Infrastructure Master Plan 2023
2023/2024 – 2053/2054
Volume 10: Wastewater

UMGENI WATER · AMANZI



Infrastructure Development Division, Umgeni Water

310 Burger Street, Pietermaritzburg, 3201, Republic of South Africa
P.O. Box 9, Pietermaritzburg, 3200, Republic of South Africa
Tel: +27 (33) 341 1111 / Fax +27 (33) 341 1167 / Toll free: 0800 331 820
Email: info@umgeni.co.za / Web: www.umgeni.co.za

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For further information, please contact:

Planning Services

Infrastructure Development Division

Umgeni Water

P.O.Box 9, Pietermaritzburg, 3200

KwaZulu-Natal, South Africa

Tel: 033 341-1522

Fax: 033 341-1218

Email: info@umgeni.co.za

Web: www.umgeni.co.za

UMGENI WATER

INFRASTRUCTURE MASTER PLAN 20232

2023/2024 – 2053/2054

JUNE 2023

Prepared by:

Graham Metcalf

Digitally signed by Graham Metcalf
DN: cn=Graham Metcalf, o=Umgeni Water, ou=Planning Services, email=graham.metcalf@umgeni.co.za, c=SC
Date: 2023.06.28 11:21:08 +02'00'

Graham Metcalf

Geohydrologist

Approved by:

Kevin Meier

Digitally signed by Kevin Meier
DN: cn=Kevin Meier, o=Umgeni Water, ou=Planning Services, email=kevin.meier@umgeni.co.za, c=ZA
Date: 2023.06.28 15:55:15 +02'00'

Kevin Meier *PrEng*

Manager: Planning Services

Kevin Meier pp

Digitally signed by Kevin Meier
DN: cn=Kevin Meier, o=Umgeni Water, ou=Planning Services, email=kevin.meier@umgeni.co.za, c=ZA
Date: 2023.06.30 12:35:48 +02'00'

Xolani Chamane *PrEng*

Executive: Infrastructure Development

PREFACE

This Infrastructure Master Plan 2023 describes:

- Umgeni Water's infrastructure plans for the financial period 2023/2024 – 2053/2054, and
- Infrastructure master plans for other areas outside of Umgeni Water's Operating Area but within KwaZulu-Natal.

It is a comprehensive technical report that provides information on current infrastructure and on future infrastructure development plans. This report replaces the last comprehensive Infrastructure Master Plan that was compiled in 2022.

The report is divided into **ten** volumes as per the organogram below.

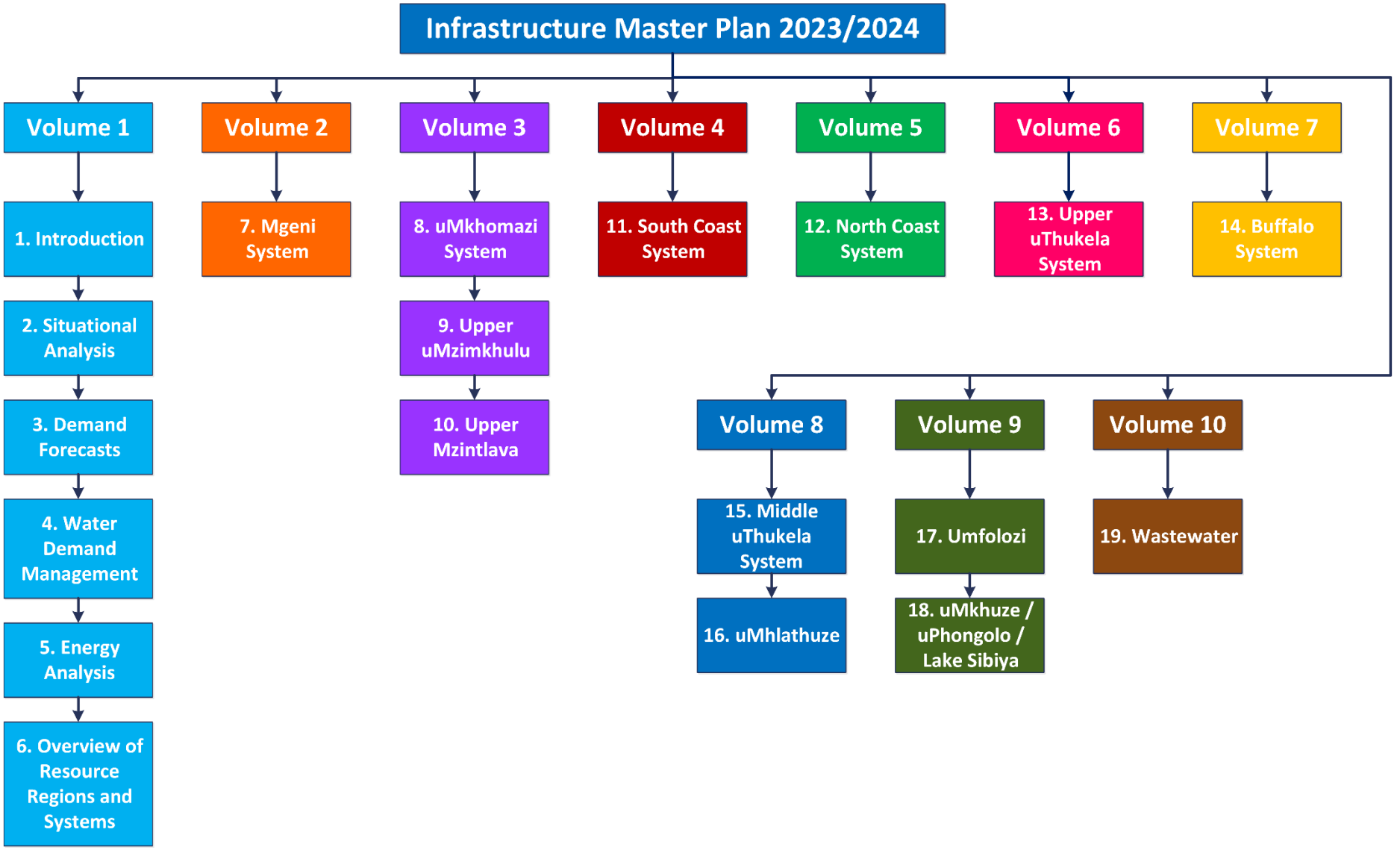
Volume 1 includes the following sections and a description of each is provided below:

- **Section 2** describes the most recent changes and trends within the primary environmental dictates that influence development plans within the province.
- **Section 3** relates only to the Umgeni Water Operational Areas and provides a review of historic water sales against past projections, as well as Umgeni Water's most recent water demand projections, compiled at the end of 2021.
- **Section 4** describes Water Demand Management initiatives that are being undertaken by the utility and the status of Water Demand Management Issues in KwaZulul-Natal.
- **Section 5**, which also relates to Umgeni Water's Operational Area, contains a high level review of the energy consumption used to produce the water volumes analysed in **Section 3**.
- **Section 6** provides an overview of the water resource regions and systems supplied within these regions.

The next eight volumes describe the current water resource situation and water supply infrastructure of the various systems in KwaZulu-Natal, including:

• **Volume 2**	**Section 7**	Mgeni System.
• **Volume 3**	**Section 8**	uMkhomazi System
	Section 9	uMzimkhulu System
	Section 10	Mzintlava System
• **Volume 4**-	**Section 11**	South Coast System
• **Volume 5**	**Section 12**	North Coast System
• **Volume 6**	**Section 13**	Upper uThukela System
• **Volume 7**	**Section 14**	Buffalo System
• **Volume 8**	**Section 15**	Middle uThukela System
	Section 16	Mhlathuze System
• **Volume 9**	**Section 17**	Umfolozi System
	Section 18	uMkhuze / uPhongolo / Lake Sibiya System

Volume 10, Section 19 describes the wastewater works currently operated by Umgeni Water (shown in pale brown in the adjacent figure) and provides plans for development of additional wastewater treatment facilities. The status of wastewater treatment in WSA's that are not supplied by Umgeni Water are also described in this section.


Infrastructure Master Plan 2023/2024
Volume 1
1. Introduction
2. Situational Analysis
3. Demand Forecasts
4. Water Demand Management
5. Energy Analysis
6. Overview of Resource Regions and Systems
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7. Mgeni System
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8. uMkhomazi System
9. Upper uMzimkhulu
10. Upper Mzintlava
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Volume 9
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18. uMkhuze / uPhongolo / Lake Sibiya
Volume 10
19. Wastewater

It is important to note that information presented in this report is in a summarised form and it is recommended that the reader refer to relevant planning reports if more detail is sought. Since the primary focus of this Infrastructure Master Plan is on bulk supply networks, the water resource infrastructure development plans are not discussed at length. The Department of Water and Sanitation (DWS), as the responsible authority, has undertaken the regional water resource development investigations. All of these investigations have been conducted in close collaboration with Umgeni Water and other major stakeholders in order to ensure that integrated planning occurs. Details on these projects can be obtained directly from DWS, Directorate: Options Analysis (East).

The Infrastructure Master Plan is a dynamic and evolving document. Outputs from current planning studies, and comments received on this document will therefore be taken into account in the preparation of the next update.

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AADD	Annual Average Daily Demand
AC	Asbestos Cement
ADWF	Average Dry Weather Flow
API	Antecedent Precipitation Index
AVGF	Autonomous Valveless Gravity Filter
BID	Background Information Document
BPT	Break Pressure Tank
BWL	Bottom Water Level
BWSP	Bulk Water Services Provider
BWSS	Bulk Water Supply Scheme
CAPEX	Capital Expenditure
CMA	Catchment Management Agency
CoGTA	Department of Co-operative Governance and Traditional Affairs
CWSS	Community Water Supply and Sanitation project
DAEA	Department of Agriculture and Environmental Affairs
DEA	Department of Environmental Affairs
DEFF	Department of Environment, Forestry and Fisheries
DM	District Municipality
DRDLR	Department of Rural Development and Land Reform
DWA	Department of Water Affairs
DWS	Department of Water and Sanitation
DWAF	Department of Water Affairs and Forestry
EFR	Estuarine Flow Requirements
EIA	Environmental Impact Assessment
EKZN Wildlife	Ezemvelo KZN Wildlife
EMP	Environmental Management Plan
EWS	eThekwini Water Services
EXCO	Executive Committee
FC	Fibre Cement
FL	Floor level
FSL	Full Supply level
GCM	General Circulation Model
GDP	Gross Domestic Product
GDPR	Gross Domestic Product of Region
GVA	Gross Value Added
HDI	Human Development Index
IDP	Integrated Development Plan
IFR	In-stream Flow Requirements
IMP	Infrastructure Master Plan
IRP	Integrated Resource Plan

ISP	Internal Strategic Perspective
IWRM	Integrated Water Resources Management
KZN	KwaZulu-Natal
LM	Local Municipality
LUMS	Land Use Management System
MA	Moving Average
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
MBR	Membrane Bioreactor
MMTS	Mooi-Mgeni Transfer Scheme
MMTS-1	Mooi-Mgeni Transfer Scheme Phase 1
MMTS-2	Mooi-Mgeni Transfer Scheme Phase 2
mPVC	Modified Polyvinyl Chloride
MTEF	Medium-Term Expenditure Framework
MTSF	Medium-Term Strategic Framework
MWP	Mkomazi Water Project
MWP-1	Mkomazi Water Project Phase 1
NCP-1	North Coast Pipeline I
NCP-2	North Coast Pipeline II
NCSS	North Coast Supply System
NGS	Natal Group Sandstone
NPV	Net Present Value
NRW	Non-Revenue Water
NSDP	National Spatial Development Perspective
NWSP	National Water Sector Plan
OPEX	Operating Expenditure
p.a.	Per annum
PES	Present Ecological Status
PEST	Political, Economical, Sociological and Technological
PGDS	Provincial Growth and Development Strategy
PPDC	Provincial Planning and Development Commission (KZN's)
PSEDS	Provincial Spatial Economic Development Strategy
PWSP	Provincial Water Sector Plan
RDP	Reconstruction and Development Programme
RO	Reverse Osmosis
ROD	Record of Decision
RQO	Resource Quality Objective
SCA	South Coast Augmentation
SCP	South Coast Pipeline
SCP-1	South Coast Pipeline Phase 1
SCP-2a	South Coast Pipeline Phase 2a
SCP-2b	South Coast Pipeline Phase 2b

SDF	Spatial Development Framework
SHR	St Helen's Rock (near Port Shepstone)
STEEPLE	Social/demographic, Technological, Economic, Environmental (Natural), Political, Legal and Ethical
SWRO	Seawater Reverse Osmosis
TEC	Target Ecological Category
TWL	Top Water Level
uPVC	Unplasticised Polyvinyl Chloride
UW	Umgeni Water
WA	Western Aqueduct
WC	Water Conservation
WDM	Water Demand Management
WMA	Water Management Area
WRC	Water Research Commission
WSA	Water Services Authority
WSDP	Water Services Development Plan
WSNIS	Water Services National Information System
WSP	Water Services Provider
WTP	Water Treatment Plant
WWW	Wastewater Works

Spellings of toponyms have been obtained from the Department of Arts and Culture (DAC). DAC provides the official spelling of place names and the spellings, together with the relevant gazette numbers, can be accessed at http://www.dac.gov.za/content/toponymic-guidelines-map-and-other-editors.

When using any part of this report as a reference, please cite as follows:

Umgeni Water, 2023. *Umgeni Water Infrastructure Master Plan 2023/2024 – 2053/54, Vol 1 - 10*. Prepared by Planning Services, June 2023.

LIST OF UNITS

Length/Distance:	mm	millimetre
	m	metre
	km	kilometre
Area:	m^2	square metres
	ha	hectare
	km^2	square kilometres
Level/Altitude:	mASL	metres above sea-level
Time:	s	second
	min	minute
	hr	hour
Volume:	m^3	cubic metres
	Mℓ	megalitre
	million m^3	million cubic metres
	mcm	million cubic metres
Water Use/Consumption/Treatment/Yield:	ℓ/c/day	litre per capita per day
	kℓ/day	kilolitre per day
	Mℓ/day	megalitre per day
	million m^3/annum	million cubic metres per annum
	kg/hr	kilograms per hour
Flow velocity/speed:	m/s	metres per second
Flow:	m^3/s	cubic metres per second
	ℓ/hr	litres per hour
	m^3/hr	cubic metres per hour

19 WASTEWATER

19.1 Overview

Umgeni Water operates a number of Wastewater Works (WWW). These are shown in relation to the existing water system configurations as shown in **Figure 19.1** and discussed in **Section 6 in Volume 1** and are illustrated in the preface above. Umgeni Water owns and operates the Darvill, Ixopo, Albert Falls North and South WWW, but manages and operates a number of other WWW on behalf of municipalities (**Figure 19.2**). Management contracts are in place for the operation and maintenance of the Howick, Cool Air, Mpofana, Appelsbosch, Camperdown, Trust Feeds and Richmond WWW for the uMgungundlovu District Municipality (UMDM) and the Lynnfield Park WWW for the Msunduzi Local Municipality. The new Mpophomeni WWW in the UMDM, is currently being constructed and will be operated by Umgeni Water once complete. All the WWW operations use aeration basins for biological nutrient removal and clarifiers for the separation process.

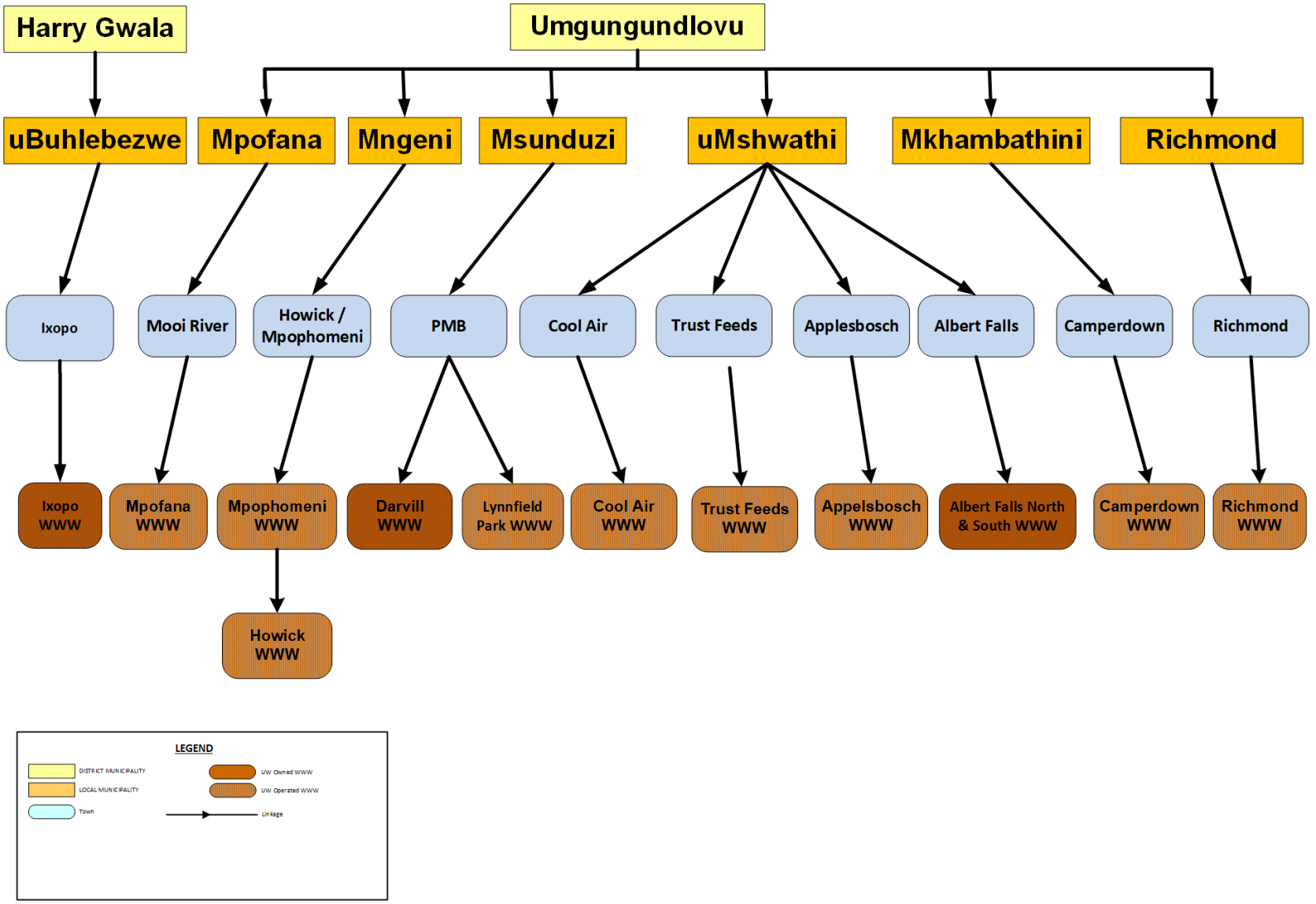

Figure 19.1 Location of Umgeni Water operated WWWs.

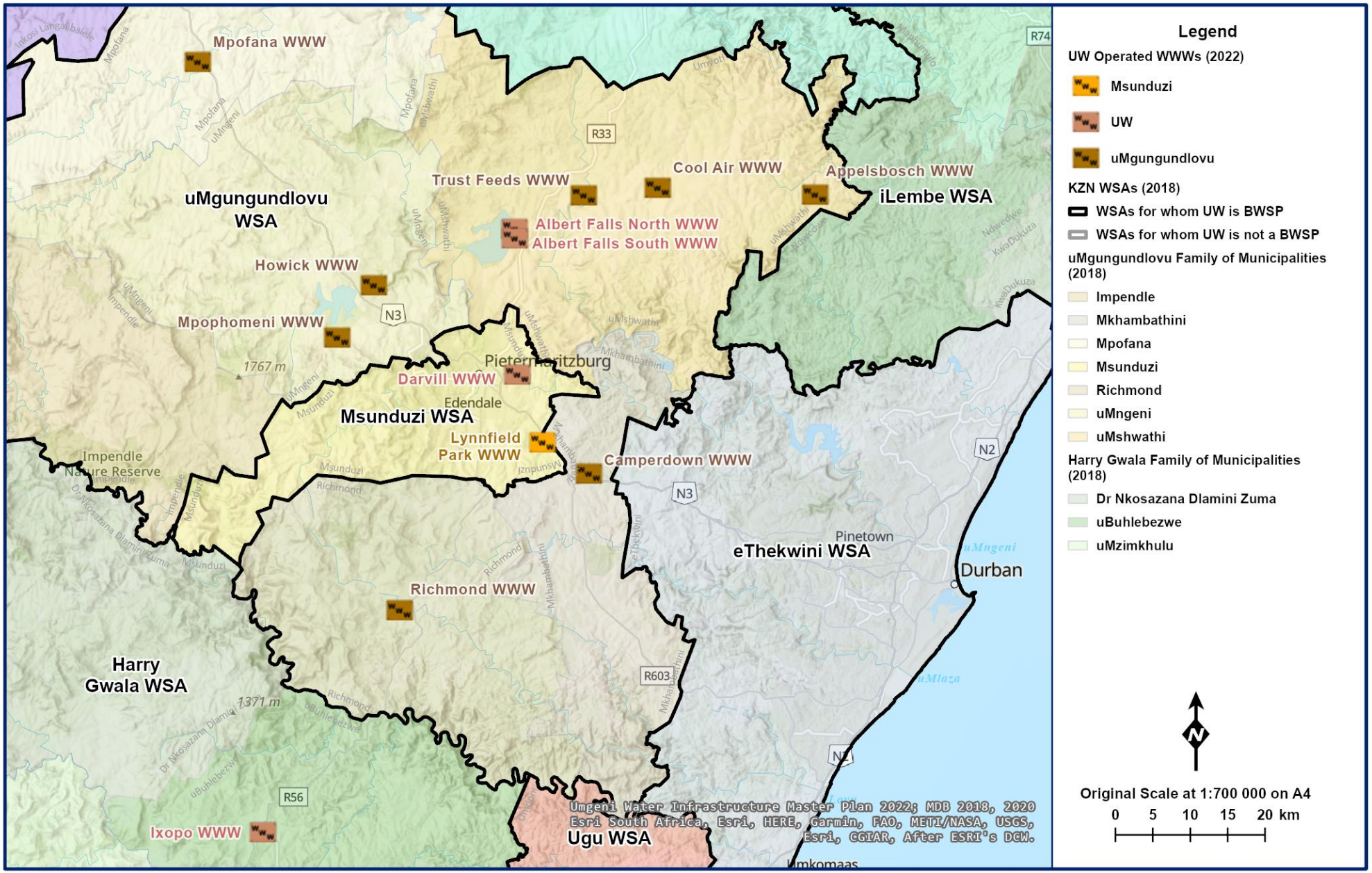

Figure 19.2 Location of WWWs operated by Umgeni Water.

19.2 Umgeni Water Owned Wastewater Works

19.2.1 Darvill Wastewater Works

a) Description

The Darvill WWW is the largest and most significant under Umgeni Water's management and serves the Msunduzi Local Municipality. A summary of the characteristics of the Darvill WWW are shown in **Table 19.1** and the location of Darvill WWW in Msunduzi Municipality is shown in **Figure 19.3**.

Table 19.1 Darvill WWW infrastructure.

WWW Name:	Darvill WWW
System:	Upper Mgeni System
Maximum Design Capacity:	120 Mℓ/day
Current Utilisation:	77 Mℓ/day
Screens:	2 x Front raked bar screen followed by 3 mm stepped screen; 1 x Hand raked by-pass 25 mm screen
Balancing Tank:	10 Mℓ/day
Primary Settling Tanks:	4 (3 x 20 Mℓ/day; 2 x 40 Mℓ/day)
Settled Sewage Pump Station:	150 Mℓ/day
Aeration Basin Area:	
Aeration Basin Capacity:	74 415 m^3
Aerators:	Diffused aeration
Clarifier Type:	Circular scraped floor
Number of Clarifiers:	7
Total Area of all Clarifiers:	6720 m^2
Total Capacity of Clarifiers:	120 Mℓ/day
Upflow Velocity:	1 m/h
RAS Pump Station Capacity:	120 Mℓ/day
Primary Sludge Thickeners	2
Anaerobic Digesters:	4 (4 x4500 m^3)
Chlorine Storage Capacity:	18 x 900 kg drums
Chlorine Dosing Capacity:	7.5 mg/ℓ
Total Capacity of Chlorine Contact Tanks:	
Total Capacity of Sludge Treatment Plant:	
Wash Water Capacity:	2 Mℓ/day
Sludge Irrigation Area:	

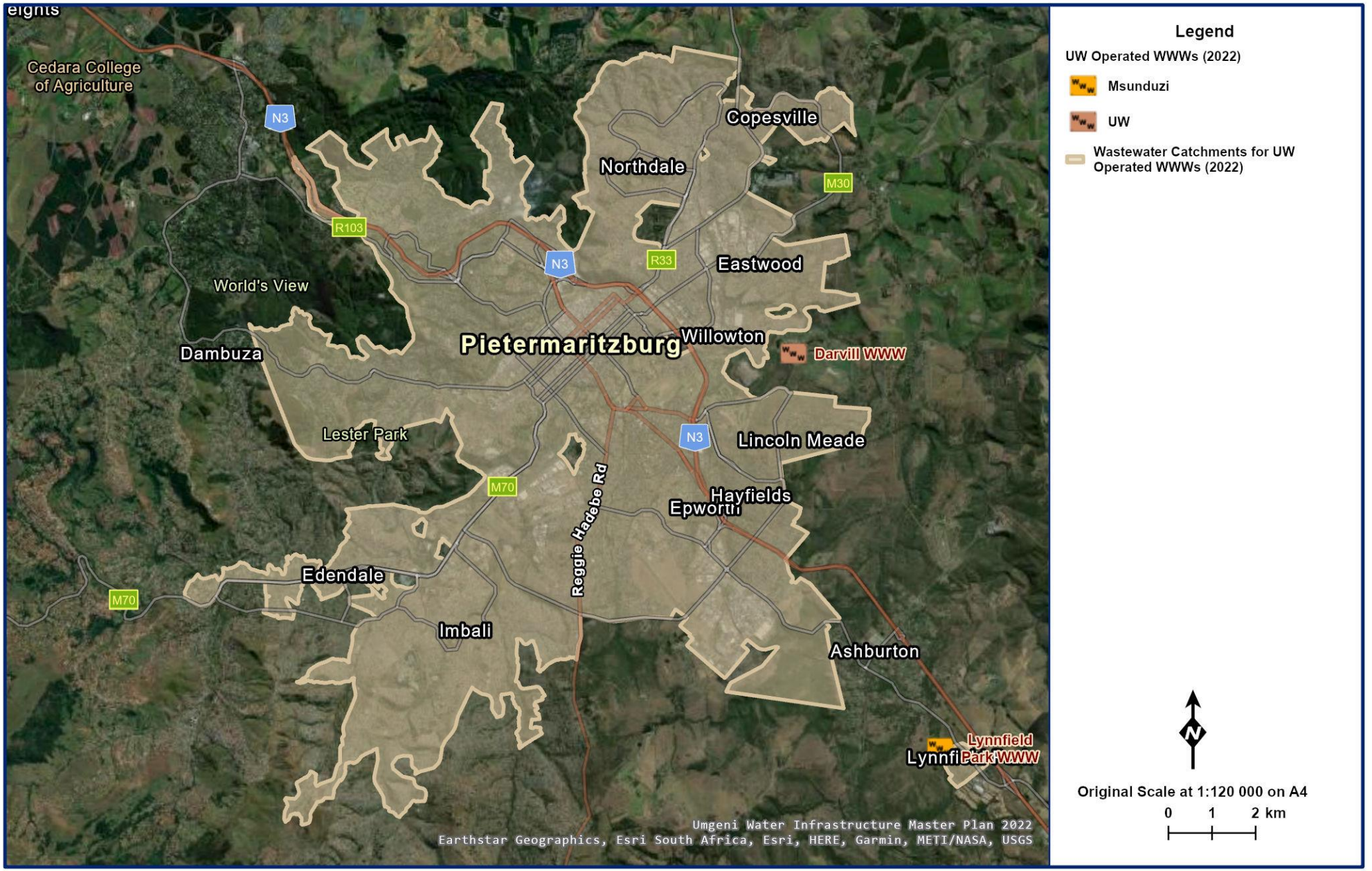

Figure 19.3 Location of Darvill WWW .

b) Status Quo

In 2011 a decision was made to upgrade the WWW to 100 Mℓ/day as the plant had been operating above its capacity. The average daily inflow (November 2021 to October 2022) is 77 Mℓ/day (**Figure** 19.4) which is above the plant's previous treatment capacity.

Inflows to the works have been fairly static over the last five years and have not increased with demand increases as would be expected (**Figure 19.4**). There appears to have been a gradual increase in inflows over the last year, however, this may have been influenced by the high rainfall and flooding that occurred in April 2022. Higher than normal return flows (7.1% above the previous year) resulted from excess storm water runoff. The 12 month moving average in Oct 2017 was 66 Mℓ/day and in Oct 2022 it was 77 Mℓ/day. This does reflect a positive increase in inflows. The average daily inflow for past five years is, however, still low at73 Mℓ/day. Umgeni Water therefore remains concerned that not all of the wastewater return flows are reaching the WWW due to spillages and leaking sewers (see **Figure 7.16 in Volume 2**), which is resulting in losses. Losses within the Msunduzi sewer catchment are undoubtedly a contributing factor in why the anticipated increase in wastewater demand is not being realised.

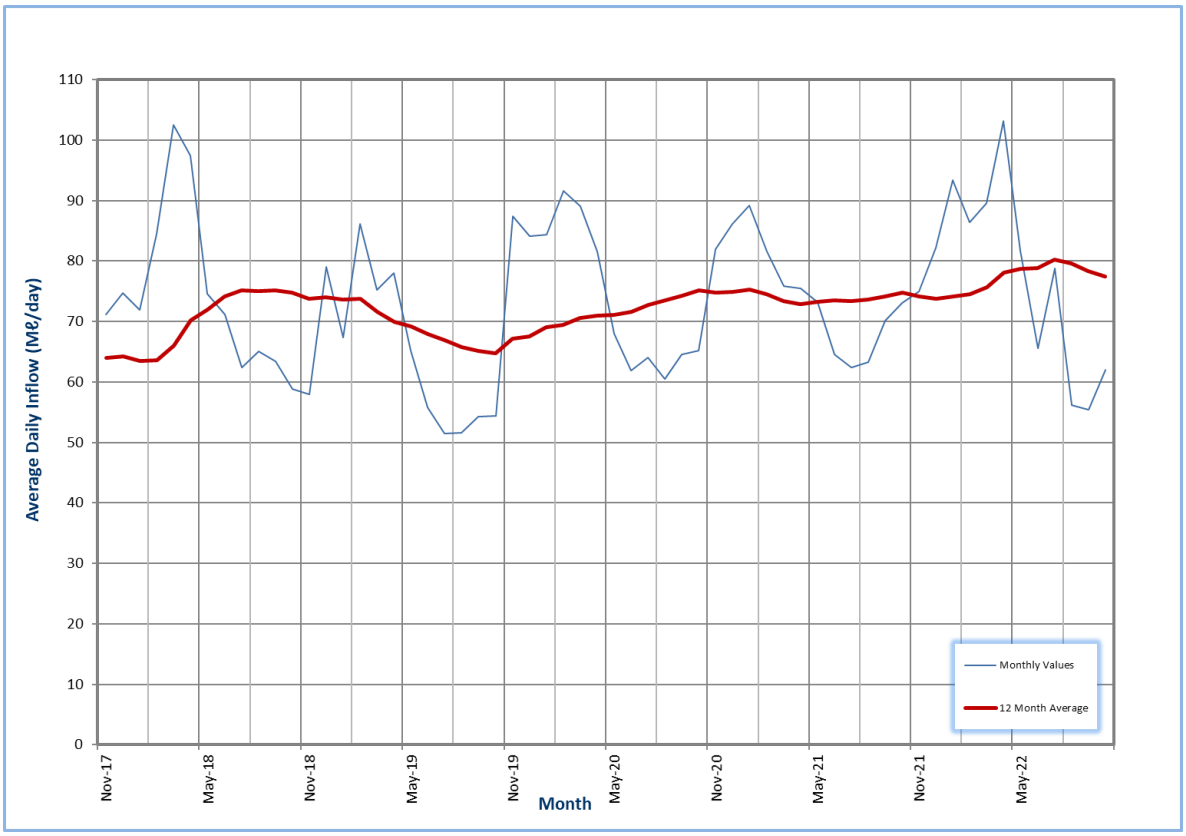

Figure 19.4 Average daily inflow (Mℓ/day) to Darvill WWW.

The plant capacity was increased by 35 Mℓ/day in 2018 to cope with the predicted wastewater demands (**Figure 19.5**). ADWF within the Darvill WWW catchment was expected to grow to about 90 Mℓ/day by 2021 (**Figure 19.5**), although this is not reflected on the graph due to the sharp drop in influent in 2017. This drop was due to various construction and maintenance activities impacting on the flow. The upgraded design allows for future expansion to a maximum capacity of 120 Mℓ/day,

which is forecast to occur in 2028. Some of the proposed demand scenarios are illustrated in **Figure 19.5.**

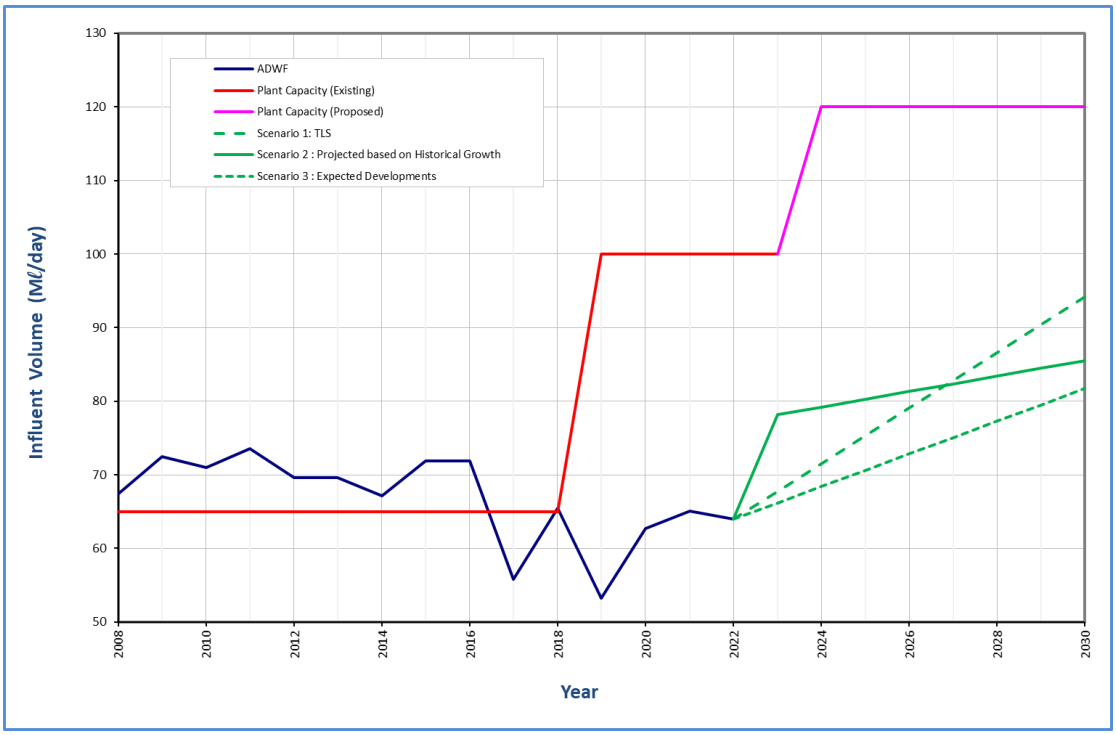

Figure 19.5 Projected inflow into Darvill WWW.

An analysis of daily historical production (November 2021 to October 2022) for the upgraded Darvill WWW is presented in **Figure 19.6.** It shows that for 43% of the time the WWW was being operated above the optimal operating capacity. The plant operated above the new 100 Mℓ/day design capacity for 14% of the time.

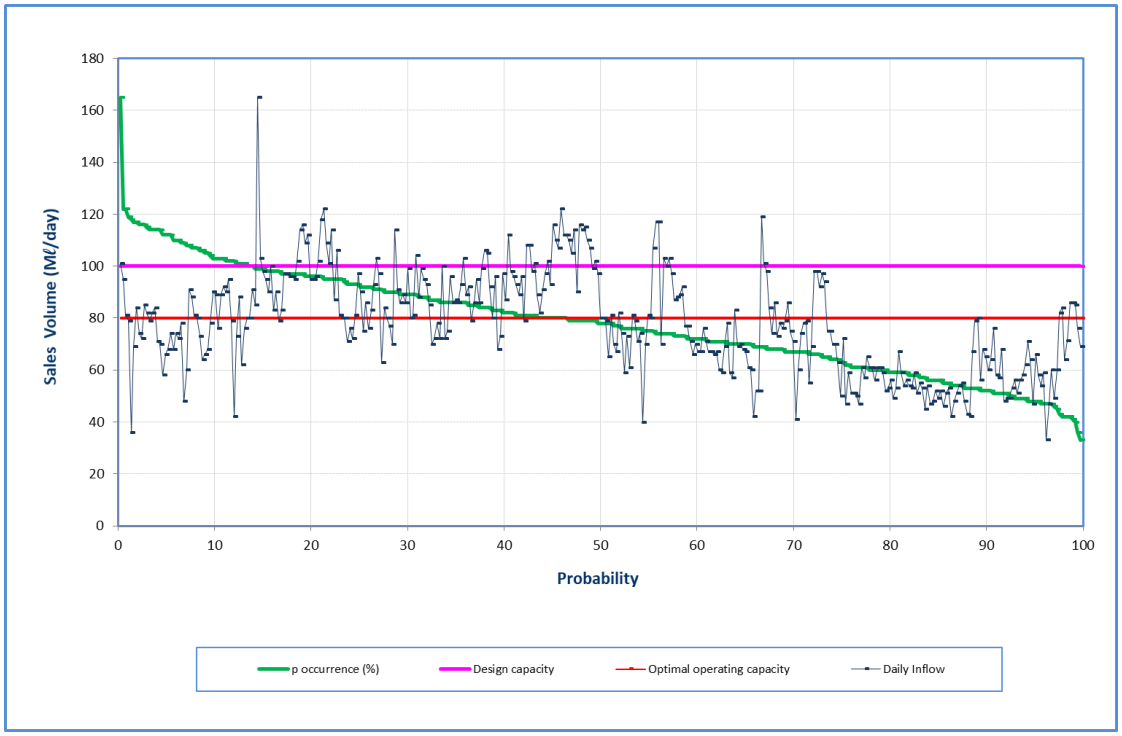

Figure 19.6 Analysis of historical production at Darvill WWW (November 2021 to October 2022).

c) Recommendations

The upgraded WWW plant comprises the following unit processes:

- Storm water overflow and storage facility
- Excess storm water chlorination facility and storm water return pump installation
- Inlet works with Fat, Oils, Grease and Grit (FOGG) removal facility
- Primary sedimentation tanks
- Activated sludge process (anaerobic, anoxic, and aeration zones (**Figure 19.7**)
- Aluminum sulfate addition to assist phosphate removal
- Secondary clarifiers for separation and return of activated sludge
- Chlorination of final effluent
- Pre-thickener for primary sludge
- Anaerobic Digesters
- Sludge dewatering facility (linear screens) and disposal
- Wash Water Plant

The inlet works consists of two inlet channels each equipped with hand raked coarse screens, four mechanical screens (installed in pairs), four vortex flow grit separators complete with submersible centrifugal grit pumps, grit classifier and belt conveyor with screenings compactor and flow measurement. The Fat, Oils and Grease (FOG) plant is combined with grit removal as an element of the inlet works to form a Fat, Oils, Grease and Grit removal facility (FOGG).

Primary treatment consists of four primary settling tanks (PST), two 30 m in diameter and two 40 m in diameter. Primary sewage is fed from the PSTs to a balancing tank (10 Mℓ).

Primary settled sewage is transferred and lifted from the balancing tank by the main pump station to an elevated level at the activated sludge tanks inlet from where the sewage receives secondary treatment. The pump station consists of two receiving sumps with two large horizontal split casing centrifugal pumps servicing each sump. A central manifold connects the two pump sets to allow for interchangeable operation. The two pumps, per sump, operate in a full duty/standby configuration and are designed to operate in a flow range of 70 – 130 Mℓ/day.

The activated sludge plant at Darvill WWW consists of a number of pre anoxic / anoxic / anaerobic zones followed by the aeration basin. A total biological volume of 74 415 m^3 is provided in the new system. Aeration in the aerobic zone of the biological reactor is achieved with fine bubble diffused air (FBDA) aeration. Air is supplied to the system by four duty and one standby blower.

Secondary treatment consists of seven clarifiers with a Return Activated Sludge (RAS) pump station fitted with centrifugal pumps operating on variable speed drives. The effluent from the clarifiers is disinfected using a high concentration chlorine solution which is discharged into the effluent upstream of the chlorine contact tank.

The chlorine disinfection unit process is followed by a series of maturation rivers / lagoons. In total there are three rivers / lagoons with a combined volume of 20 428 m^3 giving a total retention time of 8.2 hours for the design flow of 60 Mℓ/day.

The sludge treatment system has two sources of sludge produced and subsequently processed. Primary sludge withdrawn from the underflow of the primary sedimentation tanks is forwarded to a gravity sludge thickening stage before passing through a pre-fermentation process and then onto anaerobic digestion. The pre-fermentation process produces a supernatant high in volatile fatty acids (VFA's) which is returned to the liquid treatment phase and aids in denitrification ahead of the aeration basis.

The methane gas generated by the anaerobic digestion process will, in future, be utilised in a co-generation plant to produce electricity. The co-generation gas engines will be cooled by water and this water will be utilised in the digesters for heating purposes. The digested sludge will pass into the post thickeners and then be dewatered and treated with lime to provide a stable product which may be used for agricultural purposes or landfill cover.

The second sludge phase is the wasting of activated sludge. At Darvill WWW mixed liquor is wasted directly from the activated sludge reactor upstream of the final clarifiers. The waste mixed liquor will gravitate to a new building housing linear screens where it will be thickened to 6%. The sludge to the linear screens will be dosed with a cationic polyacrylamide conditioning polyelectrolyte. Thereafter it will be blended with the digested sludge and disposed of on the sludge lands adjacent to the WWW site.

The high pressure water system will operate at a pressure of 8 bar with two duty and one standby pumps. The high pressure water system will draw treated water directly from the wash water treatment plant.

Figure 19.7 Darvill Aeration Basin.

19.2.2 Ixopo Wastewater Works

a) Description

Ixopo WWW serves the town of Ixopo in the Harry Gwala District Municipality and is a Class D accredited WWW. It is located next to the R612 regional road and downstream of the Home Farm Dam, which supplies the raw water to Umgeni Water's Ixopo WTP (**Figure 19.8**).

The Ixopo WWW process train follows a typical extended aeration process consisting of an inlet works, one reactor with three aerators on timers and two clarifiers (**Figure 19.9**), five drying beds and chlorine contact channels. Sludge is dried on beds and disposed of on a local farm owned by Harry Gwala District Municipality. The characteristics of the Ixopo WWW are shown in **Table 19.2**.

Table 19.2 Ixopo WWW infrastructure.

WWW Name:	Ixopo WWW
System:	uMkhomazi System
Maximum Design Capacity:	1 Mℓ/day
Current Utilisation:	0.29 Mℓ/day
Balancing Ponds:	3 Mℓ
Raw Sewage Pump Station:	
Screens:	1 x Hand raked, 2.5 cm gaps
Grit Chambers:	2 x Constant velocity grit channel
Aeration Basin Area:	
Aeration Basin Capacity:	1150 m^3
Aerators:	3 x 18.5 kW slow speed aerators
Clarifier Type:	1 x scraped floor (12.5 m), 1 x suction lift (14.5 m)
Number of Clarifiers:	2
Total Area of all Clarifiers:	274 m^2
Total Capacity of Clarifiers:	6.6 Mℓ/day
Upflow Velocity:	1 m/h
RAS Pump Station Capacity:	
Chlorine Storage Capacity:	8 x 68 kg cylinders
Chlorine Dosing Capacity:	0 – 1 kg/h
Total Capacity of Chlorine Contact Tanks:	62 m^2
Total Capacity of Sludge Treatment Plant:	
Anaerobic Ponds:	None
Sludge Drying Beds Area:	720 m^2

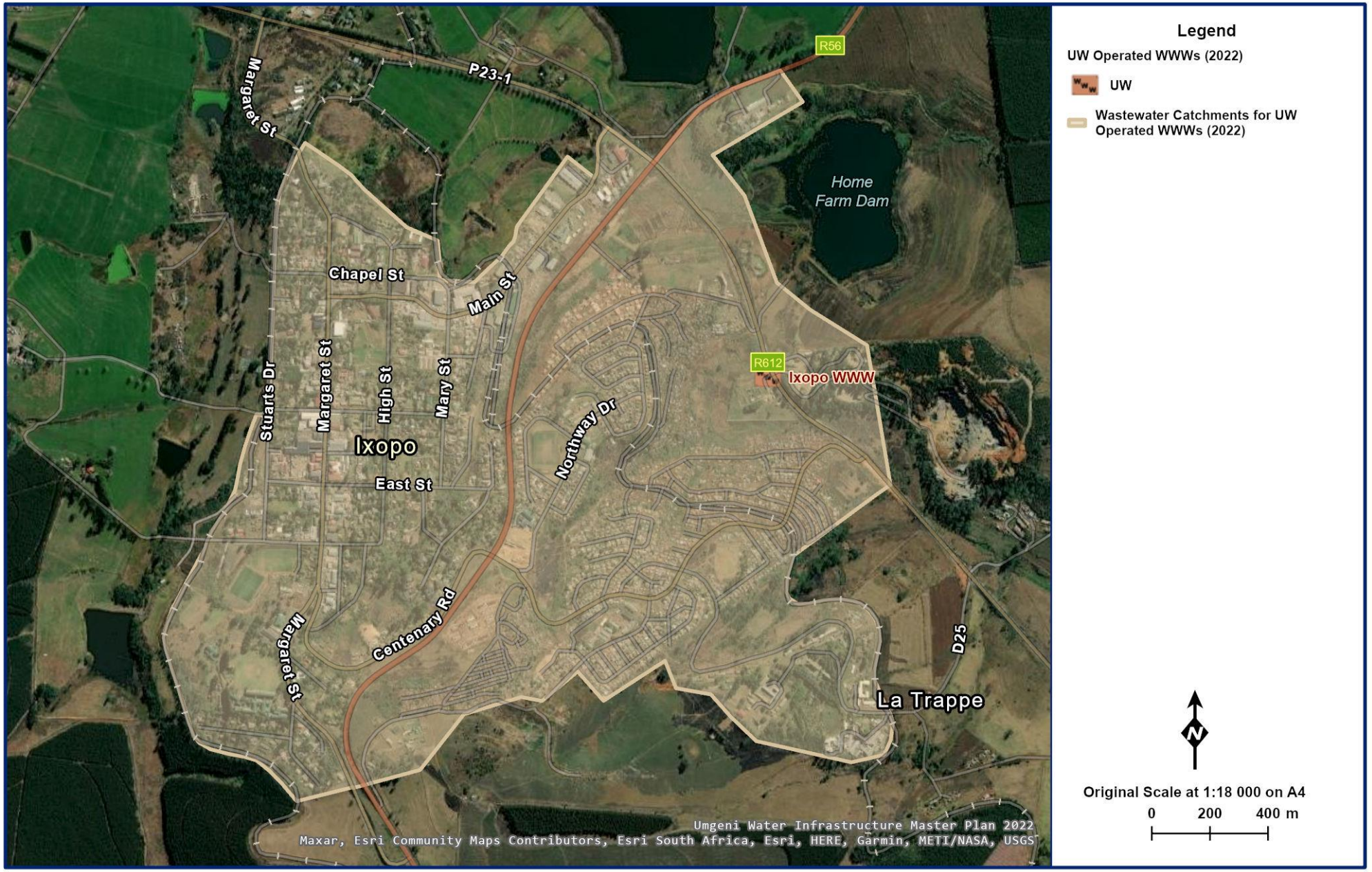

Figure 19.8 Location of Ixopo WWW.

Figure 19.9 Clarifier No. 1 Ixopo WWW.

b) Status Quo

The average daily inflow to the Ixopo WWW is shown in **Figure 19.10**.

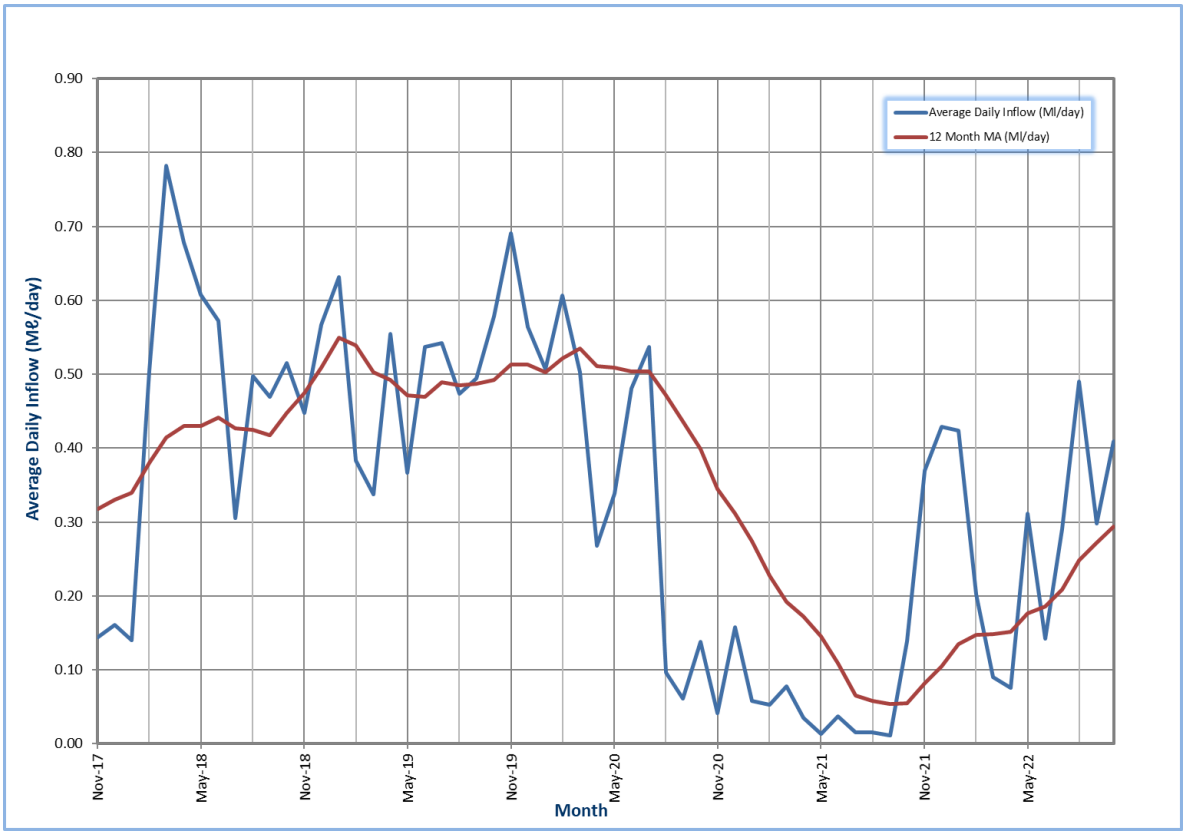

Figure 19.10 Average daily inflow (Mℓ/day) for Ixopo WWW.

Flows to the WWW have, for a number of years, been reduced as a result of blockages in the Ixopo sewer network and non-operational pump stations. The situation improved somewhat over the last year as evidenced in **Figure 19.10**. The anticipated return flows are approximately 1.3 Mℓ/day, so the improvement is still substantially less than required in order for the sewer system to be operating effectively.

Of concern is that sewage meant for the works is undoubtedly spilling into the environment and polluting water resources as well as placing communities at risk. Sampling from Umgeni Water's Home Farm Dam indicates elevated ammonia and phosphorous levels as a direct result of pollution from sewage (**Section 7.2.1(b)(iv)**). Operationally the low flows cause significant difficulties for process stability and this impacts negatively on achieving compliance with discharge standards.

An analysis of daily historical production (November 2021 to October 2022) for the Ixopo WWW is presented in **Figure 19.11.** It shows that for 1.1 % of the time the WWW was being operated above the optimal operating capacity. The plant operated above the design capacity 0.8 % of the time. This shows the plant is being vastly underutilised, especially considering that it was upgraded in October 2016 with the installation of a second clarifier.

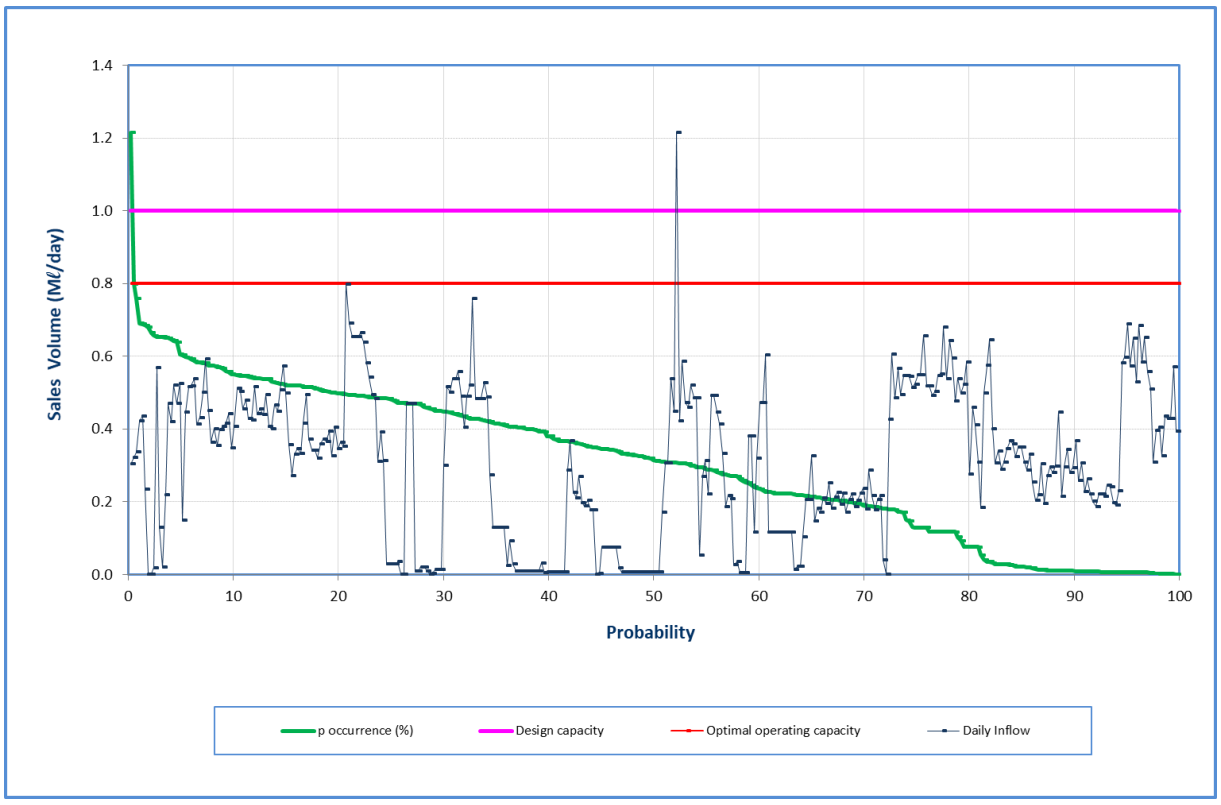

Figure 19.11 Analysis of historical production at Ixopo WWW (November 2021 to October 2022).

c) Recommendations

The underutilisation of the plant makes the operation of the plant uneconomical and results in many operational problems. For example, without a consistent inflow the aeration of the biological reactor is difficult to maintain at the correct level. The biomass is also difficult to sustain as there is a limited food source resulting in process issues.

19.2.3 Albert Falls North and South Wastewater Works

a) Description

Albert Falls North (**Figure 19.12**; **Figure 19.13**) and South WWW (**Figure 19.13**) are aerobic sequencing batch reactors (SBRs) with design capacities of 55 m^3/day and 40 m^3/day respectively. Raw sewage from the staff quarters, surrounding households and tankers is fed into the reactor via two grit channels at the Northern works and through a sump at the Southern works. Equalisation, biological treatment and secondary clarification are performed in a single tank using a timed control sequence.

The system is fitted with diffusers for oxygen supplied by two blowers for biological nutrient removal. Solid-liquid separation occurs in the reactor during an idle period when no diffusion or mixing takes place, allowing the solids to settle and a sludge-blanket to form. The diffusion occurs when the actuator valve is in a closed position and decanting occurs after the diffusion process is completed. Supernatant flows through a chlorination unit including a contact tank for disinfection. The chlorinated effluent then gravitates to a maturation pond for further stabilization and polishing. After the maturation pond the final effluent is discharged to the environment**.**

The available clarifiers are no longer in use for clarification but serve as a safe guard for over spill during actuator valve failure and pipe blockages. Waste Activated Sludge (WAS) is discharged to the neighbouring sludge drying beds. The characteristics of the Albert Falls North and South WWW are shown in **Table 19.3** and **Table 19.4** respectively.

Figure 19.12 Sequencing Batch Reactor (SBR) Albert Falls North WWW.

Figure 19.13 Location of Albert Falls North and South WWW.

Table 19.3 Albert Falls North WWW infrastructure.

WWW Name:	Albert Falls North WWW
System:	Upper Mgeni System
Maximum Design Capacity:	0.055 Mℓ/day
Current Utilisation:	Unknown (No inflow meter)
Screens:	None
Grit Chambers:	2 x grit channels
Aeration Basin:	1 x Sequencing Batch Reactor
Aeration Basin Capacity:	165 m^3
Aeration:	8 x Fine Bubble Diffuses
Blowers:	2 x 7.5 kW
Clarifier Type:	Used as overflow tank
Number of Clarifiers:	2
Total Area of all Clarifiers	NA
Total Capacity of Clarifiers:	20 m^3
Chlorine Storage Capacity:	Calcium Hypochlorite tablets
Total Capacity of Chlorine Contact Tanks:	11.34 m^3
Sludge Drying Beds Area:	51 m^2
Maturation Pond Capacity:	475 m^3

Table 19.4 Albert Falls South WWW infrastructure.

WWW Name:	Albert Falls WWW
System:	Upper Mgeni System
Maximum Design Capacity:	0.055 Mℓ/day
Current Utilisation:	Unknown (No inflow meter)
Screens:	None
Grit Chambers:	2 x grit channels
Aeration Basin:	1 x Sequencing Batch Reactor
Aeration Basin Capacity:	115 m^3
Aeration:	6 x Fine Bubble Diffuses
Blowers:	2 x 7.5 kW
Clarifier Type:	Used as overflow tank
Number of Clarifiers:	2
Total Area of all Clarifiers:	NA
Total Capacity of Clarifiers:	20 m^3
Chlorine Storage Capacity:	Calcium Hypochlorite tablets
Total Capacity of Chlorine Contact Tanks:	11.34 m^3
Sludge Drying Beds Area:	46 m^2
Maturation Pond Capacity:	140 m^3

b) Status Quo

The current Albert Falls North and South sanitation systems are very small without any significant bulk reticulation to be considered. Existing stands in this area are primarily serviced by waterborne sewage in the north and by septic tanks in the south.

c) Recommendations

The main infrastructure elements to be upgraded/added include:

- New mains are proposed within the range of 250 mmø - 200 mmø in pipe size to service the conversion of a neighbouring peri-urban area Thokozani. In addition to these future mains, the flow will need to be diverted from Albert Falls North to a new proposed WWW. The conversion of the southern septic tanks (approximately 163 stands) to waterborne sanitation will also result in the flow from Albert Falls South being diverted in future, however no additional future mains other than those specified above will be required for the septic tank conversion.
- It is estimated that the ultimate flow contribution from the Msinsi Bon Accorde Resort, the development in the surrounding Albert Falls North area and the conversion of Thokozani which is currently serviced by VIPs will be approximately 977 kℓ/day which significantly exceeds the current capacity of Albert Falls North and Albert Falls South works. Therefore, it is proposed that a new WWW, with design capacity 1000 kℓ/day, be implemented to accommodate future flows. The existing Albert Falls North and South plants should be decommissioned with existing flows being diverted to the new proposed plant.

This project will be triggered when development of the future development areas (FDAs) listed above occurs. Both conversion of the peri-urban area Thokozani and conversion of existing septic tank areas have been given a 30-year priority in the phasing approach employed.

19.3 Umgeni Water Operated Wastewater Works

Umgeni Water is responsible for the operation and maintenance of six wastewater works (Mpophomeni WWW is currently decommissioned) within the UMDM[1]. Additionally, Umgeni Water operates the Lynnfield Park WWW on behalf of the Msunduzi Local Municipality.

19.3.1 Howick Wastewater Works

a) Description

Howick WWW (**Figure 19.15**) is situated in the town of Howick in the Natal Midlands. It is owned by UMDM and operated by Umgeni Water. The WWW is a Class C accredited WWW with an extended aeration process consisting of three separate reactors and four clarifiers. All reactors follow the Johannesburg Process configuration and are fitted with mechanical mixers in the anoxic and anaerobic zones and with surface aerators in the aerobic zones. Mixed liquor from the basins is settled in four downstream clarifiers. Waste activated sludge from the reactors is dewatered in drying beds and treated effluent is disinfected using chlorine (**Figure 19.14**) before being discharged to the uMngeni

[1] In 2014 Umgeni Water entered into a management contract to manage all the wastewater works within UMDM, having previously only operated the Howick WWW.

River. Howick WWW is operating within its overall design capacity for the biological removal of COD, ammonia and phosphate.

Figure 19.14 Howick WWW Chlorine Contact Tank.

The characteristics of the Howick WWW are summarised in **Table 19.5**.

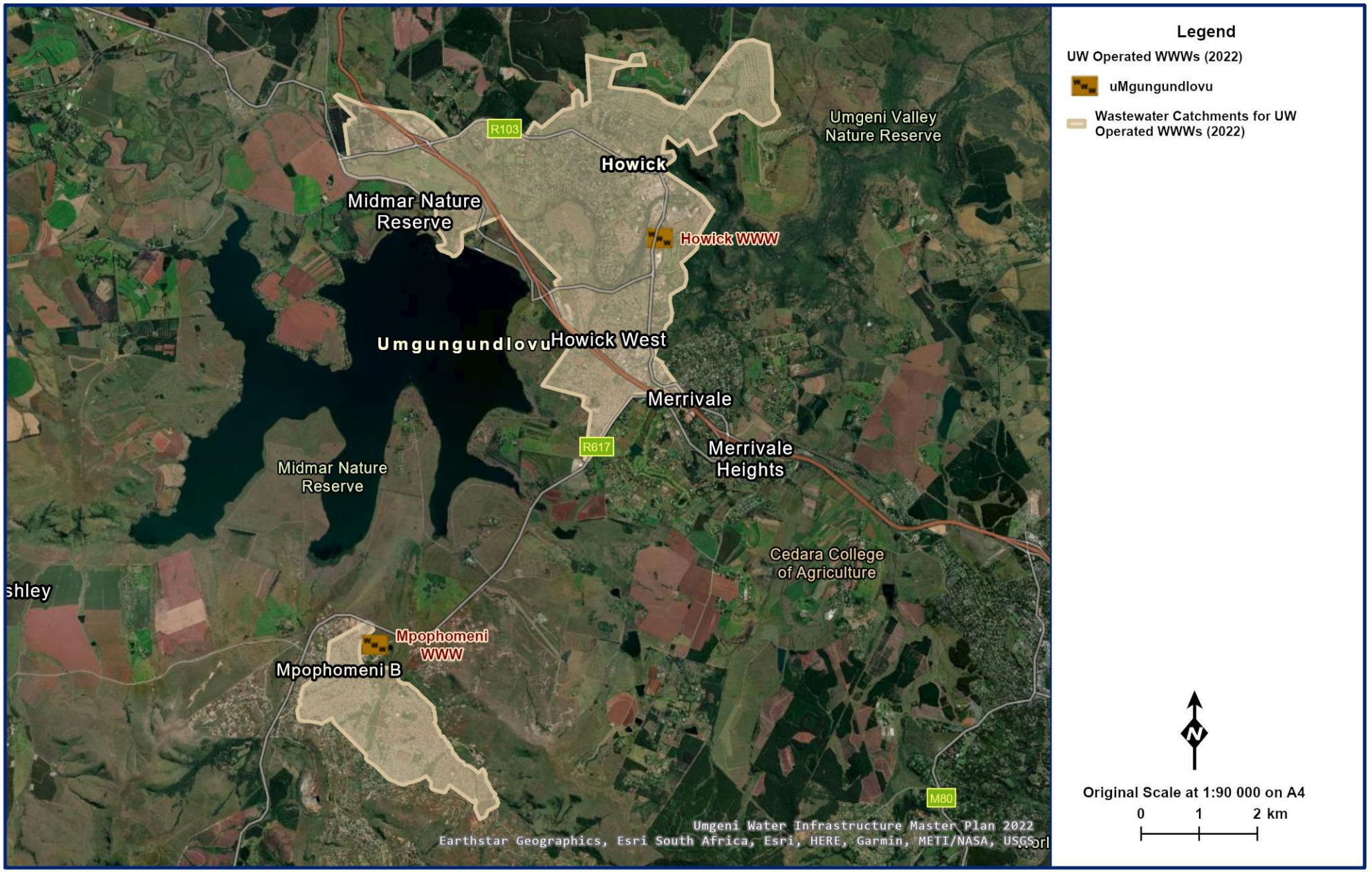

Figure 19.15 Location of Howick WWW.

Table 19.5 Howick WWW infrastructure.

WWW Name:	Howick WWW
System:	Upper Mgeni System
Maximum Design Capacity:	6.8 Mℓ/day
Current Utilisation:	4.61/day
Raw Sewage Pump Station:	
Screens:	2 x Hand Raked, 5.5 cm 1 x Mechanical Screen Raker, 1 cm (Huber); 0.75 kW Motor (Bauer)
Screw Press:	Rotary Screw Conveyor; 0.55 kW Motor (Flender)
Grit Chambers:	2 x Vortex Degritters
Degritter Pump:	2 x Airlift; 7.5 kW (Wade)
Anaerobic Basin Mixers:	6 x 1.5 kW, 3 x 2.2 kW Mixers
Anoxic Basin Mixers:	9 x 2.2 kW Mixers
Aerators:	3 x 15.5 kW (Hansen) 3 x 18.5 kW (WEG), 4 x 30 kW (Hansen)
Anaerobic Basin Area:	575 m^2
Anoxic Basin Area:	640 m^2
Aeration Basin Area:	1790 m^2
Aeration Basin Capacity:	1.7 Mℓ/day , 1.7 Mℓ/day and 3.4 Mℓ/day (9850 m^3)
Clarifier Type:	2 x Suction Lift, 2 x Mechanically Scraped
Number of Clarifiers:	4
Total Area of all Clarifiers:	830 m^2
Total Capacity of Clarifiers:	20 Mℓ/day
Upflow Velocity:	1 m/h
RAS Pump Station:	
Chlorine Storage Capacity:	68 kg Cylinder
Chlorine Dosing Capacity:	
Total Capacity of Chlorine Contact Tanks:	9 Mℓ/day
Total Capacity of Sludge Treatment Plant:	
Sludge Dewatering:	2 x Mechanical Screw Presses (Max. 5 m^3/h)
Sludge Drying Beds Area:	1920 m^2

Howick WWW (**Table 19.5**) has a design capacity of 6.8 Mℓ/day and is currently treating 4.61 Mℓ/day (**Figure 19.16**) based on a 12-month moving average. This includes (2 – 3 Mℓ/day) wastewater pumped from the decommissioned Mpophomeni WWW (**Section 19.3.2**). Mechanical dewatering equipment installed in 2013 has alleviated operational problems to a degree although the works still has capacity constraints within some processes.

b) Status Quo

An analysis of daily historical production (November 2021 to October 2022) of the Howick WWW is presented in **Figure 19.17.** It shows that for 37 % (68% in 2021) of the time the WWW was being

operated above the optimal operating capacity. The plant operated above design capacity 12% (31% in 2021) of the time.

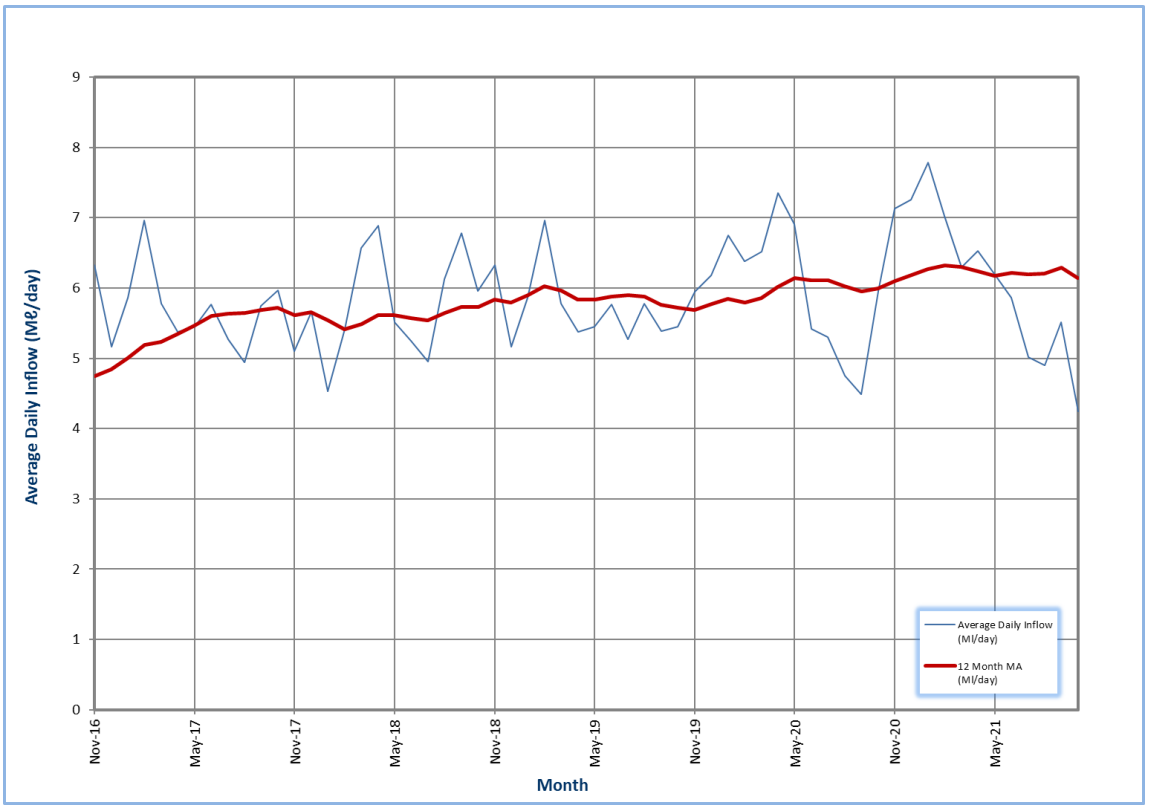

Figure 19.16 Howick WWW average daily outflows (Mℓ/day).

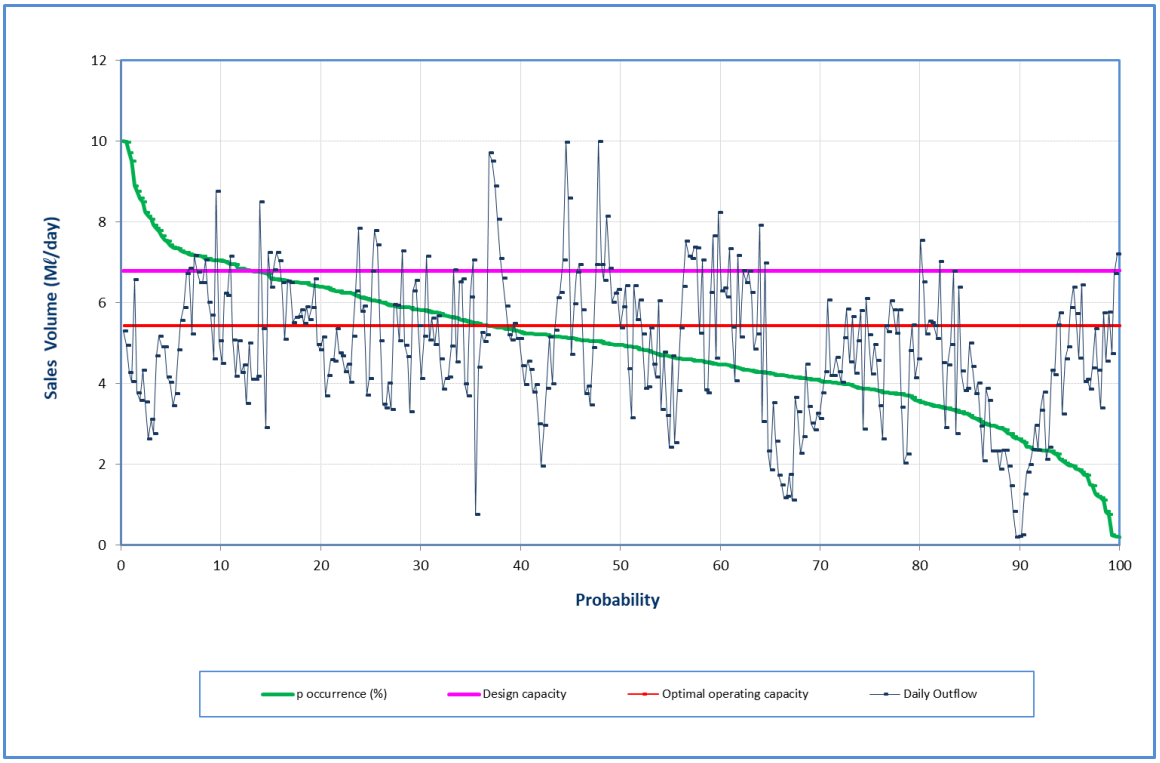

Figure 19.17 Analysis of historical production at Howick WWW (November 2021 to October 2022).

There has been a significant drop in the over-utilisation of the plant. In comparison to the previous period the plant operated 31 % less above optimum operating capacity. This was largely down to the implementation of ESKOM load-shedding, which resulted in Bridge Road (and other) sewage pump stations not operating for large periods. Subsequently the flows into the works were reduced. Umgeni Water has installed a stand-by generator system at Bridge Road to alleviate this problem in future.

c) Recommendations

The upgrading of major existing bulk infrastructure between the intersection of Main Road/Harvard Street and the Howick WWW, including the works, will be required because of upstream development. Septic tank conversions will also play a role in the required sizing.

The main infrastructure elements to be upgraded include:

i) The outfall between the intersection of Main Road/Harvard Street and Bridge Road Pump Station;
ii) Bridge Road Pump Station and 770mm rising main to the works;
iii) Upgrading of Howick WWW and inlet works.

These upgrades should be triggered when relative spare capacity remaining in the bulk infrastructure elements nears 30%.

The ultimate capacity of Howick WWW will be 17 Mℓ/day if those areas currently served by septic tanks are converted to water borne sewage. This ultimate capacity accounts for all future developments in and around Howick as well as projected growth in demand. The availability of additional land is an issue since the current site is not well utilized in terms of treatment capacity per hectare. There are two options available one being elaborated on hereunder. The second option is to decommission the existing drying beds to avail space for additional units or different technology that will accommodate the proposed additional capacity.

In discussions with the DM, it was confirmed that the land parcel immediately north of the works is municipal land. This land must be secured as soon as possible and reserved for the expansion of the WWW.

The Howick WWW is situated on Erf 997 due south from the CBD. This Erf has a size of approximately 72837 m^2 (7.28 ha). The figure above shows various land users/ coverages at and around the Howick WWW site. The fenced off area has an extent of 3.77 ha, encompassing all the current treatment processes. There is fenced and unfenced land that form part of Erf 997. Also, some portion of Erf 997 (Northeast) has been taken up by an informal settlement (in the extent of 17614 m2 or 1.76 ha. The area not taken up by informal settlements is therefore 5.52 ha. The land north of Howick WWW in the approximate extent of 2.41 Hectares and would be an ideal option to expand the plant to.

19.3.2 Mpophomeni Wastewater Works

a) Description

Presently wastewater from Mpophomeni Township is pumped from the site of the decommissioned Mpophomeni WWW (**Figure 19.18**) to Howick WWW (**Section 19.3.1**), a distance of approximately 11 km. The existing wastewater pumping and conveyance system, with an estimated operating capacity of 4.3 Mℓ/day, is inadequate to pump the projected ADWF of 5.9 Mℓ/day. Umgeni Water

started construction of a new WWW in Mpophomeni in mid-2020 (**Section 19.4.2)**. The new WWW has been designed to treat 6 Mℓ/day with the possibility of increasing the capacity to 12 Mℓ/day. The site has adequate land available for a WWW of at least 20 Mℓ/day. The existing WWW infrastructure is listed in **Table 19.6**, some of which will be retained as part of the new plant.

Table 19.6 Mpophomeni WWW infrastructure.

WWW Name:	Mpophomeni WWW
System:	Upper Mgeni System
Maximum Design Capacity:	3.5 Mℓ/day
Current Utilisation:	Decommissioned
Balancing Ponds:	2.25 Mℓ/day wet weather storage pond
Raw Sewage Pump Station:	
Screens:	1 x 30 mm Manually raked 1 x Mechanical Screen Raker (Huber)
Grit Chambers:	2 x Vortex
Primary Settling Tank:	2
Rotating Biofilters:	2 x 454 m^2
Clarifier Type:	
Number of Clarifiers:	1 x 18 m diameter
Total Area of all Clarifiers	255 m^2
Total Capacity of Clarifiers:	6 Mℓ/day
Upflow Velocity:	1 m/h
Cold Digesters:	2 x 600 kℓ
Supernatant Tank:	1 x 450 kℓ
Humus Tanks:	3
RAS Pump Station:	
Chlorine Storage Capacity:	
Chlorine Dosing Capacity:	
Total Capacity of Chlorine Contact Tanks:	
Total Capacity of Sludge Treatment Plant:	
Dewatering Facility:	
Sludge Drying Beds Area:	8

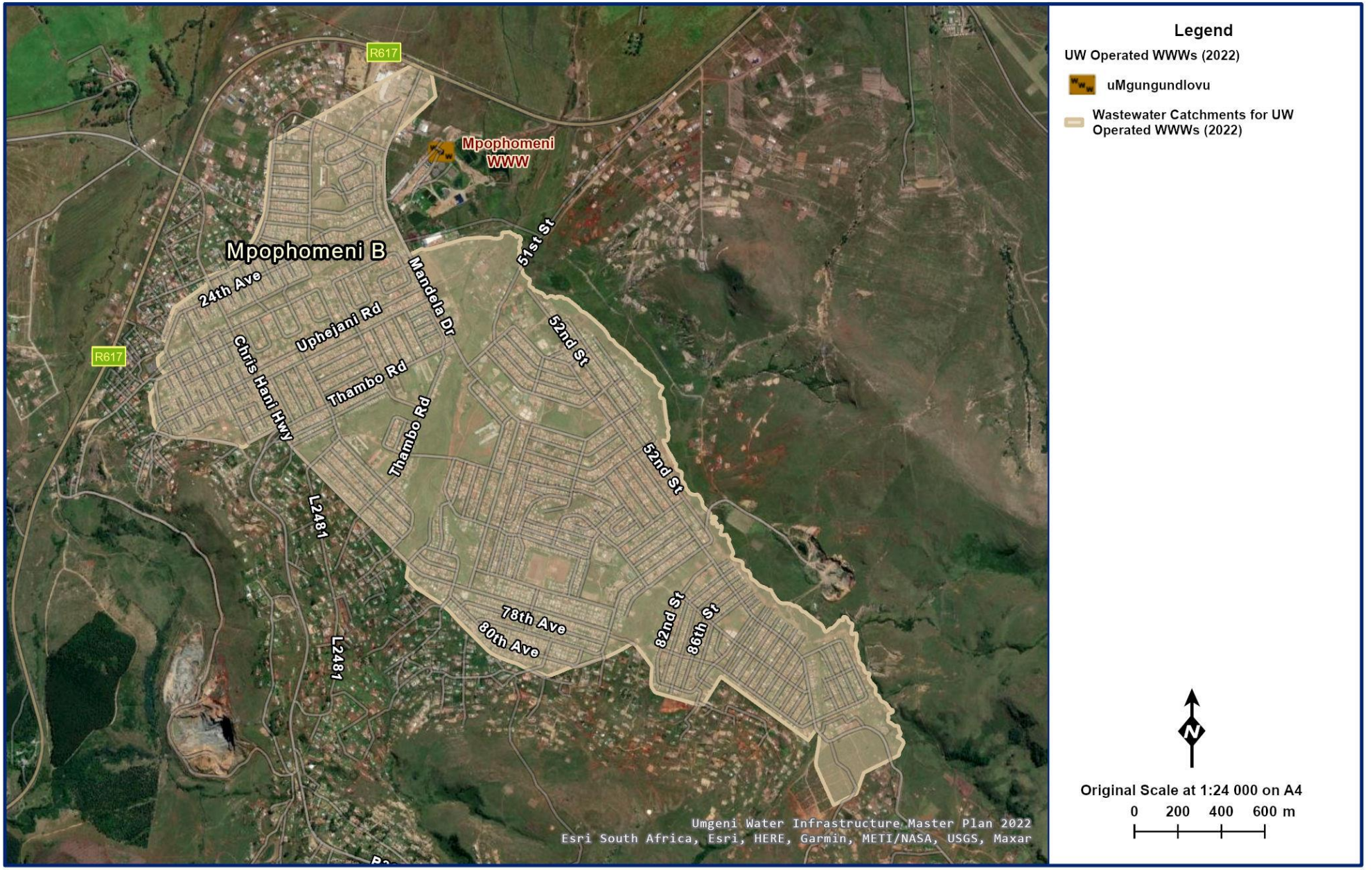

Figure 19.18 Location of decommissioned Mpophomeni WWW.

b) Status Quo

As indicated in **Section 19.3.2 a)**, wastewater from Mpophomeni Township is pumped from the site of the decommissioned Mpophomeni WWW (**Figure 19.18**) to Howick WWW. Therefore refer to **Section 19.3.1b)** for the status quo.

c) Recommendations

Brookdales development just north of Howick Airfield and shooting range is likely to be constructed before (estimated 2026) any other future developments in the Mpophomeni wastewater catchment. The internal sewer infrastructure, sewer outfall and pump station (PS), which is situated approximately 500 m north of the development, have already been designed.

A new bulk main from the Brookdales pump station (PS) to the Mpophomeni WWW is required. This will comprise a 3 km rising main from the PS, to the natural watershed located approximately 1.2 km north-east of the works along the R617. From this point a new future main will gravitate all sewage to the WWW.

As the Brookdales PS is located at the lowest point, other proposed developments adjacent to the R617 will be able to naturally drain towards the PS.

19.3.3 Lynnfield Park Wastewater Works

a) Description

The Lynnfield Park WWW is a small (0.5 Mℓ/day) works that services part of the Ashburton area (**Figure 19.19**). Umgeni Water took over the operation of the works on behalf of the Msunduzi Local Municipality in April 2014. Inflow to the works averaged 0.29 Mℓ/day on a twelve month moving average (**Figure 19.20**), up from 0.21 Mℓ/day the previous year. Despite the increase this is well below the works capacity. Prior to the installation of a flow measuring device no records were available and hence inflow readings only started in May 2017. The WWW was upgraded in 2016 with the addition of a new Sequencing Batch Reactor (SBR). The old extended aeration activated sludge reactors were decommissioned and are now used as balancing tanks and chlorine contact tanks. The Head of Works (HOW) was upgraded and comprises two channels comprising manual and mechanical screening (**Figure 19.21**).

The addition of a duplicate SBR (0.5 Mℓ/day) is planned and this would increase the capacity of the plant to 1 Mℓ/day. Any upgrades to the works are being funded by a private developer and thus the increase in capacity is being timed to coincide with planned property developments in the area. Further upgrades to 2 and 4 Mℓ/day are planned based on expected future requirements.

The characteristics of the Lynnfield Park WWW are shown in **Table 19.7**.

Table 19.7 Lynnfield WWW infrastructure.

WWW Name:	Lynnfield WWW
System:	Upper Mgeni System
Maximum Design Capacity:	0.5 Mℓ/day
Current Utilisation:	0.29 Mℓ/day
Balancing Ponds:	Storm Dam
Screens:	New 1 x Mechanical raked screen, 6 mm aperture New standby 1 x Hand raked screen, 12 mm aperture
Grit Chambers:	1 x vortex
Aeration Basin:	2 x Sequencing Batch Reactor
Aeration Basin Capacity:	500 kℓ/day
Aeration:	Fine Bubble Diffused Aeration
Blowers:	2 x 9.5 kW
Clarifier Type:	
Number of Clarifiers:	2 (decommissioned)
Total Area of all Clarifiers:	
Total Capacity of Clarifiers:	
Upflow Velocity:	
Chlorine Storage Capacity:	25 ℓ tank Liquid Sodium Hypochlorite (NaOCL)
Total Capacity of Chlorine Contact Tanks:	11.34 m^3
Sludge Drying Beds Area:	Geofabric dewatering bag contained in a disposable skip

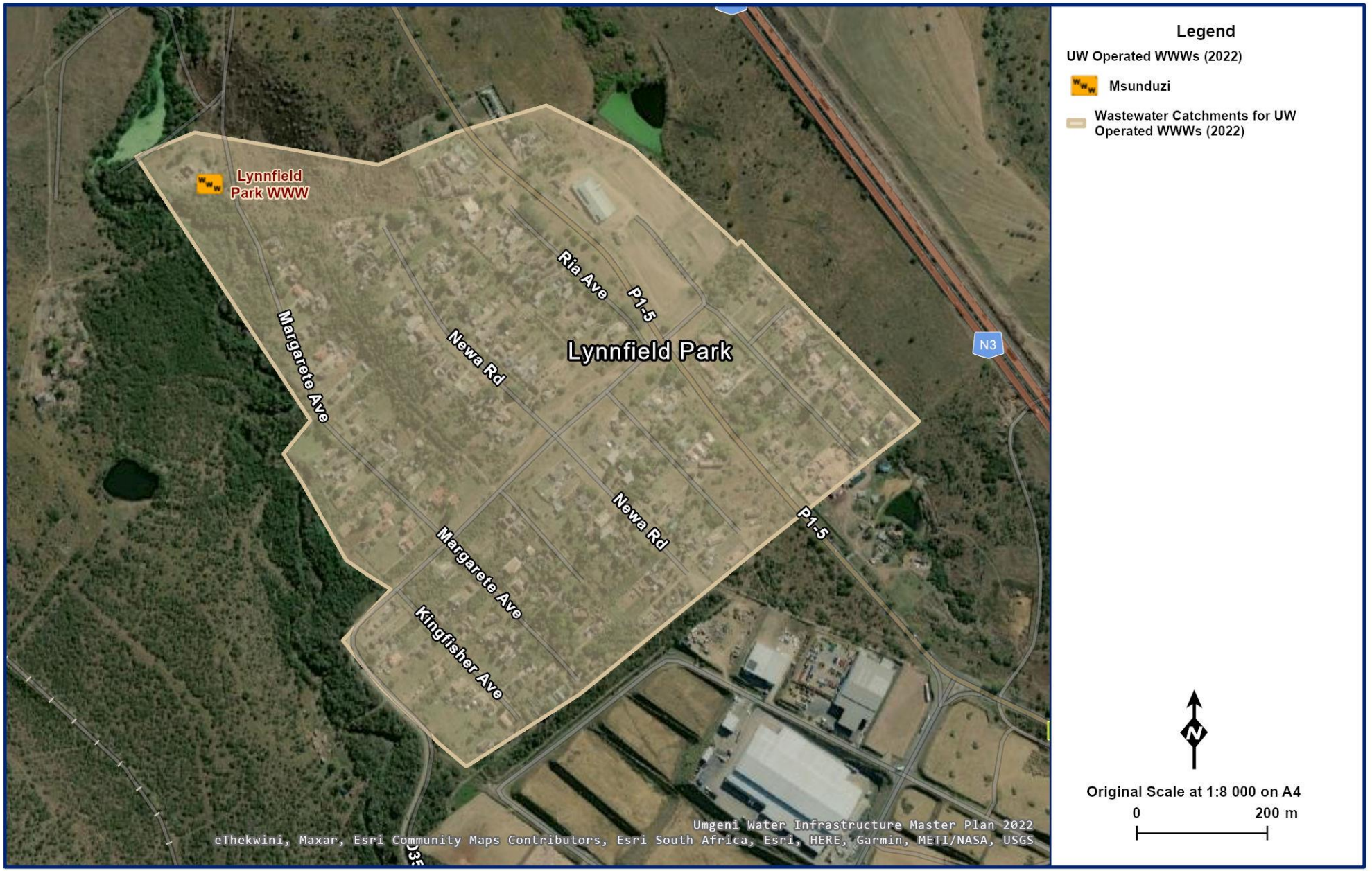

Figure 19.19 Location of Lynnfield Park WWW.

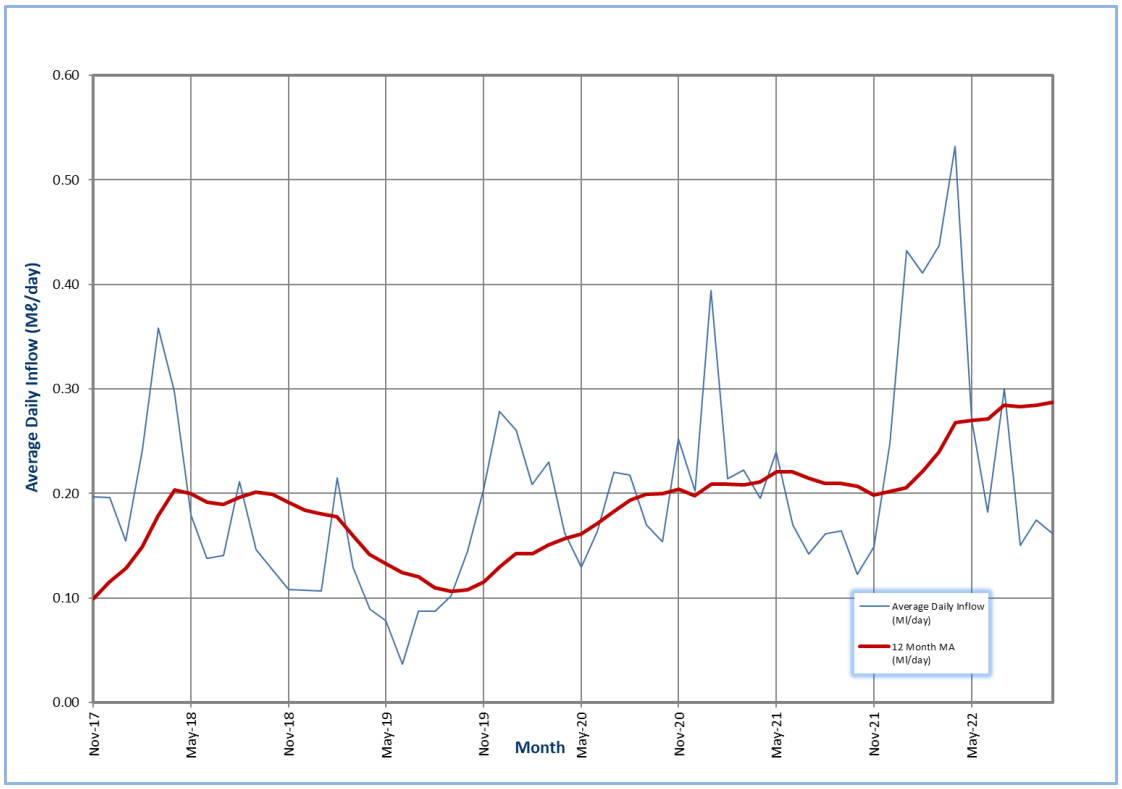

Figure 19.20 Lynnfield Park WWW average daily inflows (Mℓ/day).

Figure 19.21 Lynnfield Park WWW head of works showing manual and mechanical screening channels.

b) Status Quo

A sharp decline in flow in 2019, as a result of blockages in the sewer network, is visible in **Figure 19.20**. These blockages appear to have been cleared by the Msunduzi Municipality as the flow returned to historical volumes in 2020. The inflow has shown a gradual increase over the last two years, which cannot readily be attributed to any particular reason. Improved network management may be a contributing factor, although large rainfall events such as the April 2022 floods have also increased inflow.

An analysis of daily historical production (November 2021 to October 2022) of the Lynnfield Park WWW is presented (**Figure 19.22**)**.** It shows that for 8.7 % of the time the WWW was being operated above the optimal operating capacity. The plant operated above design capacity 3.0% of the time.

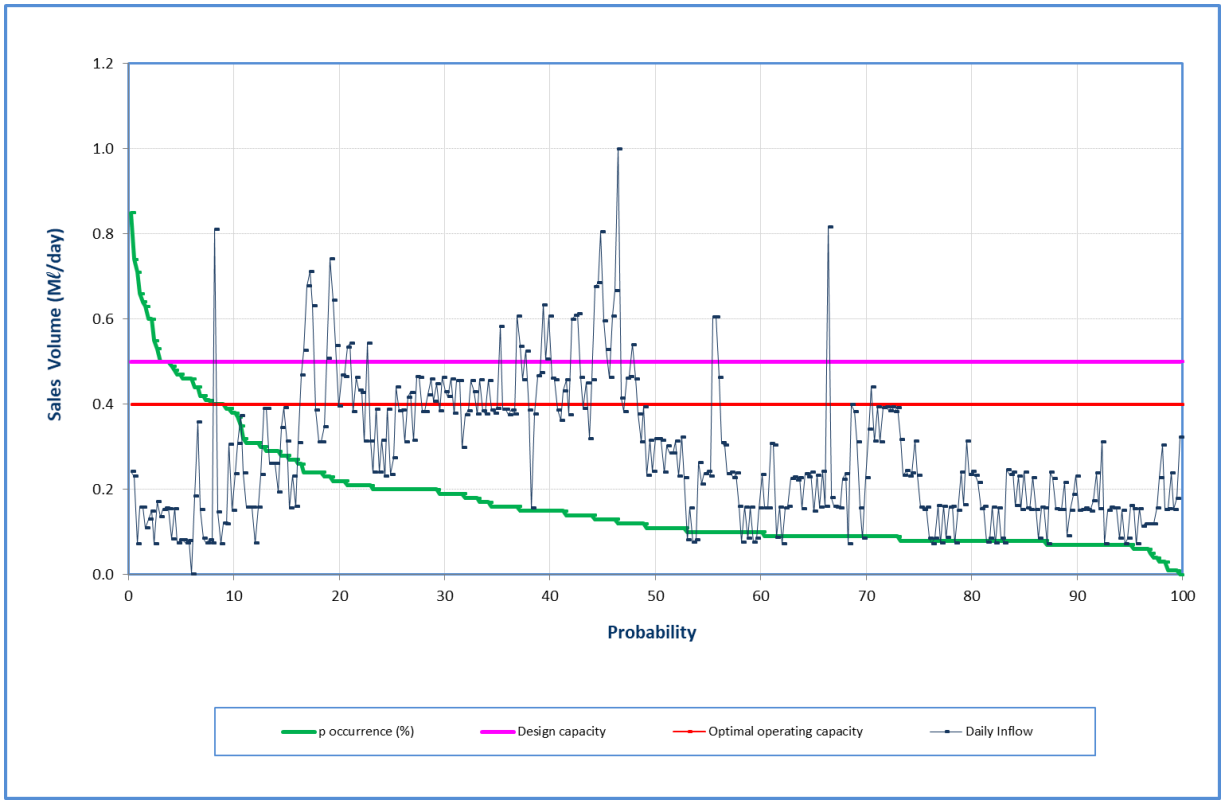

Figure 19.22 Analysis of historical production at Lynnfield Park WWW (November 2021 to October 2022).

c) Recommendations

The WWW is operating well within its capacity and there is therefore no need for an upgrade in the near future.

19.3.4 Mpofana Wastewater Works

a) Description

Umgeni Water operates the Mpofana WWW (**Figure 19.23**) on behalf of UMDM. The wastewater works services the town of Mooi River, and adjacent township of Bruntville (**Figure 19.24**). Sewage from Mooi River flows into the works by gravity whilst catchment sewage is pumped to the wastewater works by eight pump stations.

Figure 19.23 Mpofana WWW head of works.

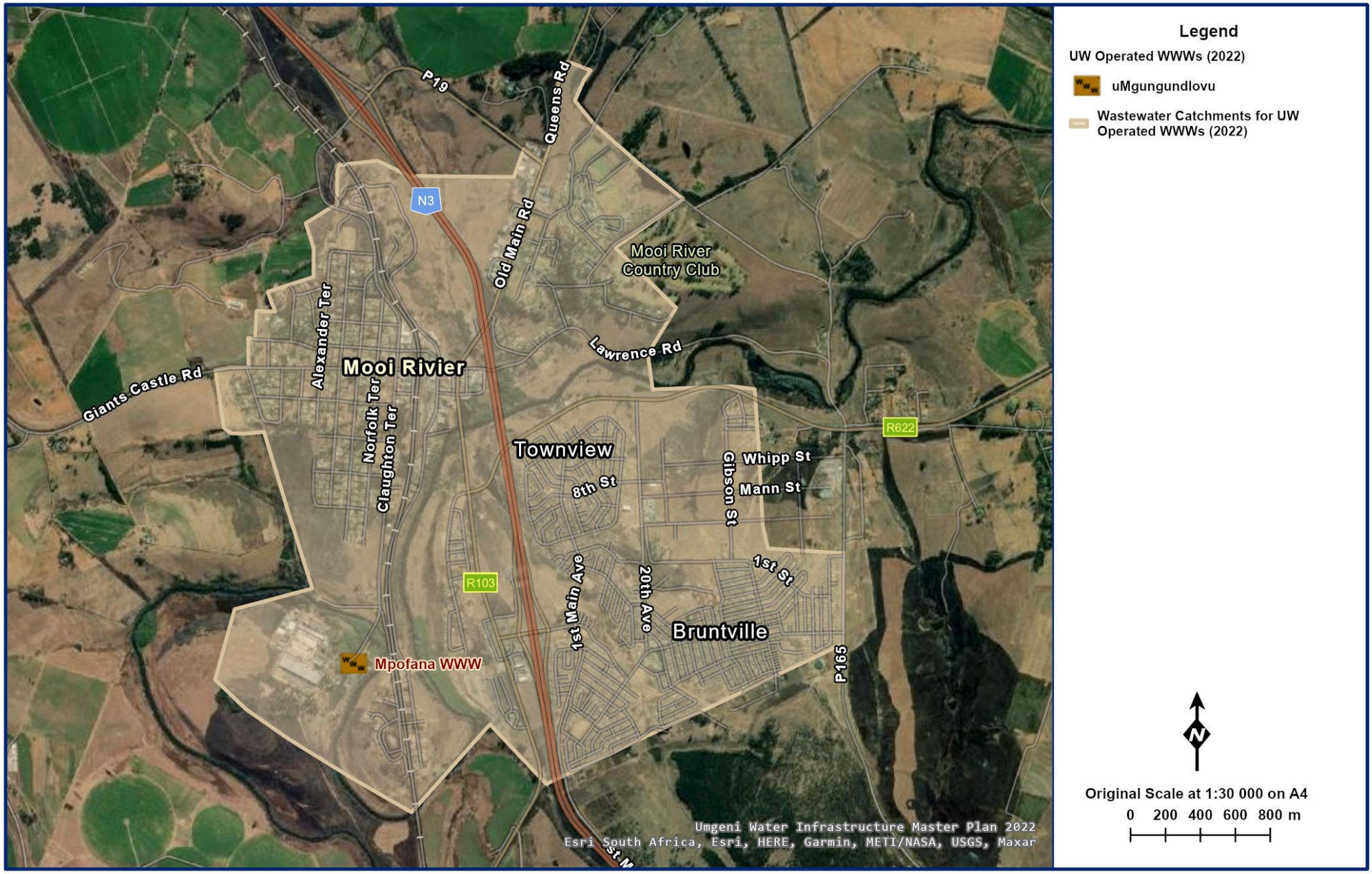

Figure 19.24 Location of the Mpofana WWW.

The characteristics of the Mpofana WWW are shown in **Table 19.8.**

Table 19.8 Mpofana WWW infrastructure.

WWW Name:	Mpofana WWW
System:	Mooi System
Maximum Design Capacity:	3.5 Mℓ/day
Current Utilisation:	1.5 Mℓ/day
Balancing Ponds:	Combined 75000 m^3
Raw Sewage Pump Station:	375 Mℓ/day @ velocity of 2.3 m/s
Screens:	3 x Hand-raked bar screen
Grit Chambers:	None
Aeration Basin:	2 x Activated sludge (1 x not operational)
Aeration Basin Capacity:	Operational 4500 m^3
Aerators:	3 x Hansen QVPD-3_UDN (45kW, 1480 rpm) 3 x SEW Eurodrive (not operational)
Clarifier Type:	Suction Lift Clarifier
Number of Clarifiers:	2 x 20 m diameter
Total Area of all Clarifiers:	628 m^2
Total Capacity of Clarifiers:	15 Mℓ/day
Upflow Velocity:	1 m/h
RAS Pump Station:	None (gravity)
Chlorine Storage Capacity:	Wallace & Tiernan, S10k Gas Chlorinator 68 kg cylinder
Chlorine Dosing Capacity:	Max. allowable 2.0 kg/h (existing)
Total Capacity of Chlorine Contact Tanks:	25m^3
Total Capacity of Sludge Treatment Plant:	5 m^3/hr
Dewatering Facility:	Operational
Sludge Drying Beds Area:	None

b) Status Quo

The works has a design capacity of 3.5 Mℓ/day and is currently treating 1.5 Mℓ/day based on a twelve-month moving average (**Figure 19.25**). The works did receive approximately 1.2 Mℓ/day of industrial influent from the adjacent textile industry until it suffered a major fire in October 2019. The factory currently remains closed.

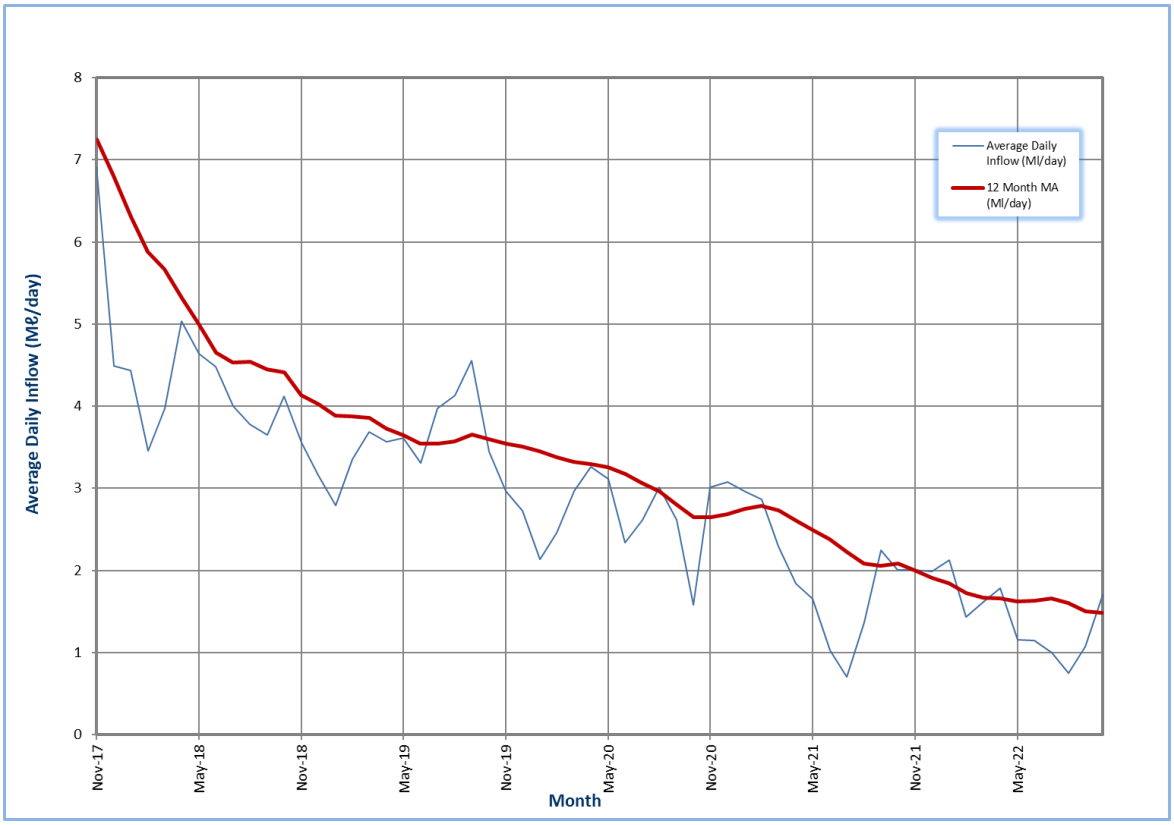

Figure 19.25 Mpofana WWW average daily inflows (Mℓ/day).

Due to zero inflow from the textile factory the average inflow of 1.5 Mℓ/day no longer exceeds the capacity of the works (**Figure 19.25**). A contributing factor to the low flows entering the works are ongoing sewage network problems. Many of the sewage pump stations are not operational for long periods of time resulting in considerable environmental pollution. An analysis of daily historical production (November 2021 to October 2022) of the Mpofana WWW is presented in **Figure 19.26.** It shows that for 4% (21% in 2021) of the time the WWW is being operated above the optimal operating capacity. The plant operated above design capacity 1% (6% in 2020) of the time. As can be seen from the graph the plant is now operating within is optimum operating capacity for the majority of the time. The plant is thus not hydraulically stressed as in the past. Low flows are the cause of this as sewage pump stations are often not operating due to breakdowns. The situation is exacerbated by load shedding.

The Detailed Feasibility Study (DFS) for the upgrade of the works has been suspended following a review of the project (**Section 19.4.5**). However, a number of operational issues have been identified at the works (mainly due to aging infrastructure) and these will be scheduled for refurbishment or replacement under a new project. The refurbishment project will increase the capacity of the works to meet demands and improve the treatment process sufficiently to meet effluent discharge standards.

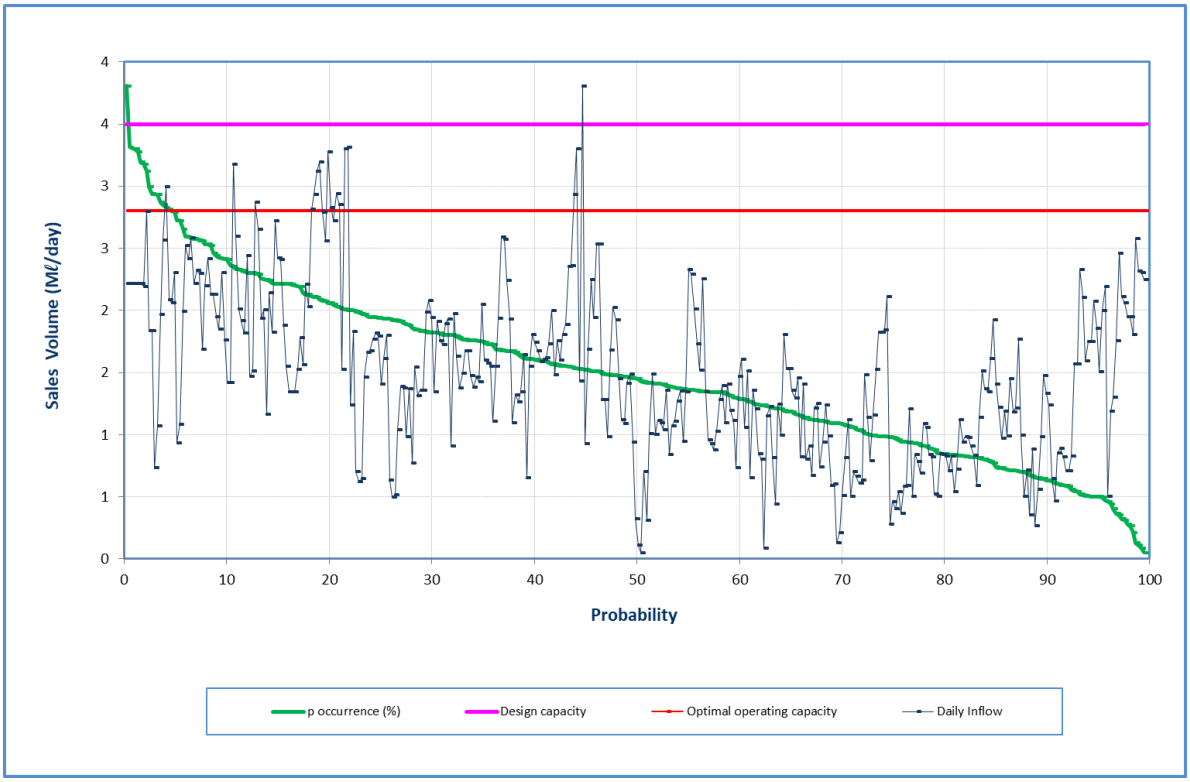

Figure 19.26 Analysis of historical production at Mpofana WWW (November 2021 to October 2022).

c) Recommendations

A number of future development areas (FDAs) have been identified in Mooi River through various sources. Proposed projects include those that would address backlogs as well as new developments. The resultant increase in demand requires that the main outfall that leads to the WWW be upgraded. The upgrade, therefore caters to all developments in the Mooi River town and Bruntville township area.

The Mpofana WWW outfalls with an existing nominal diameter of 300 mm⌀ were simulated under the theoretical zoning and future development demands associated with this development scenario. The results showed that the bulk outfalls will require upgrades within the range of 525 mm⌀- 400 mm⌀ in pipe size.

Additionally, analysis showed that the section of the outfall directly after the rising main, is a flatter slope than the pipes upstream and downstream, and due to this flat slope, the hydraulic model indicates that the pipe be upgraded to 400 mm⌀.

There are three main areas in the Mpofana scheme boundary that are serviced by septic and conservancy tanks, namely Penningdale, Brickyards and Mooi River Industrial conservancy tanks. Penningdale is located adjacent the Mpofana WWW, where the western side of converted septic tanks could drain directly into the main outfall for the Mpofana WWW. Furthermore, with the main outfall for the Mpofana WWW already catering for the larger flows from Mooi River town and Bruntville Township, the additional flow from these three areas will not be significant enough to trigger a larger upgrade to the outfall other than what is already specified.

These projects will be triggered when development of FDAs, listed above, occurs. Both conversion of the peri-urban areas and conversion of existing septic tank areas have been given a 30-year priority in the phasing approach employed.

19.3.5 Appelsbosch Wastewater Works

a) Description

The Appelsbosch WWW is situated in Appelsbosch in the uMshwathi Municipality (**Figure 19.27**). The WWW comprises a single rectangular aeration tank fitted with turbine aerators (**Figure 19.28**), a clarifier, three anaerobic ponds and a chlorine contact tank. The current treatment capacity is reported as 0.5 Mℓ/day. The plant receives sewerage from the Hospital, College and Appelsbosch Waterworks, although the Waterworks was decommissioned in November 2019. The plant is classified as a Class D works requiring a Class 1 operator onsite and a Class V supervisor available who does not necessarily have to be onsite. The characteristics of the Appelsbosch WWW are shown in **Table 19.9**.

b) Status Quo

The Appelsbosch WWW flows are represented in the graph (**Figure 19.29**) and it is apparent that the flows are very small with a 12 month moving average of 0.07 Mℓ/day in October 2022.

Figure 19.27 Location of the Appelsbosch WWW.

Figure 19.28 Appelsbosch WWW Oxidation Ditch (Aeration Tank).

Table 19.9 Appelsbosch WWW infrastructure.

WWW Name:	Appelsbosch WWW
System:	Upper Mgeni System
Maximum Design Capacity:	0.5 Mℓ/day
Current Utilisation:	0.07 Mℓ/day
Balancing Ponds:	None
Raw Sewage Pump Station:	Gravity
Screens:	1 x Hand Raked
Grit Chambers:	None
Aeration Basin:	1 x Oxidation Ditch
Aeration Basin Capacity:	667 m^3
Aerators:	2 x Brush Aerators
Clarifier Type:	Scraped Floor
Number of Clarifiers:	1
Total Area of all Clarifiers	38 m^2
Total Capacity of Clarifiers:	0.9 Mℓ/day
Upflow Velocity:	1 m/h
RAS Pump Station:	
Chlorine Storage Capacity:	
Chlorine Dosing Capacity:	
Total Capacity of Chlorine Contact Tanks:	
Total Capacity of Sludge Treatment Plant:	None
Anaerobic Ponds:	3 (35 m x 10 m)
Sludge Drying Beds Area:	Not operational

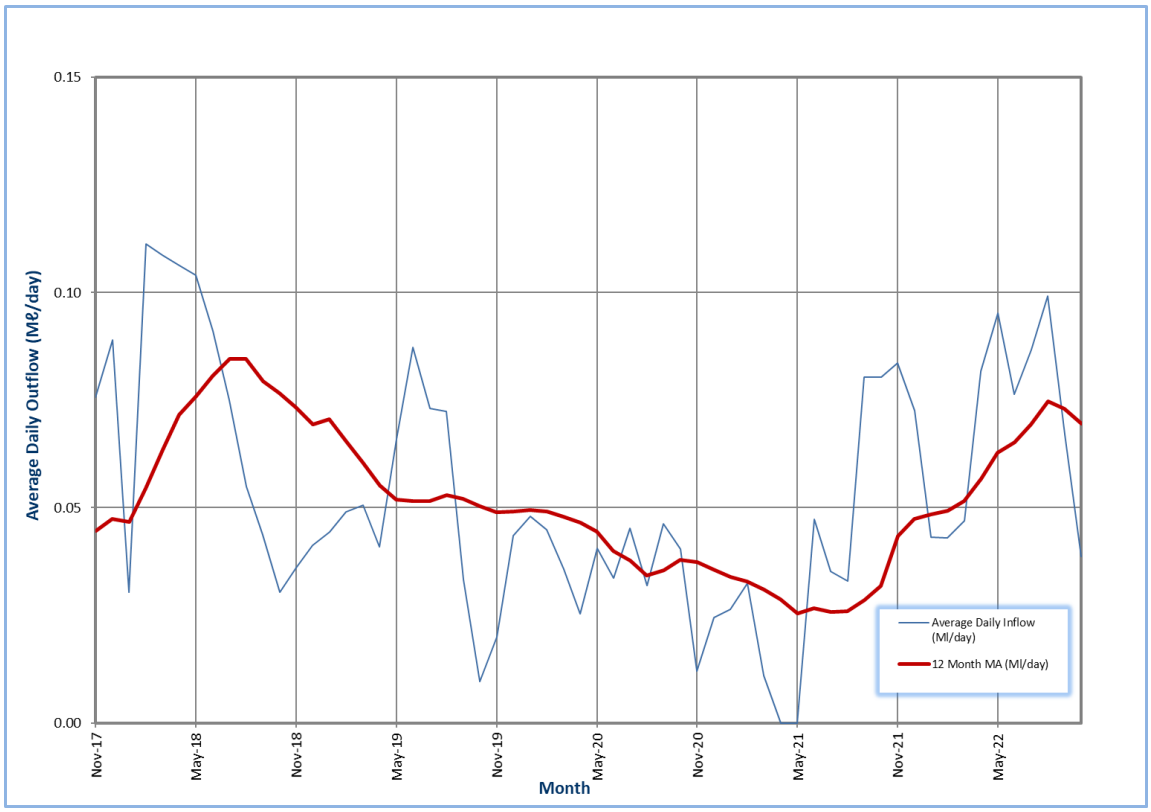

Figure 19.29 Appelsbosch WWW average daily outflows (Mℓ/day)

c) Recommendations

The flows are within the design capacity of the WWW and therefore there are no identified recommendations presently.

19.3.6 Cool Air Wastewater Works

a) Description

The Cool Air WWW is situated near the Cool Air Township (**Figure 19.30**) in the uMshwathi Local Municipality. The plant is owned by UMDM and operated by Umgeni Water. The plant is classified as a Class C and is required to have a Class 3 Operator, and a Class V Supervisor available. These staff do not necessarily have to be on the plant all of the time.

The WWW is an extended aeration activated sludge process (**Figure 19.31**) with two rectangular aeration tanks, two clarifiers and a chlorine contact tank. The characteristics of the Cool Air WWW are shown in **Table 19.10.**

Table 19.10 Cool Air WWW infrastructure.

WWW Name:	Cool Air WWW
System:	Upper Mgeni System
Maximum Design Capacity:	1.5 Mℓ/day
Current Utilisation:	0.55 Mℓ/day
Balancing Ponds:	None
Raw Sewage Pump Station:	Gravity
Screens:	Hand raked 1 x 3.5 cm, 1x2.0 cm
Grit Chambers:	None
Aeration Basin:	2 x Extended aeration
Aeration Basin Capacity:	2 x 883 m^3
Aerators:	2 x 4.48 kW, 2 x 7.5 kW
Clarifier Type:	1 x suction lift, 1 x scraped
Number of Clarifiers:	2
Total Area of all Clarifiers:	129 m^2
Total Capacity of Clarifiers:	3.12 Mℓ/day
Upflow Velocity:	1 m/h
RAS Pump Station:	2 x Archimedes Screw Pumps
Chlorine Storage Capacity:	68 kg cylinder chlorine gas
Chlorine Dosing Capacity:	0 – 1 kg/h
Total Capacity of Chlorine Contact Tanks:	
Total Capacity of Sludge Treatment Plant:	None
Anaerobic Ponds:	None
Sludge Drying Beds Area:	835 m^2

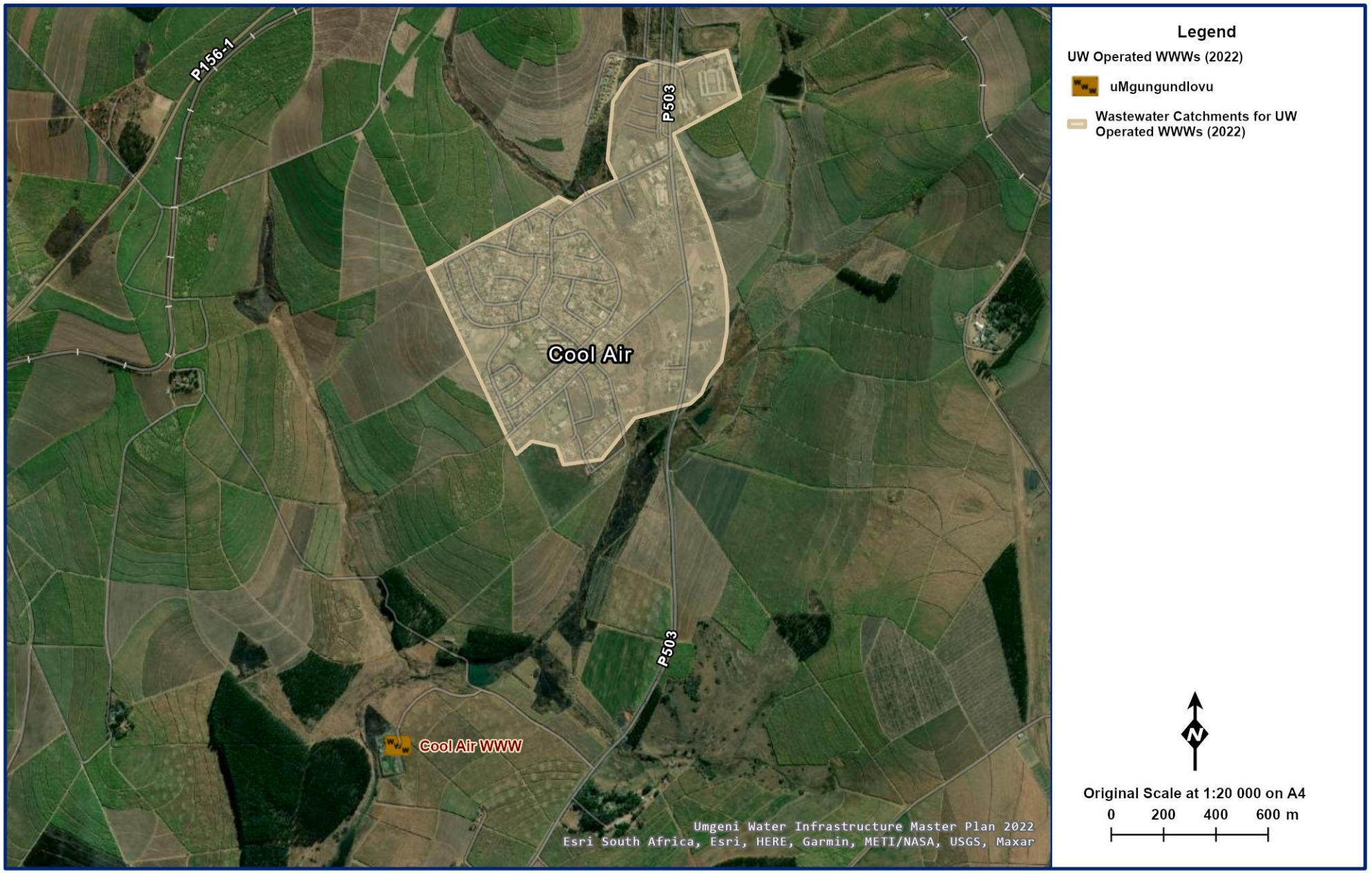

Figure 19.30 Location of the Cool Air WWW.

Figure 19.31 Different Mechanical Surface Aerators in Cool Air Reactor 1 and 2.

b) Status Quo

Cool Air WWW has a design capacity of 1.5 Mℓ/day and is currently treating 0.55 Mℓ/day (**Figure 19.32**) based on a 12-month moving average. This is still well below the historical average and is possibly attributable to blockages in the sewer network. The issue has been raised as a concern with the uMgungundlovu District Municipality.

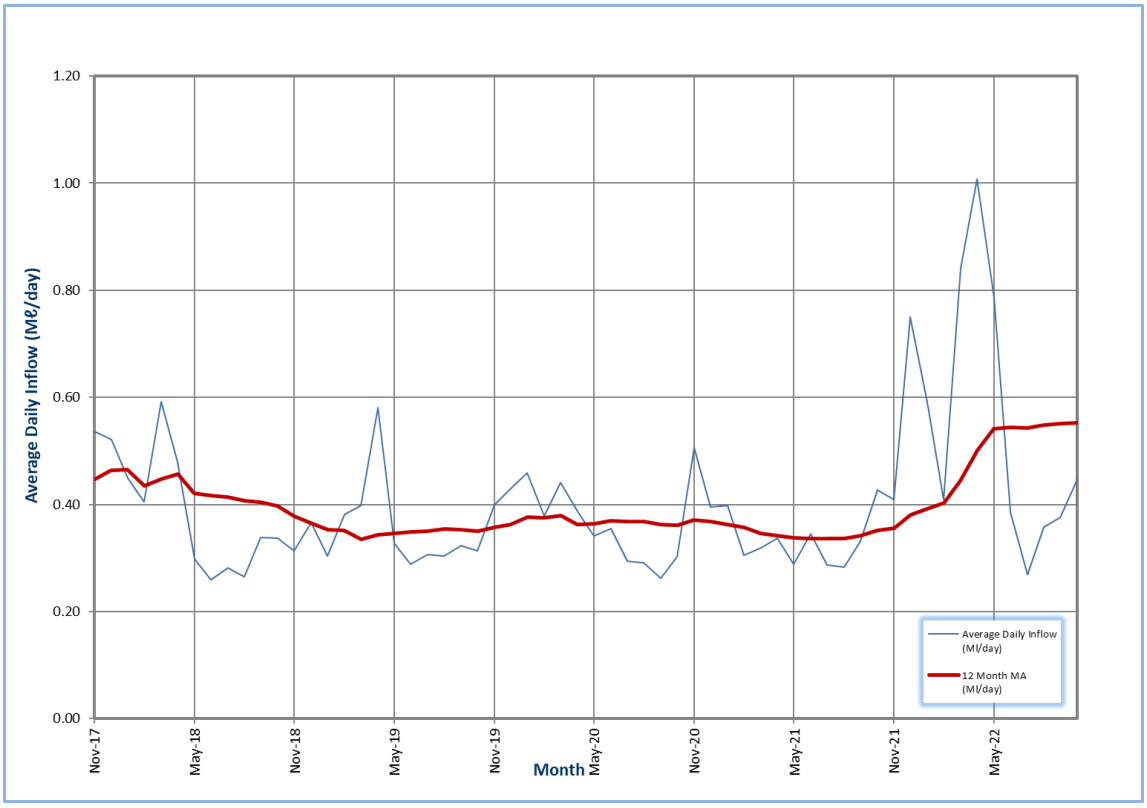

Figure 19.32 Average daily inflows to Cool Air WWW (Mℓ/day).

An analysis of daily historical production (November 2021 to October 2022) of the Cool Air WWW is presented in **Figure 19.33.** It shows that for 6.5 % of the time the WWW was being operated above the optimal operating capacity. The plant operated above design capacity 3.8 % of the time.

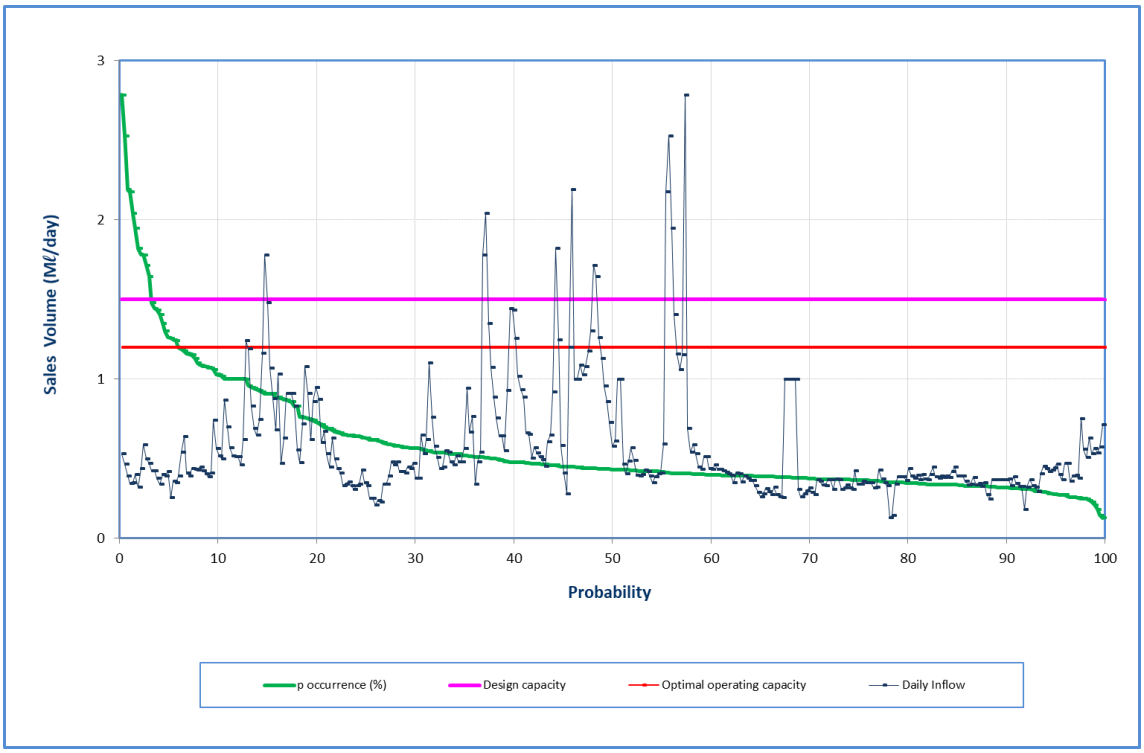

Figure 19.33 Analysis of historical production at Cool Air WWW (November 2021 to October 2022).

c) Recommendations

The main Cool Air outfall leading to the Cool Air WWW steadily gravitates alongside the Mhlalane River from the North to the South through the centre of the Cool Air scheme boundary. The sewer network consists of 13 km of sewer reticulation. All gravity sewers in Cool Air have sufficient spare capacity when analysed according to the existing demand scenario and evaluation criteria. Additionally, as detailed above the metered inflows are far below the design capacity of the WWW.

The village of Dalton lies to the north of Cool Air and it is primarily serviced by septic tanks. In order to improve the level of service septic tank conversations to water borne sewage is proposed for the existing 109 stands. To accommodate the Dalton Septic tanks in the areas which naturally drain North-Easterly as opposed to draining towards the WWW in the South a pump station will be required. The proposed pump station will be accompanied by a proposed rising main leading to the Cool Air outfall. The proposed rising main will be approximately 930 m in length and 110 mm.

It is estimated that the ultimate flow contribution from the Cool Air town and the future developments areas (FDA) will be approximately 1750 kℓ/d. Therefore, the future capacity of Cool Air WWW should have a design capacity of 2000 kℓ/d to accommodate future flows. This project will be triggered when development of FDAs occurs, estimated around 2026 to 2041.

19.3.7 Camperdown Wastewater Works

a) Description

Camperdown WWW is situated in Camperdown (**Figure 19.34**) approximately half-way between Pietermaritzburg and Cato Ridge. The WWW falls within the Mkhambathini Local Municipality and UMDM, which is the WSA for the area. The plant is owned by UMDM and is operated by Umgeni Water. The plant is classified as a Class E works requiring a Class 1 Operator onsite and a Class V Supervisor available but not necessarily onsite.

The WWW has an extended aeration activated sludge process using a rectangular aeration tank and two scraped clarifiers. The characteristics of the Camperdown WWW are shown in **Table 19.11.**

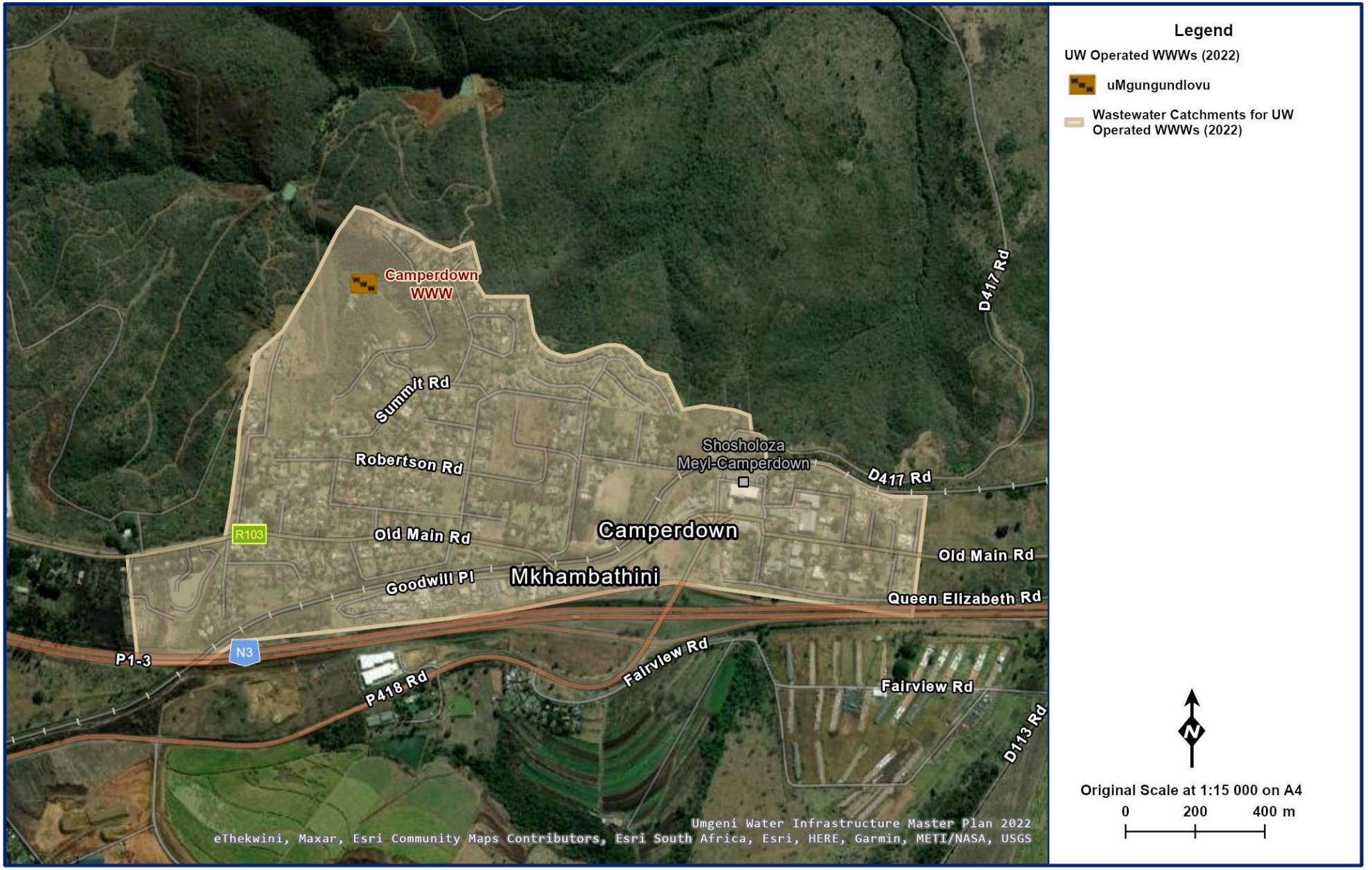

Figure 19.34 Location of the Camperdown WWW.

Table 19.11 Camperdown WWW infrastructure.

WWW Name:	Camperdown WWW
System:	Lower Mgeni System
Maximum Design Capacity:	0.5 Mℓ/day
Current Utilisation:	0.1 Mℓ/day
Balancing Ponds:	None
Raw Sewage Pump Station:	Gravity
Screens:	1 x Hand Raked, 2.5 cm Gaps
Grit Chambers:	1 x Vortex Degritter
Aeration Basin:	1
Aeration Basin Capacity:	234 m^3
Aerators:	2 x 5.5 kW
Clarifier Type:	Scraped Floor
Number of Clarifiers:	1
Total Area of all Clarifiers:	28 m^2
Total Capacity of Clarifiers:	1 x 85 m^3 (New Steel)) , 6.72 Mℓ/day,
Upflow Velocity:	1 m/h
RAS Pump Station:	
Chlorine Storage Capacity:	Sodium Hypochlorite
Chlorine Dosing Capacity:	
Total Capacity of Chlorine Contact Tanks:	
Total Capacity of Sludge Treatment Plant:	
Anaerobic Ponds:	1 x 30 m^2
Sludge Drying Beds Area:	130 m^2

b) Status Quo

Camperdown WWW (**Figure 19.36**) has a reported design capacity of 0.5 Mℓ/day and is currently treating 0.11 Mℓ/day (**Figure 19.35**) based on a 12-month moving average (0.01 Mℓ/day in 2021). There is a noticeable increase in inflow to the works over the last year. This can be partially attributed to the repair of sewage pump stations by the Municipality, but mainly due to improved flow meter accuracy.

An analysis of the daily historical production is not provided as the inflow data is not a true reflection of the volume of wastewater being produced in the catchment. Only a limited portion of sewage is actually reaching the plant rendering any analysis of plant capacity superfluous. It is, however, clear that the capacity of the works is more than sufficient for the foreseeable future as the average daily inflow is low in comparison to the works capacity. Currently the sewage network serves only a portion of Camperdown and this has been a constraint on development in the area (**Figure 19.34**). A detailed design has been completed for a new 2 Mℓ/day wastewater works named Mkhambathini WWW, to be located west of the N3 freeway (**Section 19.4.6**). This project requires that the UMDM first upgrade and expand the sewer reticulation network to accommodate all existing and future demand. Umgeni Water is engaging with UMDM in investigating alternative funding mechanisms for the project.

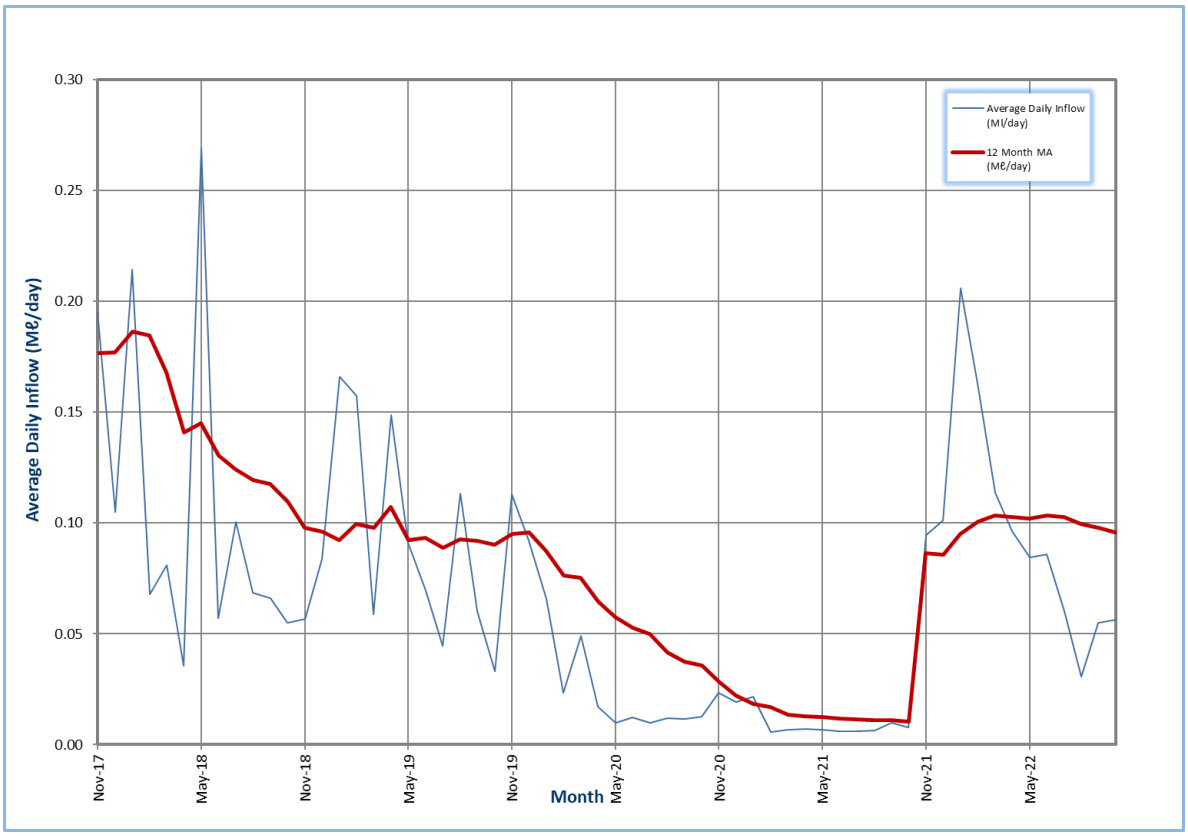

Figure 19.35 Average daily inflows to Camperdown WWW (Mℓ/day).

Figure 19.36 Camperdown Clarifier No. 2.

c) Recommendations

The existing Camperdown scheme will, in future, expand considerably to cater for vast expected future development along the N3 corridor. Additionally, the small existing Camperdown works is not located

in a suitable position to cater for this and as such should be decommissioned. A new interim Mkhambathini and ultimate Mkhambathini works at two different locations are proposed.

The interim Mkhambathini WWW **(Section 19.4.5**) was proposed a decade ago and is based on 10 potential future development areas (FDAs) directly south of the existing scheme and N3 freeway. The proposed design capacity of the Mkhambathini WWW is 2 Mℓ/day. However, an additional 12 potential FDA's have been identified in the Sanitation Master Plan study, some of which are downstream of the proposed WWW location. A future wastewater works of much larger capacity (28 Mℓ/day) it thus proposed to meet the ultimate demand in the area.

The decommissioning of the existing Camperdown WWW must include the construction of a PS (Camperdown PS 1), and a 650 m rising main to pump all sewage generated from the existing scheme to the watershed, located near the intersection of Alfred Storm Street and Horizon Place. Thereafter, a 3.1 km gravity main will be required to deliver sewage to the proposed low lift Camperdown PS 2. This PS and short rising main will pump sewage to the Mkhambathini (interim) WWW. This infrastructure will also cater for the service level upgrade (septic tanks to waterborne) for approximately 130 existing stands immediately south of the existing scheme.

The majority of this project will be required regardless of whether the Municipality opt for the interim WWW site or not, as most infrastructure will also be included in the ultimate operational configuration (excluding the works and low lift PS) and will therefore be triggered when any development occurs, expected around 2026.

19.3.8 Richmond Wastewater Works

a) Description

Umgeni Water operates the Richmond WWW on behalf of UMDM. The wastewater works services the town of Richmond (**Figure 19.37**), but does not include the adjacent township of Ndaleni. Sewage from Richmond flows by gravity to the wastewater works.

The plant is an extended aeration activated sludge process consisting of an inlet works, a single rectangular aeration tank fitted with two surface aerators and a suction lift clarifier (**Figure 19.38**). Final treated wastewater is disinfected using chlorine gas.

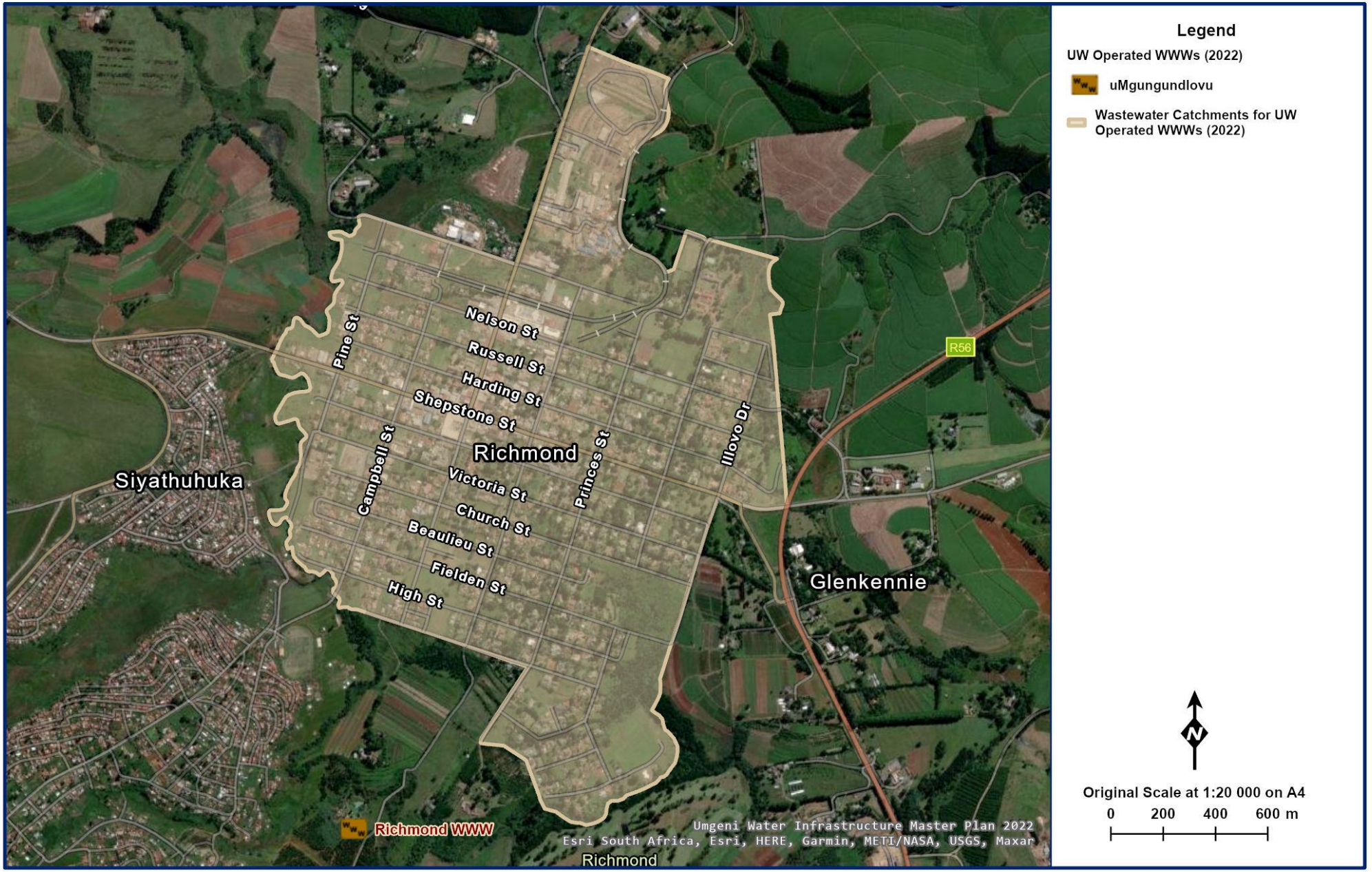

Figure 19.37 Location of the Richmond WWW.

Figure 19.38 Richmond WWW clarifier.

The works was designed for ADWF of 1 Mℓ/day with a COD loading of 740 kg/day. The WWW is classified as a Class E works requiring a Class 1 Operator onsite, and a Class V Supervisor available, but not necessarily onsite. The characteristics of the Richmond WWW are shown in **Table 19.12.**

Table 19.12 Richmond WWW infrastructure.

WWW Name:	Richmond WWW
System:	Upper Mgeni System
Maximum Design Capacity:	1 Mℓ/day (Based on ADWF) 2.9 Mℓ/day
Current Utilisation:	0.77 Mℓ/day
Raw Sewage Pump Station:	T-series Gormann Rupp
Screens:	Hand-raked 11 mm gap bar screen
Grit Chambers:	Two
Aeration Basin:	Activated sludge
Aeration Basin Capacity:	1110 m^3
Aerators:	Two slow speed Hansen Patent (18.5 kW each)
Clarifier Type:	Suction Lift Clarifier
Number of Clarifiers:	1
Total Area of all Clarifiers:	95 m^2
Total Capacity of Clarifiers:	2.28 Mℓ/day
Upflow Velocity:	1 m/h
RAS Pump Station:	T-series Gormann Rupp
Chlorine Storage Capacity:	68kg cylinder
Chlorine Dosing Capacity:	Max. allowable 2.5 kg/h
Total Capacity of Chlorine Contact Tanks:	25m^3
Total Capacity of Sludge Treatment Plant:	Sludge lagoon (volume unknown)
Sludge Drying Beds Area:	500 m^2 (not used)

b) Status Quo

Richmond WWW has a design capacity of 1.0 Mℓ/day and is currently treating 0.77 Mℓ/day based on a 12-month moving average (**Figure 19.39**). An upgrade of the works to 2 Mℓ/day (**Section 19.4.4**) was planned but this is currently on hold.

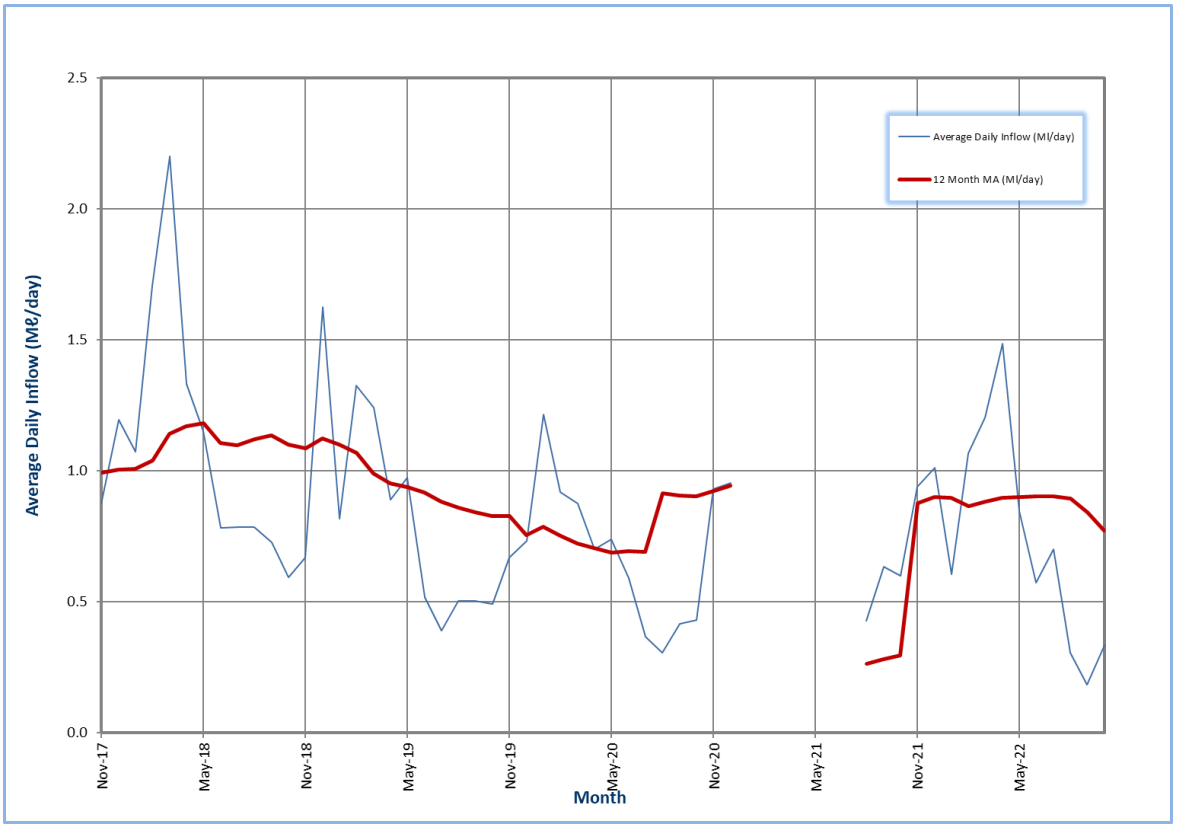

Figure 19.39 Average daily inflows to Richmond WWW (Mℓ/day).

An analysis of daily historical production (November 2021 to October 2022) of the Richmond WWW is presented in **Figure 19.40.** It shows that for 35 % of the time the WWW was being operated above the optimal operating capacity. The plant operated above design capacity 20 % of the time. It would appear that the plant is operating above its optimum operating and design capacity beyond what is acceptable. Metering reading inaccuracies may, however, be distorting the picture, especially during storm events when they are prevalent.

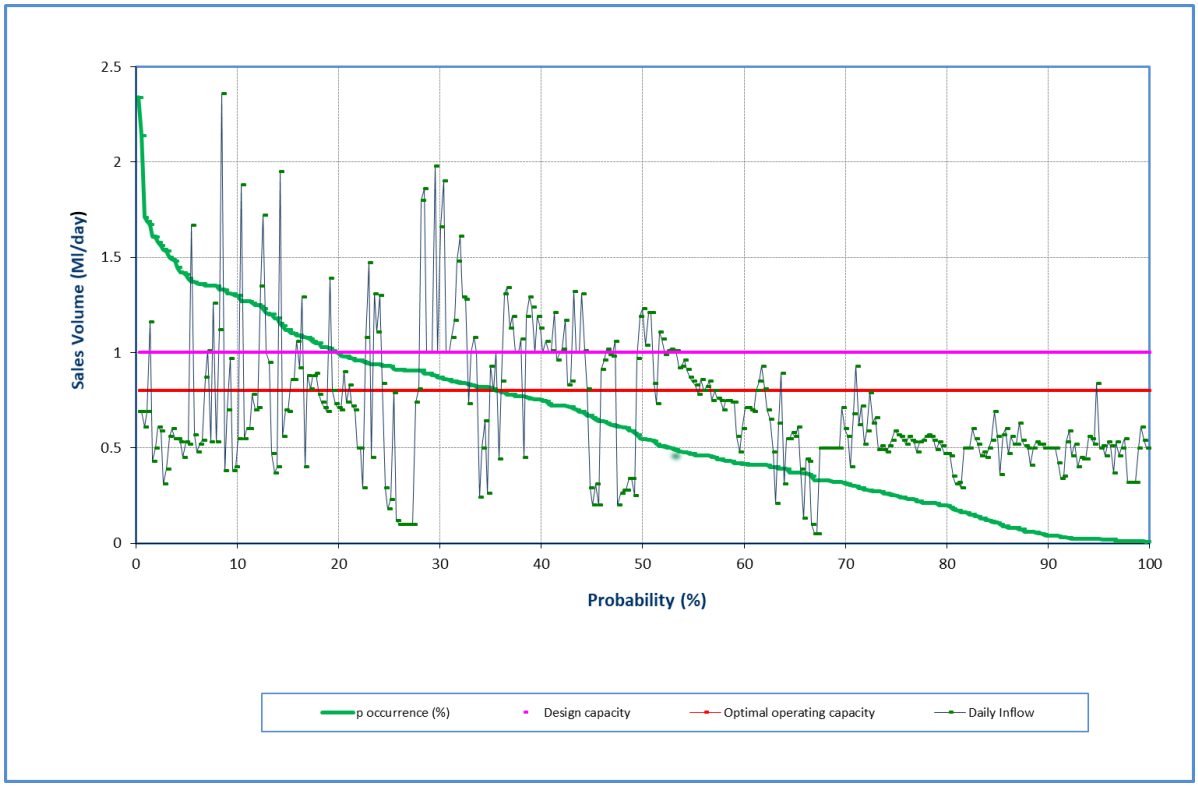

Figure 19.40: Analysis of historical production at Richmond WWW (November 2021 to October 2022

c) Recommendations

The existing Richmond scheme will expand to cater for future development areas located on the outskirts of town, and additionally, existing stands currently serviced by septic tanks may also be catered for within future waterborne schemes. These FDAs will require upgrades of the existing bulk infrastructure including the sewer outfalls and pump stations.

The following sections of existing sanitation network have insufficient capacity when analysed against the existing demand scenario and evaluation criteria and will need to be upgraded:

- The final 450 m section of 100 mmØ sewer pipe gravitating along Nelson and Pine Streets into Richmond A PS to a 160 mmØ.
- The final 100m section of 100mmØ sewer pipe gravitating along Pine and Albert Streets into Richmond B PS to a 160 mmØ.
- The 1.2km section of 200mm Ø outfall gravitating to the works to 350 mmØ.

These projects will be triggered when development of FDAs listed above occurs. Both conversion of the peri-urban areas and conversion of existing septic tank areas have been given a 30-year priority in the phasing approach employed.

19.3.9 Trust Feeds Wastewater Works

a) Description

Construction of the Trust Feeds Wastewater Works and ancillary infrastructure is complete. Practical completion was achieved on 20 October 2020. The plant was handed over to Umgeni Water on 11 December 2020. The wet commissioning will, however, only be done once 500 low cost houses have been built and occupied.

The wastewater works will serve the existing Trust Feeds community as well as the new uMshwati Ridge housing development (**Figure 19.41**). The ultimate capacity of the wastewater works will be 2 Mℓ/day, although initially only half the capacity has been constructed (1 Mℓ/day).

The WWW is located approximately 4 km north west of Wartburg, on the eastern periphery of the uMshwathi Local Municipality boundary within Ward 8 of uMshwathi Local Municipality.

The WWW will serve the following developments:

- The existing semi-formal low income housing development known as Trust Feeds, which comprises approximately 800 houses.
- The uMshwati Ridge development is a 3000 unit low-income development, which has been approved by the Department of Human Settlements to eliminate the housing backlog within the region. The new development is adjacent to Trust Feeds and 500 units (Phase 1) will be constructed initially.

The plant is an extended aeration activated sludge process consisting of an inlet works including a mechanical screen, vortex grit chamber and flume type flow meter. The Biological Nutrient Removal (BNR) process consists of an activated sludge tank with return activated sludge (RAS) and waste activated sludge (WAS) pumping systems. Two circular 15 m diameter secondary clarifiers and chlorine disinfection complete the treatment process. The sludge is pumped to 15 rectangular drying beds.

The characteristics of the Trust Feeds WWW are shown in **Table 19.13.**

Table 19.13 Trust Feeds WWW infrastructure.

WWW Name:	Trust Feeds WWW
System:	Upper Mgeni System
Maximum Design Capacity:	1 Mℓ/day (Based on ADWF)
Current Utilisation:	0.0 Mℓ/day
Raw Sewage Pump Station:	T-series Gormann Rupp
Screens:	Hand-raked 50 mm bar course screen and 10 mm Rotamat-type Huber fine screen
Grit Chambers:	Two vortex de-gritting systems
Aeration Basin:	Activated sludge (3-stage Phoredox)
Aeration Basin Capacity:	2830 m^3
Aerators:	Three slow speed mechanical aerators (30 kW each)
Clarifier Type:	Suction Lift Clarifier
Number of Clarifiers:	2
Total Area of all Clarifiers:	158 m^2
Total Capacity of Clarifiers:	2.28 Mℓ/day
Upflow Velocity:	0.53 m/h
RAS Pump Station:	T-series Gormann Rupp
Chlorine Storage Capacity:	2 x 1000 ℓ tanks
Chlorine Dosing Capacity:	10 mg/ℓ Sodium Hypochlorite
Total Capacity of Chlorine Contact Tanks:	70 m^3
Sludge Treatment Process	Mechanical dewatering
Total Capacity of Sludge Treatment Plant:	Sludge Load Max 90 kgDS/hour, Hydraulic Load Max 4 m^3/h
Sludge Drying Beds Area:	1134 m^2 (backup)

b) Status Quo

Trust Feeds WWW has a design capacity of 1.0 Mℓ/day and is currently treating 0.00 Mℓ/day.

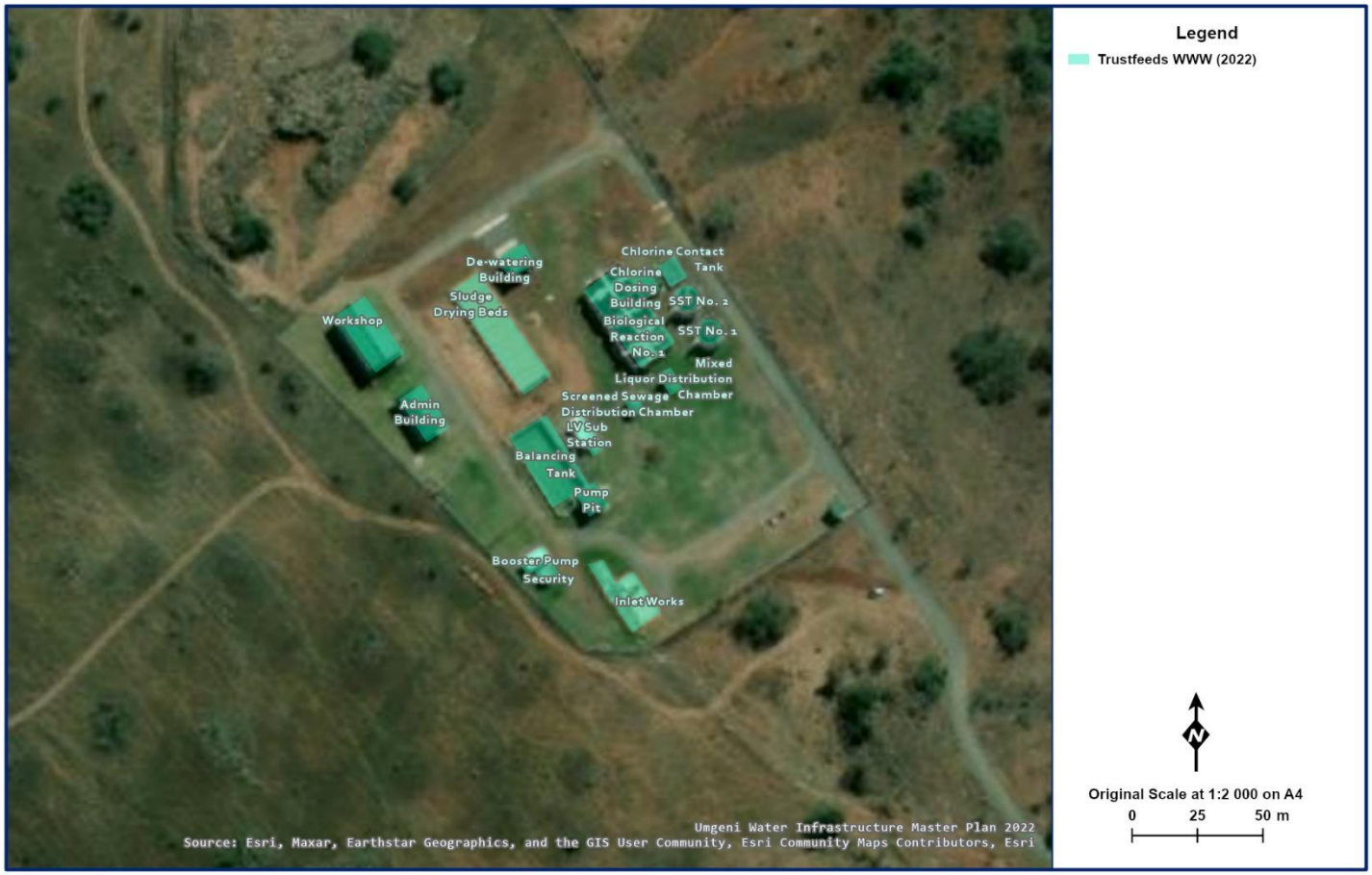

Figure 19.41 Location of Trust Feeds Wastewater Works.

c) Recommendations

The informal township of Trust Feeds lies adjacent to the Ridge Housing project and is currently serviced by VIPs. The area is considered peri-urban with potential to be converted to waterborne sanitation in future.

The main infrastructure elements to be upgraded/added include:

- A new main of 315 mm⌀ will be required to cater for the flow generated from the township once converted.
- The Trust Feeds township is situated on a terrain that allows the future internal reticulation to gravitate towards the township's lowest point. At this lowest point the collected sewerage will need to be pumped across to the Trust Feeds WWW due to topological constraints. Therefore, a new pump station is proposed to cater for the flow generated from the township. The proposed pump station will have a pump duty flow of 37 ℓ/s.
- The pump station proposed in the section above will be accompanied by a proposed rising main leading to the Trust Feeds WWW. The proposed rising main will be approximately 1033 m in length and 200 mm⌀ in size.

This project will be triggered when development of FDAs occurs. Conversion of peri-urban areas have been given a 30-year priority in the phasing approach employed. These works are therefore estimated to occur around 2051.

19.4 Recommended Projects

19.4.1 Darvill Wastewater Works Upgrade

Planning No.	104.1
Project No.	UI0665A
Project Status	Construction

(a) Project Description

The Darvill WWW serves the city of Pietermaritzburg and surrounding communities. All water borne sewage flows by gravity or is pumped to Darvill, with the exception of a small community in Lynnfield, which has its own water borne sewage that is treated by the Lynnfield Park WWW (**Section 19.3.3**). There are, however, large areas of the city that are not served by the sewer reticulation network that are reliant on on-site sanitation systems e.g. septic tanks and pit latrines. The extent of Darvill's water borne sewer catchment area is illustrated in **Figure 19.3**. Darvill WWW is thus of strategic importance to the city and to the environment at large as the quality of the effluent discharged needs to comply with regulations.

Demand was exceeding the treatment capacity of the works and a capacity upgrade was therefore required. It was also determined through process evaluations that the current process was inadequate and needed to be adapted.

The wastewater works is being upgraded from 65 Mℓ/day to 100 Mℓ/day to meet current and future demands (**Figure 19.42**). This is a comprehensive upgrade with the majority of the existing processes and infrastructure being impacted upon. Details of the process upgrades are given in **Table 19.14**.

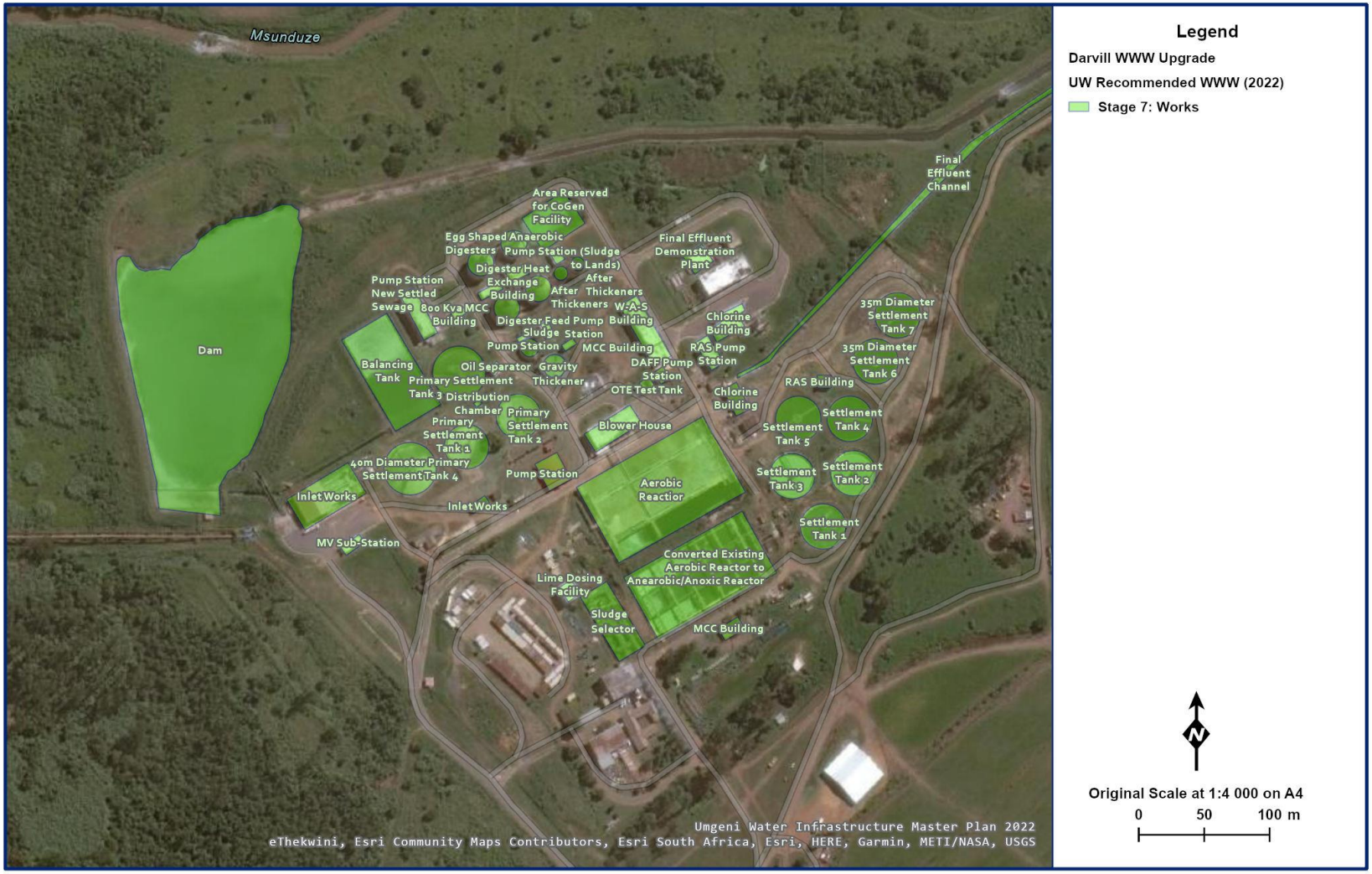

Figure 19.42 Upgrade of Darvill WWW.

Two key elements of the upgrade are the sludge treatment and biological treatment aeration system. The present method of disposal of sludge by spray irrigation to land is operating adequately, but has its limitations especially as the capacity of the works increases to address growth. A new method of sludge thickening and dewatering is to be implemented involving the construction of a new sludge treatment building. The new facility will use linear screens for mechanical thickening and dewatering of waste activated sludge and digester sludge.

The traditional surface aerators are inefficient, have been removed, and replaced by a fine bubble diffused aeration (FBDA) system. The FBDA system is made up of 22 680 diffusers in three aeration lanes that are connected by a pipe network that is supplied with air from four blowers. As opposed to surface aeration which requires a lot of mechanical energy to introduce oxygen into the system, FBDA release the air at the bottom of the aeration basin through the diffusers thus achieving an even dispersion and improved oxygen transfer.

Key information on this project is summarised in **Table 19.14**.

Table 19.14 Project information: Darvill Wastewater Works Upgrade.

Project Components:	• Inlet Works
	  ▪ New inlet works design to handle a maximum flow of 200 Mℓ/day in 4 channels.
	  ▪ Two mechanical screens in each channel.
	• Fat, Oil, Grease (FOG) and Grit Removal
	  ▪ Additional unit process because of high FOG loads in influent.
	  ▪ 200 Mℓ/day in 3 lanes.
	• Primary Settling
	  ▪ Additional 40 m PST added.
	• Settled Sewage Pump Station (SSPS)
	  ▪ The SSPS replaces the existing “Main Pump Station” which has reached its design life.
	  ▪ 3 duty, 1 standby and 1 spare.
	• Biological treatment
	  ▪ Convert the existing anaerobic reactor to an activated sludge selector.
	  ▪ Convert the existing Aerobic Reactor to an Anaerobic / Anoxic reactor.
	  ▪ Construct a new deep basin reinforced concrete Aerobic Reactor with fine bubble diffused aeration (40 150 m^3).
	• Air for Biological Treatment
	  ▪ Blower House.
	  ▪ 4 x 645 kW Blowers each with a rated delivery of 7 m^3/sec @ 90 kPa.
	  ▪ Air Header Mains.
	  ▪ 22 680 diffusers in three aeration lanes.
	• Secondary Settling
	  ▪ 2 x 35 m diameter secondary settling tanks.
	• Anaerobic Sludge Digesters
	  ▪ 2 x 4500 m^3 digesters.
	• Wash Water Treatment
	  ▪ Construct 2 Mℓ/day wash water / reclamation plant.
	  ▪ Unit processes will include disc filters, coagulation/flocculation, Ozonation granular activated carbon, ultra-filtration and hydrogen peroxide addition.

Capacity:	100 Mℓ/day Plant

(b) Institutional Arrangements

Umgeni Water owns and operates the plant and is funding the project internally. The Msunduzi Municipality is charged a monthly tariff for discharging the city's wastewater to Darvill.

(c) Beneficiaries

The Msunduzi Municipality is the main beneficiary of the upgrade as it will remove the constraint to development in the city.

(d) Implementation

Construction on this R977 million project (**Figure 19.43**) stopped when the lead contractor was placed in business rescue. The contract was subsequently terminated in April 2019. A new contractor was appointed in April 2020 to complete the outstanding works. The contractor established on site in September 2020 and it is now anticipated that the completion of the upgrade will be a year later than originally anticipated (March 2023). Some of the outstanding major works that required completion include the following:

- Digester complex
- Gravity belt thickeners

Completion certificates have been issued to the contractor for the following

- Lime dosing plant
- Sludge to lands pump station
- Inlet works
- Primary sedimentation tanks
- Biological treatment plant (the fourth Activated Sludge (AS) lane is now complete)
- Secondary reticulation
- Secondary settling tanks
- Tertiary treatment (the Chlorine plant and Scrubber and Wash Water / Reuse plant have been commissioned)

Figure 19.43 New head of works in the foreground with overflow channel teeing-off to the left.

19.4.2 Mpophomeni Wastewater Works Upgrade

Planning No.	610.1
Project No.	UI0801A
Project Status	Detailed Design Complete

(a) Project Description

The Mpophomeni WWW is currently not operational and sewage from Mpophomeni Township is pumped to the Howick WWW for treatment. The demand at Mpophomeni has increased to the extent that, on occasion, the flow exceeds the volume of effluent that the Howick WWW can treat. Additionally, there are a number of planned developments that will increase this flow significantly over the next few years. It was therefore proposed by UMDM that the Mpophomeni WWW be upgraded to treat 6 Mℓ/day with the possibility of upgrading the works to 12 Mℓ/day. The site has space for a plant of at least 20 Mℓ/day (**Figure 19.44**).

The following development initiatives by the municipality will be serviced by the Mpophomeni WWW, *viz*.:

- Refurbishment of the existing sewage reticulation system in Mpophomeni Township will increase wastewater flows to the works (ADWF 3.6 Mℓ/day);
- The development of the Khayelisha social housing development on the banks of Midmar Dam (ADWF 1.3 Mℓ/day); and
- Planned light/mixed industrial development park (3 Mℓ/day).

The effluent from the works will be pumped and disposed of to the Sakubula stream adjacent to the national road (N3) in Howick. The pumping main will be approximately 6.8 km in length and of various diameters.

Key information on this project is summarised in **Table 19.15**.

Table 19.15 Project information: Mpophomeni Wastewater Works Upgrade.

Project Components:	• Inlet Works including a mechanical screen and vortex grit tanks (2No). • Two 14 m diameter primary settling tanks. • Primary sludge pump station. • Refurbished digesters with new heating and sludge circulating system. • Mechanical equipment to dewater digested primary and activated sludge. • 6 Mℓ/d (BNR Activated Sludge Treatment Plant. • Return Activated Sludge (RAS) pumping system. • Waste Activated Sludge (WAS) pumping system. • RAS and Storm Flow Recycle Refurbished Pump Station • Sludge and Storm Flow Recycle Mechanical/Electrical Plant. • Refurbished 2.25 Mℓ Storm bypass pond. • One 25 m diameter secondary clarifier. • One refurbished 18 m diameter secondary clarifier. • Aluminium sulphate, lime and chlorine chemical dosing systems. • Recycle pump station, pumping plant and pumping main from Maturation Ponds. • Disposal pipeline (6.8 km) of various diameters. • Pump station (2 duty, 1 stand-by)
Capacity:	6 Mℓ/day Plant

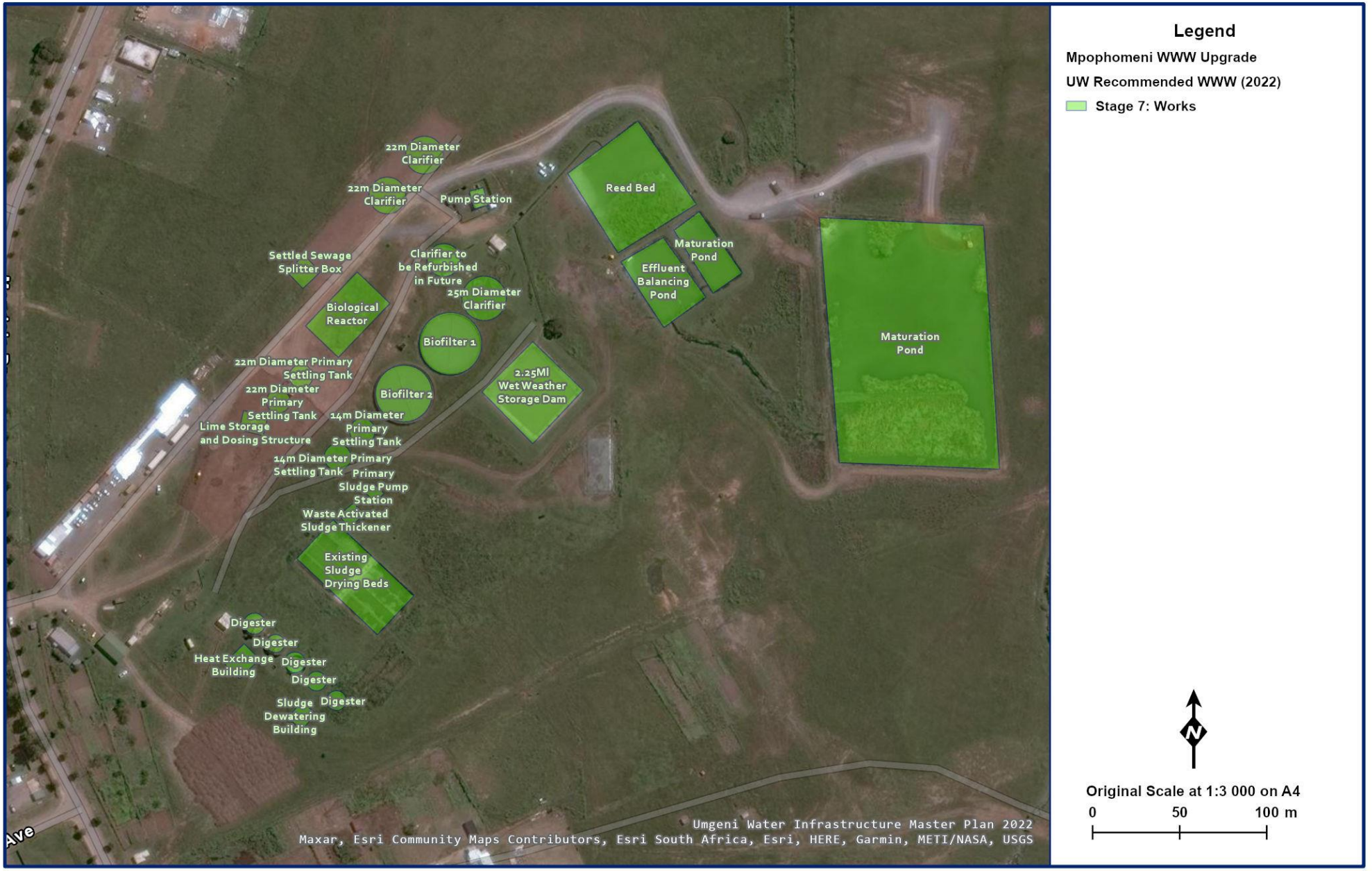

Figure 19.44 Upgrade of Mpophomeni WWW.

(b) Institutional Arrangements

Umgeni Water will operate the plant on behalf UMDM under a twenty-year management contract. Umgeni Water is responsible for funding any capital improvements required by the plant. Umgeni Water charges a monthly management fee to the Municipality to cover all operation and maintenance costs and this fee includes capital redemption.

(c) Beneficiaries

UMDM and uMngeni Local Municipality are the main beneficiaries of the upgrade.

(d) Implementation

The construction is currently 70 % complete (**Figure 19.45**). The project is behind programme due to the COVID lockdown, civil unrest and local labour issues. The following points highlight the remaining major works:

- Completion of the main treatment processes and dismantling the existing HOW.
- Completion of the chlorine contact tank currently under construction.
- Completion of the maturation ponds.
- Completion of the pipeline from the WWW to Merrivale Outfall.

Contractually the due completion is scheduled for August 2022, however the planned completion is more likely to be December 2023.

The estimated cost of the project is R275 million at 2020 prices.

Figure 19.45: Mpophomeni Wastewater Works New Head of Works

19.4.3 Richmond Wastewater Works Upgrade

Planning No.	610.3
Project No.	UI0939A
Project Status	Detailed Design

(a) Project Description

The Richmond WWW cannot currently cater for the peak demands placed on the infrastructure. As a result, UMDM have requested that Umgeni Water upgrade the Richmond WWW (**Figure 19.46**). The existing WWW serves the town of Richmond but not the low income settlements of Siyathuthuka and Lusaka that currently make use of pit latrines for basic sanitation. Once UMDM implements water borne sanitation in these low income areas then additional demand will be placed on the Richmond WWW. There are also some residential units located within the existing Richmond residential area that still need to be connected to the existing sewer network.

The proposed new extensions will cater for Biological Excess Phosphorous Removal with back-up chemical dosing facility. An increase in capacity of 1 Mℓ/day to 2 Mℓ/day is proposed.

Key information on this project is summarised in **Table 19.16**.

Table 19.16 Project information: Richmond Wastewater Works.

Project Components:	• New inlet works including a mechanical screen, mechanical degritters, screenings conveyor and compactor and venture flume • 2 No additional aeration basins • Return Activated Sludge (RAS) pumping system • Waste Activated Sludge (WAS) pumping system • 1 No additional circular 18 m diameter secondary clarifier • New chlorine contact channel • Upgrade the existing chlorine dosing building and chlorine dosing equipment • New mechanical sludge handling equipment and housing building • New sludge drying beds and scum trap • New ferric dosing equipment • Refurbishment of sewage retention pond • Refurbishment of all ancillary facilities • New SCADA system
Capacity:	5 Mℓ/day Plant

(b) Institutional Arrangements

Umgeni Water will operate the plant on behalf of UMDM under a twenty-year management contract. Umgeni Water is responsible for funding any capital improvements required by the plant. Umgeni Water charges a monthly management fee to the Municipality to cover all operation and maintenance costs and capital redemption is included in this fee.

(c) Beneficiaries

UMDM and Richmond Local Municipality are the main beneficiaries of the upgrade.

Figure 19.46 **Richmond WWW upgrade.**

(d) Implementation

The estimated project cost is R127 million at 2020 prices. This figure includes the cost of all project phases: Planning, Design, Tender Preparation and Construction. Umgeni Water has shifted this project outside the five-year CAPEX window, which means that the project is on hold until further notice. This is in the main due to the current difficult economic conditions brought on by the Pandemic.

19.4.4 Mpofana Wastewater Works Upgrade

Planning No.	610.2
Project No.	UI0940A
Project Status	Tender

(a) Project Description

Umgeni Water has a management contract with UMDM to operate and maintain the Mpofana WWW and two large sewage pump stations. The WWW services the town of Mooi River, which includes the adjacent township of Bruntville (**Figure 19.47**). The majority of the wastewater received by the works is domestic sewerage but there is also a large industrial component of between 1 to 2 Mℓ/day received from a textile factory situated adjacent to the works.

The works has a design capacity of 3.5 Mℓ/day and a reported operating capacity of 5 Mℓ/day. The works was receiving average dry weather inflows (AADW) of 6 Mℓ/day and was therefore operating above capacity. The demand has, however, reduced due to the temporary closing of the textile factory because of fire damage. Operational issues, as a result of aging infrastructure, have been identified at the works and these are being addressed. Umgeni Water has identified the need for increasing the treatment capacity to meet the future demands of Mooi River.

A PSP was appointed in 2018 to undertake the detailed feasibility and detailed design for the upgrade of the wastewater works.

(b) Institutional Arrangements

Umgeni Water currently operates the plant on behalf of UMDM under a twenty-year management contract. Umgeni Water is responsible for funding any capital improvements required at the plant. Umgeni Water charges a monthly management fee to the Municipality to cover all operation and maintenance costs and capital redemption is included in this fee.

(c) Beneficiaries

UMDM and Mpofana Local Municipality are the main beneficiaries of the upgrade.

(d) Implementation

The detailed feasibility study, including the environmental impact assessment and associated environmental specialist studies, was completed in December 2020. Following an assessment of the estimated costs of the upgrade (R350 - R400 million) the Project Steering Committee collectively agreed to suspend the study. In these difficult economic times, it was considered more prudent for the existing works to be refurbished at far lower cost. The Mpofana WWW will thus be refurbished with upgraded process capacity that will ensure efficient treatment and compliance with the regulated effluent discharge standards.

The results of the feasibility study will not be lost and will be shelved for use at a later date if needed.

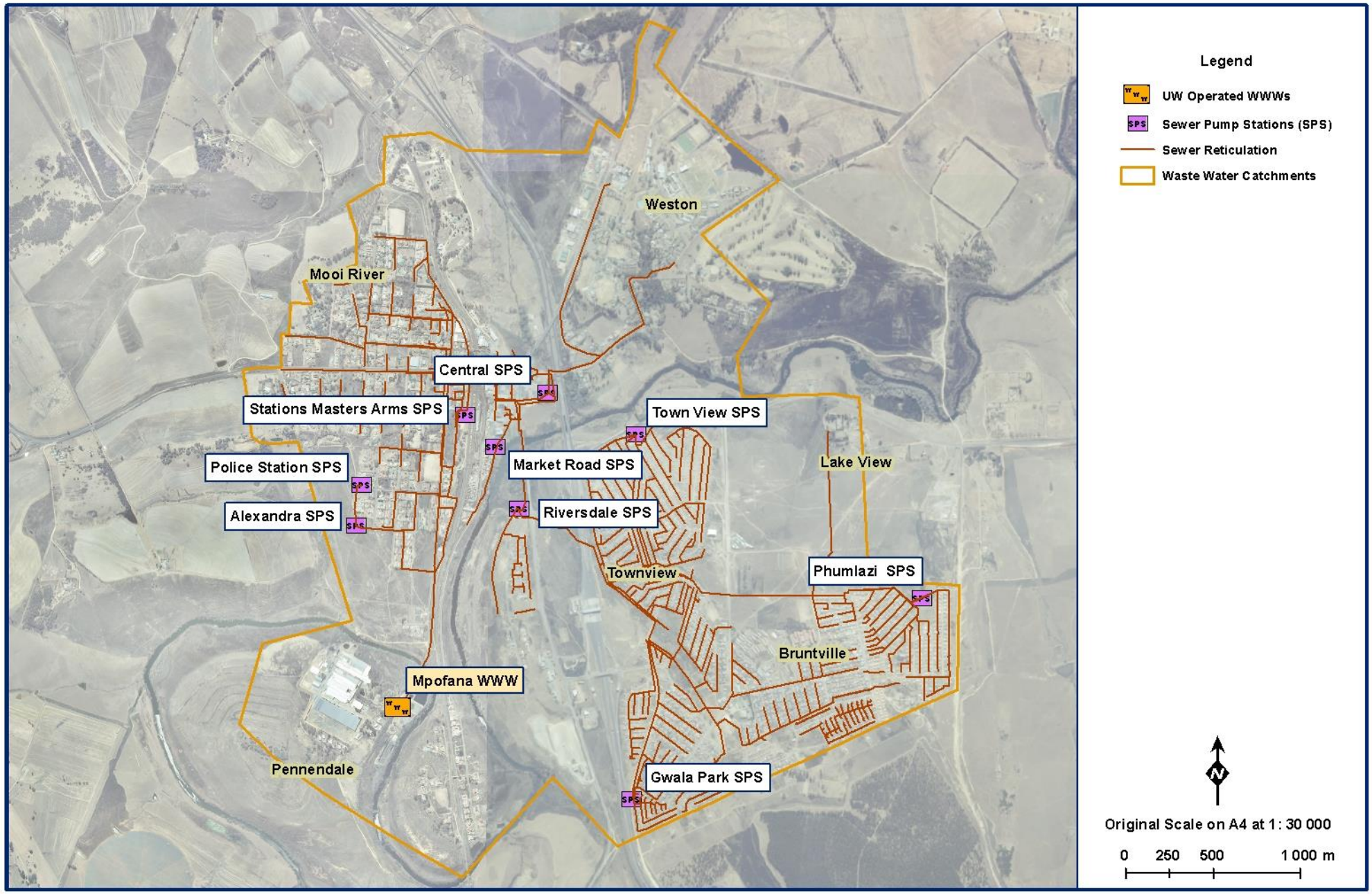

Figure 19.47 Mpofana WWW upgrade.

19.4.5 Mkhambathini Wastewater Works Upgrade

Planning No.	610.6
Project No.	
Project Status	Detailed Design

(a) Project Description

Umgeni Water has a management contract with UMDM to operate and maintain the Camperdown WWW. The WWW has a small demand (0.2 Mℓ/day) as a limited number of households are connected to the sewer reticulation network (**Figure 19.48**). The majority of households and businesses in the town still make use of on-site sanitation, such as septic tanks.

A feasibility study was undertaken which identified the need for a new WWW that would service all existing households and businesses as well as cater for future developments. A site west of the N3 freeway was identified (**Figure 19.48)** and detailed designs for a WWW and new bulk sewer network were completed.

The proposed works will include the construction of a bulk sewer network inclusive of three pump stations, as well as a 2Mℓ capacity wastewater treatment plant that will service the local population.

The proposed infrastructure (**Figure 19.49**) associated with the treatment process will consist of the following:

- Head of Works with mechanical screening and degritting, and a flow meter.
- Aeration Tank.
- Settling Tank (clarifier) to settle out and return the activated sludge back to the aeration tank.
- Chlorine dosage with contact tank, or Ultraviolet (UV) Irradiation for disinfection.
- Sludge Drying Beds for dewatering of activated sludge.

(b)Institutional Arrangements

Umgeni Water currently operates the Camperdown WWW on behalf of UMDM under a twenty-year management contract. It was identified by the feasibility study that Camperdown requires a new WWW that can serve the entire population and future development. As the existing WWW has insufficient capacity to meet future growth Umgeni Water will fund the construction and implementation of a new WWW from its CAPEX budget. Umgeni Water will charge a monthly management fee to the Municipality to cover the CAPEX and operation and maintenance of the new WWW once commissioned.

(c) Beneficiaries

UMDM and Mkhambathini Local Municipality are the main beneficiaries of the upgrade.

(d)Implementation

The detailed design phase is complete, but work has been temporality suspended until such time as funding is available. The new WWW requires the construction of a new sewage network and sewage pump stations, and this is the responsibility of UMDM. The estimated cost for the construction of the

WWW is R99 million at 2020 prices. UMDM recently submitted a proposal to the Department of Trade and Industry (DTI) to fund the bulk sewer reticulation component of the project.

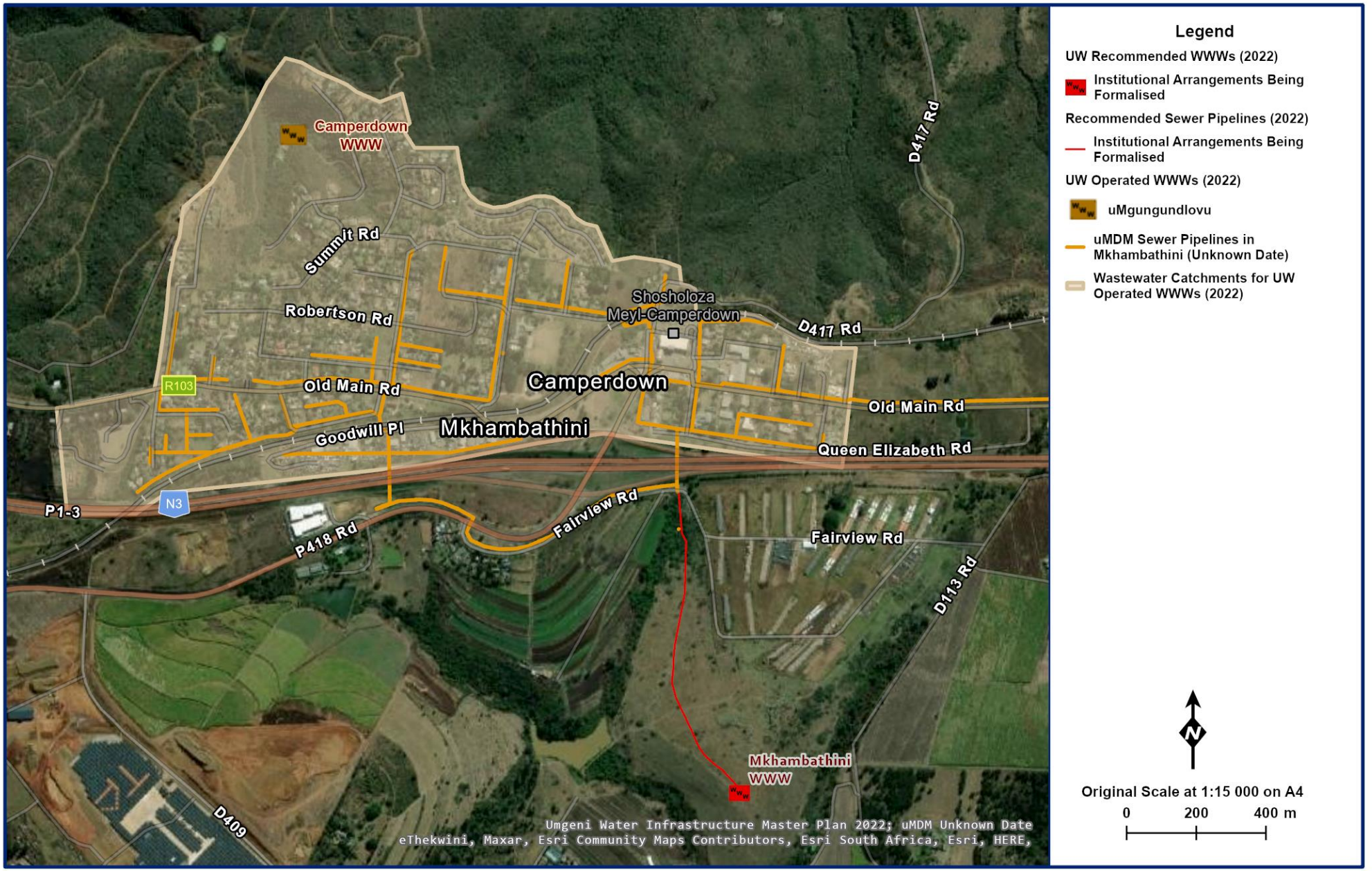

Figure 19.48 Location of the proposed Mkhambathini WWW in relation to the existing Camperdown WWW.

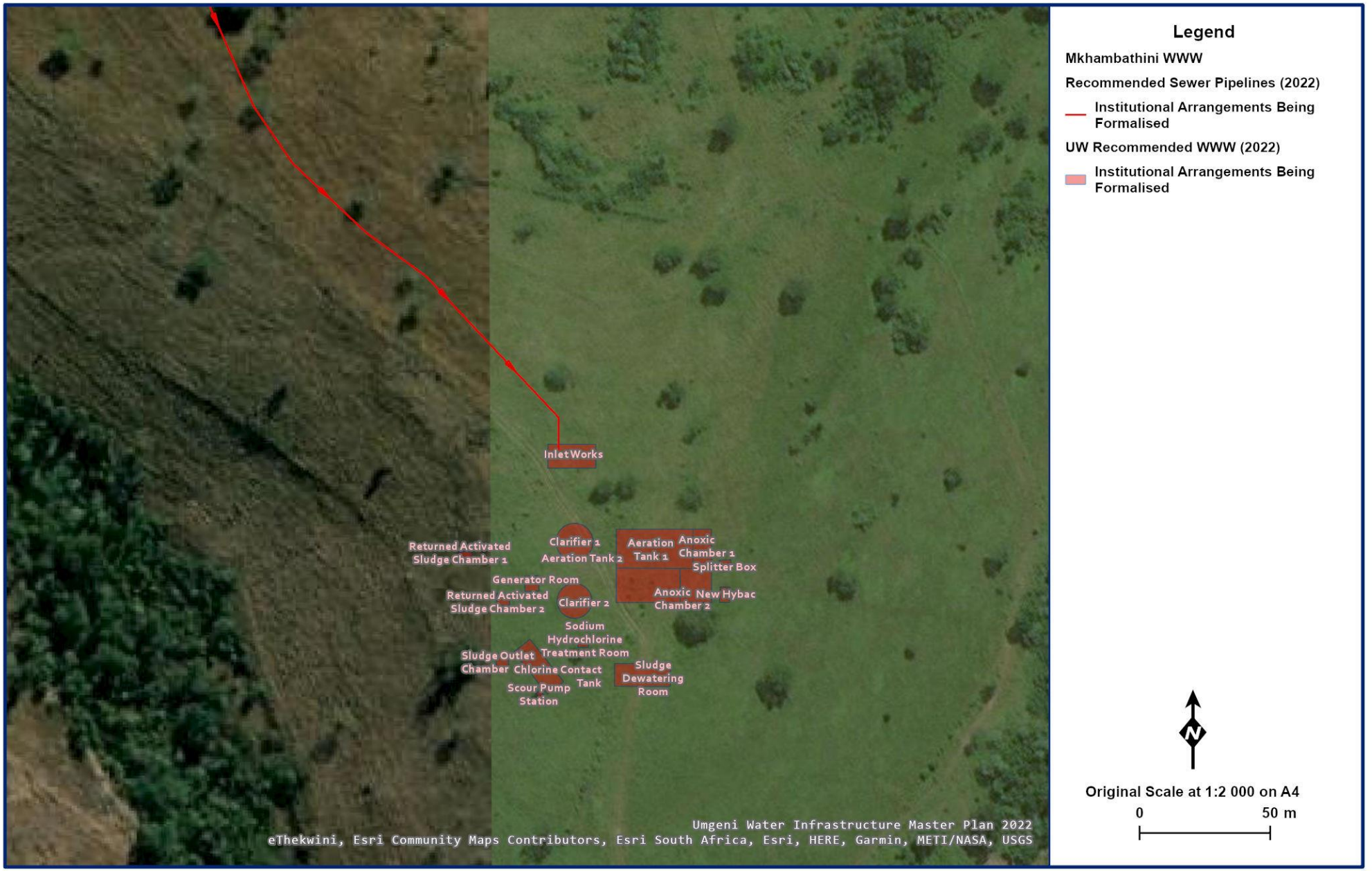

Figure 19.49 Proposed Mkhambathini WWW layout.

19.4.6 Hilton Bulk Wastewater Scheme

Planning No.	610.8
Project No.	
Project Status	Detailed Feasibility

(a) Project Description

The study area of Hilton consists primarily of "old Hilton" (existing built up village) and "new Hilton" (area between the N3 national road and Hilton College). The greater Hilton area also includes the adjacent locality of Cedara.

There is a huge potential for commercial and residential property development within this greater area, which is located at a strategic location within the KwaZulu-Natal Midlands. To allow for the development potential to be unlocked, more wastewater treatment capacity will have to be developed. Currently, the existing sanitation infrastructure is primarily septic tanks with a few independent wastewater treatment package plants (WWTPP) and the Cedara WWW.

A pre-feasibility study for sub-regional bulk wastewater for the greater Hilton area within the uMngeni Local Municipality (LM) was completed in March 2019. Various bulk wastewater options were identified as well as a new wastewater works adjacent to Hilton College (**Figure 19.50**). Approval has now been obtained to take this study to detailed feasibility.

This project will investigate the feasibility of providing water borne sanitation, as a solution to deal will the increased sewage generation

The detailed feasibility study (DFS) will include the following:

- Assessment of town planning and spatial development planning;
- Determination of sewage flows;
- Land and geotechnical survey;
- Layout and longitudinal profiles of sewer outfall pipelines;
- Positioning of Waste Water Treatment Works (WWTW);
- Preliminary process design of WWTW;
- Estimating of Capital Costs; and
- Environmental Impact Assessment.

As this project is in its infancy, it will still be a number of years before implementation is undertaken. In the interim, there is a pressing need for sanitation services and Umgeni Water is addressing this through the construction of a 2 Mℓ/day WWW, commonly referred to as the "N3 Corridor WWW". The WWW will be constructed adjacent to the Hilton Life Hospital in land obtained from Mondi. The WWW will be modular in nature with an initial treatment capacity of 1 Mℓ/day, upgradable to 2 Mℓ/day. The WWW should address the immediate and medium term sanitation needs of the area allowing development to expand.

(b)Institutional Arrangements

Umgeni Water operates many WWW on behalf of UMDM under a twenty-year management contract. As this is only a feasibility study there are, as yet, no institutional arrangements regarding this project.

(c) Beneficiaries

UMDM and uMngeni Local Municipality are the main beneficiaries of the study.

(d)Implementation

Request for Proposals (RFP) were issued in November 2022 to ten service providers utilising Umgeni Water's Framework Contract. The closing date for the tender is 31 January 2023. The SCM process will follow its course and the contract should be awarded by June 2023. The anticipated length of the detailed feasibility study is 24 months from the start date.

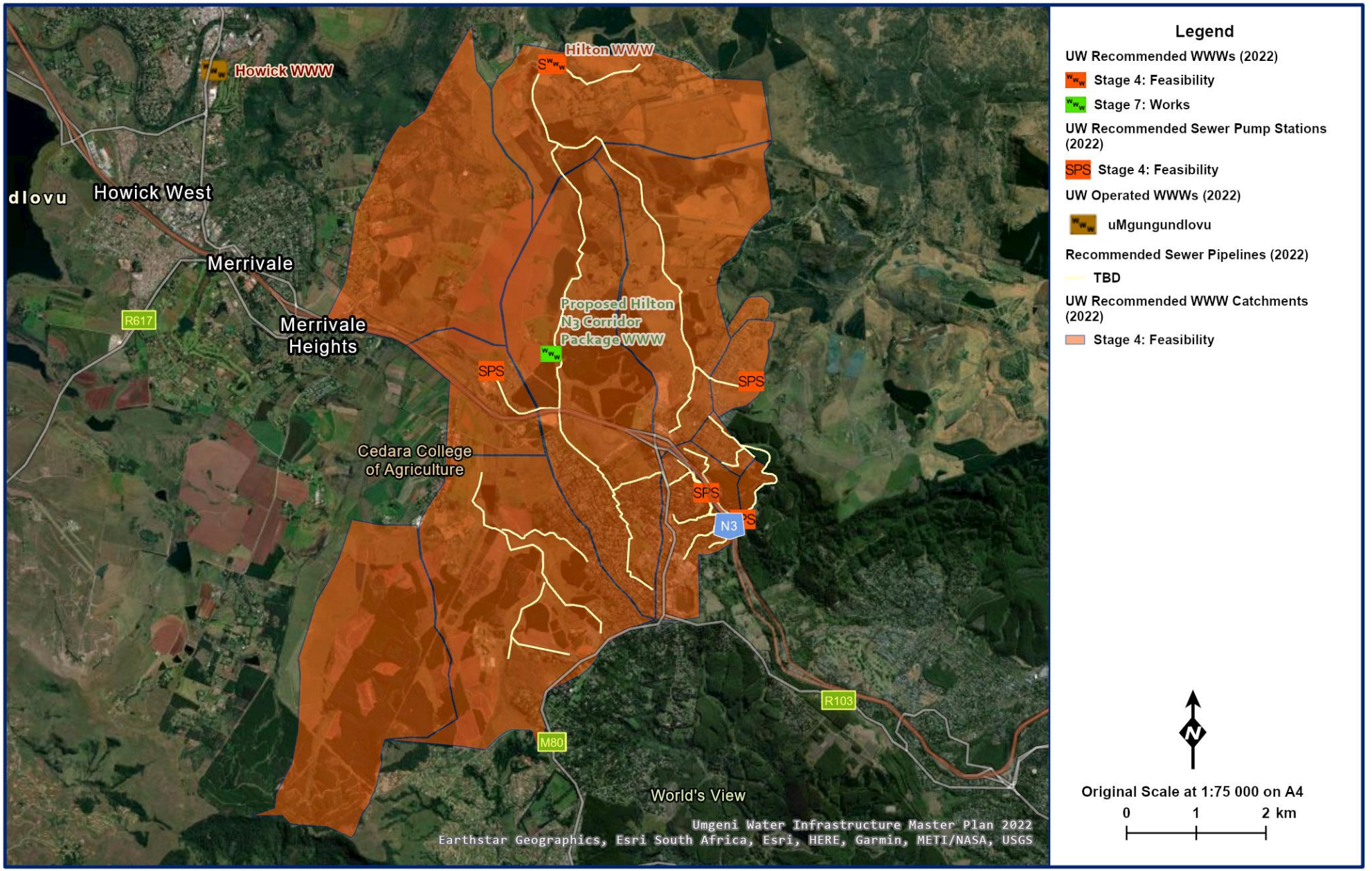

Figure 19.50Proposed Hilton WWW.

19.5 New Areas

New areas can be defined as those KZN WSAs for whom Umgeni Water is not the Bulk Water Service Provider (**Figure 1.1**) i.e. areas in KZN outside the Umgeni Water traditional area of supply. In some of these areas, Umgeni Water has received a mandate from the District Municipality to provide bulk water services, King Cetshwayo District Municipality being one of those. Umgeni Water's services are, at this stage, limited to potable water provision and no bulk wastewater infrastructure is presently being managed. The organisation's knowledge of the status of the bulk sanitation infrastructure throughout the province is thus limited to existing reports. Umgeni Water is committed to providing bulk water and sanitation throughout the province and therefore is in the process of obtaining as much sanitation information as possible from existing sources. With time, this information will have to be verified by site visits and possibly process audits so that the necessary infrastructure planning can take place. In the interim, however, the focus will be on identifying all the wastewater works within KZN and providing the salient infrastructure details.

The class of wastewater works is defined as A, B, C, D or E according to a scoring system derived from draft regulations published by the Department of Water and Sanitation. In general, the greater the capacity and the more sophisticated the treatment process the higher the class. A large WWW with a complex treatment process may be classified as Class A. Smaller more rudimentary WWW, only using saturation ponds, will be classified as Class E, such as Winterton (DWS, 2013).

19.5.1 uThukela District Municipality

a) Overview of the WWWs in uThukela District Municipality

The uThukela District Municipality (DM) has nine wastewater works, eight of which are operational (**Figure 19.51**). The capacity of the WWW ranges from very small (0.1 Mℓ/day) serving the small town of Winterton to relatively large (12 Mℓ/day) serving the large towns of Ladysmith, Estcourt and Ezakeni. A list of the WWW in the uThukela DM is provided in **Table 19.17** and a summary of each is provided in the sections hereafter

A number of sanitation projects have been implemented, are under construction or are proposed in the Municipality. A list of the sanitation projects funded by the Municipal Infrastructure Grant (MIG) and their status are provided in the **Table 19.18**.

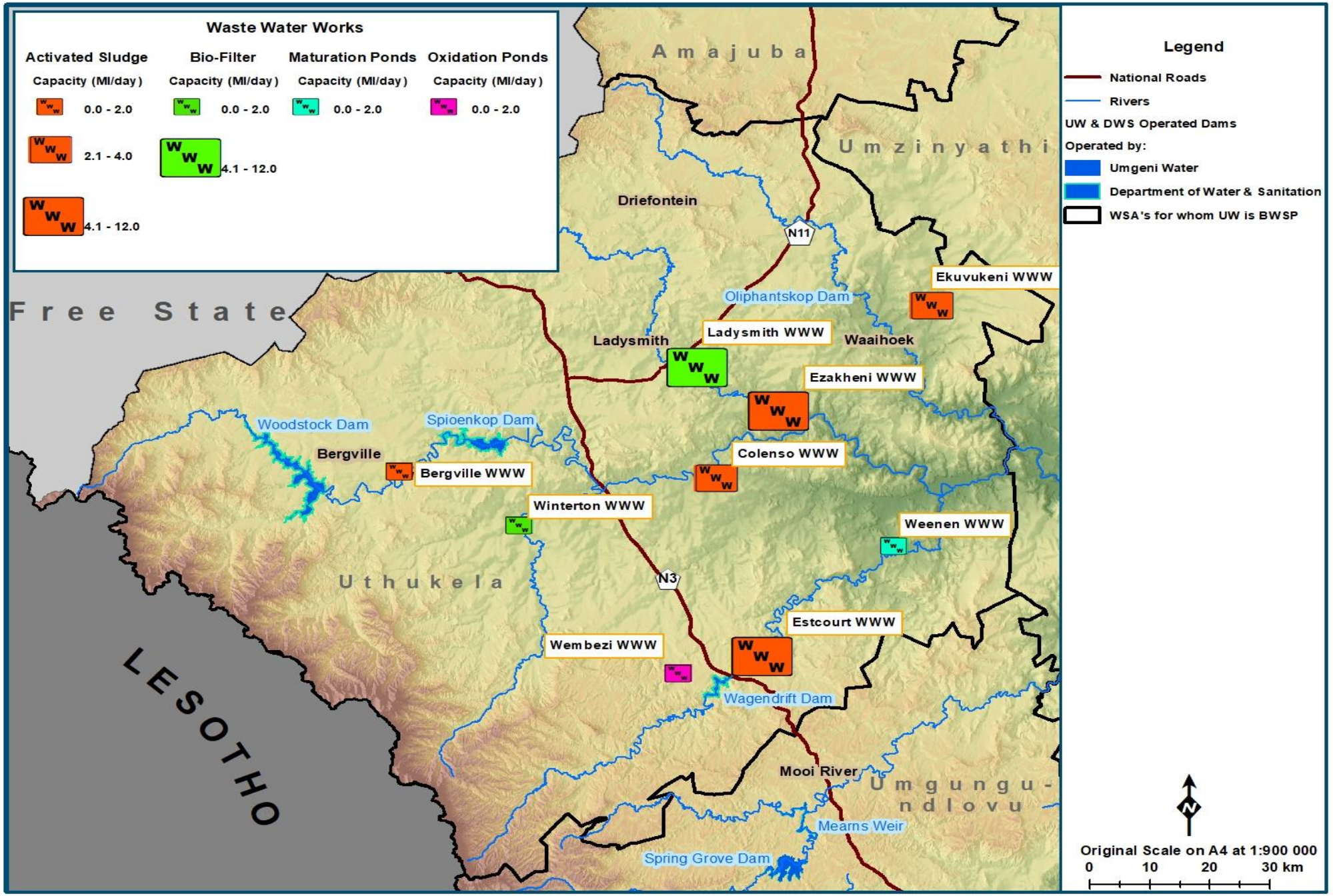

Figure 19.51 Location of uThukela DM Wastewater Works

Table 19.17 uThukela District Municipality Wastewater Works Specifications (DWS, 2011)

WWW	Description	Owner	Class	Capacity Sufficient	ADWF Capacity (Mℓ/day)	People Served	Operational	Overall Condition Rating (LTE, 2020)	Cost Estimate (LTE, 2020)
Ezakeni	Activated Sludge	uThukela DM	C	Y	12.0	38750	Y	Poor	R 24 500 000
Ekuvukeni	Activated Sludge	uThukela DM	D	Y	2.4	8750	N	Dysfunctional	R 33 000 000
Bergville	Activated Sludge	uThukela DM	E	Y	0.4	500	Y	Fair	R 800 000
Colenso	Activated Sludge	uThukela DM	E	Y	3.2	6250	Y	Poor	R 3 200 000
Ladysmith	Bio-filter	uThukela DM	C	Y	12.0	26250	Y	Poor	R 27 500 000
Estcourt	Activated Sludge	uThukela DM	D	Y	12.0	10000	N	Dysfunctional	R 16 200 000
Weenen	Activated Sludge	uThukela DM	E	Y	0.1	131	N	Dysfunctional	R 15 000 000
Winterton	Activated Sludge	uThukela DM	E	N	1.25	188	Y	Fair	R 5 600 000
Wembezi	Activated Sludge	uThukela DM	E	N	0.11	2500	Y	Fair	R 2 500 000

Table 19.18 MIG funded Sanitation Projects in uThukela District Municipality (CoGTA KwaZulu-Natal,2020)

Project	Status
Waterborne Sanitation Project Bergville Phase 2	Construction 40%
Ezakheni Sanitation Project Phase 2	Construction 80%
Weenen – Ezitendeni Sanitation Project	Construction 60%
Sanitation Coverage in Alfred Duma, Inkosi Langalibalele and Okhahlamba	Registered
UTDM COVID 19 Water & Sanitation Intervention Project	Registered
Winterton Sanitation Supply Scheme - Planning	Registered

b) Estcourt Wastewater Works

The Estcourt WWW services the town of Estcourt which is mostly on waterborne sanitation while surrounding townships are mostly serviced with VIPs. According to the Bigen Africa WSMP (2017) and the UTDM Backlog Study, there are 2 910 households falling within the scheme footprint (**Figure 19.52**). Effluent flows predominantly to the Estcourt Sewer Pumping Station under gravity from where it is pumped via a bulk line to the WWW.

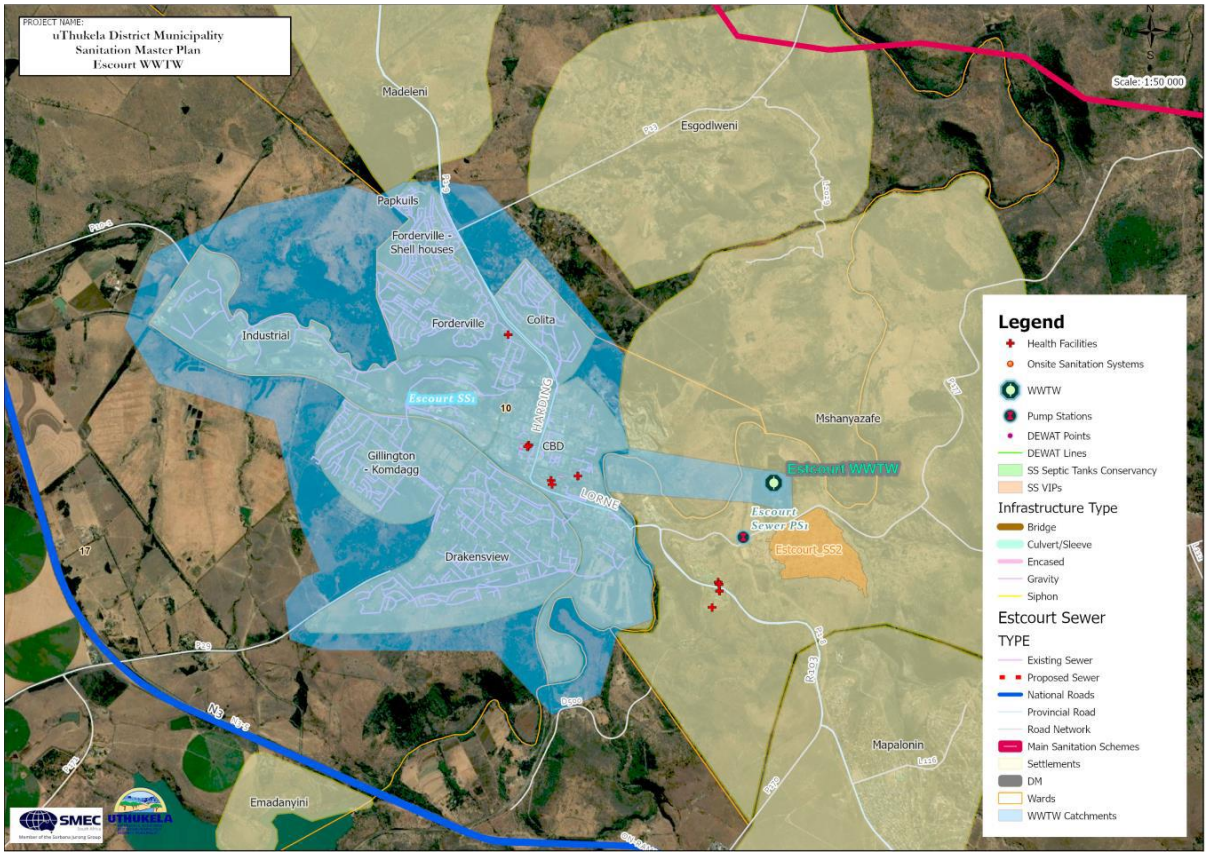

Figure 19.52 Estcourt Wastewater Works Catchment Area

The Estcourt WWTW has two process streams that work in parallel (**Figure 19.53**). The streams are an aeration and biofiltration stream each to treat reticulated effluent as well as sludge from the surrounding townships employing on-site sanitation. Inflow to the works is a combination of residential, commercial and industrial wastewater. The influent has been noted as poor quality mainly due to the discharge from the Flamingo Moon Coffee Factory. At the works the biofiltration process is currently not operational due to many of the components requiring refurbishment, these include the primary settling tanks, the biofilters, humus tanks, anaerobic digesters, drying beds and internal pump stations. The aeration process stream handles the total inflow to the works. However, the intention for the future is for both streams to be working in conjunction to treat the inflow. At the head of the works conventional mechanical screening, grit removal and flow measurement is employed. Inflow to the works occurs at intervals as a result of automated control at the upstream pump station. Effluent is then treated in the mechanical aerator tank which has eight aerators of which five are operational, three require refurbishment. Further treatment is then intended at the two secondary clarifiers however both of which are not operational thereby reducing the effectiveness of the aeration process stream. As the last step in the process, the effluent passes through a maturation/polishing pond and the treated effluent is discharged via two Asbestos Cement pipes

(300mm and 450mm diameter) to the Bushman's River. Should the biofiltration stream receive the necessary refurbishment to full operational capacity then a portion of the effluent which passes through the inlet channel and screening will be treated at three primary settling clarifiers. In which process the sludge will be separated and pumped to two anaerobic digesters from which the solids will be sent to drying beds and the liquid component back to the head of the works to be re-cycled. After primary settlement, effluent will be pumped to an elevated biofilter tank after which it will pass through two stone filter tanks and humus tanks before being pumped back to the head of works to be recycled through the process. No contact tank for disinfection is provided and chlorination does not take place. Final treatment occurs at a single polishing pond before being discharged to the Bushman's River.

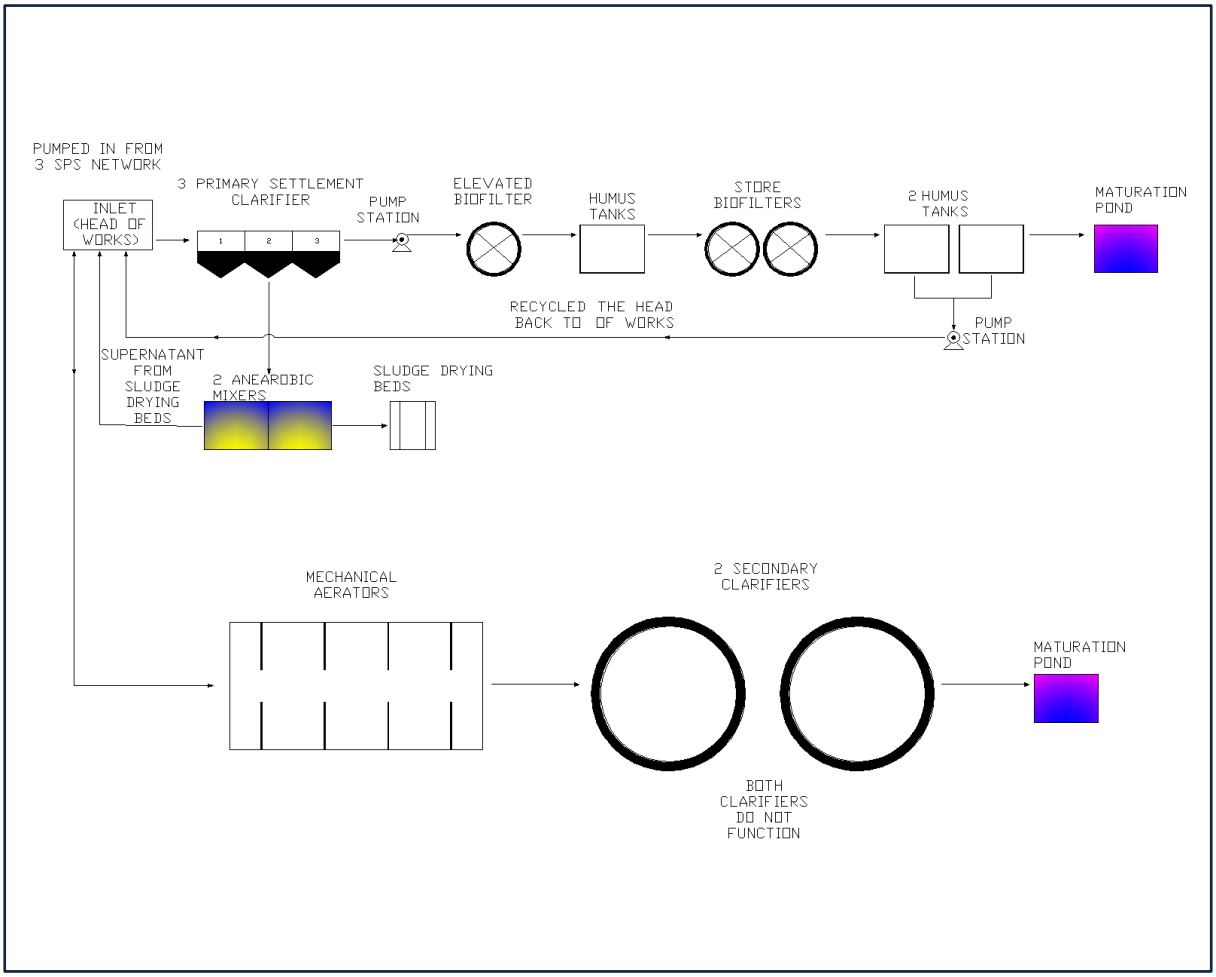

Figure 19.53 Estcourt Wastewater Process Flow Diagram

c) Wembezi Wastewater Works

The Wembezi WWW services portions of the township of Wembezi only (**Figure 19.54**). According to the Backlog Study referenced in the Bigen-Africa WSMP (2017), there are 299 households falling within the scheme footprint. Portions of Wembezi are serviced by a waterborne sewerage system whilst the remaining portions are assumed to currently be serviced by VIPs or septic tanks. Effluent flows to the Wembezi WWW under gravity as well as from one main pump station. The pump station is not operational, and the rising main is damaged resulting in raw sewage flowing into the Little Bushman's River.

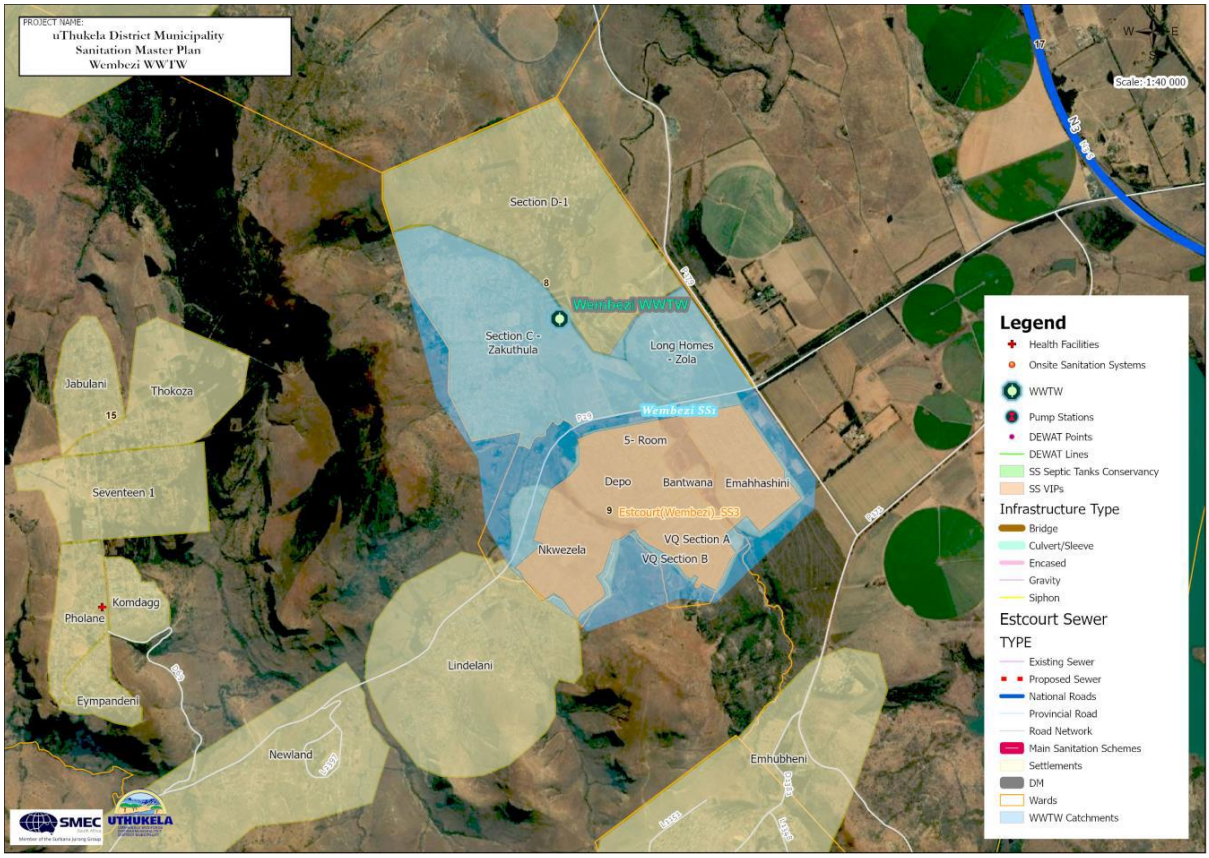

Figure 19.54 Wembezi Wastewater Works Catchment Area

The Wembezi WWW receives residential influent only. The treatment process consists of three settling ponds (**Figure 19.55**). Influent passes through mechanical screening at the inlet from which it is distributed amongst three primary settling ponds. At the time of inspection, the manhole to one of the ponds was blocked and therefore the first pond was the only one receiving the flow. Thereafter the wastewater passes through all three maturation ponds in series before chlorination and ultimately discharge.

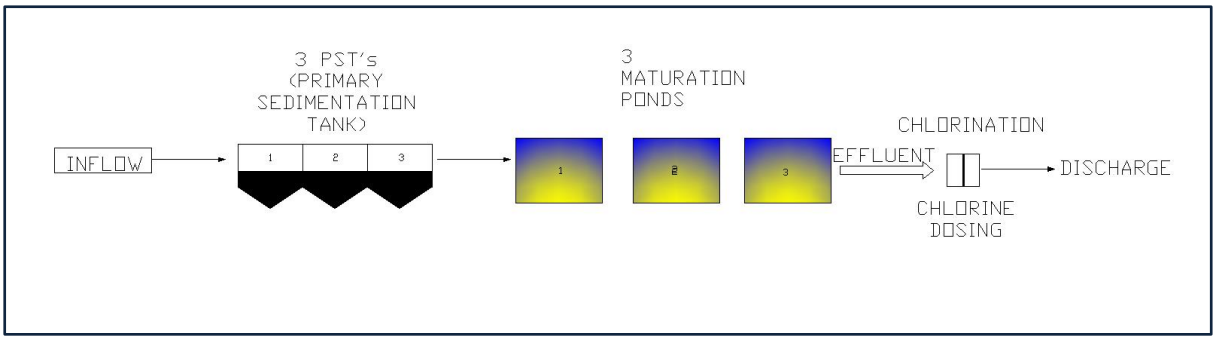

Figure 19.55 Wembezi Wastewater Works Process Flow Diagram

d) Weenen Wastewater Works

The Weenen sanitation scheme services the town of Weenen and the neighbouring township of KwaNobamba (**Figure 19.56**). According to the BA WSDP 2017 and its reference Backlog Study, there are 894 households falling within the scheme footprint. Weenen Town and KwaNobamba/Ezitendeni are currently serviced by septic tanks with the Weenen ponds receiving effluent from tankers only.

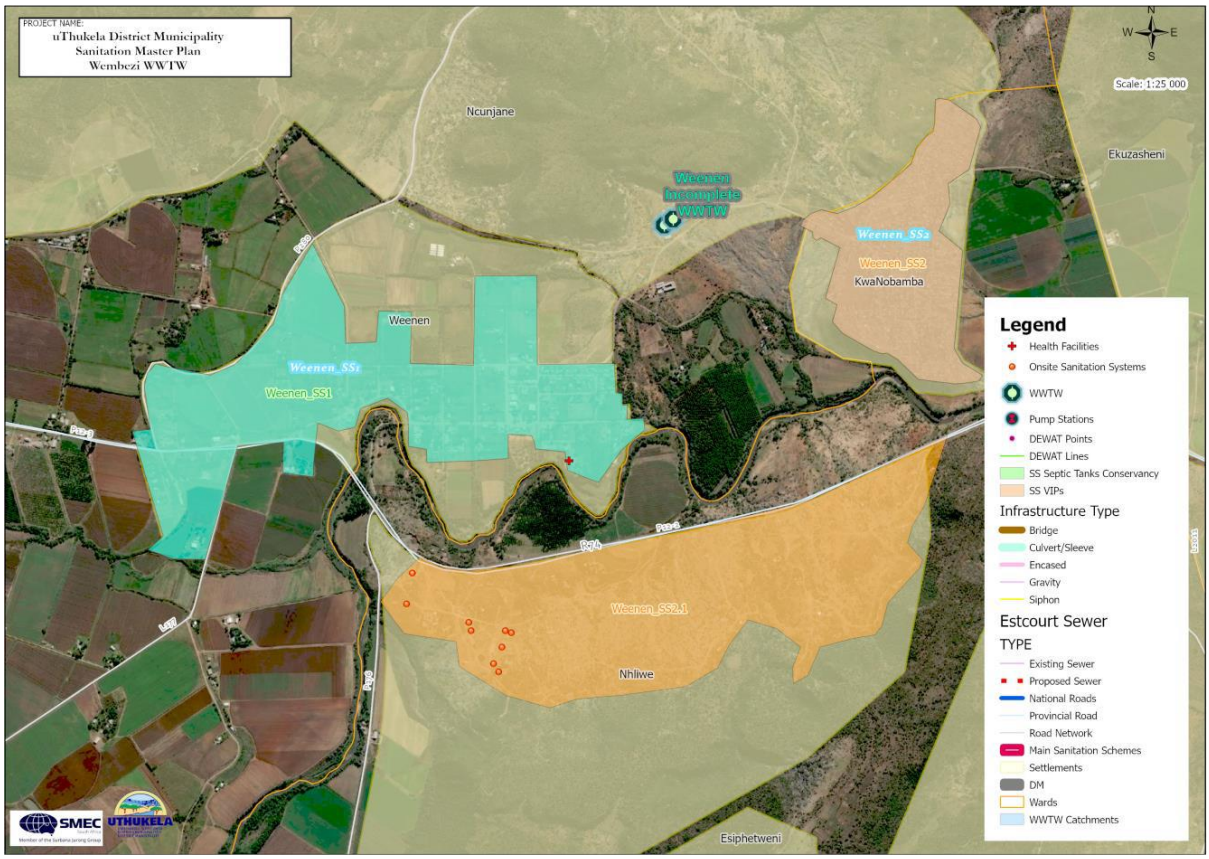

Figure 19.56 Weenen Wastewater Works Catchment Area

The WWTW consists of two concrete lined ponds and one plastic lined pond (**Figure 19.57**). The plastic lining is no longer in place. Indications are that the original design of the system was for a conventional process i.e., anaerobic digestion followed by aerobic treatment. However, due to underutilization, the treatment ponds are acting aerobically to treat the effluent.

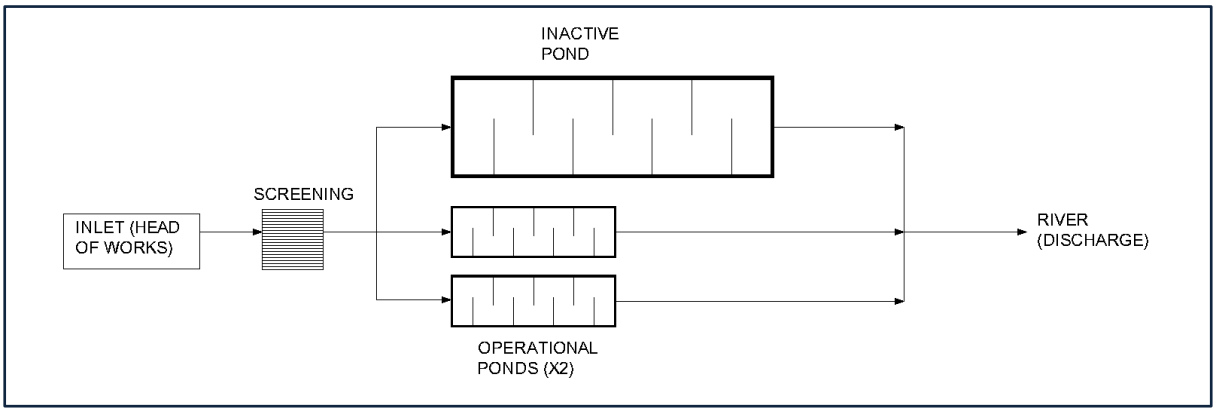

Figure 19.57 Weenen Wastewater Works Process Flow Diagram

e) Ezakeni Wastewater Works

The Ezakheni sanitation scheme services the township of Ezakheni only (**Figure 19.58**). According to the BA WSMP 2017 and its referenced Backlog Study, there are 10 864 households falling within the scheme footprint. As per discussions with the Alfred Duma Superintendent, the Ezakheni WWW was built in the 1970s to treat domestic waste only. The development of the Ithala industrial area in the 1980s, has required process changes at the WWW to deal with the addition of industrial effluent. A sewer pump station with a 350mm diameter steel rising main pumps sewage to the Ezakheni WWW from the Ithala industrial area.

Ezakheni is serviced by a waterborne sewerage system. Effluent flows to the Ezakheni WWW under gravity as well as from nine sewage pumping stations all operated by the UTDM. Only sewerage from the Section B area gravitates to the Ezakheni WWW.

The WWW utilizes the combined process of activated sludge and bio filtration to treat effluent in a so-called Biological Nutrient Removal (BNR) process (**Figure 19.59**). It consists of holding tanks, screening, de-gritting channels, drying beds, two anaerobic ponds, humus tank, a backup generator, flow splitter, disinfection process and anaerobic digestion for sludge. There are six aerators, with only two in operation. There are three mixers, with only one in operation. There are two secondary settlement clarifiers and chlorine dosing tanks. The sludge pump house and control room consist of four pumps. The works received some refurbishment and upgrading by Talbot and Talbot in 2017 and is coping with the inflow. As per discussions with the superintendent, there is a huge shortage of houses in the Ezakheni area. New developments have been halted due to the shortfalls in the sewerage system.

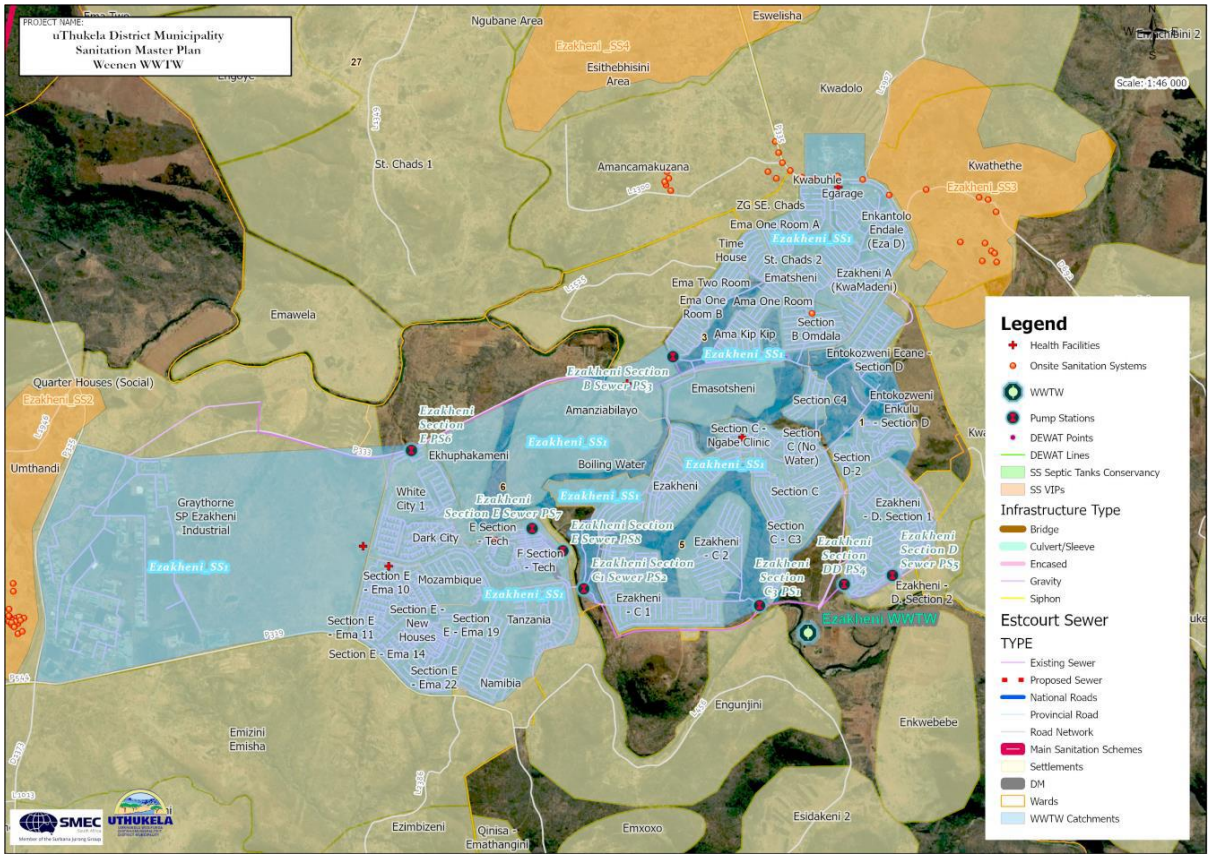

Figure 19.58 Ezakheni Wastewater Works Catchment Area

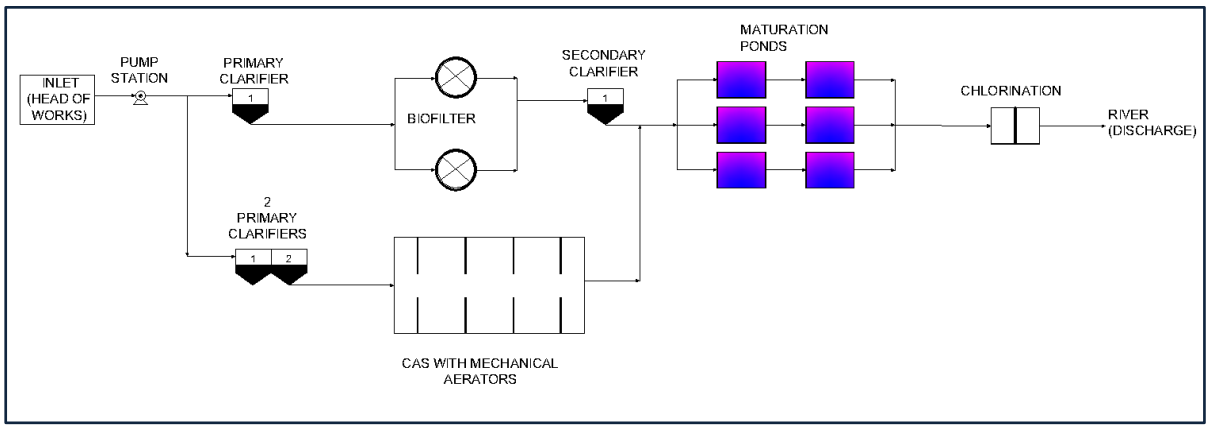

Figure 19.59 Ezakheni Wastewater Works Process Flow Diagram

f) Ekuvukeni Wastewater Works

The Ekuvukeni sanitation scheme services the township of Ekuvukeni only (**Figure 19.60**). According to the BA WSMP 2017 and its referenced Backlog Study, there are 2 602 households falling within the scheme footprint. Ekuvukeni is serviced by a waterborne sewerage system. The WWTW receives effluent under gravity flow as well as from tankers. Only 30% of Ekuvukeni's sewerage is connected (piped) to the WWTW.

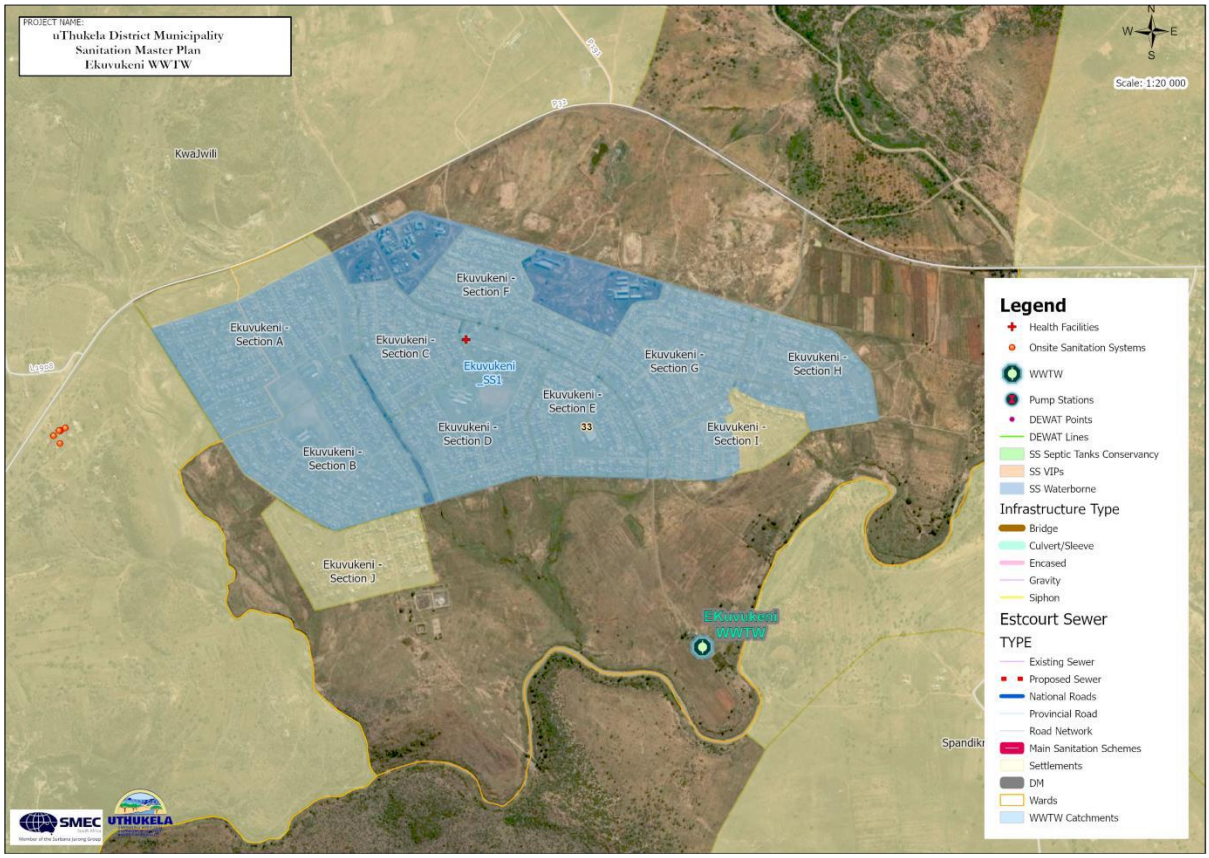

Figure 19.60 Ekuvukeni Wastewater Works Catchment Area

The WWTW utilizes a combined process of extended aeration and activated sludge with biological nutrient removal to treat the sewerage influent (**Figure 19.61**). The works consists of screens, de-gritter channels, biological nutrient removal, a single clarifier/scraper bridge, a return sludge pump, gas chlorination, maturation ponds, two mixers, axial flow rec pump, three aerators and waste sludge pump.

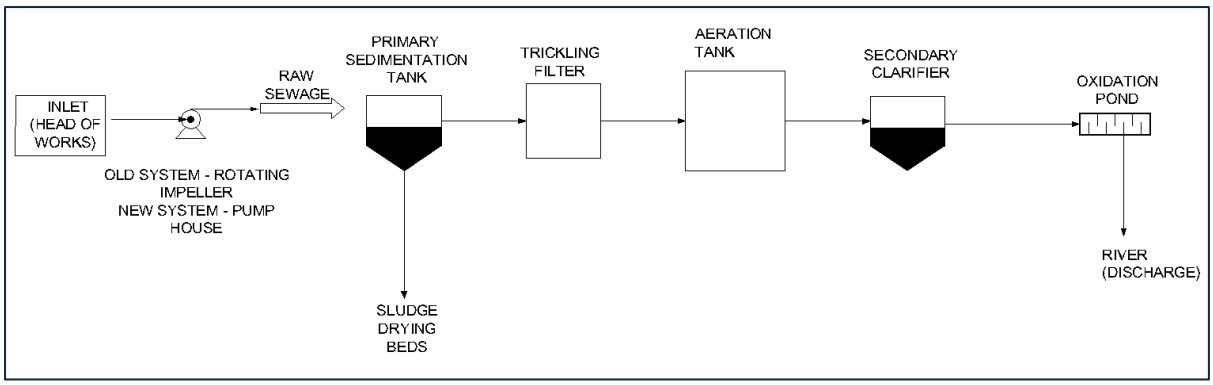

Figure 19.61 Ekuvukeni Wastewater Works Process Flow Diagram

g) Ladysmith Wastewater Works

The Ladysmith sanitation scheme services the town of Ladysmith and the neighbouring township of Steadville (**Figure 19.62**). According to the BA WSMP 2017 and its referenced Backlog Study, there were 9 522 households falling within the scheme footprint in 2017. Ladysmith and Steadville are serviced by a waterborne sewerage system. Effluent flows to the Ladysmith WWTW under gravity as well as from nineteen pump stations.

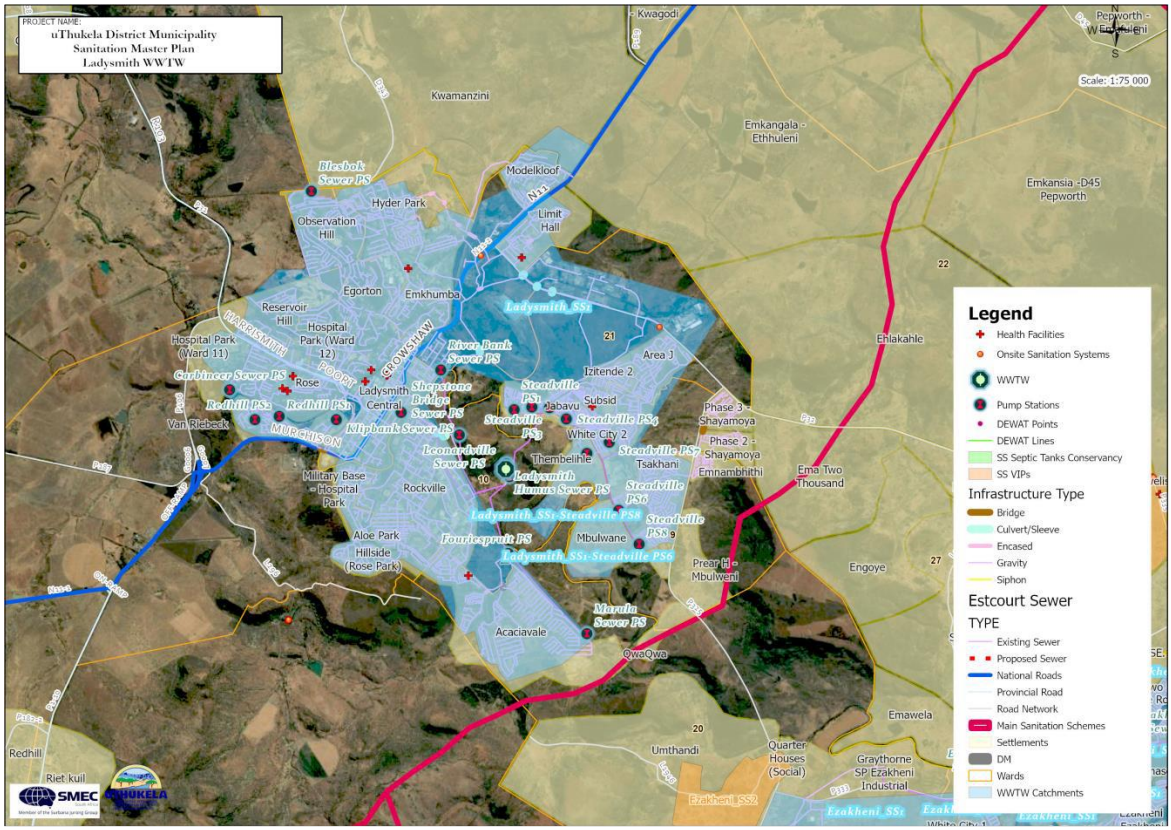

Figure 19.62 Ladysmith wastewater Works Catchment Area

The WWTW utilizes various treatment processes comprising of holding tanks, screening, de-gritting channels, flow measurement, flow splitting and disinfection. The bio filtration section of the plant is comprised of bio filters, humus tanks, anaerobic digesters, sludge digesters and maturation ponds (**Figure 19.63**).

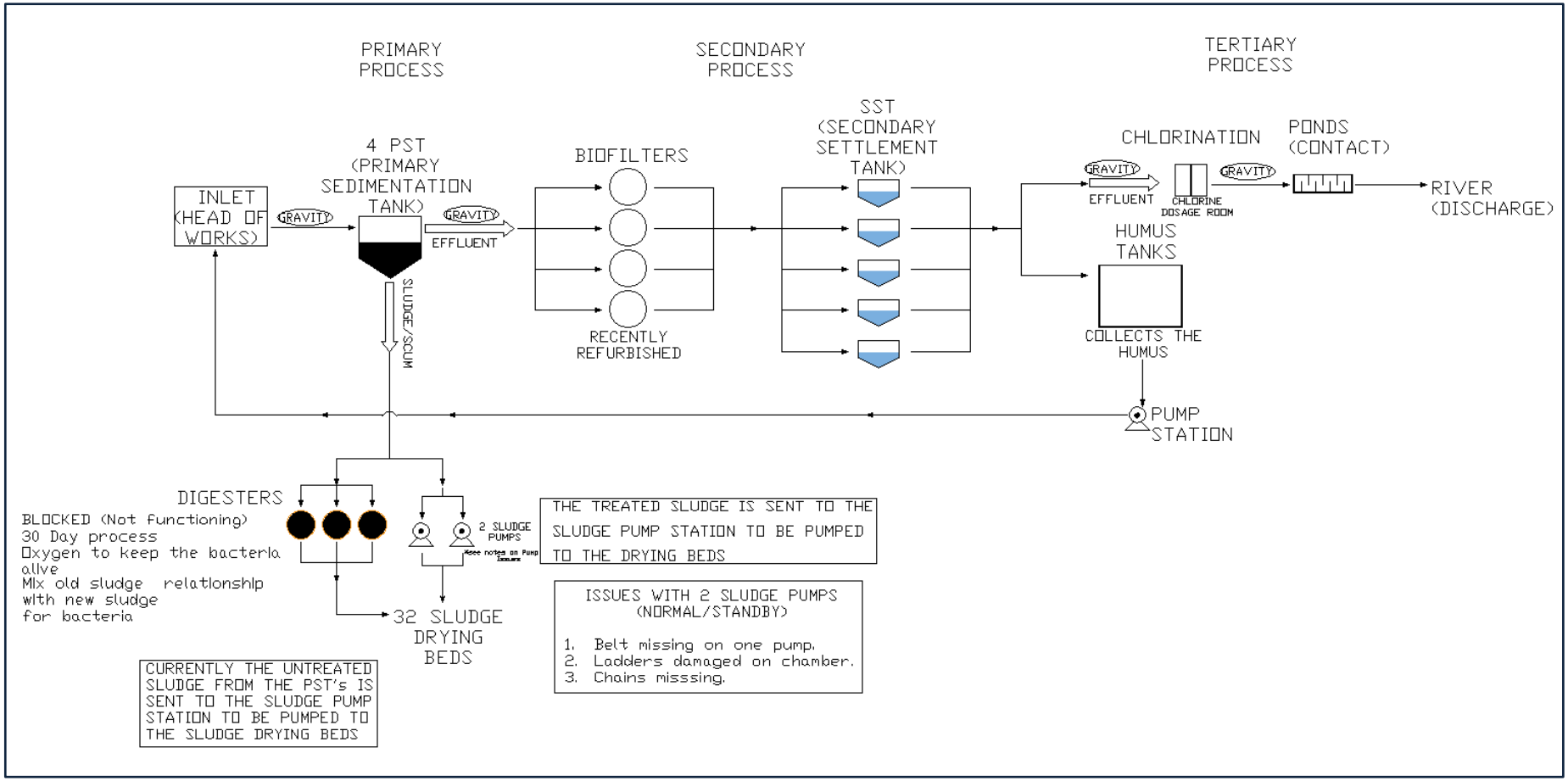

Figure 19.63 Ladysmith Wastewater Works Process Flow Diagram

h) Colenso Wastewater Works

The Colenso sanitation scheme services the town of Colenso and the neighbouring township of Inkanyezi (**Figure 19.64**). According to the BA WSMP 2017 study and its referenced Backlog Study, there were 1 350 households falling within the scheme footprint in 2017. Colenso and Inkanyezi are serviced by a waterborne sewerage system. Effluent flows to the Colenso WWTW under gravity as well as from seven pump stations.

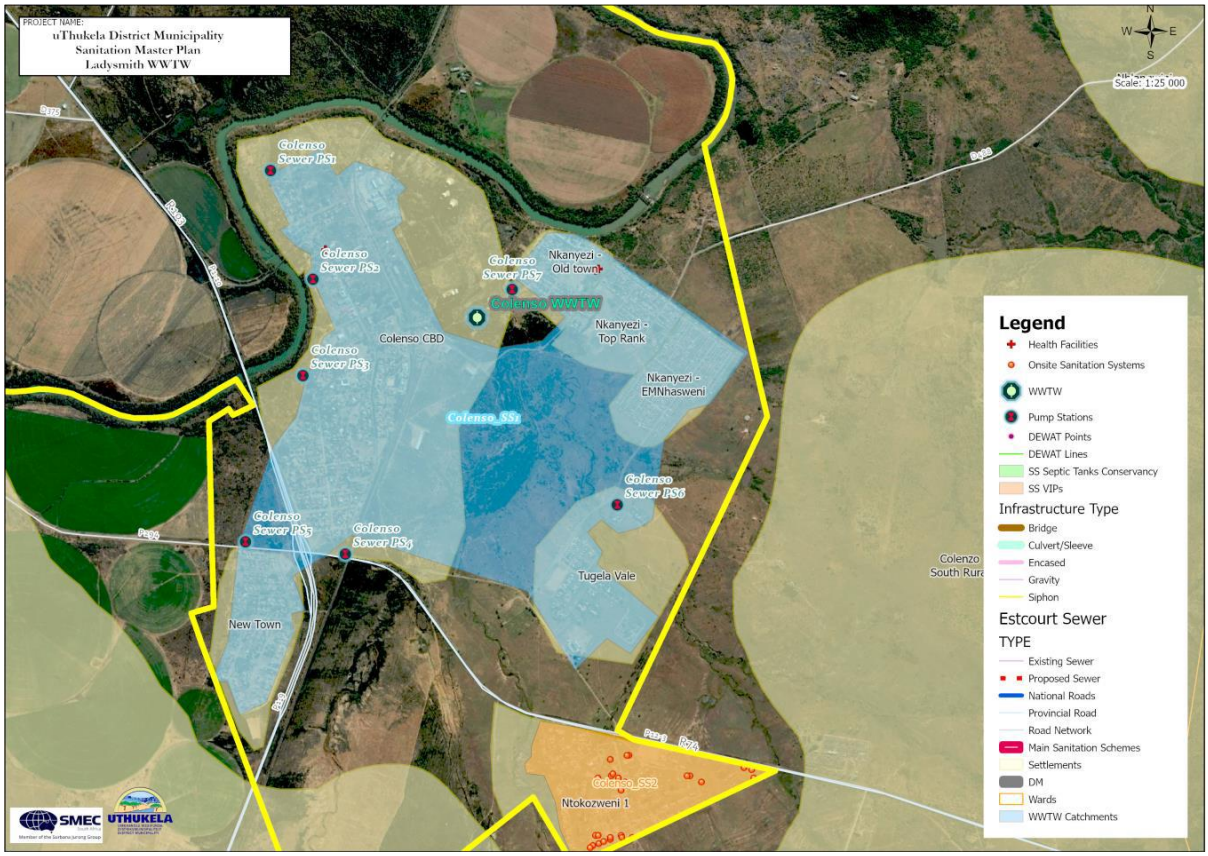

Figure 19.64 Colenso Wastewater Works Catchment Area

The WWW process consists of an activated sludge system and utilizes combined screening, de-gritting, activated sludge, secondary settling, sludge drying and disinfection (**Figure 19.65**). Limited flow enters the works as a result of the various pump stations that are non-operational. The flow that does reach the works cannot be transferred to the next unit process when the screw pumps are not working. Two aerators and a RAS system are provided but occasional breakdown and overall mechanical malfunctioning reduces the plant's effectiveness.

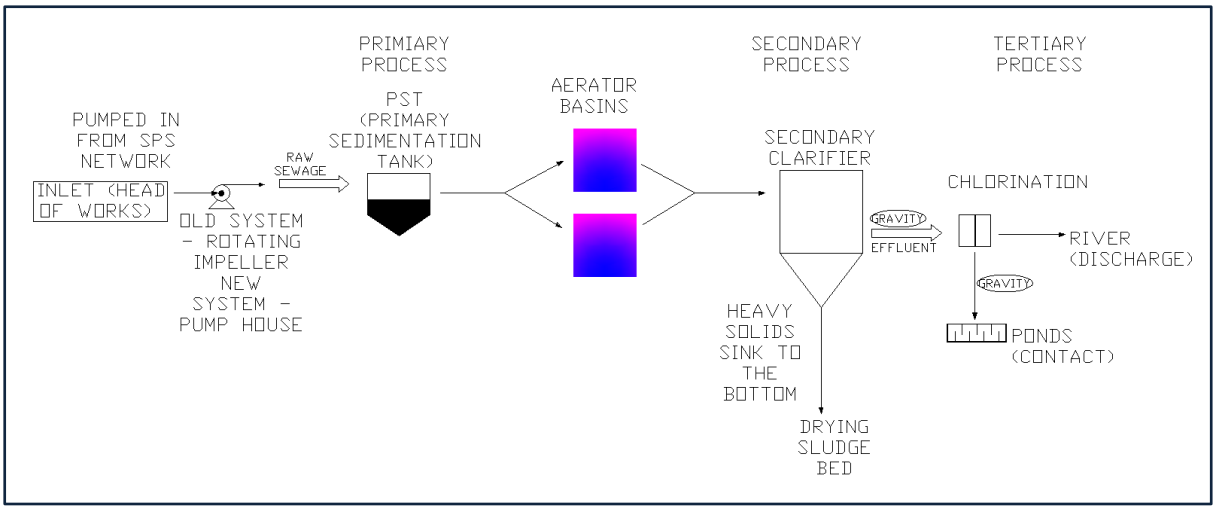

Figure 19.65 Colenso Wastewater Works Process Flow Diagram

i) Bergville Wastewater Works

The Bergville sanitation scheme services the town of Bergville only. According to the Backlog Study, there are 228 households falling within the scheme footprint (**Figure 19.66**). Bergville is currently serviced by septic tanks with the Bergville WWW receiving effluent from tankers only. The works also accepts effluent from tankers from the nearby town of Winterton.

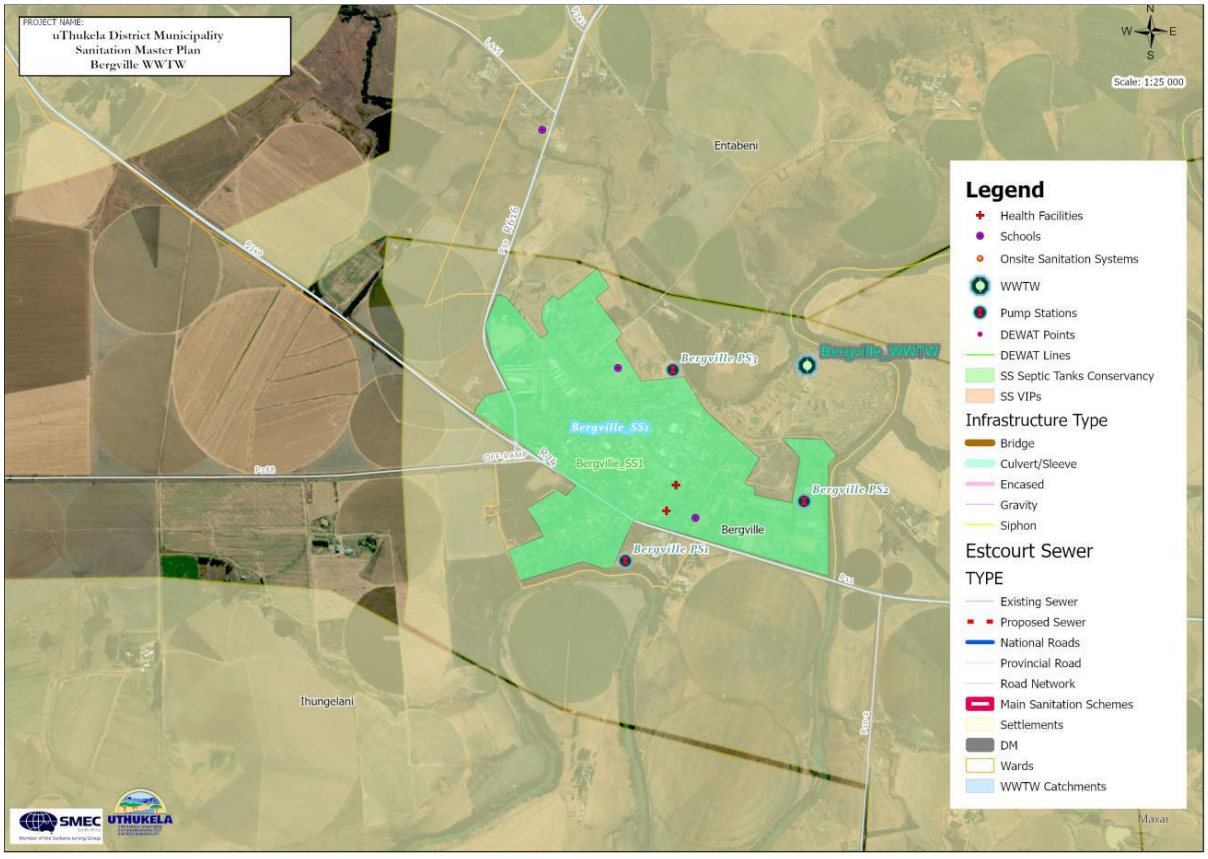

Figure 19.66 Bergville Wastewater Works Catchment Area

The existing WWW utilizes a series of oxidation ponds (**Figure 19.67**). Tankers discharge into a sump that flows through a screened inlet works to the ponds. The first two ponds are extremely silted up with limited process capacity. A floating aerator is located in the last pond but is non-operational. The effluent from the oxidation ponds is meant to flow to a system of four maturation ponds but these are also severely silted up and the effluent flows directly into the uThukela River. No provision for disinfection of the effluent is made.

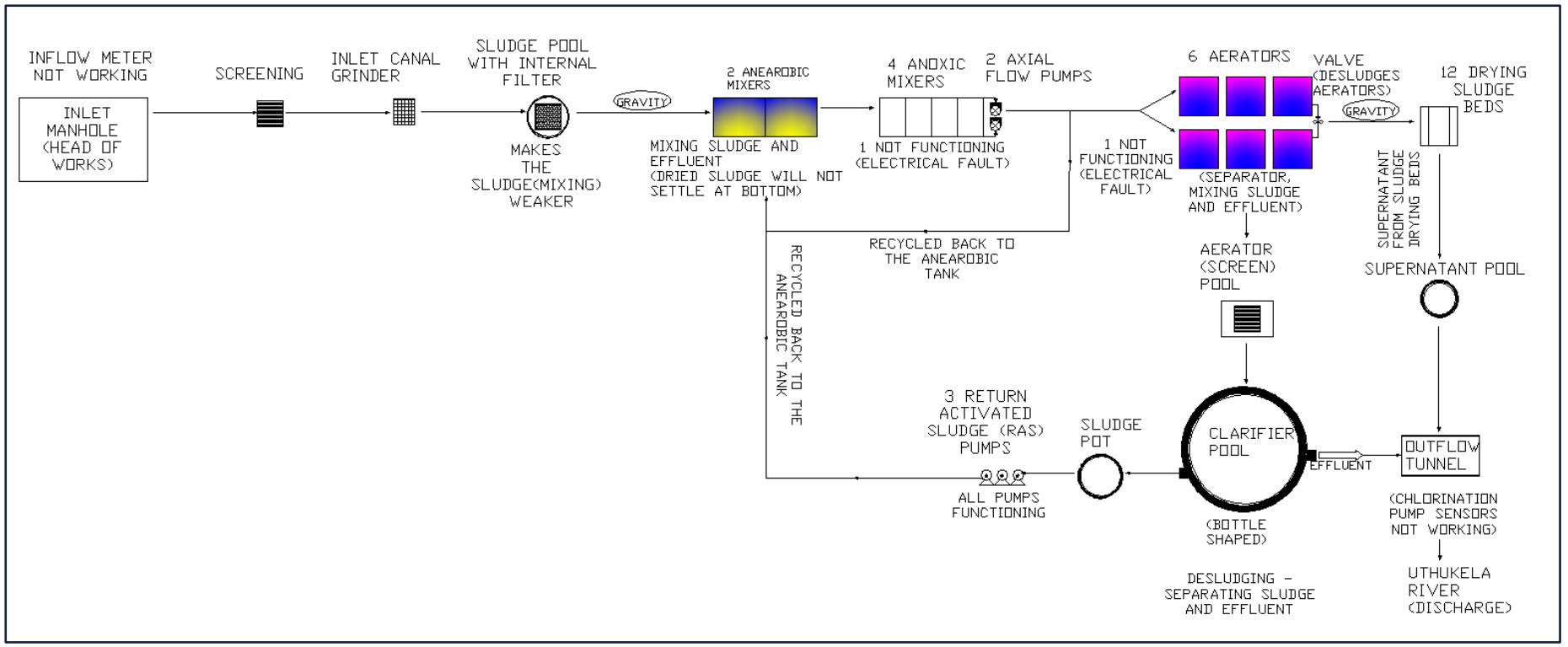

Figure 19.67 Bergville Wastewater Works Process Flow Diagram

j) Winterton Wastewater Works

The Winterton scheme services the town of Winterton and the neighbouring township of Khethani. According to the Backlog Study, there are 146 households falling within the scheme footprint (**Figure 19.68**). Winterton and Khethani are mostly serviced by a waterborne sewerage system although some areas are believed to have septic tanks. Effluent flows to the Winterton WWW under gravity as well as from one pump station.

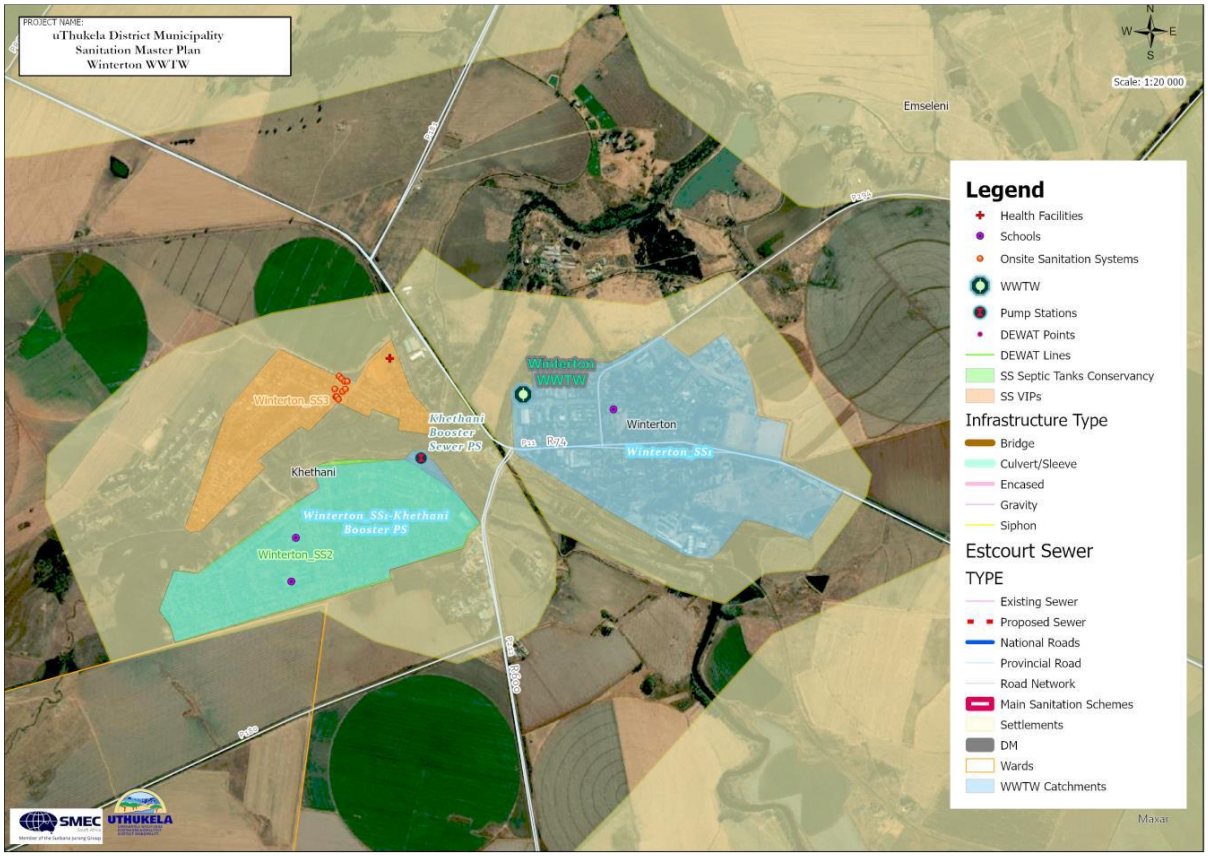

Figure 19.68 Winterton Wastewater Works Catchment Area

The WWW process consists of an inlet works and a poorly constructed flume. The effluent then enters an open septic tank before being pumped to a small stone biofilter. The biofilter underflow is then pumped to an aeration basin. Four drying beds are present but have not been utilized in a long time. A container-based chlorination system is provided (**Figure 19.69**).

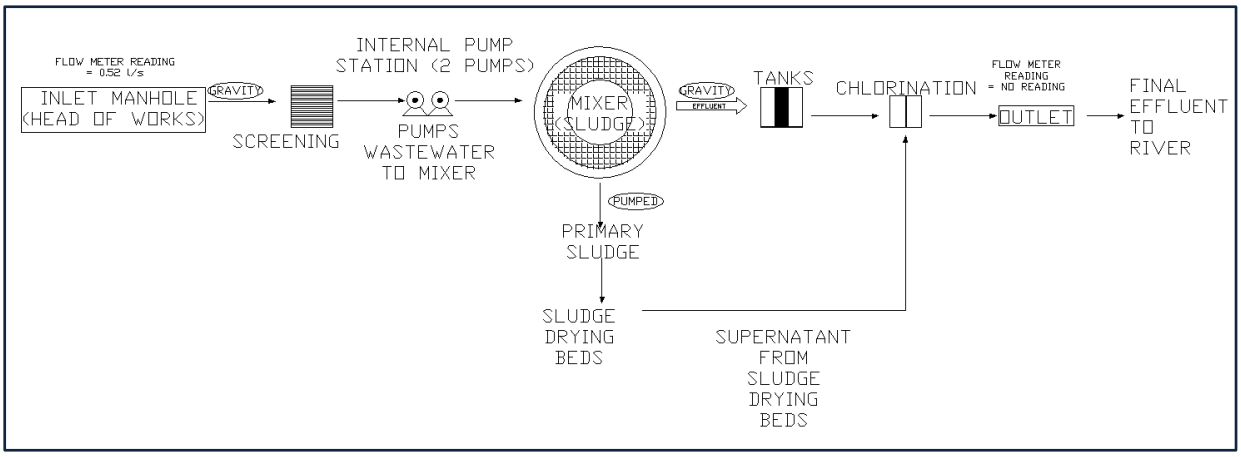

Figure 19.69 Winterton Wastewater Works Process Flow Diagram

19.5.2 uMzinyathi District Municipality

The uMzinyathi District Municipality has nine WWW, seven of which are operational (**Figure 19.70**). The capacity of the WWWs range from very small (0.25 Mℓ/day) serving the community of Wasbank to small (3.2 Mℓ/day) serving the town of Greytown. A list of the WWW in the uMzinyathi DM is provided in **Table 19.19**.

A number of sanitation projects have been implemented, are under construction or are proposed in the Municipality. A list of the sanitation projects funded by the Municipal Infrastructure Grant (MIG) and their status are provided in **Table 19.20**.

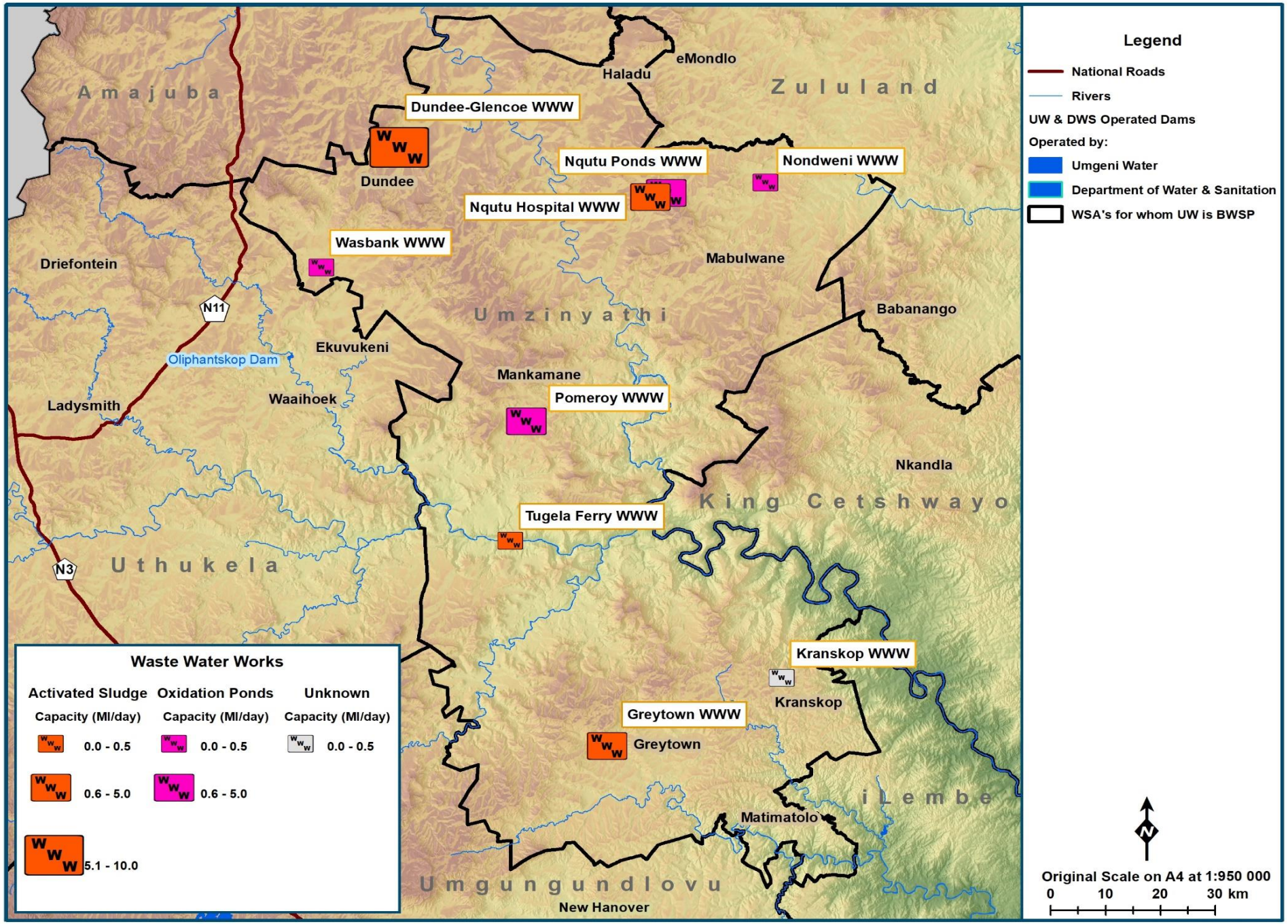

Figure 19.70 Location of uMzinyathi Wastewater Works

Table 19.19 uMzinyathi District Municipality Wastewater Works Specifications (DWS, 2011)

WWW	Description	Owner	Class	Capacity Sufficient	ADWF Capacity (Mℓ/day)	People Served	Operational	Overall Condition Rating (LTE, 2020)	Cost Estimate (LTE, 2020)
Tugela Ferry	Activated Sludge	uThukela Water	D	N	0.5	625	Y	Fair	R 918 500
Dundee-Glencoe	Activated Sludge	uThukela Water	B	Y	10	12500	Y	Fair	R 5 685 500
Greytown	Activated Sludge	uThukela Water	D	N	3.2	4000	Y	Good	R 480 500
Kranskop	None	uThukela Water	E	N	0.0	63	N	Fair	R 337 500
Nondweni	Oxidation Ponds	uThukela Water	D	Y	0.0	625	N	Unknown	Unknown
Nqutu Hospital	Activated Sludge	uThukela Water	D	Y	2.0	2500	Y	Uunknown	Unknown
Nqutu Ponds	Oxidation Ponds	uThukela Water	E	Y	3.0	Unknown	Y	Fair	R 125 000
Pomeroy	Oxidation Ponds	uThukela Water	D	Y	1.0	1250	Y	Fair	R1 003 000
Wasbank	Activated Sludge	uThukela Water	D	Y	0.25	625	Y	Unknown	Unknown

Table 19.20 MIG funded Sanitation Projects in uMzinyathi District Municipality (CoGTA KwaZulu-Natal)

Project	Status
KwaSenge Sanitation Project	Design & Tender
Eradication of Sanitation Backlogs Umvoti LM	Construction 60%
Nquthu North Eastern Waterborne Sanitation Project	Feasibility Completed
Eradication of Msinga Sanitation Backlog	Construction 20%
Eradication of Nquthu Sanitation Backlogs	Construction 80%

19.5.3 iLembe District Municipality

The iLembe District Municipality (DM) has 15 WWW including two that are operated by Siza Water (Frasers and Shakaskraal). All the wastewater works are reported operational with the exception of Melville, which has yet to be commissioned (**Figure 19.71**). The capacity of the WWW's range from very small (0.05 Mℓ/day) serving Ntunjambili Hospital to relatively large (12 Mℓ/day) serving the Sundumbili community. A list of the WWW in the iLembe DM is provided in **Table 19.21**.

19% of the population of iLembe DM still do not have access to basic sanitation. The urban areas have proper waterborne sanitation systems, but the peri-urban and rural areas rely on pit latrines or no system at all. Plans are currently in place to construct a regional wastewater scheme (in planning phase) in KwaDukuza to address the current infrastructure limitations of the area. Proposed wastewater works are planned for Ndwedwe, Mandeni, Maphumulo and various parts of KwaDukuza.

A number of sanitation projects have been implemented, are under construction or are proposed in the Municipality. A list of the sanitation projects funded by the Municipal Infrastructure grant (MIG) and their status are provided in **Table 19.22**.

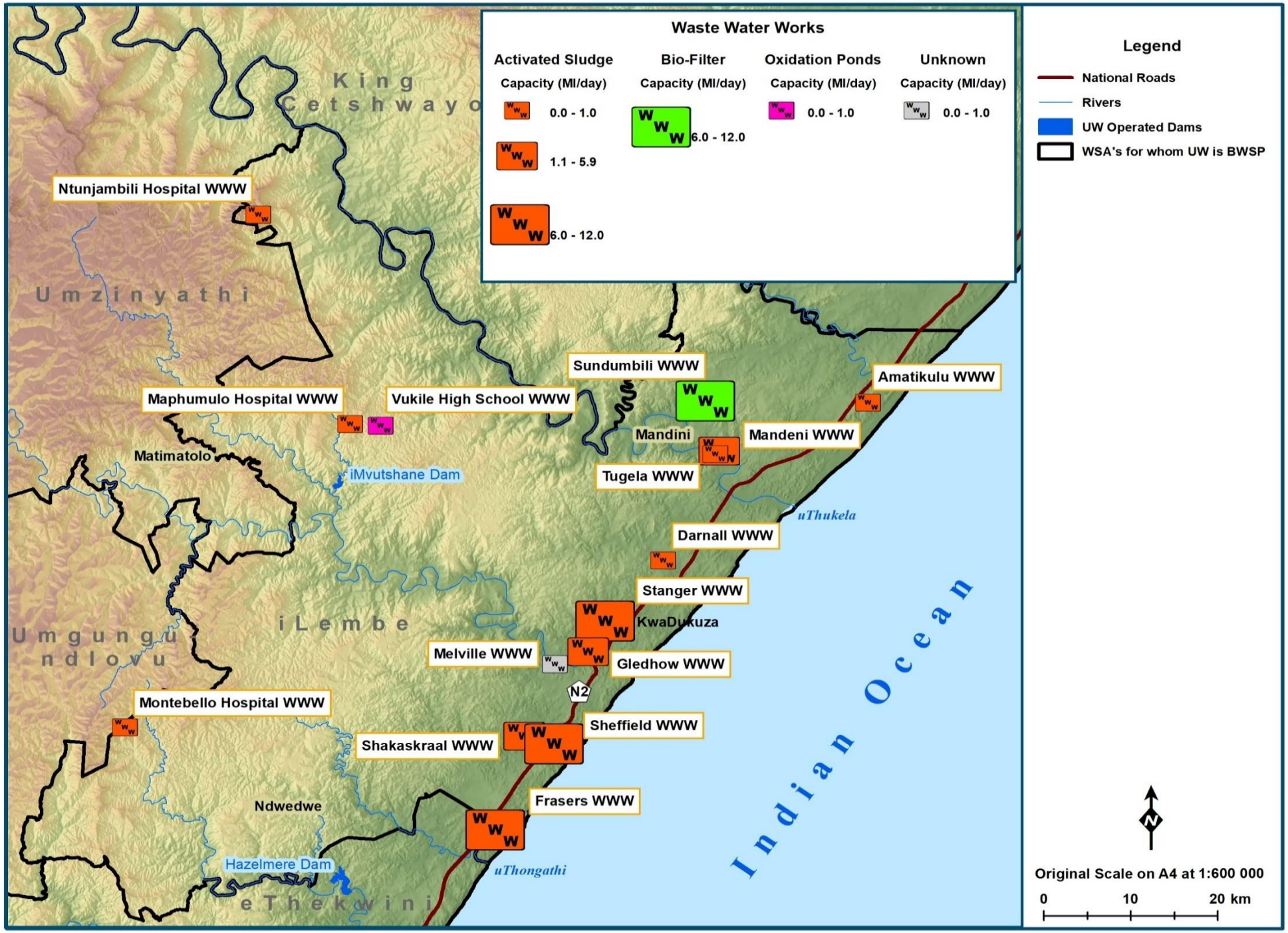

Figure 19.71 Location of iLembe District Municipality Wastewater Works

Table 19.21 iLembe District Municipality Wastewater Works Specifications (DWS, 2011)

WWW	Description	Owner	Class	Capacity Sufficient	ADWF Capacity (Mℓ/day)	People Served	Operational	Overall Condition Rating (LTE, 2020)	Cost Estimate (LTE, 2020)
Sundumbili	Bio-filter	iLembe DM	B	N	12.0	15000	Y	Poor	R 2 518 800
Frasers	Activated Sludge	Siza Water	C	Y	12.0	15000	Y	Poor	R 441 000
Mandeni	Activated Sludge	iLembe DM	D	Y	1.3	1500	Y	Poor	R 2 703 500
Darnall	Activated Sludge	iLembe DM	D	Y	0.33	375	Y	Poor	R 1 728 200
Shakaskraal	Activated Sludge	Siza Water	D	Y	1.6	1500	Y	Poor	R 440 000
Stanger	Activated Sludge	iLembe DM	D	Y	10.0	12500	Y	Poor	R 2 297 500
Tugela	Activated Sludge	iLembe DM		Y	0.75	750	Y	Fair	R 660 500
Maphumulo Hospital	Activated Sludge	iLembe DM	D	Y	0.15	37	Y	Fair	R 296 00
Amatikulu	Activated Sludge	iLembe DM	D	Y	0.25	250	Y	Poor	R 757 000
Gledhow	Activated Sludge	iLembe DM	C	Y	3.0	250	Y	Poor	R 3 148 000
Melville	Not commissioned	iLembe DM		Y	0.06	0	N	Fair	R 260 000
Montebello Hospital	Activated Sludge	iLembe DM	D	Y	0.15	188	Y	Poor	R 2 540 000
Ntunjambili Hospital	Activated Sludge	iLembe DM	D	Y	0.05	375	Y	Poor	R 1 922 000
Sheffield	Activated Sludge	iLembe DM		Y	6.0	Unknown	Y	Fair	R 97 000
Vukile High School	Oxidation Ponds	iLembe DM		Y	0.03	Unknown	Y	Fair	R 285 000

Table 19.22 MIG funded Sanitation Projects in iLembe District Municipality (CoGTA KwaZulu-Natal, 2021)

Project	Status
Inyoni Housing Development Bulk Sewer Project	Construction 80%
Mandeni Sanitation Master Business Plan	Construction 80%
Ndwedwe Sanitation Master Business Plan	Construction 60%
Mdlebeni Sanitation Project	Construction 80%
Southern Regional Bulk Water and Sanitation Scheme	Construction 20%
Darnall Sewer Upgrade within Ward 2 of KwaDukuza Municipality	Design & Tender
Maphumulo Town WWW and Sewer Reticulation Phase 1	Planning & Design
Groutville D Sanitation Project Phase 2	Construction 40%
Driefontein Housing Sanitation Project – Planning Phase	Registered
Lindelani Upgrading of Sewer Reticulation Network	Construction 20%
KwaDukuza Regional Wastewater Works	Design & Tender
Mandafarm Waterborne Sanitation – Planning Phase (Mandeni Ward 7)	Registered
Construction of 10142 VIPs within Mandeni Municipality	Registered
Construction of 840 VIPs in Ndwedwe Ward 15	Construction
Sundamuili Wastewater Works Addendum: Fees for Detailed Design	Registered
Frasers Wastewater Works Upgrade – Planning Phase	Registered
KwaDukuza Town Bulk Sewer Replacement and Upgrade	Registered

19.5.4 Harry Gwala District Municipality

The Harry Gwala District Municipality (HGDM) has ten WWW, nine of which are operational (**Figure 19.72**)**.** The capacity of the WWW's range from very small (0.1 Mℓ/day) serving the community of Franklin to small (1 Mℓ/day) serving the town of Ixopo. A list of the WWW in the Harry Gwala DM is provided in **Table 19.23**.

The municipality reported that sanitation backlogs have been eradicated in the Greater Kokstad Local Municipality. The municipality is working to eradicate sanitation backlogs in the remaining three local municipalities i.e. Dr Nkosazana Dlamini-Zuma, uMzimkhulu and uBuhlebezwe. The total sanitation backlog equates to 22 % of the households in HGDM without basic RDP sanitation.

A number of sanitation projects have been implemented, are under construction or are proposed in the HGDM. A list of the sanitation projects funded by the Municipal Infrastructure grant (MIG) and their status are provided in **Table 19.24**.

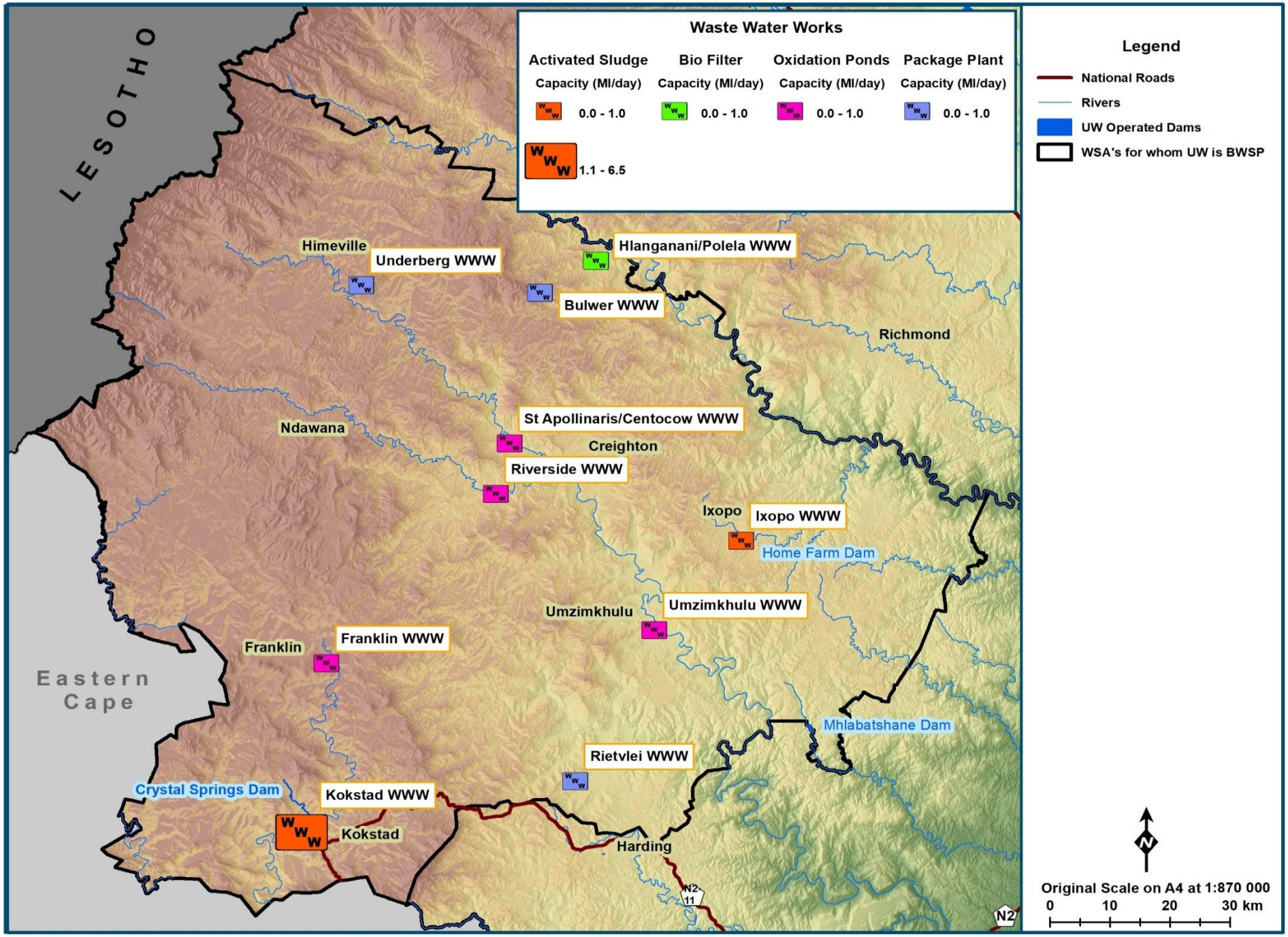

Figure 19.72 Location of Harry Gwala District Municipality Wastewater Works

Table 19.23 Harry Gwala District Municipality Wastewater Works Specifications (DWS, 2011)

WWW	Description	Owner	Class: Harry Gwala	Capacity Sufficient	ADWF Capacity (Mℓ/day)	People Served	Operational	Overall Condition Rating (LTE, 2020)	Cost Estimate (LTE, 2020)
Ixopo	Activated Sludge	Umgeni Water	C	Y	0.95		Y	Good	-
Kokstad	Activated Sludge	Harry Gwala DM	C	Y	6.4	22500	Y	Poor	R 7 295 000
Underberg	Package Plant	Harry Gwala DM	D	N	0.1	125	Y	Good	R 103 000
Bulwer	Package Plant	Harry Gwala DM	C	Y	0.08	125	Y	Fair	R 2 079 000
Franklin	Oxidation Ponds	Harry Gwala DM	D	Y	0.1	125	Y	Poor	R 2 765 000
Hlanganani/Polela	Bio-filter	Harry Gwala DM	D	Y	0.22	313	N	Fair	R 304 000
Riverside	Oxidation Ponds	Harry Gwala DM	E	Y	0.36	500	N	Dysfunctional	R 4 858 200
St Apollinaris/Centocow	Oxidation Ponds	Harry Gwala DM	D	Y	0.09	125	Y	Poor	R5 355 400
Umzimkhulu	Oxidation Ponds	Harry Gwala DM	C	Y	0.56	750	Y	Fair	R 1 467 000
Rietvlei	Package Plant	Harry Gwala DM	D	Y	Unknown	625	N	Dysfunctional	R 20 000 000

Table 19.24 MIG funded Sanitation Projects in Harry Gwala District Municipality (CoGTA KwaZulu-Natal, 2020)

Project	Status
Umzimkhulu Urban and Peri Urban Sanitation	Construction 80%
Donnybrook Bulk Sewer Upgrade	Design & Tender
Upgrade of Fairview and Ixopo Sewer System	Design & Tender
Umzimkhulu Sewers Upgrade Phase 2 (Ward 16)	Design & Tender
Shayamoya Emergency Sewer Intervention	Construction 80%
Emergency Trunk Sewer Intervention Greater Kokstad	Practical Completion
Emergency Sewer Intevention for Bhongweni Area Greater Kokstad	Practical Completion
Himeville Sanitation Project	Registered
Ibisi Sewer Reticulation	Design & Tender
Universal Rural Sanitation Coverage Ubuhlebezwe	Construction 20%
Horseshoe Sanitation Project Phase 2	Design & Tender

19.5.5 Ugu District Municipality

The Ugu District Municipality (DM) has 16 WWW, the majority of them small. All but one of them are reported as being operational (**Figure 19.73**). The capacity of the WWWs range from very small (0.2 Mℓ/day) serving the community of Eden Wilds to relatively large (12 Mℓ/day) serving the large town of Port Shepstone. A list of the WWW in the DM is provided in **Table 19.25**.

The urban areas within Ugu are located predominantly within a narrow coastal strip comprising erven occupied by a combination of permanent residents and local tourists who descend on the area during holiday periods. The Sanitation Services Master Plan (SSMP) (SSI, 2005) suggests that the water demand (and hence wastewater flows) in the peak December/January period is typically 33% higher than the annual average values. Although largely "residential" most urban areas include some "commercial" activity and there are some "light and/or service industrial" nodes particularly at Port Shepstone (Marburg) and at Park Rynie to a lesser extent. The urban sanitation comprises a combination of waterborne sewerage linked to wastewater works as well as a system of septic tanks and conservancy tanks in the less densely populated areas.

Most of the treatment facilities are owned and managed by Ugu although there are also a number of privately owned and managed, small sewage treatment plants,– mostly "package" plants. With the exception of Gamalakhe, the sewerage coverage of formal, urban areas, which have a municipal water connection, is approximately 30%.

A total estimated capital investment (2014) of the order of R 3 billion is required to reticulate and upgrade sanitation within the urban strip. The urban strip are areas adjoining the coastal and by nature of their density should be provided with reticulated, waterborne sewerage as opposed to a basic level of service *viz*. septic tanks.

A number of sanitation projects have been implemented, are under construction or are proposed in Ugu. A list of the sanitation projects funded by the Municipal Infrastructure grant (MIG) and their status are provided in **Table 19.26**.

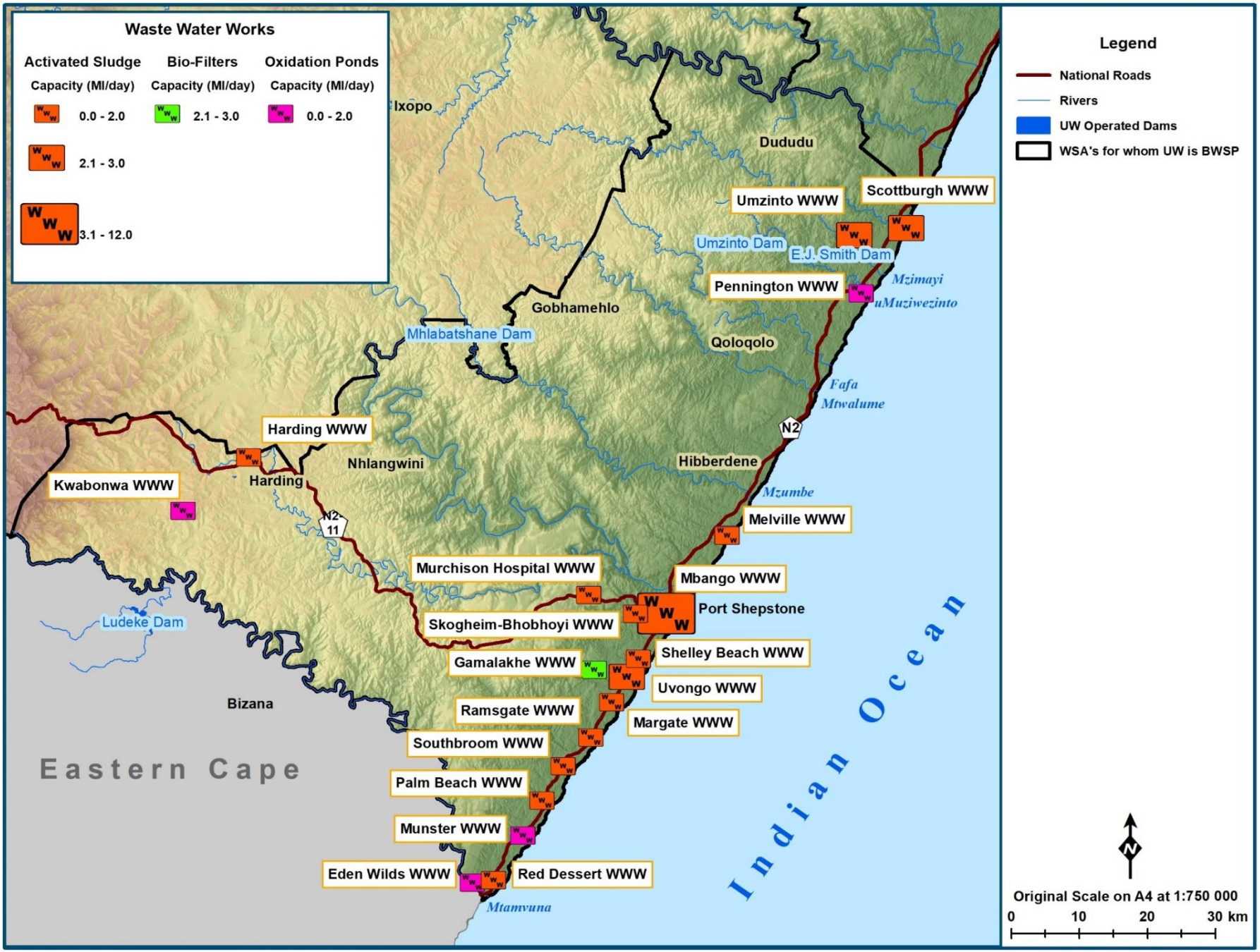

Figure 19.73 Location of Ugu District Municipality Wastewater Works

Table 19.25 Ugu District Municipality Wastewater Works Specifications

WWW	Description	Owner	Class	Capacity Sufficient	ADWF Capacity (Mℓ/day)	People Served	Operational	Overall Condition Rating (LTE, 2020)	Cost Estimate (LTE, 2020)
Kwabonwa	Oxidation Ponds	Ugu DM	D	Y	0.6	63	Y	Fair	R 3 853 500
Gamalakhe	Bio-filter	Ugu DM	C	Y	3.0	2500	Y	Fair	R 5 950 200
Ramsgate	Activated Sludge	Ugu DM	C	N	1.2	1125	Y	Poor	R 2 542 700
Uvongo	Activated Sludge	Ugu DM	B	Y	2.4	1875	Y	Fair	R 2 154 950
Palm Beach	Activated Sludge	Ugu DM	C	Y	0.7	750	Y	Poor	R 2 850 000
Umzinto	Activated Sludge	Ugu DM	C	Y	2.5	2000	Y	Fair	R 10 051 500
Shelley Beach	Activated Sludge	Ugu DM	C	N	0.75	875	Y	Fair	R 8 059 500
Scottburgh	Activated Sludge	Ugu DM	B	Y	2.3	2250	Y	Poor	R 9 627 500
Margate	Activated Sludge	Ugu DM	B	Y	0.6	6250	Y	Fair	R 4 061 000
Murchiston Hospital	Activated Sludge	Ugu DM		Y	0.2	2500	Y	Fair	R 10 414 000
Eden Wilds	Oxidation Ponds	Ugu DM	D	Y	0.2	188	Y	Fair	R 2 100 500
Southbroom	Activated Sludge	Ugu DM	D	Y	0.2	63	N	Dysfunctional	R 5 301 500
Harding	Activated Sludge	Ugu DM	C	Y	1.6	563	Y	Fair	R 1 232 000
Hibberdene	Oxidation Ponds	Ugu DM	C	Y	0.28		N	Decommissioned	
Mbango	Activated Sludge	Ugu DM	B	N	12.0	11250	Y	Poor	R 8 413 500
Melville	Activated Sludge	Ugu DM	C	Y	0.28	344	Y	Fair	R 6 162 000
Munster	Oxidation Ponds	Ugu DM	D	Y	0.25	225	Y	Poor	R 4 640 000

Pennington	Oxidation Ponds	Ugu DM	C	N	2.0	750	Y	Fair	R 3 482 000
Red Dessert	Activated Sludge	Ugu DM	D	Y	0.6	563	Y	Fair	R 1 842 500
Skogheim-Bhobhoyi	Activated Sludge	Ugu DM	D	Y	0.14	150	Y	Unknown	R 482 000

Table 19.26 MIG funded Sanitation Projects in Ugu District Municipality (CoGTA KwaZulu-Natal, 2020)

Project	Status
Margate Sewer Pipeline Replacement	Construction 40%
Harding Sanitation Scheme Phase 3	Construction 80%
Pennington Waterborne Bulk Sewer Sanitation Project	Construction 80%
Sanitation Refurbishment Phase 1 – Port Edward to Park Rynie	Construction 80%
Kwalatshoda Water and Sanitation Project	Construction 80%
Extension (5.5 Ml/day)to uMbango WWW Planning Phase	Registered
New 1.5 Ml/day Melville WWW Planning Phase	Registered
Masinenge/uVongo Sanitation Project	Construction
Umzinto WWW and Outfall Sewers Upgrade and Rehabilitation	Construction
Mkholombe Sanitation Project	Practical Completion
Hibiscus Coast Sanitation Project	Construction
Refurbishment of Scottburgh WWW – Phase 1	Registered
Margate Extension 3 & 7 Sanitation Scheme – Ward 6	Registered

19.5.6 uMkhanyakude District Municipality

The uMkhanyakude District Municipality (UKDM) has 11 WWWs all of which are 1 Mℓ/day and smaller in capacity (**Figure 19.74**). A list of the WWW in the DM is provided in **Table 19.27**. The provision of appropriate sanitation in the DM is a serious issue with massive backlogs.

The percentage of households in the district with access to a flush toilet (connected to either a sewerage system or a septic tank) is only 13%, a figure significantly lower than the 45% at provincial level. About 18 % of households in UKDM do not have access to any form of sanitation facilities compared to only 6.3% at provincial level. The dominant forms of sanitation infrastructure in the district include ventilated improved pit latrines (25% of households) and unimproved pit toilets (19% of households).

The sanitation access backlogs were determined utilising a combination of Census 2011 and the Stats SA 2016 Community Survey. The sanitation backlog for the district was 43% in 2016 compared to 45% in 2011. This shows a very slow pace in the eradication of sanitation backlogs which can be attributed to the municipality's main focus on water provision. In accordance with the 2016 Community Survey, a total of 65 675 households have below minimum level of service in terms of sanitation access.

The sanitation eradication backlog cost is estimated at R 985 million assuming dry sanitation to all those households without access at present. Similar to the water backlogs eradication cost, this figure does not account for maintenance backlogs as there are some households which were previously served but their schemes are currently dysfunctional due to prolonged lack of maintenance.

A number of sanitation projects have been implemented, are under construction or are proposed in UKDM. A list of the sanitation projects funded by the Municipal Infrastructure Grant (MIG) and their status are provided in **Table 19.28.**

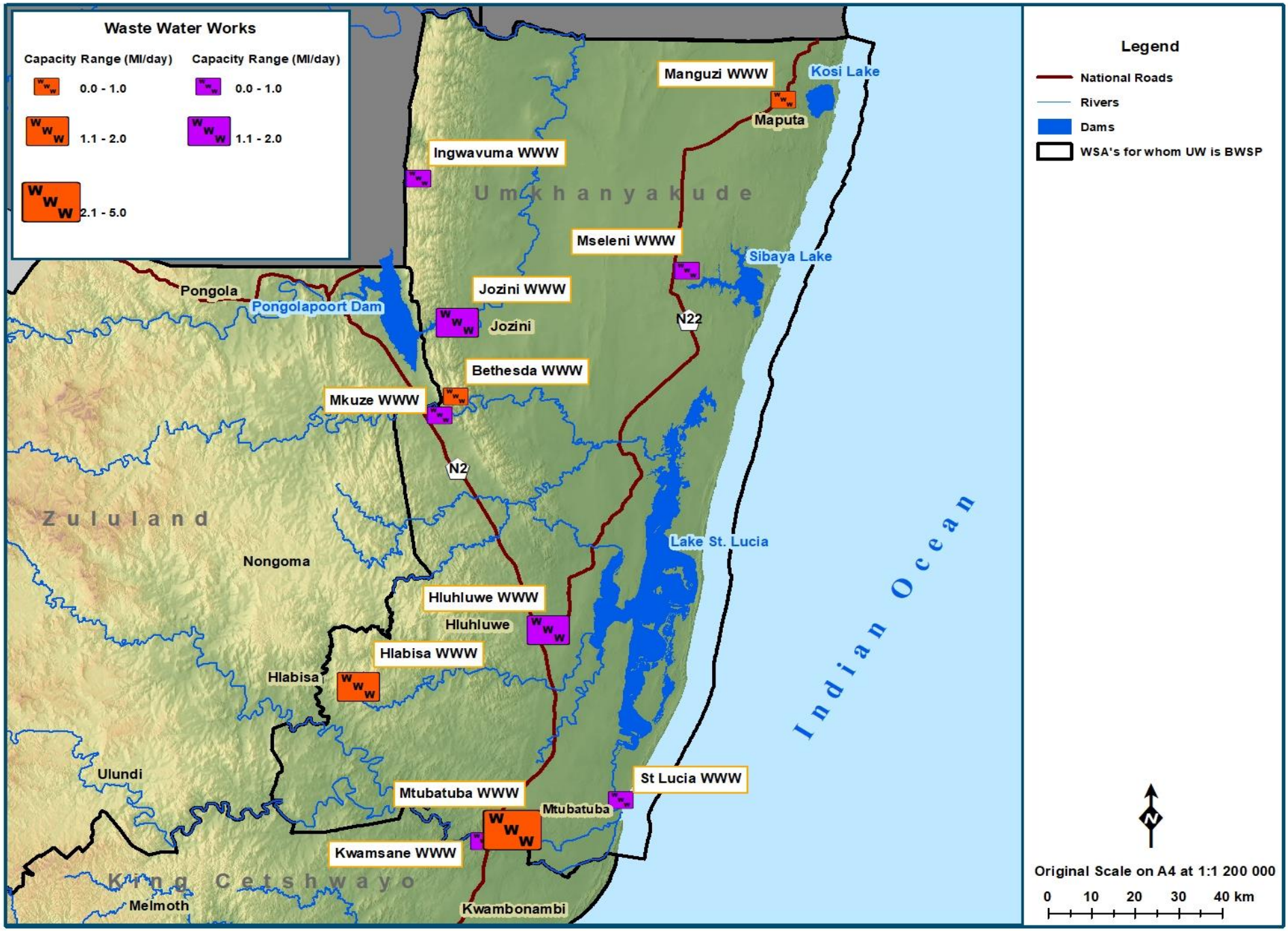

Figure 19.74 Location of uMkhanyakude District Municipality Wastewater Works

Table 19.27 uMkhanyakude District Municipality Wastewater Works Specifications (DWS, 2011)

WWW	Description	Owner	Class	Capacity Sufficient	ADWF Capacity (Mℓ/day)	People Served	Operational	Overall Condition Rating (LTE, 2020)	Cost Estimate (LTE, 2020)
Jozini	Oxidation Ponds	uMkhanyakude DM	Unknown	N	1.0	625	Y	Fair	R 122 000
Hluhluwe	Oxidation Ponds	uMkhanyakude DM	Unknown	Y	0.75	250	N	Dysfunctional	R 3738 000
Mtubatuba	Activated Sludge	uMkhanyakude DM	E	Y	0.7	2500	Y	Poor	R 1 668 500
Hlabisa Hospital	Activated Sludge	uMkhanyakude DM	E	Y	0.75	625	N	Dysfunctional	R 560 500
St Lucia	Oxidation Ponds	uMkhanyakude DM	Unknown	Y	1.0	1250	Y	Fair	R 5 000
Mseleni	Oxidation Ponds	uMkhanyakude DM	Unknown	Y	0.7	625	Y	Fair	R 1 000 000
Bethesda	Activated Sludge	uMkhanyakude DM	Unknown	N	1.0	375	Y	Fair	R 1 657 000
Ingwavuma	Oxidation Ponds	uMkhanyakude DM	Unknown	N	1.0	625	Y	Good	R 120 000
KwaMsane	Activated Sludge	uMkhanyakude DM	Unknown	N	1.0	1250	Y	Poor	R 2 985 500
Manguzi Hospital	Activated Sludge	uMkhanyakude DM	Unknown	N	1.0	625	Y	Poor	R 1 355 000
Mkuze	Oxidation Ponds	uMkhanyakude DM	Unknown	N	1.0	625	Y	Fair	R 39 500

Table 19.28 MIG funded Sanitation Projects in uMkhanyakude District Municipality (CoGTA KwaZulu-Natal, 2020)

Project	Status
Thembalethu Sanitation Project	Construction 40%
Jozini Low Cost Housing Sewer Upgrade	Construction 60%
Jozini Umhlabuyalingana VIP Sanitation Project	Registered (2018)
Refurbishment of Sewer Pipeline Umtuba LM	Registered (2019)
Upgrade of Hlabisa Town Sanitation System	Registered (2020)
Upgrade and Refurbishment of Manguzi WWW Collection Sewer and Outfall Phase 1	Registered (2021)

19.5.7 King Cetshwayo District Municipality

The King Cetshwayo District Municipality (KCDM) has 20 WWW, the majority of them small, all of which are reported operational (**Figure 19.76)**. The capacity of the WWWs range from very small (0.08 Mℓ/day) serving the community of KwaBadda to relatively large (14.5 Mℓ/day) serving the town of Empangeni. A list of the WWW in the DM is provided in **Table 19.29**.

The King Cetshwayo DM consists of largely rural areas where dry sanitation systems predominate due to the scattered nature of settlements. The exception is the City of uMhlathuze Municipality (CoU) that includes towns such as Empangeni and the industrial centre of Richards Bay. The bulk sanitation system in the CoU Municipality is managed by the City of uMhlathuze (CoU). The seven bulk sewerage sub-systems that together make up the CoU's existing (current) bulk sewerage system are listed in **Figure 19.75**.

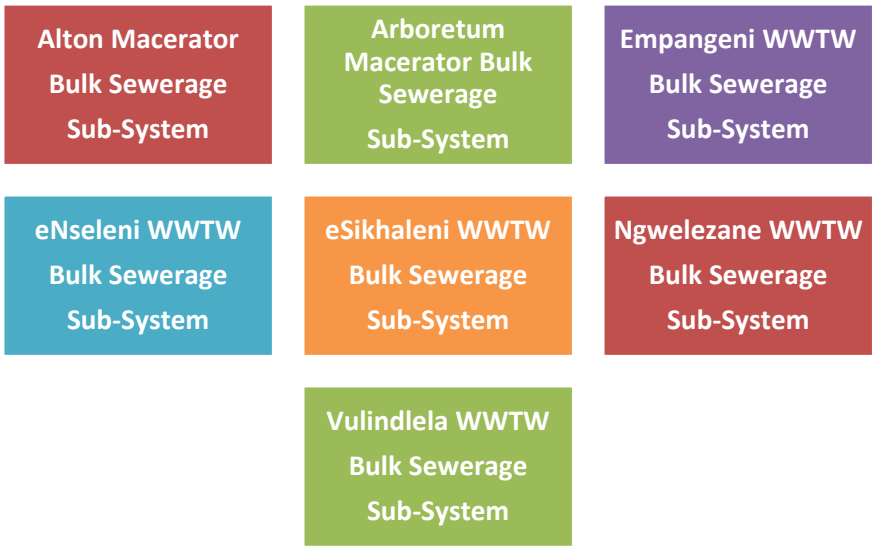

Figure 19.75 City of uMhlathuze existing bulk sewerage sub-systems

It is important to note that, because of the City's proximity to the sea, some wastewater only receives primary treatment in the form of maceration and is then discharged directly to sea via sewer outfalls. Thus, a large proportion of the City's wastewater remains relatively untreated. It is estimated that the capacity of the Alton and Arboretum macerators is 7 and 12 Mℓ/day respectively.

Based on planned and approved developments, augmentation of the Alton and Arboretum systems is proposed by 7 and 5 Mℓ/day respectively. Present indications are that spare capacity exists at the Empangeni, eNseleni, eSikhaleni and Ngwelezane WWW and no augmentation is currently required.

The City of uMhlathuze is considering closing the Vulindlela WWW for operational reasons. In that event, sewage/wastewater could be transferred into the bulk.

A number of sanitation projects have been implemented, are under construction or are proposed in the CoU. A list of the sanitation projects funded by the Municipal Infrastructure grant (MIG) and their status are provided in **Table 19.30.**

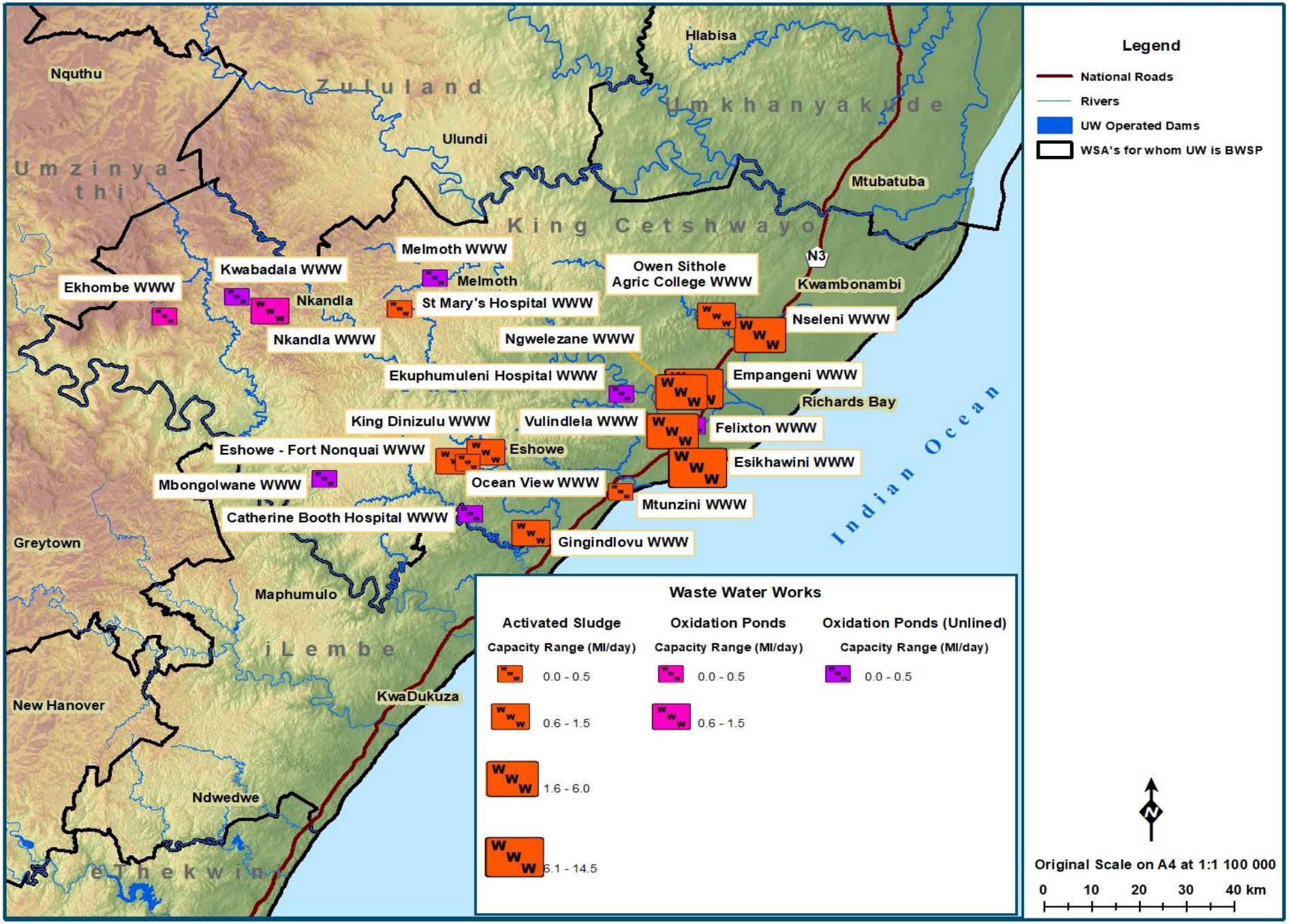

Figure 19.76 Location of King CetshwayoKing Cetshwayo District Municipality Wastewater Works

Table 19.29 King Cetshwayo District Municipality Wastewater Works Specifications (DWS, 2011)

WWW	Description	Owner	Class	Capacity Sufficient	ADWF Capacity (Mℓ/day)	People Served	Operational	Overall Condition Rating (LTE, 2020)	Cost Estimate (LTE, 2020)
Vulindlela	Activated Sludge	CoU	D	Y	3.0	Unknown	Y	Fair	R 1 970 000
Esikhawini	Activated Sludge	CoU	C	N	12.5	Unknown	Y	Fair	R 1 709 000
Ekhombe	Unknown	KCDM	E	N	0.15	1250	Y	Poor	R 33 300
Empangeni	Activated Sludge	CoU	B	Y	14.5	Unknown	Y	Fair	R 405 000
Ngwelezane	Activated Sludge	CoU	C	Y	5.8	Unknown	Y	Fair	R 3 073 000
Eshowe	Unknown	KCDM	E	N	1.5	875	Y	Fair	R 882 000
King Dinizulu	Unknown	KCDM	D	Y	0.7	1875	Y	Poor	R 872 600
Melmoth	Unknown	KCDM	E	Y	0.4	500	Y	Fair	R 450 000
Mtunzini	Unknown	KCDM	E	Y	0.32	375	Y	Fair	R 340 000
Nkandla	Unknown	KCDM	E	Y	0.8	1050	Y	Fair	R 169 000
Nseleni	Activated Sludge	CoU	C	Y	3.0	Unknown	Y	Fair	R 938 100
Catherine Booth Hospital	Unknown	KCDM	E	Y	0.15	138	Y	Poor	R 70 600
Mbongolwane	Unknown	KCDM	E	Y	0.2	270	Y	Poor	R 1 227 000
Gingindlovu	Unknown	KCDM	E	N	0.8	1000	Y	Poor	R 429 995
Felixton	Transferred to Vulindlela WWW	CoU		Y	0.0		Y	Unknown	Transfer Pipeline
Ekuphumuleni Hospital	Unknown	KCDM	E	Y	0.1	563	Y	Poor	R 70 700
Kwabadala	Unknown	KCDM	E	Y	0.08	89	Y	Dysfunctional	R 109 100

Ocean View	Unknown	KCDM	E	Y	0.5	1050	Y	Fair	R 915 500
Owen Sithole Agric College	Unknown	KCDM	E	Y	1.5	44	Y	Poor	R 2 746 500
St Mary's Hospital	Unknown	KCDM	E	Y	0.45	0	Y	Fair	R 210 000

Table 19.30 MIG funded Sanitation Projects in King Cetshwayo District Municipality (CoGTA KwaZulu-Natal, 2020)

Project	Status
Ntambanana Rural Sanitation Area Business Plan	Construction 60%
Nkandla VIP Sanitation Area Business Plan	Construction 80%
Umlalazi Sanitation Area Business Plan	Construction 80%
Upgrade of Sewer Infrastructure Melmoth	Completed
Upgrade of Sewer Infrastructure Eshowe	Practical Completion
Mthunzini Sanitation Project	Practical Completion
Upgrade of Sewer Infrastructure for Melmoth Phase 1	Construction 20%

19.5.8 Zululand District Municipality

The Zululand District Municipality (ZDM) has 19 WWWs (**Figure 19.77**), the majority of them being very small and rudimentary in nature (Class E). Fourteen of the wastewater works are reported as operational. The capacity of the WWW's range from very small (0.08 Mℓ/day) serving the Thlasizwe Hospital to relatively large (16 Mℓ/day) serving the town of Klipfontein. A list of the WWW in the ZDM is provided in **Table 19.31**.

In terms of sanitation, 34,973 or 19% of households have no access to sanitation. éDumbe carries the highest percentage with Nongoma (24%) and AbaQulusi and Ulundi at 22% respectively. Investment of R1.064 billion is required to eradicate the sanitation backlog.

Over the years the number of households and non-domestic customers with sanitation, in the district, has steadily increased – from 105 077, in the year 2011/12, to 117 228 in 2015/16. The number of ventilated pit-latrines has also steadily increased over the same period – from 69 475 to 84 105.

A number of sanitation projects have been implemented, are under construction or are proposed in the Municipality. A list of the sanitation projects funded by the Municipal Infrastructure Grant (MIG) and their status are provided in **Table 19.32**.

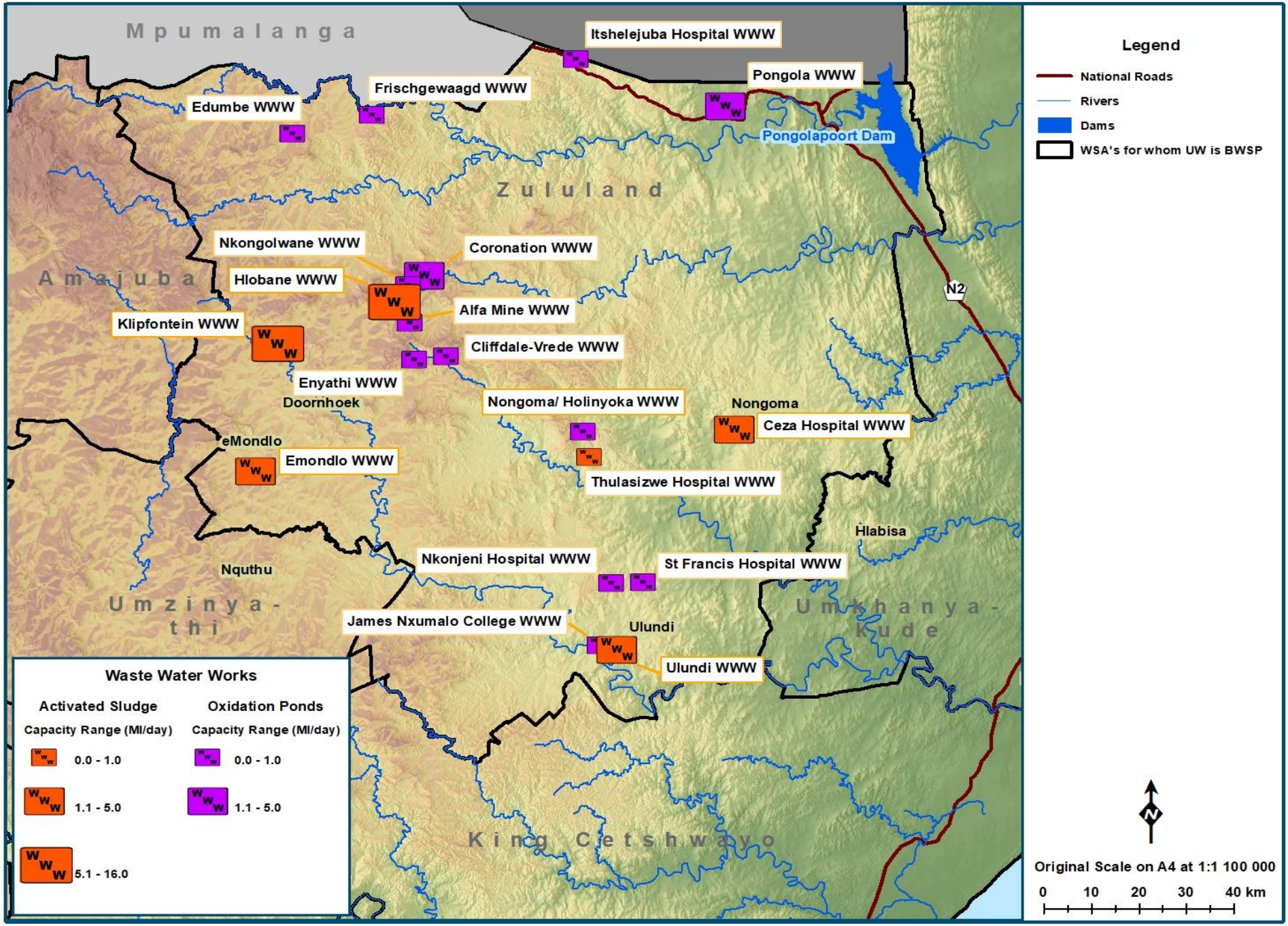

Figure 19.77 Location of Zululand District Municipality Wastewater Works

Table 19.31 Zululand District Municipality Wastewater Works Specifications (DWS, 2011)

WWW	Description	Owner	Class	Capacity Sufficient	ADWF Capacity (Mℓ/day)	People Served	Operational	Overall Condition Rating (LTE, 2020)	Cost Estimate (LTE, 2020)
Frishgewald	Oxidation Ponds	Zululand DM		Y	0.15	0	Y	Unknown	R 425 000
St Franics Hospital	Oxidation Ponds	Zululand DM	E	N	0.12	250	Y	Poor	R 4 027 500
Ceza Hospital	Activated Sludge	Zululand DM	E	N	0.2	250	Y	Poor	R 1 028 000
Nonggoma/Holiyoka	Oxidation Ponds	Zululand DM	C	Y	3.0	3750	N	Poor	R 1 029 000
Thlasizwe Hospital	Oxidation Ponds	Zululand DM	E	Y	0.08	103	N	Poor	R 356 000
Itshelejuba Hospital	Oxidation Ponds	Zululand DM	E	N	0.18	225	Y	Poor	R 1 056 000
Pongola	Oxidation Ponds	Zululand DM	D	N	2.0	2500	Y	Fair	R 727 000
James Nxumalo College	Oxidation Ponds	Zululand DM	E	N	0.17	213	Y	Fair	R1 119 000
Nkojeni Hospital	Oxidation Ponds	Zululand DM	E	Y	0.14	170	Y	Unknown	R 190 000
Ulundi	Activated Sludge	Zululand DM	C	Y	5.0	6250	Y	Poor	R 2 100 000
Emondlo	Activated Sludge	Zululand DM	B	Y	4.0	5000	Y	Unknown	R 818 000
Alfa Mine	Oxidation Ponds	Zululand DM	E	Y	0.0	0	N	Unknown	
Cliffdale-Vrede	Oxidation Ponds	Zululand DM	E	Y	0.2	250	N	Unknown	
Coronation	Oxidation Ponds	Zululand DM	D	N	2.0	2500	N	Dysfunctional	R 20 000 000
Edumbe	Oxidation Ponds	Zululand DM	E	Y	0.2	250	Y	Fair	R 455 000
Enyathi	Oxidation Ponds	Zululand DM	E	Y	0.0	0	N	Poor	R945 000

Hlobane	Activated Sludge	Zululand DM	C	Y	6.0	7500	Y	Poor	R 1 675 500
Klipfontein	Activated Sludge	Zululand DM	B	Y	16.0	20000	Y	Poor	R 4 962 000
Nkongolwane	Oxidation Ponds	Zululand DM	E	Y	0.3	0	Y	Poor	R 4 547 000

Table 19.32 MIG funded Sanitation Projects in Zululand District Municipality (CoGTA KwaZulu-Natal, 2020)

Project	Status
Zululand Rural Sanitation: Phase 2D	Construct 80%

19.5.9 Amajuba District Municipality

The Amajuba District Municipality (DM) has ten WWW, nine of which are reported as being operational (**Figure 19.78)**. The capacity of the WWWs are generally 2 Mℓ/day and lower, however, the municipality is unique in that it has four wastewater exceeding 10 Mℓ/day in capacity with the largest servicing Newcastle at 25 Mℓ/day. A list of the WWW in the DM is provided in **Table 19.33.**

About 58% (Community Survey 2016) of the households in Amajuba DM area have flush toilets that are connected to a sewerage system of some type. This is an improvement of 4% when compared to figures from Census 2011. The 2016 figures also indicate that only 41% of households in the ADM do not have any form of sanitation. There are, however, wide variations within the district.

- 74% of households in the eMadlangeni municipality do not have access to any form of toilet i.e. pit with no ventilation, other (home built or none)
- 7% of households within the Dannhauser municipality are below the basic level of service (backlog).
- Out of the three municipal areas, the highest level of service is found in Newcastle Municipality where over 68% of households have either flush or chemical toilets or pit latrines

A number of sanitation projects have been implemented, are under construction or are proposed in the Municipality. A list of the sanitation projects funded by the Municipal Infrastructure Grant (MIG) and their status are provided in **Table 19.34**.

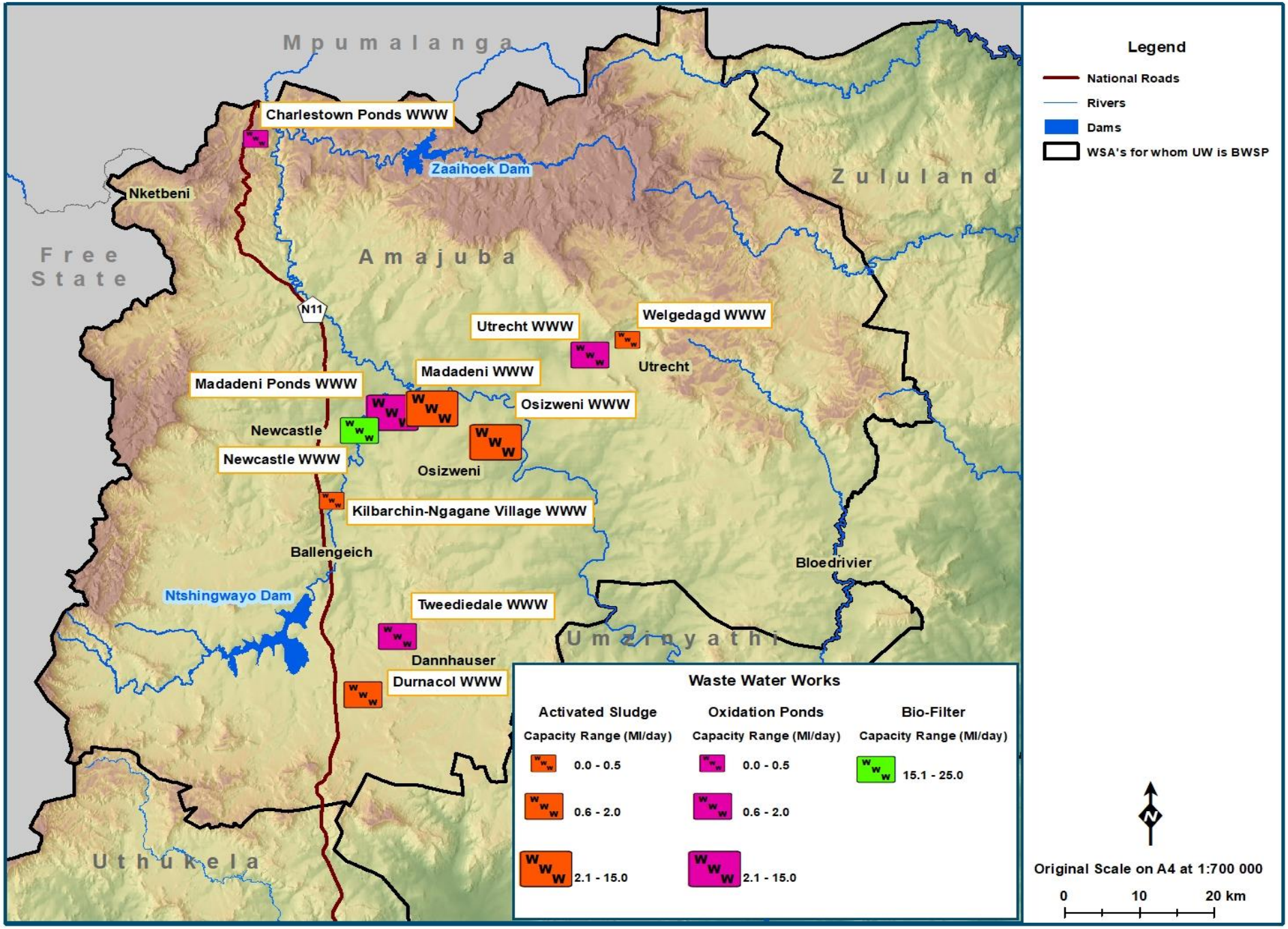

Figure 19.78 Location of Amajuba District Municipality Wastewater Works

Table 19.33Amajuba District Municipality Wastewater Works Specifications (DWS, 2011)

WWW	Description	Owner	Class	Capacity Sufficient	ADWF Capacity (Mℓ/day)	People Served	Operational	Overall Condition Rating (LTE, 2020)	Cost Estimate (LTE, 2020)
Utrecht	Oxidation Ponds	uThukela Water	D	Y	1.0	1250	N	Dysfunctional	R 2 595 000
Charslestown Ponds	Oxidation Ponds	uThukela Water	E	Y	0.5		Y	Poor	R 1 820 000
Durnacol	Activated Sludge	uThukela Water	D	Y	2.0	2500	Y	Fair	R 2 480 000
Tweediedale	Oxidation ponds	uThukela Water	D	Y	2.0	2500	Y	Poor	R 2 173 000
Kilbarchin-Ngagane Village	Activated Sludge	uThukela Water	C	N	0.5		Y	Fair	R 3 910 000
Osizweni	Activated Sludge	uThukela Water	B	N	15.0		N	Dysfunctional	R 7 522 000
Madadeni	Activated Sludge	uThukela Water	B	N	12.0		N	Dysfunctional	R 8 355 000
Newcastle	Bio-filter	uThukela Water	B	Y	25.0		N	Dysfunctional	R 9 915 000
Welgedagd	Activated Sludge	uThukela Water	D	Y	0.5	625	N	Dysfunctional	R 1 692 000
Madadeni Ponds	Oxidation ponds	uThukela Water	E	N	12.0		Y	Poor	Unknown

Table 19.34 MIG funded Sanitation Projects in Amajuba District Municipality (CoGTA KwaZulu-Natal, 2020)

Project	Status
Emadlangeni Sanitation Project	Construction 80%
Goedehoop Bulk Water and Sanitation	Construction 20%
Dannhauser Housing Development Bulk Water and Sanitation	Construction 20%
Goedehoop Bulk Water and Sanitation Phase 2	Registered

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Kevin Meier,
MANAGER: PLANNING SERVICES