SFD Lite Report

Tarkastad

Enoch Mgijima Local Municipality, Chris Hani District Municipality

Eastern Cape, South Africa

This SFD Lite Report was prepared by Emanti Management

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1 The SFD Graphic

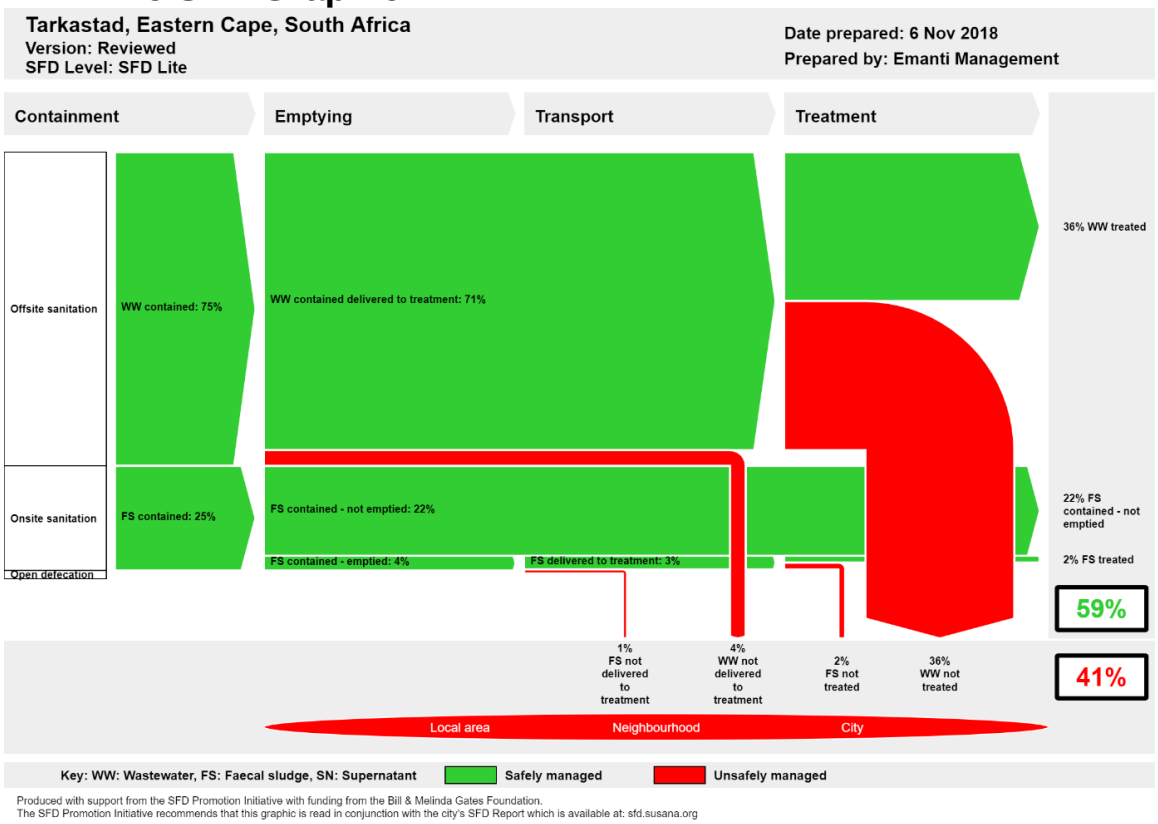

Figure 1. SFD graphic of Tarkastad located in the Enoch Mgijima Local Municipality, Eastern Cape province, South Africa

2 SFD Lite information

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Centre for Science and Environment (CSE), New Delhi, India
Produced by Thabisa Manxodidi and Unathi Jack from Emanti Management with support / close collaboration / inputs from CSE India.

Collaborating partners:
Chris Hani District Municipality (CHDM)
South African Local Government Association (SALGA)
Municipal Benchmarking Initiative (MBI)
Institute of Municipal Engineering South Africa (IMESA)

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3 General municipal information

This *Shit Flow Diagram* (SFD) Lite Report was developed for Tarkastad town and surrounding townships situated in the Enoch Mgijima *Local Municipality* (LM) in the Eastern Cape province, South Africa. *Local Municipalities* (referred to as *Category B* municipalities) form the third sphere of local government and are usually the arm of government closest to the people. *District Municipalities* (DMs) (referred to as *Category C* municipalities) usually consist of more than one (1) LM. The DM administers some of the functions of local government for a district which includes more than 1 LM. The Enoch Mgijima LM, wherein the town of Tarkastad is located, forms part of the *Chris Hani District Municipality* (CHDM), Eastern Cape province, South Africa.

The CHDM is a *Water Services Authority* (WSA) for its area of jurisdiction in terms of the *Water Services Act* (Act 108 of 1997, Water Services Act) (Republic of South Africa, 1997). It therefore has statutory responsibilities and accountability in terms of legislation and policy with respect to the provision of water services. Water and sanitation services are provided through a contract between the CHDM and its 8 Local Municipalities.

Cities and towns that fall under CHDM (Chris Hani District Municipality, 2020): Tarkastad, Cradock, Middleburg, Cala, Khowa former Elliot, Tsomo, Engcobo, Molteno, Sterkstroom, Cofimvaba, Hofmeyr, Dordrecht, Indwe, Whittlesea, Cacadu former Lady Frere.

Towns that fall under Enoch Mgijima LM (Municipalities of South Africa, 2021): Tarkastad, Molteno, Hofmeyer, Sterkstroom, Whittlesea, Queenstown

Tarkastad (GPS coordinates: 32.0048 S, 26.2717 E) is a primary development node and serves as the local administrative centre for Enoch Mgijima LM (Enoch Mgijima Local Municipality, 2017). Tarkastad used to form part of the Tsolwana Municipality which was subsequently absorbed as part of the Enoch Mgijima LM. Tarkastad initially developed as a farming area and later as a church centre and a municipality in the 1800s. The 2011 Census noted that Tarkastad had a population of 1,604 people living in 499 households with an average household size of 3 persons per household. The land area of Tarkastad is 81.79 square kilometres (km^2). As an urban node, the town has relatively high access to potable water (over 95%) and appropriate sanitation (84%). The 2011 Census noted that nearly 16% did not have appropriate sanitation (bucket toilets = 11% and no toilets = 5%). Around 75% of the Tarkastad population have access to electricity for lighting purposes and around 96% have access to weekly refuse removal (Stats SA, 2011). Tarkastad normally receives about 355 mm of rain per year with most rainfall occurring mainly during summer. Average midday temperatures for Tarkastad range from 15°C in winter to 28°C in summer (SA Explorer, 2014). Areas around Tarkastad have slope of less than 5%. Shale, mudstone and sandstone of the Beaufort Group of the Karoo Sequence predominate in this area. Soil salinity is a challenge in irrigation areas of Tarkastad (Tsolwana Municipality, 2007).

This SFD Lite Report was developed for Tarkastad and included surrounding townships of Zola, Matyhantya and Ivanlew. It is typical within South Africa to have townships developing around primary urban nodes. The township of Zola has a population of 4,455 with 1,385 households (average household size of 3.2). The Zola township population is higher than Tarkastad town. According to (Stats SA, 2011), around 55% of the population in Zola had access to flush toilets connected to the sewer with smaller percentages having access to septic tanks (2.5%) and *Ventilated Improved Pit* (VIP) latrines (0.1%). A significant proportion of the population made use of bucket toilets (34%) and had no facilities at all (6%). However, the municipality account indicates that there has been significant reduction of open defecation and use of the bucket toilets since the Census 2011.

In developing this SFD Lite Report, a total population of 7,227 and a total number of households of 1,763 was used (estimated average household size of 4 persons per household). This population profile was provided by Municipal officials involved in the SFD Lite Report development and defined by the DM in terms of how they geographically demarcate sanitation service supply / provision. It is assumed that the area is called Tarkastad as the town serves the centralised point from where service is provided and extended to surrounding areas.

4 Service outcomes

This section presents the range of sanitation technologies/infrastructure, methods and services designed to support the management of *faecal sludge* (FS) and/or *wastewate*r (WW) through the sanitation services chain in Tarkastad (see also section 5 for further details of the quality of the services provided).

4.1 Containment

Table 1 shows the different sanitation technologies used in Tarkastad and how these are defined by the SFD Promotion Initiative, alongside the estimated percentage of population using each system.

For example, all the plastic, concrete and cement block tanks are referred to as *septic tanks* by the municipality. However, some of these tanks do not have an outlet/discharge point they are not defined as a septic tank but as a fully lined tank as per SFD definitions (see row reference number 2 on Table 1).

Table 1: Sanitation technologies and contribution of excreta in terms of percentage of population

No.	Sanitation technologies and systems as defined by:		SFD reference variable	Percentage of population
	Chris Hani DM	SFD promotion initiative		
1	Toilet discharges directly to sewer	Toilet discharges directly to a decentralised foul/separate sewer	T1A1C2	75%
2	Septic tank (plastic or concrete)	Fully lined tank (sealed) no outlet or overflow	T1A3C10	1%
3	Septic tank (plastic or concrete)	Septic tanks connected to soak pits?	T1A2C5	3%
4	VIPs (urban)	Pit (all types), never emptied but abandoned when full and covered with soil, no outlet or overflow	T1B7C10	21%

4.2 Off-site sanitation

4.2.1 Containment and transport

According to CHDM records, an estimated 75% of the population have access to the sewerage network (T1A1C2 = 75% on Figure 2). It is estimated by CHDM that 95% of the sewage is transported to the Tarkastad *Wastewater Treatment Works* (WWTW) (W4a = 95% on Figure 2).

Tarkastad, Eastern Cape, South Africa, 6 Nov 2018. SFD Level: SFD Lite Population: 7227 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	75.0	95.0	50.0			
T1A2C5 Septic tank connected to soak pit	3.0			100.0	100.0	50.0
T1A3C10 Fully lined tank (sealed), no outlet or overflow	1.0			50.0	50.0	50.0
T1B7C10 Pit (all types), never emptied but abandoned when full and covered with soil, no outlet or overflow	21.0					

Figure 2: SFD Matrix for Tarkastad (2018)

4.2.2 Treatment

CHDM estimate that 50% of the wastewater received is treated to effluent discharge standards (W5a = 50% on Figure 2). This estimation had been made with assumption that the WWTW is non-compliant with respect to effluent requirements. An estimated average compliance for a year of 50% has been used and guided by CHDM. The following data sources support this assumption:

- Green Drop Report scores for water services performance for WWTWs in CHDM is around 50% (van der Merwe Botha, 2019).
- In 2011, the Tarkastad WWTW recorded a Green Drop score of 14.3% with a wastewater compliance score of 20 (out of 30 in terms of weighted percentage and plant operational age).
- The Tarkastad WWTW had a risk rating of 72.2% (Department of Water Affairs, 2011).

4.3 On-site sanitation

4.3.1 Containment

25% of the total population is served with on-site sanitation, the majority of which are VIP type pit latrines which have not been emptied (T1B7C10 = 21% on Figure 2).

4.3.2 Emptying and transport

CHDM estimate that half of the fully lined (aka *septic*) tanks with no outlet or overflow are emptied (F3 for T1A3C10 = 50%) and that only half the emptied sludge is transported to WWTWs (F4 = 50% for T1A3C10).

For the fully lined (aka *septic*) tanks connected to a soak pit, CHDM estimate that all of the faecal sludge is emptied and transported to WWTWs (F3 = F4 = 100% for T1A2C5).

4.3.3 Treatment

Faecal sludge is delivered to and co-treated with wastewater at the WWTW – see details in section 4.2. The proportion of faecal sludge treated is therefore based on the same CHDM estimate that only 50% of incoming waste is treated to effluent discharge standards at the WWTW (F5 = 50% on Figure 2).

4.4 Open defecation

The municipality noted that there is no open defecation as stated by the municipal officials. All households are serviced at Tarkastad. As stated in section 3, the municipality account indicates that there has been significant reduction of open defecation and use of the bucket toilets since the Census 2011.

4.5 Risk of groundwater contamination

No information was provided in relation to the groundwater contamination. Groundwater contamination is challenging to determine for the site. The assumption used in this SFD Lite Report is that there is no/little groundwater pollution as VIPs cannot be built less than 30 metres from a borehole or well and the base of the pit should be more than 2 metres above groundwater. Pits are not recommended to be built within 100 to 200 metres of a natural drainage course and within 1:50 year flood lines for water courses. Raising of the slab is also recommended based on seasonal or permanent groundwater within 0.3 metres of the ground surface (Bester & Austin, 2000). Further, pollution plumes from on-site systems are not expected to exceed more than 3 metres except in high water table areas with significant rainfall (plume can reach nearly 30 metres) (Lorentz, Wickham, & Still, 2015).

4.6 SFD Graphic

Based on the above data, estimates and assumptions, the SFD graphic illustrates that 59% of excreta is safely managed in Tarkastad and the surrounding townships (Figure 3).

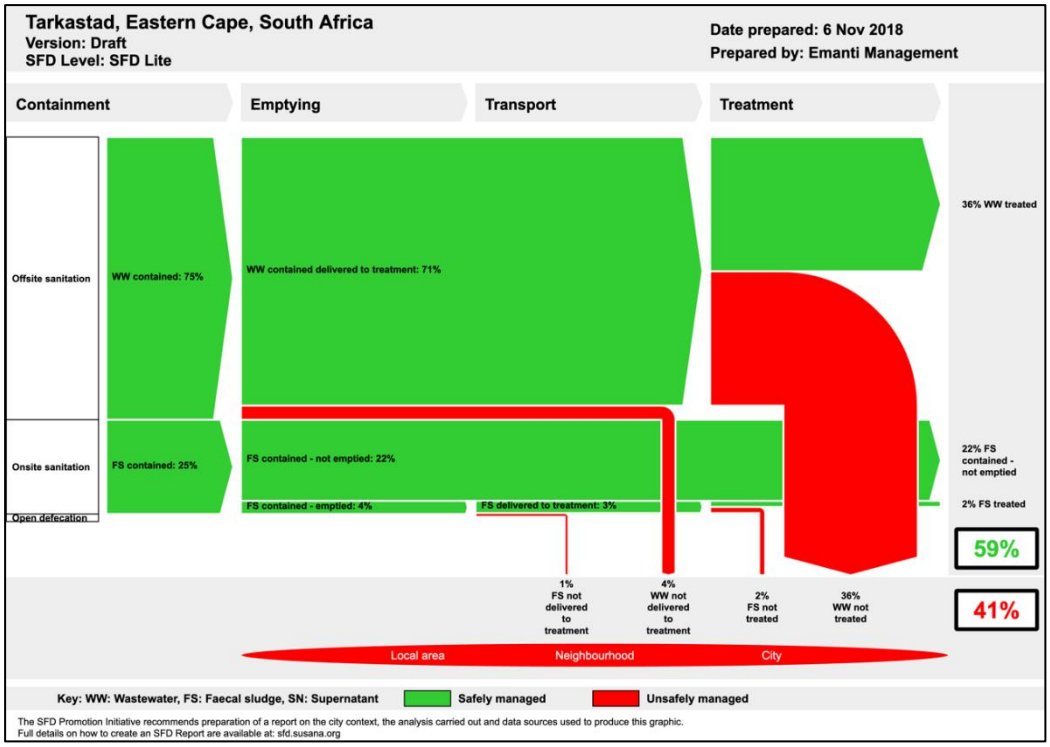

Figure 3: SFD Graphic of Tarkastad and surrounding townships

Most of Tarkastad use off-site sanitation (75%) and the balance (25%) use on-site sanitation. There is no open defecation.

Two-thirds of the safely managed excreta is wastewater that has been treated at the treatment plants (36% WW treated on Figure 3). The majority of the safely managed onsite sanitation is from the 21% of the total population using VIPs which are not emptied. This proportion is considered safely managed based on the assumption that there is a low risk of groundwater contamination (22% FS contained not emptied on Figure 3). There may be a future challenge with these VIPs (where the faecal sludge is contained but no emptying operations have been undertaken) as this scenario could change within 5-years as pits fill (5-years is the estimated emptying cycle of VIPs) (Still, Salisbury, Foxon, Buckley, & Bhagwan, 2010). Importantly, only 2% of safely managed excreta is faecal sludge emptied from the tanks and transported for treatment at the WWTW.

An estimated 41% of the excreta from the total population is not safely managed. The largest proportion is wastewater which is not adequately treated at the WWTW (36% WW not treated on Figure 3). It has been noted that the Green Drop compliance in the CHDM is not high and that there are challenges with operation and maintenance in the area (van der Merwe Botha, 2019). The Green Drop report from 2009 indicated that the average score was 10% (Tarkastad WWTW was not included in that assessment) (Department of Water Affairs, 2009).

Leakage from the sewer network accounts for a tenth of unsafely managed sanitation (4% WW not delivered to treatment on Figure 3), and only 3% of all excreta is unsafely managed faecal sludge.

5 Data and assumptions

This section provides the background to data and assumption used in developing the SFD Lite Report for Tarkastad and surrounding townships. In developing the SFD Lite Report, a number of information sources were used and have been noted in section 6. Data has been sourced from CHDM. This includes personal interviews and published and unpublished reports from CHDM. The Stats SA data does not correlate with the data used in this SFD Lite Report. It is assumed that the CHDM data is most the recent as the Stats SA data was obtained over 5 years ago. The assumptions used in this SFD Lite Report have been classified according to the different sanitation supply chain components.

5.1 Containment

The sewerage network represents the off-site formal waterborne sewer system. Around 75% of the population in the area is linked to the Tarkastad WWTW.

VIPs make up the second highest percentage of technology used by the targeted population (21%). There are parts of Tarkastad urban and rural areas where communities use VIP toilets. To-date, these toilets have never been emptied. In rural areas, communities are used to covering up and abandoning a full VIP and relocating the VIP to a new location.

5.2 Emptying and Transport

The area served by the Tarkastad WWTW is situated at the lower reaches of the town. The system comprises of four drainage areas, namely Tarkastad Town and Matyhantya, Zola and Ivanlew townships. The effluent from some areas, notably Zola and Ivanlew townships, are collected by night soil tanker and deposited into the Tarkastad WWTW. The topography of the catchment in the built-up areas allows for the effluent from all serviced areas to gravitate to pump station one which is then pumped to the main pump station that directs wastewater to

the WWTW. The only effluent that arrives through external energy input is the tankered night soil effluent.

The Tarkastad drainage system comprises of largely domestic consumers with a low to upper lower income profile. The central business district comprises of retail stores providing food (fast food and groceries), clothing and furniture, with institutional services (police, banks, government social services, higher education, etc. Commercial consumers form a smaller portion in numbers because Tarkastad is a rural town. Their contribution however has a large impact to the drainage system. The area is generally rural with an urban/township characteristic. There is an informal/undeveloped component to it with a lower apparent level of service, albeit waterborne, with a distinctly lower economic profile.

The Zola Township is the largest in population with almost half of its household waste draining to pump station one and the other to pump station two. Mathyantya Township is the second largest in population with 298 households. The wastewater is domestic from the government sponsored *Reconstruction and Development Plan* (RDP) houses.

Vacuum tankers are used to empty and transport sewage from the concrete and plastic tanks to Tarkastad WWTW.

5.3 Treatment and Disposal

This SFD Lite Report for Tarkastad and surrounding villages has used a 50% compliance of effluent discharge parameters for the Tarkastad WWTW. The estimation was based on the municipal official's understanding of their average annual compliance as the effluent results were not provided as they were considered sensitive information. It has been noted previously that the Tarkastad WWTW had a Green Drop score of 20 (out 30) for effluent compliance in 2011 (Department of Water Affairs, 2011). The same calculation assumption had been made in respect to off-site sludge delivered for treatment at the Tarkastad WWTW.

5.4 Availability and Accessibility of Data and Data Gaps

Data is easily accessible from Stats SA for the town of Tarkastad and Zola. Data collection and compilation is undertaken every 5-years. SFDs that are developed in between this 5 year period may not have data that take into account recent developments in service provision.

The *Integrated Development Plan* (IDP) is a plan for an area that provides for an overall framework for development. This can be done at District or Local Municipality level and has a lifespan of 5 years. Plans within the IDP have a budget approved by the municipal council. IDPs are available on municipal websites for the LM and DM for the targeted area.

The team responsible for the SFD development has relied on data obtained from CHDM including key informant interviews and published and unpublished reports. The full list of sources for information are presented in the next section.

6 List of data sources

The relevant CHDM staff were contacted through e-mail, letter and telephone. The purpose of the SFD study and depth of data required was conveyed through an introductory letter to respective staff. Although a number of stakeholders of government departments were noted, this SFD study aimed to focus on interviews with staff from CHDM and their associated service providers.

In addition to stakeholder interviews, below is the list of data sources used for the development of this SFD Lite Report.

- Chris Hani District Municipality; Lukhanji Local Municipality – Draft Water Sector Plan (2016). This report is available with Emanti Management.
- Chris Hani District Municipality, *Water Services Development Plan* (WSDP) Overview Report (2017 – 2022). This report is available with Emanti Management.
- Chris Hani District Municipality – Chris Hani Water Resource Master Plan – Groundwater Component (2013). This report is available with Emanti Management.
- Stats SA Census (2011)
- Tarkastad WWTW Wastewater Risk Abatement Plan (W2RAP) – (2016). This document was sourced directly from the CHDM and is not available online.

7 References

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8 Acknowledgements

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Appendix

Table 2. Tracking of stakeholder engagement

Name of organization	Name of contact person	Designation	Date of engagement	Purpose of engagement
Chris Hani District Municipality	Zendani Kuboni	Senior Technician WMIS	07 November 2018	Development of the SFD and Site inspection
Chris Hani District Municipality	Mvuyeleni Somkoko	WSP Area Manager	07 November 2018	Development of the SFD and Site inspection
Chris Hani District Municipality	MK Ramulifho	Water Quality	07 November 2018	Development of the SFD and Site inspection
Chris Hani District Municipality	S. Sinyeke	Civil Technician	07 November 2018	Development of the SFD and Site inspection
Chris Hani District Municipality	Zandile Mngomeni	Engineering Technician	07 November 2018	Development of the SFD and Site inspection
Chris Hani District Municipality	Sinawo Nzuzo	Technician - WMIS	07 November 2018	Development of the SFD and Site inspection
Chris Hani District Municipality	Mphumzi Pama	Civil Technical	07 November 2018	Development of the SFD and Site inspection
Chris Hani District Municipality	R. Pottas	Area Manager	07 November 2018	Development of the SFD and Site inspection
Chris Hani District Municipality	S. Nzuzo	Technician - WMIS	07 November 2018	Development of the SFD and Site inspection
Chris Hani District Municipality	Nkwenkwezi Mfesane	Water Quality Technician	07 November 2018	Development of the SFD and Site inspection
Chris Hani District Municipality	N. Bongweni	Senior Technician - WCDM	07 November 2018	Development of the SFD and Site inspection
Chris Hani District Municipality	N. Ncedo	Civil Technician	07 November 2018	Development of the SFD and Site inspection

Figure 4: Typical sanitation systems in the targeted area.

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