoirs (10Mℓ x 2), at elevation 1 570 m, via a ø 700mm primary pipeline to Comrie dam WTP (elevation 1 216 m). At chainage 13km of the ø 700mm primary pipeline from Stephen Dlamini command to SAPPI reservoirs & Comrie dam, a proposed secondary bulk offtake (ø 350mm) with a booster pumpstation will pump water to Nkwezela Reservoir at elevation 1 620 m.

From the Comrie Dam WTP, water is pumped back to Nkwezela Reservoir (ring main). Water will gravitate to supply the areas of Voyizane, Kwabhidla and Ncwadi. From the SAPPI reservoirs, water is then proposed to be distributed by secondary pipelines, via gravity, to the areas of Masameni, Kwasawoti, Esikhesheni and Emnyameni. From the Masemeni Reservoir (1 363 m) the existing Mariathal/Chibini Reservoir (1 264 m) can be fed via gravity by a ø 700mm primary pipeline which will in turn supply the areas of Ixopo and Hopewell.

Supply to Bulwer town, Xosheyakhe and Shaya

Potable water will be pumped from the planned Stephen Dlamini WTP to the planned Stephen Dlamini Command Reservoir and then gravitates to the Bulwer Town Reservoir (1 560 m) via a ø 250mm primary pipeline. Water will then be able to gravitate to Xosheyakhe Reservoir (1 500 m) via a ø 250 mm secondary pipeline (already on the ground). From Xosheyakhe Reservoir, the currently under construction Kwashaya Reservoir (1 380 m) can be fed via gravity. Water can then be distributed by secondary and tertiary pipelines via gravity to areas of Mngwaneni, Emqulelwa, Hlanganani, Nkumba and Emacabazini.

Supply to Gala, Tarrs Valley, Creighton and Mahhehle

Potable water is proposed to be pumped from the planned Stephen Dlamini WTP to the planned Stephen Dlamini Command Reservoir and then transferred to the Gala Reservoir (1650 m) and Tarrs Valley Reservoir (1 210 m) via a ø 250 mm secondary pipeline (already on the ground). Water can then gravitate to Mahhehle Reservoir (1 195 m) via a ø 110 mm secondary pipeline and to Creighton Reservoir (1 020 m) through an off-take.

Supply to Mahwaqa, Underberg and Himeville

From the Stephen Dlamini Command Reservoir water can be gravity fed to Mahwaqa Reservoir (1 600 m) via a ø 100 mm secondary pipeline that will need to be upgraded to ø 160 mm to meet the 2050 demand for Underberg, Himeville and Mahwqa.

9.1.2.2 Proposed Interventions

- ✓ The existing Luhane River WTP needs to be upgraded to 24 Mℓ/day to meet the 2050 demand;
- ✓ The planned Stephen Dlamini Command Reservoir will need to be upgraded to 30 Mℓ/day to cater for the 2050 demand;
- ✓ The planned ø 100 mm secondary pipeline to Underberg and Himeville will need to be upgraded to ø 160 mm;
- ✓ The planned ø 300 mm secondary pipeline to Ixopo is proposed to be upgraded to ø 500 mm;

- ✓ The planned ø 355 mm primary pipeline from Stephen Dlamini Command reservoir to Comrie Dam Command is proposed to be upgraded to a ø 700 mm pipeline; and
- ✓ The planned ø 355 mm primary pipeline from Stephen Dlamini Command Reservoir to Chibini Reservoir is proposed to be up graded to a ø 700 mm pipeline.

Design details of all the infrastructure components are provided within **Annexure B**.

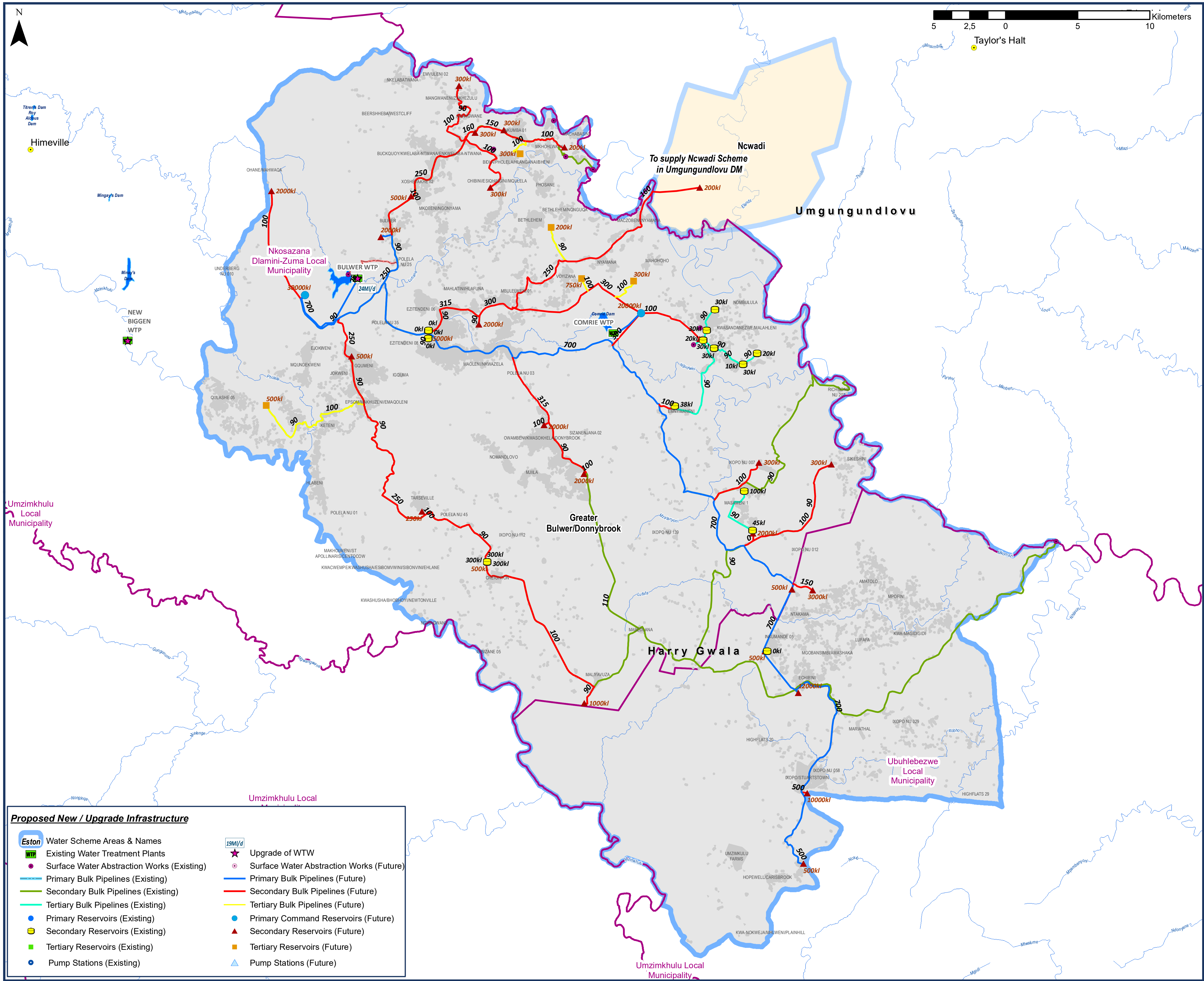
9.1.3 Financial Requirements

The bulk cost requirement for Greater Bulwer/Donnybrook Bulk Water Supply Scheme is summarised within **Table 9-2** below.

Table 9-2: Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (excl VAT)
Primary	R52 203 000.00	R5 220 300.00	R57 423 300.00
Secondary	R67 713 296.88	R6 771 329.69	R74 484 626.56
Tertiary	R4 843 349.28	R484 334.93	R5 327 684.21
Total	**R124 759 646.16**	**R12 475 964.62**	**R137 235 610.77**

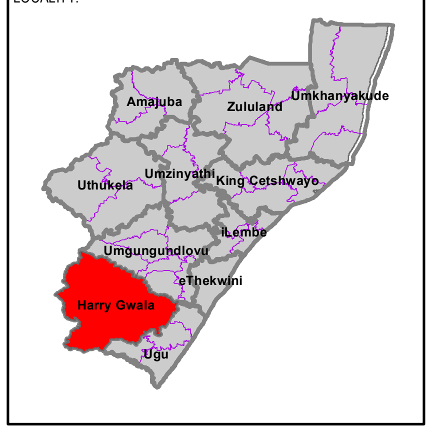
The total bulk cost requirement for the Greater Bulwer/Donnybrook Scheme is R 137 235 610.77 (excl VAT). The scheme development cost per household is approximately R 3 600.



Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

MUNICIPALITY:

HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

MARISWE

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - HG001: Greater Bulwer/Donnybrook

Harry Gwala District Municipality

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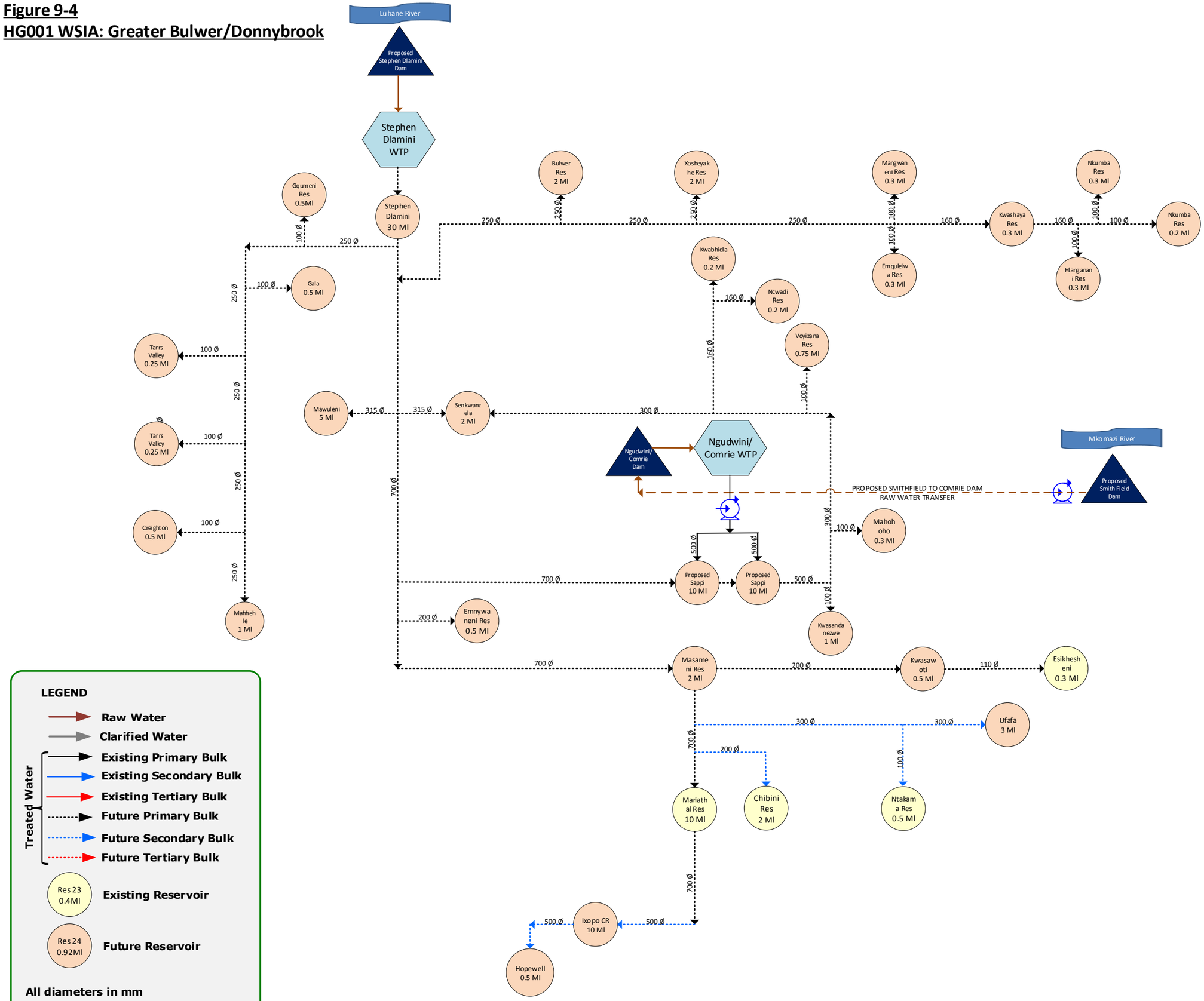
MAP NO.:

DC 43 Figure 9-3

Figure 9-4
HG001 WSIA: Greater Bulwer/Donnybrook



9.2 HG002 WSIA: GREATER KILIMON SCHEME

9.2.1 Demand Model Intervention

9.2.1.1 Water Demand

The water demand for the Greater Kilimon Scheme was determined for 2020 and 2050 and included within **Table 9-3** below.

Table 9-3: Population and Water demand 2020 and 2050 for the Greater Kilimon WSIA

Population	**Population 2020**	**Population 2050**
	29 773	38 091
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	5.01	6.73

9.2.1.2 Water Resource Consideration

The proposed Greater Kilimon Water Supply Scheme will abstract water from the Ngwangwane River and will be treated at a proposed 3.5 Mℓ/day WTP. The water resource assessment that was undertaken by Terratest states that the minimum yield of the river abstraction to supply the scheme is unattainable at 98% assurance. The surface water analysis report further mentions that an impoundment with a 6m high dam wall will provide sufficient storage that will allow for the required demand to be met at the 98% supply assurance.

A water resource investigation will need to be undertaken at the abstraction point to determine if the proposed dam will be sufficient for the 2050 demand if there is a need to raise dam wall by 6m.

9.2.2 Water Supply Infrastructure

9.2.2.1 Bulk conveyance and Storage

Raw water will be pumped, via two stage pumping, from the Ngwangwane River through a ø 300mm steel pipeline to the proposed 7 Mℓ/day WTP. The pumpstation power rating is proposed to be 12kW to deliver the demand of 6.73 Mℓ/day.

Potable water will be pumped from the WTP, via 2 stage pumping (371 kW), to the proposed 7 Mℓ Thonsini Command Reservoir (1 794 m) through a ø 300mm bulk rising main.

Water will then be distributed to storage reservoirs via secondary and tertiary distribution mains (pipe sizes ranging from ø 75 mm to ø 250 mm) to supply the Mfulumane, Ngwangwane, Kamlenze, Manzangene, Lusutu, New Village, Esikolweni and Kayeka areas. The northern areas of the Kukhulela Scheme will also be supplied via the Thonsini Command Reservoir.

9.2.2.2 Proposed Interventions

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Greater Kilimon WSIA and is illustrated within **Figure 9-5** followed by the schematic layout of the WSIA within **Figure 9-6**.

- ✓ The water resource assessment needs to be undertaken to determine if the source can yield the 2050 demand;
- ✓ The proposed WTP needs to be upgraded to 7 Mℓ/day to meet the 2050 demand for both the schemes;
- ✓ The existing rising mains should be upgraded to cater for the 2050 capacity;
- ✓ The existing secondary and tertiary bulk mains should be upgraded; and
- ✓ The existing secondary and tertiary storage should be upgraded.

Design details of all the infrastructure components are provided within **Annexure B**.

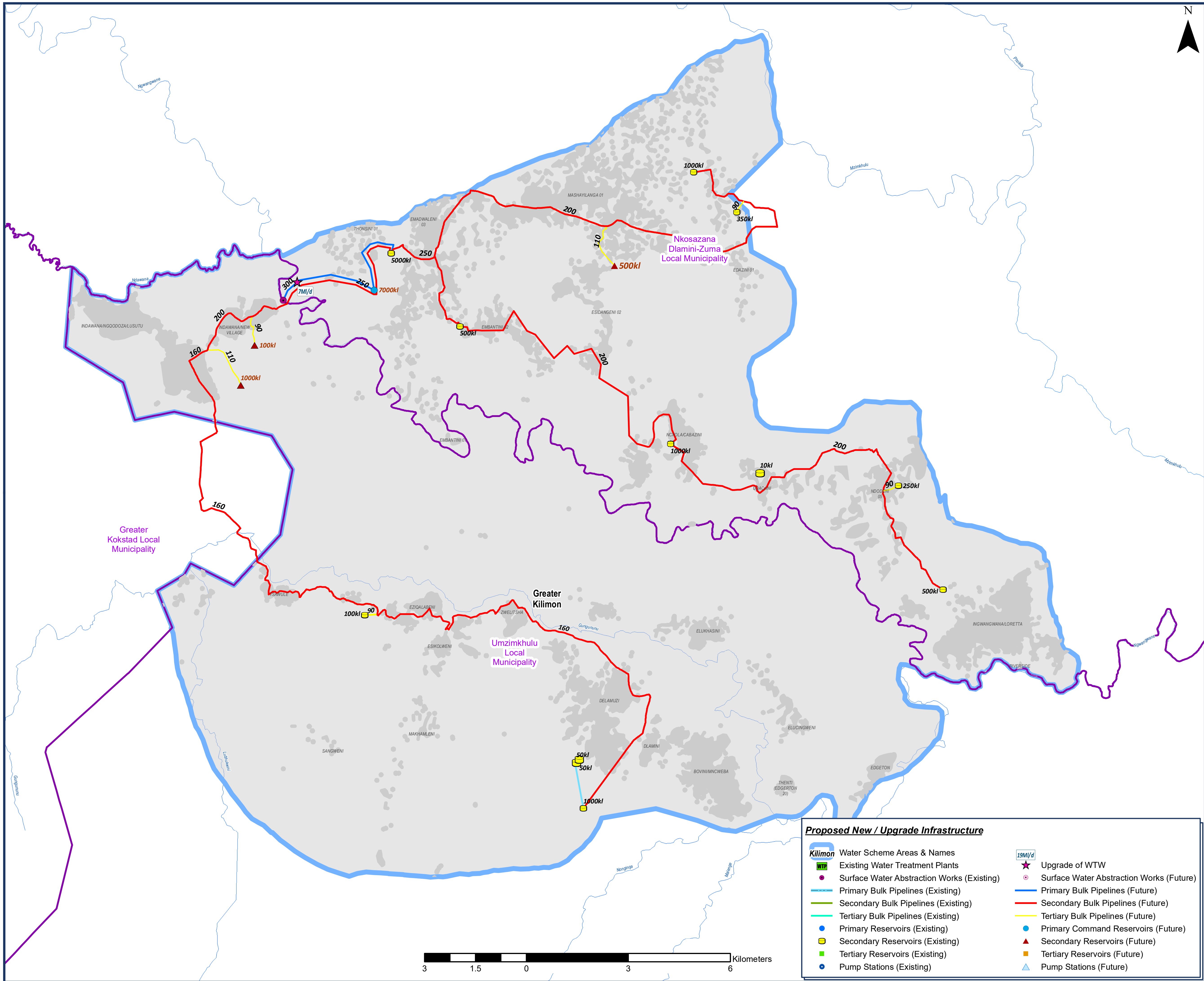
9.2.3 Financial Requirements

The bulk cost requirement for Greater Kilimon WSIA is summarised within **Table 9-4** below.

Table 9-4: Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (excl VAT)
Primary	R41 114 000.00	R4 111 400.00	R45 225 400.00
Secondary	R154 455 885.86	R15 445 588.59	R169 901 474.44
Tertiary	R65 511 728.49	R6 551 172.85	R72 062 901.34
Total	**R261 081 614.35**	**R26 108 161.44**	**R287 189 775.79**

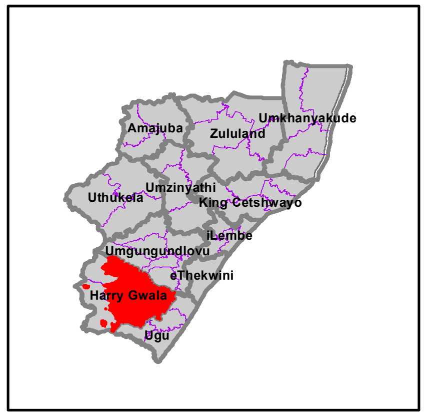
The total bulk cost requirement for the Greater Kilimon WSIA is R287 189 775.79 (excl VAT). The scheme development cost per household is approximately R31 100.


N
Nkosazana
Dlamini-Zuma
Local Municipality
Greater
Kokstad Local
Municipality
Umzimkhulu
Local
Municipality
Greater
Kilimon
7Ml/d
7000kl
5000kl
1000kl
350kl
500kl
100kl
10kl
250kl
50kl
Proposed New / Upgrade Infrastructure
Kilimon Water Scheme Areas & Names
Existing Water Treatment Plants
Surface Water Abstraction Works (Existing)
Primary Bulk Pipelines (Existing)
Secondary Bulk Pipelines (Existing)
Tertiary Bulk Pipelines (Existing)
Primary Reservoirs (Existing)
Secondary Reservoirs (Existing)
Tertiary Reservoirs (Existing)
Pump Stations (Existing)
19Ml/d
Upgrade of WTW
Surface Water Abstraction Works (Future)
Primary Bulk Pipelines (Future)
Secondary Bulk Pipelines (Future)
Tertiary Bulk Pipelines (Future)
Primary Command Reservoirs (Future)
Secondary Reservoirs (Future)
Tertiary Reservoirs (Future)
Pump Stations (Future)
3 1.5 0 3 6
Kilometers

Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

MUNICIPALITY:

HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

MARISWE

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

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Total Bulk Water Supply Interventions - HG002 Greater Kilimon
Harry Gwala District Municipality

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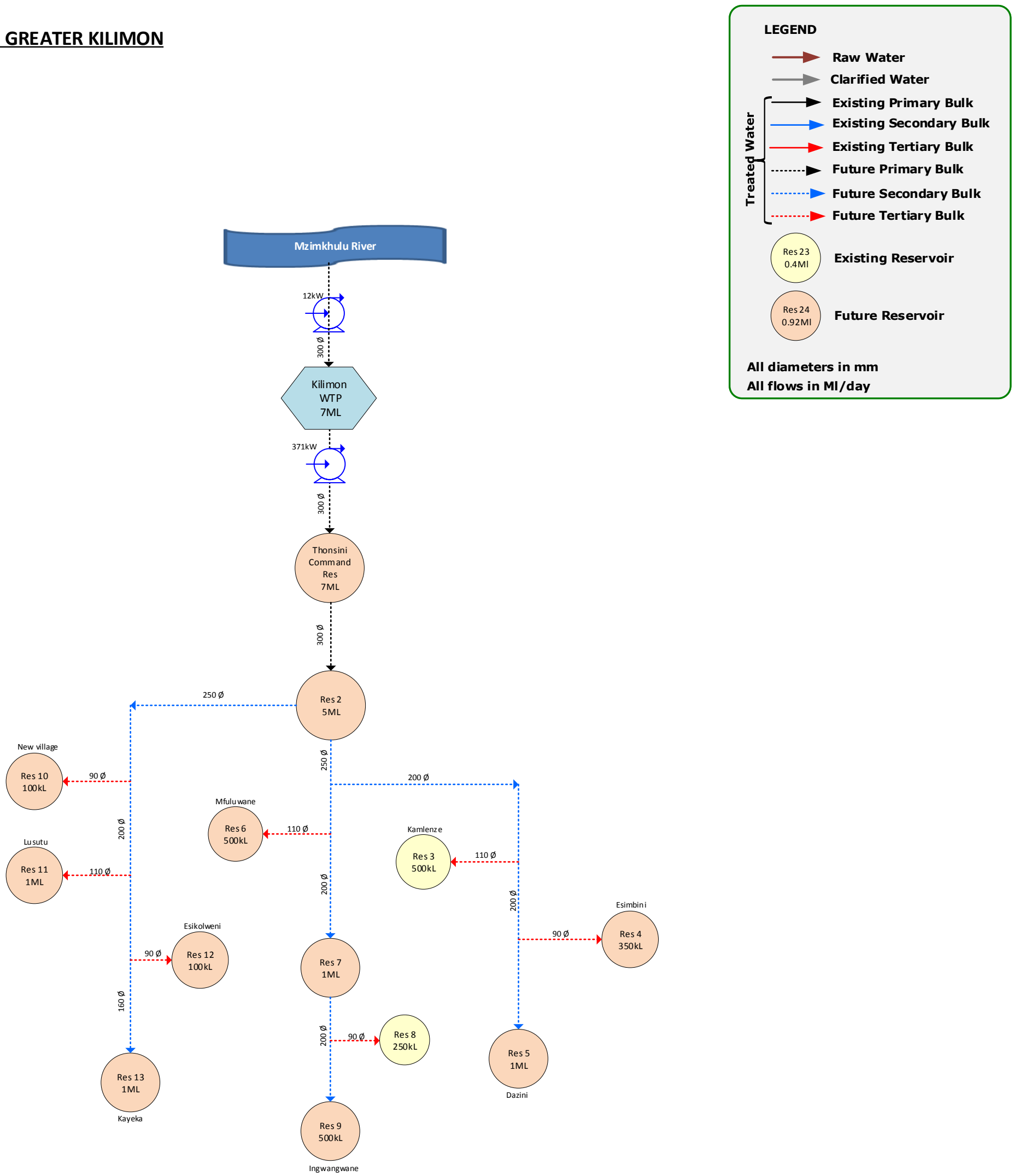
DC 43 Figure 9-5

Figure 9-6
HG002 WSIA: GREATER KILIMON



9.3 HG003 WSIA: NOKWEJA SCHEME

9.3.1 Demand Model Intervention

9.3.1.1 Water Demand

The water demand for the Nokweja Scheme was determined for 2020 and 2050 and included within **Table 9-5** below.

Table 9-5: Population and Water demand 2020 and 2050 for the Nokweja WSIA

Population	**Population 2020**	**Population 2050**
	10 451	13 370
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	1.7	2.3

9.3.1.2 Water Resource Consideration

The Nokweja Water Supply Scheme abstracts water from the Mzimkhulu River and is treated at a 1.8 Mℓ/day WTP. The WTP is planned to be upgraded to 10 Mℓ/day.

A water resource investigation will need to be undertaken at the abstraction point to determine if the run-off river abstraction is sufficient or if there is a need for an impoundment such as a weir or an off-channel dam.

9.3.2 Water Supply Infrastructure

9.3.2.1 Bulk conveyance and Storage

Raw water will be pumped from the Mzimkhulu River through a ø 350mm steel pipeline to the 10 Mℓ/day WTP. The pumpstation power rating is proposed to be 48kW to deliver the demand of 8 Mℓ/day (Nokweja Scheme including Greater Mhlabashane Scheme.

Potable water will be pumped from the WTP, via 2 stage pumping (307 kW), to the St. Aloi and Plain Hill Command Reservoirs (969 m and 1 018 m respectively) through a ø 350mm bulk rising main. The St. Aloi and Plain Hill reservoirs would both need to be upgraded to 8 Mℓ. The WTP will also feed the Icabazi reservoir (740m), via a ø 75mm rising main, that will need to be upgraded to 0.3 Mℓ through a ø 75mm uPVC pipeline.

Water will then be distributed to storage reservoirs (kwaNokweja and Ngongonini reservoirs) via secondary and tertiary distribution mains (ø 160 mm). The Plain Hill reservoir will extend supply to the Ntambana, Velabethuke, Ntshayamoya, Incalu and Bovini areas via gravity through a ø 160 mm secondary bulk pipeline.

The Plain Hill command reservoir will also supply the Greater Mhlabashane Scheme and is detailed further in Section 9.4.

9.3.2.2 Proposed Interventions

The following infrastructure upgrades will be required in order to adequately supply the Nokweja WSIA and is illustrated within **Figure 9-7** followed by the schematic layout of the WSIA within **Figure 9-8**.

- ✓ The water resource assessment needs to be undertaken to determine if the source can yield the 2050 demand;
- ✓ The proposed rising mains should be upgraded to cater for the 2050 capacity;
- ✓ The existing secondary and tertiary bulk mains should be upgraded; and
- ✓ The existing secondary and tertiary storage should be upgraded.

Design details of all the infrastructure components are provided within **Annexure B**.

9.3.3 Financial Requirements

The bulk cost requirement for Nokweja WSIA is summarised within **Table 9-6** below.

Table 9-6: Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (excl VAT)
Primary	R61 526 979.16	R6 152 698	R67 679 677
Secondary	R87 673 956.31	R8 767 396	R96 441 352
Tertiary	R7 896 604.72	R789 660	R8 686 265
Total	**R157 097 540**	**R15 709 754**	**R172 807 294**

The total bulk cost requirement for the Nokweja Scheme is R 172 807 294 (excl VAT). The scheme development cost per household is approximately R 51 700.

Kilometers
2 1 0 2 4

N

Harry Gwala

Umzimkhulu Local Municipality

Ubuhlebezwe Local Municipality

To Greater Mhlabashane

NOKWEJA WTP
WTP
10Ml/d

Nokweja WSS

HOPEWELL/CARISBROOK
IXOPO NU 058
UMZIMKULU FARMS
KWA-NOKWEJA/MHLWENI/PLAATHILL
CABAZI
UMGELO/VELABETHUKE/AMAZABEKO/MDIBANISO
SILVERBROOK FARM/NTAMBAMA
NTSHAYAMOYA
INCALU
BOVINI
MPHESHENI
NGONGONINI
MVUTSHINI
NKALOKAZI
UMGODI HIGHLATS/AJIMPIYAMANDLA/ETSHENTLENDLANA

120kl 300kl 75 500kl 350 300kl 50kl 8000kl 110 70kl 160 110 100kl 110 100kl 1000kl 8000kl 900kl 100kl 75 50kl 90 500kl 350 320kl 350 90 75 200kl 90 200kl 110kl 90 200kl 75 160 110kl 75 320kl 200kl 75 100kl 200kl

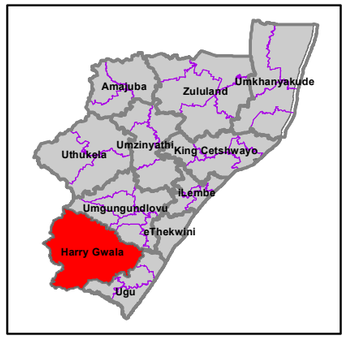
Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names (Dam)
- Rivers
- Settlements (Ncxola)
- Major Towns (Hilton)

Proposed New / Upgrade Infrastructure

- Water Scheme Areas & Names (Eston)
- Existing Water Treatment Plants (WTP)
- Surface Water Abstraction Works (Existing)
- Primary Bulk Pipelines (Existing)
- Secondary Bulk Pipelines (Existing)
- Tertiary Bulk Pipelines (Existing)
- Primary Reservoirs (Existing)
- Secondary Reservoirs (Existing)
- Tertiary Reservoirs (Existing)
- Upgrade of WTW (19Ml/d)
- Surface Water Abstraction Works (Future)
- Primary Bulk Pipelines (Future)
- Secondary Bulk Pipelines (Future)
- Tertiary Bulk Pipelines (Future)
- Primary Command Reservoirs (Future)
- Secondary Reservoirs (Future)
- Tertiary Reservoirs (Future)

LOCALITY:



CLIENT:
UMGENI WATER · AMANZI

MUNICIPALITY:
HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS
Project No.: 27814

MARISWE
JTN CONSULTING
Mariswe
PO Box 25549, Monument Park
Pretoria, 0105
Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE
Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

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Total Bulk Water Supply Interventions - HG003: Nokweja
Harry Gwala District Municipality

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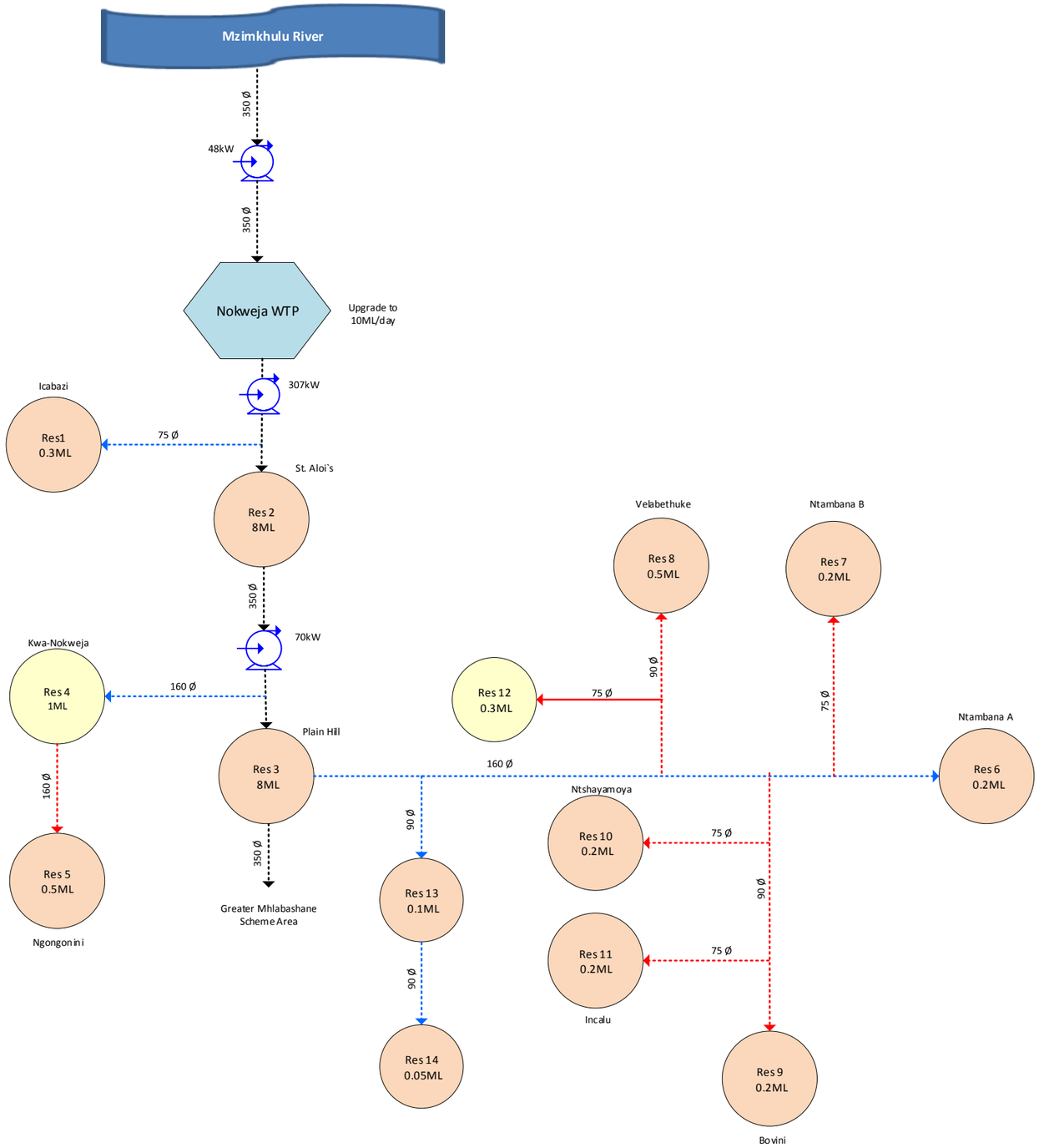
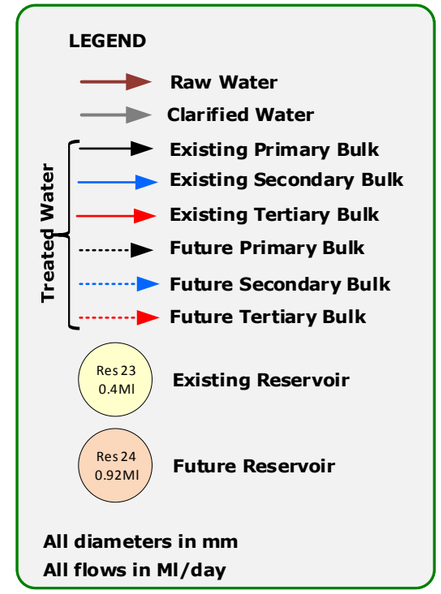
January 2021

MAP NO.:
DC 43 Figure 9-7

Figure 9-8
HG003 WSIA: Nokweja





9.4 HG004 WSIA: GREATER MHLABASHANE SCHEME

9.4.1 Demand Model Intervention

9.4.1.1 Water Demand

The water demand for the Greater Mhlabashane Scheme was determined for 2020 and 2050 and included within **Table 9-7** below.

Table 9-7: Population and Water demand 2020 and 2050 for the Greater Mhlabashane WSIA

Population	**Population 2020**	**Population 2050**
	22 909	29 309
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	3.90	5.25

9.4.1.2 Water Resource Consideration

The Greater Mhlabashane Water Supply Scheme is supplied via localized schemes (springs and boreholes) and is earmarked to be supplied via the 10Mℓ/day WTP that caters for the Nokweja Scheme.

A water resource investigation will need to be undertaken at the abstraction point to determine if the run-off river abstraction is sufficient or if there is a need for an impoundment such as a weir or an off-channel dam.

9.4.2 Water Supply Infrastructure

9.4.2.1 Bulk conveyance and Storage

As mentioned in Section 9.3, potable water from the Plain Hill Reservoir (1 018m) is proposed to supply the Greater Mhlabashane scheme area via a ø 300 mm rising main (power rating 25 kW). The rising main will supply the proposed command reservoir (1 045m) and will in turn distribute supply to the Mhlabatshane, Tsheleni, Etshenilenduna, Mgodi, Hlokozi, Highflats and Enhlangwini areas via secondary bulk mains ranging from ø 110 mm to ø 160 mm.

9.4.2.2 Proposed Interventions

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Greater Mhlabashane WSIA and is illustrated within **Figure 9-9** followed by the schematic layout of the WSIA within **Figure 9-10**.

- ✓ The water resource assessment needs to be undertaken to determine if the source can yield the 2050 demand;
- ✓ The proposed primary, secondary and tertiary bulk mains is required to cater for the 2050 capacity; and

✓ The proposed secondary storage upgrades are required.

Design details of all the infrastructure components are provided within **Annexure B**.

9.4.3 Financial Requirements

The bulk cost requirement for Greater Mhlabashane WSIA is summarised within **Table 9-8** below.

Table 9-8: Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (excl VAT)
Primary	R7 250 000.00	R725 000.00	R7 975 000.00
Secondary	R163 447 510.02	R16 344 751.00	R179 792 261.02
Tertiary	R27 159 491.97	R2 715 949.20	R29 875 441.16
Total	**R197 857 001.99**	**R19 785 700.20**	**R217 642 702.18**

The total bulk cost requirement for the Greater Mhlabashane Scheme is R 217 642 702.18 (excl VAT). The scheme development cost per household is approximately R 33 400.

Kilometers
3 1,5 0 3 6

N

Supplied from Mkhunya Regional Scheme

Umzimkhulu Local Municipality

Harry Gwala

Ubuhlebezwe Local Municipality

Greater Mhlabashane

Umzimkhulu Local Municipality

Ugu

Ugu

NOKWEJA WTP
NOKWEJA WTP
10Ml/d

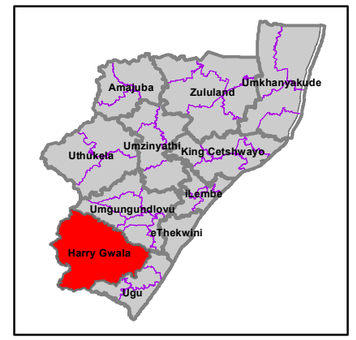
300kl
8000kl
8000kl
500kl
1000kl
2500kl
100kl
1kl
10kl
8,8kl
8,8kl
20kl
55kl
10kl
25kl
0kl
0,6kl
350kl
200kl
370kl
390kl
6000kl
390kl
1500kl
0kl
100kl
350kl
0kl
0kl
350kl

0
160
200
250
300
350

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names (Driel Dam)
- Rivers
- Settlements (Ncxola)
- Major Towns (Hilton)

LOCALITY:



CLIENT:

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HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

MARISWE
JTN CONSULTING

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - HG004: Greater Mhlabashane
Harry Gwala District Municipality

DATE COMPLETED:

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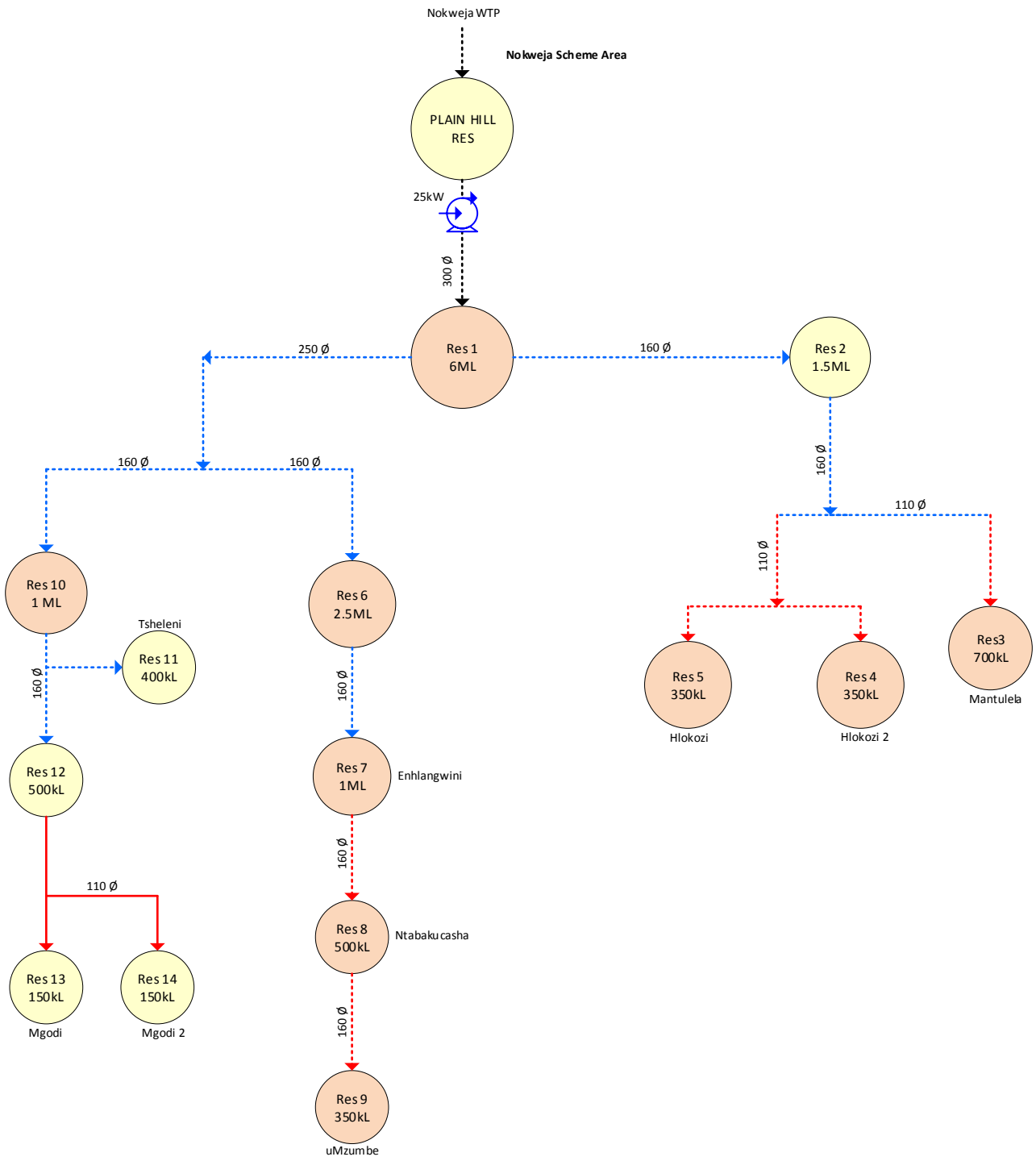
MAP NO.:

DC 43 Figure 9-9

Proposed New / Upgrade Infrastructure

- Eston — Water Scheme Areas & Names
- WTP — Existing Water Treatment Plants
- Surface Water Abstraction Works (Existing)
- Primary Bulk Pipelines (Existing)
- Secondary Bulk Pipelines (Existing)
- Tertiary Bulk Pipelines (Existing)
- Primary Reservoirs (Existing)
- Secondary Reservoirs (Existing)
- Tertiary Reservoirs (Existing)
- 19Ml/d — Upgrade of WTW
- Surface Water Abstraction Works (Future)
- Primary Bulk Pipelines (Future)
- Secondary Bulk Pipelines (Future)
- Tertiary Bulk Pipelines (Future)
- Primary Command Reservoirs (Future)
- Secondary Reservoirs (Future)
- Tertiary Reservoirs (Future)

Figure 9-10
HG004 WSIA: GREATER MHLABASHANE



LEGEND

- Raw Water
- Clarified Water
- Treated Water
  - Existing Primary Bulk
  - Existing Secondary Bulk
  - Existing Tertiary Bulk
  - Future Primary Bulk
  - Future Secondary Bulk
  - Future Tertiary Bulk
- Res 23 0.4Ml — Existing Reservoir
- Res 24 0.92Ml — Future Reservoir

All diameters in mm
All flows in Ml/day

9.5 HG005 WSIA: MKHUNYA SCHEME

9.5.1 Demand Model Intervention

9.5.1.1 Water Demand

The water demand for the Mkhunya Scheme was determined for 2020 and 2050 and included within **Table 9-9** below.

Table 9-9: Population and Water demand 2020 and 2050 for the Mkhunya WSIA

Population	**Population 2020**	**Population 2050**
	21 424	27 409
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	3.61	4.81

9.5.1.2 Water Resource Consideration

The Mkhunya Scheme abstracts water from the Mkhomazi River and is treated at the 1.5 Mℓ/day Esiqandwuleni WTP. The WTP is planned to be upgraded to 5 Mℓ/day and was being constructed until land issues halted progress.

A water resource investigation will need to be undertaken at the abstraction point to determine if the run-off river abstraction is sufficient or if there is a need for an impoundment such as a weir or an off-channel dam.

9.5.2 Water Supply Infrastructure

9.5.2.1 Bulk conveyance and Storage

Raw water will be pumped from the Mkhomazi River through a ø 250mm steel pipeline to the proposed 5 Mℓ/day WTP. The pumpstation power rating is proposed to be 12kW to deliver the demand of 4.81 Mℓ/day.

Potable water will be pumped from the WTP, via 3 stage pumping (493 kW), to the Kweletsheni Command Reservoir (814 m) through a ø 250mm bulk rising main. The command reservoir would need to be upgraded to 5 Mℓ.

Water will then be distributed to storage reservoirs (Mkhunya, Sangcwaba, Kumpotshosi, Nhlozane and Kozondi reservoirs) via secondary and tertiary distribution mains (pipe sizes ranging from ø 90 mm to ø 250 mm).

9.5.2.2 Proposed Interventions

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Mkhunya WSIA and is illustrated within **Figure 9-11** followed by the schematic layout of the WSIA within **Figure 9-12**.

- ✓ The water resource assessment needs to be undertaken to determine if the source can yield the 2050 demand;
- ✓ The proposed rising mains should be upgraded to cater for the 2050 capacity;
- ✓ The existing secondary and tertiary bulk mains should be upgraded; and
- ✓ The existing secondary and tertiary storage should be upgraded.

Design details of all the infrastructure components are provided within **Annexure B**.

9.5.3 Financial Requirements

The bulk cost requirement for Mkhunya WSIA is summarised within **Table 9-10** below.

Table 9-10: Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (excl VAT)
Primary	R35 397 000.00	R3 539 700.00	R38 936 700.00
Secondary	R70 580 171.19	R7 058 017.12	R77 638 188.31
Tertiary	R35 391 248.74	R3 539 124.87	R38 930 373.61
Total	**R141 368 419.93**	**R14 136 841.99**	**R155 505 261.93**

The total bulk cost requirement for the Mkhunya Scheme is R 155 505 261.93 (excl VAT). The scheme development cost per household is approximately R 22 700.

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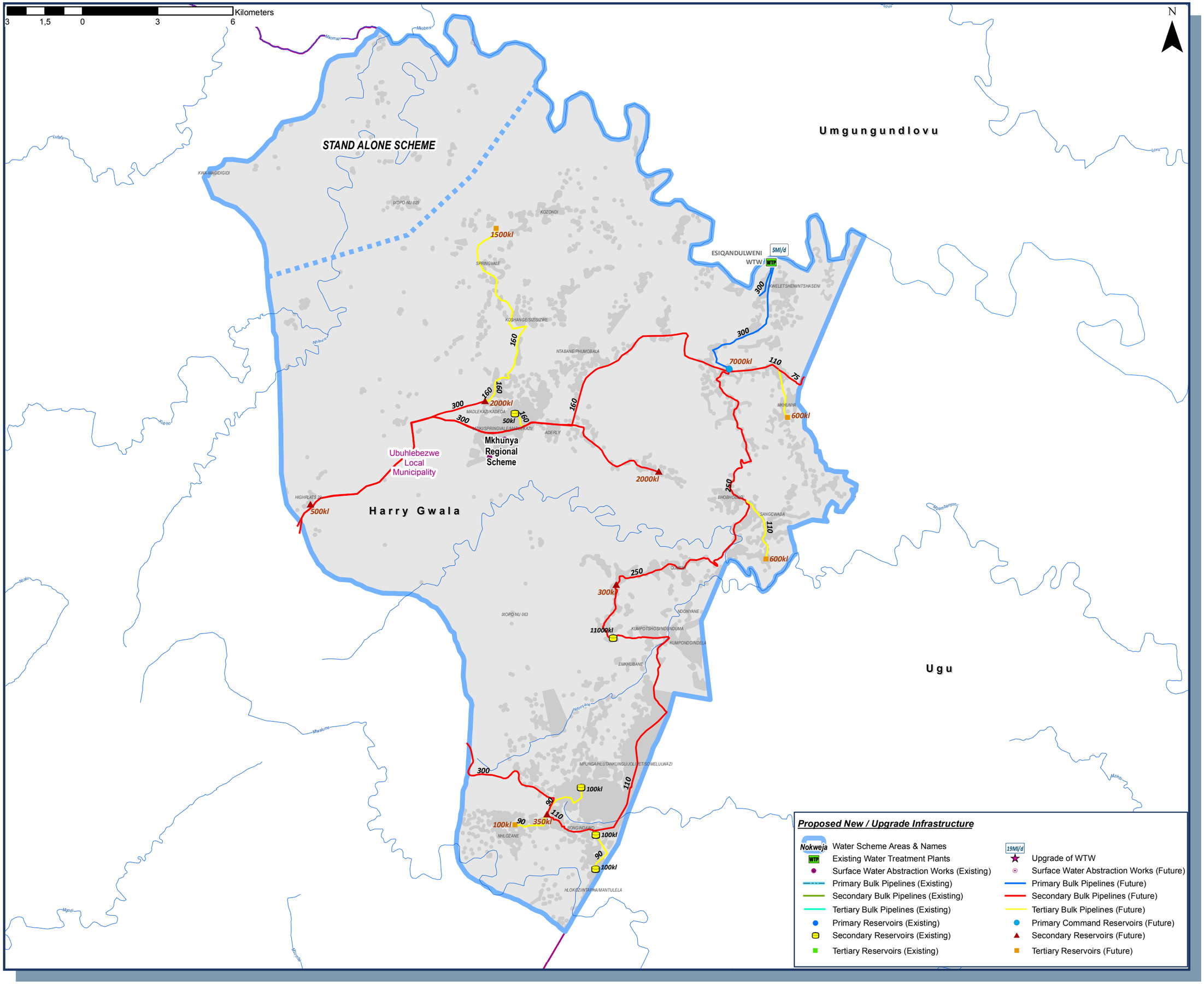
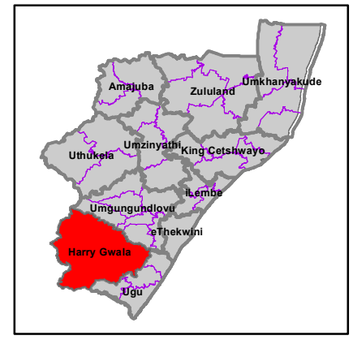


Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements (Ncxola)
- Major Towns (Hilton)

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

MUNICIPALITY:

HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

MARISWE

JTN CONSULTING

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - HG005: Mkhunya
Harry Gwala District Municipality

DATE COMPLETED:

January 2021

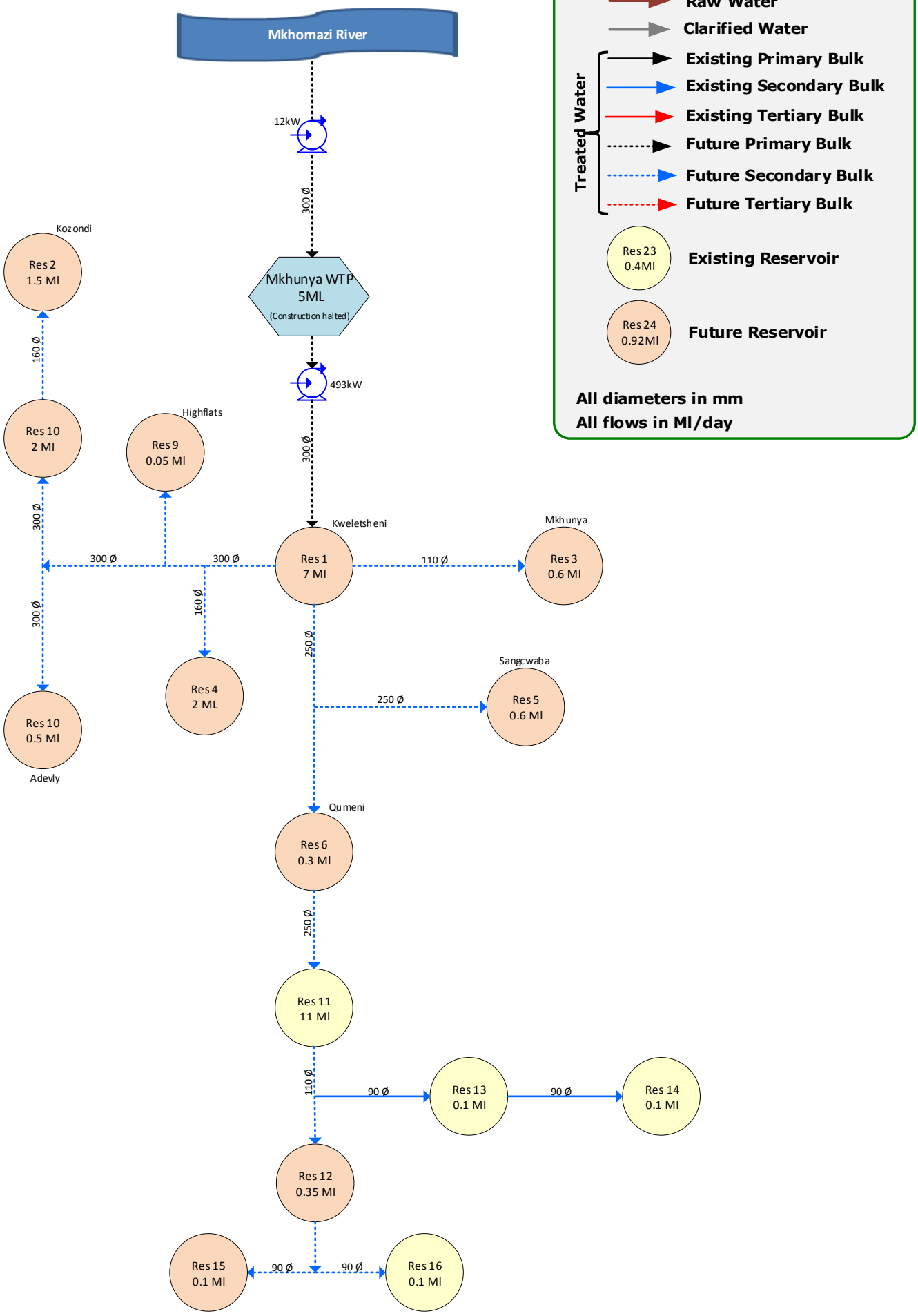
MAP NO.:

DC 43 Figure 9-11

Proposed New / Upgrade Infrastructure

- Nokweja — Water Scheme Areas & Names
- Existing Water Treatment Plants
- Surface Water Abstraction Works (Existing)
- Primary Bulk Pipelines (Existing)
- Secondary Bulk Pipelines (Existing)
- Tertiary Bulk Pipelines (Existing)
- Primary Reservoirs (Existing)
- Secondary Reservoirs (Existing)
- Tertiary Reservoirs (Existing)
- 19Ml/d — Upgrade of WTW
- Surface Water Abstraction Works (Future)
- Primary Bulk Pipelines (Future)
- Secondary Bulk Pipelines (Future)
- Tertiary Bulk Pipelines (Future)
- Primary Command Reservoirs (Future)
- Secondary Reservoirs (Future)
- Tertiary Reservoirs (Future)

Figure 9-12
HG005 WSIA: MKHUNYA



9.6 HG006 WSIA: CENTOCOW SCHEME

9.6.1 Demand Model Intervention

9.6.1.1 Water Demand

The water demand for the Centocow Scheme was determined for 2020 and 2050 and included within **Table 9-11** below.

Table 9-11: Population and Water demand 2020 and 2050 for the Centocow WSIA

Population	**Population 2020**	**Population 2050**
	13 147	16 820
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	2.3	3.2

9.6.1.2 Water Resource Consideration

The Centocow Scheme abstracts water from the Mzimkhulu River and is treated at the 0.77 Mℓ/day WTP. The WTP is planned to be upgraded to 2.5 Mℓ/day as part of the Centocow Water Supply Scheme upgrade. The Centocow Scheme also extends supply into the Kukhulela Scheme area.

A water resource investigation will need to be undertaken at the abstraction point to determine if the run-off river abstraction is sufficient or if there is a need for an impoundment such as a weir or an off-channel dam.

9.6.2 Water Supply Infrastructure

9.6.2.1 Bulk conveyance and Storage

Raw water will be pumped from the Mzimkhulu River through a ø 250mm steel pipeline to the proposed WTP that will have to be upgraded to 5 Mℓ/day. The pumpstation power rating is proposed to be 58kW to deliver the combined demand of 3.9 Mℓ/day (Centocow and Kukhulela).

Potable water will be pumped from the WTP (pumpstation power rating of 74 kW) to the upgraded 5 Mℓ Command Reservoir (1 165 m) through a ø 250mm bulk rising main.

Water will then be distributed to storage reservoirs via secondary and tertiary distribution mains (ranging from ø 90 mm to ø 200 mm). The Command reservoir will extend supply to the Sibonvini, Enhlane, Kwacwempe, Bhobhoyi and Newtonville areas via gravity.

The command reservoir will also supply the Kukhulela Scheme and is detailed further in Section 9.7.

9.6.2.2 Proposed Interventions

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Centocow WSIA and is illustrated within **Figure 9-13** followed by the schematic layout of the WSIA within **Figure 9-14**.

- ✓ The water resource assessment needs to be undertaken to determine if the source can yield the 2050 demand;
- ✓ The proposed WTP needs to be upgraded to5 Mℓ/day to meet the 2050 demand for both the schemes;
- ✓ The existing rising mains should be upgraded to cater for the 2050 capacity;
- ✓ The existing secondary and tertiary bulk mains should be upgraded; and
- ✓ The existing secondary and tertiary storage should be upgraded.

Design details of all the infrastructure components are provided within **Annexure B**.

9.6.3 Financial Requirements

The bulk cost requirement for Centocow WSIA is summarised within **Table 9-12** below.

Table 9-12: Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (excl VAT)
Primary	R33 405 000.00	R3 340 500.00	R36 745 500.00
Secondary	R3 000 000.00	R300 000.00	R3 300 000.00
Tertiary	R1 717 682.59	R171 768.26	R1 889 450.84
Total	**R38 122 682.59**	**R3 812 268.26**	**R41 934 950.84**

The total bulk cost requirement for the Centocow Scheme is R 41 934 950.84 (excl VAT). The scheme development cost per household is approximately R 10 000.

N

Kilometers
1 0,5 0 1 2

To Kukhulela

Kukhulela

160

0,77Ml/d

5Ml/d

ST APOLLINARIS/CENTOCOW WTP

250

MAKHOLWENI/ST APOLLINARIS/CENTOCOW

250kl

5000kl

MAKHOLWENI 04

150

100kl

110

50kl

KWACWEMPE/KWASHUSHA/ESIBOMVWINI/SIBONVINI/EHLANE

Nkosazana Dlamini-Zuma Local Municipality

50kl

110

160

130kl

Harry Gwala

Centocow

100kl

1500kl

150

100kl

100kl

350kl

90

350kl

110

100kl

90

100kl

100kl

90

KWASHUSHA/BHOBHOYI/NEWTONVILLE

INGWANGWANA/LORETTA

Umzimkhulu Local Municipality

CORINTH (KORINTE)/MKINTLANGA/PHONGOLO/MDENI

Mzimkhulu

Ingwangwana

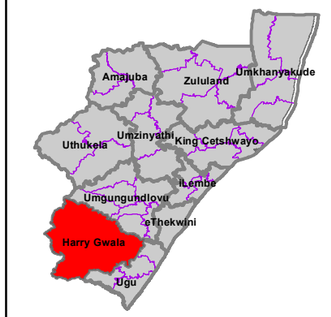
Proposed New / Upgrade Infrastructure

Centocow Water Scheme Areas & Names	19Ml/d Upgrade of WTW
WTP Existing Water Treatment Plants	Surface Water Abstraction Works (Future)
Surface Water Abstraction Works (Existing)	Primary Bulk Pipelines (Future)
Primary Bulk Pipelines (Existing)	Secondary Bulk Pipelines (Future)
Secondary Bulk Pipelines (Existing)	Tertiary Bulk Pipelines (Future)
Tertiary Bulk Pipelines (Existing)	Primary Command Reservoirs (Future)
Primary Reservoirs (Existing)	Secondary Reservoirs (Future)
Secondary Reservoirs (Existing)	Tertiary Reservoirs (Future)
Tertiary Reservoirs (Existing)	

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements (Ncxola)
- Major Towns (Hilton)

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

MUNICIPALITY:

HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

MARISWE

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - HG006: Centocow
Harry Gwala District Municipality

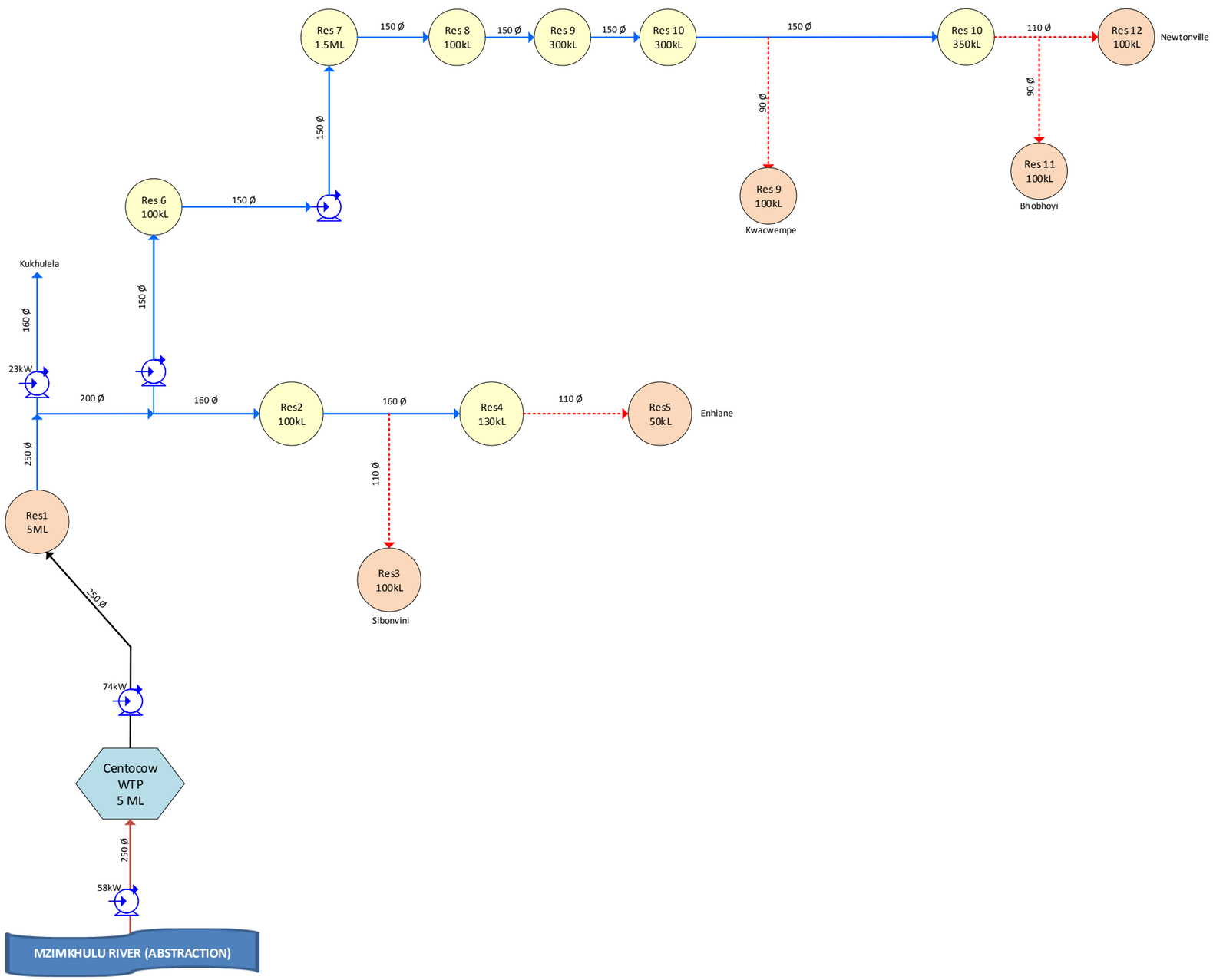
DATE COMPLETED:

January 2021

MAP NO.:

DC 43 Figure 9-13

Figure 9-14
HG006 WSIA: CENTOCOW SCHEME



LEGEND

- Raw Water
- Clarified Water
- Treated Water
  - Existing Primary Bulk
  - Existing Secondary Bulk
  - Existing Tertiary Bulk
  - Future Primary Bulk
  - Future Secondary Bulk
  - Future Tertiary Bulk
- Res 23 0.4Ml — Existing Reservoir
- Res 24 0.92Ml — Future Reservoir

All diameters in mm
All flows in Ml/day

9.7 HG007 WSIA: KUKHULELA SCHEME

9.7.1 Demand Model Intervention

9.7.1.1 Water Demand

The water demand for the Kukhulela Scheme was determined for 2020 and 2050 and included within **Table 9-13** below.

Table 9-13: Population and Water demand 2020 and 2050 for the Kukhulela WSIA

Population	**Population 2020**	**Population 2050**
	3 375	4 318
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	0.6	0.7

9.7.1.2 Water Resource Consideration

The Kukhulela Scheme is earmarked to be supplied via the Centocow Water Supply Scheme upgrade highlighted in Section 9.6. The Centocow WTP abstracts water from the Mzimhulu River and will be upgraded to 2.5 Mℓ/day.

A water resource investigation will need to be undertaken at the abstraction point to determine if the run-off river abstraction is sufficient or if there is a need for an impoundment such as a weir or an off-channel dam.

9.7.2 Water Supply Infrastructure

9.7.2.1 Bulk conveyance and Storage

As detailed in Section 9.6, the Centocow WTP will extend supply into the Kukhulela Scheme area. The WTP is proposed to be upgraded to 5 Mℓ/day in order to cater for the demands for both scheme areas.

The proposed 5 Mℓ Command reservoir, within the Centocow Scheme, will feed the proposed command reservoir within the Kukhulela Scheme Area (1 353 m), which is proposed to be upgraded to 2 Mℓ, via a ø 160mm rising main (pump rating of 23 kW). The command reservoir will supply the Ndodeni and Emnamaneni areas through secondary distribution pipelines ranging from ø 75 mm to ø 200 mm.

The Dazini and Mpumulwane areas will be supplied by the Thonsini Command reservoir within the Greater Kilimon Scheme Area. (Section 9.2)

The existing WTP on the Ngwangwane River that supplies the scheme is proposed to be upgraded to 1 Mℓ/day to augment the scheme. A 27 kW pumpstation along with a ø 110mm rising main is proposed for this augmentation.

9.7.2.2 Proposed Interventions

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Kukhulela WSIA and is illustrated within **Figure 9-15** followed by the schematic layout of the WSIA within **Figure 9-16**.

- ✓ The water resource assessment needs to be undertaken to determine if the source can yield the 2050 demand;
- ✓ The proposed Centocow WTP needs to be upgraded to 5 Mℓ/day to meet the 2050 demand for both the schemes;
- ✓ The proposed Kukhulela WTP needs to be upgraded to augment the scheme area;
- ✓ The proposed primary, secondary and tertiary bulk mains is required to cater for the 2050 capacity; and
- ✓ The existing secondary and tertiary storage should be upgraded.

Design details of all the infrastructure components are provided within **Annexure B**.

9.7.3 Financial Requirements

The bulk cost requirement for Kukhulela WSIA is summarised within **Table 9-14** below.

Table 9-14: Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (excl VAT)
Primary	R14 600 000.00	R1 460 000	R16 060 000
Secondary	R21 206 414.50	R2 120 641	R23 327 056
Tertiary	R5 107 549.12	R510 755	R5 618 304
Total	**R40 913 964**	**R4 091 396**	**R45 005 360**

The total bulk cost requirement for the Kukhulela Scheme is R 45 005 360 (excl VAT). The scheme development cost per household is approximately R 41 700.

N

Kilometers
1 0,5 0 1 2

Supplied by Greater Kilimon

MASHAYILANGA 01
EDAZINI 01
MPUMULWANE 01
MPUMULWANE 02
NGXALINGENWA 02
NDODENI 06

Nkosazana Dlamini-Zuma Local Municipality

Harry Gwala

Kukhulela

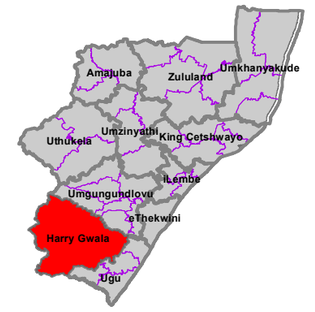
Centocow

1Ml/d
5Ml/d
2000kl
50kl
5kl
10kl
10kl
10kl
25kl
75
75
90
90
110
160

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

MUNICIPALITY:

HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

MARISWE

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - HG007: Kukhulela
Harry Gwala District Municipality

DATE COMPLETED:

January 2021

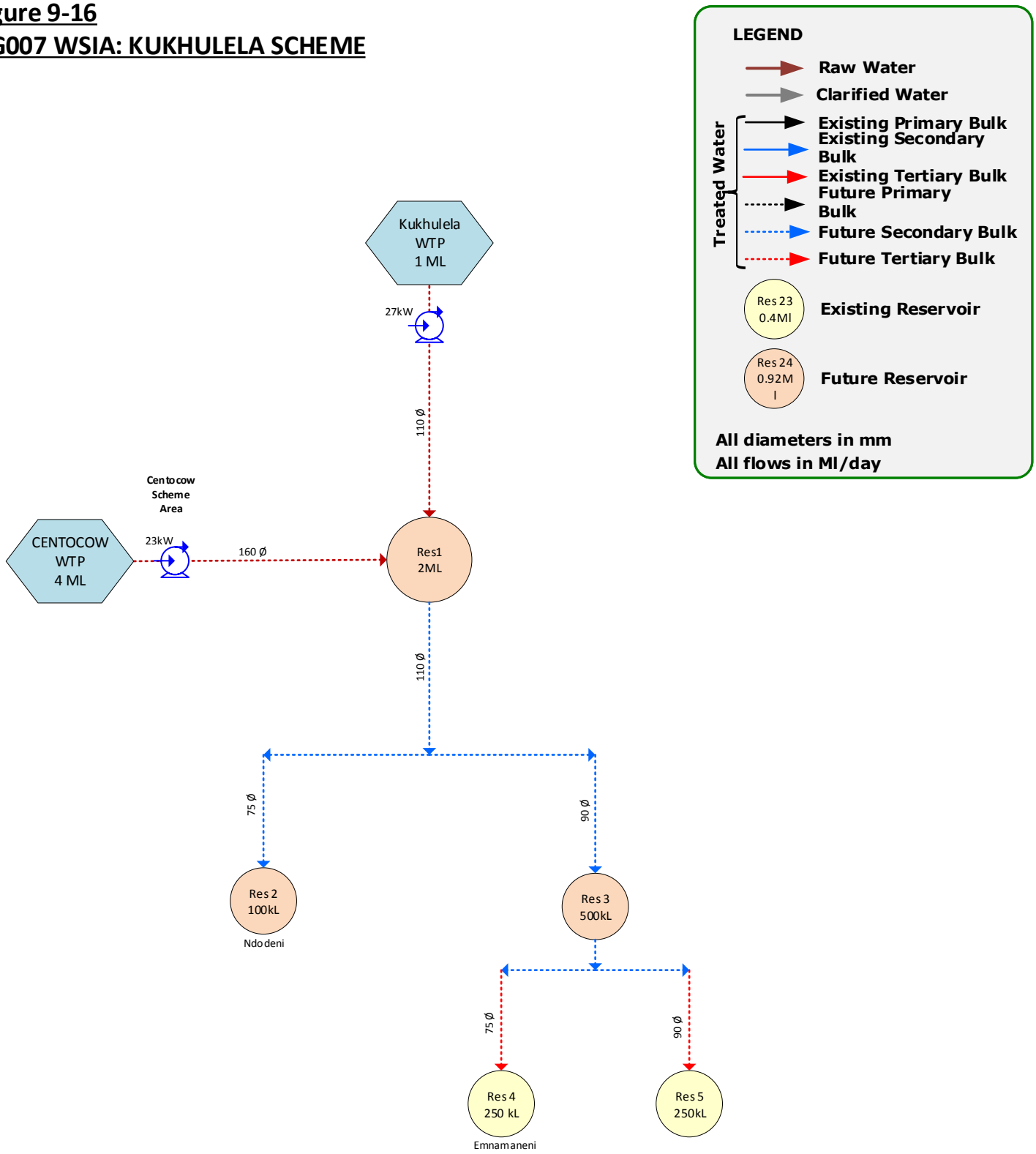
MAP NO.:

DC 43 Figure 9-15

Proposed New / Upgrade Infrastructure

- Eston — Water Scheme Areas & Names
- WTP — Existing Water Treatment Plants
- Surface Water Abstraction Works (Existing)
- Primary Bulk Pipelines (Existing)
- Secondary Bulk Pipelines (Existing)
- Tertiary Bulk Pipelines (Existing)
- Primary Reservoirs (Existing)
- Secondary Reservoirs (Existing)
- Tertiary Reservoirs (Existing)
- Pump Stations (Existing)
- 19Ml/d — Upgrade of WTW
- Surface Water Abstraction Works (Future)
- Primary Bulk Pipelines (Future)
- Secondary Bulk Pipelines (Future)
- Tertiary Bulk Pipelines (Future)
- Primary Command Reservoirs (Future)
- Secondary Reservoirs (Future)
- Tertiary Reservoirs (Future)
- Pump Stations (Future)

Figure 9-16
HG007 WSIA: KUKHULELA SCHEME



9.8 HG008 WSIA: UNDERBERG-HIMEVILLE SCHEME

9.8.1 Demand Model Intervention

9.8.1.1 Water Demand

The water demand for the Underberg-Himeville Scheme was determined for 2020 and 2050 and included within **Table 9-15** below.

Table 9-15: Population and Water demand 2020 and 2050 for the Underberg-Himeville WSIA

Population	**Population 2020**	**Population 2050**
	4 977	6 368
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	1.3	1.8

9.8.1.2 Water Resource Consideration

The Underberg-Himeville Scheme is supplied by a weir on the Mzimkhulu River via the Underberg WTP. The treatment plant has been upgraded from 3.6 Mℓ/day to a capacity of approximately 5 Mℓ/day.

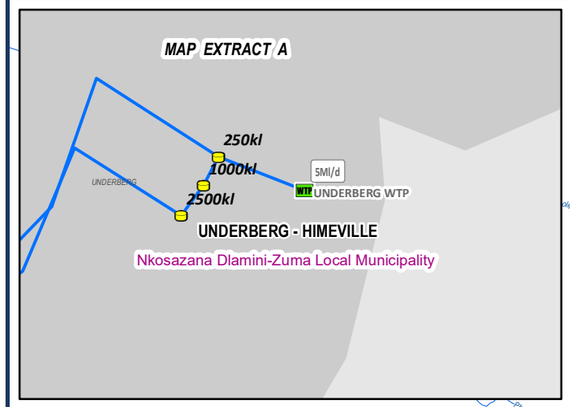
A water resource investigation will need to be undertaken at the abstraction point to determine if the run-off river abstraction is sufficient or if there is a need for an impoundment such as a weir or an off-channel dam.

9.8.2 Water Supply Infrastructure

9.8.2.1 Proposed Interventions

No upgrades or interventions are proposed for the Underberg-Himeville Scheme Area. As per Section 8.8 there are no gaps in supply as the scheme area is adequately covered for the 2050 demand horizon by existing and planned infrastructure.

The Underberg-Himeville WSIA is illustrated within **Figure 9-17** followed by the schematic layout of the WSIA within **Figure 9-18**.



N

10kl
90kl
35kl
0,2kl

UNDERBERG - HIMEVILLE

Nkosazana Dlamini-Zuma Local Municipality

200kl
Himeville

UNDERBERG - HIMEVILLE

Harry Gwala

200kl

SEE MAP EXTRACT A

250kl
1000kl
2500kl
5Ml/d

200kl
Underberg

Kilometers
3 1,5 0 3 6

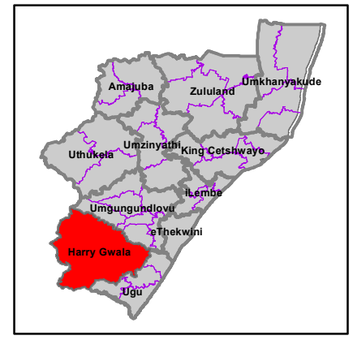
Proposed New / Upgrade Infrastructure

- Eston — Water Scheme Areas & Names
- WTP — Existing Water Treatment Plants
- Surface Water Abstraction Works (Existing)
- Primary Bulk Pipelines (Future)
- Primary Bulk Pipelines (Existing)
- Primary Command Reservoirs (Future)

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements (Ncxola)
- Major Towns (Hilton)

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

MUNICIPALITY:

HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

MARISWE
JTN CONSULTING

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - HG008: Underberg - Himeville
Harry Gwala District Municipality

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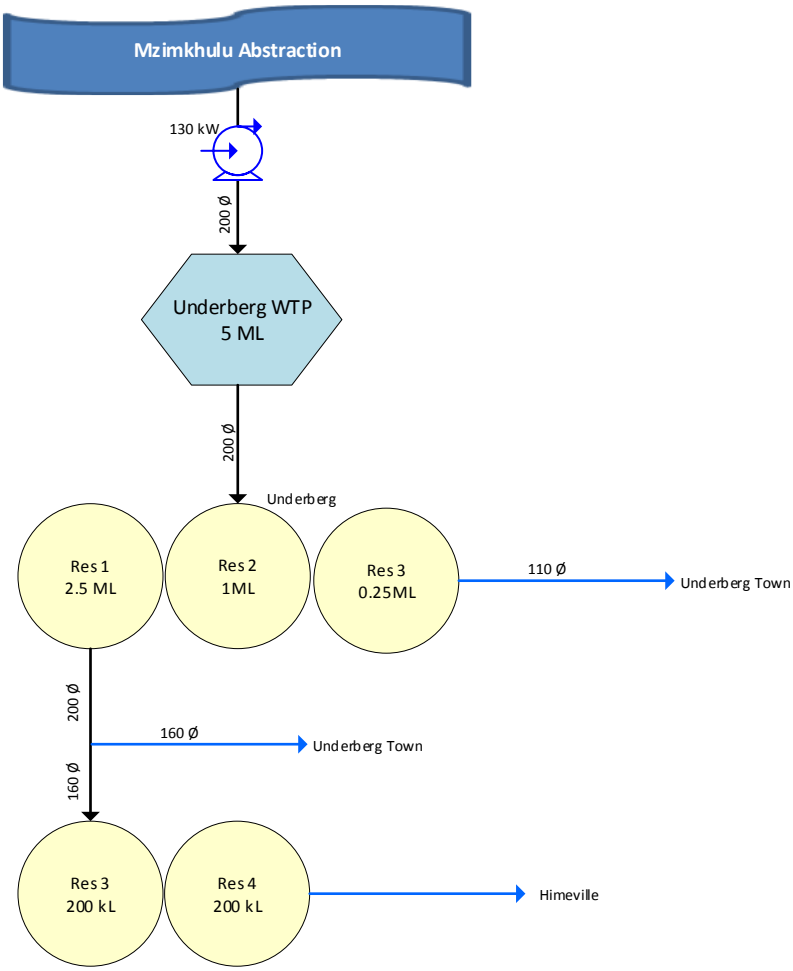
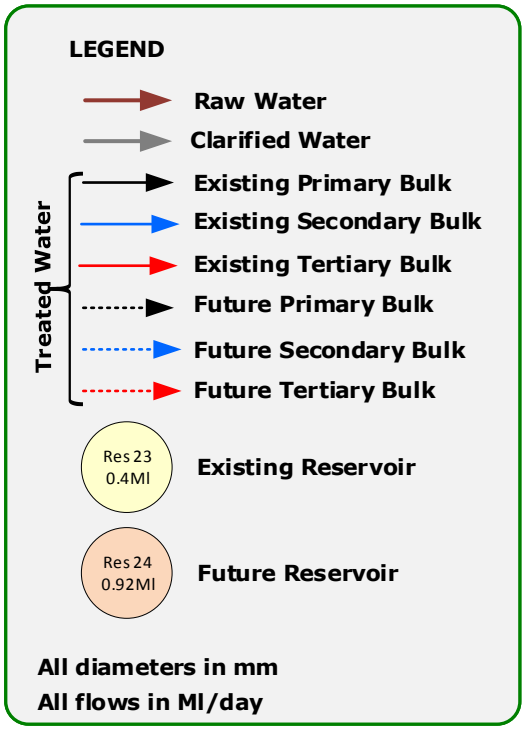
MAP NO.:

DC 43 Figure 9-17

Figure 9-18
HG008 WSIA: Underberg-Himeville





9.9 HG009 WSIA: GREATER SUMMERFIELD SCHEME

9.9.1 Demand Model Intervention

9.9.1.1 Water Demand

The water demand for the Greater Summerfield Scheme was determined for 2020 and 2050 and included within **Table 9-16** below.

Table 9-16: Population and Water demand 2020 and 2050 for the Greater Summerfield WSIA

Population	**Population 2020**	**Population 2050**
	23 249	29 745
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	3.8	5.1

9.9.1.2 Water Resource Consideration

The Greater Summerfield Scheme is planned to be supplied by a 3 Mℓ/day package plant that is currently under construction. The package plant will abstract raw water from the Mzimkhulu River at the Old Prison site.

A water resource investigation will need to be undertaken at the abstraction point to determine if the run-off river abstraction is sufficient or if there is a need for an impoundment such as a weir or an off-channel dam.

9.9.2 Water Supply Infrastructure

9.9.2.1 Bulk conveyance and Storage

Raw water will be pumped from the abstraction works through a ø 350mm pipeline to the proposed 6 Mℓ/day WTP. The pumpstation power rating is proposed to be 86 kW to deliver the demand of 5.1 Mℓ/day.

Potable water will then be pumped from the WTP (pumpstation power rating 222 kW) to the existing 1 Mℓ Command Reservoir (1 069 m) through a ø 350mm bulk rising main. The Command reservoir, once upgraded to supply the demand of 5.1 Mℓ/day, will feed the Tembeni, Takeni, Tafeni, Waschbank, Mutama, Hopewell, Highlands, Strangerest, Krom Hoek and the Gloveester areas via secondary bulk pipelines that range from ø 110 mm to ø 300 mm.

9.9.2.2 Proposed Interventions

The following infrastructure upgrades will be required in order to adequately supply the Greater Summerfield WSIA and is illustrated within **Figure 9-19** followed by the schematic layout of the WSIA within **Figure 9-20**.

- ✓ The water resource assessment needs to be undertaken to determine if the source can yield the 2050 demand;
- ✓ The proposed WTP needs to be upgraded to 6 Mℓ/day to meet the 2050 demand for the scheme;
- ✓ The existing rising mains should be upgraded to cater for the 2050 capacity;
- ✓ The existing secondary and tertiary bulk mains should be upgraded; and
- ✓ The existing secondary and tertiary storage should be upgraded.

Design details of all the infrastructure components are provided within **Annexure B**.

9.9.3 Financial Requirements

The bulk cost requirement for Greater Summerfield WSIA is summarised within **Table 9-17** below.

Table 9-17: Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (excl VAT)
Primary	R35 742 000.00	R3 574 200.00	R39 316 200.00
Secondary	R94 244 652.83	R9 424 465.28	R103 669 118.11
Tertiary	R30 025 662.98	R3 002 566.30	R33 028 229.27
Total	**R160 012 315.81**	**R16 001 231.58**	**R176 013 547.39**

The total bulk cost requirement for the Greater Summerfield Scheme is R 176 013 547.39 (excl VAT). The scheme development cost per household is approximately R 25 900.

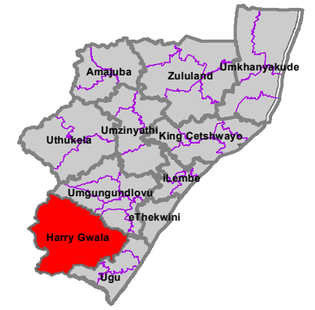
N

Kilometers
2 1 0 2 4

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

MUNICIPALITY:

HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

MARISWE

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - HG009: Greater Summerfield
Harry Gwala District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 43 Figure 9-19

Proposed New / Upgrade Infrastructure

- Eston — Water Scheme Areas & Names
- WTP — Existing Water Treatment Plants
- Surface Water Abstraction Works (Existing)
- Primary Bulk Pipelines (Existing)
- Secondary Bulk Pipelines (Existing)
- Tertiary Bulk Pipelines (Existing)
- Primary Reservoirs (Existing)
- Secondary Reservoirs (Existing)
- Tertiary Reservoirs (Existing)
- Pump Stations (Existing)
- 19Ml/d — Upgrade of WTW
- Surface Water Abstraction Works (Future)
- Primary Bulk Pipelines (Future)
- Secondary Bulk Pipelines (Future)
- Tertiary Bulk Pipelines (Future)
- Primary Command Reservoirs (Future)
- Secondary Reservoirs (Future)
- Tertiary Reservoirs (Future)
- Pump Stations (Future)

Harry Gwala

Umzimkhulu Local Municipality

Ubuhlebezwe Local Municipality

Ugu

GREATER SUMMERFIELD

GREATER SUMMERFIELD WTP

5,1Ml/d

5100kl

500kl

200kl

400kl

800kl

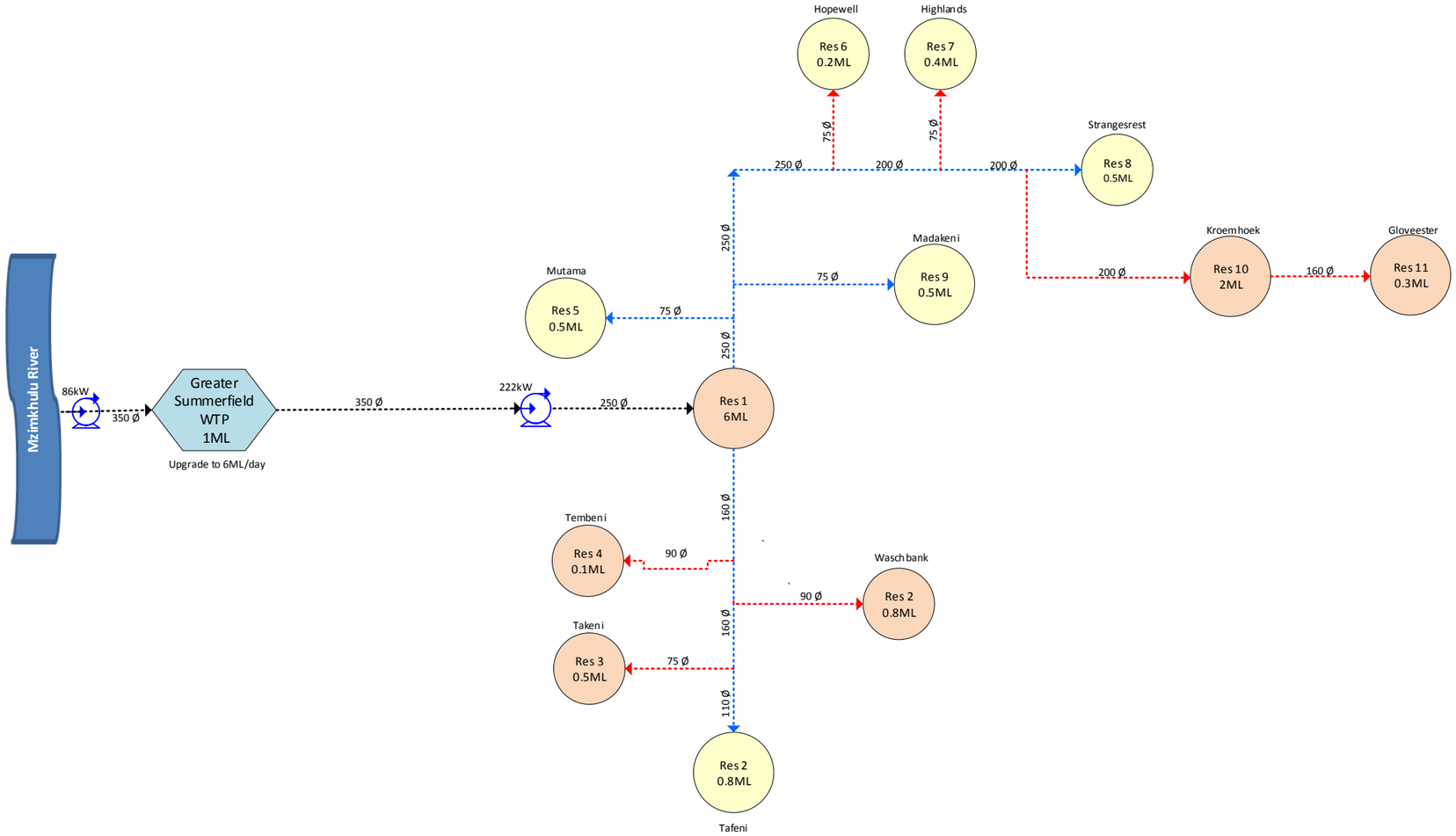
100kl

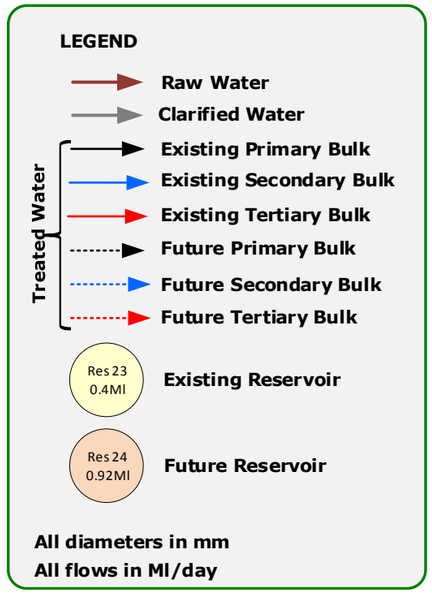
2000kl

300kl

75 90 110 160 200 250

Figure 9-20
HG009 WSIA: Greater Summerfield





9.10 HG010 WSIA: ST. BARNABAS-CHABANE SCHEME

9.10.1 Demand Model Intervention

9.10.1.1 Water Demand

The water demand for the St. Barnabas-Chabane Scheme was determined for 2020 and 2050 and included within **Table 9-18** below.

Table 9-18: Population and Water demand 2020 and 2050 for the St. Barnabas-Chabane WSIA

Population	**Population 2020**	**Population 2050**
	11 346	14 518
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	1.94	2.7

9.10.1.2 Water Resource Consideration

A project is planned to supply the St. Barnabas-Chabane Scheme via a 3 Mℓ/day WTP that will abstract water from the Chabane River.

A water resource investigation will need to be undertaken at the abstraction point to determine if the run-off river abstraction is sufficient or if there is a need for an impoundment such as a weir or an off-channel dam.

9.10.2 Water Supply Infrastructure

9.10.2.1 Bulk conveyance and Storage

Raw water will be pumped from the abstraction works through a ø 200mm pipeline to the proposed 3 Mℓ/day WTP. The pumpstation power rating is proposed to be 46 kW to deliver the demand of 2.7 Mℓ/day.

Potable water will then be pumped, via three stage pumping, from the WTP (pumpstation power rating 261 kW) to the proposed 3 Mℓ Command Reservoir (1 619 m) through a ø 200mm bulk rising main. The Command reservoir will feed the Mountain Home, Nolangeni, Lusizini, Emvubukazi, Marhwaqa, Gudlintaba, Nazareth, Nongidi, Maduna, Zadungeni, Dryhoek and Myembe areas via secondary bulk pipelines that range from ø 75 mm and ø 160 mm.

9.10.2.2 Proposed Interventions

The following infrastructure upgrades and augmentation will be required in order to adequately supply the St. Barnabas-Chabane WSIA and is illustrated within **Figure 9-21** followed by the schematic layout of the WSIA within **Figure 9-22**.

- ✓ The water resource assessment needs to be undertaken to determine if the source can yield the 2050 demand;
- ✓ The existing rising mains should be upgraded to cater for the 2050 capacity;
- ✓ The existing secondary and tertiary bulk mains should be upgraded; and
- ✓ The existing secondary and tertiary storage should be upgraded.

Design details of all the infrastructure components are provided within **Annexure B**.

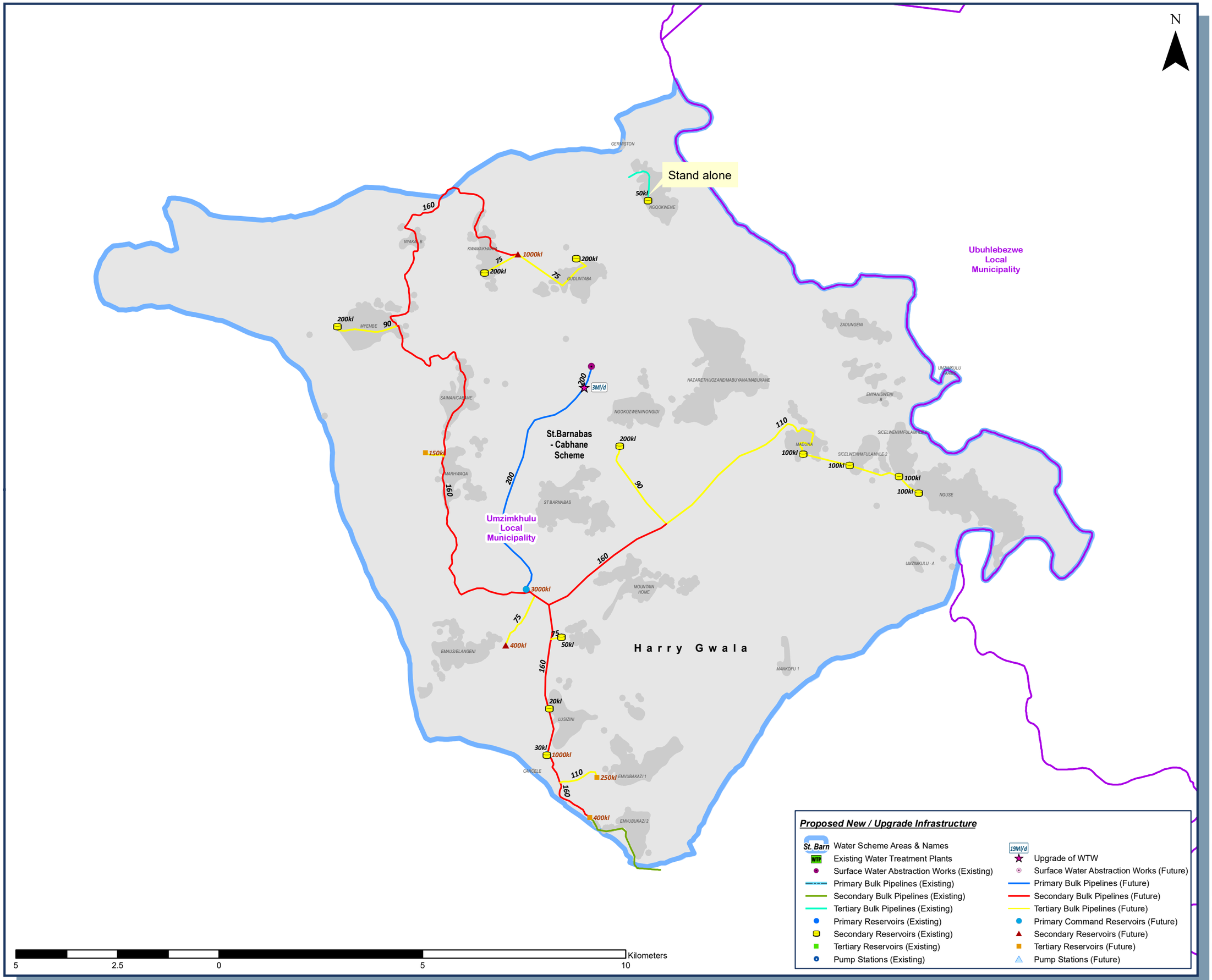
9.10.3 Financial Requirements

The bulk cost requirement for St. Barnabas-Chabane WSIA is summarised within **Table 9-19** below.

Table 9-19: Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (excl VAT)
Primary	R26 339 000.00	R2 633 900.00	R28 972 900.00
Secondary	R64 337 541.35	R6 433 754.14	R70 771 295.49
Tertiary	R23 888 025.87	R2 388 802.59	R26 276 828.46
Total	**R114 564 567.22**	**R11 456 456.72**	**R126 021 023.94**

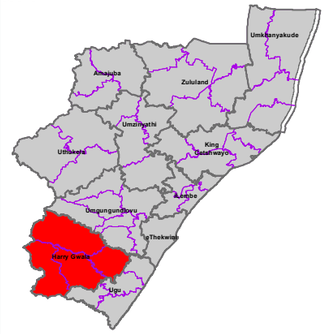
The total bulk cost requirement for the St. Barnabas-Chabane Scheme is R 126 021 023.94 (excl VAT). The scheme development cost per household is approximately R 33 400.



Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements & Settlement Names
- Major Towns

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS: Project No.: 27814

MARISWE

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: + 27 (0) 12 424 9700
Fax: + 27 (0) 12 460 4071
Email: pretoria@mariswe.com

JTN CONSULTING

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions- HG010: St. Barnabas Harry Gwala District Municipality

DATE COMPLETED:

January 2021

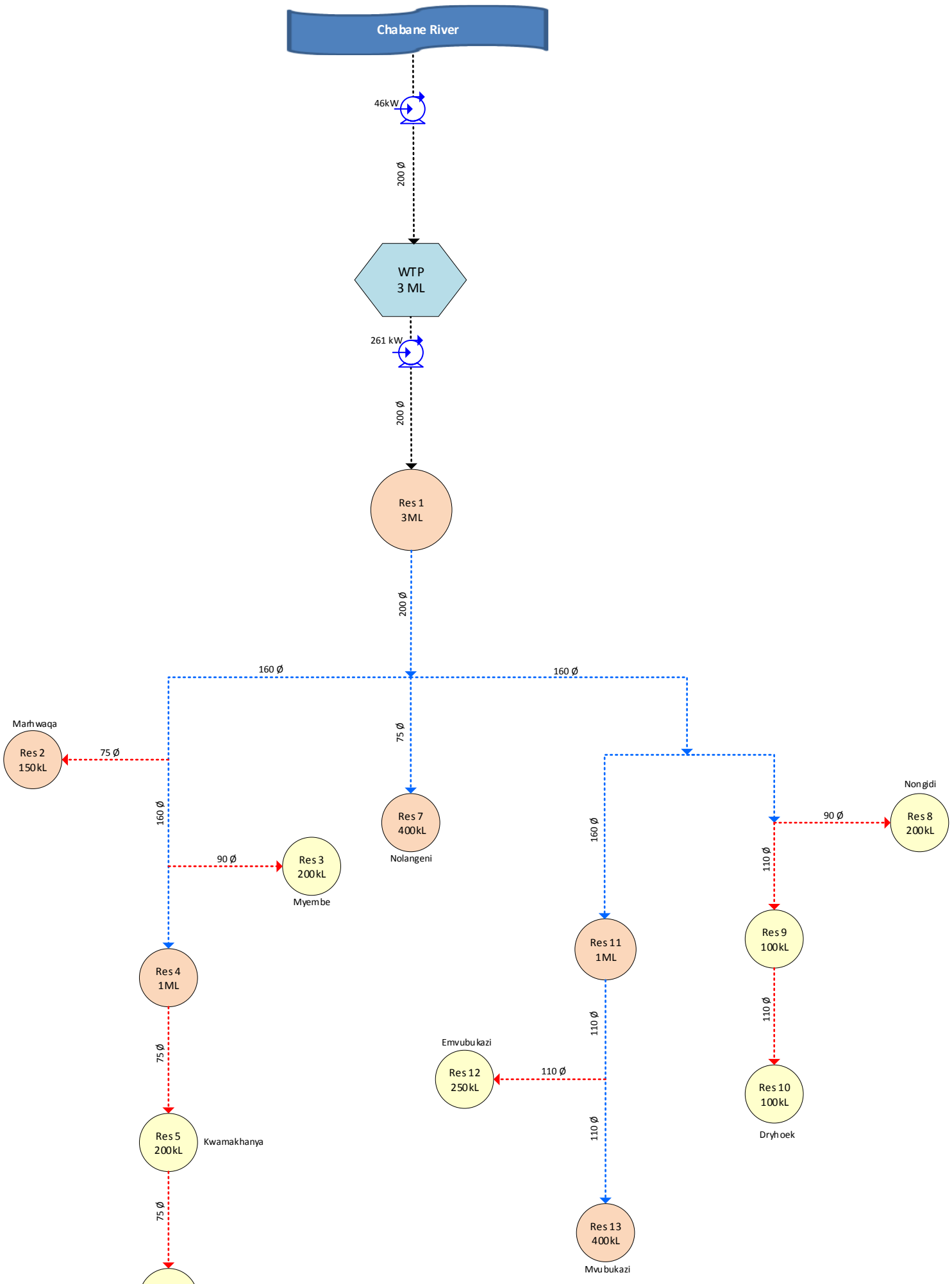
MAP NO.:

DC43: Figure 9-21

Proposed New / Upgrade Infrastructure

- St. Barn — Water Scheme Areas & Names
- WTP — Existing Water Treatment Plants
- Surface Water Abstraction Works (Existing)
- Primary Bulk Pipelines (Existing)
- Secondary Bulk Pipelines (Existing)
- Tertiary Bulk Pipelines (Existing)
- Primary Reservoirs (Existing)
- Secondary Reservoirs (Existing)
- Tertiary Reservoirs (Existing)
- Pump Stations (Existing)
- 19Ml/d — Upgrade of WTW
- Surface Water Abstraction Works (Future)
- Primary Bulk Pipelines (Future)
- Secondary Bulk Pipelines (Future)
- Tertiary Bulk Pipelines (Future)
- Primary Command Reservoirs (Future)
- Secondary Reservoirs (Future)
- Tertiary Reservoirs (Future)
- Pump Stations (Future)

Figure 9-22
HG010 WSIA: ST. BARNABAS-CHABANE



9.11 HG011 WSIA: GREATER NJUNGA SCHEME

9.11.1 Demand Model Intervention

9.11.1.1 Water Demand

The water demand for the Greater Njunga Scheme was determined for 2020 and 2050 and included within **Table 9-20** below.

Table 9-20: Population and Water demand 2020 and 2050 for the Greater Njunga WSIA

Population	**Population 2020**	**Population 2050**
	22 237	28 449
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	3.9	5.15

9.11.1.2 Water Resource Consideration

The Greater Njunga Water Supply Project plans to supply the Greater Njunga Scheme via a 3 Mℓ/day WTP that will abstract water upstream of the Little Ibisi River.

A water resource investigation will need to be undertaken at the abstraction point to determine if the run-off river abstraction is sufficient or if there is a need for an impoundment such as a weir or an off-channel dam.

9.11.2 Water Supply Infrastructure

9.11.2.1 Bulk conveyance and Storage

Raw water will be pumped from the abstraction works through a ø 250mm pipeline to the proposed 3 Mℓ/day WTP site that will need to be upgraded to 6 Mℓ/day to deliver the demand of 5.15 Mℓ/day. The pumpstation power rating is proposed to be 4 kW.

Potable water will then be pumped from the WTP (pumpstation power rating 251 kW) to the proposed 6 Mℓ Command Reservoir (1 409 m) through a ø 250mm bulk rising main. The Command reservoir will feed the Njunga, Kwapile, Kromdraai, Mmisa, Pholanyoni, Balbel, Ncambele, Manqarholweni, Gaybrook, Sikhulu, Mpindweni, Nkampini, Amaroma, Madlathu, Mthwane, Kwanongodi, Paninkhukhu, Dikidiki, Ngunjini, Rockymount, Mpur, KwaSenti and Nonjoni/Ndzombane via secondary bulk pipelines that range from ø 50 mm and ø 250 mm.

9.11.2.2 Proposed Interventions

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Greater Njunga WSIA and is illustrated within **Figure 9-23** followed by the schematic layout of the WSIA within **Figure 9-24**.

- ✓ The water resource assessment needs to be undertaken to determine if the source can yield the 2050 demand;
- ✓ The proposed WTP needs to be upgraded to 6 Mℓ/day to meet the 2050 demand for both the schemes;
- ✓ The existing rising mains should be upgraded to cater for the 2050 capacity;
- ✓ The existing secondary and tertiary bulk mains should be upgraded; and
- ✓ The existing secondary and tertiary storage should be upgraded.

Design details of all the infrastructure components are provided within **Annexure B**.

9.11.3 Financial Requirements

The bulk cost requirement for Greater Njunga WSIA is summarised within **Table 9-21** below.

Table 9-21: Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (excl VAT)
Primary	R0.00	R0.00	R0.00
Secondary	R5 194 693.35	R519 469.34	R5 714 162.69
Tertiary	R0.00	R0.00	R0.00
Total	**R5 194 693.35**	**R519 469.34**	**R5 714 162.69**

The total bulk cost requirement for the Greater Njunga Scheme is R 5 714 162.69 (excl VAT). The scheme development cost per household is approximately R 800.

N

Kilometers
1 0.5 0 1 2

Greater Kokstad Local Municipality

Umzimkhulu Local Municipality

Greater Njunga

Harry Gwala

KWANJUNGA WTP

3Ml/d

Singisi Dam

Elandskuil Dam

Kokstad

Bhongweni

SMEZEWOOD (LOURDES SETTLEMENT)
SINGISI
DRESSINI
MPUR
TIGERHOEK -TAKO
TIGERHOEK/EGUNJINI
MAROMENI
DEKEDEKINI
NIEWJAARSFONTEIN
ORIEFONTEIN
NZOMBANE - B
PHOLANYONI
GOXE
NGQOKOZWENI/MPENKULU/DLANGAMANDLA
SENTI
ROCKY MOUNT
FOURTEENDRIEFONTEIN
NJUNGA/GLENGARRY
BALBEL
NOJUKELA/MNCEBA
JUTA
NKAMPINI - A
AMAROMA
SAWMILL/NCAMBELE
SIKHULU
MOHOKWENI
GCWENTSA/NTLANGWINI
BONTRAND
MMUSA
KROMDRAAI
MANQORHOWENI/WEEFONTEIN
RIESDALE
MTWANA
KWANONGIDI
PAMPINKUKHOMA/MKALA
MPOLA
MOUNT CURRIE NU 299

70kl 63 700kl 63 60kl 170kl 110 75 50kl 63 50kl
140 50 50 90 100kl 60kl 63 75 100kl 100kl
250 250 63 180kl 6000kl
63 50kl 250 50 25kl 30kl 180 50 170kl
75 20kl 50 30kl 50 90 900kl
150kl 2200kl 110 40kl
50kl 75 5kl 75 75 900kl 160 50 120kl 75 150kl 75 50kl

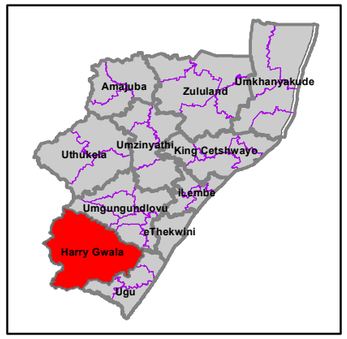
Proposed New / Upgrade Infrastructure

Njunga Water Scheme Areas & Names	19Ml/d Upgrade of WTW
WTP Existing Water Treatment Plants	Surface Water Abstraction Works (Future)
Surface Water Abstraction Works (Existing)	Primary Bulk Pipelines (Future)
Primary Bulk Pipelines (Existing)	Secondary Bulk Pipelines (Future)
Secondary Bulk Pipelines (Existing)	Tertiary Bulk Pipelines (Future)
Tertiary Bulk Pipelines (Existing)	Primary Command Reservoirs (Future)
Primary Reservoirs (Existing)	Secondary Reservoirs (Future)
Secondary Reservoirs (Existing)	Tertiary Reservoirs (Future)
Tertiary Reservoirs (Existing)	Pump Stations (Future)
Pump Stations (Existing)	

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements (Ncxola)
- Major Towns (Ixopo)

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

MUNICIPALITY:

HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS Project No.: 27814

MARISWE

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

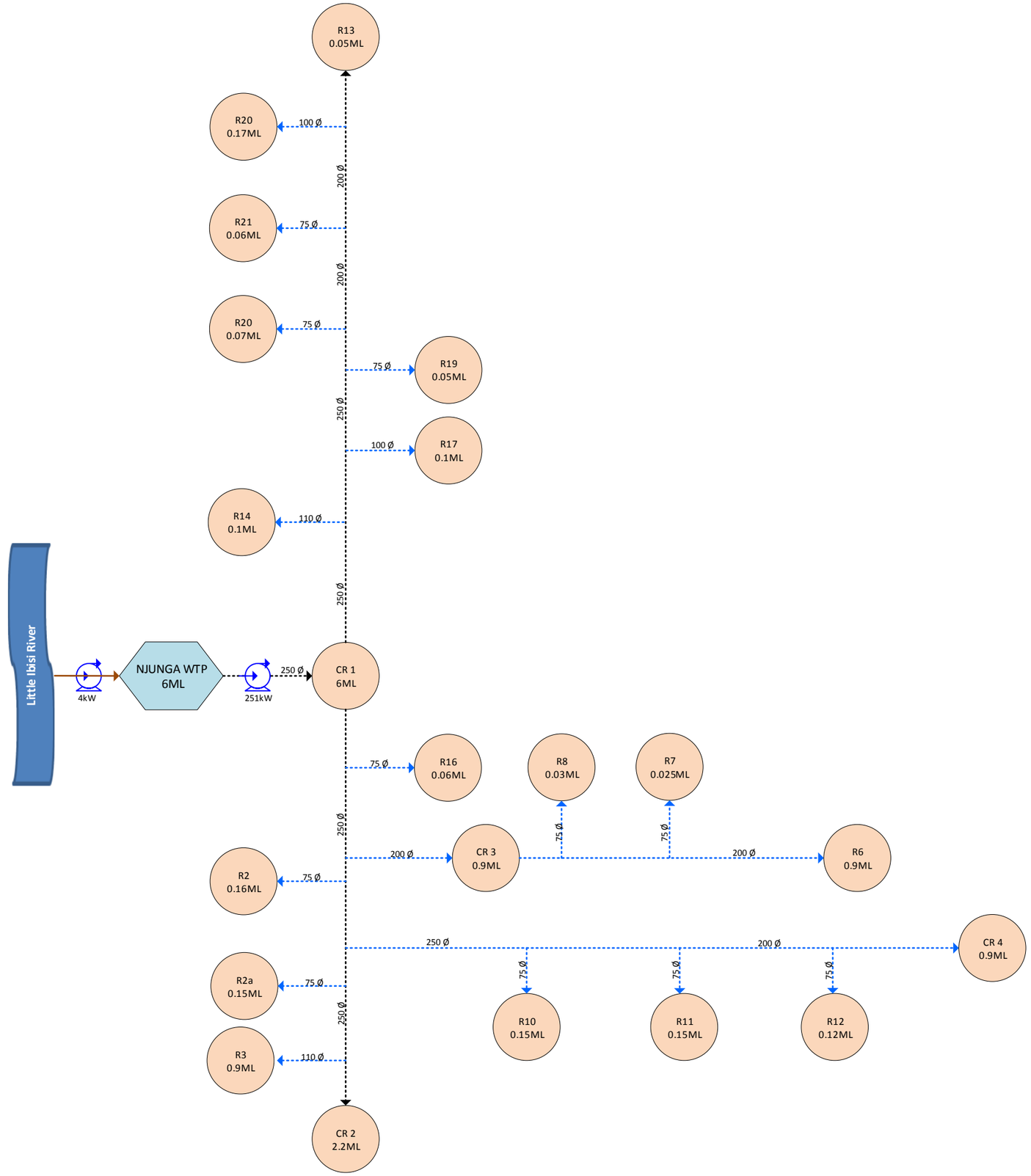
MAP TITLE:

Total Bulk Water Supply Interventions - HG011: Greater Njunga
Harry Gwala District Municipality

DATE COMPLETED: January 2021

MAP NO.: **DC 43 Figure 9-23**

Figure 9-24
HG011 WSIA: Greater Njunga



LEGEND

- Raw Water
- Clarified Water
- Treated Water
  - Existing Primary Bulk
  - Existing Secondary Bulk
  - Existing Tertiary Bulk
  - Future Primary Bulk
  - Future Secondary Bulk
  - Future Tertiary Bulk
- Res 23 0.4Ml — Existing Reservoir
- Res 24 0.92Ml — Future Reservoir

All diameters in mm
All flows in Ml/day

9.12 HG012 WSIA: GREATER RIVERSIDE SCHEME

9.12.1 Demand Model Intervention

9.12.1.1 Water Demand

The water demand for the Greater Riverside Scheme was determined for 2020 and 2050 and included within **Table 9-22** below.

Table 9-22: Population and Water demand 2020 and 2050 for the Greater Riverside WSIA

Population	**Population 2020**	**Population 2050**
	14 446	18 481
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	2.55	3.46

9.12.1.2 Water Resource Consideration

The existing 0.7 Mℓ/day WTP that abstracts water from the Ngwangwane River will be upgraded to 4 Mℓ/day as part of the Greater Riverside Water Supply Project.

9.12.2 Water Supply Infrastructure

9.12.2.1 Proposed Interventions

No upgrades or interventions are proposed for the Greater Riverside Scheme Area. As per Section 8.12 there are no gaps in supply as the scheme area is adequately covered for the 2050 demand horizon by existing and planned infrastructure.

The Greater Riverside WSIA is illustrated within **Figure 9-25** followed by the schematic layout of the WSIA within **Figure 9-26**.

Design details of all the infrastructure components are provided within **Annexure B**.

Kilometers
2 1 0 2 4

N

Nkosazana Dlamini-Zuma Local Municipality

Greater Kilimon

Greater Riverside

Harry Gwala

Umzimkhulu Local Municipality

Ubuhlebezwe Local Municipality

Nsingizi - Mkhangala

4Ml/d
WTP
RIVERSIDE WTP

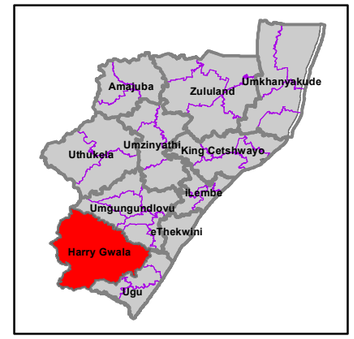
300
250
1000kl
500kl
250
1000kl
5000kl
250
1000kl
90kl
3000kl
100kl
90
200
1000kl
30kl
200
1000kl
50kl
100kl
200kl
110
90
150kl
50kl
120kl
76,504kl
250kl
75
50kl
110
100kl
90
90
150kl
30kl
90
1000kl

NGWAGWANA/LORETTA
RIVERSIDE
MDENI 2
NDUMA KUDE
NGWAGWANE
CORINTH (KORINTE) MPINTLANA PHONGOLOMDENI
EDGETON
EMANISWENI A
DEDA
SIDWADENI
LUKALWENI
NKOMENI
THON ANI
SARIYA
MAGANGXOSINI
GUJEDLINI
GERMISTON
BRIDGE
NGWAQA
MATSHETSHA
MARAMBENI - B
MOYENI - (LOURDES SETTLEMENT)

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements (Ncxola)
- Major Towns (Hilton)

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

MUNICIPALITY:

HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

MARISWE
JTN CONSULTING

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - HG012: Greater Riverside
Harry Gwala District Municipality

DATE COMPLETED:

January 2021

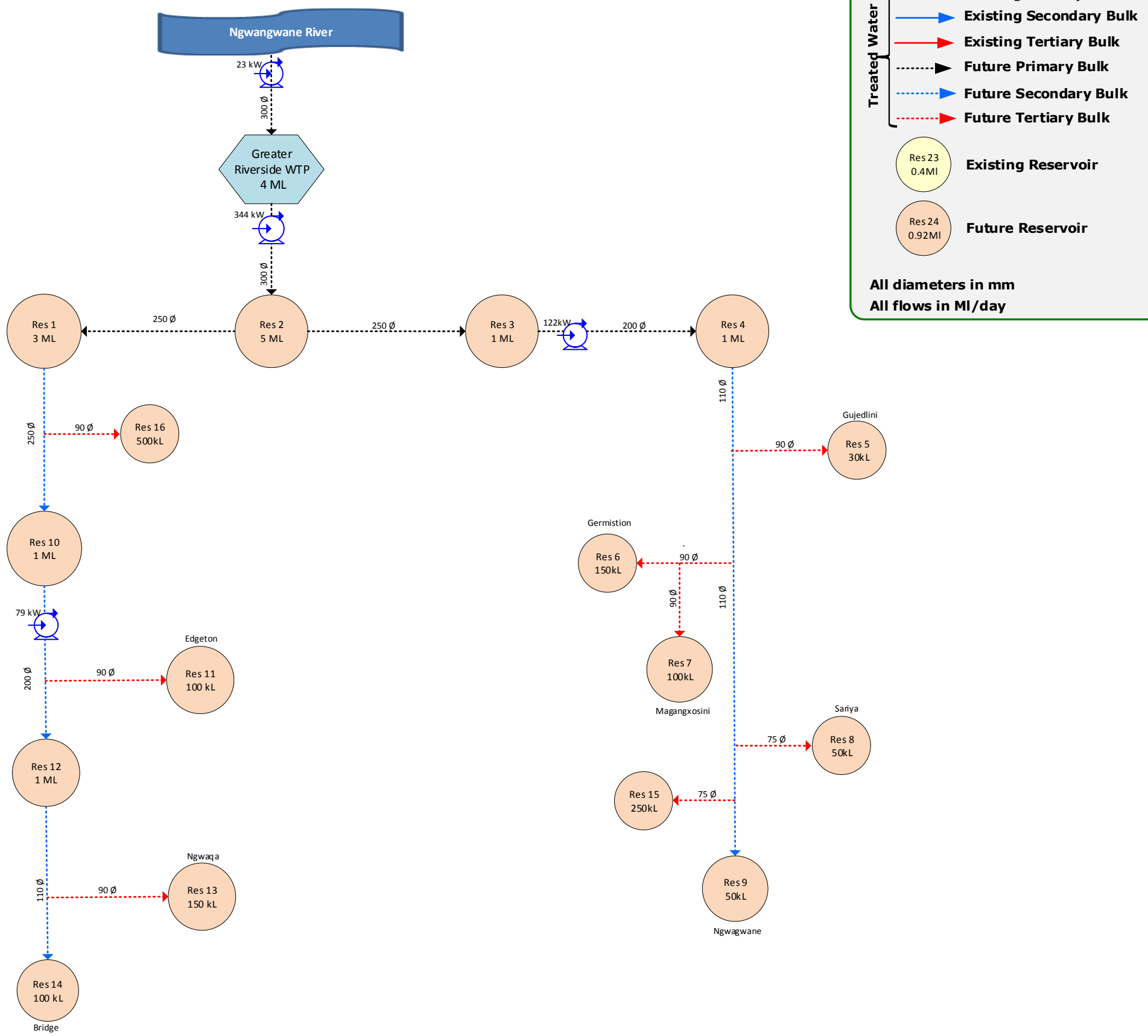
MAP NO.:

DC 43 Figure 9-25

Proposed New / Upgrade Infrastructure

- Water Scheme Areas & Names (Ibisi)
- Existing Water Treatment Plants (WTP)
- Surface Water Abstraction Works (Existing)
- Primary Bulk Pipelines (Existing)
- Secondary Bulk Pipelines (Existing)
- Tertiary Bulk Pipelines (Existing)
- Primary Reservoirs (Existing)
- Secondary Reservoirs (Existing)
- Tertiary Reservoirs (Existing)
- Pump Stations (Existing)
- Upgrade of WTW (19Ml/d)
- Surface Water Abstraction Works (Future)
- Primary Bulk Pipelines (Future)
- Secondary Bulk Pipelines (Future)
- Tertiary Bulk Pipelines (Future)
- Primary Command Reservoirs (Future)
- Secondary Reservoirs (Future)
- Tertiary Reservoirs (Future)
- Pump Stations (Future)

Figure 9-26
HG012 WSIA: GREATER RIVERSIDE



9.13 HG013 WSIA: IBISI-MACHUNWINI SCHEME

9.13.1 Demand Model Intervention

9.13.1.1 Water Demand

The water demand for the Ibisi-Machunwini Scheme was determined for 2020 and 2050 and included within **Table 9-23** below.

Table 9-23: Population and Water demand 2020 and 2050 for the Ibisi-Machunwini WSIA

Population	**Population 2020**	**Population 2050**
	20 803	26 615
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	3.6	4.9

9.13.1.2 Water Resource Consideration

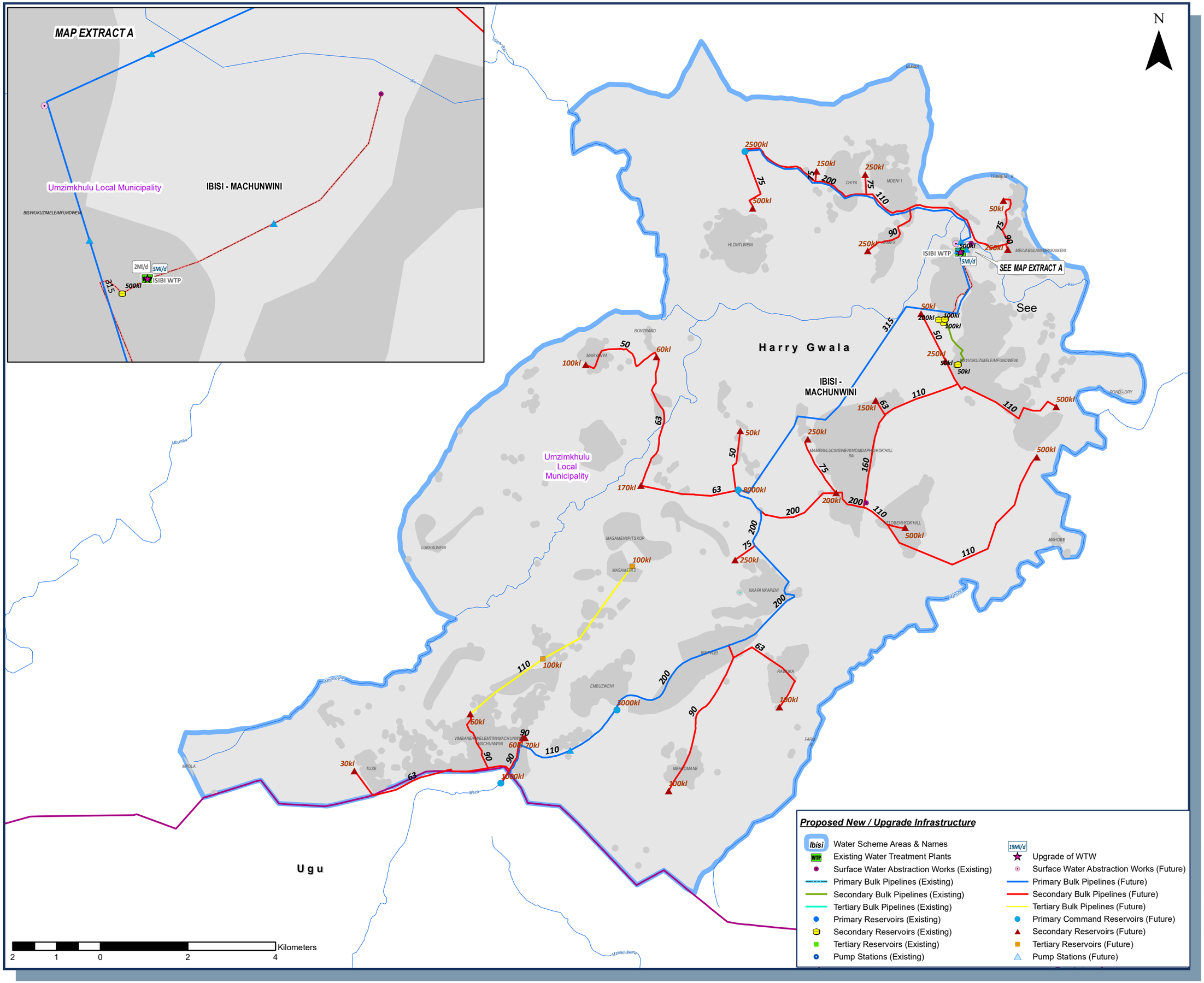
An existing WTP with a capacity of 2 Mℓ/day that abstracts water from the Ibisi River is planned to be upgraded to 5 Mℓ/day and forms part of the Ibisi-Kokshill Water Supply Project.

9.13.2 Water Supply Infrastructure

9.13.2.1 Proposed Interventions

No upgrades or interventions are proposed for the Ibisi-Machunwini Scheme Area. As per Section 8.13 there are no gaps in supply as the scheme area is adequately covered for the 2050 demand horizon by existing and planned infrastructure.

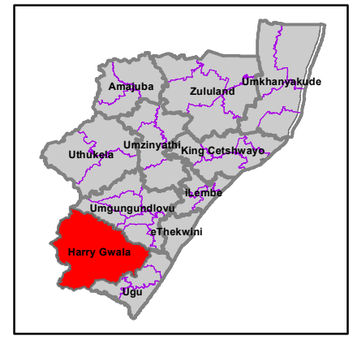
The Ibisi-Machunwini WSIA is illustrated within **Figure 9-27** followed by the schematic layout of the WSIA within **Figure 9-28**.



Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

MUNICIPALITY:

HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - HG013: Ibisi-Machunwini
Harry Gwala District Municipality

DATE COMPLETED:

January 2021

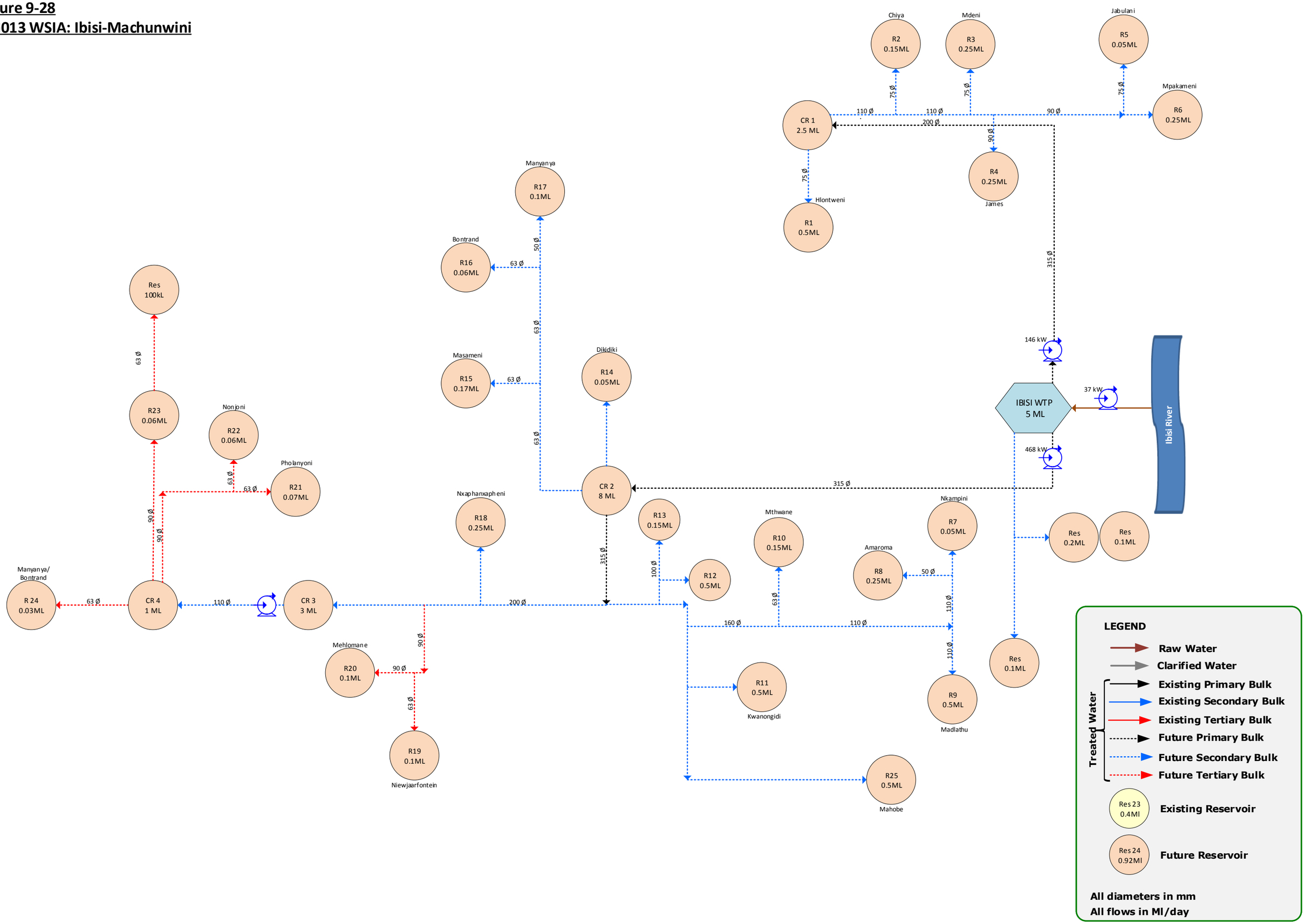
MAP NO.:

DC 43 Figure 9-27

Proposed New / Upgrade Infrastructure

- Ibisi — Water Scheme Areas & Names
- WTP — Existing Water Treatment Plants
- Surface Water Abstraction Works (Existing)
- Primary Bulk Pipelines (Existing)
- Secondary Bulk Pipelines (Existing)
- Tertiary Bulk Pipelines (Existing)
- Primary Reservoirs (Existing)
- Secondary Reservoirs (Existing)
- Tertiary Reservoirs (Existing)
- Pump Stations (Existing)
- 19Ml/d — Upgrade of WTW
- Surface Water Abstraction Works (Future)
- Primary Bulk Pipelines (Future)
- Secondary Bulk Pipelines (Future)
- Tertiary Bulk Pipelines (Future)
- Primary Command Reservoirs (Future)
- Secondary Reservoirs (Future)
- Tertiary Reservoirs (Future)
- Pump Stations (Future)

Figure 9-28
HG013 WSIA: Ibisi-Machunwini



9.14 HG014 WSIA: LOURDES-NDZOMBANE SCHEME

9.14.1 Demand Model Intervention

9.14.1.1 Water Demand

The water demand for the Lourdes-Ndzombane Scheme was determined for 2020 and 2050 and included within **Table 9-24** below.

Table 9-24: Population and Water demand 2020 and 2050 for the Lourdes-Ndzombane WSIA

Population	**Population 2020**	**Population 2050**
	15 971	20 433
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	2.82	3.80

9.14.1.2 Water Resource Consideration

The planned Lourdes-Ndzombane Bulk Water Supply Scheme involves the construction of a weir on the Upper Ibisi River to provide 5 Mℓ/day. An abstraction works along with the 5 Mℓ/day Ndzombane WTP is also planned to supply the scheme.

The Nsingizi Dam was found to be an alternative source of supply for the Lourdes-Ndzombane Bulk Water Supply Scheme and is detailed below and in Section 9.17. A water resource investigation will need to be undertaken to determine if the proposed dam will be sufficient to cater for the 2050 demands of the schemes that it is proposed to supply.

9.14.2 Water Supply Infrastructure

9.14.2.1 Bulk conveyance and Storage

As per the planned Lourdes-Ndzombane Bulk Water Supply Scheme a weir will be constructed on the Upper Ibisi River that will provide 5 Mℓ/day. An abstraction works with a pumpstation (105 ℓ/s at 100m head – 158 kW) will deliver raw water to the proposed 5 Mℓ/day Ndzombane WTP via a 600m long, ø 500 mm raw water rising main.

Two highlift pumpstations are also proposed at the WTP to deliver potable water to the proposed 5 Mℓ Mpakameni Reservoir (1 558 m), the proposed 4 Mℓ Emmausi Reservoir (1 380 m)and the 300 kℓ Moyeni elevated tank (1 595 m) through approximately 36km of ø 300 mm bulk rising mains. The reservoir will then supply the Moyeni, Siphangeni, Gaybrook, Phungula, Lalini, Dumisa, Mpakameni, Cancele, KwaCebe, Jabula and Mahawini areas via secondary bulk pipelines that range from ø 75 mm and ø 200 mm.

As per the gap analysis conducted in Section 8.14, the Lourdes-Ndzombane Bulk Water Supply Scheme project adequately covers the scheme for the 2050 demand.

9.14.2.2 Proposed Interventions

An alternative source of supply, Option 2, for the Lourdes-Ndzombane Bulk Water Supply Scheme was investigated and is detailed below.

As mentioned in Section 9.17, potable water can be gravitated from the Nsingizi Command Reservoir (1 821 m) through a ø 250mm pipeline to the proposed Moyeni Elevated Tank site (1 595 m). From this point potable water can be distributed to the scheme area.

The Lourdes-Ndzombane WSIA and the alternative option is illustrated within **Figure 9-29** and **Figure 9-30** followed by the schematic layout of the WSIA within **Figure 9-31**.

- ✓ The water resource assessment needs to be undertaken to determine if the dam can yield the 2050 demand;
- ✓ The proposed WTP and command reservoir at the Nsingizi Dam be sized to cater for the demands of the Nsingizi-Mkhangala Scheme, the Lourdes-Ndzombane Scheme and the Franklin Scheme.
- ✓ The existing rising mains should be upgraded to cater for the 2050 capacity;
- ✓ The existing secondary and tertiary bulk mains should be upgraded; and
- ✓ The existing secondary and tertiary storage should be upgraded.

Design details of all the infrastructure components are provided within **Annexure B**.

9.14.3 Financial Requirements

The bulk cost requirement for Lourdes-Ndzombane WSIA is summarised within **Table 9-25** and **Table 9-26**.

Table 9-25: Cost Requirement (Option 1)

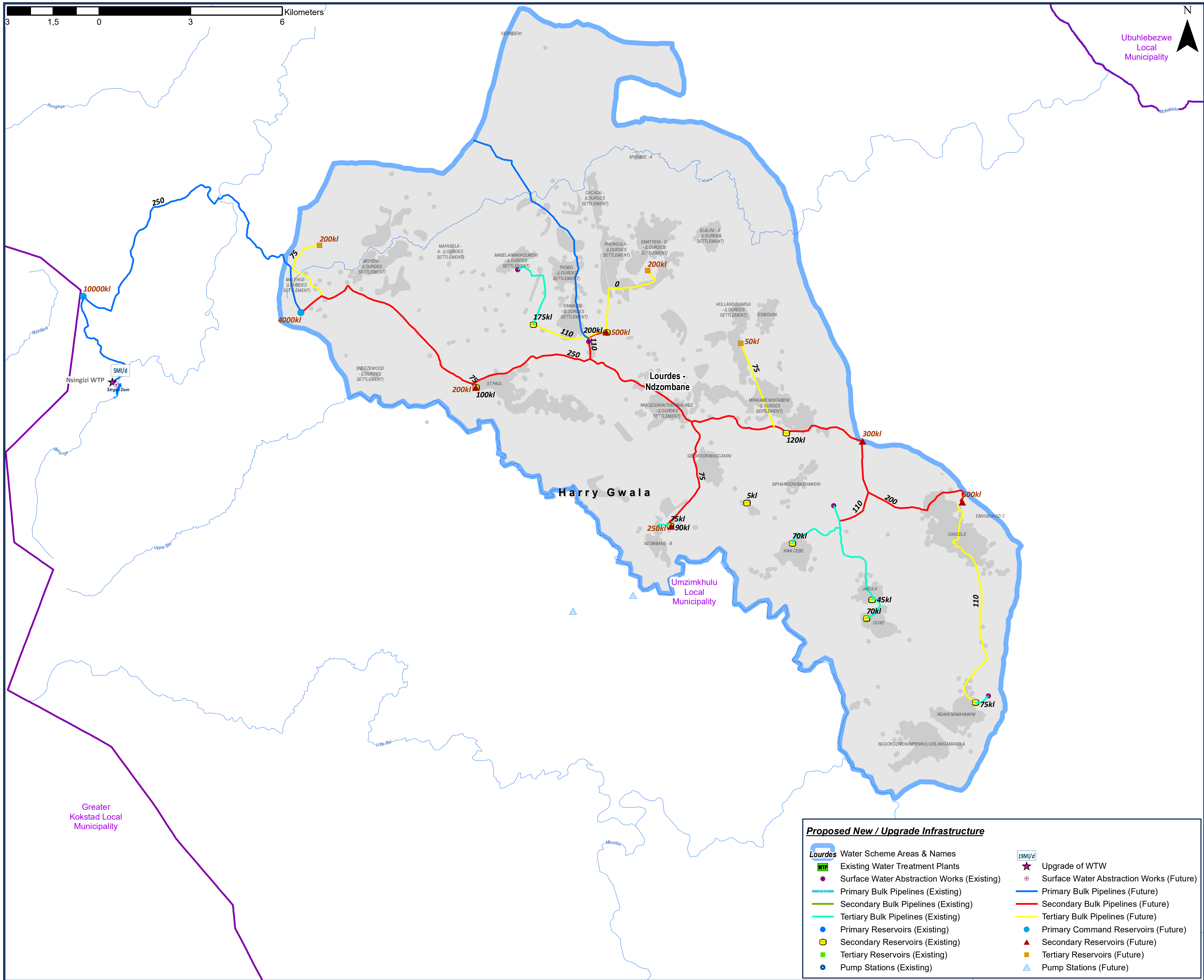
	Capital Cost	10% Contingencies	Total Cost (excl VAT)
Primary	R27 590 737.43	R2 759 073.74	R30 349 811.17
Secondary	R109 460 413.46	R10 946 041.35	R120 406 454.81
Tertiary	R0.00	R0.00	R0.00
Total	**R137 051 150.89**	**R13 705 115.09**	**R150 756 265.98**

The total bulk cost requirement for the Lourdes-Ndzombane WSIA (Option 1) is R 150 756 265.98 (excl VAT). The scheme development cost per household is approximately R 30 500.

Table 9-26: Cost Requirement (Option 2)

	Capital Cost	10% Contingencies	Total Cost (excl VAT)
Primary	R0.00	R0.00	R0.00
Secondary	R121 539 915.33	R12 153 991.53	R133 693 906.86
Tertiary	R84 368 779.80	R8 436 877.98	R92 805 657.78
Total	**R121 539 915.33**	**R12 153 991.53**	**R133 693 906.86**

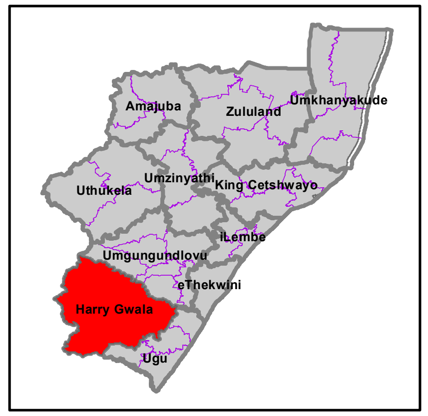
The total bulk cost requirement for the Lourdes-Ndzombane WSIA (Option 2) is R 133 693 906.86 (excl VAT). The scheme development cost per household is approximately R 27 000.



Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

MUNICIPALITY:

HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

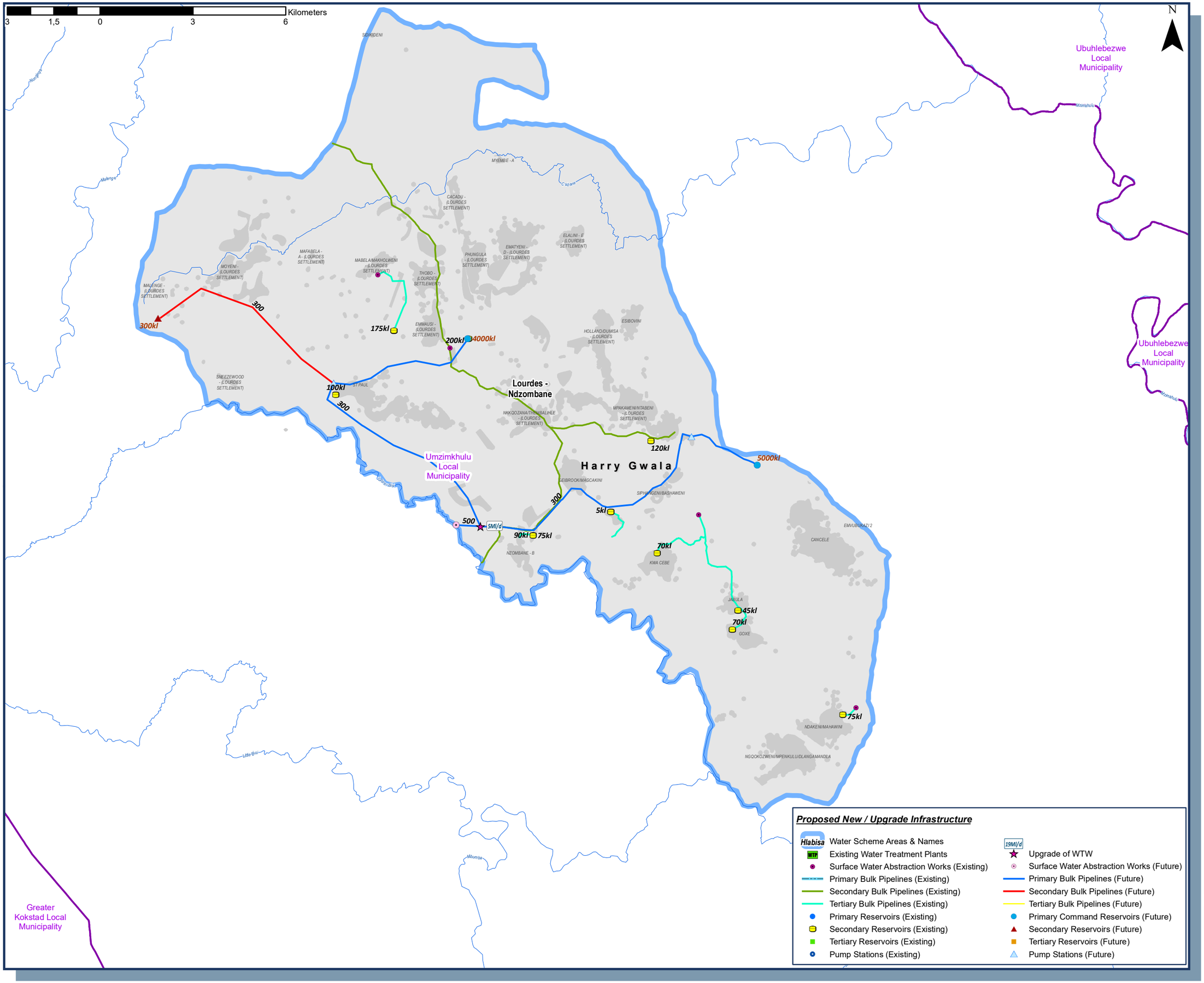
Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - HG014: Lourdes-Ndzombane
Harry Gwala District Municipality

DATE COMPLETED: January 2021

MAP NO.: DC 43 Option 2 Figure 9-29



Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
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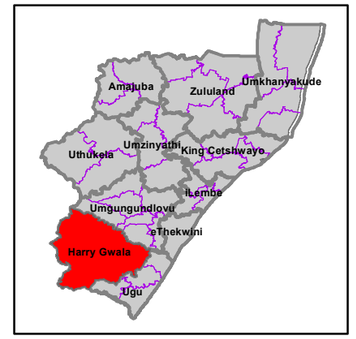
LOCALITY:



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CONSULTANTS

Project No.: 27814

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

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Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - HG014: Lourdes-Nzombane
Harry Gwala District Municipality

DATE COMPLETED:

January 2021

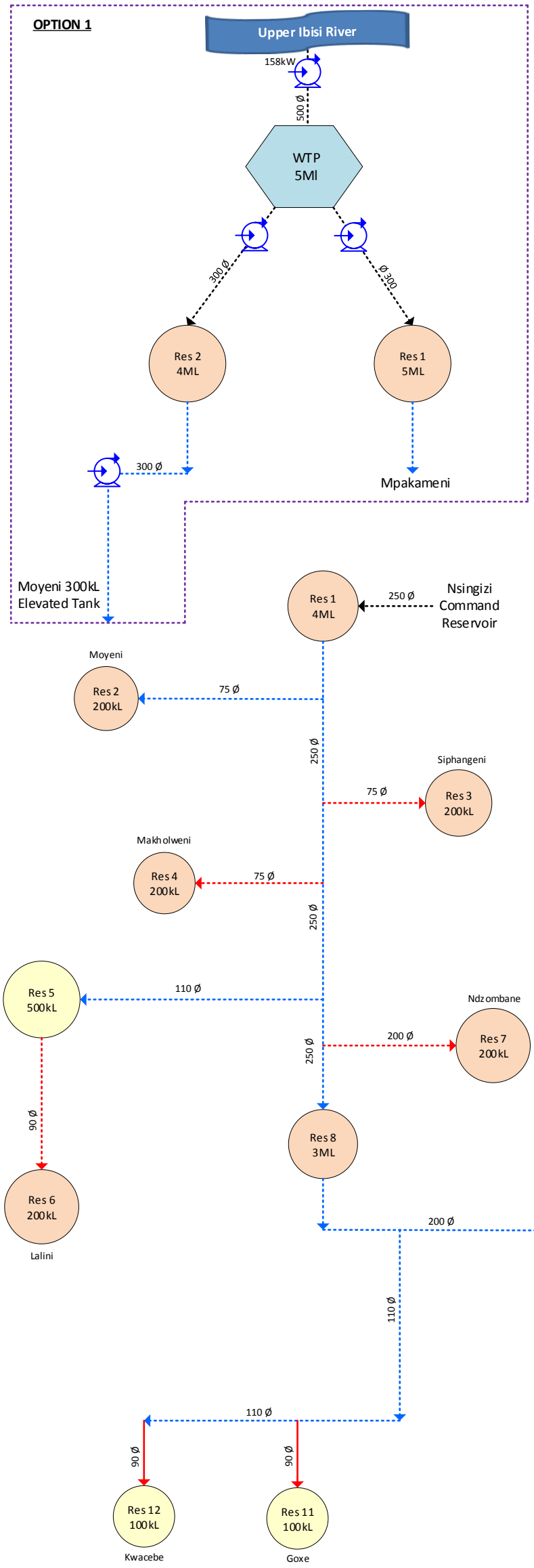
MAP NO.: DC 43

Option 1
Figure 9-30

Proposed New / Upgrade Infrastructure

- Hlabisa — Water Scheme Areas & Names
- WTP — Existing Water Treatment Plants
- Surface Water Abstraction Works (Existing)
- Primary Bulk Pipelines (Existing)
- Secondary Bulk Pipelines (Existing)
- Tertiary Bulk Pipelines (Existing)
- Primary Reservoirs (Existing)
- Secondary Reservoirs (Existing)
- Tertiary Reservoirs (Existing)
- Pump Stations (Existing)
- 19Ml/d — Upgrade of WTW
- Surface Water Abstraction Works (Future)
- Primary Bulk Pipelines (Future)
- Secondary Bulk Pipelines (Future)
- Tertiary Bulk Pipelines (Future)
- Primary Command Reservoirs (Future)
- Secondary Reservoirs (Future)
- Tertiary Reservoirs (Future)
- Pump Stations (Future)

Figure 9-31
HG014 WSIA: LOURDES-NDZOMBANE (OPTION 1&2)



LEGEND

- Raw Water
- Clarified Water
- Treated Water
  - Existing Primary Bulk
  - Existing Secondary Bulk
  - Existing Tertiary Bulk
  - Future Primary Bulk
  - Future Secondary Bulk
  - Future Tertiary Bulk
- Res 23 0.4Ml — Existing Reservoir
- Res 24 0.92Ml — Future Reservoir

All diameters in mm
All flows in Ml/day

9.15 HG015 WSIA: MNQUMENI SCHEME

9.15.1 Demand Model Intervention

9.15.1.1 Water Demand

The water demand for the Mnqumeni Scheme was determined for 2020 and 2050 and included within **Table 9-27** below.

Table 9-27: Population and Water demand 2020 and 2050 for the Mnqumeni WSIA

Population	**Population 2020**	**Population 2050**
	13 945	17 841
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	2.34	3.12

9.15.1.2 Water Resource Consideration

As part of the Santombe Water Supply Scheme, it was planned to develop water sources for the Mnqumeni Scheme Area. Three options for the source of supply were analysed in the feasibility study, namely, development of borehole schemes, abstraction and treatment from the Ibisi River and a connection to the existing Ugu DM Weza WTP. It was found that the connection to the Weza WTP was the most economical option. A water resource investigation will need to be undertaken to determine if the Weza WTP will be sufficient to cater for the 2050 demand for the scheme in HGDM as well as the schemes supplied within Ugu DM. The Weza WTP and Ugu DM can no longer meet the demand for the scheme hence an alternative water resource would have to be investigated. (Umpisi Engineers, 2011)

9.15.2 Water Supply Infrastructure

9.15.2.1 Bulk conveyance and Storage

Raw water will be pumped from the abstraction works through a ø 250mm pipeline to the existing WTP that will need to be upgraded to 4 Mℓ/day WTP to deliver the demand of 3.12 Mℓ/day. The raw water pumpstation power rating is proposed to be 11 kW.

Potable water will then be pumped from the WTP to an existing reservoir (784 m), that will need to be upgraded to 4 Mℓ, through a ø 250mm bulk rising main. The water will then be pumped, via a ø 250mm pipeline, to the Command reservoir site at elevation 870 m (pumpstation power rating 47 kW) which will in turn feed the Mantuzeleni, Matyeni, Kwalori, Nkofeni, Imbulumbu, Nkapha and Ndlovini areas via secondary bulk pipelines that range from ø 75 mm and ø 200 mm.

9.15.2.2 Proposed Interventions

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Mnqumeni WSIA and is illustrated within **Figure 9-32** followed by the schematic layout of the WSIA within **Figure 9-33**.

- ✓ The water resource assessment needs to be undertaken to determine if the source can yield the 2050 demand;
- ✓ The proposed WTP needs to be upgraded to 4 Mℓ/day to meet the 2050 demand for both the schemes;
- ✓ The existing rising mains should be upgraded to cater for the 2050 capacity;
- ✓ The existing secondary and tertiary bulk mains should be upgraded; and
- ✓ The existing secondary and tertiary storage should be upgraded.

Design details of all the infrastructure components are provided within **Annexure B**.

9.15.3 Financial Requirements

The bulk cost requirement for Mnqumeni WSIA is summarised within **Table 9-28** below.

Table 9-28: Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (excl VAT)
Primary	R28 730 000.00	R2 873 000.00	R31 603 000.00
Secondary	R79 368 026.06	R7 936 802.61	R87 304 828.67
Tertiary	R33 739 344.64	R3 373 934.46	R37 113 279.10
Total	**R141 837 370.70**	**R14 183 737.07**	**R156 021 107.77**

The total bulk cost requirement for the Mnqumeni Scheme is R 156 021 107.77 (excl VAT). The scheme development cost per household is approximately R 35 000.

Kilometers
2 1 0 2 4

N

Harry Gwala

Umzimkhulu Local Municipality

Mnqumeni

Harding

50kl
90
500kl
110
4000kl
100kl
90
100kl
75
200
2000kl
90
4Ml/d
MNQUMENI (FUTURE)
250
4000kl
250

NDIDENI
MABISANE
MTSHAZO
NKAPHA
HLAZAKA
MAHOBE
NDLOVINI
MATYENI
KHETHENI
FARM - A
DRESSINI/MAPLAZINI/MANTOLENI
MNQUMENI 2
NKOFENI
GUGWINI/SIPHAHLENI
KILIVE
MNQUMENI 1
IMBULUMBU
DEEPDALE TSHALI
JALIMEKA
KWALORI
MBANJWA
MAKHALENI
Mzimkhulwana

Legend

- Provinical Boundaries
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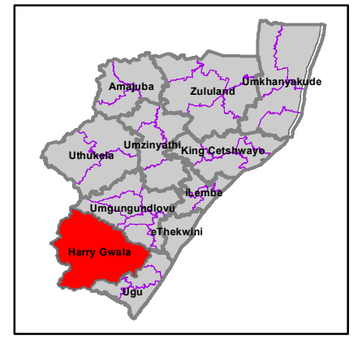
- Dams & Dam Names
- Rivers
- Settlements (Ncxola)
- Major Towns (Hilton)

LOCALITY:



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MUNICIPALITY:

HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - HG015: Mnqumeni
Harry Gwala District Municipality

DATE COMPLETED:

January 2021

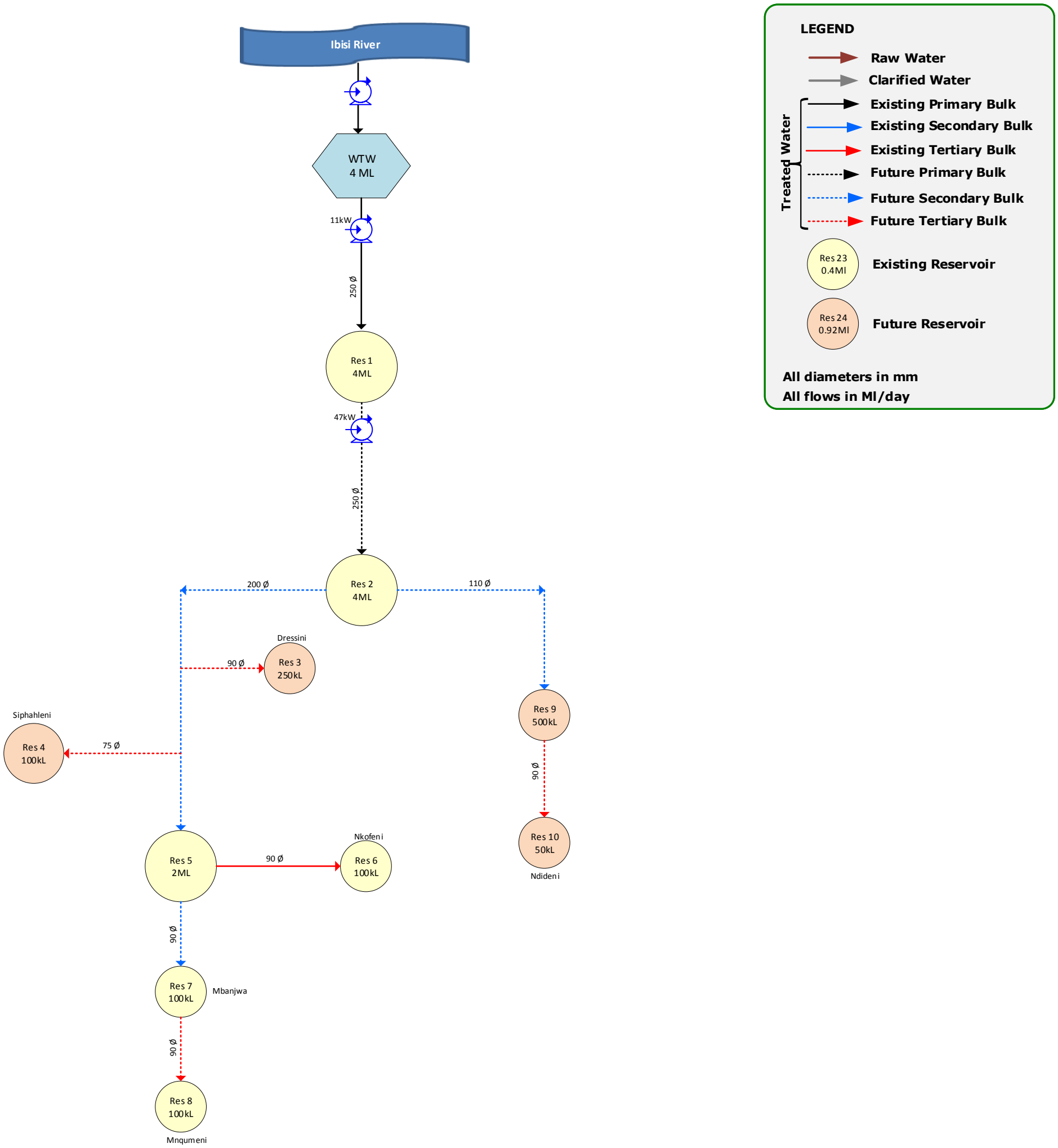
MAP NO.:

DC 43 Figure 9-32

Proposed New / Upgrade Infrastructure

- Water Scheme Areas & Names (Hlabisa)
- Existing Water Treatment Plants (WTP)
- Surface Water Abstraction Works (Existing)
- Primary Bulk Pipelines (Existing)
- Secondary Bulk Pipelines (Existing)
- Tertiary Bulk Pipelines (Existing)
- Primary Reservoirs (Existing)
- Secondary Reservoirs (Existing)
- Tertiary Reservoirs (Existing)
- Pump Stations (Existing)
- Upgrade of WTW (19Ml/d)
- Surface Water Abstraction Works (Future)
- Primary Bulk Pipelines (Future)
- Secondary Bulk Pipelines (Future)
- Tertiary Bulk Pipelines (Future)
- Primary Command Reservoirs (Future)
- Secondary Reservoirs (Future)
- Tertiary Reservoirs (Future)
- Pump Stations (Future)

Figure 9-33
HG015 WSIA: MNQUMENI



9.16 HG016 WSIA: UMZIMKHULU TOWN SCHEME

9.16.1 Demand Model Intervention

9.16.1.1 Water Demand

The water demand for the Umzimkhulu Town Scheme was determined for 2020 and 2050 and included within **Table 9-29** below.

Table 9-29: Population and Water demand 2020 and 2050 for the Umzimkhulu Town WSIA

Population	**Population 2020**	**Population 2050**
	18 477	23 638
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	3.94	5.24

9.16.1.2 Water Resource Consideration

The Mzimkhulu WTP receives its raw water from two sources, a gravity main from the Ntlambamasoka Stream (a tributary of the Mzimkhulu River) which flows directly to the Mzimkhulu WTP and a raw water pumping system that pumps water directly from the Mzimkhulu River to the Mzimkhulu WTP. HGDM plans to upgrade the WTP from its current 5 Mℓ/day capacity to 14 Mℓ/day in future to cater for the growth in demand.

A water resource investigation will need to be undertaken to determine if the weir and river abstraction will be sufficient to cater for the 2050 demand or if there is a need for an impoundment such as an off-channel dam.

9.16.2 Water Supply Infrastructure

9.16.2.1 Bulk conveyance and Storage

Based on the gap analysis in Section 8.16, the scheme only requires an upgrade on the existing storage to meet the 2050 demand horizon. The two 1 Mℓ potable water reservoirs at the WTP currently feeds two high level reservoirs above the works. Potable water is pumped to a 0.25 Mℓ and a 1 Mℓ reservoir via a ø 160 mm uPVC pipeline. In order to meet the 2050 demand a further 4 Mℓ of bulk storage is required.

9.16.2.2 Proposed Interventions

The following infrastructure upgrades will be required in order to adequately supply the Umzimkhulu Town WSIA and is illustrated within **Figure 9-34** followed by the schematic layout of the WSIA within **Figure 9-35**.

✓ The existing storage should be increased by a further 4 Mℓ.

Design details of all the infrastructure components are provided within **Annexure B**.

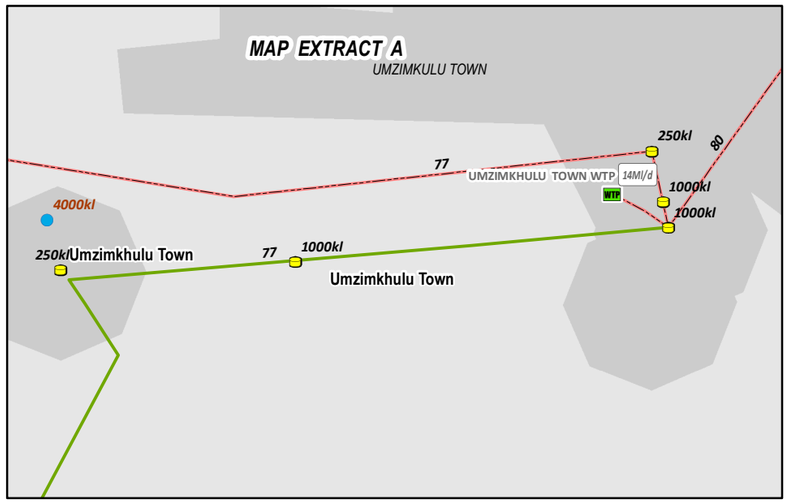
9.16.3 Financial Requirements

The bulk cost requirement for Umzimkhulu Town WSIA is summarised within **Table 9-30** below.

Table 9-30: Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (excl VAT)
Primary	R0.00	R0	R0
Secondary	R19 523 621.87	R1 952 362.19	R21 475 984.06
Tertiary	R4 180 977.66	R418 097.77	R4 599 075.43
Total	**R19 523 621.87**	**R1 952 362.19**	**R21 475 984.06**

The total bulk cost requirement for the Umzimkhulu Town Scheme is R 21 475 984.06 (excl VAT). The scheme development cost per household is approximately R 3 600.



Legend

- Provinical Boundaries
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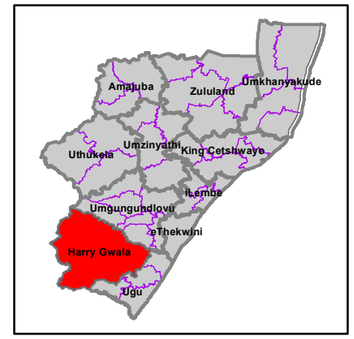
LOCALITY:



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HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - HG016: Umzimkhulu Town
Harry Gwala District Municipality

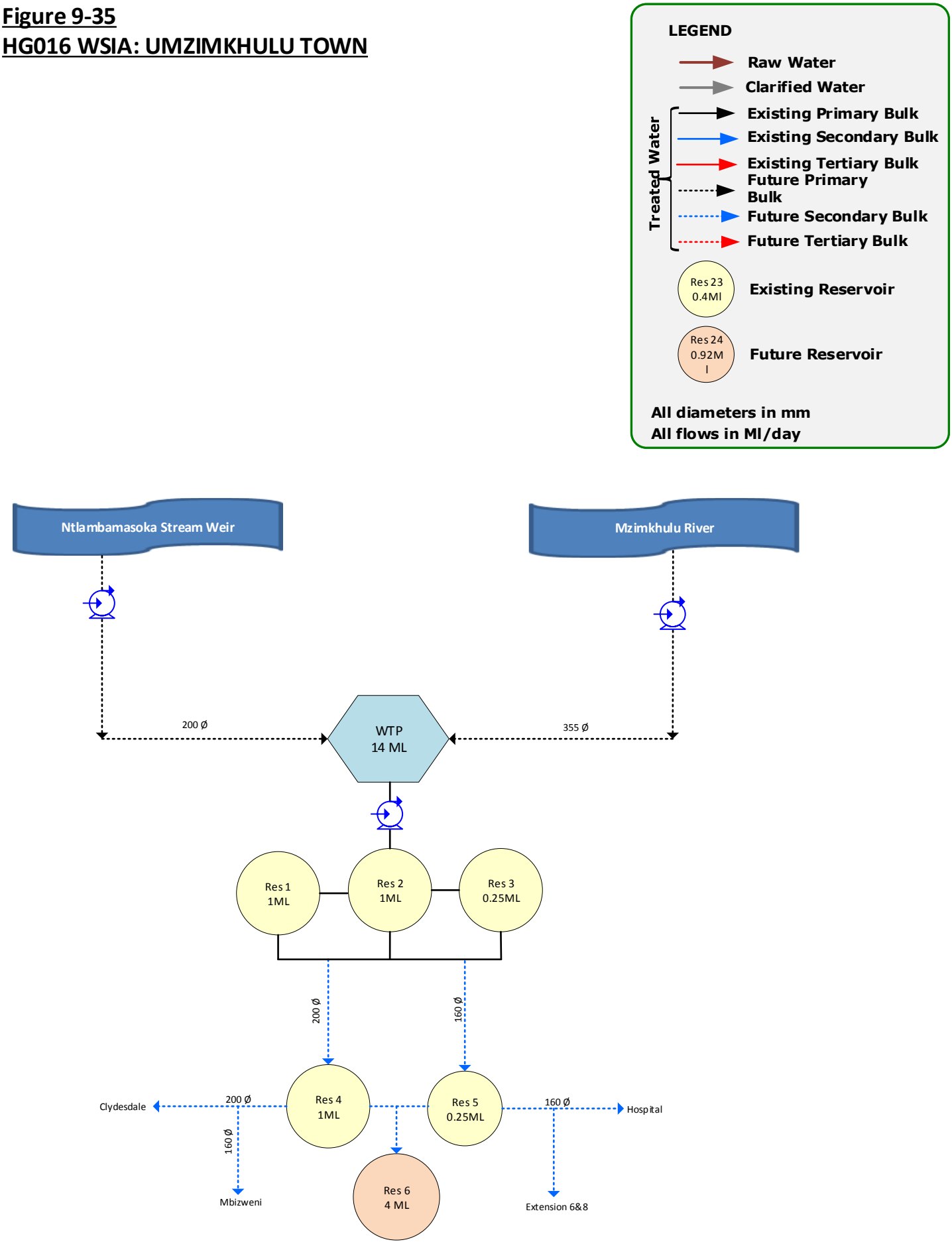
DATE COMPLETED:

January 2021

MAP NO.:

DC 43 Figure 9-34

Figure 9-35
HG016 WSIA: UMZIMKHULU TOWN



9.17 HG017 WSIA: NSINGIZI-MKHANGALA SCHEME

9.17.1 Demand Model Intervention

9.17.1.1 Water Demand

The water demand for the Nsingizi-Mkhangala Scheme was determined for 2020 and 2050 and included within **Table 9-31** below.

Table 9-31: Population and Water demand 2020 and 2050 for the Nsingizi-Mkhangala WSIA

Population	**Population 2020**	**Population 2050**
	16 043	20 524
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	2.88	3.85

9.17.1.2 Water Resource Consideration

After consultations with the DM it was found that the scheme has no existing assured water source. The existing Nsingizi Dam (30°14'58.56"S; 29°32'14.28"E) is proposed as an intervention to supply the Nsingizi-Mkhangala Scheme. The Franklin scheme also proposes the use of the Nsingizi Dam for supply and is discussed further in the following section (9.18). The yield of the dam is unknown therefore a water resource assessment will need to be undertaken for the dam in order to ascertain if the dam yield will be sufficient to cater for the 2050 demand of both the Nsingizi-Mkhangala and Franklin Schemes.

9.17.2 Water Supply Infrastructure

9.17.2.1 Bulk conveyance and Storage

The existing Nsingizi Dam is proposed to supply the scheme area if the available yield allows. Raw water will be pumped (54 kW) from the dam to the proposed 10 Mℓ/day Nsingizi WTP through a ø 400mm pipeline. Potable water will then be conveyed through a ø 400 mm rising main to the proposed 10 Mℓ Nsingizi Command Reservoir (1 821 m).

In addition to the Nsingizi-Mkhangala Scheme area, the Nsingizi Command Reservoir is also proposed to extend supply to the Franklin and Lourdes-Ndzombane Scheme areas. Details of the conveyance to these schemes can be found in Section 9.14 and 9.18.

The Dressini, Singisi, Mlenzana, Maranjana, Nqabelweni and Ntsikeni areas within the Nsingizi-Mkhangala scheme area will be supplied via secondary and tertiary bulk pipelines that range from ø 90 mm to ø 250 mm from the proposed command reservoir.

9.17.2.2 Proposed Interventions

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Nsingizi-Mkhangala WSIA and is illustrated within **Figure 9-36** followed by the schematic layout of the WSIA within **Figure 9-37**.

- ✓ The water resource assessment needs to be undertaken to determine if the dam can yield the 2050 demand;
- ✓ The proposed WTP and command reservoir at the Nsingizi Dam be sized to cater for the demands of the Nsingizi-Mkhangala Scheme, the Lourdes-Ndzombane Scheme and the Franklin Scheme.
- ✓ The proposed rising mains should be upgraded to cater for the 2050 capacity;
- ✓ The proposed/existing secondary and tertiary bulk mains should be upgraded; and
- ✓ The proposed/existing secondary and tertiary storage should be upgraded.

Design details of all the infrastructure components are provided within **Annexure B**.

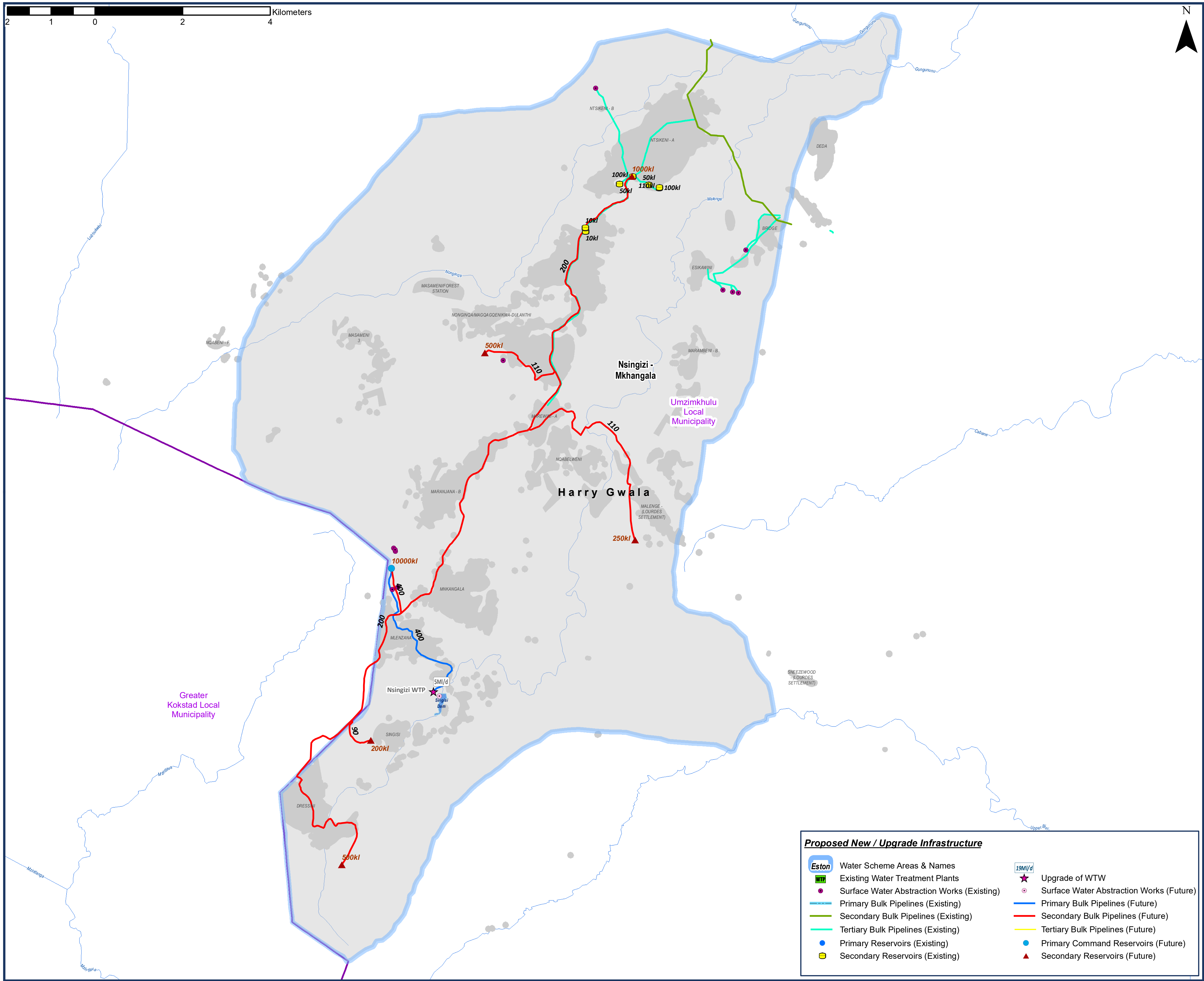
9.17.3 Financial Requirements

The bulk cost requirement for Nsingizi-Mkhangala WSIA is summarised within **Table 9-32** below.

Table 9-32: Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (excl VAT)
Primary	R73 422 319.91	R7 342 231.99	R80 764 551.90
Secondary	R108 067 922.79	R10 806 792.28	R118 874 715.07
Tertiary	R49 337 931.26	R4 933 793.13	R54 271 724.38
Total	**R230 828 173.96**	**R23 082 817.40**	**R253 910 991.36**

The total bulk cost requirement for the Nsingizi-Mkhangala Scheme is R 253 910 991.36 (excl VAT). The scheme development cost per household is approximately R 50 000.



Kilometers
2 1 0 2 4
N
Nsingizi - Mkhangala
Umzimkhulu Local Municipality
Greater Kokstad Local Municipality
Harry Gwala
Nsingizi WTP
5Ml/d
Singisi Dam
1000kl
100kl
50kl
50kl
110kl
100kl
10kl
10kl
200
500kl
110
110
250kl
10000kl
400
200
400
90
200kl
500kl
NTSIKENI - B
NTSIKENI - A
DEDA
BRIDGE
ESIKAWINI
MASAMENI/FOREST STATION
NONGINQA/MAGQAGQENIKWA-DULANTHI
MASAMENI
NQABENI - F
MARAMBENI - B
NQABELWENI
MARANJANA - B
MALENGE - (LOURDES SETTLEMENT)
MKANGALA
MLENZANA
SINGISI
DRESSINI
SNEEZEWOOD (LOURDES SETTLEMENT)
Proposed New / Upgrade Infrastructure
Eston
Water Scheme Areas & Names
Existing Water Treatment Plants
Surface Water Abstraction Works (Existing)
Primary Bulk Pipelines (Existing)
Secondary Bulk Pipelines (Existing)
Tertiary Bulk Pipelines (Existing)
Primary Reservoirs (Existing)
Secondary Reservoirs (Existing)
19Ml/d
Upgrade of WTW
Surface Water Abstraction Works (Future)
Primary Bulk Pipelines (Future)
Secondary Bulk Pipelines (Future)
Tertiary Bulk Pipelines (Future)
Primary Command Reservoirs (Future)
Secondary Reservoirs (Future)

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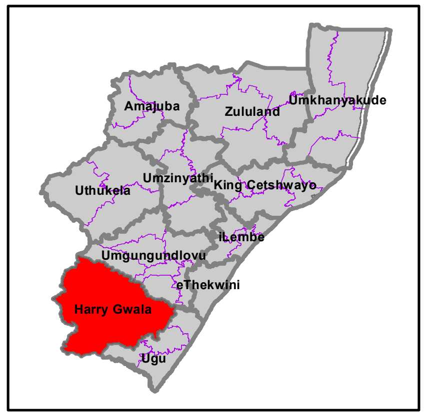

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CONSULTANTS

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Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
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PROJECT TITLE

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MAP TITLE:

Total Bulk Water Supply Interventions - HG017: Nsingizi-Mkhangala

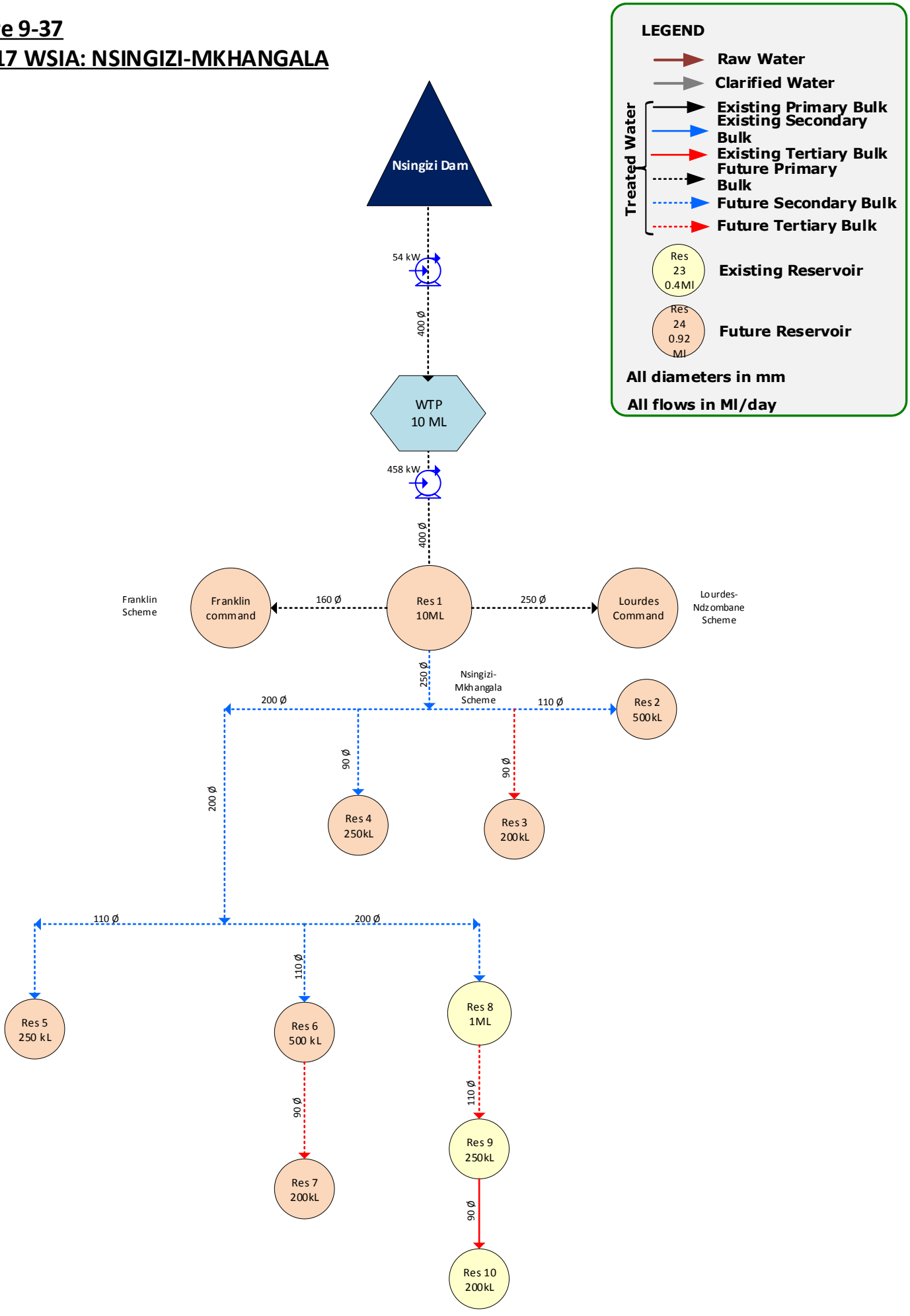
Harry Gwala District Municipality

DATE COMPLETED: January 2021

MAP NO.: DC 43 Figure 9-36

Figure 9-37

HG017 WSIA: NSINGIZI-MKHANGALA



9.18 HG018 WSIA: FRANKLIN SCHEME

9.18.1 Demand Model Intervention

9.18.1.1 Water Demand

The water demand for the Franklin Scheme was determined for 2020 and 2050 and included within **Table 9-33** below.

Table 9-33: Population and Water demand 2020 and 2050 for the Franklin WSIA

Population	**Population 2020**	**Population 2050**
	3 965	5 073
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	0.90	1.17

9.18.1.2 Water Resource Consideration

The Franklin Scheme abstracts water raw water from the Upper Mzintlava River and a 0.36 Mℓ/day yielding borehole that is conveyed to the Franklin WTP for treatment. The Franklin WTP has a capacity of 0.22 Mℓ/day. The Nsingizi Dam highlighted in the previous section (9.17) was found to be a possible supply option for the Franklin Scheme. The yield of the dam is unknown therefore a water resource assessment will need to be undertaken for the dam in order to ascertain if the dam yield will be sufficient to cater for the 2050 demand for both the Nsingizi-Mkhangala and Franklin Schemes.

9.18.2 Water Supply Infrastructure

9.18.2.1 Bulk conveyance and Storage

As mentioned in Section 9.17, potable water will be pumped (1.17 Mℓ/day at 31m head) from the Nsingizi Command Reservoir (1 821 m) through a ø 160mm uPVC pipeline to the proposed 1.5 Mℓ Franklin Command Reservoir (1 852 m). The command reservoir will feed the Franklin Reservoir (1 547m) via a ø 75 mm uPVC secondary bulk pipeline. The Franklin reservoir will need to be upgraded to 0.2 Mℓ to supply the town of Franklin.

Supply will also be extended from the proposed command reservoir to feed the Makhoba, Tefgete and Kransdraai areas via a ø 110 mm secondary bulk main to several 200kℓ reservoirs that would supply these communities.

9.18.2.2 Proposed Interventions

The following infrastructure upgrades will be required in order to adequately supply the Franklin WSIA and is illustrated within **Figure 9-38** followed by the schematic layout of the WSIA within **Figure 9-39**.

- ✓ The water resource assessment needs to be undertaken to determine if the dam can yield the 2050 demand;
- ✓ The proposed WTP and command reservoir at the Nsingizi Dam be sized to cater for the demands of the Nsingizi-Mkhangala Scheme, the Lourdes-Ndzombane Scheme and the Franklin Scheme.
- ✓ The proposed rising mains should be upgraded to cater for the 2050 capacity;
- ✓ The existing secondary and tertiary bulk mains should be upgraded; and
- ✓ The existing secondary and tertiary storage should be upgraded.

Design details of all the infrastructure components are provided within **Annexure B**.

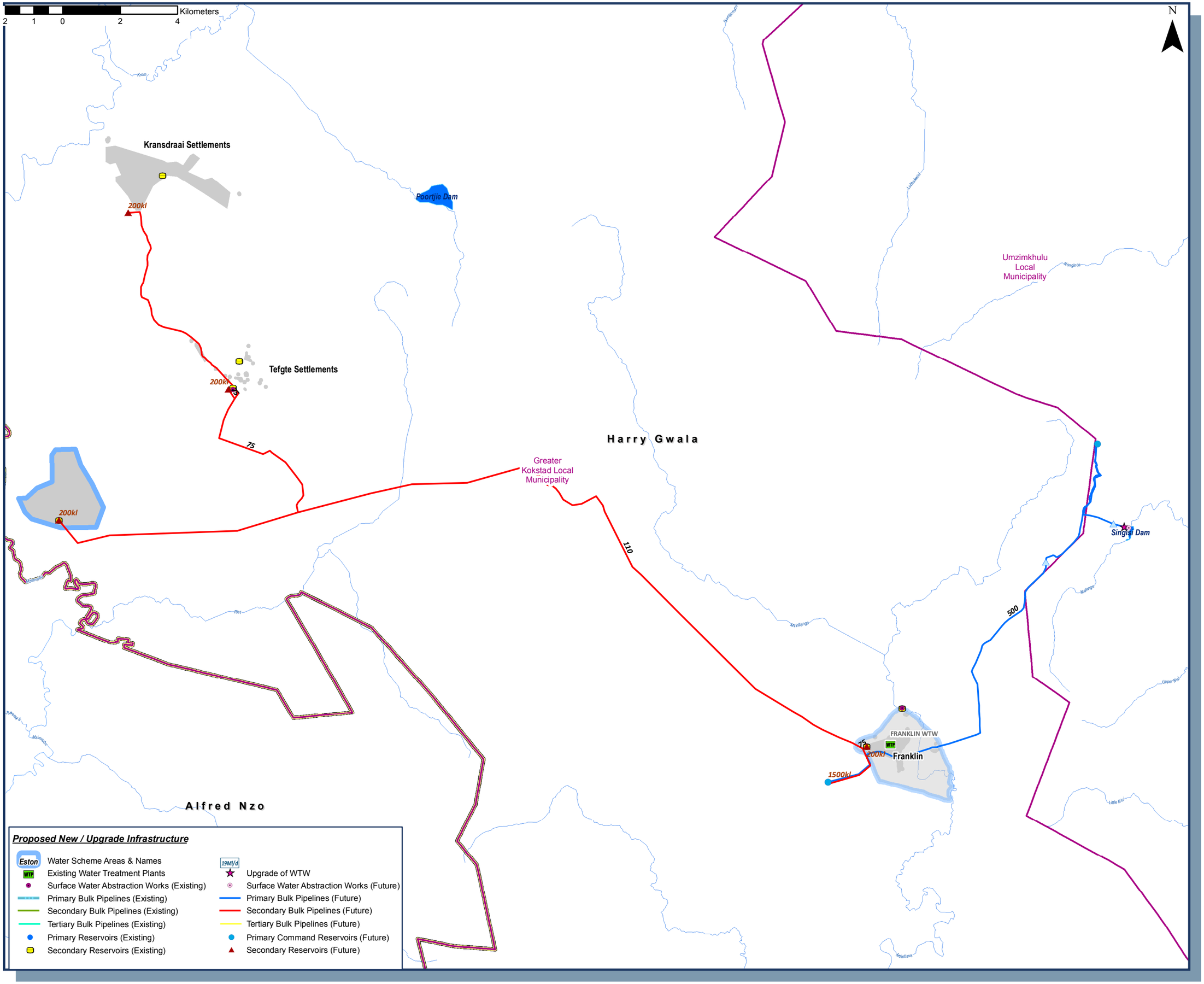
9.18.3 Financial Requirements

The bulk cost requirement for Franklin WSIA is summarised within **Table 9-34** below.

Table 9-34: Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (excl VAT)
Primary	R42 494 000.00	R4 249 400.00	R46 743 400.00
Secondary	R15 321 863.16	R1 532 186.32	R16 854 049.48
Tertiary	R13 543 334.50	R1 354 333.45	R14 897 667.95
Total	**R71 359 197.66**	**R7 135 919.77**	**R78 495 117.43**

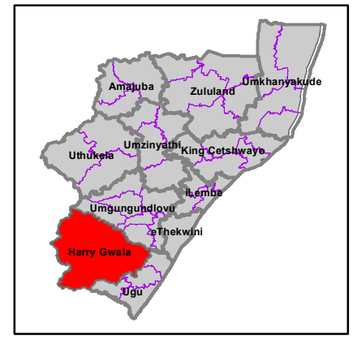
The total bulk cost requirement for the Franklin Scheme is R 78 495 117.43 (excl VAT). The scheme development cost per household is approximately R 62 000.



Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

MUNICIPALITY:

HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - HG018: Franklin

Harry Gwala District Municipality

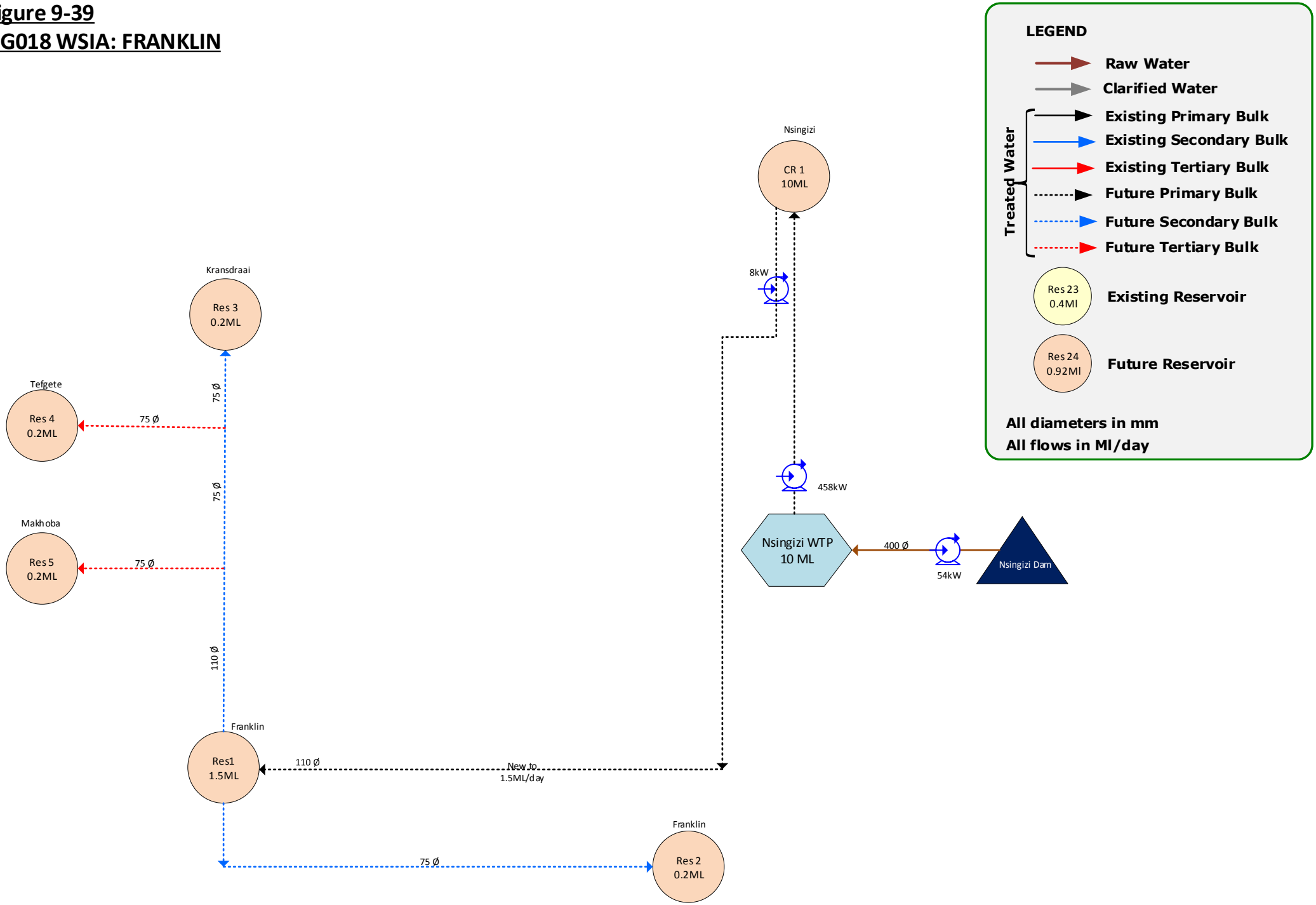
DATE COMPLETED:

January 2021

MAP NO.:

DC 43 Figure 9-38

Figure 9-39
HG018 WSIA: FRANKLIN



9.19 HG019 WSIA: KOKSTAD TOWN SCHEME

9.19.1 Demand Model Intervention

9.19.1.1 Water Demand

The water demand for the Kokstad Town Scheme was determined for 2020 and 2050 and included within **Table 9-35** below.

Table 9-35: Population and Water demand 2020 and 2050 for the Kokstad Town WSIA

Population	**Population 2020**	**Population 2050**
	59 957	76 705
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	16.36	21.36

9.19.1.2 Water Resource Consideration

The Kokstad WTP has been upgraded from 13Mℓ/day to 18Mℓ/day with the construction of an additional filter gallery. The plants historical output was approximately 15Mℓ/day but was recently reduced to approximately 12Mℓ/day, due to raw water supply issues.

Within the UAP Phase II study for the Harry Gwala DM, it was recommended that a detailed water resources assessment of the catchment above Kokstad on the Mzintlava River be undertaken to confirm existing water use. According to the All Towns Reconciliation Study, the natural MAR of Mzintlava River from the catchments upstream of Kokstad is 99.3 Mm^3. Whilst additional water may be abstracted from the Mzintlava River for use in Kokstad, water use upstream is affecting river flow. As this river is the closest and thus possibly the most feasible surface water source to meet the long term water demands of Kokstad, a detailed hydrological assessment is required of the catchments above Kokstad to determine water use and allowable abstraction for Kokstad. The option of additional storage either at Kempdale, Crystal Springs Dam or at some other point in the vicinity of Kokstad will be considered to secure water especially during low flow months.

The UAP Phase II study further stated that an impoundment on the Mzintlava River in Quarternary Catchment T32B (co-ordinates -30.4585 S; 29.4817 E) will provide additional storage that can be released to the Kempdale Dam from where water is currently abstracted for supply to Kokstad town. The yield of the dam is unknown therefore a detailed water resource assessment will need to be undertaken in order to ascertain if the dam yield will be sufficient to cater for the 2050 demand of the proposed supply areas.

9.19.2 Water Supply Infrastructure

9.19.2.1 Bulk conveyance and Storage

The Kokstad Dam identified within the UAP Phase II study will be used as an intervention to augment the supply of raw water to the Kokstad Town Scheme Area. Raw water will be pumped from the proposed Kokstad Dam on the Mzintlava River through a ø 500mm steel pipeline to a proposed 22 Mℓ/day WTP at the dam. The pumpstation power rating is proposed to be 154kW to deliver the demand of 21.36 Mℓ/day.

Potable water will then be distributed to the Prison, Main and Shayamoya reservoirs as well as the Galaxy Tank. The bulk pipeline that supplies the Main reservoir will require an upgrade to a 500mm steel pipeline.

The Main Reservoir is proposed to also supply the Pakkies-Willowdale Scheme and is detailed further in Section 9.20.

The Nsingizi Dam is proposed as an alternative option to augment the supply of potable water to Kokstad Town. Dependent on the available yield of the dam, the Nsingizi WTP will be able to feed the Kokstad WTP via a ø 500mm pipeline.

9.19.2.2 Proposed Interventions

The following proposed intervention, infrastructure upgrades or augmentation will be required in order to adequately supply the Kokstad Town WSIA and is illustrated within **Figure 9-40** and **Figure 9-41** followed by the schematic layout of the WSIA within **Figure 9-42**.

- ✓ The development of the proposed Kokstad dam within the UAP Phase II study needs to be investigated further to confirm if the yield of the proposed dam can meet the 2050 demand (both Kokstad town and Pakkies-Willowdale); only then can
    - The proposed WTP be upgraded to 22 Mℓ/day to meet the 2050 demand for both the schemes; and
    - The existing bulk mains should be upgraded to cater for the 2050 capacity.
- ✓ A water resource assessment needs to be undertaken to determine if the Nsingizi Dam can yield the 2050 demand;of the Nsingizi-Mkhangala Scheme, the Lourdes-Ndzombane Scheme, the Franklin Scheme as well as the Kokstad Town Scheme.

Design details of all the infrastructure components are provided within **Annexure B**.

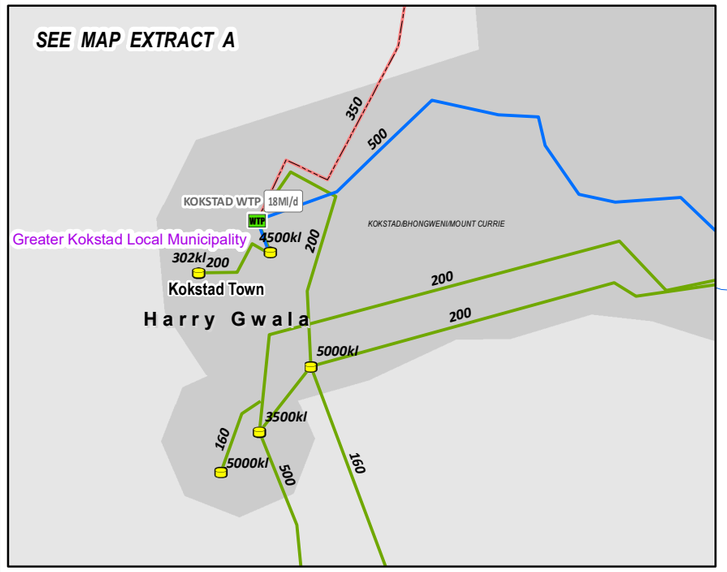
9.19.3 Financial Requirements

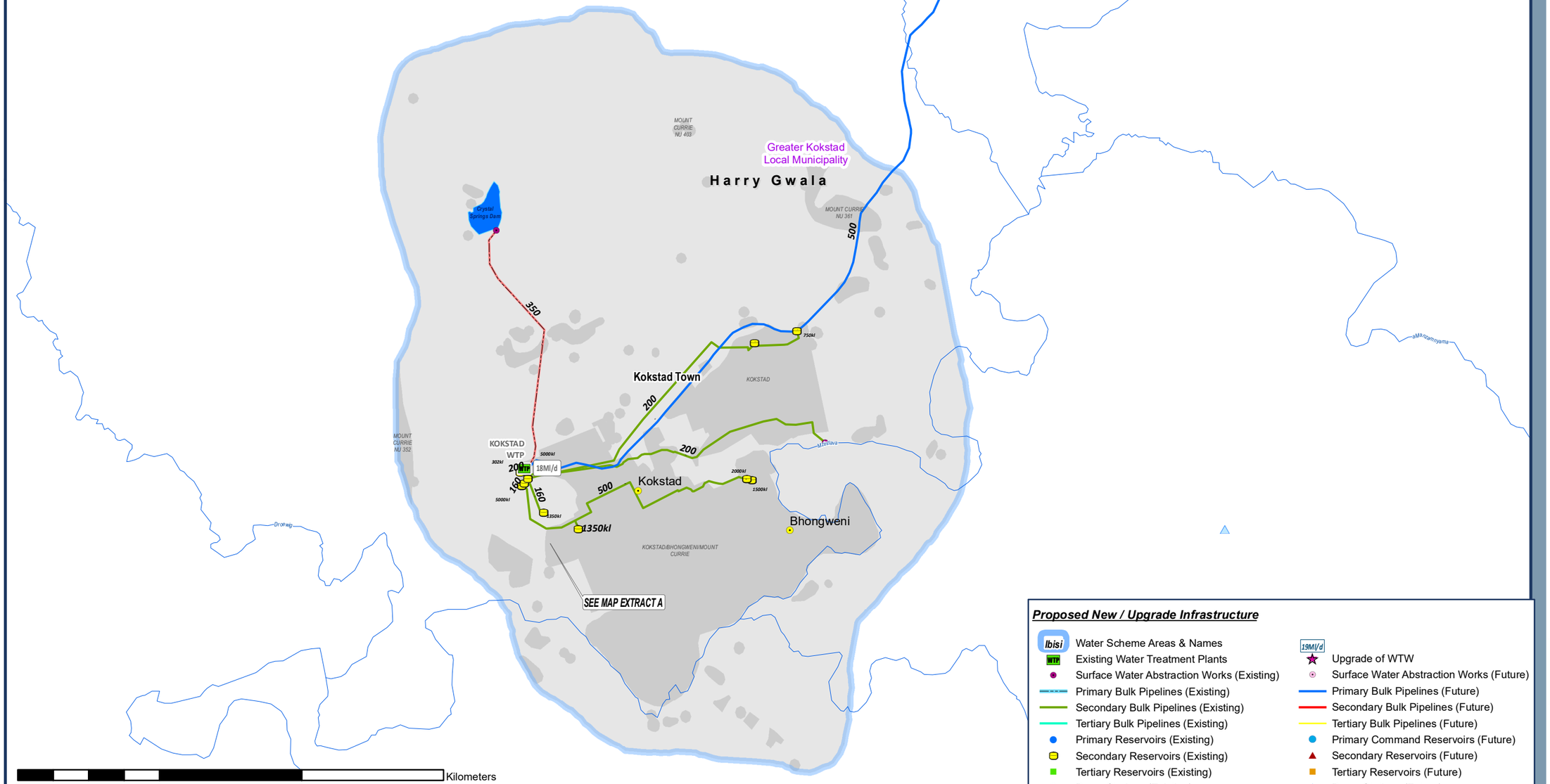
The bulk cost requirement for Kokstad Town WSIA is summarised within **Table 9-36** below.

Table 9-36: Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (excl VAT)
Primary	R2 329 694 586.53	R232 969 458.65	R2 562 664 045.18
Secondary	R0.00	R0.00	R0.00
Tertiary	R0.00	R0.00	R0.00
Total	**R2 329 694 586.53**	**R232 969 458.65**	**R2 562 664 045.18**

The total bulk cost requirement for the Kokstad Town Scheme is R 2 562 664 045.18 (excl VAT). The scheme development cost per household is approximately R 133 600.



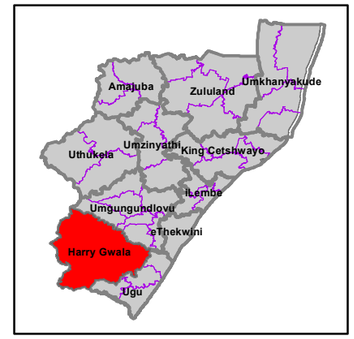


N

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

MUNICIPALITY:

HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - HG019: Kokstad Town
Harry Gwala District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 43 Figure 9-40

Proposed New / Upgrade Infrastructure

- Water Scheme Areas & Names
- Existing Water Treatment Plants
- Surface Water Abstraction Works (Existing)
- Primary Bulk Pipelines (Existing)
- Secondary Bulk Pipelines (Existing)
- Tertiary Bulk Pipelines (Existing)
- Primary Reservoirs (Existing)
- Secondary Reservoirs (Existing)
- Tertiary Reservoirs (Existing)
- Pump Stations (Existing)
- Upgrade of WTW
- Surface Water Abstraction Works (Future)
- Primary Bulk Pipelines (Future)
- Secondary Bulk Pipelines (Future)
- Tertiary Bulk Pipelines (Future)
- Primary Command Reservoirs (Future)
- Secondary Reservoirs (Future)
- Tertiary Reservoirs (Future)
- Pump Stations (Future)

Kilometers
2 1 0 2 4

N

To kwaMakhoba scheme

110

500

500

500

Singisi Dam

FRANKLIN WTW

WTP

Franklin

12 Ml

3kl

8kl

Umzimkhulu Local Municipality

KWANJUNGA WTP

WTP

Harry Gwala

Greater Kokstad Local Municipality

Crystal Springs Dam

KOKSTAD WTP

WTP

Kokstad

Bhongweni

Elandskuil Dam

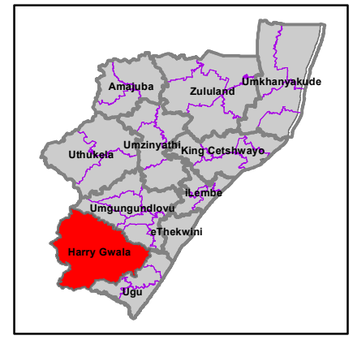
Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements (Ncxola)
- Major Towns (Hilton)

Proposed New / Upgrade Infrastructure

- Water Scheme Areas & Names (Eston)
- Existing Water Treatment Plants (WTP)
- Surface Water Abstraction Works (Existing)
- Primary Bulk Pipelines (Existing)
- Secondary Bulk Pipelines (Existing)
- Tertiary Bulk Pipelines (Existing)
- Primary Reservoirs (Existing)
- Secondary Reservoirs (Existing)
- Upgrade of WTW (19Ml/d)
- Surface Water Abstraction Works (Future)
- Primary Bulk Pipelines (Future)
- Secondary Bulk Pipelines (Future)
- Tertiary Bulk Pipelines (Future)
- Primary Command Reservoirs (Future)
- Secondary Reservoirs (Future)

LOCALITY:



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CONSULTANTS

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Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - HG018: Kokstad Town

Harry Gwala District Municipality

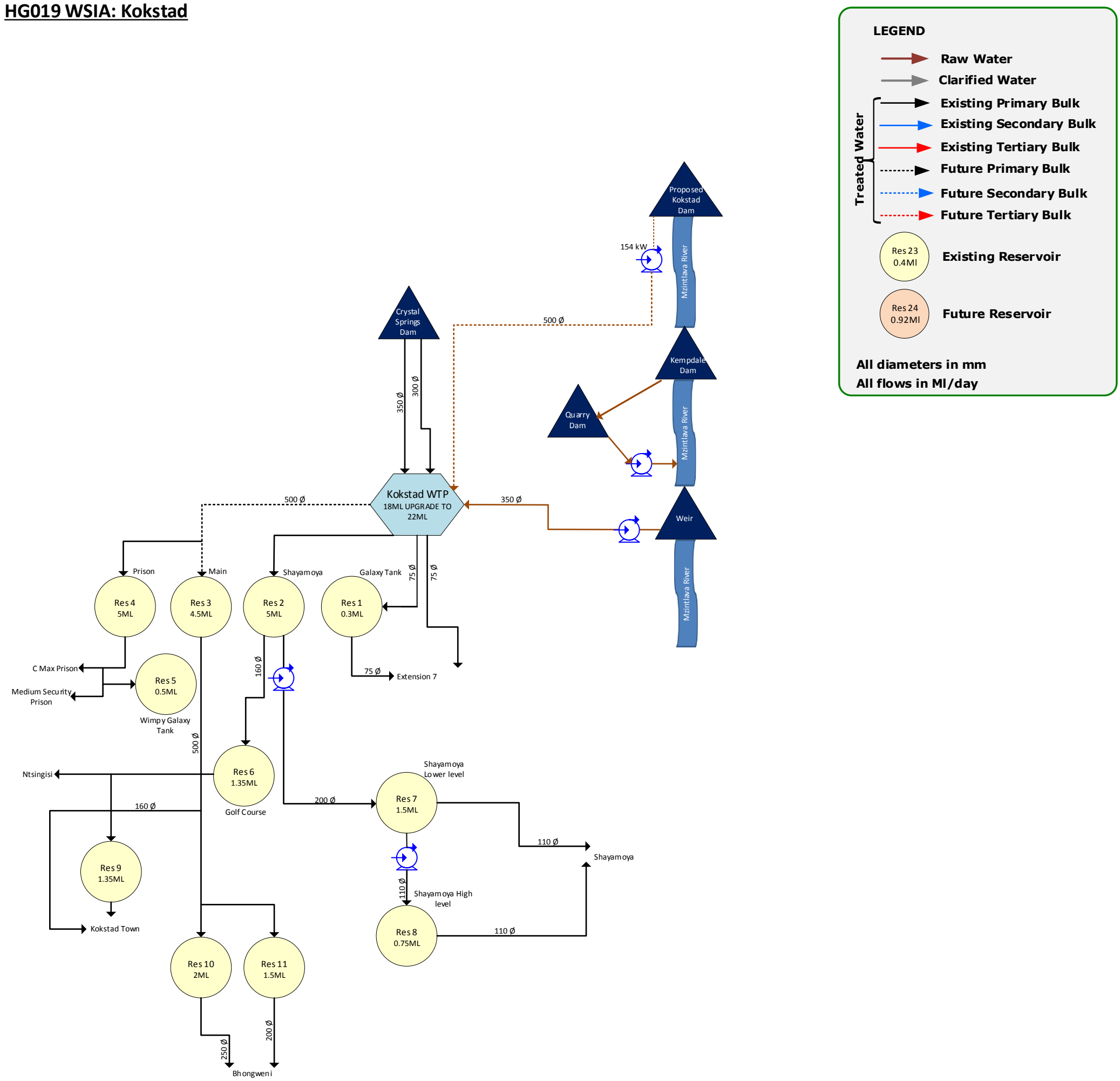
DATE COMPLETED:

January 2021

MAP NO.:

DC 43 Figure 9-41

Figure 9-42
HG019 WSIA: Kokstad



9.20 HG020 WSIA: PAKKIES-WILLOWDALE SCHEME

9.20.1 Demand Model Intervention

9.20.1.1 Water Demand

The water demand for the Pakkies-Willowdale Scheme was determined for 2020 and 2050 and included within **Table 9-37** below.

Table 9-37: Population and Water demand 2020 and 2050 for the Pakkies-Willowdale WSIA

Population	**Population 2020**	**Population 2050**
	2 589	3 313
Water Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	0.45	0.61

9.20.1.2 Water Resource Consideration

The scheme is currenty supplied by localized sources. The proposed dam on the Mzintlava River, highlighted in the UAP Phase II study and in the previous section (9.19), was found to be a possible supply option for the Pakkies-Willowdale Scheme. The yield of the dam is unknown therefore a water resource assessment will need to be undertaken for the dam in order to ascertain if the dam yield will be sufficient to cater for the 2050 demand for the schemes that it will supply.

9.20.2 Water Supply Infrastructure

9.20.2.1 Bulk conveyance and Storage

As detailed in Section 9.19, the Kokstad Dam identified within the UAP Phase II study will be used as an intervention to augment the supply of raw water to the Kokstad Town Scheme Area. Potable water from the Main Reservoir at Kokstad town is proposed to supply the Pakkies-Willowdale Scheme Area via a 90 mm ø rising main (power rating 42 kW). The rising main will supply the proposed command reservoir (1 783m) and will distribute supply to the Pakkies A & B areas via ø 75 mm secondary bulk mains.

9.20.2.2 Proposed Interventions

The following proposed intervention, infrastructure upgrades or augmentation will be required in order to adequately supply the Pakkies-Willowdale WSIA and is illustrated within **Figure 9-43** followed by the schematic layout of the WSIA within **Figure 9-44**.

- ✓ The Kokstad dam proposed within the UAP Phase II study needs to be investigated to confirm if the yield of the proposed dam can meet the 2050 demand (both Kokstad town and Pakkies-Willowdale);

- ✓ The proposed WTP needs to be upgraded to 22 Mℓ/day to meet the 2050 demand for both schemes; and
- ✓ The proposed primary, secondary and tertiary bulk mains is required to cater for the 2050 capacity.
- ✓ The proposed secondary storage is required.

Design details of all the infrastructure components are provided within **Annexure B**.

9.20.3 Financial Requirements

The bulk cost requirement for Pakkies-Willowdale WSIA is summarised within **Table 9-38** below.

Table 9-38: Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (excl VAT)
Primary	R8 100 000.00	R810 000.00	R8 910 000.00
Secondary	R28 572 187.89	R2 857 218.79	R31 429 406.68
Tertiary	R6 873 095.00	R687 309.50	R7 560 404.50
Total	**R43 545 282.89**	**R4 354 528.29**	**R47 899 811.18**

The total bulk cost requirement for the Pakkies-Willowdale Scheme is R 47 899 811.18 (excl VAT). The scheme development cost per household is approximately R 58 000.

Kilometers
3 1,5 0 3 6

N

Kokstad Town

Crystal Springs Dam

18Ml/d 22Ml/d
KOKSTAD WTP
4500kl

Kokstad

Bhongweni

Greater Kokstad Local Municipality

90

Harry Gwala

Umzimkhulu Local Municipality

MOUNT CURRIE NU 361

Pakkies - Willowdale

PAKKIES FARM

300kl
75
10kl
10kl
300kl
10kl
10kl
75
5kl
10kl
600kl
10kl

THUTHUKANE

MOUNT CURRIE NU 352

Ugu

Mishini

Alfred Nzo

Brooks Nek

Proposed New / Upgrade Infrastructure

Pakkies Water Scheme Areas & Names	19Ml/d Upgrade of WTW
WTP Existing Water Treatment Plants	Surface Water Abstraction Works (Future)
Surface Water Abstraction Works (Existing)	Primary Bulk Pipelines (Future)
Primary Bulk Pipelines (Existing)	Secondary Bulk Pipelines (Future)
Secondary Bulk Pipelines (Existing)	Tertiary Bulk Pipelines (Future)
Tertiary Bulk Pipelines (Existing)	Primary Command Reservoirs (Future)
Primary Reservoirs (Existing)	Secondary Reservoirs (Future)
Secondary Reservoirs (Existing)	Tertiary Reservoirs (Future)
Tertiary Reservoirs (Existing)	Pump Stations (Future)
Pump Stations (Existing)	

Legend

- Provinical Boundaries
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- Settlements (Ncxola)
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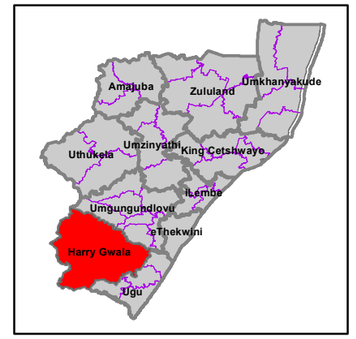
LOCALITY:



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CONSULTANTS

Project No.: 27814

MARISWE
JTN CONSULTING

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - HG020: Pakkies-Willowdale
Harry Gwala District Municipality

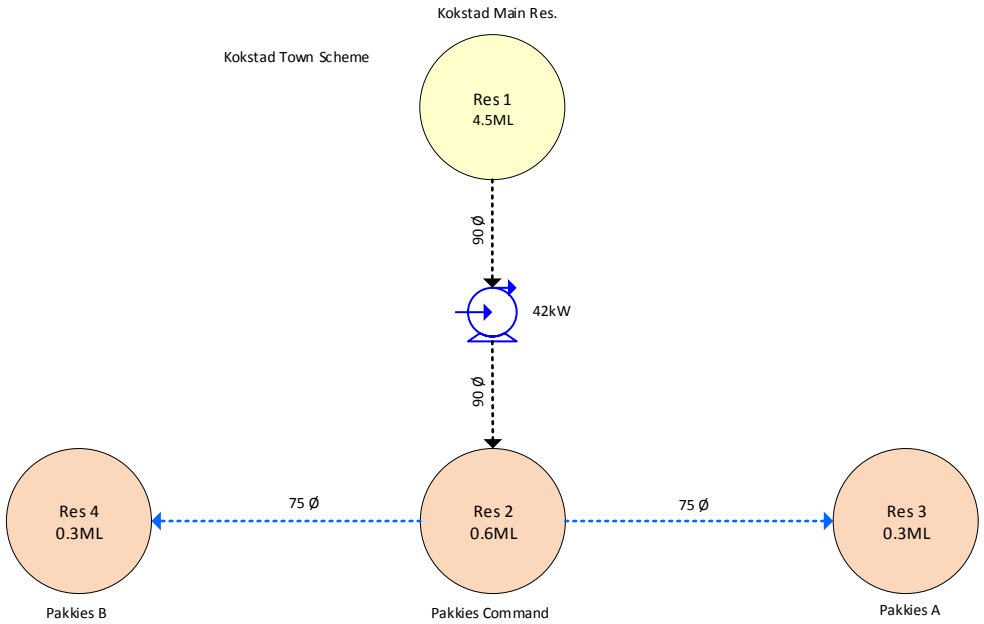
DATE COMPLETED:

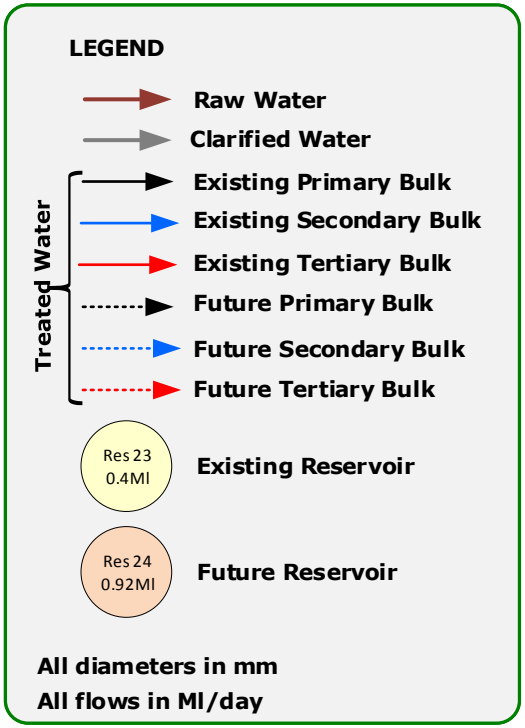
January 2021

MAP NO.:

DC 43 Figure 9-43

Figure 9-44
HG020 WSIA: Pakkies





9.21 HG0021 WSIA: NEW BIGGEN REGIONAL BULK WATER SUPPLY SCHEME

A detailed feasibility study for water supply to the Mzimkhulu Local Municipality was completed by Umgeni Water in 2018. The proposed Umzimkhulu Bulk Regional Water Supply Scheme (EVN Africa, 2018) consists of an earth fill dam, New Biggen Dam, and a water treatment plant at the edge of the dam and bulk distribution pipelines.

The Dam has the potential to supply other areas outside the Mzimkhulu Local Municipality and possibly the entire Harry Gwala District as well as areas in the Umgungundlovu, Msunduzi and Ugu District Municipalities. The yield of the proposed dam will however be a constraint on how far the scheme could be extended.

For the purposes of this report the name *New Biggen Regional Bulk Water Supply Scheme* has been adopted.

9.21.1 Demand Model Intervention

9.21.1.1 Water Demand

The 2050 demand on the New Biggen Dam for the proposed New Biggen Bulk Regional Water Supply Scheme for all the proposed supply areas including the Msunduzi, Umgungundlovu and Ugu District Municipalities is estimated at 246 Mℓ/day. As the proposed dam has currently only been sized for 95.23 Mℓ/day, and in order to extend supply beyond the original intended area, the possibility of increasing the yield of New Biggen Dam to 246 Mℓ/day will have to be investigated.

9.21.1.2 Water Resource Consideration

As per the EVN Africa report, the dam was sized to have a capacity of 8.206 x 10^6 m^3 and a yield of 95.23 Mℓ/day, which at the time when the UAP Phase II study was undertaken, was the projected water demand for the HGDM. The proposed WTP approximately 350m downstream of the dam wall will have a treatment capacity of 52 Mℓ/day, and a network of pipelines, pump stations and reservoirs that would essentially supply the Umzimkhulu Local Municipality. (EVN Africa, 2018)

It is recommended that a detailed hydrological study be undertaken to determine if the yield of the proposed New Biggen Dam could be increased. Only then can the interventions proposed in this chapter be implemented. Apart from the investigation to increase the size of the impoundment at the recommended site, which could have environmental, social or other technical challenges, other options that could be investigated would include:-

- ✓ A smaller impoundment/ weir downstream at the original proposed new Biggen Dam site with a raw water pumping scheme back to the recommended dam site for the Umzimkhulu Bulk Regional Water Supply scheme, and,

- ✓ An upstream impoundment at another proposed dam site closer to Underberg town for raw water releases into the main dam to augment raw water abstraction potential at the proposed dam.

It is also recommended that a detailed feasibility be undertaken to investigate the possibility of an inter-catchment raw water transfer from the Mkhomazi catchment to the Mgeni catchment to address the projected 2050 water deficit. Possible options to be investigated would include:-

- ✓ The Smithfield Dam to Midmar Dam raw water transfer; and
- ✓ Development of a water source on the upper Mzimkhulu River catchment (New Biggen Dam) for an inter-catchment transfer to the Mkhomazi System to augment this as well as the Upper Mgeni system. The three (3) sites for the proposed New Biggen Dam will require environmental, social and land investigations. As this dam is a long-term option to augment the raw water resources of the Mkhomazi and Upper Mgeni system, Umgeni Water should start the process of addressing the environmental, social and land issues now.

9.21.2 Water Supply Infrastructure

In order to present the proposed scheme's infrastructure and the extent that it could cover, it was decided to divide the possible supply from the New Biggen Regional Bulk Water Supply Scheme into projects which could supply the following existing or proposed scheme areas:

- ✓ Greater Kilimon Scheme
- ✓ Kukhulela Scheme
- ✓ Centocow Scheme
- ✓ Greater Riverside Scheme
- ✓ Nsingizi Scheme
- ✓ Lourdes Scheme
- ✓ S.t Barnabas Scheme
- ✓ Greater Njunga Scheme
- ✓ Ibisi-Machunwini Scheme
- ✓ Ibisi-Kokshilli Scheme
- ✓ Greater Summerfield
- ✓ Mnqumeni Scheme
- ✓ Machunwini Scheme
- ✓ Pakkies-Willowdale
- ✓ Underberg Scheme
- ✓ Himeville Scheme
- ✓ Greater Bulwer/Donnybrook Regional Water Supply Scheme

- ✓ Greater Mbulelweni Scheme
- ✓ Ufafa Scheme
- ✓ Chibini Scheme
- ✓ Mkhunya Scheme
- ✓ Supply to Ixopo Town
- ✓ Nokweja Scheme
- ✓ Greater Mhlabashane Scheme.
- ✓ Harding Town and Weza Supply area (Umuziwabanthu LM) (Ugu DM)
- ✓ Possible extension to Izingolweni & Umtamvuna WTP (Ugu DM)
- ✓ Harding/Weza Scheme, Pungashe/Mhlabashane Scheme, Umzimkhulu/Bhobhoyi Scheme and Umtamvuna Scheme areas (Ugu DM)
- ✓ Mhlabashane Sub-Regional Scheme (Ugu DM)
- ✓ Port Shepstone (Ugu DM)
- ✓ Impendle & Vulindlela Sub-regional Schemes (UMDM)

The scheme along with its projects are illustrated within **Figure 9-45** followed by the schematic layout of the WSIA within **Figure 9-46**.

9.21.2.1 Proposed Interventions

9.21.2.2 Project 1: Umzimkhulu Regional Water Supply Scheme

To supply the: Greater Kilimon Scheme, Kukhulela Scheme, Centocow Scheme, Greater Riverside Scheme, Nsingizi Scheme, Lourdes Scheme, St. Barnabas Scheme, Greater Njunga Scheme, Ibisi-Machunwini Scheme, Ibisi-Kokshilli Scheme, Greater Summerfield Scheme, Mnqumeni Scheme, Harding/Weza Scheme and Umtamvuna Scheme

The bulk water supply from the proposed New Biggen WTP will require water to be pumped by three booster pumps through a DN750, 13 km long rising main to Command Reservoir A. From Command Reservoir A, water will be supplied to two principal areas, namely, the Greater Kilimon Region and the district of Umzimkhulu.

Project 1 will have to be further broken down into sub projects for bulk, secondary bulk and reticulation projects to allow phased implementation according to funding availability for the Umzimkhulu Regional Bulk Water Supply and feasibility of further extensions into the Ugu DM.

The feasibility of a DN 1200, 93 km trunk main from Command Reservoir A to the Kwanongidi Reservoir will have to be investigated to provide capacity for supply to Harding, Weza, Izingolweni and Umtamvuna.

From the proposed Kwanongidi Reservoir on the Umzimkhulu Regional Bulk Water Supply Scheme (elevation 1323m), supply under gravity will be possible to augment the current water supply to Harding. A proposed DN1200, 23 km pipeline will convey water from the Kwanongidi Reservoir to the existing Harding WTP command reservoir at an elevation 924m.

Additional storage of 18 Mℓ/day will be required to meet the 2050 demand and to be able to supply water to the Weza WTP.

A proposed DN1000, 13 km off take on the Kwanongidi to Harding pipeline will allow supply to the Weza area and remainder of the uMuziwabanthi LM by linking to the Weza WTP potable water storage.

A further off take on the Kwanongidi Reservoir to the Weza pipeline could supply the Izingolweni area as well as link to the Umtamvuna WTP water storage to augment supply when necessary to the Umtamvuna WTP supply footprint as far as Port Edward.

A 22km pipeline from Izingolweni along the N2 could link the New Biggen Regional Bulk Water Supply Scheme to the Bhobhoyi WTP thereby augmenting supply to this plant and is supply footprint in Port Shepstone.

As mentioned earlier in this section, depending on final feasibility and funding, these links will have to be broken down into sub projects.

9.21.2.3 Project 2: Supply to Underberg, Augmentation of the Greater Bulwer/Donnybrook Regional Scheme (Underberg Scheme and Himeville Scheme) and Bulk Storage for other phases

A proposed DN1000 diameter pipeline, in an easterly direction along the P320 road and then the R617 with a total length of 20 km, is intended to convey water from the proposed New Biggen WTP (elevation 1 482m) to the proposed Stephen Dlamini Command Reservoir (elevation 1 665m) on the Greater Bulwer/Donnybrook Regional Scheme.

The Stephen Dlamini Command reservoir is strategically placed to allow bulk water supply to downstream water users in the Umgungundlovu DM, the remainder of the Harry Gwala DM as well as Ugu DM. These possible supply areas and links to existing schemes are described in some of the following phases of the proposed New Biggen Regional Bulk Water Supply Scheme.

A DN160, 32 km long off take on the New Biggen WTP to Stephen Dlamini Command Reservoir will allow supply to the Underberg Terminal Reservoir positioned at 1604m.

Additional long storage of 81 Mℓ/day will be required to meet the 2050 demand and to be able to supply water to Ugu, Umgungundlovu and the remainder of the Harry Gwala DM's. This storage could be upgraded in phases as the water demand increases.

9.21.2.4 Project 3: Augmentation of Greater Bulwer/Donnybrook (Bulwer Town, Gala Area, Greater Mbulelweni Scheme, Chibini Scheme and Ufafa Scheme)

Project 3 of the proposed New Biggen Regional Bulk Water Supply Scheme links to and augments the Greater Bulwer/Donnybrook regional Water Supply Scheme that is currently under construction. This scheme will be supplied with water conjunctively from the proposed Stephen Dlamini Dam and the existing Comrie Dam.

Extending the proposed infrastructure in the Greater Bulwer/Donnybrook Regional Scheme viz, the Stephen Dlamini Command Reservoir (with storage upgrades) as well as bulk pipelines will further provide bulk storage as well as bulk water transfers to other projects of the proposed New Biggen Regional Bulk Water Supply Scheme.

Project 3 is broken down into two sub projects and are as follows:

9.21.2.4.1 Project 3A: Augmentation of Greater Bulwer/Donnybrook Scheme (Bulwer Town, Gala Area and Greater Mbulelweni Scheme) - Currently in construction

The water supplied from the New Biggen WTP will augment supply that will be provided by the Stephen Dlamini Dam for the Greater Bulwer/Donnybrook Regional Water Supply Scheme that is currently under construction.

A DN700 pipeline from the Proposed Stephen Dlamini Command Reservoir will link to Comrie Dam. Consumers on route would be supplied from this pipeline via secondary and tertiary storage reservoirs.

Another WTP is planned at the Comrie Dam with the intention to make conjunctive use of Stephen Dlamini Dam and Comrie Dam to supply the Greater Bulwer Donnybrook Regional Water Supply Scheme. The intention is to augment raw water supply to the scheme via an inter-basin raw water transfer from the future proposed Smithfield Dam. (AECOM, 2015)

The proposed New Biggen to Stephen Dlamini - Comrie Dam WTP link could be viewed as an alternative to the uMkhomazi - Comrie inter-basin raw water transfer to secure water resources for the Greater Bulwer/Donnybrook Scheme. The added advantage is that the New Biggen option will provide potable water that could allow either limited use or mothballing of the Comrie Dam WTP.

9.21.2.4.2 Project 3B: Supply to Remainder of Greater Bulwer/Donnybrook and bulk Storage for downstream users

As previously highlighted, within the UAP Phase II study the Harry Gwala DM was divided into a number of supply zones (**Figure 9-1**). The Greater Bulwer/Donnybrook Regional Water Supply Scheme covers Zones 15, 16, 17 and 18 and will provide bulk storage for the remaining Zones 19 and 20 in Ubuhlebezwe LM. (Chibini Scheme and Ufafa Scheme)

As part of the Greater Bulwer/Donnybrook Regional Water Supply Scheme, a DN700 pipeline is planned from the proposed Comrie Dam Command Reservoir (1 314m). This pipeline together with offtakes will supply Zones 16, 17 and 20. The bulk pipeline will terminate at the proposed Mariathal Reservoir (1 264m). Additional storage of 45 Mℓ/day will be required to meet the 2050 demand and be able to supply downstream users.

Note: As discussed in Section 9.1.1.3.1, a WTP is planned at Comrie Dam to augment supply from Stephen Dlamini Dam.

9.21.2.5 Project 4A: Supply to the Vulindlela Sub Regional Scheme - UMDM

Note: Whilst Projects 4A & 4B supply areas are outside of the Harry Gwala DM, it was decided to present these options in this report so that the reader will get an idea of the extent and entire footprint of the proposed New Biggen Regional Bulk Water Supply Scheme.

The Vulindlela Sub Regional Scheme is currently supplied from the Upper Mgeni System. Bulk water supply to this scheme is currently being upgraded and is discussed in Section 8 within the UAP Phase III study for the Umgungundlovu DM.

Should it be necessary to either augment supply or shed load from the Mgeni System to the proposed Umzimkhulu System at some point in the future, this will be possible via linkage to the New Biggen Regional Bulk Water Supply Scheme at the Stephen Dlamini Command Reservoir (1665m) to the existing Vulindlela Sub Regional Scheme.

Vulindlela Reservoir 5 is situated at 1489m. This is the terminal bulk reservoir and is positioned at the highest elevation within the Vulindlela System. Reservoir 5 currently provides bulk storage to seven (7) downstream reservoirs.

A link to this reservoir from the New Biggen Regional Bulk Water Supply Scheme will not only allow supply to the seven (7) downstream reservoirs that Reservoir No. 5 currently supplies. It will also be possible to supply all of the other eleven (11) current upstream reservoirs on the Vulindlela System, via reverse flow under gravity to bulk storage Reservoirs 1 to 4.

This will eliminate the need for pumping to Reservoirs 1, 2 & 5 from Groenekloof and Howick-West Pump Stations.

It will be possible to supply water under gravity as far back as the Groenekloof and Howick-West Reservoirs from Vulindlela Reservoir 5. This could either augment, shed load or reduce supply risk failure to current Umgungundlovu & Msunduzi consumers as there will be option of supply from either the Mgeni or Umzimkhulu Systems.

A proposed 700 mm diameter pipeline with the total length of 65 km will convey water from Stephen Dlamini Command Reservoir to Vulindlela Reservoir 5 at elevation 1 489m. A break pressure tank and a booster pump station will be required across the uMkhomazi valley to allow for water transfer to Vulindlela Reservoir 5.

Whilst the length of pipeline required to link the Umzimkhulu and Mgeni Systems may be considerable, it is possible to supply the entire Impendle LM en route. There will also be considerable savings in pumping costs from Midmar Dam to Groenekloof and the current Vulindlela System (Upper Mgeni System) if supply to Vulindlela Reservoir 5 from the New Biggen System proves feasible.

An economic analysis of the two options taking supply risk management into account as well as potential supply to Impendle LM will confirm the feasibility of Project 4A.

NOTE: An option to supply Impendle LM from Vulindlela Reservoir 5 is presented in the Umgungundlovu DM UAP Phase III Study. Should this option prove feasible, a section of the infrastructure that will be required to link the New Biggen Regional Scheme to Vulindlela Reservoir 5 will have to be constructed. Consideration should therefore be given in the design hydraulics and infrastructure sizing to allow for flow from Stephen Dlamini Command Reservoir to both Impendle LM and Vulindlela Reservoir 5 via reverse flow.

9.21.2.6 Project 4B: Impendle Sub Regional Scheme - UMDM

In order to supply water to the entire Impendle LM, a 13km long, 500 mm diameter pipeline will be required as an offtake from the proposed pipeline presented in Project 4A.

The bulk pipeline to supply the Impendle Regional Scheme will terminate at a proposed Command Reservoir at elevation 1 673m. From this point it will be possible to supply the entire Impendle LM.

9.21.2.7 Project 5 (Chibini Scheme, Ixopo Town, Greater Mhlabashane Scheme and Mkhunya Scheme)

Project 5 of the proposed New Biggen Regional Bulk Water Supply Scheme will cover Supply Zones 20 and 21 (southern section of the Greater Bulwer/Donnybrook, Greater Mahlabashane and the Nokweja Scheme) including supply to the Ixopo Town.

The Greater Bulwer Donnybrook Scheme bulk water pipeline will terminate at the Mariathal Reservoir (1264m). From this reservoir it will be possible to supply water under gravity to the remainder of the supply

zones in HGDM as well as into Ugu DM. It will also be possible to augment existing schemes and infrastructure en route.

Water will be conveyed from Mariathal Reservoir through the proposed DN700 diameter pipeline with a total length of 44 km to the proposed Mhlabashane Command Reservoir (955m).

Several off-takes are proposed along this pipeline to the Mhlabashane Reservoir and are highlighted below:

9.21.2.7.1 Project 5A Mariathal Reservoir to Ixopo Reservoir (Chibini Scheme and Greater Mhlabashane Scheme)

A proposed 500 mm diameter off take, at chainage 9.2 km, on the 44km long DN700 diameter pipeline from the Mariathal Reservoir to the Mahlabashane Command Reservoir will supply the existing Ixopo Reservoir (1 134m) and augment supply to Ixopo Town. From this reservoir, Zone 21 (Greater Mahlabashane and part of the Nokweja Scheme), including Hopewell, could be supplied.

9.21.2.7.2 Project 5B (Mkhunya Scheme)

A proposed DN300 diameter off take, at chainage 22.9 km, on the 44km long DN700 diameter pipeline from the Mariathal Reservoir to the Mahlabashane Command Reservoir will supply the existing Mandlekazi Reservoir (881m) and proposed Bhobho Reservoir (834m). These reservoirs will supply Zone 22 (Mkhunya Scheme Area).

9.21.2.7.3 Project 5C (Mkhunya Scheme)

A proposed DN300 off take, at chainage 36.4 km, on the 44km long DN700 diameter pipeline from the Mariathal Reservoir to the Mahlabashane Command Reservoir will supply the existing Hlokozi Reservoir (1 048m). The entire Hlokozi area (Zone 21) would be supplied from this reservoir via existing reticulation.

9.21.2.7.4 Project 5D (Nokweja Scheme)

A proposed DN300 off take, at chainage 24.8 km, on the 44km long DN700 diameter pipeline from the Mariathal Reservoir to the Mahlabashane Command Reservoir will supply the existing Bovini Reservoir (1 083m). Zone 21 would be supplied from this reservoir.

9.21.2.7.5 Project 5E (Mkhunya Scheme)

A proposed DN300 off take, at chainage 31.2 km, on the 44km long DN700 diameter pipeline from the Mariathal Reservoir to the Mahlabashane Command Reservoir will supply the existing Somelulwazi Reservoir (1 055m). Zone 22 would be supplied from this reservoir.

9.21.2.8 Project 6 (Pungashe/Mhlabashane Scheme - Ugu DM)

The proposed Mhlabashane Command Reservoir (955m) will provide storage for downstream water users in the Ugu DM.

A 10km long DN700 pipeline with a total length of 10 km will link the Mhlabashane Command Reservoir to the existing Mhlabashane WTP storage reservoir as well as any storage reservoirs on the Mhlabashane system en route. This will allow the augmentation of water supply to the Mhlabashane Scheme from the New Biggen Regional Bulk Water Supply Scheme.

9.21.2.9 Project 7 (Pungashe/Mhlanashane Scheme - Ugu DM)

There is an existing 700 mm diameter pipeline from the Mhlabashane WTP to the existing Mehlamnyama Reservoir (527m). Using this pipeline, it will be possible to convey water from the New Biggen Regional Bulk Water Supply Scheme to the Mehlamnyama Reservoir and supply the western areas in the Ugu DM.

Additional storage of 28 Mℓ/day will be required to meet the 2050 demand for downstream users.

9.21.2.10 Project 8 (Pungashe/Mhlabashane Scheme and Umzimkhulu Bhobhoyi Scheme - Ugu DM)

A proposed DN700, 25 km gravity pipeline will eventually link the existing Mehlamnyama Reservoir with the existing Umzimkhulu Reservoir, in Port Shepstone, at an elevation of 127m.

The Umzimkhulu Reservoir is strategic in that it is the main storage from Bhobhoyi WTP. This reservoir provides storage for the greater Port Shepstone area. Additional storage of 22 Mℓ/day will be required at the Umzimkhulu Reservoir to cater for the 2050 demand. A link to the Umzimkhulu Reservoir will therefore allow supply from the Bhobhoyi WTP to be augmented from the New Biggen Regional Bulk Water Supply Scheme.

9.21.2.11 Project 9 (Nokweja Scheme)

The proposed Newcity Reservoir at elevation 835m (Umzimkhulu Regional Bulk from New Biggen Dam) will convey potable water via a proposed DN300, 8 km gravity main to Nokweja WTP at elevation 755m. This will serve as an augmentation option for the existing Nokweja Scheme in Ixopo that is currently abstracting water from the Umzimkhulu River.

Design details of all the infrastructure components are provided within **Annexure B**.

9.21.3 Financial Requirements

The bulk cost requirement for New Biggen Regional Bulk Water Supply Scheme is tabled within **Table 9-39** below.

Table 9-39: Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (excl VAT)
Primary	R9 355 128 046	R935 512 805	R10 290 640 850
Secondary	R701 806 757	R70 180 676	R771 987 433
Tertiary	R14 225 661	R1 422 566	R15 648 228
Total	**R10 071 160 464**	**R1 007 116 046**	**R11 078 276 511**

The total bulk cost requirement for the New Biggen Bulk Regional Water Supply Scheme is R 11 078 276 511 (excl VAT). The scheme development cost per household is approximately R 33 600.

N

Proposed New / Upgrade Infrastructure

- Eston — Water Scheme Areas & Names
- WTP — Existing Water Treatment Plants
- Surface Water Abstraction Works (Existing)
- Primary Bulk Pipelines (Existing)
- Secondary Bulk Pipelines (Existing)
- Tertiary Bulk Pipelines (Existing)
- Primary Reservoirs (Existing)
- Secondary Reservoirs (Existing)
- Tertiary Reservoirs (Existing)
- Pump Stations (Existing)
- 19Ml/d — Upgrade of WTW
- Surface Water Abstraction Works (Future)
- Primary Bulk Pipelines (Future)
- Secondary Bulk Pipelines (Future)
- Tertiary Bulk Pipelines (Future)
- Primary Command Reservoirs (Future)
- Secondary Reservoirs (Future)
- Tertiary Reservoirs (Future)
- Pump Stations (Future)

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Ncxola — Settlements
- Hilton — Major Towns

To UMDM

To UGDM

To UGDM

Greater Mhlangeni WSS

UNDERBERG - HIMEVILLE

UNDERBERG - HIMEVILLE

Himeville

Underberg

Harry Gwala

Umgungundlovu

Mkhambathini

Richmond

BULWER WTP

NEW BIGGEN WTP

COMRIE WTP

Gala

Kukhulela

Greater Kilimon

Greater Bulwer/Donnybrook

Ufafa WSS

Ufafa WSS

Greater Riverside

Mahhehle-Ncakubane

Chibini WSS

Mkhunya Regional Scheme

Ixopo Town

Hopewell - Carriesbrook

Nsingizi - Mkhangala

Lourdes - Ndzombane

Umzimkhulu Town

Nokweja WSS

Greater Mhlabashane

Greater Njunga

GREATER SUMMERFIELD

Mnqumeni

Harding

Franklin

Alfred Nzo

Cedarville

Wynesberg

Khonlweni

Hillside

Makholweni

Protection

Mafefeni

Pamlaville

Mhlangeni

Komkhulu

Lubaleke

KwaVikinduku

Vermiljoenskuil

Mvenyane

Upper Mvenyane

Ludidi

KwaDane

Ntola

Mdakeni

Phikwa

Colana

Siqingeni

Kokstad Town

Bhongweni

Kokstad

Pakkies - Willowdale

Mishini

Brooks Nek

Ugu

uMzumbe

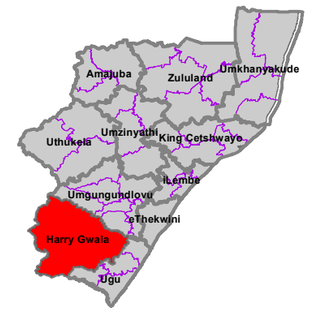
Pumula

Melville

Settlements omitted for Clarity

7 3,5 0 7 14 Kilometers

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

MUNICIPALITY:

HARRY GWALA DISTRICT MUNICIPALITY

CONSULTANTS

Project No.: 27814

MARISWE

JTN CONSULTING

Mariswe
PO Box 25549, Monument Park
Pretoria, 0105

Tel: +27 (0) 12 424 9700
Fax: +27 (0) 12 460 4071
Email: pretoria@uwp.co.za

PROJECT TITLE

Harry Gwala DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - HG021: New Biggen

Harry Gwala District Municipality

DATE COMPLETED:

January 2021

MAP NO.:

DC 43 Figure 9-45

Figure 9-46
HG021 WSIA: New Biggen

Greater Summerfield
St.Barnabas
Greater Riverside
Ibisi
Lourdes
Mnqumeni
Nsingizi
Franklin
Kokstad
Greater Njunga

Mzimkhulu River
Proposed New Biggen Dam
New Biggen Ph 1 WTP
Underburg/Himeville
160 Ø
1200 Ø

Luhane River
Proposed Stephen Dlamini Dam
Stephen Dlamini WTP
1000 Ø
Stephen Dlamini 30 Ml
700 Ø

Greater Bulwer/
Donnybrook
Greater Mahhehle
Greater Mhlabashane
Mkhunya
Nokweja
Centocow
Kukhulela
Ixopo

UMDM SUPPLY AREA

MSUNDUZI SUPPLY AREA

Impendle
10 Ml
500 Ø
700 Ø
Vulindela
18 Ml

Nsingizi Dam
Nsingizi WTP
10 ML
500 Ø
Nsingizi Command 10 ML
500 Ø
Franklin 1.5 Ml
160 Ø
Maranjana R18 1 Ml
500 Ø
Kokstad Res. 30 Ml
90 Ø
Pakkies Res. 0.6 Ml

uMtzimkhulu 15 Ml
1200 Ø
1000 Ø
1000 Ø
Ezigalabeni Res 2.5 Ml
Ndumakude Res 0.25 Ml
200 Ø
Delamuzi 15 Ml
1000 Ø
Korinte Res 3.5 Ml
Gujdini Res. 1 Ml
200 Ø
R19 Res 0.84 Ml
300 Ø
250 Ø
450 Ø
200 Ø
350 Ø
Nongidi 1 Res 2 Ml
Myembe Res 1 Ml
200 Ø
Dumisa Res 0.5 Ml
Nolangeni Res 1 Ml
Siphangen 1.5 Ml
350 Ø
800 Ø
800 Ø
800 Ø
500 Ø
New City Res 10 Ml
Niewjwaarsfontein 1.5 Ml
450 Ø
250 Ø
Mpakameni Res 0.5 Ml
Jabula Res 1 Ml
250 Ø
500 Ø
Sawmill Res 1.5 Ml
450 Ø
Ndakeni Res 0.5 Ml
200 Ø
450 Ø
500 Ø
Mvubukazi Res 3 Ml
450 Ø
Madakeni 2 Ml
Kwapile 2.5 Ml
450 Ø
250 Ø
Takeni Res 0.5 Ml
350 Ø
Ntlangwini Res 0.5 Ml
350 Ø
Tafeni 0.5 Ml
200 Ø
350 Ø
Kromhoek 1 Ml
250 Ø
Gloveester 0.5 Ml
Kwanongidi Res 1 Ml
350 Ø
Kwelemtini Res 2.5 Ml
300 Ø
300 Ø
R7 Res. 2.5 Ml
300 Ø
Maplazini Res 0.5 Ml
200 Ø
Deepdale Res 3 Ml

Thonsini Res 1 Ml
200 Ø
200 Ø
Mfulumane Res 0.5 Ml
Kilimon Scheme Area
Kamlenze 2 Ml
200 Ø
400 Ø
Duzini Res 0.75 Ml
200 Ø
200 Ø
Shayilanga Res 0.5 Ml
Gxalingene Res 2 Ml
200 Ø
East Griqualand 2 Ml
300 Ø
250 Ø
Ndodeni Res 1 Ml
300 Ø
R26 Res 2 Ml
Loretto Res 1 Ml
200 Ø
Kwashusha 1.5 Ml

Mawuleni 5 Ml
315 Ø
315 Ø
Senkwanzela 2 Ml
300 Ø
Vuyizana Res 0.75 Ml
700 Ø
Ngudwini/ Comrie Dam
Ngudwini/ Comrie WTP
PROPOSED SMITHFIELD TO COMRIE DAM RAW WATER TRANSFER
Mkomazi River
Proposed Smith Field Dam
300 Ø
100 Ø
Mahohoho 0.3 Ml
500 Ø
500 Ø
Proposed Sappi 10 Ml
Proposed Sappi 10 Ml
500 Ø
700 Ø
200 Ø
Emnywaneni Res 0.5 Ml
200 Ø
Kwasandaneawe 1 Ml
700 Ø
Masameni Res 2 Ml
200 Ø
Kwasawoti 0.5 Ml
110 Ø
Esikheshini 0.3 Ml
300 Ø
300 Ø
Ufafa 3 Ml
700 Ø
200 Ø
100 Ø
Mariathal Res 10 Ml
Chibini Res 2 Ml
Ntakama Res 0.5 Ml
Mandlekazi Res 2 Ml
700 Ø
300 Ø
Nokweja /Plainhill 3 Ml
200 Ø
500 Ø
Ixopo CR 10 Ml
500 Ø
300 Ø
300 Ø
Bhobho 2 Ml
Hopewell 0.5 Ml
300 Ø
Somelulwazi 0.84 Ml
Bovini 4.5 Ml
300 Ø
300 Ø
Hlokozi 2.5 Ml

UGU DM SUPPLY AREA

Umzimkhulu/Bhobhoyi Scheme

Mhlabatshane 30 Ml
700 Ø
Mhlabatshane WTP
Proposed Mhlabatshane Dam
700 Ø
Mehlonyama 30 Ml
700 Ø
Umzimkhulu CR 30 Ml

Weza WTP
650 Ø
Harding Res 10 Ml
500 Ø
POSSIBLE SUPPLY TO BHOBHOYI
Umtamvuna WTP

Mzimkhulu River
Existing Bhobhoyi WTP

LEGEND

Raw Water
Clarified Water
Treated Water
Existing Primary Bulk
Existing Secondary Bulk
Existing Tertiary Bulk
Future Primary Bulk
Future Secondary Bulk
Future Tertiary Bulk

Res 23 0.4Ml — Existing Reservoir
Res 24 0.92Ml — Future Reservoir

All diameters in mm
All flows in Ml/day

10. CONCLUSIONS

10.1 TOTAL WATER DEMAND PER WATER SUPPLY INTERVENTION AREA (WSIA)

The total water demand per WSIA is detailed within **Table 10-1** below.

Table 10-1: Total Water Demand 2050 per WSIA

WSIA	Population 2020	Population 2050	Water Demand 2020 (Mℓ/d)	Water Demand 2050 (Mℓ/d)
Greater Bulwer/Donnybrook	89 892	115 001	17.83	23.60
Greater Kilimon	29 773	38 091	5.01	6.73
Nokweja	10 451	13 370	1.70	2.30
Greater Mhlabashane	22 909	29 309	3.90	5.25
Mkhunya	21 424	27 409	3.61	4.81
Centocow	13 147	16 820	2.30	3.20
Kukhulela	3 375	4 318	0.60	0.70
Underberg-Himeville	4 977	6 368	1.30	1.80
Greater Summerfield	23 249	29 745	3.80	5.10
St. Barnabas-Chabane	11 346	14 518	1.94	2.70
Greater Njunga	22 237	28 449	3.90	5.15
Greater Riverside	14 446	18 481	2.55	3.46
Ibisi-Machunwini	20 803	26 615	3.60	4.90
Lourdes-Ndzombane	15 971	20 433	2.82	3.80
Mnqumeni	13 945	17 841	2.34	3.12
Umzimkhulu Town	18 477	23 638	3.94	5.24
Nsingizi-Mkhangala	16 043	20 524	2.88	3.85
Franklin	3 965	5 073	0.90	1.17
Kokstad Town	59 957	76 705	16.36	21.36
Pakkies-Willowdale	2 589	3 313	0.45	0.61
New Biggen Bulk Regional Water Supply Scheme	-	-	-	246.00

10.2 Total Water Resources Required vs Proposed Water Supply Interventions (WSI)

The total volume of water required is compared to the existing proposed water supply interventions are tabled within **Table 10-2** below:

Table 10-2: Water Resources Required vs proposed WSI

WSIA	WSIA Name	Population (2050)	2050 Demand (Mℓ/day)	2050 Demand (Mm^3/a)	Existing Resources (Mm^3/a)	Proposed Additional under UAP Phase 3 (Mm^3/a)	Total (Mm^3/a)	Balance (Mm^3/a)
HG001	Greater Bulwer/Donnybrook	115 001	23.6	8.61	3.65	5.11	8.76	0.15
HG002	Greater Kilimon	38 091	6.73	2.46	1.28	1.28	2.56	0.10
HG003	Nokweja	13 370	2.3	0.84	3.65	0.00	3.65	2.81
HG004	Greater Mhlabashane	29 309	5.25	1.92	2.81	0.00	2.81	0.89
HG005	Mkhunya	27 409	4.81	1.76	1.83	0.00	1.83	0.07
HG006	Centocow	16 820	3.2	1.17	0.91	0.91	1.83	0.66
HG007	Kukhulela	4 318	0.7	0.26	0.91	0.00	0.91	0.66
HG008	Underberg-Himeville	6 368	1.8	0.66	1.83	0.00	1.83	1.17
HG009	Greater Summerfield	29 745	5.1	1.86	1.10	1.10	2.19	0.33
HG010	St. Barnabas-Chabane	14 518	2.7	0.99	1.10	0.00	1.10	0.11
HG011	Greater Njunga	28 449	5.15	1.88	1.10	1.10	2.19	0.31
HG012	Greater Riverside	18 481	3.46	1.26	1.46	0.00	1.46	0.20
HG013	Ibisi-Machunwini	26 615	4.9	1.79	1.83	0.00	1.83	0.04
HG014	Lourdes-Ndzombane	20 433	3.8	1.39	1.83	0.00	1.83	0.44
HG015	Mnqumeni	17 841	3.12	1.14	0.00	1.46	1.46	0.32
HG016	Umzimkhulu Town	23 638	5.24	1.91	5.11	0.00	5.11	3.20
HG017	Nsingizi-Mkhangala	20 524	3.85	1.41	0.00	3.65	3.65	2.24
HG018	Franklin	5 073	1.17	0.43	0.08	3.57	3.65	3.22
HG019	Kokstad Town	76 705	21.36	7.80	6.57	1.46	8.03	0.23
HG020	Pakkies-Willowdale	3 313	0.61	0.22	0.00	8.03	8.03	7.81
HG021*	New Biggen Bulk Regional Water Supply Scheme	-	246	89.79				
TOTAL		**536 021**	**108.85**	**39.73**	**37.02**	**27.66**	**64.68**	**24.95**
*** The New Biggen BRWSS is not included in the final totals as it is proposed as an intervention to supply the entire DM.**								

From **Table 10-2** above, it is noted all the schemes will have adequate raw water resources after upgrades/interventions to meet the 2050 demand requirements. The feasibility studies for the proposed resources and, in addition, the implementation of the New Biggen Bulk Regional Water Supply Scheme should be prioritised.

10.3 Summary of Total Bulk Water Infrastructure Requirements per WSIA

A summary of the total bulk water infrastructure requirements per proposed WSIA is provided within the tables and pages hereafter.

10.3.1 HG001: Greater Bulwer/Donnybrook WSIA

Table 10-3: WSIA Summary for the HG001: Greater Bulwer/Donnybrook WSIA

Greater Bulwer/DonnybrookScheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTP	Various	Regional Bulk	0	0
		WTP	Various	Internal Bulk	1	2.5
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	6	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	286.82
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	57.24
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	73	2.2 kl to 500 kl
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	WTP	UNDERBERG	Internal Bulk	-	24
		Bulk Pipelines		Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	8
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	1	30000 kl to 30000 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	Primary PS	Primary Bulk	-	161

10.3.2 HG002: Greater Kilimon WSIA

Table 10-4: WSIA Summary for the HG002: Greater Kilimon WSIA

Greater Kilimon Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTP	Various	Regional Bulk	0	0
		WTP	Various	Internal Bulk	0	0
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	0	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	34.73
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	3.32
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	27	2.5 kl to 500 kl
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	WTP	Greater Kilimon	Primary Bulk	-	7
		Bulk Pipelines		Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	69
				Tertiary Bulk	50 ø mm - 110 ømm	9.75
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	13	100 kl to 1000 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	Primary PS	Primary Bulk	-	371
			Primary PS	Primary Bulk	-	12

10.3.3 HG003: Nokweja WSIA

Table 10-5: WSIA Summary for the HG003: Nokweja WSIA

Nokweja Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTP	Various	Regional Bulk	0	0
		WTP	Various	Internal Bulk	1	0.12
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	2	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.01
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	41.48
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	7	5 kl to 420 kl
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	6.3
				Secondary Bulk	160 ø mm - 300 ømm	10
				Tertiary Bulk	50 ø mm - 110 ømm	10.2
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	10	500 kl to 8000 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	Primary PS	Primary Bulk	-	48
			Primary PS	Primary Bulk	-	307
			Primary PS	Primary Bulk	-	9
			Secondary PS	Secondary Bulk	-	70

10.3.4 HG004: Greater Mhlabashane WSIA

Table 10-6: WSIA Summary for the HG004: Greater Mhlabashane WSIA

Greater Mhlabashane Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTP	Various	Regional Bulk	0	0
		WTP	Various	Internal Bulk	2	0.8
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	2	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	4.70
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	2.66
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	3	360 kl to 390 kl
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	49.28
				Tertiary Bulk	50 ø mm - 110 ømm	12.3
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	11	500 kl to 6000 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	Primary PS	Primary Bulk	-	25

10.3.5 HG005: Mkhunya WSIA

Table 10-7: WSIA Summary for the HG005: Mkhunya WSIA

Mkhunya Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTP	Various	Regional Bulk	0	0
		WTP	Various	Internal Bulk	0	0
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	0	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	18.20
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	2.55
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	6	10 kl to 55 kl
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	28.2
				Tertiary Bulk	50 ø mm - 110 ømm	12.2
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	5	500 kl to 5000 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	Primary PS	Primary Bulk	-	493
			Primary PS	Primary Bulk	-	12

10.3.6 HG006: Centocow WSIA

Table 10-8: WSIA Summary for the HG006: Centocow WSIA

Centocow Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTP	Various	Regional Bulk	0	0
		WTP	Various	Internal Bulk	1	0.6
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	1	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	0.00
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	0	0
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	WTP	Centocow	Primary Bulk	-	5
		Bulk Pipelines		Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	0
				Tertiary Bulk	50 ø mm - 110 ømm	6.9
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	5	50 kl to 100 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	Primary PS	Primary Bulk	-	74
			Primary PS	Primary Bulk	-	58
			Primary PS	Primary Bulk	-	23

10.3.7 HG007: Kukhulela WSIA

Table 10-9: WSIA Summary for the HG007: Kukhulela WSIA

Kukhulela Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTP	Various	Regional Bulk	0	0
		WTP	Various	Internal Bulk	0	0
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	0	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	0.00
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	0	
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	5
				Tertiary Bulk	50 ø mm - 110 ømm	10.83
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	5	100 kl to 2000 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	Primary PS	Primary Bulk	-	27
			Primary PS	Primary Bulk	-	25

10.3.8 HG009: Greater Summerfield WSIA

Table 10-10: WSIA Summary for the HG009: Greater Summerfield WSIA

Greater Summerfield Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTP	Various	Regional Bulk	0	0
		WTP	Various	Internal Bulk	1	0.8
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	3	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	2.43
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	9.21
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	3	10 kl to 360 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		WTP	Greater Summerfield	Regional Bulk	-	6
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	31.05
				Tertiary Bulk	50 ø mm - 110 ømm	8.2
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	12	100 kl to 6000 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	Primary PS	Primary Bulk	-	222
			Primary PS	Primary Bulk	-	86

10.3.9 HG010: St. Barnabas-Chabane WSIA

Table 10-11: WSIA Summary for the HG010: St. Barnabas-Chabane WSIA

St. Barnabas Cabhane Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTP	Various	Regional Bulk	0	0
		WTP	Various	Internal Bulk	0	0
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	1	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	0.35
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	7	10 kl to 290 kl
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	29.3
				Tertiary Bulk	50 ø mm - 110 ømm	17.13
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	13	100 kl to 3000 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	Primary PS	Primary Bulk	0,091 M3/s	198
			Secondary PS	Primary Bulk	0,006 M3/s	13

10.3.10 HG011: Greater Njunga WSIA

Table 10-12: WSIA Summary for the HG011: Greater Njunga WSIA

Greater Njunga Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTP	Various	Regional Bulk	0	0
		WTP	Various	Internal Bulk	1	0
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	1	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	11.25
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	15.84
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	17	5 kl to 50 kl
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	3.5
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	0	0
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	Primary PS	Primary Bulk	-	-
			Primary PS	Primary Bulk	-	-

10.3.11 HG014: Lourdes-Ndzombane WSIA

Table 10-13: WSIA Summary for the HG014: Lourdes-Ndzombane WSIA

Lourdes-Ndzombane Scheme (Option 1)						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTP	Various	Regional Bulk	0	0
		WTP	Various	Internal Bulk	0	0
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	6	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	26.56
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	0.83
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	8	70 kl to 200 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		WTP	Lourdes-Ndzombane	Primary Bulk	-	5
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	1
				Secondary Bulk	160 ø mm - 300 ømm	23.5
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	2	4000 kl to 5000 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	Primary PS	Primary Bulk	-	158

Lourdes-Ndzombane Scheme (Option 2)						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTP	Various	Regional Bulk	0	0
		WTP	Various	Internal Bulk	0	0
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	6	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	26.56
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	0.83
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	7	70 kl to 200 kl
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	55.8
				Tertiary Bulk	50 ø mm - 110 ømm	17.9
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	7	100 kl to 4000 kl
			Supply Reservoirs	Tertiary Bulk	-	-

10.3.12 HG015: Mnqumeni WSIA

Table 10-14: WSIA Summary for the HG015: Mnqumeni WSIA

Mnqumeni Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTP	Various	Regional Bulk	2	0.4
		WTP	Various	Internal Bulk	1	0
		Pump Stations	Various	Regional Bulk	1	0
		Pump Stations	Various	Internal Bulk	3	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	26.92
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	0.00
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	3	60 kl to 240 kl
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	24.6
				Tertiary Bulk	50 ø mm - 110 ømm	17.1
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	10	50 kl to 4000 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations				
			Primary PS	Primary Bulk	0,091 M3/s	198
			Secondary PS	Primary Bulk	0,006 M3/s	13

10.3.13 HG016: Umzimkhulu Town WSIA

Table 10-15: WSIA Summary for the HG016: Umzimkhulu Town WSIA

Umzimkhulu Town Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTP	Various	Regional Bulk	0	0
		WTP	Various	Internal Bulk	1	4.7
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	2	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	27.09
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	5	220 kl to 2500 kl
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	2.13
				Secondary Bulk	160 ø mm - 300 ømm	4.64
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	1	4000 kl to 4000 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	Primary PS	Primary Bulk	-	-
			Secondary PS	Primary Bulk	-	-

10.3.14 HG017: Nsingizi-Mkhangala WSIA

Table 10-16: WSIA Summary for the HG017: Nsingizi-Mkhangala WSIA

Nsingizi-Mkhangala Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTP	Various	Regional Bulk	0	0
		WTP	Various	Internal Bulk	0	0
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	0	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.04
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	0.00
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	15	5 kl to 260 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		WTP	Nsingizi	Regional Bulk	-	10
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	4.17
				Secondary Bulk	160 ø mm - 300 ømm	44.3
				Tertiary Bulk	50 ø mm - 110 ømm	18.45
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	11	200 kl to 10000 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	Primary PS	Primary Bulk	-	458
			Primary PS	Primary Bulk	-	54

10.3.15 HG018: Franklin WSIA

Table 10-17: WSIA Summary for the HG018: Franklin WSIA

Franklin Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTP	Various	Regional Bulk	0	0
		WTP	Various	Internal Bulk	1	0.5
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	5	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	0.28
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	5	10 kl to 75 kl
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	0
				Tertiary Bulk	50 ø mm - 110 ømm	64.277
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	5	200 kl to 1500 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	Primary PS	Primary Bulk	-	458
			Primary PS	Primary Bulk	-	54
			Primary PS	Primary Bulk	-	8

10.3.16 HG019: Kokstad Town WSIA

Table 10-18: WSIA Summary for the HG019: Kokstad Town WSIA

Kokstad Town Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Total	**1**	**59 957**	**76 705**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Total	**1**	**16**	**21**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Proposed Mzintlava Dam	82.2	30	Water is sourced from the proposed Mzintlava Dam	
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	WTP	Various	Regional Bulk	0	0
		WTP	Various	Internal Bulk	1	18
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	5	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	6.86
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	0.00
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	9	180 kl to 5000 kl
			Supply Reservoirs	Tertiary Bulk	-	-
4.2	**Future**	Source	Proposed Mzintlava Dam	Primary Bulk	1	30
		WTP	KOKSTAD	Internal Bulk	-	22
		Bulk Pipelines		Primary Bulk	>350	13
				Secondary Bulk	160 ø mm - 300 ømm	0
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	0	0
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	Primary PS	Primary Bulk	-	154

10.3.17 HG020: Pakkies-Willowdale WSIA

Table 10-19: WSIA Summary for the HG020: Pakkies-Willowdale WSIA

Pakkies-Willowdale Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTP	Various	Regional Bulk	0	0
		WTP	Various	Internal Bulk	0	0
		Pump Stations	Various	Regional Bulk	0	0
		Pump Stations	Various	Internal Bulk	0	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	0.00
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	7	5 kl to 10 kl
			Supply Reservoirs	Tertiary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	0
				Tertiary Bulk	50 ø mm - 110 ømm	38.1
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	4	600 kl to 4500 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	Primary PS	Primary Bulk	-	42

10.3.18 HG021: New Biggen Bulk Regional Water Supply Scheme WSIA

Table 10-20: WSIA Summary for the HG021: New Biggen Bulk Regional Water Supply Scheme WSIA

New Biggen Regional Bulk Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
1.1	**Existing**	WTP	Various	Regional Bulk	0	0
		WTP	Various	Internal Bulk	0	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	621.63
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	209.91
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	55	0.05 kl to 5000 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Source	Proposed New Biggen Dam	Primary Bulk	1	95
		WTP	Proposed New Biggen WTP	Primary Bulk	1	24
1.2	**Future**	Bulk Pipelines		Primary Bulk	>350	291.4
				Secondary Bulk	160 ø mm - 300 ømm	75
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	11	2500 kl to 81000 kl
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	Primary PS	Primary Bulk	0,944 M3/s	2807
			Secondary PS	Primary Bulk	0,360 M3/s	81

10.4 FINANCIAL REQUIREMENTS

The financial requirements for the provision of bulk infrastructure per WSIA based on the demand model intervention by 2050 is summarised in the **Table 10-21** below.

Table 10-21: Financial requirements

WSIA	WSIA Name	Total Cost Requirement				
		Primary	Secondary	Tertiary	10% Contingencies	Total Cost (excl VAT)
HG001	Greater Bulwer/Donnybrook	R52 203 000	R67 713 297	R4 843 349	R12 475 965	R137 235 611
HG002	Greater Kilimon	R41 114 000	R154 455 886	R65 511 728	R26 108 161	R287 189 776
HG003	Nokweja	R61 526 979	R87 673 956	R7 896 605	R15 709 754	R172 807 294
HG004	Greater Mhlabashane	R7 250 000	R163 447 510	R27 159 492	R19 785 700	R217 642 702
HG005	Mkhunya	R35 397 000	R70 580 171	R35 391 249	R14 136 842	R155 505 262
HG006	Centocow	R33 405 000	R3 000 000	R1 717 683	R3 812 268	R41 934 951
HG007	Kukhulela	R14 600 000	R21 206 415	R5 107 549	R4 091 396	R45 005 360
HG008	Underberg-Himeville	-	-	-	-	-
HG009	Greater Summerfield	R35 742 000	R94 244 653	R30 025 663	R16 001 232	R176 013 547
HG010	St. Barnabas-Chabane	R26 339 000	R64 337 541	R23 888 026	R11 456 457	R126 021 024
HG011	Greater Njunga	-	R5 194 693	-	R519 469	R5 714 163
HG012	Greater Riverside	-	-	-	-	-
HG013	Ibisi-Machunwini	-	-	-	-	-
HG014	Lourdes-Ndzombane (1)	R27 590 737	R109 460 413	-	R13 705 115	R150 756 266
	Lourdes-Ndzombane (2)		R121 539 915	R84 368 780	R12 153 992	R133 693 907
HG015	Mnqumeni	R28 730 000	R79 368 026	R33 739 345	R14 183 737	R156 021 108
HG016	Umzimkhulu Town		R19 523 622	R4 180 978	R1 952 362	R21 475 984
HG017	Nsingizi-Mkhangala	R73 422 320	R108 067 923	R49 337 931	R23 082 817	R253 910 991
HG018	Franklin	R42 494 000	R15 321 863	R13 543 335	R7 135 920	R78 495 117
HG019	Kokstad Town	R2 329 694 587			R232 969 459	R2 562 664 045
HG020	Pakkies-Willowdale	R8 100 000	R28 572 188	R6 873 095	R4 354 528	R47 899 811
HG021	New Biggen Bulk Regional Water Supply Scheme	R9 355 128 046	R701 806 757	R14 225 661	R1 007 116 046	R11 078 276 511
Total		R12 172 736 669	R1 915 514 830	R407 810 468	R1 440 751 220	R15 848 263 430

A total estimate of approximately R 15.85 billion is required to address the total bulk water supply requirement by 2050.

10.5 Funding Options

The HGDM relies mainly on grant funding programmes to fund their water supply projects. These funding programmes are mainly MIG, RBIG and WSIG. Based on all the current funding streams available to the District Municipality over the MTEF period, it will take a minimum of 30 years for the WSA to address their water supply requirements. Another funding option that the HGDM could consider is loan funding through the Development Bank of Southern Africa (DBSA). Special submissions to National Treasury could also be considered to create an awareness of the DM's planning and implementation readiness.

10.6 Implementation Programme

The implementation programme will depend on the availability of funds from National Treasury as well as the capacity of the Municipality to implement projects. Although all twenty-one (21) area interventions would be an implementation priority for the DM, it is proposed to consider the following three (3) priorities detailed within **Table 10-22**. It is also proposed to follow a phased approach for implementation for e.g. initiate only the upgrade to the WTP at first and then when funding permits, can the bulk conveyance and storage be extended, upgraded or constructed.

However, the order would most likely be determined by the availability of funds or intervention programmes and should be confirmed with the WSA.

Table 10-22: Proposed Implementation Order (Phased Approach)

Proposed Priorities (Phased Approach)	WSIA No and Name		Proposed Project Name	Proposed Estimated Project Value
1	HG021	New Biggen Bulk Regional Water Supply Scheme	Dam development	R11 078 276 511
2	HG019	Kokstad Town	Dam development	R2 562 664 045
3	HG001	Greater Bulwer/Donnybrook	Raw water transfer to augment Stephen Dlamini Dam from the proposed Polela Dam, Smithfield Dam and New Biggen Dam	R137 235 611

The detailed feasibility study of the proposed New Biggen Dam has been completed. The configuration of the planned and existing schemes are such that this dam could provide a secure source of water to many of these schemes. Consideration should therefore be given to implement the New Biggen Dam instead of the Stephen Dlamini Dam for a water source for not only the Greater Bulwer/Donnybrook scheme but also many other schemes in the HGDM as detailed in this report.

11. RECOMMENDATIONS

11.1 RESPONSIBILITIES

The provision of water services remains the responsibility of the HGDM as the WSA. The HGDM should ensure that they meet all the requirements to take these interventions to implementation readiness.

These planning studies are in various stages of readiness to lobby for grant funding and Umgeni Water could consider this as a Regional Utility to assist the HGDM to take this process further.

11.2 SELECTION OF SOLUTIONS

The twenty-one (21) proposed water supply intervention areas (WSIA's) are the appropriate solutions for bulk water supply development within HGDM and are as follows:

- ✓ HG001 WSIA: Greater Bulwer/Donnybrook
- ✓ HG002 WSIA: Greater Kilimon
- ✓ HG003 WSIA: Nokweja
- ✓ HG004 WSIA: Greater Mhlabashane
- ✓ HG005 WSIA: Mkhunya
- ✓ HG006 WSIA: Centocow
- ✓ HG007 WSIA: Kukhulela
- ✓ HG008 WSIA: Underberg-Himeville
- ✓ HG009 WSIA: Greater Summerfield
- ✓ HG010 WSIA: St. Barnabas-Chabane
- ✓ HG011 WSIA: Greater Njunga
- ✓ HG012 WSIA: Greater Riverside
- ✓ HG013 WSIA: Ibisi-Machunwini
- ✓ HG014 WSIA: Lourdes-Ndzombane
- ✓ HG015 WSIA: Mnqumeni
- ✓ HG016 WSIA: Umzimkhulu Town
- ✓ HG017 WSIA: Nsingizi-Mkhangala
- ✓ HG018 WSIA: Franklin
- ✓ HG019 WSIA: Kokstad Town
- ✓ HG020 WSIA: Pakkies-Willowdale
- ✓ HG021 WSIA: New Biggen Bulk Regional Water Supply Scheme

The following three WSI are prioritized for consideration:

- ✓ Priority 1 HG021: New Biggen Bulk Regional Water Supply Scheme - Dam development
- ✓ Priority 2 HG019: Kokstad Town – Dam development
- ✓ Priority 3 HG001: Greater Bulwer/Donnybrook – Raw water transfer to augment Stephen Dlamini Dam from the proposed Polela Dam, Smithfield Dam and New Biggen Dam.

The remainder of the WSI's should be prioritized dependent on budget availability.

11.3 Pertinent Legislation

Various Acts of Parliament make provision for existing or planned institutional structures for management of water resources and water and sanitation services. These are:

- ✓ Current Acts of Parliament: National Water, Water Services, Municipal Structures, Municipal Systems, Division of Revenue Acts; and
- ✓ Existing and proposed policy documents such as The White Paper on Water Services, the Local Government White Paper and the White Paper on Municipal Service Partnerships.

These Acts deal with the management of water resources and the provision of water services. Provision for the bodies listed below is made in these acts:

- ✓ The Catchment Management Agencies (CMA's) which will be established throughout South Africa over the next three years;
- ✓ Water User Associations comprising co-operative associations of individual water users at a restricted local level;
- ✓ National Government;
- ✓ Water Service Authorities comprising District Municipalities or Local Municipalities;
- ✓ Water Boards;
- ✓ Water Service Providers;
- ✓ Provincial Government; and
- ✓ Advisory Committees.

11.3.1 Municipal Structures Act

The Municipal Structures Act (117 of 1997), which was subsequently amended by the Municipal Structure Amendment Act (33 of 2000), addresses the basis for establishing municipalities (Category A,B & C) and stipulates that Category A and C (Metropolitan and District) municipalities are WSA's and the Category B (local) municipalities can only be WSA's if authorised by the Minister of DPLG.

11.3.2 Municipal Systems Act

The Municipal Systems Act (32 of 2000) legislates internal systems and addresses the differences between the authority and the provider functions as well as alternative mechanisms for providing municipal services.

11.3.3 Water Services Act

The Water Services Act (Act 108 of 1997) states that each WSA must for its area of jurisdiction, prepare a Water Services Development Plan (WSDP). Whilst the WSDP is a legal requirement, the real value in preparing the WSDP lies in the need to plan for Water Services (Water Supply and Sanitation Provision) whereby key targets are set over the next five years. At least six WSDP key focus areas need to be addressed during the planning process. These are:

- ✓ Basic Service: Water supply, sanitation, free basic water supply and free basic sanitation;
- ✓ Higher Levels of Service: Water supply, sanitation, associated needs and economic development;
- ✓ Water Resources: Appropriate choice, demand and water conservation management, water resource protection and integrated water resource management;
- ✓ Environmental Issues: Health, natural and social environment;
- ✓ Effective Management: planning, organisational or institutional aspects, management, financial and regulatory aspects; and
- ✓ Transfers: Infrastructure related transfers.

Water services development planning must also be done as part of the IDP process (section 12 (1) (a)) and the WSDP must be incorporated into the IDP (section 15 (5)).

Water Services Authorities must report on the implementation of its WSDP every year i.e. annual performance reporting (section 18).

Water Services Authorities must also comply with applicable regulations including Regulation No. R. 509, Government Gazette No. 22355, 8 June 2001 which requires the inclusion of a Water Services Audit as part of the annual performance report.

The Department must monitor the performance of every water services authority to ensure its compliance with every applicable water services development plan…section 62 (1) (c).

The Minister may- issue guidelines to water services institutions on performing their functions in terms of this Act section 73 (1) (h).

The Minister must ensure that there is a national information system on water services….to monitor the performance of water services institutions. section 68 (b) (i).

The Minister may require any…water services institution…to furnish information to be included in the national information system. section 68 (a).

Based on the above, the preparation of a WSDP is a legal requirement.

ANNEXURE A – REFERENCES

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ANNEXURE B – DETAILED PROPOSED WSI INFRASTRUCTURE COMPONENT DETAIL

HG001: Greater Bulwer/Donnybrook Scheme

The total bulk cost requirement for the Greater Bulwer/Donnybrook Scheme is R 137 235 610.77 (excl VAT). The scheme development cost per household is approximately R 3 600.

Greater Bulwer Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Greater Bulwer Scheme	HGA006 (F)	18 622	23 824	
			HGA012 (F)	92 428	118 246	
			HGA021	5 361	6 858	
			HGA017	2 968	3 797	
		Total		**119 378**	**152 724**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Greater Bulwer Scheme	HGA006 (F)	3.35	4.45	
			HGA012 (F)	16.65	22.13	
			HGA021	0.94	1.25	
			HGA017	0.81	1.06	
		Total		**21.75**	**28.89**	
3	**Water Resource**	**Source**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Luhane River	-	-	-	
4	**Infrastructure**		**WTP Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTP**	UNDERBERG WTP	Internal Bulk	HGA017	2.5
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	286.82
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	57.24
		Pump stations	Unknown	Internal Bulk	HGA012 (F)	0
			WPS021	Internal Bulk	HGA012 (F)	0
			WPS005	Internal Bulk	HGA012 (F)	0
			Unknown	Internal Bulk	HGA017	0
			Unknown	Internal Bulk	HGA017	0
			WPS001	Internal Bulk	HGA017	0
		Reservoirs	NKWAZELA RES 1	Secondary Bulk	1	0
			NKWAZELA RES 3	Secondary Bulk	1	0

			NKWAZELA RES 2	Secondary Bulk	1	0
			MPHITHINI JOJO TANK 2	Secondary Bulk	1	10
			VOYIZANA JOJO 1	Secondary Bulk	1	10
			VOYIZANA JOJO 3	Secondary Bulk	1	10
			VOYIZANA JOJO 2	Secondary Bulk	1	5
			VOYIZANA JOJO 4	Secondary Bulk	1	5
			CARISBROOK RES 2	Secondary Bulk	1	0
			HOPEWELL JOJO TANK 2	Secondary Bulk	1	10
			HOPEWELL JOJO TANK 1	Secondary Bulk	1	10
			IXOPO BPT	Secondary Bulk	1	0
			NOMANDLOVU RES 23	Secondary Bulk	1	10
			NOMANDLOVU RES 7	Secondary Bulk	1	20
			NOMANDLOVU RES 8	Secondary Bulk	1	20
			NOMANDLOVU RES 2	Secondary Bulk	1	2
			NOMANDLOVU RES 10	Secondary Bulk	1	2
			LUWAMBENI RES 1	Secondary Bulk	1	10
			NOMANDLOVU RES 1	Secondary Bulk	1	2
			NOMANDLOVU RES 9	Secondary Bulk	1	2
			NOMANDLOVU RES 22	Secondary Bulk	1	10
			NOMANDLOVU RES 25	Secondary Bulk	1	0
			NOMANDLOVU RES 3	Secondary Bulk	1	2
			NOMANDLOVU RES 11	Secondary Bulk	1	2
			NOMANDLOVU RES 26	Secondary Bulk	1	0
			NOMANDLOVU RES 4	Secondary Bulk	1	2
			NOMANDLOVU RES 19	Secondary Bulk	1	2
			NOMANDLOVU RES 13	Secondary Bulk	1	2
			NOMANDLOVU RES 12	Secondary Bulk	1	10
			OKHETHENI JOJO 5	Secondary Bulk	1	5
			OKHETHENI JOJO 3	Secondary Bulk	1	5
			OKHETHENI JOJO 4	Secondary Bulk	1	5
			KWASOKHELA RES 4	Secondary Bulk	1	10
			NGCESHENI JOJO TANK 1	Secondary Bulk	1	10
			NGCESHENI JOJO TANK 2	Secondary Bulk	1	5
			NGCESHENI JOJO TANK 3	Secondary Bulk	1	5
			MNYWANENI JOJO TANK 1	Secondary Bulk	1	38

			QULASHE AREA JOJO TANK 7	Secondary Bulk	1	10
			QULASHE AREA JOJO TANK 10	Secondary Bulk	1	10
			QULASHE AREA JOJO TANK 8	Secondary Bulk	1	10
			QULASHE AREA JOJO TANK 2	Secondary Bulk	1	10
			QULASHE AREA JOJO TANK 9	Secondary Bulk	1	10
			QULASHE AREA JOJO TANK 5	Secondary Bulk	1	10
			QULASHE AREA JOJO TANK 1	Secondary Bulk	1	10
			QULASHE AREA JOJO TANK 4	Secondary Bulk	1	10
			QULASHE AREA JOJO TANK 3	Secondary Bulk	1	10
			GALA RES 5	Secondary Bulk	1	100
			GALA JOJO TANK 1	Secondary Bulk	1	5
			QULASHE AREA JOJO TANK 6	Secondary Bulk	1	10
			GALA RES 3	Secondary Bulk	1	2
			GALA RES 4	Secondary Bulk	1	2
			SANDANEZWE CON RES 4	Secondary Bulk	1	10
			SANDANEZWE CON RES 6	Secondary Bulk	1	30
			MNQUNDEKWENI JOJO TANK 1	Secondary Bulk	1	5
			GALA RES 2	Secondary Bulk	1	500
			SANDANEZWE CON RES 2	Secondary Bulk	1	15
			SANDANEZWE CON RES 9	Secondary Bulk	1	30
			GALA RES 1	Secondary Bulk	1	0
			SANDANEZWE CON RES 12	Secondary Bulk	1	20
			SANDANEZWE CON RES 13	Secondary Bulk	1	30
			SANDANEZWE CON RES 14	Secondary Bulk	1	30
			SANDANEZWE CON RES 1	Secondary Bulk	1	30
			MNQUNDEKWENI JOJO TANK 2	Secondary Bulk	1	5
			SANDANEZWE CON RES 10	Secondary Bulk	1	20
			UNDERBERG GALAXY RES	Secondary Bulk	1	200
			UNDERBERG WTP RES 2	Secondary Bulk	1	0
			UNDERBERG WTP RES 3	Secondary Bulk	1	0
			UNDERBERG RES 1	Secondary Bulk	1	0
			UNDERBERG CLARIFYING JOJO TANK	Secondary Bulk	1	5
			UNDERBERG AERATION JOJO TANK 3	Secondary Bulk	1	15
			UNDERBERG AERATION JOJO TANK 2	Secondary Bulk	1	15
			UNDERBERG AERATION JOJO TANK 1	Secondary Bulk	1	15

		WTP	UNDERBERG AERATION JOJO TANK 4	Secondary Bulk	1	15
4.2	**Future**		UNDERBERG	Internal Bulk	-	24
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	8
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Reservoir	Secondary Bulk	1	30000
		Pump stations	Primary PS	Primary Bulk	-	161
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R52 203 000.00**	**R5 220 300.00**	**R57 423 300.00**	
		Secondary Bulk	R67 713 296.88	**R6 771 329.69**	**R74 484 626.56**	
		Tertiary Bulk	R4 843 349.28	**R484 334.93**	**R5 327 684.21**	
		Total	**R124 759 646.16**	**R12 475 964.62**	**R137 235 610.77**	

HG002: Greater Kilimon Scheme

The total bulk cost requirement for the Greater Kilimon Scheme is R 287 189 775.79 (excl VAT). The scheme development cost per household is approximately R 31 100.

Greater Kilimon Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Greater Kilimon Scheme	HGA010 (F)	18 412	23 555	
			HGA051	4 639	5 934	
			HGA026	2 534	3 242	
			HGA145	2 025	2 591	
			HGA151	648	829	
			HGA032	579	741	
		Total		**28 837**	**36 892**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Greater Kilimon Scheme	HGA010 (F)	3.10	4.13	
			HGA051	0.82	1.11	
			HGA026	0.45	0.60	
			HGA145	0.36	0.48	
			HGA151	0.11	0.15	
			HGA032	0.10	0.14	
		Total		**4.95**	**6.73**	
3	**Water Resource**	**River**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Ngwangwane	-	-	-	
4	**Infrastructure**		**WTP Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTP**	-	-	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	34.73
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	3.32
		Pump stations	-	-	-	-
		Reservoirs	CENTOCOW GALAXY RES 3	Secondary Bulk	1	130.00
			CENTOCOW GALAXY RES 2	Secondary Bulk	1	350.00
			CENTOCOW GALAXY RES 6	Secondary Bulk	1	100.00

			CENTOCOW GALAXY RES 5	Secondary Bulk	1	500.00
			CENTOCOW GALAXY RES 4	Secondary Bulk	1	100.00
			OQAQENI JOJO TANK 1	Secondary Bulk	1	10.00
			CENTOCOW RAW RES 2	Secondary Bulk	1	58.00
			MASAMANI KHUKHULELA JOJO TANK 5	Secondary Bulk	1	2.50
			MASAMANI KHUKHULELA JOJO TANK 1	Secondary Bulk	1	10.00
			MASAMANI KHUKHULELA JOJO TANK 3	Secondary Bulk	1	10.00
			INDAWANA RES 2	Secondary Bulk	1	70.00
			INDAWANA GALAXY RES 1	Secondary Bulk	1	30.00
			INDAWANA RES 7	Secondary Bulk	1	0.00
			INDAWANA RES 1	Secondary Bulk	1	50.00
			INDAWANA GALAXY RES 2	Secondary Bulk	1	25.00
			INDAWANA MASONARY	Secondary Bulk	1	18.00
			INDAWANA RES 6	Secondary Bulk	1	0.00
			DELAMZI JOJO TANK 4	Secondary Bulk	1	10.00
			DELAMZI JOJO TANK 3	Secondary Bulk	1	10.00
			DELAMZI RES 2	Secondary Bulk	1	10.00
			DELAMZI JOJO TANK 1	Secondary Bulk	1	10.00
			TSAWULE JOJO TANK 2	Secondary Bulk	1	10.00
			TSAWULE JOJO TANK 1	Secondary Bulk	1	10.00
			ZIQALABENI JOJO TANK 1	Secondary Bulk	1	5.00
			ZIQALABENI JOJO TANK 3	Secondary Bulk	1	10.00
			EDGERTON JOJO TANK 2	Secondary Bulk	1	10.00
			EDGERTON JOJO TANK 1	Secondary Bulk	1	10.00
4.2	**Future**	WTP	Greater Kilimon	Primary Bulk	-	7.00
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	69
				Tertiary Bulk	50 ø mm - 110 ømm	9.75
		Reservoirs	Reservoir	Secondary Bulk	1	7000
			Reservoir	Secondary Bulk	1	5000
			Reservoir	Secondary Bulk	4	1000
			Reservoir	Secondary Bulk	3	500
			Reservoir	Secondary Bulk	1	350
			Reservoir	Secondary Bulk	1	250
			Reservoir	Secondary Bulk	2	100

		Pump stations	Primary PS	Primary Bulk	-	371
			Primary PS	Primary Bulk	-	12
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R41 114 000.00**	**R4 111 400.00**	**R45 225 400.00**	
		Secondary Bulk	R154 455 885.86	**R15 445 588.59**	**R169 901 474.44**	
		Tertiary Bulk	R65 511 728.49	**R6 551 172.85**	**R72 062 901.34**	
		Total	**R261 081 614.35**	**R26 108 161.44**	**R287 189 775.79**	

HG003: Nokweja Scheme

The total bulk cost requirement for the Nokweja Scheme is R 172 807 294 (excl VAT). The scheme development cost per household is approximately R 51 700.

Nokweja Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Nokweja Scheme	HGA014	10 451	13 370	
		Total		**10 451**	**13 370**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Nokweja Scheme	HGA014	1.74	2.32	
		Total		**1.74**	**2.32**	
3	**Water Resource**	**River**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Umzimkhulu	-	-	-	
4	**Infrastructure**		**WTP Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTP**	NOKWEJA WTP (PACKAGE PLANT)	Internal Bulk	HGA014	0.12
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.01
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	41.48
		Pump stations	AN_PD_006124	Internal Bulk	HGA014	0
			Unknown	Internal Bulk	HGA014	0
		Reservoirs	NOKWEJA BPT 17	Secondary Bulk	1	5.00
			NOKWEJA BPT 14	Secondary Bulk	1	5.00
			NOKWEJA BPT 15	Secondary Bulk	1	5.00
			NOKWEJA BPT 2	Secondary Bulk	1	5.00
			NOKWEJA BPT N-1	Secondary Bulk	1	5.00
			NOKWEJA RES 1	Secondary Bulk	1	420.00
			NOKWEJA BPT 24	Secondary Bulk	1	5.00
4.2	**Future**	**WTP**	-	-	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	6.3
				Secondary Bulk	160 ø mm - 300 ømm	10
				Tertiary Bulk	50 ø mm - 110 ømm	10.2
			Reservoir	Secondary Bulk	1	1000
			Reservoir	Secondary Bulk	2	8000

			Reservoir	Secondary Bulk	1	500
			Reservoir	Secondary Bulk	1	300
			Reservoir	Secondary Bulk	5	200
			Reservoir	Tertiary Bulk	2	200
			Reservoir	Tertiary Bulk	2	100
			Reservoir	Tertiary Bulk	1	50
		Pump stations	Primary PS	Primary Bulk	-	48
			Primary PS	Primary Bulk	-	307
			Primary PS	Primary Bulk	-	9
			Secondary PS	Secondary Bulk	-	70
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R61 526 979.16**	**R6 152 698**	**R67 679 677**	
		Secondary Bulk	R87 673 956.31	**R8 767 396**	**R96 441 352**	
		Tertiary Bulk	R7 896 604.72	**R789 660**	**R8 686 265**	
		Total	**R157 097 540**	**R15 709 754**	**R172 807 294**	

HG004: Greater Mhlabashane Scheme

The total bulk cost requirement for the Greater Mhlabashane Scheme is R 217 642 702.18 (excl VAT). The scheme development cost per household is approximately R 33 400.

Greater Mhlabashane Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Greater Mhlabashane Scheme	HGA048	11 675	14 937	
			HGA008	8 072	10 326	
			HGA007	642	821	
		Total		**20 389**	**26 084**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Greater Mhlabashane Scheme	HGA048	1.96	2.61	
			HGA008	1.42	1.91	
			HGA007	0.12	0.16	
		Total		**3.49**	**4.67**	
3	**Water Resource**	**River**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Umzimkhulu	-	-	-	
4	**Infrastructure**		**WTP Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTP**	HIGHLANDS/WASHBANK WTP (PACKAGE PLANT)	Internal Bulk	HGA008	0.8
			HIGHFLATS WTP	Internal Bulk	HGA007	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	4.70
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	2.66
		Pump stations	AN_PD_006127	Internal Bulk	HGA008	0
			AN_PD_006096	Internal Bulk	HGA008	0
		Reservoirs	HLOKOZI RES 3	Secondary Bulk	1	0.00
			HLOKOZI RES 4	Secondary Bulk	1	390.00
			IBISI RES 11	Secondary Bulk	1	360.00
4.2	**Future**	Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	49.28
				Tertiary Bulk	50 ø mm - 110 ømm	12.3
		Reservoirs	Reservoir	Secondary Bulk	1	2500
			Reservoir	Secondary Bulk	1	1500

			Reservoir	Secondary Bulk	1	1000
			Reservoir	Secondary Bulk	1	700
			Reservoir	Secondary Bulk	1	500
			Reservoir	Secondary Bulk	1	400
			Reservoir	Secondary Bulk	3	350
			Reservoir	Secondary Bulk	1	6000
			Reservoir	Secondary Bulk	1	200
		Pump stations	Primary PS	Primary Bulk	-	25
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R7 250 000.00**	**R725 000.00**	**R7 975 000.00**	
		Secondary Bulk	R163 447 510.02	**R16 344 751.00**	**R179 792 261.02**	
		Tertiary Bulk	R27 159 491.97	**R2 715 949.20**	**R29 875 441.16**	
		Total	**R197 857 001.99**	**R19 785 700.20**	**R217 642 702.18**	

HG005: Mkhunya Scheme

The total bulk cost requirement for the Mkhunya Scheme is R 155 505 261.93 (excl VAT). The scheme development cost per household is approximately R 22 700.

Mkhunya Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Mkhunya Scheme	HGA090	21 424	27 409	
		Total		**21 424**	**27 409**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Mkhunya Scheme	HGA090	3.61	4.81	
		Total		**3.61**	**4.81**	
3	**Water Resource**	**River**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Mkhomazi	-	-	-	
4	**Infrastructure**		**WTP Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTP**	-	-	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	18.20
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	2.55
		Pump stations	-	-	-	-
		Reservoirs	ERITH TRUST RES 5	Secondary Bulk	1	25.00
			ERITH TRUST RES 6	Secondary Bulk	1	55.00
			MGODI/SKEI JOJO TANK 3	Secondary Bulk	1	10.00
			MGODI/SKEI JOJO TANK 2	Secondary Bulk	1	10.00
			MGODI/SKEI JOJO TANK 10	Secondary Bulk	1	10.00
			MGODI/SKEI JOJO TANK 9	Secondary Bulk	1	10.00
4.2	**Future**	Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	28.2
				Tertiary Bulk	50 ø mm - 110 ømm	12.2
		Reservoirs	Reservoir	Secondary Bulk	1	7000
			Reservoir	Secondary Bulk	1	300
			Reservoir	Secondary Bulk	2	2000
			Reservoir	Secondary Bulk	1	3500

			Reservoir	Secondary Bulk	1	100
		Pump stations	Primary PS	Primary Bulk	-	493
			Primary PS	Primary Bulk	-	12
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R35 397 000.00**	**R3 539 700.00**	**R38 936 700.00**	
		Secondary Bulk	R70 580 171.19	**R7 058 017.12**	**R77 638 188.31**	
		Tertiary Bulk	R35 391 248.74	**R3 539 124.87**	**R38 930 373.61**	
		Total	**R141 368 419.93**	**R14 136 841.99**	**R155 505 261.93**	

HG006: Centocow Scheme

The total bulk cost requirement for the Centocow Scheme is R 41 934 950.84 (excl VAT). The scheme development cost per household is approximately R 10 000.

Centocow Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Centocow Scheme	HGA002	13 147	16 820	
		Total		**13 147**	**16 820**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Centocow Scheme	HGA002	2.38	3.17	
		Total		**2.38**	**3.17**	
3	**Water Resource**	**River**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Umzimkhulu	-	-	-	
4	**Infrastructure**		**WTP Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTP**	ST APOLLINARIS/CENTOCOW WTP	Internal Bulk	HGA002	0.6
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	0.00
		Pump stations	Unknown	Internal Bulk	HGA002	0
		Reservoirs	-	-	-	-
4.2	**Future**	WTP	Centocow	Primary Bulk	-	5
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	0
				Tertiary Bulk	50 ø mm - 110 ømm	6.9
		Reservoirs	Reservoir	Secondary Bulk	4	100
			Reservoir	Secondary Bulk	2	50
		Pump stations	Primary PS	Primary Bulk	-	74
			Primary PS	Primary Bulk	-	58
			Primary PS	Primary Bulk	-	23
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R33 405 000.00**	**R3 340 500.00**	**R36 745 500.00**	

		Secondary Bulk	R3 000 000.00	**R300 000.00**	**R3 300 000.00**	
		Tertiary Bulk	R1 717 682.59	**R171 768.26**	**R1 889 450.84**	
		Total	**R38 122 682.59**	**R3 812 268.26**	**R41 934 950.84**	

HG007: Kukhulela Scheme

The total bulk cost requirement for the Kukhulela Scheme is R 45 005 360 (excl VAT). The scheme development cost per household is approximately R 41 700.

Kukhulela Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Kukhulela Scheme	HGA081	3 375	4 318	
		Total		**3 375**	**4 318**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Kukhulela Scheme	HGA081	0.55	0.72	
		Total		**0.55**	**0.72**	
3	**Water Resource**	**River**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Umzimkhulu River	-	-	-	
4	**Infrastructure**		**WTP Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTP**	-	-	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	0.00
		Pump stations	-	-	-	-
		Reservoirs	-	-	-	-
4.2	**Future**	Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	5
				Tertiary Bulk	50 ø mm - 110 ømm	10.83
		Reservoirs	Reservoir	Secondary Bulk	1	2000
			Reservoir	Secondary Bulk	1	500
			Reservoir	Secondary Bulk	2	250
			Reservoir	Secondary Bulk	1	100
		Pump stations	Primary PS	Primary Bulk	-	27
			Primary PS	Primary Bulk	-	25
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R14 600 000.00**	**R1 460 000**	**R16 060 000**	
		Secondary Bulk	R21 206 414.50	**R2 120 641**	**R23 327 056**	
		Tertiary Bulk	R5 107 549.12	**R510 755**	**R5 618 304**	

		Total	**R40 913 964**	**R4 091 396**	**R45 005 360**	

HG009: Greater Summerfield Scheme

The total bulk cost requirement for the Greater Summerfield Scheme is R 176 013 547.39 (excl VAT). The scheme development cost per household is approximately R 25 900.

Greater Summerfield Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Greater Summerfield Scheme	HGA014 (F)	9 611	12 296	
			HGA008	8 072	10 326	
			HGA049	1 933	2 473	
			HGA059	907	1 161	
			HGA142	748	957	
		Total		**21 271**	**27 213**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Greater Summerfield Scheme	HGA014 (F)	1.63	2.17	
			HGA008	1.42	1.91	
			HGA049	0.42	0.57	
			HGA059	0.15	0.20	
			HGA142	0.13	0.18	
		Total		**3.75**	**5.10**	
3	**Water Resource**	**River**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Umzimkhulu	-	-	-	
4	**Infrastructure**		**WTP Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTP**	HIGHLANDS/WASHBANK WTP (PACKAGE PLANT)	Internal Bulk	HGA008	0.8
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	2.43
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	9.21
		Pump stations	AN_PD_006127	Internal Bulk	HGA008	0
			AN_PD_006096	Internal Bulk	HGA008	0
			Unknown	Internal Bulk	HGA049	0
			IBISI RES 11	Secondary Bulk	1	360.00
			KROMHOEK RES 1	Secondary Bulk	1	10.00
			STRANGERS REST GALAXY RES	Secondary Bulk	1	85.00

4.2	**Future**	WTP	Greater Summerfield	Regional Bulk	-	6
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	31.05
				Tertiary Bulk	50 ø mm - 110 ømm	8.2
		Reservoirs	Reservoir	Secondary Bulk	1	6000
			Reservoir	Secondary Bulk	1	2000
			Reservoir	Secondary Bulk	2	800
			Reservoir	Secondary Bulk	4	500
			Reservoir	Secondary Bulk	1	400
			Reservoir	Secondary Bulk	1	300
			Reservoir	Secondary Bulk	1	200
			Reservoir	Secondary Bulk	3	100
		Pump stations	Primary PS	Primary Bulk	-	222
			Primary PS	Primary Bulk	-	86
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R35 742 000.00**	**R3 574 200.00**	**R39 316 200.00**	
		Secondary Bulk	R94 244 652.83	**R9 424 465.28**	**R103 669 118.11**	
		Tertiary Bulk	R30 025 662.98	**R3 002 566.30**	**R33 028 229.27**	
		Total	**R160 012 315.81**	**R16 001 231.58**	**R176 013 547.39**	

HG010: St. Barnabas-Chabane Scheme

The total bulk cost requirement for the St. Barnabas-Chabane Scheme is R 126 021 023.94 (excl VAT). The scheme development cost per household is approximately R 33 400.

St. Barnabas Cabhane Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		St. Barnabas Cabhane Scheme	HGA088	5 059	6 472	
			HGA101	3 441	4 403	
			HGA139	2 636	3 372	
			HGA108	675	864	
		Total		**11 811**	**15 111**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		St. Barnabas Cabhane Scheme	HGA088	0.89	1.20	
			HGA101	0.61	0.81	
			HGA139	0.43	0.57	
			HGA108	0.12	0.16	
		Total		**2.05**	**2.73**	
3	**Water Resource**	**River**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Chabane	-	-	-	
4	**Infrastructure**		**WTP Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTP**	-	-	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	0.35
		Pump stations	Unknown	Internal Bulk	HGA139	0
		Reservoirs	MFULAMHLE GALAXY RES 1	Secondary Bulk	1	0.00
			MFULAMHLE GALAXY RES 2	Secondary Bulk	1	27.00
			NARAZETH RES 1	Secondary Bulk	1	290.00
			NARAZETH JOJO TANK 1	Secondary Bulk	1	10.00
			ST BARNABAS GALAXY RES 1	Secondary Bulk	1	50.00
			NGQOKOZWENI RES 1	Secondary Bulk	1	0.00
			NGQOKOZWENI RES 4	Secondary Bulk	1	0.00

		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	29.3
				Tertiary Bulk	50 ø mm - 110 ømm	17.13
		Reservoirs	Reservoir	Secondary Bulk	1	3000
			Reservoir	Secondary Bulk	2	1000
			Reservoir	Secondary Bulk	2	400
			Reservoir	Secondary Bulk	1	250
			Reservoir	Secondary Bulk	4	200
			Reservoir	Secondary Bulk	1	150
			Reservoir	Secondary Bulk	2	100
			Reservoir	Secondary Bulk	0	0
			Reservoir	Secondary Bulk	0	0
			Reservoir	Secondary Bulk	0	0
			Reservoir	Secondary Bulk	0	0
			Reservoir	Secondary Bulk	0	0
			Reservoir	Secondary Bulk	0	0
			Reservoir	Secondary Bulk	0	0
			Reservoir	Secondary Bulk	0	0
			Reservoir	Secondary Bulk	0	0
			Reservoir	Secondary Bulk	0	0
			Reservoir	Secondary Bulk	0	0
			Reservoir	Secondary Bulk	0	0
			Reservoir	Secondary Bulk	0	0
			Reservoir	Secondary Bulk	0	0
			Reservoir	Secondary Bulk	0	0
			Reservoir	Secondary Bulk	0	0
		Pump stations	Primary PS	Primary Bulk	-	261
			Primary PS	Primary Bulk	-	46
4.2	**Future**					
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R26 339 000.00**	**R2 633 900.00**	**R28 972 900.00**	
		Secondary Bulk	R64 337 541.35	**R6 433 754.14**	**R70 771 295.49**	
		Tertiary Bulk	R23 888 025.87	**R2 388 802.59**	**R26 276 828.46**	
		Total	**R114 564 567.22**	**R11 456 456.72**	**R126 021 023.94**	

HG011: Greater Njunga Scheme

The total bulk cost requirement for the Greater Njunga Scheme is R 5 714 162.69 (excl VAT). The scheme development cost per household is approximately R 800.

Greater Njunga Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Injunga Scheme	HGA112	3 393	4 341	
			HGA111	3 233	4 136	
			HGA019 (F)	1 828	2 339	
			HGA013 (F)	1 748	2 236	
			HGA102	1 620	2 073	
			HGA149	1 521	1 945	
			HGA063	1 285	1 644	
			HGA130	1 001	1 280	
			HGA072	720	921	
			HGA132	695	889	
			HGA060	628	803	
			HGA020	609	779	
		Total		**22 237**	**28 449**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Injunga Scheme	HGA112	0.60	0.80	
			HGA111	0.54	0.72	
			HGA019 (F)	0.30	0.41	
			HGA013 (F)	0.29	0.39	
			HGA102	0.29	0.38	
			HGA149	0.27	0.36	
			HGA063	0.22	0.30	
			HGA130	0.18	0.24	
			HGA072	0.13	0.17	
			HGA132	0.12	0.17	
			HGA060	0.11	0.15	
			HGA020	0.11	0.14	
		Total		**3.90**	**5.15**	
3		**River**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	

	Water Resource	**Ibisi**	-	-	-	
4	**Infrastructure**		**WTP Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTP**	KWANJUNGA WTP (PACKAGE PLANT)	Internal Bulk	HGA112	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	11.25
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	15.84
		Pump stations	Unknown	Internal Bulk	HGA149	0
		Reservoirs	NJUNGA GALAXY	Secondary Bulk	1	0.00
			NJUNGA RES 1	Secondary Bulk	1	0.00
			NJUNGA TOWER	Secondary Bulk	1	0.00
			NGWINJINI JOJO 6	Secondary Bulk	1	10.00
			NGWINJINI JOJO 4	Secondary Bulk	1	10.00
			NGWINJINI JOJO 2	Secondary Bulk	1	10.00
			NGWINJINI JOJO 5	Secondary Bulk	1	10.00
			NGWINJINI JOJO 3	Secondary Bulk	1	10.00
			NGWINJINI JOJO 1	Secondary Bulk	1	10.00
			NCAMBELE/BLOEMFONTEIN GALAXY	Secondary Bulk	1	50.00
			WATERFALL/NTLANGWINI RES 1	Secondary Bulk	1	0.00
			WATERFALL/NTLANGWINI JOJO 1	Secondary Bulk	1	20.00
			WATERFALL/NTLANGWINI JOJO 3	Secondary Bulk	1	20.00
			WATERFALL/NTLANGWINI JOJO 2	Secondary Bulk	1	20.00
			KWASENTI JOJO TANK 1	Secondary Bulk	1	10.00
			KWASENTI RES 1	Secondary Bulk	1	40.00
			RIESDALE JOJO 2	Secondary Bulk	1	10.00
			MAGQORHOLWENI JOJO TANK 3	Secondary Bulk	1	10.00
			MAGQORHOLWENI JOJO TANK 2	Secondary Bulk	1	10.00
			ROCKY MOUNT GALAXY RES	Secondary Bulk	1	0.00
			KWABASE/PIKININI JOJO TANK 1	Secondary Bulk	1	5.00
			KWABASE/PIKININI JOJO TANK 2	Secondary Bulk	1	15.00
			BORNDRAND TANK	Secondary Bulk	1	0.00
4.2	**Future**	Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	3.5

				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Reservoir	Secondary Bulk		0
		Pump stations	Primary PS	Primary Bulk	-	-
			Primary PS	Primary Bulk	-	-
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R0.00**	**R0.00**	**R0.00**	
		Secondary Bulk	R5 194 693.35	**R519 469.34**	**R5 714 162.69**	
		Tertiary Bulk	R0.00	**R0.00**	**R0.00**	
		Total	**R5 194 693.35**	**R519 469.34**	**R5 714 162.69**	

HG014: Lourdes-Ndzombane Scheme

The total bulk cost requirement for the Lourdes-Ndzombane Scheme (Option 1) is R 150 756 265.98 (excl VAT). The scheme development cost per household is approximately R 30 500.

Lourdes-Ndzombane Scheme (Option 1)						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Lourdes-Ndzombane Scheme (Option 1)	HGA027	5 502	7 039	
			HGA124	2 173	2 780	
			HGA052	1 979	2 532	
			HGA140	1 663	2 127	
			HGA084	1 607	2 056	
			HGA075	1 272	1 627	
			HGA148	763	976	
			HGA105	507	648	
		Total		**15 465**	**19 785**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Lourdes-Ndzombane Scheme (Option 1)	HGA027	0.98	1.32	
			HGA124	0.38	0.52	
			HGA052	0.35	0.47	
			HGA140	0.30	0.40	
			HGA084	0.28	0.38	
			HGA075	0.22	0.30	
			HGA148	0.13	0.18	
			HGA105	0.09	0.12	
		Total		**2.74**	**3.79**	
3	**Water Resource**	**River**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Ibisi	-	-	-	
4	**Infrastructure**		**WTP Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTP**	-	-	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	26.56
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	0.83
		Pump stations	AN_PD_006097	Internal Bulk	HGA124	0

			AN_PD_006091	Internal Bulk	HGA124	0
			WPS019	Internal Bulk	HGA140	0
			AN_PD_006130	Internal Bulk	HGA105	0
			AN_PD_006125	Internal Bulk	HGA105	0
		Reservoirs	DIPHINI RES 1	Secondary Bulk	1	200.00
			NZIMANKULU RES 2	Secondary Bulk	1	73.00
			JABULA RES 2	Secondary Bulk	1	70.00
			ST PAUL RES	Secondary Bulk	1	0.00
			MAWUSI RES 1	Secondary Bulk	1	120.00
			MAKHOLWENI RES 1	Secondary Bulk	1	175.00
			VUKA RES	Secondary Bulk	1	70.00
			NDZOMBANE RES 1	Secondary Bulk	1	75.00
4.2	**Future**	WTP	Lourdes-Ndzombane	Primary Bulk	-	5.00
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	1
				Secondary Bulk	160 ø mm - 300 ømm	23.5
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Reservoir	Secondary Bulk	1	5000
			Reservoir	Secondary Bulk	1	4000
		Pump stations	Primary PS	Primary Bulk	-	158
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R27 590 737.43**	**R2 759 073.74**	**R30 349 811.17**	
		Secondary Bulk	R109 460 413.46	**R10 946 041.35**	**R120 406 454.81**	
		Tertiary Bulk	R0.00	**R0.00**	**R0.00**	
		Total	**R137 051 150.89**	**R13 705 115.09**	**R150 756 265.98**	

The total bulk cost requirement for the Lourdes-Ndzombane Scheme (Option 2) is R 133 693 906.86 (excl VAT). The scheme development cost per household is approximately R 27 000.

Lourdes-Ndzombane Scheme (Option 2)						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Lourdes-Ndzombane Scheme (Option 2)	HGA027	5 502	7 039	
			HGA124	2 173	2 780	
			HGA052	1 979	2 532	
			HGA140	1 663	2 127	
			HGA084	1 607	2 056	
			HGA075	1 272	1 627	
			HGA148	763	976	
			HGA105	507	648	
		Total		**15 465**	**19 785**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Lourdes-Ndzombane Scheme (Option 2)	HGA027	0.98	1.32	
			HGA124	0.38	0.52	
			HGA052	0.35	0.47	
			HGA140	0.30	0.40	
			HGA084	0.28	0.38	
			HGA075	0.22	0.30	
			HGA148	0.13	0.18	
			HGA105	0.09	0.12	
		Total		**2.75**	**3.80**	
3	**Water Resource**	**River**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Ibisi	-	-	-	
4	**Infrastructure**		**WTP Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTP**	-	-	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	26.56
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	0.83
		Pump stations	AN_PD_006097	Internal Bulk	HGA124	0
			AN_PD_006091	Internal Bulk	HGA124	0

			WPS019	Internal Bulk	HGA140	0
			AN_PD_006130	Internal Bulk	HGA105	0
			AN_PD_006125	Internal Bulk	HGA105	0
		Reservoirs	DIPHINI RES 1	Secondary Bulk	1	200.00
			NZIMANKULU RES 2	Secondary Bulk	1	73.00
			JABULA RES 2	Secondary Bulk	1	70.00
			ST PAUL RES	Secondary Bulk	1	0.00
			MAWUSI RES 1	Secondary Bulk	1	120.00
			MAKHOLWENI RES 1	Secondary Bulk	1	175.00
			VUKA RES	Secondary Bulk	1	70.00
			NDZOMBANE RES 1	Secondary Bulk	1	75.00
4.2	**Future**	Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	55.8
				Tertiary Bulk	50 ø mm - 110 ømm	17.9
		Reservoirs	Reservoir	Secondary Bulk	1	4000
			Reservoir	Secondary Bulk	1	3000
			Reservoir	Secondary Bulk	1	1000
			Reservoir	Secondary Bulk	2	500
			Reservoir	Secondary Bulk	3	200
			Reservoir	Secondary Bulk	1	250
			Reservoir	Secondary Bulk	1	50
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R0.00**	**R0.00**	**R0.00**	
		Secondary Bulk	R121 539 915.33	**R12 153 991.53**	**R133 693 906.86**	
		Tertiary Bulk	R84 368 779.80	**R8 436 877.98**	**R92 805 657.78**	
		Total	**R121 539 915.33**	**R12 153 991.53**	**R133 693 906.86**	

HG015: Mnqumeni Scheme

The total bulk cost requirement for the Mnqumeni Scheme is R 156 021 107.77 (excl VAT). The scheme development cost per household is approximately R 35 000.

Mnqumeni Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Mnqumeni Scheme	HGA009 (F)	6 973	8 921	
			HGA094	6 973	8 920	
		Total		**13 945**	**17 841**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Mnqumeni Scheme	HGA009 (F)	2.61	3.67	
			HGA094	0.16	0.21	
		Total		**2.34**	**3.12**	
3	**Water Resource**	**River**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Ibisi	-	-	-	
4	**Infrastructure**		**WTP Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTP**	BULWER TOWN WTP	Regional Bulk	HGA009 (F)	0.4
			NGWANGWANE WTP (FUTURE)	Regional Bulk	HGA009 (F)	0
			MNQUMENI (FUTURE)	Internal Bulk	HGA009 (F)	0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	26.92
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	0.00
		Pump stations	WPS	Regional Bulk	HGA009 (F)	0
			AN_PD_006094	Internal Bulk	HGA009 (F)	0
			AN_PD_006114	Internal Bulk	HGA009 (F)	0
			Unknown	Internal Bulk	HGA009 (F)	0
		Reservoirs	GUGWINI RES 1	Secondary Bulk	1	240.00
			GUGWINI RES 4		1	0.00
			SMALL MAHOBE GALAXY RES	Secondary Bulk	1	60.00
4.2	**Future**	Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	24.6
				Tertiary Bulk	50 ø mm - 110 ømm	17.1

		Reservoirs	Reservoir	Secondary Bulk	2	4000
			Reservoir	Secondary Bulk	1	2000
			Reservoir	Secondary Bulk	1	500
			Reservoir	Secondary Bulk	4	100
			Reservoir	Secondary Bulk	1	50
		Pump stations	Primary PS	Primary Bulk	-	47
			Primary PS	Primary Bulk	-	12
			Primary PS	Primary Bulk	-	11
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R28 730 000.00**	**R2 873 000.00**	**R31 603 000.00**	
		Secondary Bulk	R79 368 026.06	**R7 936 802.61**	**R87 304 828.67**	
		Tertiary Bulk	R33 739 344.64	**R3 373 934.46**	**R37 113 279.10**	
		Total	**R141 837 370.70**	**R14 183 737.07**	**R156 021 107.77**	

HG016: Umzimkhulu Town Scheme

The total bulk cost requirement for the Umzimkhulu Town Scheme is R 21 475 984.06 (excl VAT). The scheme development cost per household is approximately R 3 600.

Umzimkhulu Town Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Umzimkhulu Town Scheme	HGA016	10 354	13 246	
			HGA023	7 256	9 282	
			HGA117	835	1 068	
			HGA031	33	42	
		Total		**18 477**	**23 639**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Umzimkhulu Town Scheme	HGA016	2.51	3.28	
			HGA023	1.29	1.73	
			HGA117	0.15	0.20	
			HGA031	0.01	0.01	
		Total		**3.95**	**5.22**	
3	**Water Resource**	**River**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Ntlambamasoka/ Umzimkhulu	-	-	-	
4	**Infrastructure**		**WTP Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTP**	UMZIMKHULU TOWN WTP	Internal Bulk	HGA016	4.7
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	27.09
		Pump stations	Unknown	Internal Bulk	HGA016	0
			WPS002	Internal Bulk	HGA023	0
		Reservoirs	UMZIMKHULU RES 1	Secondary Bulk	1	2500.00
			UMZIMKHULU RES 2	Secondary Bulk	1	1500.00
			UMZIMKHULU WTP RES 2	Secondary Bulk	1	0.00
			UMZIMKHULU WTP RES 3	Secondary Bulk	1	0.00
			COMMONVILLE/HOPEVALE CONCRETE RES	Secondary Bulk	1	220.00
4.2	**Future**	Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	2.13

				Secondary Bulk	160 ø mm - 300 ømm	4.64
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Reservoir	Secondary Bulk	1	4000
		Pump stations	Primary PS	Primary Bulk	-	-
			Secondary PS	Primary Bulk	-	-
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R0.00**	**R0**	**R0**	
		Secondary Bulk	R19 523 621.87	**R1 952 362.19**	**R21 475 984.06**	
		Tertiary Bulk	R4 180 977.66	**R418 097.77**	**R4 599 075.43**	
		Total	**R19 523 621.87**	**R1 952 362.19**	**R21 475 984.06**	

HG017: Nsingizi-Mkhangala Scheme

The total bulk cost requirement for the Nsingizi-Mkhangala Scheme is R 253 910 991.36 (excl VAT). The scheme development cost per household is approximately R 50 000.

Nsingizi-Mkhangala Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Nsingizi-Mkhangala Scheme	HGA118	3 581	4 581	
			HGA091	3 472	4 442	
			HGA073	2 631	3 366	
			HGA040	2 567	3 285	
			HGA076	1 696	2 170	
			HGA071	1 228	1 571	
			HGA135	867	1 109	
		Total		**16 043**	**20 524**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Nsingizi-Mkhangala Scheme	HGA118	0.63	0.83	
			HGA091	0.62	0.83	
			HGA073	0.47	0.62	
			HGA040	0.46	0.62	
			HGA076	0.30	0.40	
			HGA071	0.22	0.29	
			HGA135	0.20	0.26	
		Total		**2.88**	**3.85**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Nsingizi	-	-	-	
4	**Infrastructure**		**WTP Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTP**	-	-	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.04
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	0.00
		Pump stations	-	-	-	-
		Reservoirs	NTSIKENI RES 1	Secondary Bulk	1	100.00

			NTSIKENI RES 2	Secondary Bulk	1	110.00
			NTSIKENI RES 3	Secondary Bulk	1	50.00
			NTSIKENI RES 5	Secondary Bulk	1	50.00
			MNKANGALA RESERVOIR B	Secondary Bulk	1	50.00
			MAHEWINI GALAXY RES	Secondary Bulk	1	260.00
			ESIZINGENI GALAXY RES 3	Secondary Bulk	1	0.00
			ESIZINGENI GALAXY RES 2	Secondary Bulk	1	100.00
			MALENGE RES 1	Secondary Bulk	1	45.00
			MALENGE RES 2	Secondary Bulk	1	50.00
			MALENGE RES 9	Secondary Bulk	1	0.00
			MAGQAGQENI JOJO TANK 1	Secondary Bulk	1	5.00
			MAGQAGQENI JOJO TANK 4	Secondary Bulk	1	10.00
			MAGQAGQENI JOJO TANK 3	Secondary Bulk	1	5.00
			MAGQAGQENI JOJO TANK 2	Secondary Bulk	1	10.00
4.2	**Future**	**WTP**	Nsingizi	Regional Bulk	-	10
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	4.17
				Secondary Bulk	160 ø mm - 300 ømm	44.3
				Tertiary Bulk	50 ø mm - 110 ømm	18.45
		Reservoirs	Reservoir	Secondary Bulk	1	1000
			Reservoir	Secondary Bulk	1	10000
			Reservoir	Secondary Bulk	1	2000
			Reservoir	Secondary Bulk	2	500
			Reservoir	Secondary Bulk	3	250
			Reservoir	Secondary Bulk	1	200
		Pump stations	Primary PS	Primary Bulk	-	458
			Primary PS	Primary Bulk	-	54
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R73 422 319.91**	**R7 342 231.99**	**R80 764 551.90**	
		Secondary Bulk	R108 067 922.79	**R10 806 792.28**	**R118 874 715.07**	
		Tertiary Bulk	R49 337 931.26	**R4 933 793.13**	**R54 271 724.38**	
		Total	**R230 828 173.96**	**R23 082 817.40**	**R253 910 991.36**	

HG018: Franklin Scheme

The total bulk cost requirement for the Franklin Scheme is R 78 495 117.43 (excl VAT). The scheme development cost per household is approximately R 62 000.

Franklin Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Franklin Scheme	HGA006	2 390	3 057	
			HGA079	1 068	1 367	
			HGA058	508	650	
		Total		**3 966**	**5 074**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Franklin Scheme	HGA006	0.60	0.79	
			HGA079	0.19	0.25	
			HGA058	0.09	0.12	
		Total		**0.88**	**1.16**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Mzintlava	-	-	-	
4	**Infrastructure**		**WTP Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTP**	FRANKLIN WTP	Internal Bulk	HGA006	0.5
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	0.28
		Pump stations	AN_PD_006092	Internal Bulk	HGA006	0
			WPS015	Internal Bulk	HGA006	0
			WPS013	Internal Bulk	HGA006	0
			WPS018	Internal Bulk	HGA058	0
			WPS016	Internal Bulk	HGA058	0
		Reservoirs	FRANKLIN ELEVATED TANK	Secondary Bulk	1	75.00
			FRANKLIN RES 1	Secondary Bulk	1	0.00
			MARAISKOP JOJO TANK 9	Secondary Bulk	1	10.00
			MARAISKOP JOJO TANK 10	Secondary Bulk	1	10.00
			KRAANSDRAAI / GLEN EDWARD RES 1	Secondary Bulk	1	40.00

4.2	**Future**	Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	0
				Tertiary Bulk	50 ø mm - 110 ømm	64.277
		Reservoirs	Reservoir	Secondary Bulk	1	1500
			Reservoir	Secondary Bulk	4	200
		Pump stations	Primary PS	Primary Bulk	-	458
			Primary PS	Primary Bulk	-	54
			Primary PS	Primary Bulk	-	8
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R42 494 000.00**	**R4 249 400.00**	**R46 743 400.00**	
		Secondary Bulk	R15 321 863.16	**R1 532 186.32**	**R16 854 049.48**	
		Tertiary Bulk	R13 543 334.50	**R1 354 333.45**	**R14 897 667.95**	
		Total	**R71 359 197.66**	**R7 135 919.77**	**R78 495 117.43**	

HG019: Kokstad Town Scheme

The total bulk cost requirement for the Kokstad Town Scheme is R 2 562 664 045.18 (excl VAT). The scheme development cost per household is approximately R 133 600.

Kokstad Dam						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Kokstad Dam	HGA013	59 957	76 705	
		Total		**59 957**	**76 705**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Kokstad Dam	HGA013	16.36	21.36	
		Total		**16.36**	**21.36**	
3	**Water Resource**	**Source**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Proposed Mzintlava Dam	10.95	30	Water is sourced from the proposed Mzintlava Dam	
4	**Infrastructure**		**WTP Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTP**	KOKSTAD WTP	Internal Bulk	HGA013	18
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	6.86
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	0.00
		Pump stations	Unknown	Internal Bulk	HGA013	0
			Unknown	Internal Bulk	HGA013	0
			Unknown	Internal Bulk	HGA013	0
			Unknown	Internal Bulk	HGA013	0
			Unknown	Internal Bulk	HGA013	0
		Reservoirs	KOKSTAD GRENSWAG RES	Secondary Bulk	1	1350.00
			KOKSTAD GOLF COURSE RES	Secondary Bulk	1	1350.00
			KOKSTAD WTP RESERVOIR	Secondary Bulk	1	5000.00
			BHONGWENI RES	Secondary Bulk	1	1500.00
			KOKSTAD WTP RESERVOIR	Secondary Bulk	1	4500.00
			BHONGWENI ELEVATED TANK	Secondary Bulk	1	180.00
			BHONGWENI RES	Secondary Bulk	1	2000.00
			KOKSTAD WTP RES	Secondary Bulk	1	5000.00
			KOKSTAD WTP GALAXY TANK	Secondary Bulk	1	302.00

			KOKSTAD WTP SUMP	Secondary Bulk	1	0.00
4.2	Future	Source	Proposed Mzintlava Dam	Primary Bulk	1	30
		WTP	KOKSTAD	Internal Bulk	-	22.00
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	13
				Secondary Bulk	160 ø mm - 300 ømm	0
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Reservoir	Secondary Bulk	1	30000
		Pump stations	Primary PS	Primary Bulk	-	154
5	Cost Requirement		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R2 329 694 586.53**	**R232 969 458.65**	**R2 562 664 045.18**	
		Secondary Bulk	R0.00	**R0.00**	**R0.00**	
		Tertiary Bulk	R0.00	**R0.00**	**R0.00**	
		Total	**R2 329 694 586.53**	**R232 969 458.65**	**R2 562 664 045.18**	

HG020: Pakkies-Willowdale Scheme

The total bulk cost requirement for the Pakkies-Willowdale Scheme is R 47 899 811.18 (excl VAT). The scheme development cost per household is approximately R 58 000.

Pakkies-Willowdale Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Pakkies-Willowdale Scheme	HGA127	1 536	1 965	
			HGA144	1 054	1 348	
		Total		**2 590**	**3 313**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Pakkies-Willowdale Scheme	HGA127	0.27	0.36	
			HGA144	0.18	0.25	
		Total		**0.46**	**0.61**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		Mzintlava	-	-	-	
4	**Infrastructure**		**WTP Name**	**Class**	**Scheme Number**	**Capacity (Ml/d or Length or kW)**
4.1	**Existing**	**WTP**	-	-	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0.00
				Secondary Bulk	160 ø mm - 300 ømm	0.00
				Tertiary Bulk	50 ø mm - 110 ømm	0.00
		Pump stations	-	-	-	-
		Reservoirs	PAKKIES JOJO 2	Secondary Bulk	1	10.00
			PAKKIES JOJO 1	Secondary Bulk	1	10.00
			PAKKIES JOJO 4	Secondary Bulk	1	5.00
			PAKKIES JOJO 3	Secondary Bulk	1	10.00
			PAKKIES JOJO 5	Secondary Bulk	1	10.00
			PAKKIES STORAGE JOJO 2	Secondary Bulk	1	10.00
			PAKKIES STORAGE JOJO 1	Secondary Bulk	1	10.00
4.2	**Future**	Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	0
				Secondary Bulk	160 ø mm - 300 ømm	0
				Tertiary Bulk	50 ø mm - 110 ømm	38.1
		Reservoirs	Reservoir	Secondary Bulk	1	4500

			Reservoir	Secondary Bulk	1	600
			Reservoir	Secondary Bulk	2	300
		Pump stations	Primary PS	Primary Bulk	-	42
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R8 100 000.00**	**R810 000.00**	**R8 910 000.00**	
		Secondary Bulk	R28 572 187.89	**R2 857 218.79**	**R31 429 406.68**	
		Tertiary Bulk	R6 873 095.00	**R687 309.50**	**R7 560 404.50**	
		Total	**R43 545 282.89**	**R4 354 528.29**	**R47 899 811.18**	

HG021: New Biggen Bulk Regional Water Supply Scheme

The total bulk cost requirement for the New Biggen Bulk Regional Water Supply Scheme is R 11 078 276 511 (excl VAT). The scheme development cost per household is approximately R 33 600.

New Biggen Regional Bulk Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		New Biggen Regional Bulk Scheme	UMZ-LM	213 489	273 122	
			UHL-LM	122 397	156 586	
			NDZ-LM	125 653	160 752	
			UMG018	926	1 357	
			UMG019	363	532	
			UMG020	306	448	
			UGU012	224 213	360 162	
			UGU001	117 433	188 638	
			UGU010	134 978	216 820	
		Total		**939 759**	**1 358 417**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		New Biggen Regional Bulk Scheme	UMZ-LM	38.26	51.09	
			UHL-LM	22.72	30.17	
			NDZ-LM	23.17	30.72	
			UMG018	0.20	0.30	
			UMG019	0.08	0.12	
			UMG020	0.06	0.09	
			UGU012	63.71	104.63	
			UGU001	22.14	36.97	
			UGU010	26.16	43.72	
		Total		**196.49**	**297.81**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Ml/d)**	**Comments**	
		New Biggen	34.68	95	Water is sourced from the proposed New Biggen Dam	
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or Length or kW)**
	Existing	Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	621.63
				Secondary Bulk	160 ø mm - 300 ømm	0.00

				Tertiary Bulk	50 ø mm - 110 ømm	209.91
		Reservoirs	FRANKLIN RES 2	Secondary Bulk	0	0.00
			FOUNTAINS GALAXY RES	Secondary Bulk	1	30.00
			FOUNTAINS RES 2	Secondary Bulk	1	100.00
			FOUNTAINS RES 1	Secondary Bulk	1	75.00
			FERNCLIFFE RESERVOIR	Secondary Bulk	1	5.00
			FERNCLIFFE/NORWOOD BPT	Secondary Bulk	1	0.20
			ESIZINGENI GALAXY RES 3	Secondary Bulk	0	0.00
			ESIZINGENI GALAXY RES 2	Secondary Bulk	1	100.00
			BHONGWENI RES	Secondary Bulk	1	1500.00
			KOKSTAD WTP RESERVOIR	Secondary Bulk	1	4500.00
			BHONGWENI ELEVATED TANK	Secondary Bulk	1	180.00
			BHONGWENI RES	Secondary Bulk	1	2000.00
			KOKSTAD WTP RES	Secondary Bulk	1	5000.00
			KOKSTAD WTP GALAXY TANK	Secondary Bulk	1	302.00
			KOKSTAD WTP SUMP	Secondary Bulk	0	0.00
			SHAYAMOYA LOW RES	Secondary Bulk	1	1500.00
			SHAYAMOYA HIGH RES	Secondary Bulk	1	750.00
			SHAYAMOYA ELEVATED TANK	Secondary Bulk	1	22.00
			KOKSHILL RB RES 1	Secondary Bulk	0	0.00
			KOKSHILL RA GALAXY RES	Secondary Bulk	1	50.00
			KOKSHILL RA RES 2	Secondary Bulk	1	100.00
			KOKSHILL RA RES 4	Secondary Bulk	1	25.00
			KOKSHILL RA RES 35MÂ³	Secondary Bulk	1	100.00
			KLIPSPRUIT JOJO STORAGE	Secondary Bulk	1	10.00
			CENTOCOW GALAXY RES 3	Secondary Bulk	1	130.00
			CENTOCOW GALAXY RES 1	Secondary Bulk	1	100.00
			CENTOCOW GALAXY RES 2	Secondary Bulk	1	350.00
			CENTOCOW GALAXY RES 6	Secondary Bulk	1	100.00
			CENTOCOW GALAXY RES 5	Secondary Bulk	1	500.00
			CENTOCOW GALAXY RES 4	Secondary Bulk	1	100.00
			CENTOCOW GALAXY RES 7	Secondary Bulk	1	150.00
			CENTOCOW GALAXY RES 8	Secondary Bulk	1	100.00
			CENTOCOW GALAXY RES 9	Secondary Bulk	1	250.00
			CENTOCOW GALAXY RES 10	Secondary Bulk	1	250.00

			OQAQENI JOJO TANK 3	Secondary Bulk	1	10.00
			OQAQENI JOJO TANK 2	Secondary Bulk	1	10.00
			OQAQENI JOJO TANK 1	Secondary Bulk	1	10.00
			CENTOCOW RAW RES 1	Secondary Bulk	1	100.00
			CENTOCOW REINFORCED CLEAR RES 1	Secondary Bulk	1	550.00
			CENTOCOW REINFORCED CLEAR RES 2	Secondary Bulk	1	550.00
			CENTOCOW REINFORCED CLEAR RES 3	Secondary Bulk	1	550.00
			MASAMANI KHUKHULELA JOJO TANK 4	Secondary Bulk	1	10.00
			MASAMANI KHUKHULELA JOJO TANK 2	Secondary Bulk	1	10.00
			CENTOCOW RAW RES 2	Secondary Bulk	1	58.00
			MASAMANI KHUKHULELA JOJO TANK 5	Secondary Bulk	1	2.50
			MASAMANI KHUKHULELA JOJO TANK 1	Secondary Bulk	1	10.00
			MALENGE RES 2	Secondary Bulk	1	50.00
			MALENGE RES 9	Secondary Bulk	0	0.00
			MALENGE RES 5	Secondary Bulk	1	5.00
			MALENGE RES 8	Secondary Bulk	0	0.00
			MALENGE RES 7	Secondary Bulk	0	0.00
			MALENGE RES 6	Secondary Bulk	1	5.00
			MALENGE RES 3	Secondary Bulk	1	5.00
			MALENGE RES 4	Secondary Bulk	1	5.00
			MAKHOLWENI RES 1	Secondary Bulk	1	175.00
			Santomba Reservoir (G)	Secondary Bulk	0	0.00
			Isitebele Reservoir (Kwambotho)	Secondary Bulk	1	0.12
			Kwanonkala Reservoir (Kwambotho)	Secondary Bulk	1	0.20
			Kwambotho Reservoir	Secondary Bulk	1	0.12
			Kwanyuswa Reservoir	Secondary Bulk	0	0.00
			KwaFodo Reservoir	Secondary Bulk	1	0.55
			KWAMAKHOBA RES 1	Secondary Bulk	0	0.00
			KwaQiko Reservoir no.1/ Plant	Secondary Bulk	1	0.20
			KwaQiko Reservoir no.2	Secondary Bulk	0	0.00
			Umgubo Reservoir	Secondary Bulk	1	0.10
			Santombe KwaFodo South Reservoir (A)	Secondary Bulk	0	0.00
			KwaFodo South reservoir (C)	Secondary Bulk	1	0.05
			KwaFodo South reservoir (F)	Secondary Bulk	0	0.00

			KwaFodo South Reservoir (E)	Secondary Bulk	0	0.00
4.2	Future	Source	Proposed New Biggen Dam	Primary Bulk	1	95.00
		WTP	Proposed New Biggen WTP	Primary Bulk	1	95.00
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	>350	291.4
				Secondary Bulk	160 ø mm - 300 ømm	75
				Tertiary Bulk	50 ø mm - 110 ømm	0
		Reservoirs	Reservoir	Secondary Bulk	1	128000
			Reservoir	Secondary Bulk	1	69000
			Reservoir	Secondary Bulk	1	22000
			Reservoir	Secondary Bulk	1	39000
			Reservoir	Secondary Bulk	1	18000
			Reservoir	Secondary Bulk	1	10000
			Reservoir	Secondary Bulk	1	41000
			Reservoir	Secondary Bulk	1	3500
			Reservoir	Secondary Bulk	1	2500
			Reservoir	Secondary Bulk	1	3000
			Reservoir	Secondary Bulk	2	2000
			Reservoir	Secondary Bulk	1	4500
			Reservoir	Secondary Bulk	1	30000
		Pump stations	Primary PS	Primary Bulk	0,944 M3/s	2807
			Secondary PS	Primary Bulk	0,360 M3/s	81
5	Cost Requirement		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary Bulk	**R9 355 128 046**	**R935 512 805**	**R10 290 640 850**	
		Secondary Bulk	R701 806 757	**R70 180 676**	**R771 987 433**	
		Tertiary Bulk	R14 225 661	**R1 422 566**	**R15 648 228**	
		Total	**R10 071 160 464**	**R1 007 116 046**	**R11 078 276 511**	