

Report on the Jagersfontein Tailings Disaster



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List of Abbreviations

DMRE	Department of Mineral Resources and Energy
IMS	Institute of Mine Seismology
MPRDA	Minerals and Petroleum Resources Development Act
R704	Regional Road 704
SABS	South African Bureau of Standards
SANS	South African National Standards

Foreword

by the Chairperson of the Board of the Bench Marks Foundation

The Rt Rev Jo Seoka

On Sunday 11 September 2022 we woke up to the sad news that the Jagersfontein tailings broke releasing a tidal wave of tailings sludge that swept through parts of Charlesville and Itumeleng taking with it people, houses, vehicles and infrastructure. Four people perished; dozens were injured. The sludge stopped more than twenty kilometers downstream covering vast tracks of farm land.

A steady stream of politicians including the President, the Premier of the Free State, the Minister of Mineral Resources and Energy, and the Chairperson of the National Council of Provinces inspected the damage. More than a month after the disaster the owners and managers of the mine still have not engaged adequately with the victims of the disaster. Instead, there was an attempt to further muddy the water by claiming that the mine was not operational at the time. Yet, the team of the Bench Marks Foundation interviewed employees of the mine who stated that they warned management of the impending disaster.

Jagersfontein sadly is yet another example of corporate impunity. The report which follows confirms many of the long-held propositions from the Bench Marks Foundation to the mining industry and the Department of Mineral, Resources and Energy concerning the management of tailings.

We empathise with the people of Jagersfontein for the tragedy they went through and are still going through. We thank them for their openness to provide us with invaluable insights and share their stories with us.

We launch this report in the interest of transparency and accountability. We hope that those responsible will be brought to book and that in the end justice will be done.

1. Introduction

On Sunday morning, 11 September 2022, between 02:00 and 06:00 in the morning, the residents of Charlesville and Itumeleng villages in Jagersfontein woke up to a rumbling sound. The rumbling sound were soon followed by a wave of ‘grey mud’ that rolled through the edges of both communities. The ‘grey mud’ (tailing sludge from a nearby mine), swept over the R704 regional road in three places. The sludge wiped away six houses and four community members, injured dozens more, and carried motor vehicles, heavy containers, water tanks, street lights and fences downstream. The sludge covered farmland and grazing fields, ending in the Proses River some ten to fifteen kilometres away. Most health and safety officials would concur that most mine disasters are caused by human negligence, error, or greed.

What caused this particular disaster in Jagersfontein?



Figure 1 Location of Jagersfontein in South Africa(Sapora, 2010)

In this report we first explain what tailing dams are. Second, we focus on the methodology that informed the research. The methodology is followed by the historical context of Jagersfontein, the mine ownership history, and the disaster event that unfolded through eyewitness accounts. After that, we provide the context of governance aspects related to tailing dams. Then we clarify what went wrong at the Jagersfontein tailing dam and focus on the official responses of the mining company and the state. Lastly, we conclude and provide recommendations for the mining company and national government.

2. Tailing dams

2.1 What are mine tailings?

IndustriALL Global Union, the global umbrella labour organisation, describes tailings as the waste products from mining. Mechanical and chemical processes are used to grind up rock into a fine sand to extract the valuable mineral or metal from the rock ore. All the unrecoverable and uneconomic remnants from this process are waste. This includes finely ground rock particles, chemicals, minerals, and water. Depending on the type of mining, tailings can be liquid, solid or a slurry of fine particles. Many substances found in tailings are toxic, even radioactive, and it is not uncommon to find large amounts of cyanide, mercury and arsenic in tailings (IndustriALL Global Union, 2019).

Tailings dams are used to store water and waste that come as by-products from the mining process. It is estimated there are at least 3 500 tailings dams around the world; however, as there are around 30 000 industrial mines, the number of tailings dams is likely to be much higher (IndustriALL Global Union, 2019).

Tailings dams can be huge in size, as big as lakes, and reach a height of 300 m. As the slurry of waste is piped into the dam, the solids settle to the bottom and the water is recycled to be used in the separation process again.

Rather than reinforced concrete, tailings dams use earth or rock to create a barrage. However, most tailings dams use the cheaper but more dangerous upstream method of construction, using the tailings themselves to create a barrier. The dam is then continually raised to accommodate more waste. These dams are more unstable and more prone to leakage (IndustriALL Global Union, 2019).

Tailings dams need regular maintenance and monitoring to ensure that there is sufficient drainage and that the dam is strong enough to contain the mining waste.

Tailings dams can pose a threat to local wildlife as birds and animals bathe in and drink from the contaminated water. Leakage of toxic substances from tailings dams can also cause damage to the immediate environment (IndustriALL Global Union, 2019).

The insurance industry has to set the bar high, even where standards exist. This is especially so in the case of tailings facilities, given that the risks involved are sizable and extremely challenging to assess. Many tailings dams are thirty or more years old, making it almost impossible to accurately establish their current condition, much less how they will continue to perform over time. This is a major reason why tailings dams are generally not insured.

The possible effects of climate change on tailings facilities are adding to the challenges faced by the industry and creating an additional level of uncertainty for insurers. Unlike water retention dams, tailings dams are continuously constructed by 'raises' during the life of a mine (Dugdale & Isleib, 2019). Given the potential for the frequency and intensity of rainfall to increase in certain regions, this can increase the aggregate risk of dam failure – as tailings may liquify or break down over time when exposed to heavier rainfall if not managed appropriately.

(Becker, 2020:207).

2.2 Tailings storage facilities

Tailings storage facilities are some of the most challenging structures to operate in the mining industry. These structures fail far more regularly than normal water-storage dams. Many of these structures are susceptible to liquefaction and piping failure. Liquefaction is when the tailings become too wet, the balance between liquids and solids tilts in favour of the liquids, which causes the tailings to become unstable and dangerous. Therefore, tailing dams need to be monitored carefully. Most current tailings monitoring techniques can easily miss the early signs of failure, where the zone of degradation may be small and localised (Institute of Mine Seismology [IMS], 2022). In some cases, radars and/or high-resolution cameras are used to monitor small deformations on the dam walls. Unfortunately, these methods measure surface perturbations and are incapable of detecting internal changes within the walls (IMS, 2022).

A concern with current monitoring technologies of tailings dams is the poor performance during periods of heavy rainfall. Water and tailings do not go together. Tailings exist to evaporate and train water out of mine sludge as quickly as possible. Where tailings are overfull and start to overflow (seepage flow) it should be recognised as a clear sign of imminent disaster. Small deformations on the dam wall become very difficult to detect due to the fluid on the wall's surface. Similarly, seepage flow rates are difficult to interpret during heavy rainfall due to rainwater flowing down the embankment, making seepage flow measuring challenging. Limitations in measuring seepage flow are unfortunate, as heavy rain has been known to be a significant contributing factor to tailings dam wall failures (IMS, 2022).

The Bench Marks Foundation research team presents the following arguments:

- a) The Jagersfontein tailings dam was constructed on top of a shallow aquifer.¹ Shallow aquifers make it impossible for the tailings to dry out, weakening the dam from its base. The design of the tailings dam on a shallow aquifer was a factor in the liquidity, instability, and inevitable collapse of the tailings.
- b) The Jagersfontein tailings dam was constructed at the confluence of three of four catchments into a tributary of the Proses River which is a tributary of the Vaal River. This poor location of the tailings dam further increased the liquidity and instability of the tailings. The tailings dam is located below a number of normal dams upstream.
- c) The tailings dam was constructed on a slope with two township communities directly below it. Given its instability, the downward slope on which it stood increased the force of the surge once it collapsed, contributing to the destruction of property and infrastructure below it.
- d) The tailings dam was severely overloaded, and signs of spillage over its steepest wall, also called the rim, should have alerted the owners of the rim's inevitable collapse.
- e) Reports indicate that the collapse of the old historic open-cast pit² caused seismic disturbances (vibrations of the earth) which could have contributed to the collapse. "The Pit has an extent of 19.635ha and is a near vertical sided hole, with some of the faces being more

¹ An aquifer is an underground layer of water-bearing permeable rock, rock fractures or unconsolidated materials. Groundwater from aquifers can be extracted using a water well.

² Open-cast or open-cut mining is a surface mining technique of extracting rock or minerals from the earth from an open pit.

than 200m in height. It is unstable, breaking back and poses vibration risks. The Pit's instability presents a very serious safety risk, placing local residents at potential risk in the long term" (Turn 180 Environmental Consultants [hereafter Turn 180], 2018).

3. Methodology

This research paper represents a rapid response to a mine-induced humanitarian and environmental crisis at Jagersfontein on 11 September 2022 because of a major tailings dam failure. Bench Marks Foundation used the following methodology:

- a) A week-long visit to the affected community and the mining area where the disaster happened.
- b) An in-depth review of the history of the mine and its current status.
- c) Extensive interviews and interactions with community members and local government officials.
- d) A detailed review of the environmental impact assessments, the environmental management plans and other official documents and correspondence related to the mining operation.
- e) Extensive review of global best practice on national laws and regulations pertaining to the construction, management, and maintenance of tailings.
- f) Participation in public meetings involving the Department of Mineral Resources and Energy (DMRE), the National Council of Provinces and the Mayor's Office.
- g) Unsuccessful attempts at engaging the management of the mine.

4. Historical context of Jagersfontein

4.1 1867 until 1931, the pre-DeBeers era

The history of Jagersfontein has been well documented (Philip, 2014). Therefore, this section provides only a short historical context of Jagersfontein, with greater attention to the perplexing ownership of the mine.

Jagersfontein originally belonged to Gert Jagers, a Griqua farmer. Those who farmed in the south-western Free State often settled in close proximity to fountains. The stream emanating from the fountain ended up under the tailings that broke on 11 September 2022. Cornelius Johannes Visser bought Jagersfontein from Gert Jagers in 1856. Visser employed a foreman named De Klerk, who was retained on the farm after Visser passed away. De Klerk started to look for diamonds on the farm, influenced by diggers who passed from the Vaal River diggings to Kimberley. De Klerk eventually found a diamond, which spurred a few diggers from Kimberley and the Vaal River. Mrs Visser set aside a portion of the farm as a public-digging site, charging a monthly fee of £2 per digger. By 1875, the opencast diggings developed into a deep mine, and it was realised that "the diamonds were concentrated within a narrowing area of ever increasing yields of good quality gem stones, unlike those found along the rivers, or the diggings by now closely grouped around Kimberley" (McNish, 1968:160-161).

After 1880, the big diamond mining companies began to show an interest in Jagersfontein. At first, it was worked as an opencast system resulting in a huge pit, or hole like that in Kimberley. By 1910, however, a “shaft 1,020 feet deep was sunk ... to determine the possibility of working the mine on the underground system practised at Kimberley, and at that depth there was no sign of the blue ground giving out. A second shaft was added later” (McNish, 1968). The 1929 depression saw the mine closed for a brief period. It employed some 400 white Europeans and 4 000 blacks. In 1931, De Beers took over the mine and operated it until 1975, when it was placed under their care and maintenance until De Beers sold it in 2009.

4.2 De Beers area: 1931 to 2010

De Beers took over the management of the mine and its effects in 1931. Most of the mining equipment was outdated and not on par with De Beers’ other mines further north. The old equipment increased the cost of mining. In 1946, De Beers instructed consulting engineers to proceed with development for re-equipping and re-opening the mine. Production started in the late 1940s, and the mine was officially re-opened on 12 December 1949 (Philip, 2014).

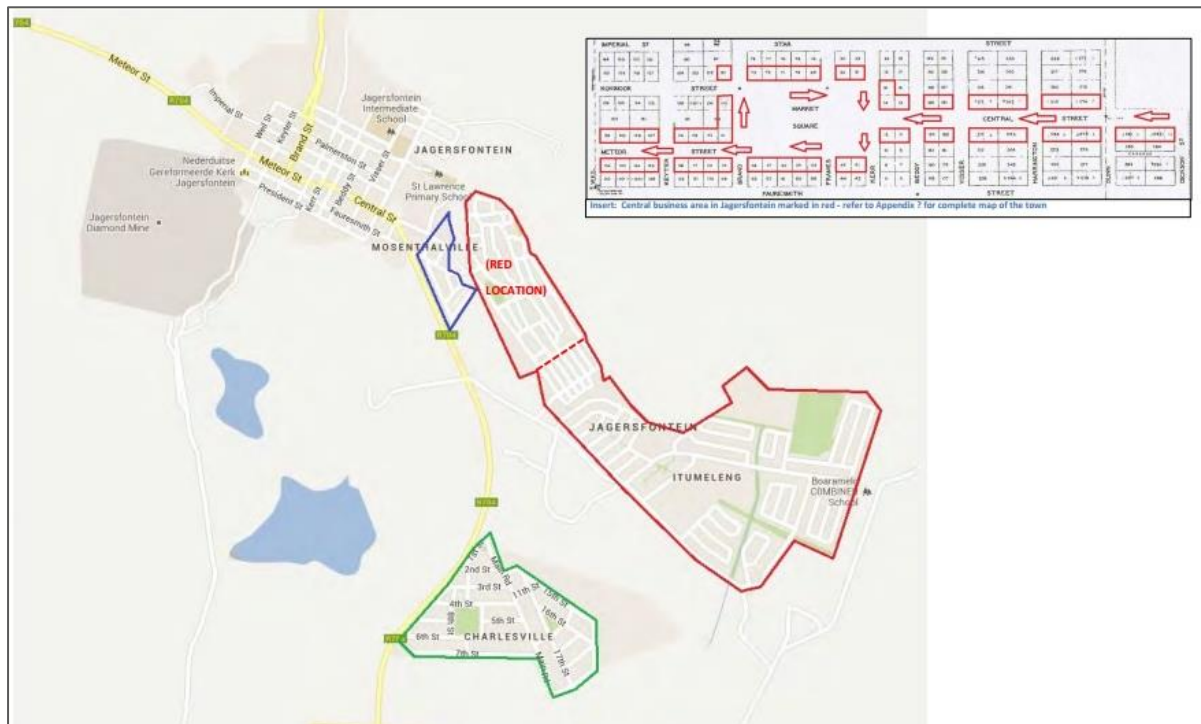


Figure 2 Layout of the town of Jagersfontein

Although the De Beers period can be considered the second major period of prosperity for the town, it did not leave such a visible footprint on the town itself, as during the first period, with the Jagersfontein Mining and Exploration Company already establishing the town. Unsuccessful negotiations with the town in obtaining municipal grounds for the erection of housing for mining employees before the mine re-opening resulted in the establishment of a new mining town, Charlesville, south-east of Jagersfontein and topographically below the mining operation. The establishment of Charlesville meant that the town Jagersfontein mainly served as an economic business centre for the mine, the mining village, and nearby smaller towns.

De Beers remained the owners of the mine with seemingly little regard for the welfare of the town it left to fend for itself. De Beers did build a state-of-the-art mine hospital on the mine premises. Three years prior to the closing, the University of the Free State conducted a socio-economic assessment to assess the impact the closure of the mine would have on the town. Then already, the research pointed out that three small towns as closely as Charlesville, Jagersfontein and Fauresmith, had little chance of survival as individual towns in a rural area mainly reliant on agricultural activities for income. The suggestion was to demolish Charlesville, which was only approximately 20 years old then, and Jagersfontein and Fauresmith combined their forces to become one town (Philip, 2014). Instead, De Beers Consolidated Mining donated the mining town, Charlesville, to the Department of Welfare to house pensioners and people with disabilities unable to work (Philip, 2014). The donation of Charlesville had an adverse effect on the town's economy as it meant an addition of economically inactive residents that was not conducive to the town's growth (Philip, 2014). In 1994, Charlesville was handed over to black pensioners, according to local informants the researchers spoke to. At that time, the tailings were small and insignificant.

4.3 Post-DeBeers Era: 2010 to 2022

When De Beers finally sold its mining effects in 2010 to the Superkolong Consortium, the price tag included a social responsibility clause whereby the new mine owners had to ensure they would do the following:

- *“establish a Community Trust of which the Jagersfontein Community is the sole beneficiary.*
- *the Community Trust will hold 10 per cent equity ownership in the holding company that acquires the De Beers Jagersfontein assets.*
- *the Trust must, on formation and registration, receive R20 million in cash for investment and, after due process, expenditure on community benefiting projects.*
- *the Trust will have a deferred right to an amount of R30 million, which will accrue interest over time and contribute to the future financial position of the Community Trust.*
- *the new mine owners must be committed to facilitate skills transfer to members of the community, with a view to ultimately sourcing skilled labour from Jagersfontein”* (Jagersfontein Developments Pty Ltd, 2010).

Very few new buildings were added to the business area during this later period. The Jagersfontein Hotel, which was situated at the corner of Brand and Meteor Streets, was destroyed in a fire and replaced by the current building. Pep Stores in Town Square was gutted by fire but only received a new façade, and the building at the corner of Brand and Kohinoor in Town Square was demolished to make place for Lewis Stores. The latest development was the demolition of the old blacksmith store at the corner of Kerr and Central Street in Town Square to make place for the new library during the 1990s. And, of course, the disastrous strike in 2009 against the municipality resulted in the torching of the 1892 municipal offices in Market Square. However, what did grow alarmingly and exponentially was the tailings dam.

De Beers has closed a transaction with Superkolong Consortium which has acquired all of De Beers' assets (including its mine dumps) at Jagersfontein. De Beers had begun a thorough disposal process of the same in March 2010.

Superkolong is a broad-based BEE holding company for a number of mining operations including alluvial diamond operations. Shareholders include Manyatti Investments and Kolong Investments.

The deal acknowledged and met the criteria set by De Beers including technical, economic, community, technical competence, available funding to develop the new processing operation, BEE equity participation; employment creation and significant community based initiatives in an area where mining ceased almost 40 years ago.

De Beers Acting CEO, Barend Petersen, said, "I am very pleased to say that De Beers, with some determination to do the 'right thing', and taking the time necessary to engage with stakeholders affected by our business, has concluded another transaction to introduce miners with empowerment credentials to opportunities which have the potential to deliver significant returns for many. The impact, particularly at local government level, and in the Provinces where economic development is so important to communities near mining resources, cannot be over-stated as development in the rural areas of South Africa can exponentially benefit the economy and therefore society."

Barend also pointed out to Superkolong's responsibility as "We hope that this deal will make a meaningful contribution to the community."

The Jagersfontein Community is to be the sole beneficiary of a soon-to-be established Community Trust. The Community Trust will hold 10 per cent equity ownership in the holding company that has acquired the Company's assets. The Trust deed will restrict outflows from the Trust to credible community-based initiatives presented by community bodies that demonstrate a sufficient level of internal organisation and governance as managed by the Trustees, who will be drawn from the local community and the new owners. Further, the Trust will, on formation and registration, receive R20 million in cash for investment and, after due process, expenditure on community benefiting projects. The Trust will have a deferred right to an amount of R30 million, which will accrue interest over time and contribute to the future financial position of the Community Trust.

The Superkolong consortium has committed facilitating skills transfer to the members of the community, to ultimately source skilled labour from Jagersfontein. The investment into redeveloping Jagersfontein Mine to process the tailings resource (mine dumps) will promote local economic development. It is envisaged that the transaction will create opportunities for local Free State entrepreneurs as has been the case at De Beers Voorspoed Mine near Kroonstad.

(Diamond World News Service, 2010).



Photo 1 Tailings in 2005



Photo 2 Tailings in 2022

(Picture credit Google Earth)

Jagersfontein Developments (Pty) Ltd came into being in 2011 when Johann Rupert, through Luxembourg, registered Reinert and Chris Potgieter of Sonop, the largest alluvial diamond mining operation in the southern hemisphere, who took shares in Superkolong (Ryan, 2011).

4.4 Recent ownership changes

In 2022, Rupert sold his shares to Stargem in Dubai, just months before the current tailings disaster. Members of Itumeleng Township and Charlesville claimed that they became concerned when the Reinert/Sonop partnership, known as Jagersfontein Developments (Pty) Ltd, started piling layer upon steep layer of fresh tailings on the steep northern embankment/wall of the tailings. The tailings started towering over both communities. Both Charlesville and Itumeleng Township are located downhill and below the tailings. The tailings are on a slope slanting towards these two communities. The height and gradient of the tailings are also risky, and obvious signs of stress and overload started showing. The Department of Mineral Resources and Energy claim that they ordered the mine to stop operating two years ago, but that the company ignored this instruction. At 14:00 on Sunday, 11 September 2022, members of the two communities claimed they heard rumbling sounds from the tailings dams. Some informants claim that they phoned mine security, but security told them they had nothing to fear from the tailings. The tailings burst between 14:00 and 17:00. Six houses in Charlesville have been completely swept away, and twenty-four others severely damaged. Two people died, and four are still missing. The spill flooded down the valley for fifteen kilometres, and a farmer in Vlakfontein lost 90% of his sheep.

The Minister of Minerals, Petroleum and Energy responded that the Department was unable to inspect the tailings. A court order, involving De Beers in 2007, prohibited the Department from doing so: “Mantashe says ‘dangerous’ high court judgment crippled his department’s jurisdiction over all tailings dams” (Evans & Dlangamandla, 2022).

We suspect that the tailings contained arsenic, silica and possibly asbestos. When the soil dries out the dust may be harmful to human health. We took samples to be tested at a laboratory. The mining company offered R20 million in damage repair to the affected communities. The Mining Council offered another R50 million. Bench Marks Foundation suggests that the damage would exceed R150 million.

5. The Disaster – Eyewitness accounts

T, former employee of the mine and current resident of Charlesville, recounts the events:

“I was working at the mine from 2009 to 2011. In 2009, I started as general worker; we build the diamond sorting plant. In 2011, I became an x-ray operator in the sorting plant. In 2009, when we started, we got R9 an hour. When the plant started to work, we earned R11 an hour, with increases to R15 to R18 and hour overtime, by 2021, it was R35 and some cents.

“On Saturday we were not aware of the trouble to come. But the people who know these things say it started around two in the morning. For me it started at 5 in the morning when my wife woke me up to say I must go and check the kettle in the kitchen, it is boiling. She heard a noise. I went to the kitchen and checked the kettle, but it was off. Then I thought it was a manganese truck passing, they drive through here from the Northern Cape. But I was wondering what kind of truck was that which is not passing, staying in one place.

“So, I went outside. But my fears told me that the sound came from the mines. When I check it, I saw a wet that is not normal, we know that place it is our place ... I thought that thing [the tailings] was broken. Then I went outside the yard to make sure. Then I saw it, it was coming out, I saw black, it was like it was boiling. Then I went back inside, and I said, ‘My wife, that thing we thought all the years, it happened! Wake up, wake up the kids and be aware. I am coming, I just want to go and make sure what I see with my eyes.’ My brother came from top when I was waking the other people up shouting! My brother heard me shouting and he came from topside, and he said, ‘that thing we were always talking about, it is the truth, it is happening! It has broken, let’s go and make sure.’ Then we ran, but when we came that side, we found that we can’t cross, it has already crossed the road.

“Then that side I shouted those people who were taking photos, laughing. I shouted, ‘go away there, that thing is going to make a big broken place, then it is going to come out like that, go away!’ Ntate David, then we heard an explosion [As the tailings wall gave way]. I saw something huge in the sky, like a storm, dust with water and everything. It is why I am saying, Ntate David, till today, I don’t think anyone can see what we saw that day! It was very horrible. Then in seconds after I ran home and shouted to my wife, ‘Mama take your ID and take the children and run and go away!’ and mama listened.

“Ten minutes we stepped away from the house then we saw it first take the shanty, but there were two houses there. It leaves the first one, but it takes the second one. It breaks the Mukuku that was standing at the side then we saw that house exploding like *BAM!* then the roof came down. That was when we realised, all of us, that this was serious! And I look back and started to run away. It was where I saw that father and his son struggling with the mother on the fence, then I saw myself, I was on that scene helping. We just took the mother to the other side of the fence, and we also go other side. When I looked, in seconds the son was not there. It took me lying on my stomach a very long distance. It tossed me again on my back, it is where I saw light, I saw my family, then my mind told me that, ‘Thabo, you are in Wolwas, that river.’

“Then, but luckily, I hit something with shoulder. It was where my mind told me ‘Thabo, fetch!’ Then I used this hand to fetch [the interviewee shows me his badly swollen hand]. I grabbed the fence which touched my shoulder. Then I fetched, Ntate David, but I feel that this thing is taking

me. But I caught, Ntate David, and I tried to come out of it, but now it is too high, I am under it, then I came out. When I came out, I looked back and saw my father also came out, and we asked each other where is the mother, and we don't know, Ntate David. I am covered in the stuff [tailings mud], me and the father. We tried to survive with the fence, when we go at the back of the gate when we look at the house, we saw his son hanging from the roof, using the window ledge for support. Imagine now, that short guy, how did he manage to catch the roof? You saw him mos, Ntate David. Then I realised that God was with us.

"When I go out, I was shouting, 'hey, hey, hey, going up ...'. Then the ambulance came, I showed them my injured hand and they said, 'No, Thabo just go home and clean yourself up, you will be fine.' Then I came back, Ntate David, to go and look, and the fence that saved me it was also not there anymore, it was gone. That is when I realised that God is alive. The father, the brother, escaped but the mother was gone ...

"We spoke about these tailings breaking for years and years before it happened. We even made toy-toys, because we were afraid of that dam, but the police were involved shooting us, they don't want us to protest or even talk to this mine boss. The police were always in front of us, between us and the mine boss, protecting him. So, we realised that there is much money given to the police so that they can interrupt and stop the right things from happening. It is very bad, Ntate David, you can't even accept such things from happening in our lives."

Interviewer: "Since the 11th when this happened has anyone from the mine come to speak to you?"

Interviewee: "No one, no one ..."

Interviewer: "The president came, the minister came, the premier came ..."

Interviewee: "... but they also failed us, but they came."

Interviewer: "... but they came to speak to you? The mine boss never came"

Interviewee: "They [the politicians] don't even talk about him. That man is free. He is walking free, but he made such a murder."

Interviewer: "So, no one from the mine came, only the politicians?"

Interviewee: "They are hiding this guy [the mine boss].

B, employee in the pump station that oversaw the pumping of slurry into the tailings:

"We were pumping too much slurry into the tailings dam every hour and every day. On the Saturday night before the tailings broke (10 September 2022), we warned our supervisors three times to say that the tailings dam is going to break. But they said, 'don't worry, nothing will happen, go back to work.'"

C, the Mayor's response to the question, "Were you aware that the tailings posed a danger?"

"Yes, I was, I warned the mine bosses many times and even the Department of Mineral Resources and Energy, but they refused to listen. Mining is a national competency so I could do nothing about what happened in the mine, but the environment is a local competency, now I am expected to clear up the environmental mess."

D, Chairperson of the Minerals and Energy portfolio in the National Council of Provinces, to the question from a journalist, "Who does the mine belong to?"

"The DMRE told us, the portfolio committee, that the mine was not operational."

When asked a second time, the Chairperson arrogantly responded: "I already answered that question, I am not going to answer it again."

6. What does the law, regulations and global best practice say about tailings management?

Mining in South Africa is regulated by the Water Act 1998, the Minerals Act 1991 and the Mine Health and Safety Act 1996. The DMRE is responsible for implementing the provisions of the Acts. South African legislation requires that mine residue deposits, tailings storage facilities, tailings deposits, or slimes dams be managed over their entire lifecycle. By law, management of residue deposits should be done by appropriately qualified persons, often professional engineers, so that they do not pose unreasonable risk to the public and the environment. The principal management guidance document for tailings facilities in South Africa is the Code of Practice for Mine Residue Deposits, published by the South African Bureau of Standards in 1998. The standard referred to as the South African Bureau of Standards [SABS] 0286:1998, later renamed to SANS 10286, contains fundamental objectives, principles, and minimum requirements for best practice, all aimed at ensuring that no unavoidable risks, problems and/or legacies are left to future generations.

The standard was developed because of a major tailings' impoundment failure in Virginia in the Free State in February 1994. The tailings escaped into the suburb of Merriespruit, killing and injuring people as well as causing vast environmental destruction. The standard does not address the environmental issues or health and safety concerns of tailings storage, but places more focus on the need for management throughout the life cycle of a tailings management facility. The standard was initiated primarily to address safety concerns related to structural failure of a tailings management facility and how to prevent this from occurring. The key principles on which the SABS standard is based are the following (taken from SANS 1998):

- Continual management – Stressing the importance of ongoing management attention.
- The minimisation of waste and the impacts of waste – The steps that should be taken to reduce the amount of waste produced and the impact of its disposal.
- Precautionary principle – A conservative approach where there is risk to human health, property or the environment exists.
- Internalisation of costs – Detailing the full cost of satisfying the requirements of the standard reiterating that this should not be avoided by neglecting safety, health, or the environment.
- Assessment of the full life cycle implications – Stressing that waste disposal should be seen in the context of the entire mining process, and the need to rehabilitate for sustainable land use after it has ceased.

Tailings management in South Africa is regulated by law in the Guideline for the Compilation of a Mandatory Code of Practice on Mine Residue Deposits issued by the DMRE in 2000. This guideline

makes implementation of a code of practice mandatory for each tailings facility with compulsory adherence to SANS 10286, Code of Practice for Mine Residue Deposits. In July 2015, the Mining Residue Regulations was established by the Department of Environmental Affairs to control mine waste dumps, stockpiles, and tailings storage.

6.1 Tailings dam safety

According to the law, regulations, and global best practices (United Nations Economic Commission for Europe, 2014), with planning and designing a safe tailings dam facility, particular attention should be paid to the following:

- a) The tailings pond, for which the following parameters need to be assessed accurately:
 - i. The stability of the tailings (or other deposited material such as water treatment sludge).
 - ii. The geological situation.
 - iii. The hydrogeological situation.
 - iv. The hydrological situation.
 - v. The geophysical situation.
- b) The tailings dam, for which the following parameters need to be assessed accurately:
 - i. The slope stability of the dam.
 - ii. The strength and stability of the foundation for the dam.
 - iii. The stability of the tailing material (induced liquefaction).
 - iv. Erosion to the dam (suffusion and outside erosion).
 - v. Water recovery systems.
 - vi. Emergency spillways.
 - vii. Slope sliding.
 - viii. The tailings delivery system to and on/around the tailings dam facility should take into consideration safety and environmental protection.

The dam-raising method should be chosen for local conditions (e.g., seismicity, tailings composition, severe climate). Special attention must be given to quality control and site supervision during the starter works construction phase of the tailings dam. Additional impoundments should be designed to contain inflow from emergency outlets. Hazardous substances and process water should be reused as far as technically possible (recycling). If it is impossible to recycle hazardous substances, they should be neutralised before being discharged into the tailings dam facility (United Nations Economic Commission for Europe, 2014).

Earthworks published ten guidelines as “must do” steps in ensuring tailings safety (Ellis, 2022):

10: Ensure independence of reviews to ensure safety

There must be an independent evaluation of all aspects of the design, construction, operation, and maintenance – including during closure and rehabilitation – of tailings and other mine waste facilities, regardless of the projected consequences of failure of the mine waste facility, by a group of competent, objective, third-party reviewers (Ellis, 2022).

09: *Appropriate monitoring systems must identify and mitigate risk*

Tailings facilities must have appropriate monitoring systems in place to identify and mitigate risk and have a clearly defined Adaptive Management Plan linked to tailings monitoring results that encompasses a complete set of predictions and pre-planned actions (Ellis, 2022).

08: *Ensure detailed evaluation of dam foundations and tailings properties*

Prior to permitting approval, operating companies must provide a detailed engineering evaluation of the dam foundation to relevant regulatory agencies, and a physical and chemical characterisation of the tailings, with special attention to the clay content, brittleness, and susceptibility to liquefaction of the tailings.

The characterisation of the underlying geology must be conducted before the dam and the impoundment are constructed.

07: *Implement rigorous controls for safety*

The design, construction, operation, and closure of any tailings facility must be subject to best available technologies and practices. An annual report must verify that dam operations and construction adhere to the approved final dam design.

If a feature of the design was approved by a regulatory agency, all requested changes to that design must be submitted to the same regulatory agency for approval. Any deviation from the original design must be justified, documented, and evaluated by an Independent Tailings Review Board.

06: *Mandate the use of Best Available Technology for tailings, in particular filtered tailings*

All new mines that create tailings must begin with an analysis of the best available technology for tailings disposal. The best available technology has three components derived from the first principles of soil mechanics:

- Eliminate surface water from the impoundment.
- Promote unsaturated conditions in the tailings with drainage provisions.
- Achieve dilatant conditions throughout the tailings deposit by compaction (Ellis, 2022).

05: *Any potential loss of life is an extreme event and design must respond accordingly*

If an operating company, regulatory agency, or independent third-party identifies any potential loss of life as a result of a tailings dam failure, the dam must be designed to withstand the Probable Maximum Flood, the largest flood that is theoretically possible at a given location, and the Maximum Credible Earthquake, which is the largest earthquake that is theoretically possible at a given location (Ellis, 2022).

Where the failure of a tailings dam would have no potential for the loss of human life, the facility must be designed to withstand a 10 000-year flood and a 10 000-year earthquake.

04: *Ban upstream dams at new mines and close existing upstream facilities*

Because of the demonstrated risk associated with upstream dam construction, upstream dams must not be built at any new facilities. Upstream construction is especially problematic in areas with moderate or high seismic risk, or in wet climate areas with net precipitation (more precipitation than evaporation), especially as weather events become increasingly severe with climate change (Ellis, 2022).

The structural zone of a filtered tailings stack must not be constructed on top of uncompacted or lightly compacted filtered tailings. If it is, it would be an upstream dam and must be prohibited.

03: *Ban new tailings facilities where inhabited areas are in the path of a tailings dam failure*

The most effective way to minimise risk to people is to prevent the construction of new tailings facilities where there is a population living or working in close proximity, downstream, or down gradient from the facility. Operating companies must not build infrastructure in which workers are likely to be present – offices, cafeterias, warehouses – in the zone of influence (Ellis, 2022).

The zone of influence is the “area that would be significantly affected in case of a [tailings facility] failure and should be categorised as a risk zone”. New tailings facilities must not be constructed if the operating company cannot ensure the safe and timely assisted evacuation of any population that lives in the zone of influence (Ellis, 2022).

02: *Consent of affected communities*

Consent must be achieved through an ongoing dialogue over the life of the mine for both proposed and existing facilities. The First Nations Mining and Energy Council states that “consent is simple – it is the right to say yes, the right to say no, or the right to say yes with conditions”.

Consent can be given or withheld at distinct stages of a project, including exploration. Operating companies must ensure the meaningful engagement, participation, and consent of all affected communities for any tailings facility (Ellis, 2022).

01: *Make safety the guiding principle in design, construction, operation, and closure*

Given the hazardous nature of mine tailings, the fundamental goal of tailings management must be to “ensure that public safety, environmental safety, and economic safety are the determinative factors in governing what tailings disposal system will be implemented”.

Specifically, tailings management must ensure zero harm to people and zero tolerance for human fatalities. We must recognise that mining is a fundamentally destructive industry. A goal of zero harm to the environment is impossible to achieve. Nevertheless, operating companies must do all they can to minimise environmental harm everywhere. In particular, governance must limit any environmental harm that inevitably occurs within the mining site. Safety must be evaluated by independent third parties, such as an Independent Tailings Review Board, to ensure that cost reduction is not prioritised at the expense of people and the environment. Operating companies must document that, at all points of design, operation, closure, and post-closure of tailings facilities, protecting human and environmental health and safety is the primary concern (Ellis, 2022).

This report shows that in the case of Jagersfontein most of these ten absolute requirements were simply ignored (Ellis, 2022).

7. What went wrong with the Jagersfontein tailings dam? Why did it break?

In 1949, A.T. Moir contributed a part to a book titled *Bold Metallurgy on the Witwatersrand, Part 4 – Slime Residue Disposal Dams*. In 1972, R.J. Adamson edited a follow-up book, *Gold Metallurgy in South Africa*, in which best practice in tailings (slimes or slurry) management was reemphasised. Despite the gap in time, both authors concurred in their findings, which can be summarised as follows:

- 1) Tailings should not be constructed on wetlands.
- 2) Tailings should not be constructed on slopes.
- 3) Tailings should not be constructed in proximity of towns, townships, or critical infrastructure such as electricity supply networks and substations, roads, and bridges. There should be an exclusion zone of between 500 m and 1 500 m.
- 4) Townships, housing, and public amenities should not be constructed in close proximity or downstream or downhill from tailings.
- 5) Tailings should not be constructed near public institutions such as schools and hospitals or government offices.
- 6) Tailings should not pose a threat of seepage or flooding into otherwise unpolluted surface water or groundwater.
- 7) Attention should be paid to the gradient of tailings dams. Too steep tailing gradients pose a threat of collapse.
- 8) Attention should be paid to the height of tailings dams. Tailings dams that are too high pose a threat of potential collapse.
- 9) Attention should be paid to the outer retaining walls of tailings. These should be firm, strong, and dry.
- 10) Attention should be paid to dust mitigation from tailings as most tailings contain arsenic and silica, and in most diamond mines it contains asbestos. Therefore, tailings should be vegetated to not only contain windblown dust but also to bind and strengthen the tailings.
- 11) All tailings should be fenced, sign-posted and secured. There should be no unauthorised public access to tailings.

Based on both experience and on research by the Council for Scientific and Industrial Research, a Code of Practice has been drawn up by the Chamber of Mines of South Africa as a guide to mining companies for the construction of slimes dams and the condition in which they should be left at the time the mine ceases operations. In addition, the Chamber of Mines has established a Vegetation Unit whose function is to establish vegetation on the tops and sides of disused (tailings) dams to prevent erosion by either wind or rain (Adamson, 1972:153).

Sadly, the tailings at Jagersfontein and most tailings in South Africa, no longer comply with the above prescripts and the current Mining Council which replaced the Chamber of Mines no longer has a tailings vegetation unit. The rest of this report demonstrates how the Jagersfontein operation failed to comply with the above requirements for safe tailings.

7.1 Finding 1

Tailings should not be constructed on wetlands

- a) Tailings will pollute the surface water and groundwater if constructed on wetlands.
- b) The retention walls of tailings will be weakened by a wet base.

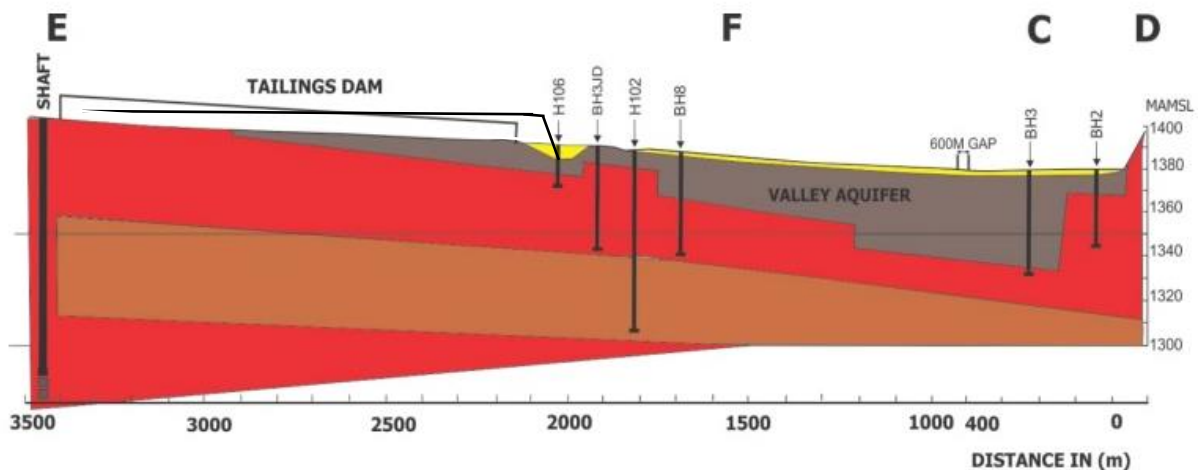


Figure 3 South-west to north-east cross-section of the Jagersfontein tailings (Adapted from a desk study by Colliston, 2021)

Figure 3 shows that the Jagersfontein tailings lies directly on top of the shallow Valley aquifer. The aquifer and water table surfaces are exactly underneath the highest and therefore most stressed/pressured northern retaining wall of the tailings. It was thus not a matter of if the tailings would break, but of when.

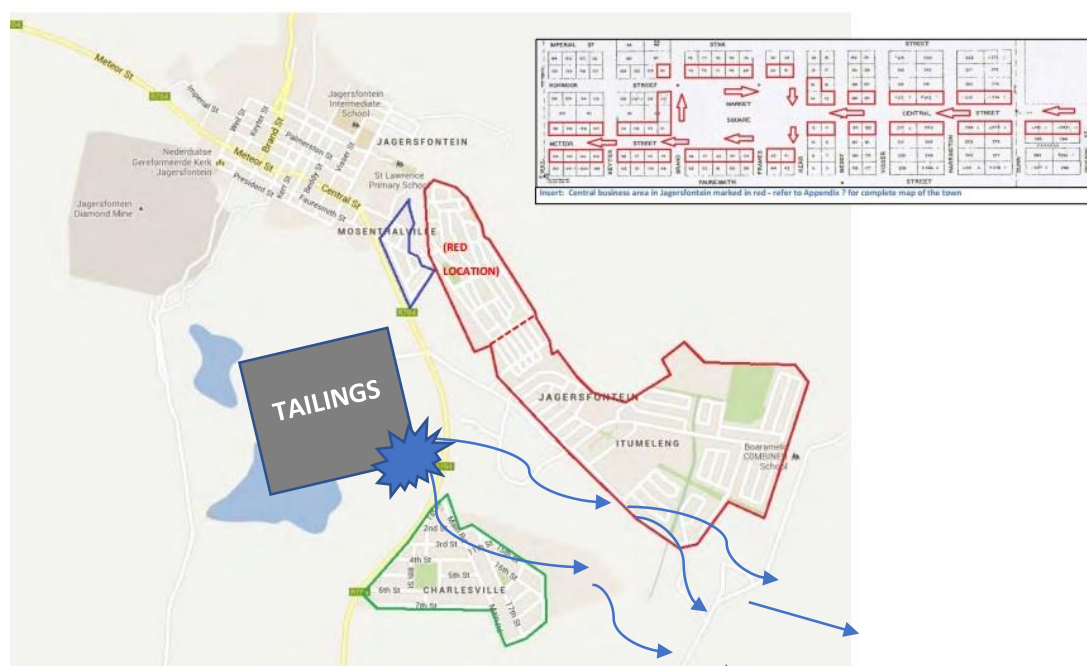


Figure 4 Breach and direction of the flow of the slurry on the impacted sections of Charlesville and Itumeleng (Adapted from Philip, 2014)

7.2 Finding 2

Tailings should not be constructed on slopes

The Jagersfontein tailings, as shown in Photo 3, are constructed on a slope. The speed and power of the surge were in part determined by the slope. Typically, of apartheid urban planning and space allocation, the former white town of Jagersfontein was constructed above the mining operation and its tailings. The black townships of Itumeleng and Charlesville were constructed downhill and downwind of the tailings below the steepest gradients of the tailings on its south-eastern and north-western corners. The south-eastern corner of the tailings dam broke and rushed down the valley, sweeping away parts of Charlesville. Six homes were wiped away and numerous others damaged. Casualties and injuries happened before the surge turned up into the opposite side of the valley hitting parts of Itumeleng and causing massive damage to homes there. Photo 3 shows the slope, the gradient of the tailings and the location of the two townships from a vantage point to the north.



Photo 3 Slope, gradient of tailings and location of the two townships from a vantage point to the north
(Adapted from Google Maps)



Photo 4 Only thing left of the houses in the front of the photo are their foundations, Charlesville (Photo credit Brown Motsau and David van Wyk)



Photo 5 Many of the low-income residents of Charlesville lost cars, furniture, homes and loved ones (Photo credit Brown Motsau and David van Wyk)

7.3 Finding 3 and 4

Tailings should not be constructed near towns, townships, or critical infrastructure such as electricity supply networks and substations, roads, and bridges



Photo 6 Remains of the electricity substation of Jagersfontein (Photo credit David van Wyk and Brown Motsau)

When the tailings broke, it swept away the electricity substation feeding the town, swamped the sewage works and halted water, apart from sweeping across the R704 in three separate places. Typical of apartheid urban planning and space allocation, the former white town of Jagersfontein was constructed above the mining operation and its tailings, while the black townships of Itumeleng and Charlesville were constructed downhill and downwind of the tailings below the steepest gradients of the tailings on its north-eastern and north-western corners.



Photo 7 Sewage infrastructure in some private homes and in the municipal infrastructure was swept away (Photo credit Brown Motsau and David van Wyk)



Photo 8 Slurry swept 792 m wide across the R704
(Photo credit: Brown Motsau and David van Wyk)

7.4 Finding 5

Tailings should not be constructed near public institutions such as schools and hospitals or government offices; housing should not be near tailings

The offices of the South African Social Security Agency (SASSA) in Charlesville came close to disaster, as did some schools in Itumeleng. The R704 provincial road linking Jagersfontein to Bloemfontein is below the tailings and less than 100 m from it. The nearest houses in Charlesville are less than 250 m away from it. The Bench Marks Foundation has long called for exclusion zones of between 500 and 1 500 m around tailings.

7.5 Finding 6

Tailings should not pose a threat of seepage or flooding into otherwise unpolluted surface water or groundwater.

Figure 5 shows that the tailings dam was built on top of a shallow aquifer. Several catchments also flowed in directly behind the tailings, increasing its liquidity and the pressure on its northern wall above the communities of Charlesville and Itumeleng.



Figure 5 Blue arrows showing catchments flowing towards and converging exactly where the tailings are located (Turn 180)

The slurry surge washed downstream and entirely drowned the Vlakfontein farm. The media reported that the farmer lost 90% of his sheep. The damage to his grazing is irreparable. The surge eventually ended up in the Proses River, ten kilometres downstream from Jagersfontein. The Proses River feeds into the Vaal River before it merges with the Xhariep River. Locals reported dead fish along the banks of the river.



*Photo 9 Cars swept away by the tailings surge as it edged through Itumeleng
(Photo credit Brown Motsau and David van Wyk)*



*Photo 10 Heavily impacted Proses River, some 10 km out of town
(Photo credit Brown Motsau and David van Wyk)*



*Photo 11 Proses River, the fish leapt out onto the banks to escape the tailings mud
(Photo Credit David van Wyk and Brown Motsau)*

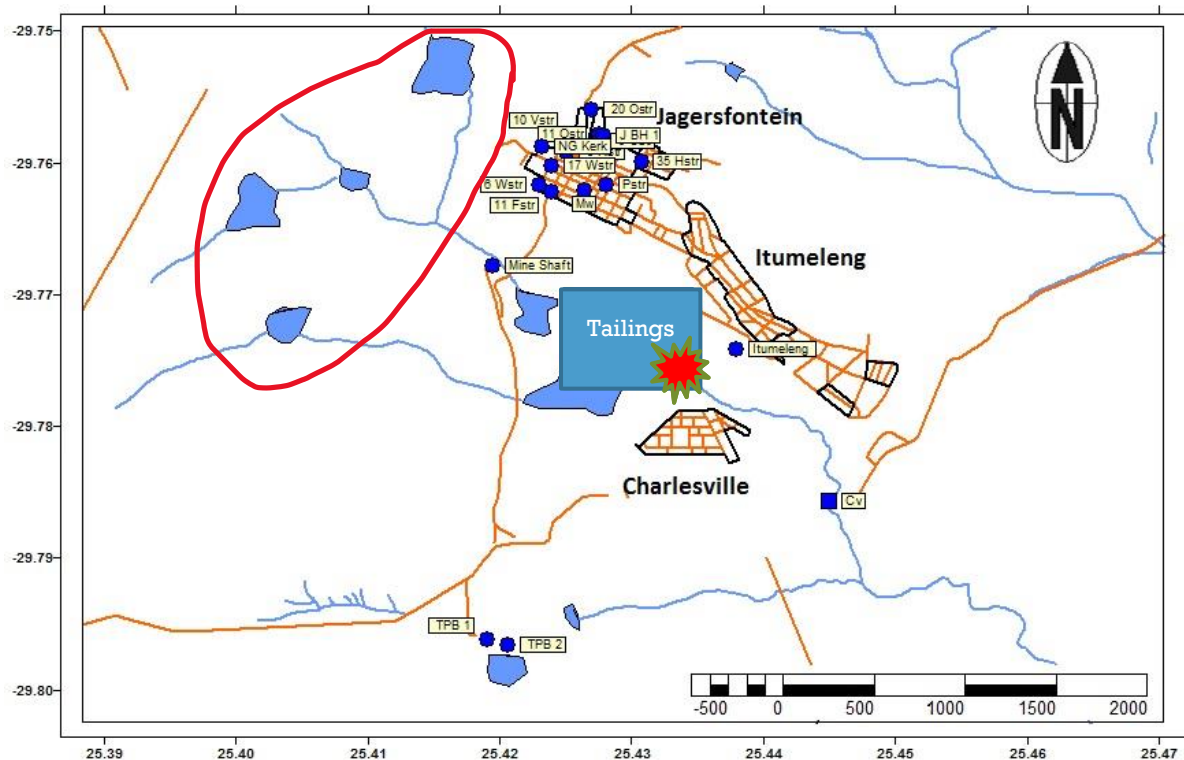


Figure 6 River catchments converged where the tailings is located.

Note the upstream dams from the tailings indicating very poor planning, environmental impact assessment and environmental management plan by the mine, and absolute failure by the regulator (Adapted from Hoon, 2013)

7.6 Findings 7 and 8

Attention should be paid to the gradient of tailings dams. Too steep tailings gradients pose a threat of collapse. Attention should be paid to the height of tailings dams. Tailings dams that are too high pose a threat of potential collapse.

According to informants in the communities of Charlesville and Itumeleng, they complained about the height and gradient of the tailings, "... but they would not listen to us. They simply ignored us." The DMRE quoted in newspaper reports saying that they have instructed the mine to stop operating two years ago. The DMRE also claims that they could not inspect the tailings because of a court order by De Beers, preventing them from accessing the tailings. Also, see Findings 1 and 2 above.

7.7 Finding 9

Attention should be paid to the outer retaining walls of tailings. These should be firm, strong, and dry.

Built on top of a shallow aquifer and a wetland with very steep retaining walls and on a slope, it is clear that the dryness, firmness, and strength of the northern wall of the tailings would be compromised.

7.8 Finding 10

Attention should be paid to dust mitigation from tailings as most tailings contain arsenic and silica, and in many diamond mines probably asbestos. Therefore, tailings should be vegetated to not only contain wind-blown dust but also to bind and strengthen the tailings.

There is absolutely no indication that there was ever any attempt to vegetate the tailings. Residents in Charlesville and Itumeleng indicated that they suffer from coughing and respiratory problems. The researchers took water and sludge samples for laboratory testing to determine if the tailings contain arsenic, silica or asbestos.

G.J. Hoon of Eko Environmental produced a report in 2013, *An impact assessment of the diamond recovery operation at Jagersfontein on surface and groundwater resources*, indicating high levels of arsenic in the natural water in and around the mine. The report also references the use of semi-treated sewage water in the diamond washing process. Water and tailings waste impacted by the operation would have flooded in the slurry wave that washed down, skirting the edges of Charlesville and Itumeleng on 11 September 2022. This long-term impact is still not clear.

8. Immediate official responses to the disaster

8.1 The response of the mining company

The first email response from the company Stargems from Dubai, which bought Johann Rupert's shares, read: "A full due diligence was conducted prior to this acquisition showing that the assets, including the dam were safe and secure", by a promise to "donate" R20 million to the impacted communities (Njinji, 2022). Clearly, the due diligence must have been very shoddy. Twenty million rands will not afford the price of one upmarket house in the leafy suburbs of Johannesburg or Cape Town. The Chamber of Mines offered another fifty million rands, and combined, these figures will not nearly repair the damage caused.

The following day, the legal compliance officer for Jagersfontein Developments (Pty) Ltd said on Tuesday afternoon that "the company would take full responsibility and accept liability following the collapse of a mining wall dam in the town on Sunday". "I am not going to refer to this as a mine, but it is a processing facility. The processing facility must accept liability that comes with the operations and with the break of the mining wall dam collapse in the town", Marius de Villiers said following a meeting with Mineral Resources Minister, Gwede Mantashe, on Tuesday. De Villiers added that the company had made R20 million available for disaster relief, including food parcels and temporary housing for displaced residents (Pijoos, 2022).

This creates the impression that no mining operations was going on at the mine, which is misleading as the old tailings were being re-mined. The sludge from the process landed on the ever-growing and overloaded tailings facility that overshadowed the impacted Itumeleng township and Charlesville. The Bench Marks research team interviewed employees of the mine, including some who worked at the pump station that pumped the slurry into the tailings facility. Not only did these employees confirmed that sludge was being pumped but they alleged that the volumes pumped ultimately led to the overload and the collapse of the tailings.

The managers met with the minister, but ten days after the disaster still failed to meet with the distressed impacted communities. The temporary housing for those whose houses were destroyed and washed away took the form of accommodation resembling a concentration camp some 120 km away on the N1 national road between Bloemfontein and Kroonstad, as far away from the media as possible. Community members feared that what was left of their houses and belongings in Charlesville and Itumeleng would be further plundered. They also felt cut off from family members and the rest of the community that remained behind.

The Mayor of Kopanong, in conversations with the researchers, expressed his frustration about all the meetings he has had to attend, “now is not the time for meetings, now is the time for repair, reconstruction and development”. He was also concerned about the mining company’s lack of response and engagement with the affected communities.

Some days after the disaster, a truck arrived daily and dumped a load of oranges on the pavement next to the road in Charlesville, with no attempt to package or distribute the oranges in an orderly manner. The researchers also found no evidence of food parcels distributed in the community. Community members expressed their disgust at this, “These oranges are from Johan Rupert’s orchards”. claimed an old female pensioner, “these people have no respect for us, they throw food on the floor as if we are animals”.



Photo 12 Oranges dumped on the pavement of Charlesville (Photo credit David van Wyk)

The research team phoned the compliance officer for a company response, his number was relayed to his secretary. She attempted to divert the call directly to him, but he failed to pick up the call. She then took the email address of the lead researcher and promised that he would respond in writing. He never did. The managers were noticeable by their absence from community meetings held by the state from the level of the president, right down to the level of the level of the mayor.

8.2 The state

On 13 September 2022, the State President visited the disaster area, and the following headline appeared, *'We won't abandon you' – Ramaphosa stunned by Jagersfontein damage, promises to provide support*. This is a community in which the mining operation employed less than two hundred people. One of our informants summed it up, "We had a disaster here long before the tailings dam broke. Our town is long dead. When these mine owners came in 2009, they promised to create jobs and revive our economy. Nothing like that ever happened." The president is repeatedly shocked, dismayed, surprised by the realities of South Africa when he ventures out of the state and corporate protected bubble he exists in.

On 12 September 2022, prior to the president's visit, the national minister of Minerals and Energy, Gwede Mantashe, visited Jagersfontein and had a meeting with the mine managers. It would seem as if they convinced him that they were only sorting diamonds there and that the tailings were really the responsibility of De Beers who mined there fifty years prior, with no explanation of how the tailings got excessively wet and overloaded, or of how the tailings grew exponentially in height and size over the thirteen years since 2009.

Mantashe informed the National Council of Provinces that this was not an operational mine. He also claimed that a De Beers High Court case in 2007 prevented his department from inspecting tailings (Evans & Dlangamandla, 2022). The researchers learned this when Tebogo Modise, Chair of the National Council of Provinces' Minerals and Energy Portfolio Committee, told an ENCA journalist on 22 September during a visit that the DMRE told her that the mine was not operational (Landu, 2022).

On Tuesday 27 September, the government announced that it will build houses for those whose houses were destroyed in the disaster. The immediate questions which arise are:

- Why is the cost of the disaster externalised to the taxpayer.
- Why are the owners not forced to build those houses?
- Why is the 'polluter pays principle' not applied?
- Is anyone going to be prosecuted for this entirely avoidable mess?

On Tuesday 27 September, a distraught community member contacted the researchers telephonically:

"Ntate David, they told us that we are going to be dumped back in Jagersfontein today."

"Did you get medical attention for your injured hand?"

"No, Ntate David, they promised a doctor yesterday, but no one came."

"Why are you worried about going back now?"

"We are worried because some of us don't have houses to go back to. We will also not have food to feed ourselves. Many of us lost all our clothes. We are worried that if the state dumps us, they will forget about us again. They separated my pregnant wife from my family, I have not seen her since coming here, I am worried about her. We are afraid for our children and the mud. We are afraid that the mine will victimise us for speaking to the media. There is still no electricity and water in our community."

The Mayor of Kopanong, Mr Xolani Tseletsele, in conversations with the researchers, expressed his frustration about all the meetings he has had to attend. “Now is not the time for meetings, now is the time for repair, reconstruction and development”, he said. He was also concerned about the lack of response and engagement from the mining company with the affected communities. He was also concerned that mining was a national competency and that there was little that local and provincial government could do to call mining companies to account. However, the environmental mess left behind are local and provincial competencies. This is perhaps why mining companies so glibly abandon mines or fail to comply with regulations and laws relating to pollution and the destruction of the environment.



Photo 13 Mayoral meeting in Itumeleng following the disaster (Photo credit David van Wyk)

On Saturday, 1 October 2022, community members began complaining about the dust emanating from the drying tailings waste that surged down the valley, indicating widespread coughing and nosebleeds among children. The impact is far from over. Heavy summer storms in October, November and December could also see the rest of the tailings dam crumble and wash down the river.

9. Conclusions

We can safely make the following conclusions:

- The DMRE failed in its regulatory oversight. The DMRE keenly promotes and grants new mining licenses, but dismally fails in its regulatory and oversight role.
- The environmental consultants responsible for the environmental impact assessments of the mine and the tailings dismally failed to take common sense and best practice into account, while the DMRE failed to scrutinise the environmental impact assessment and the environmental management plans submitted by the mine for obvious oversights and weaknesses.
- The mine managers failed to heed the warnings of the community and of employees about the imminent collapse of the tailings dam.

According to a community member interviewed, the police in Jagersfontein lack impartiality in that they suppressed community protests that attempted to bring the dangers posed by the tailings to the attention of management and the authorities:

- The mine clearly had no disaster management plan.
- The mine failed to engage with the community before and after the disaster.
- The fact that mining is a national competence according to the Constitution of the Republic of South Africa, 1996, while the environment is a local responsibility, is incongruent and a recipe for disaster.
- The mine owners, management and the National Department of Mineral Resources and Energy should be held criminally liable.

10. Recommendations

10.1 For the mining company

- a) Hold those accountable that are responsible for the non-compliance of the tailings with the law, regulations and global best practice.
- b) Take full responsibility for the death and destruction that resulted from the disaster and compensate those affected accordingly.
- c) Completely remove the tailings from its current location.
- d) Charge the compliance officer and the consultants who drew up the environmental impact assessment, the environmental management plan and the construction and oversight of the tailings with gross negligence and failure to disclose the obvious problems with regard to the location, construction, and management of the tailings.
- e) Demand that the consultants be deregistered as accredited consultants in environmental management and planning.

10.2 For national government

- a) Dismiss the officials in the DMRE, the Department of the Environment, and the Department of Water Affairs who approved the environmental impact assessment and environmental management plan for this mining operation.
- b) Fully capacitate the division of the mining inspectorate and ensure regular inspections of tailings and other hazardous mine waste management activities.
- c) Apply the polluter pays principle and force the company involved to pay for the damages caused through its negligence.
- d) Amend the regulatory requirements to include community consultation throughout the life of the mine and community participation in all mine disaster management units, assessments and planning, environmental management impact assessments, planning and compliance oversight and adherence.

- e) Amend the Minerals Petroleum Resource Development Act (MPRDA) to prohibit mining companies from selling non-profitable mines, instead of closing and properly rehabilitating such mines.
- f) Amend the MPRDA to make a 1 500 meter exclusion zone around mining operations compulsory.
- g) Amend the MPRDA to make applications for mining licenses in heavily populated areas impossible.
- h) Amend the MPRDA to make the construction of housing, public infrastructure, and roads below tailings illegal.

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