



SFD Report

City of uMhlathuze South Africa

Final Report

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SFD Report City of uMhlathuze, South Africa, 2026

Produced by: City of uMhlathuze

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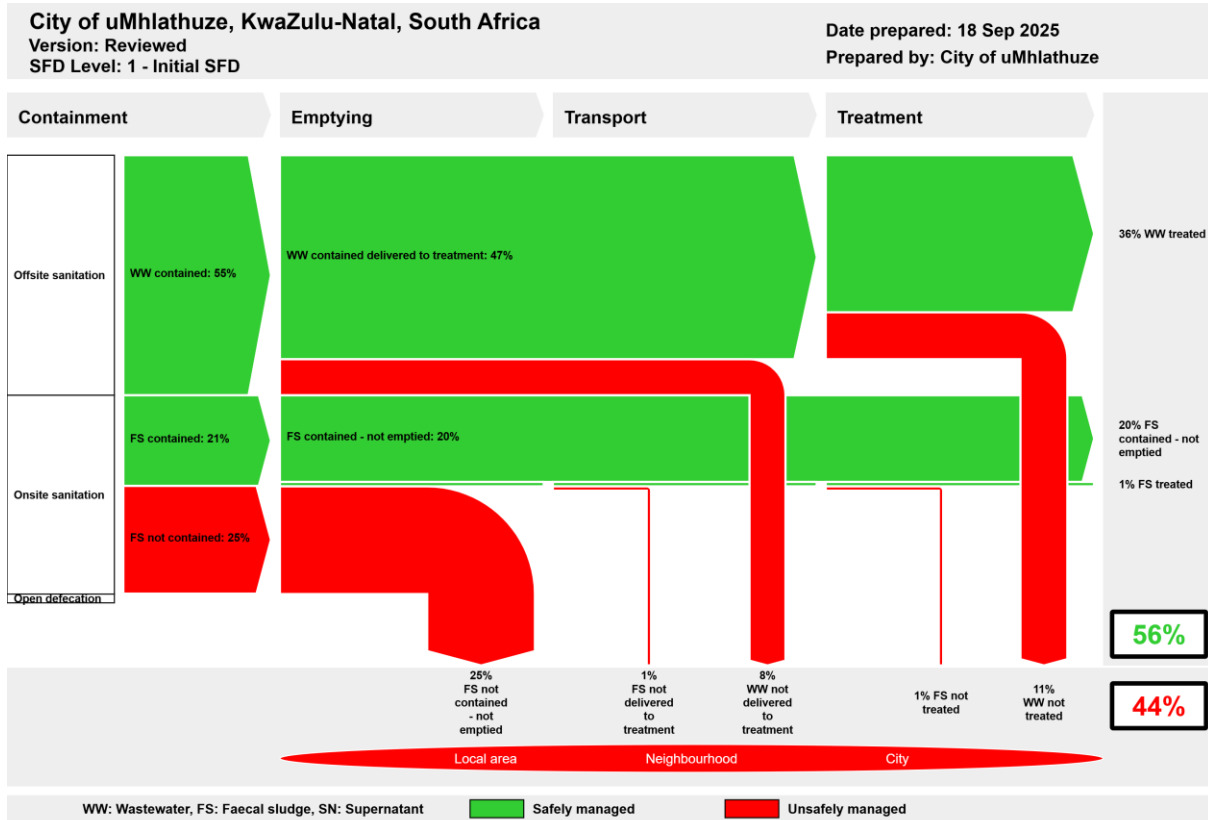
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1. The SFD Graphic



2. Diagram information

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Produced by:

City of uMhlathuze

Collaborating partners:

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3. General city information

The City of uMhlathuze (CoU) Local Municipality is comprised of Richards Bay, Empangeni, Vulindlela, eSikheleni (Esikhawini), Nseleni, Felixton, Ngwelezane and four Traditional Authority Areas.

The 2022 national census (Stats SA) indicates a population of 412,075 people in 100,441 households. Most of the population (58%) within the municipality resides in tribal or traditional areas, while 39% reside in urban areas and the remaining 3% reside on farmland. The average household size in 2022 was 4.1 persons. More recent figures, as per the COGTA Water and Sanitation Ward Profile Access Report, dated November 2024, indicates that the City of Mhlathuze has 34 wards with total population of 92,314 households. This latter report also provides a breakdown of the various sanitation services per ward and thus was used as the base data report in developing the SFD graphic and calculations.

The uMhlathuze municipal area has wetlands and natural water features. The CoU Municipality's climate is characterized by a

warm to hot and humid subtropical climate, with warm moist summers.

4. Service outcomes

95.2% of households in the City of uMhlathuze have access to some sort of sanitation service. 4.7% of CoU households have plain pit toilets, which are assumed to be damaged, failed, collapsed or flooded. No data on open defecation was available, so it is assumed to be negligible.

54.8% of households utilise off-site sanitation facilities. These are households with toilets that are connected to sewer, and are all recorded as toilets discharging directly to a centralised foul / separate sewer.

40.4% of households utilise on-site sanitation facilities as presented below:

- o 0.6% utilise septic tanks connected to soak pits.
- o 0.3% utilise impermeable / permeable tanks. These are fully lined tanks which are sealed and have no outlet or overflow. These include chemical toilets, conservancy tanks, and “other” waterborne toilets as listed in the Water and Sanitation Profile Access.
- o 39.5% utilise pit toilets, which are VIP toilets. These are never emptied but abandoned when full, and half is assumed to be adequately covered with soil. The other half is assumed to be not adequately covered with soil.

According to the Wastewater Sludge Management Concept Plan for the City of uMhlathuze (2025), the groundwater level in CoU ranges from 0.64m and 3.89m below ground level. This varies across the CoU, and site-specific information is required to fully assess the groundwater risk of on-site sanitation systems. If the groundwater table is high in areas with pit toilets and septic tanks with soak pits, the groundwater risk may be high. Damaged, collapsed or flooded toilets that soak into the ground can also pose a risk to groundwater.

5. Service delivery context

Overall, the SFD graphic shows that 56% of households are served by safely managed sanitation, and the remaining 44% are served by unsafely managed sanitation.

Safely managed sanitation is primarily made up of 36% of households connected to the sewer network, whose wastewater is delivered to

treatment and fully treated. In addition, 20% of households have on-site sanitation which is never emptied but abandoned when full and adequately covered with soil.

It is assumed that groundwater contamination risk from these toilets is minimal.

Unsafely managed sanitation is mostly as a result of on-site sanitation systems that are abandoned when full but assumed to be inadequately covered with soil (25%). This highlights the need for monitoring of this process to limit environmental and public health challenges. In addition, 8% of households’ wastewater is not delivered to the Wastewater Treatment Works (WWTWs), and 14% of households’ wastewater is not fully treated in the WWTWs.

The above situation suggests increased need of monitoring and adaptive management for both on- and off-site sanitation systems.

6. Overview of stakeholders

The responsibility to carry out delivery of water and sanitation services lies with the CoU Municipality in its capacity as the Water Services Authority (WSA) and the Water Service Provider (WSP). The Department of Water and Sanitation is responsible for the regulatory framework (Table 1).

Table 1. Key stakeholders.

Key Stakeholders	Institutions / Organizations /
Public Institutions	King Cetshwayo District Municipality, DWS, DHS (National and Provincial), DEA, SALGA, COGTA, WRC, GRDM, CoU Municipal Departments (Planning, Infrastructure Services that has Water and Sanitation Services among other divisions, Human Settlements, Scientific Services, Mechanical Maintenance, Waste Management and Engineering Support Services), KwaZulu-Natal Provincial Government, and other institutions
Political	Councillors and Ward Committees
Non-governmental Organizations and community-based organisations	NGOs, Labour Unions, Community, Farmers
Private Sector	Private emptiers, Industry & Business, Farmers
Others	Academia (Universities), Researchers

	Traditional Councils
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7. Process of SFD development

The SFD graphic was produced as part of the Low Carbon and Climate Resilient (LCCR) project, funded by GIZ. The City of uMhlathuze (CoU) participated as one of the beneficiary municipalities and attended a workshop on the SFD graphic in August 2025. The workshop introduced the SFD process and served as a platform for the initial discussions on data sources and gaps.

Following the workshop, the SFD data input sheet from the DWS/WRC SFD initiative was completed using available data sources.

The SFD graphic is based primarily on the municipality’s COGTA Water and Sanitation Ward Profile Access November 2024, along effluent quality data published in the CoU Annual Report (2024/2025). The specific data sources used are described in more detail below.

The SFD graphic was created using tools developed through the WRC/DWS SFD promotion initiative (2024), specifically, the Excel workbook developed for data gathering and input. The information was then transferred to the SuSanA SFD graphic generator platform. The SuSanA tool allows users to enter data and produce the sanitation selection grid, SFD matrix, and SFD graphic. In addition, it allows users to download the “.json” file which contains all data. This file can be opened again on the SuSanA platform for editing (sfd.susana.org).

The generated SFD graphic was reviewed with the CoU before generating the report and they agreed that the graphic does reflect the reality on the ground.

8. Credibility of data

The data sources utilised in the SFD graphic creation are generally accepted as credible and reflective of the municipal situation. Updated effluent quality information could be used to improve the recency of the data.

9. List of data sources

Abbreviated list of all data sources used for the production of the SFD report:

- City of uMhlathuze Draft Annual Report 2024/2025
- Wastewater Sludge Management Concept Plan for the City of uMhlathuze (LCCR project report), 30 September 2025
- uMhlathuze Local Municipality Fifth Generation IDP 2022/2023 – 2026/2027, Final May 2022
- Green Drop Assessment results for the 2023/2024 year
- COGTA Water and Sanitation Ward Profile Access November 2024



SFD City of uMhlathuze, South Africa, 2026

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Abbreviations

BSMP	Bulk Sewerage Master Plan
CAS	Conventional Activated Sludge
CBOs	Community Based Organisations
COD	Chemical Oxygen Demand
CoU	City of uMhlathuze
CRR	Cumulative Risk Rating
DEA	Department of Environmental Affairs
DM	District Municipality
DHS	Department of Human Settlements
DWS	Department of Water and Sanitation
ESMP	Environmental Services Management Plan
FS	Faecal Sludge
GDPAT	Green Drop Progress Assessment Tool
IDP	Integrated Development Plan
KCDM	King Cetshwayo District Municipality
KL/D	Kilo Litres Per Day
LCCR	Low Carbon and Climate Resilient
LM	Local Municipality
ML/D	Mega Litres Per Day
NGOs	Non-Governmental Organisations
O&M	Operation and Maintenance
PCs	Process Controllers
PST	Primary Settlement Tank
RAS	Return Activated Sludge
SDBIP	Service Delivery and Budget Implementation Plan
SFD	Excreta Flow Diagram
SN	Supernatant
SST	Secondary Settling Tank
WAS	Waste Activated Sludge
WSA	Water Services Authority
WSDP	Water Services Development Plan
WSMP	Water Services Management Plan
WSP	Water Services Provider
WW	Wastewater
WWTW	Wastewater Treatment Work

1 City context

The Constitution of South Africa classifies municipalities into three categories: A, B, and C. Category A municipalities are metropolitan areas with a major urban core. Category C municipalities are District Municipalities (DMs) that include one or more Local Municipalities (LMs which are Category B). City of uMhlathuze (CoU) is a Category B Municipality within the King Cetshwayo District Municipality (KCDM) in the KwaZulu-Natal Province. CoU is a Water Services Authority (WSA) and a Water Service Provider (WSP) with the authority and responsibility to provide water services within its area of jurisdiction in line with the Constitution of South Africa. As a WSA, the CoU also manages and maintains its water and sanitation infrastructure.

The CoU is situated on the north-east coast of the province of KwaZulu-Natal, about 180 kilometres north-east of Durban (Figure 1). The uMhlathuze land area currently covers 123,359 ha and has 34 municipal wards. In terms of land ownership within uMhlathuze Municipality, 26% of land is under private ownership and 51% of the land is under Ingonyama Trust Board (which is administered by Traditional Authorities). Most of this land is in the peri-urban and infill areas.



Figure 1: City of uMhlathuze Local Municipality and surrounding local.

Distribution and allocation of land that falls in the Ingonyama Trust Board poses a challenge to the municipality in terms of planning for service provision. This is due to the establishment of unplanned settlements which put pressure to the Municipality from a services provision perspective. The 2022 national census indicates a population of 412,075 people in 100,441 households (Stats SA). A later report, the COGTA Water and Sanitation Ward Profile Access, dated November 2024, however, indicates a household number of 92,314. The latter report

was used in all the calculations of the SFD graphic, as it was also the report that had the sanitation service level breakdowns per household per ward.

The main access into the municipal area is via the N2 in the north-south direction and the R34 from Ntambanana in the east-west direction. Other significant roads in the area include the MR431 (that provides a northerly entry into Richards Bay from the N2) as well as the Old Main Road that straddle the N2. The municipal area includes the formal towns of Empangeni, Richards Bay, eSikhaleni, Ngwelezane, eNseleni, Vulindlela and Felixton as well as the Traditional Authority areas under Amakhosi Dube, Mkhwanazi, Khoza, Mbuyazi, Mthembu, small portions of Biyela (Obuka), Cebekhulu and Zungu. Apart from the areas of natural significance, large tracts of land are under commercial agricultural production.

The municipality has several wetlands and natural water features such as Lakes Cubhu, Mzingazi, Nsezi and Nhlabane. Major rivers include the Mhlathuze and Nsezi. The coastal Lakes (Lake Mzingazi, Lake Cubhu and Lake Nseze) are important water resources for the municipality. The uMhlathuze Municipal area is supplied with potable water from Lake Mzingazi, Lake Cubhu, Nseleni river (Nsezi Lake) and Mhlathuze River.

uMhlathuze's climate is characterized by a warm to hot and humid subtropical climate, with warm, moist summers. Average daily maximum temperatures range from 29°C in January to 23°C in July, and extremes can reach more than 40°C in summer. The average annual rainfall is 1,228 mm with 80% occurring in summer, from October to March. The municipality also experiences 20% of its rainfall in winter. Generally, the KwaZulu-Natal region experiences extreme rainfall and thundershowers, often resulting in flooding that can cause damage to infrastructure. The Richards Bay area is generally very flat and is situated on a coastal plain. Moving towards Empangeni the terrain rises and becomes undulating.

2 Service Outcomes

2.1 Overview

The SFD Selection Grid is presented in Figure 2 below, highlighting the types of sanitation systems in use in the CoU. The various containment systems are also described.

List A: Where does the toilet discharge to? (i.e. what type of containment technology, if any?)	List B: What is the containment technology connected to? (i.e. where does the outlet or overflow discharge to, if anything?)									
	to centralised combined sewer	to centralised foul/separate sewer	to decentralised combined sewer	to decentralised foul/separate sewer	to soakpit	to open drain or storm sewer	to water body	to open ground	to 'don't know where'	no outlet or overflow
No onsite container. Toilet discharges directly to destination given in List B		T1A1C2			Significant risk of GW pollution Low risk of GW pollution					Not Applicable
Septic tank					Significant risk of GW pollution T1A2C5					
Fully lined tank (sealed)					Significant risk of GW pollution Low risk of GW pollution					T1A3C10
Lined tank with impermeable walls and open bottom	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution					Significant risk of GW pollution Low risk of GW pollution
Lined pit with semi-permeable walls and open bottom	Not Applicable									Significant risk of GW pollution Low risk of GW pollution
Unlined pit										Significant risk of GW pollution Low risk of GW pollution
Pit (all types), never emptied but abandoned when full and covered with soil										Significant risk of GW pollution Low risk of GW pollution
Pit (all types), never emptied, abandoned when full but NOT adequately covered with soil	Not Applicable									T1B7C10
Toilet failed, damaged, collapsed or flooded										T1B9 C1 TO C10
Containment (septic tank or tank or pit latrine) failed, damaged, collapsed or flooded										
No toilet. Open defecation	Not Applicable									Not Applicable

Figure 2: CoU LM SFD Selection Grid (Source: SuSanA Website, 2025).

The most common sanitation system used in the CoU is flush toilets connected to a centralised foul/separate sewer (54.8% of households, system T1A1C2).

40.4% of households use on-site sanitation technologies as described below:

- 0.6% of households utilise septic tanks that discharge to a soak pit (system T1A2C5).
- 0.3% of households utilise fully lined tanks that have no outlet or overflow (system T1A3C10).
- 39.5% utilise VIP toilets that are never emptied but abandoned when full. It is assumed that half of these are adequately covered with soil and half are not (systems T1B7C10 and T1B8C10).

4.8% of households use unimproved pit toilets, and these are all assumed to be damaged, failed, collapsed, or flooded (system T1B9 C1 TO C10). No evidence of open defecation was provided.

There is no distinction of excreta origin, for example, households, public institutions, industry, etc. All contributors are collectively referred to as 'households'.

The table presented below (Table 1) illustrates the various sanitation systems employed in the municipality, along with the population that utilises these systems.

Table 1: Type of sanitation systems and the corresponding system according to the SFD PI.

Type of Sanitation Systems	No. households	SFD PI methodology
Flush toilet connected to a public sewerage system	50,630	T1A1C2
Flush toilet connected to a septic tank	517	T1A2C5
Chemical toilets, conservancy tanks, and "other" waterborne toilets	258	T1A3C10
VIP toilet	36,479	T1B7C10/T1B8C10
Unimproved pit toilets (damaged, failed, collapsed, or flooded)	4,430	T1B9 C1 TO C10
Total	92,314	--

2.2 SFD Matrix

The SFD Matrix below provides a summary of the service chain (emptying, transport, treatment) for each of the sanitation systems in use in CoU. Very little data was available on the service chain, and the specific data or assumptions used are described in Figure 3.

City of uMhlatuze, KwaZulu-Natal, South Africa, 18 Sep 2025. SFD Level: 1 - Initial SFD
 Population: 92314
 Proportion of tanks: septic tanks: 100%, fully lined tanks: 100%, lined, open bottom tanks: 100%

Containment						
System type	Population	WW transport	WW treatment	FS emptying	FS transport	FS treatment
	Pop	W4a	W5a	F3	F4	F5
System label and description	Proportion of population using this type of system (p)	Proportion of wastewater in sewer system, which is delivered to centralised treatment plants	Proportion of wastewater delivered to centralised treatment plants, which is treated	Proportion of this type of system from which faecal sludge is emptied	Proportion of faecal sludge emptied, which is delivered to treatment plants	Proportion of faecal sludge delivered to treatment plants, which is treated
T1A1C2 Toilet discharges directly to a centralised foul/separate sewer	54.8	85.0	77.0			
T1A2C5 Septic tank connected to soak pit	0.6			100.0	90.0	77.0
T1A3C10 Fully lined tank (sealed), no outlet or overflow	0.3			100.0	90.0	77.0
T1B7C10 Pit (all types), never emptied but abandoned when full and covered with soil, no outlet or overflow	19.8					
T1B8C10 Pit (all types), never emptied, abandoned when full but NOT adequately covered with soil, no outlet or overflow	19.8					
T1B9 C1 TO C10 Toilet failed, damaged, collapsed or flooded, connected to sewer, soak pit, open drain or storm sewer, water body, open ground or 'don't know where'	4.8					

Figure 3: CoU LM SFD Matrix (Source: SuSanA Website, 2025).

2.2.1 Off-site sanitation

Off-site sanitation accounts for all households connected to sewers which discharge at one of CoU's 5 WWTWs or their 2 Macerator sites.

From July 2003 to September 2014, Water and Sanitation Services South Africa (Pty) Ltd (WSSA) operated CoU's treatment works. In this period, all Wastewater Treatment Works (WWTWs) performed well in their Green Drop assessments, and in 2013, three plants – Ngwelezane, Nseleni and Vulindlela - were awarded Green Drop Certificates for excellence in wastewater management, with scores above 90%. WSSA subsequently lost the follow-up bid to uMhlathuze Water, which did not conclude optimally. The municipality subsequently took over the management of these systems and has struggled to maintain the high standards achieved previously, as reflected in a marked decline Green Drop-related assessments.

54.8% of households in CoU Municipality utilise off-site sanitation technologies. These are toilets that discharge directly into a centralised foul / separate sewer. 85% of wastewater (WW) in the sewer network is assumed to be delivered to centralised separate treatment plants (variable W4a set to 85%) and 15% is assumed to be lost through leakages. Of the 85% delivered to the treatment plants, 77% is assumed to be fully treated (variable W5a set to 77%). This is calculated based on weighted average of compliance of the WWTW (microbiological, physical, chemical) from the 2024/2025 Annual Report and assuming 100% compliance for macerators which are authorised for marine discharge.

The steps of the service chain are discussed in more detail below.

WW Emptying

Emptying is not relevant for off-site sanitation systems, as no excreta is contained on site.

WW Transportation

This refers to transport of wastewater in sewers to the WWTW. To determine the percentage of wastewater reaching the WWTW, the various flow records provided for the works were compared and the most representative set was utilised in the calculation. The following data was utilised for this WW flow input:

- Assumed flow reaching WWTWs (CoU Annual Reports or WWTW Logs) or Macerator Flows (CoU comment) (M³/d). These inflows to WWTWs, as reported in CoU Annual Reports and WWTW logs for periods 2020/21 to 2023/24 and as per WWTW logs 2023/24.
- Macerator Flows based on CoU comment (included for total flow calculation). No flow records used CoU WW management input based on current flows, using as a constant value across years.
- COGTA Report Nov 2024 Ops Flows.

Table 2: Calculation for percent WWTW capacity utilisation (Source: Wastewater Sludge Management Concept Plan for the City of uMhlathuze, 2025).

WWTW name	Design Capacity (ML/d)	Assumed flow reaching WWTWs <i>(CoU Annual Reports or WWTW Logs) or Macerator Flows (CoU comment)</i> (Mℓ/d)	Assumed flow reaching WWTWs <i>(COGTA Report Nov 2024 Ops Flows) or Macerator Flows (CoU comment)</i> (Mℓ/d)
Empangeni	15.0	7.7	7.7
Esikhawini	12.5	5.5	7.6
Ngwelezane	5.8	1.6	1.4
Nseleni	3.0	2.7	0.9
Vulindlela	2.8	2.9	1.8
Macerator 1 (Alton)	20.0	15.0	15.0
Macerator 2 (Arboretum)	25.0	18.8	18.8
Combined	84.1	54.1	53.1
% of Design Capacity Utilisation		64.3%	63.1%

The calculations are summarised in Table 2 above. The operational flows from the COGTA Report Nov 2024 (last column in Table 2– 63.1%), are the same as the monthly flow logs & trends (uploaded on IRIS, Green Drop 2025) and appear to be the most representative data set to base further calculations on.

Further assumptions used in developing the SFD graphic:

- The previous Table 2 shows that only 63% of the design capacity is utilised. However, this does not imply that 37% of the flow does not reach the works. The 2021 Sewer Master Plan comments that there is existing spare capacity at the works but does not quantify which and how much. One can thus not use the 63% as a reliable percentage of flow reaching the works and assume that the remainder is being lost through leaks, etc.
- Based on discussion with CoU wastewater management section, it was assumed that 85% of the flow reaches the WWTWs and that 15% is lost in the sewers through leaks or spillages.
- This assumption represents a generous value, as most other municipalities, specifically in the KZN province, have substantially higher sewer losses. It is recommended that for future iterations of the SFD graphic this value can more effectively be confirmed if the various pump stations' flow records are analysed in conjunction with the total flows received at the WWTWs and or pump station and the water supplied to the specific service area, linked to their sanitation service level.

WW Treatment

The percentage of wastewater classified as “treated” in CoU’s SFD graphic is determined by comparing the level of treatment achieved at each WWTW against the applicable regulatory standards. The calculation is based on data available from the 2025 Green Drop Assessment for the 2023/2024 financial year. For each WWTW, compliance percentages across microbiological, physical, and chemical determinants were averaged. These values were then weighted according to the operational flows reported in the COGTA Operations Flows Report (Nov 2024). Macerators were treated as 100% compliant, as they are authorised for marine discharge.

Using this approach, it was determined that approximately 77% of the wastewater is fully treated. This figure incorporates assumed flow contributions from the macerators. It should be noted that this calculation may be revised in future as the national SA-SFD methodology is further developed and standardised to improve consistency and accuracy. The detailed calculation, using COGTA (Nov 2024) operational flows and assumed macerator flows, is presented below. Further information on the WWTWs is then provided (Table 3).

Table 3: Weighted average calculation for percentage wastewater treated (2023 Green Drop Progress Report) (Source: Wastewater Sludge Management Concept Plan for the City of uMhlatuze, 2025).

WWTW name	Empangeni	Esikhawini	Ngwelezana	Nseleni	Vulindlela	Macerator 1 (Alton)	Macerator 2 (Arboretum)	Combined
Assumed flow reaching WWTWs (ML/d)	7.7	7.6	1.4	0.9	1.8	15.0	18.8	53.1
% Microbiological Compliance	0%	2%	5%	5%	92%	100%	100%	
% Physical Compliance	71%	0%	89%	71%	99%	100%	100%	
% Chemical Compliance	84%	0%	100%	46%	100%	100%	100%	
% Compliance - combined	52%	1%	65%	41%	97%	100%	100%	
Weighted Compliance Contribution (%)	7%	0%	2%	1%	3%	28%	35%	77%

Wastewater from Richards Bay is collected and then screened and macerated at the Alton, Arboretum and John Ross Macerators. It is mixed with sea water and then discharged 4 kms out to sea through uMhlatuze Water’s marine outfall at Alkantstrand in two pipelines, A and B. The A-line handles domestic and industrial effluent while the B-line handles gypsum slurry from Foskor and pulp from Mondi.

All other sewage is treated at 5 WWTWs that use an activated sludge process configuration. CoU documents and newspaper reports indicate that a significant volume of sewage does not reach the works, due to faulty pumps, blockages and decaying sewers.

Sewage that is collected and treated at the Empangeni, Ngwelezane and the Vulindlela WWTW is discharged to the Mhlatuze River upstream of Mhlatuze Water’s weir. Treated wastewater from Nseleni WWTW is discharged into the Nseleni River upstream of Lake Nsezi. Treated effluent from the Esikhawini WWTW is discharged to sea from a second marine outfall.

Status of the 5 WWTWs

- The **Empangeni WWTW** is a conventional activated sludge (CAS) plant and consists of a single module with a reported capacity of 14.5 Mℓ/d (Umngeni-Uthukela Water, 2021) or 15 Mℓ/d (CoU) with an operational flow of 5,979 m³/day (2023/24). The Process Audit Report 2025 noted significant deficiencies in the plant's treatment processes, as indicated by alarmingly high downstream levels of contaminants such as *E. coli*, ammonia, Chemical Oxygen Demand (COD), and suspended solids. These findings highlight the plant's diminished ability to effectively treat wastewater, which has severe environmental and public health implications (Figure 4).



Figure 4: The Empangeni WWTW (a conventional activated sludge (CAS) plant).

Critical process units are non-functional, including the Primary Settlement Tank (PST) and Secondary Settling Tank (SST), Return Activated Sludge (RAS) pumps, digesters, and drying beds. The failure of the RAS pumps continues to disrupt the recycling of activated sludge, which is necessary to maintain the required sludge age for effective nitrification and COD reduction. Furthermore, the failure of SSTs results in the carryover of suspended solids into the receiving river, posing significant environmental risks.

- The **Esikhaleni WWTW** is a conventional activated sludge plant and consists of a single module with a reported capacity of 12.5 Mℓ/d with an operational flow of 7,478 m³/day (2023/24). The 2025 Process Audit Report notes severe deficiencies in the plant's current treatment processes, stemming primarily from non-functional critical equipment and operational lapses. These pose significant environmental, regulatory, and public health concerns. Untreated sewage is being discharged directly into the sea, with severe consequences for public health and the environment.

Sludge carryover from the SST is a major issue, resulting in solids being discharged into the sea, which violates environmental standards. Both RAS and screw pumps are nonfunctional, preventing proper sludge recycling and reducing treatment efficiency. The drying beds are in poor condition, and the drainage system meant to recycle water to the head of works is non-functional.

No upstream or downstream catchment samples are taken to monitor the marine water quality at the discharge point, which raises concerns about compliance with environmental regulations.

- The **Ngwelezane WWTW** is a conventional activated sludge plant and consists of a single module with a reported capacity of 5.8 Ml/d with an operational flow of 1,548 m³/day (2023/24). The Process Audit 2025 confirms that the treatment processes are severely compromised due to non-functional mechanical and process units, such as damaged fine screens, inoperative mixers, and non-functional SSTs (Figure 5).



Figure 5: The Ngwelezane WWTW.

Water quality results reveal alarmingly high levels of contamination, including *E. coli*, ammonia, and COD, far exceeding acceptable limits. SS also indicate poor clarification performance.

Untreated or partially treated sewage is passing through the plant and being discharged directly into the uMhlatuze River. This poses a severe risk to public health and the environment, with potential legal and regulatory consequences for non-compliance.

Immediate repairs are required to fix non-functional process units, including mixers, SST bridges, and mechanical fine screens.

- The **Nseleni WWTW** is a conventional activated sludge plant and consists of a single module with a reported capacity of 3 Ml/d with an operational flow of 634 m³/day. The key operational challenges reported are that the chlorine dosing system is not working. One of the RAS pumps is non-operational, compromising the critical sludge recycling process required for maintaining proper sludge age and ensuring effective nitrification and oxidation. There is only 1 operational Waste Activated Sludge (WAS) pump. The secondary settler is in a severely deteriorated condition and is unable to settle solids adequately before transfer of the effluent to the disinfection process unit.

Sludge handling at the facility is significantly compromised due to the absence of a fixed schedule for sludge wasting, as well as a lack of process control metrics to guide the wasting operations. Currently, no sludge is being directed to the drying beds. These

beds have been out of operation for an extended period and are now in a state of severe disrepair. Additionally, the emergency ponds are also in poor condition, further limiting the facility's ability to manage sludge effectively and posing a potential environmental risk.

- The **Vulindlela WWTW** is a conventional activated sludge plant and consists of a single module with a reported capacity of 2.8 Ml/d with an operational flow of 3,177 m³/day (2023/24). The majority of the process units are functional, including the inlet works, anoxic zone, aerators, and chlorine dosing system. However, the WAS valve is inoperable, preventing proper desludging and maintenance of the desired sludge age. The sludge drying beds are currently not in use, which negatively impacts the overall sludge management strategy and reduces the operational efficiency of the treatment plant (Figure 6).



Figure 6: The Vulindlela WWTW.

The plant meets most of the final effluent quality standards, reflecting the effectiveness of its operational processes. The only exception is ortho-phosphate, which shows lower compliance levels. This issue can be addressed by ensuring that the sludge age is properly controlled through the proper functioning of the waste system.

2.2.2 On-site sanitation

Operational data for on-site systems is based primarily on assumptions at this stage. To develop more accurate estimates, detailed quantities of faecal sludge emptied, transported, and treated would be required.

Data on the fate of the Faecal Sludge (FS) and WW stated above is based on assumptions as there are information gaps. These data gaps should be filled through key informant interviews with municipal officials and private vacuum truck operators. Transactional walks could be conducted at the selected areas where semi-structured interviews could be conducted with sanitation technology. Observations could also be conducted during emptying of onsite sanitation systems and also at the WWTWs.

FS Emptying

Percentage of FS emptied from on-site sanitation systems was based on assumptions for individual technologies. This would need to be verified based on actual data. The following assumptions were made:

- Chemical toilets: 100% FS emptied (variable F3 set to 100%).
- Septic/conservancy tanks: 100% FS emptied (variable F3 set to 100%).
- VIP toilets: 0% emptied.
- FS emptying services: All use private tanker (honeysuckers) services as CoU has no service available.
- Tanker discharge at all the WWTWs and the 2 Macerator sites.

FS transportation

Determining the percentage of faecal sludge transported requires a faecal sludge balance between what is emptied and what eventually reaches the WWTW. No records were provided for the faecal sludge discharged at the WWTWs, and it was also not possible to cross-check against records of faecal sludge emptied. Therefore, it was assumed that 10% of faecal sludge is lost during transport (i.e., 90% reaches the WWTW) and hence, variable F4 for systems T1A2C5 and T1A3C10 is set to 90%. Faecal sludge may be lost during transport due to spills or illegal dumping. Verification is required to refine this assumption.

CoU's 5 WWTWs rated the likelihood of honeysuckers / vacuum tanker dumping non-compliant effluent as zero, but this should be verified through field observation and FS balance.

FS discharge and treatment

Tanker discharges occur at all the WWTWs and the 2 Macerator sites, though Empangeni WWTW is the primary recipient of FS. FS is currently discharged into the head of works (HoW) of the treatment facilities. For the macerators, the discharge will either be at the HoW or at emergency ponds which flow back to the HoW. Therefore, the same percentage treated is used (i.e., 77%). Therefore, variable F5 for systems T1A2C5 and T1A3C10 is set to 77% (Figure 7).



Figure 7: FS Tankers discharging at Alton Macerator.

Risk of groundwater contamination

Groundwater contamination risk should be assessed for all on-site sanitation systems that drain liquid into the ground (e.g., septic tanks with soak pits and VIP toilets). Available data online for groundwater in CoU indicates that the level ranges from 0.64 metres to 3.89 metres below ground level. Thus, the average groundwater level is assumed to be 1.5m. This will vary from one area to another, and thus site-specific information is required to adequately assess groundwater contamination risk linked to specific sanitation technologies. It is also important soil type in the area to accurately assess the risk of groundwater contamination. For the purposes of this SFD, a low groundwater contamination risk has been assumed, primarily because CoU relies largely on surface water (systems T1A2C5 and T1B7C10).

2.2.3 Open defecation

No information on open defecation was supplied or available. It is assumed that no open defecation occurs, but this must be verified through primary data collection (e.g., surveys, field observations).

2.2.4 Certainty/uncertainty levels of associated data used for the SFD Matrix

There are some data gaps and concerns about credibility of data used to prepare the SFD matrix. While accepted sources have been used (e.g., COGTA data and Annual Report), the information in these sources should be verified through primary data collection. This can be done through field observations, key informant interviews, and surveys. Operational data for both on-site and offsite systems is based primarily on assumptions. To develop more accurate estimates, detailed quantities of faecal sludge emptied, transported, and treated would be required.

Other areas which have limited information available include:

- Management of the vacuum tankers discharge, with no records on volumes, types and origin. No data on service providers through the different stages of the sanitation service chain was available during the production of this SFD report.
- The final destination of faecal sludge is unknown. This is particularly true for VIP toilets which are not emptied by the municipality but also for FS that is emptied and transported. An accurate FS balance is required.
- Detailed flow records for the WWTWs and associated pumpstations will help to build up a better understanding of WW transported to the WWTWs.

2.3 SFD Graphic

The SFD graphic for CoU is presented in Figure 8, highlighting 56% safely managed and 44% unsafely managed sanitation in the municipality.

Most households in CoU (55%) utilize off-site sanitation systems made up of flush toilets connected to sewerage networks that discharge at WWTWs and macerators. Despite this representing the largest share of sanitation, it only contributes a total of 19% of unsafely managed sanitation. Specifically, 8% for WW possibly not reaching the WWTWs and 11% for WW not effectively treated at the WWTWs.

On-site sanitation represents the next largest share of sanitation (46%), including primarily VIP and plain pit toilets where safely managed sanitation corresponds to 20% due to FS contained

- not emptied and 1% due to FS reated. It also contributes the largest percentage to unsafely managed sanitation (27%) where FS not contained - not emptied is 25%, FS not delivered to treatment is 1%, and FS not treated is 1%. Unsafely managed on-site sanitation is made up primarily of VIP toilets which are not emptied and inadequately covered with soil after filling but also includes failed containments (unimproved pit toilets).

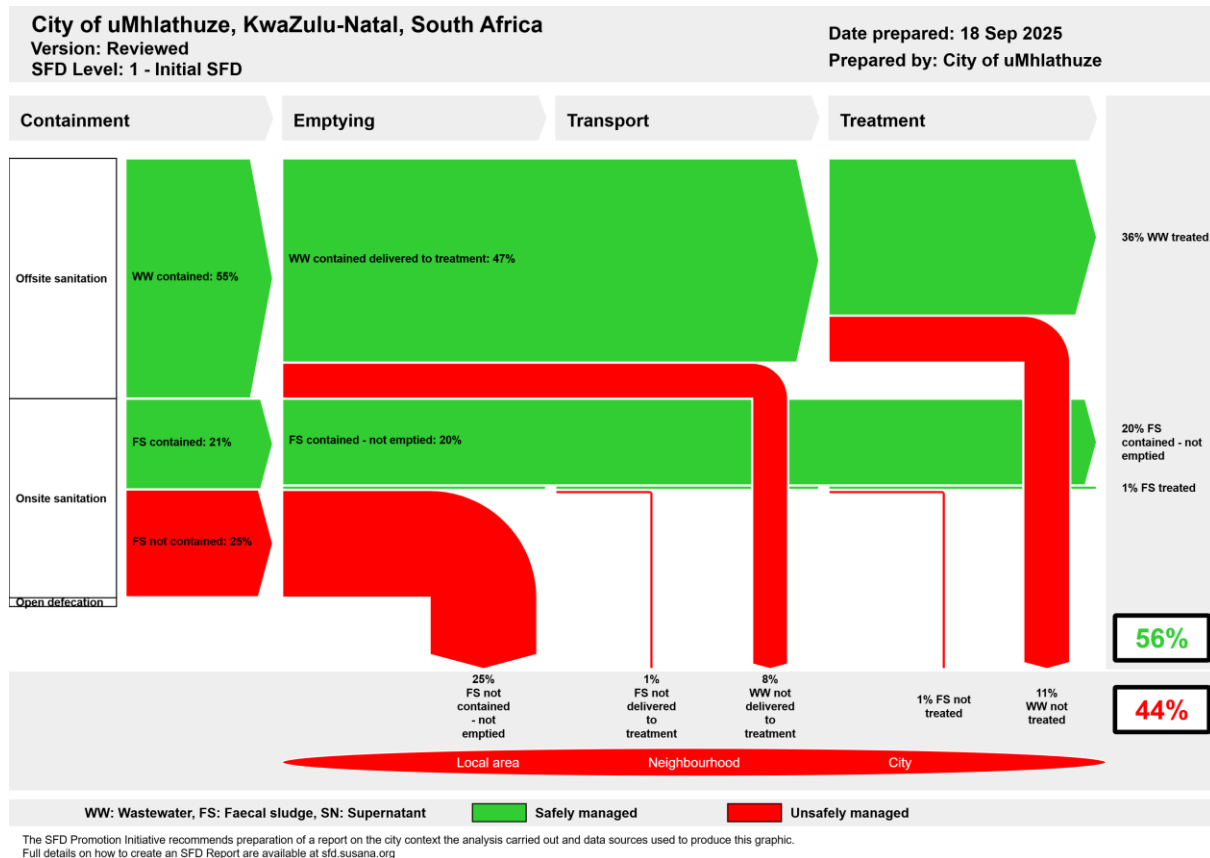


Figure 8: CoU LM SFD Graphic (Source: SuSanA Website, 2025).

These results highlight the need to actively manage on-site sanitation systems and faecal sludge produced by them. This would require ongoing monitoring after initial installation of VIPs, to ensure the following:

- i. Facilitating and encouraging the emptying of pits and VIPs on a regular basis to ensure sustainability and durability of the pit.
- ii. If a new VIP is required, to facilitate and ensure that the household builds a correct pit and safely decommissions the old system.
- iii. CoU should consider the option available to encourage and facilitate the emptying of pits (whether VIP or pit) to actively encourage the households to inculcate this in action in their management of their sanitation facility.

Although on-site sanitation in tribal and rural settlements requires improvement to enhance service levels and user dignity, effective management of off-site sanitation systems is equally critical. In particular, the Operation and Maintenance (O&M) of the sewer network must be prioritised to minimise losses and failures caused by blockages, leakages, and pump station

breakdowns. Strengthening these areas is essential to ensure that excreta flows within the municipality are safely and sustainably managed.

3 Service delivery context

3.1 Policy, legislation and regulation

3.1.1 Policy

The sanitation sector in the country is guided and regulated by various policy documents, which are described briefly below.

Constitution of the Republic of South Africa (1996): Section 27(1)(b); Section 27(2)

Section 24(a), Bill of Rights in the Constitution states that “everyone has a right to an environment that is not harmful to their health or well-being” and 24(b) “to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that (i) prevent pollution and ecological degradation, (ii) promote conservation; and (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development” (Constitution of the Republic of South Africa, 1996).

Section 27(1)(b) of the Bill of Rights in the Constitution states that “everyone has the right to have access to sufficient food and water”.

Section 27(2) tasks the state to “take reasonable legislative and other measures, within its available resources, to achieve the progressive realisation” to ensure access to basic water supply.

These clauses have often been interpreted as implying a right to basic sanitation for all. Water and sanitation are intrinsically linked. All spheres of government are responsible for ensuring that these basic water supply and sanitation services are provided.

Water Services Act (Act 108 of 1997)

The Water Services Act (Act 108 of 1997) is the primary law relating to the provision of water services, including sanitation supply, to households and other municipal users.

Section 3 of the Water Services Act of 1997 states that:

- (1) Everyone has a right of access to basic water supply and basic sanitation.
- (2) Every water services institution must take reasonable measures to realise these rights.
- (3) Every water services authority must, in its Water Services Development Plan (WSDP), provide for measures to realise these rights.
- (4) The rights mentioned in this section are subject to the limitations contained in this Act”.

Basic sanitation is defined in the Water Services Act of 1997 as:

“The prescribed minimum standard of services necessary for the safe, hygienic and adequate collection, removal, disposal or purification of human excreta, domestic wastewater and sewage from households, including informal households.”

The 1997 Water Services Act defined the role of WSAs and other water institutions such as WSPs and water boards. According to section 12, WSAs are obliged to prepare and adopt a WSDP for their areas of jurisdiction. The WSDP shall also prioritise and include how the WSA

intends to improve access to basic water and sanitation services should it not be able to deliver on its obligations.

Notice is expected to be given to municipal users of the drafting of the WSDP, with the draft expected to undergo stakeholder consultation and, therefore, sent to the Minister, the Province and neighbouring WSAs.

Municipalities also must develop an IDP to organise and budget for development plans for their area of jurisdiction. The IDP is done in conjunction with various stakeholders, including the municipality, councillors, communities and national and provincial sector departments, which are affected at any stage of the plan. The WSDP must form part of the municipality's IDP, and it is expected that WSAs will report on its implementation during each financial year (Republic of South Africa, 1997).

Revised compulsory national water and sanitation services standards in terms of Section 9 (1) of the Water Services Act (Act no 108 of 1997)

Within the Water Services Act is the Norms and Standards for water and sanitation services standards. These were recently revised and published in June 2025. They provide specific minimum requirements for sanitation service provision, including basic services and interim basic services.

uMhlathuze Local Municipality Water Services Bylaws

The CoU Water Services Bylaws detailing regulations and provisions related to water supply, sanitation services, and the management of water resources in the municipality.

3.1.2 Institutional roles

The CoU Municipality is a Water Service Authority (WSA) and a Water Services Provider (WSP) responsible for providing water and sanitation services. Table 4 below provides a summary of other institutional roles on a national, regional and local level.

Provision of sanitation services is the responsibility of the Infrastructure Services, Water and Sanitation Services: Operations Management Section within the CoU. There are also several municipal sub sections who facilitate sanitation service provision. Their responsibilities relating to sanitation are identified below:

- Human Settlements: Facilitate installation of VIPs, pit latrines, mainly in tribal and rural areas.
- Scientific Services (consisting of subsections such as the Laboratory Services and Water Quality Management Services): Approval of installations, permits for private entities discharging at macerators and WWTWs. Administer illegal dumping fines and non-compliance letters to contractors, abattoirs, etc.
- Mechanical Maintenance: Maintenance of mechanical and electrical equipment at WWTWs, pump stations and macerators.
- Waste Management Department: Provide support operations, skips at sites to landfills, data, volumes, costs, stock piling and DWS compliance. The latter has led to refurbishment project which included sludge drying beds / remove stockpiles and classifying the sludge.

- Engineering Support Services: Mainly at PMU and funding level.

The CoU has a Bulk Sewerage Master Plan (BSMP) to address sanitation needs and infrastructure development within the municipal area. The scope of the BSMP covers sewers that are 200mm in diameter and larger, pump stations, pumping mains, and sewage/wastewater treatment facilities. The plan focuses on areas identified in the Integrated Development Plan (IDP), Spatial Development Framework (SDF), and Human Settlements Plan.

Table 4: Summary of institutional roles played by public and private institutions engaged in the sanitation service chain.

Level	Institution	Role(s)	Responsibility
National (Public)	DWS	Policy formation & Regulation	Overseer of water and sanitation policy and regulation
	National Treasury	Funding & financial management	Allocates funding for sanitation services through the Municipal Infrastructure Grant (MIG)
	COGTA	Governance & oversight	Supports municipalities in service delivery, coordinates between national and local levels, and ensures policy implementation.
	SABS	Regulation & quality control	Develops technical standards for sanitation infrastructure and ensures compliance with safety and quality regulations.
	WRC	Research and Innovation	Conducts research on innovative sanitation technologies, evaluates service delivery models, and provides recommendations for sustainable sanitation solutions.
	DHS	Integration of sanitation in housing	Ensures that sanitation infrastructure is included in housing and urban planning, especially in low-income settlements.
	Department of Health	Public health & hygiene promotion	Monitors sanitation-related diseases, ensures hygiene compliance in public areas, and conducts health awareness campaigns on sanitation.
	NBI	Public-private partnerships	Facilitates collaboration between businesses and government for improved sanitation service delivery.
	Financial Institutions	Financing	Provide loans and grants for large-scale sanitation infrastructure and support municipal service providers.
	Consulting & Engineering Firms	Infrastructure development	Design, construct, and manage sanitation facilities and wastewater treatment plants, ensuring compliance with industry standards.
Regional	Provincial Departments of Water and Sanitation	Oversight & technical support	Ensure sanitation policies are implemented at the provincial level, provide technical guidance to municipalities, and monitor compliance.

Level	Institution	Role(s)	Responsibility
	Water Boards	Bulk water supply & wastewater management	Supply bulk water for sanitation purposes, maintain regional wastewater treatment plants, and ensure wastewater quality meets national standards.
	District Municipalities	Support & shared services	Assist local municipalities with technical and financial resources for sanitation projects, especially where local capacity is weak.
	NGOs	Advocacy & community engagement	Support sanitation awareness campaigns, implement community-based sanitation projects, and advocate for improved access.
	Sanitation Technology Providers	Innovation & service delivery	Develop and distribute sustainable sanitation technologies such as water-saving toilets and decentralized treatment systems.
Local	Local Municipalities	Service provision & infrastructure management	Plan, implement, and maintain sanitation infrastructure, ensure household and community sanitation service delivery, and enforce local sanitation by-laws.
	Municipal Water Services Authorities (WSAs)	Wastewater treatment & infrastructure operation	Manage sewer systems, operate wastewater treatment facilities, and monitor sanitation service compliance.
	Environmental Health Departments	Hygiene monitoring & awareness	Conduct sanitation awareness campaigns, enforce hygiene regulations, and monitor health risks associated with poor sanitation.
	Private Water and Sanitation Service Providers	Infrastructure management	Contracted by municipalities to operate and maintain sanitation infrastructure, including public toilets and decentralized wastewater treatment systems.
	Construction & Waste Management Companies	Infrastructure development & waste disposal	Build and maintain sewerage systems, provide waste collection services, and manage faecal sludge treatment.
	Community-Based Organizations (CBOs)	Local service delivery & community engagement	Operate small-scale sanitation projects in informal settlements, manage communal toilets, and promote community-led sanitation solutions.

3.1.3 Monitoring and reporting access to services

Section 40 of the Municipal Systems Act of 2000, together with the Municipal Planning and Performance Management Regulations (2001), requires that municipalities establish mechanisms to monitor and review their Performance Management System (PMS). This is to ensure the effective measurement, monitoring, evaluation, review, and continuous improvement of performance at the organisational, departmental, and individual employee levels.

The CoU Municipality put in place a Performance Management Framework and Policy to monitor and measure progress. This mechanism is reviewed on an annual basis. Key performance indicators have been defined in support of the municipality's development priorities and objectives aligned with the organizational structure in line with the Integrated Development Plan framework to ensure consistency in measuring and reporting on long term strategies and projects. Measurable performance targets for each of these development priorities and objectives were established and are reflected on the Organisational Performance Management Scorecard attached to the Integrated Development Plan. A process to ensure regular reporting is in place and gets reported quarterly to the Council via the Performance Audit Committee.

The following mechanisms are used by the CoU to plan for delivery of services and monitor and measure performance:

- 1. Integrated Development Plan (IDP):** The IDP serves as the municipality's principal strategic planning document, outlining development priorities and objectives. It ensures coordination between projects and programs, both internally and with other government spheres. The IDP informs all financial planning and budgeting, with its implementation monitored and evaluated through Service Delivery and Budget Implementation Plans (SDBIPs). This process facilitates ongoing assessment of service delivery against set targets. Through the IDP, the municipality, its constituencies, various sector departments, as well as the interested and affected parties, come together to prepare clear objectives and strategies which serve to guide allocation and management of resources within the municipal area of jurisdiction.
- 2. District Development Model:** This is an integrated planning model for cooperative governance which addresses fragmentation through integrated district-based service delivery approach that is aimed at fast-tracking service delivery and ensuring that municipalities are adequately supported and resourced to carry out their mandates.
- 3. Infrastructure Master Plan:** The municipality develops this plan to guide the efficient development and implementation of infrastructure projects.
- 4. Service Delivery and Budget Implementation Plan (SDBIP):** The SDBIP is a management, implementation and monitoring tool that assists the Mayor, Councillors, Municipal Manager, senior managers and the community. It provides the link between the Mayor, Council and the administration, thereby facilitating the process of holding management accountable for its performance. SDBIP provides detailed plans for implementing municipal services and capital projects, aligning with the IDP and budget. It includes performance indicators and quarterly targets, enabling systematic monitoring and reporting on service delivery progress. Regular performance reports derived from the SDBIP are submitted to the Executive Mayor and Council, promoting accountability and transparency. The SDBIP enables the Municipal Manager to monitor the performance of the Deputy Municipal Manager, the Mayor to monitor the performance of the Municipal Manager, and the community to monitor the performance of the municipality.
- 5. Environmental Services Management Plan (ESMP):** The municipality developed this broader planning tool (ESMP) and uses it to guide spatial development.

6. Drinking Water and Wastewater Systems: CoU is responsible for the water and wastewater purification and distribution function. To fulfil this function, the municipality implements an extensive water quality-monitoring program for drinking water and wastewater effluent.

7. Water Pollution Management: The municipality has also developed and implemented the Water Quality Monitoring Program (WQMP) (CR4711, 7 August 2008) so the Council could meet the statutory requirements and ensure the sustainability of water resources within the municipality's area of jurisdiction. Through this program, the municipality monitors surface water, coastal water, ground water, and sewage.

8. Water Services Management Plan (WSMP): This plan specifies the water and sanitation priorities, and its focus is on the provision of safe, sustainable and affordable water services, as well as the right to access basic water supply and sanitation. The WSMP also identifies and acknowledges the threats of diseases and environmental problems posed by water and sanitation backlogs in rural areas.

9. Community Engagement and Public Participation: The process plan for community engagement includes opportunities for communities to participate at every stage of the Integrated Development Plan (IDP) development. The CoU established 34 Ward Committees that serve as a link between the municipality and the community. Ward Committees are the interface between the municipality and communities. They facilitate public participation on local government matters. Ward Committees actively participate in IDP and budget consultation forums, enabling residents to contribute to local planning processes. They identify community needs and also fine-tune municipal programmes to accommodate local circumstances. Ward Councillors are required to hold at least one community meeting every three months. These gatherings provide updates on municipal projects and Council decisions.

10. Annual Performance Reports: In compliance with Section 46 of the Municipal Systems Act, the municipality prepares annual performance reports reflecting:

- The performance of the municipality and each external service provider during the financial year.
- A comparison of actual performance with targets set for the previous financial year.
- Measures to be taken to improve performance. These reports are made public as part of the annual report, allowing community members to assess municipal performance.

An annual performance report must form part of the municipality's annual report in terms of Chapter 12 of the Municipal Finance Management Act.

11. Performance Audit Committee: The Performance Audit Committee was established in terms of Section 14(2) (a) of the Local Government: Municipal Planning and Performance Management Regulations of 2001 and membership changes over time. The Performance Audit Committee meets quarterly every financial year to ensure compliance with relevant legislation, procedures, and to consider the quarterly performance achievements reported on the OPMS Scorecard/Top Layer SDBIP as well as the performance achievements reported in terms of the Departmental Service Delivery Budget Implementation Plans.

12. External Audits and Oversight: The Auditor-General annually audits the municipality's financial statements and performance information. Findings and recommendations from these

audits are incorporated into oversight reports, which the Council considers addressing identified issues and enhance service delivery.

13. Indigent Policy Monitoring: CoU Municipality has adopted an Indigent Policy to ensure provision of services such as water, electricity and waste removal to poor households who are unable to pay for such services. The Indigent Policy ensures that a register is compiled of all indigent households within the municipal area and that all registered indigent households have access to basic municipal services and that they receive dedicated financial assistance with their municipal service levies and arrears on the municipal accounts of the properties on which they reside. The municipality keeps and reviews a register of indigent households. Application based Indigent relief is granted for a reviewable period of 24 months which is determined by Council from time to time.

Registered indigents must ensure that their monthly consumption does not exceed the limited level of services allocated in terms of this policy. Should the situation of the registered indigent household change, the onus is on that household to either inform the municipality that re-evaluation may be considered or to apply for de-registration. Indigency status re-evaluation may be performed either at any stage or by no later than 12-month intervals. This re-evaluation may be performed by way of a physical inspection or an electronic verification through the credit bureaus. Ad hoc evaluations / electronic verifications through the credit bureaus will be undertaken on all registered indigent households exceeding certain consumption levels which indicate abuse or if false information on applications is suspected and when the property is sold within 1 year after being included on the indigent register.

4 Stakeholder Engagement

The data used in the development of this SFD report was collected through secondary sources and in direct consultation with municipal officials. The relevant municipality stakeholders in the sanitation department were engaged through meetings and workshops. To kick off engagements with the CoU, a workshop was held where the scope of work for the LCCR project in the municipality was discussed. This was specifically on the operations of WWTWs with a focus on sludge handling and energy efficiency.

Field visits and observations were conducted under the GIZ-supported initiative, where several key observations were made regarding knowledge transfer, technical capacity, and the readiness of process controllers (PCs) and supervisors to implement and sustain operational improvements. These findings highlight both the strengths of the current capacity development efforts and areas requiring further support to ensure effective implementation.

The CoU also attended an SFD workshop to introduce the data requirements and process for development. Following engagements and consultations with the CoU, the draft SFD graphic was presented and discussed during a virtual workshop held on 28 August, providing an opportunity for capacity building, stakeholder input, and collaborative refinement of the municipal SFD graphic.

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- Water Group
- Partners in Development (PID)

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SFD Promotion Initiative



SFD City of uMhlatuze, South Africa, 2026

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