the federation for a sustainable environment

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PRELIMINARY COMMENTS ON MINE WASTE SOLUTIONS (PTY) LTD'S KAREERAND TAILINGS STORAGE FACILITY EXPANSION PROJECT'S DRAFT SCOPING REPORT

The following comments are submitted on behalf of the Federation for Sustainable Environment (FSE). The FSE is a federation of community based civil society organisations committed to the realisation of the constitutional right to an environment that is not harmful to health or well-being, and to having the environment sustainably managed and protected for future generations. Their mission is specifically focussed on addressing the adverse impacts of mining and industrial activities on the lives and livelihoods of vulnerable and disadvantaged communities who live and work near South Africa's mines and industries.

We respectfully request that our comments be attached to the Comments and Response Report in toto and not abridged. We furthermore request that the Environmental Assessment Practitioner (EAP) responds to our comments in a meaningful and intelligent manner and not merely "*noted*" and that the Applicant will recognise and incorporate the contribution of the FSE into the scoping-, environmental impact assessment and environmental management reports. In this regard we refer to Judge Spilg's judgement in the Uzani Environmental Advocacy v BP Southern Africa (Pty) Ltd case regarding the value of civil society in the light of dysfunctional law enforcement agencies, namely:

"NEMA not only requires a transparent administration but recognised the contribution that can be made to the protection of the environment by a vigilant and committed public which has most to lose….Securing protection is therefore no longer the exclusive preserve of those engaged in these activities, nor of an opaque administration or an under-capacitated and potentially inhibited law enforcement agency which cannot claim the number of successful convictions one would have expected despite clear evidence of historic degradation to our environment."

We furthermore express the hope that since AngloGold Ashanti is a global gold mining company and a founding member of the International Council on Mining and Metals (ICMM) the environmental performance of its Mine Waste Solutions' (MWS) operations will be aligned to the ICMM's principles[1] and its publicly stated environmental values, namely its commitment to *"continually improve our processes in order to prevent pollution, minimise waste, increase our carbon efficiency and make efficient use of natural resources. We will develop innovative solutions to mitigate environmental and climate risk*s" and that the EIA/EMPR will reflect this.

RECLAMATION OPERATIONS

We refer to page 47 of the Draft Scoping Report which discusses the sustainable development considerations of the proposed project. It states that "*sustainability of tailings deposition can be seen in two contexts by MWS.*" We refer to the second perspective, namely "*the second perspective is from the vantage point of the community… A new mega tailings facility therefore represents an opportunity for the region to bring about a significant improvement by removing all the current diffuse sources of potential contamination and consolidating them into a single facility capable of storing the orphan tailings facilities dotted around the area.*"

This argument in support of the proposed project can only be supported if the footprints of the reclaimed historic tailings storage facilities (TSFs) are rehabilitated to a sustainable and agreed upon land use with sustainable livelihood opportunities for the community.

[1] Apply ethical business practices and sound systems of corporate governance and transparency to support sustainable development; Integrate sustainable development in corporate strategy and decision-making processes; Respect human rights and the interests, cultures, customs and values of employees and communities affected by our activities; Implement effective risk-management strategies and systems based on sound science and which account for stakeholder perceptions of risks; Pursue continual improvement in health and safety performance with the ultimate goal of zero harm; Pursue continual improvement in environmental performance issues, such as water stewardship, energy use and climate change; Contribute to the conservation of biodiversity and integrated approaches to landuse planning; Facilitate and support the knowledge-base and systems for responsible design, use, re-use, recycling and disposal of products containing metals and minerals; Pursue continual improvement in social performance and contribute to the social, economic and institutional development of host countries and communities; and Proactively engage key stakeholders on sustainable development challenges and opportunities in an open and transparent manner.

Our statement in this regard finds support in the Council of Geoscience's recommendations, namely:

a. *"Any new application to exploit mining residues should only be approved if it involves the removal of an entire residue deposit and the rehabilitation of the remaining footprint.*

b. *"The past practice of granting rights and authorization for the reprocessing of individual residue deposits may need to be reviewed insofar as it allows the selective extraction of value from portions of a site without ploughing some of that value back into the rehabilitation of the entire mining area."*

We consider (advised by the findings of academic research) residential townships, edible crop production and livestock grazing to be high risk land uses for TSFs, TSF footprints and areas within the aqueous or aerial zone of influence of TSFs in the Stilfontein area[2].

HISTORICAL PERFORMANCE

On page 1 of the DSR we are informed that "*once a TSF has been completely recovered, it is cleaned-up and rehabilitated.*"

Notwithstanding the above aspirational statement by the Environmental Assessment Practitioner (EAP) we express little or no confidence that the above-mentioned initiative will be implemented in view of AngloGold Ashanti's MWS's historical performance.

In substantiation:

Radioactive and toxic spillages from AngloGold Ashanti's Mine Waste Solutions operations have been recorded since Anglo Ashanti took ownership of Mine Waste Solutions on the 31st of July, 2012. Please see subjoined photographs of the spillages which occurred during 2012 and 2013.

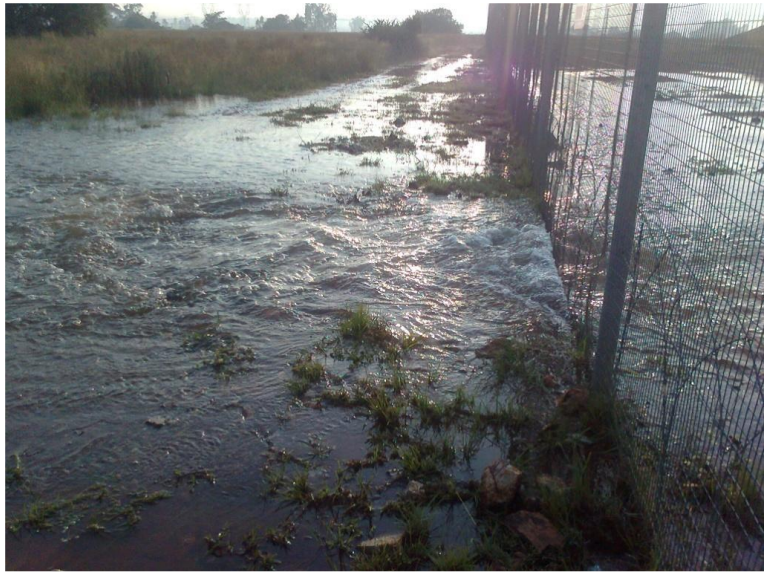
[2] MW Sutton & IM Weiersbye. South African Legislation Pertinent to Gold Mine Closure and Residual Risk. Mine Closure 2007. A. Fourie, M. Tibbett and j. Wiertz (eds).

Toxic and radioactive spillages from Mine Waste Solutions reclamation operations on Mr Flip Jooste's farmland

Toxic and radioactive spillages from Mine Waste Solutions reclamation operations on Mr Flip Jooste's farmland in close proximity to the Koekemoerspruit, a tributary of the Vaal River

Failure of Tailings Storage Facility's walls with resultant spillages of toxic and radioactive slurry on farmland and into the Koekemoerspruit

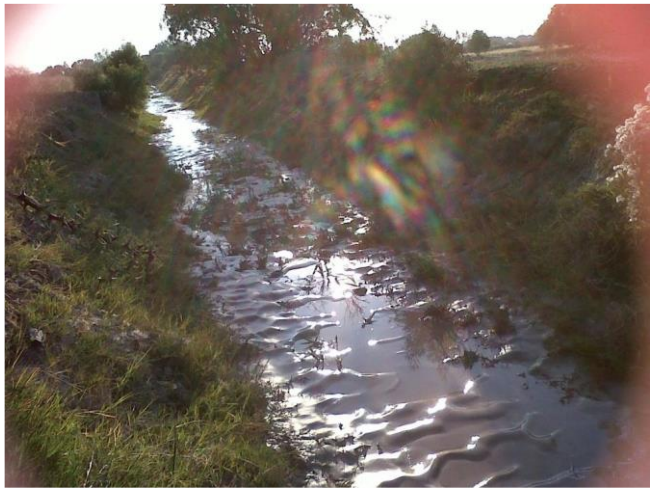
Radioactive and toxic spillages which occurred on the 26th of December 2012



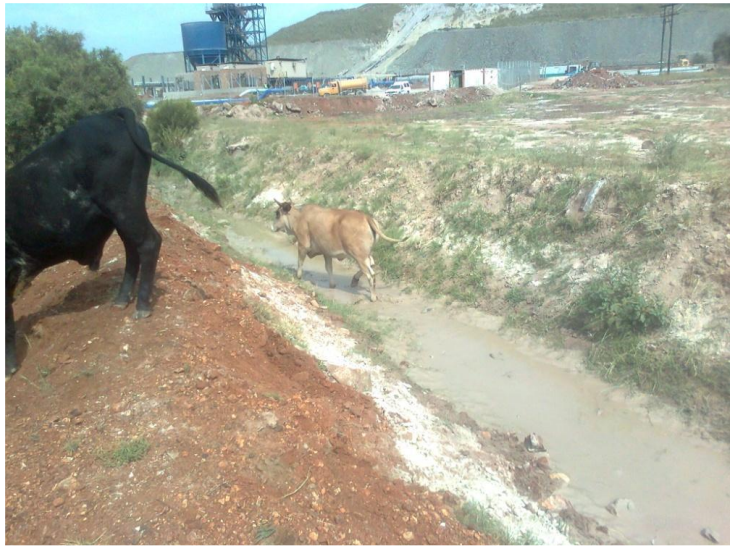
Midway Dam, containing contaminated process water overflowing its walls.

Toxic and radioactive spillages from Pump Station No 2.

Overflow of toxic and radioactive water from Pump Station No 2



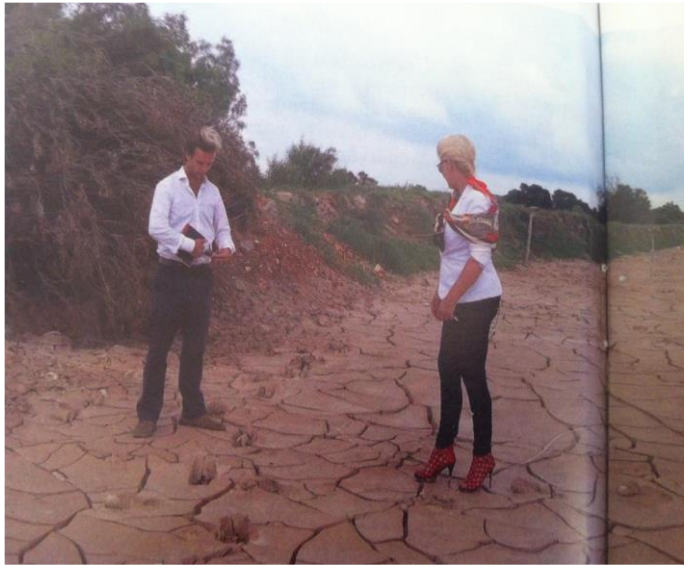
Uraniferous slurry flowing in an unlined trench on dolomitic land



Radioactive and toxic slurry spillage with cattle grazing and drinking the contaminated water

Uraniferous slurry on farmland

On the 30th of October 2012 a containment wall collapsed causing toxic and radioactive contamination of farmland



Central Chinese Station and other news media documented the radioactive and toxic spillages.

Pollution of the Koekemoerspruit by Mine Waste Solutions' operations as photographed on the 12th of September, 2013.

The FSE's whistleblowing on the matter resulted in the purchase of the contaminated land from affected landowners. We wish to advise that the purchase of contaminated land of the above parties does not exonerate the Applicant from its responsibilities and liabilities in terms of the National Environmental Management Act, 107 of 1998 (NEMA), the Mineral and Petroleum Resources Development Act, 28 of 2002 (MPRDA) and its Regulations; the National Water Act, 36 of 1998 (NWA) and its Regulations, the National Nuclear Regulations Act, 47 of 1999 (NNRA) namely to remedy the effects of the pollution; and remedy the effects of any disturbance to the bed and banks of a watercourse (NWA, s19 subsection (2)

(e) and (f)); to contain or prevent the movement of pollutants or the causant of degradation; eliminate any source of the pollution or degradation; or remedy the effects of the pollution or degradation (NEMA, s28(3)(d)(e)(f)).

The application for the Kareerand Tailings Storage Facility Expansion Project should not be approved unless evidence can be adduced that the above-mentioned contaminated sites were rehabilitated to an agreed upon sustainable land use in terms of 2014 EIA Regulations (Chapter 5) which directs that the environment must be rehabilitated to "*its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development.*"

Since the closure of a mining operation must incorporate a process which must start at the commencement of the operations and continue throughout the life of the operations, we request that the Applicant provides us with the specific objectives which the Applicant had undertaken in consultation with interested and affected parties, to rehabilitate the above-mentioned degraded and polluted farmland and water sources. Section 28 (1) of the National Environmental Management Act (107 of 1998) (NEMA) directs that "*every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures ..to rectify such pollution or degradation of the environment*". Measures such as sloping, grassing.re-vegetation, phytoremediation, woodlands, wilderness status, stockpiling for road building material, etc. cannot be regarded as reasonable measures for remediation and are at best measures for interim stabilisation unless it can be demonstrated that the implementation of these measures will facilitate the agreed sustainable future land use.

It should furthermore not be overlooked that during reclamation of the historic TSFs there is remobilisation of radioactive material and metal bound cyanides through the reprocessing activities[3]. The impacts of the remobilisation of these contaminants during the disturbance of the old tailings deposits must be assessed.

IMPACTS OF THE EXPANSION PROJECT ON THE INTEGRATED VAAL RIVER SYSTEM

The Draft Scoping Report informs us Option 4/7 was selected as the preferred site for the Kareerand TSF Expansion. Option 4 is leased from the community while Option 7 is located within the 500m buffer zone of the Vaal River (page 23 of the DSR). The Site of Option 4 is a greenfields site. Option 7 is located within the 500m buffer zone of the Vaal River.

[3] MW Sutton & IM Weiersbye. South African Legislation Pertinent to Gold Mine Closure and Residual Risk. Mine Closure 2007. A. Fourie, M. Tibbett and j. Wiertz (eds). p 96.

In the assessment of the impacts of the proposed expansion of the Kareerand TSF, the following factors must be considered namely:

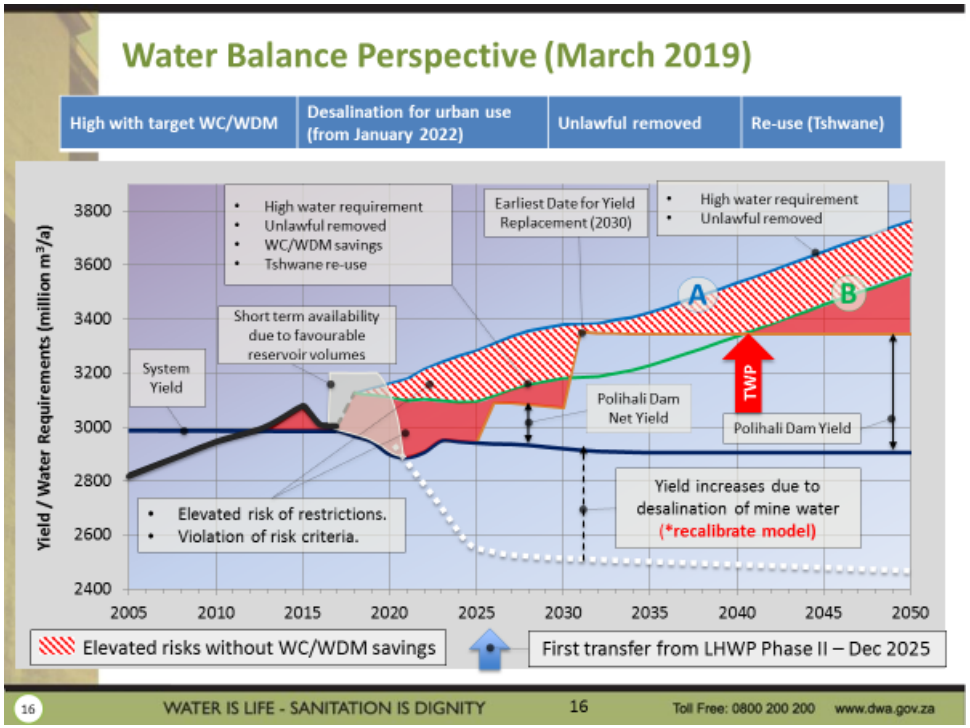
- According to the Department of Human settlements, Water and Sanitations River EcoStatus Monitoring Rogramme State of Rivers' Report (2017-2018) "*the Vaal River Management Area (WMA) had no sites in a good (better than C category) condition*".
- The project involves a Category A Mine in terms of the Department of Water and Sanitation's Mine Water Management Policy since it is acid producing. Category A Mines have a significant adverse impact potential.
- This is corroborated by the DSR on page 33 which confirms that "*elevated TDS and sulphate concentrations were observed within the direct vicinity of the Current Kareerand TSF"* and that some boreholes contain elevated manganese, iron, aluminium, etc.
- The geochemical data and analyses of the current Kareerand TSF suggest that the seepage from the existing unlined TSF falls within a sulphate concentration range of 1500 to 4 000 mg/l, which is significantly elevated and in non-compliance with the resource quality objectives of the Vaal River.
- The seepage volumes from the current Kareerand TSF according to the DSR (page 34) are in the order of 5000 to 7000M^3/day.

The associated contribution of acid mine water to the surface and groundwater in the area, as well as downstream on the Vaal River is likely to be considerable as the old tailings within the area are hydraulically mined using high-pressure water cannons.

The accumulative impact of the reclamation operations, the existing unlined Kareerand TSF and the contribution of the expanded TSF, notwithstanding the fact that it will be lined, on the salinity of the Vaal River may be significant and may exceed the environmental threshold.

In terms of the Reconciliation Strategy for the Integrated Vaal River System (Phases 2 & 3) the following facts must be taken into consideration in the assessment of the long term impacts of the existing Kareerand TSF and the expanded TSF upon the Vaal River System:

- The water security risks within the Integrated Vaal River System. Please see subjoined graph.



- Seepage from the existing Tailings Storage Facility will continue to find its way to the Vaal River.
- The elevated Total Dissolved Solid (TDS) concentrations in and below the Vaal Barrage remain to be of concern.
- Acid Mine Drainage contains the most concentrated salt stream.

Furthermore, it is common cause that:

- TSFs can never be maintained in a completely reducing environment hence the longterm risks of water pollution. While most mines recognise the fact that tailings dams generate acid mine drainage, it is generally and incorrectly assumed that the impact will decrease to acceptable levels when mining operations cease or within 3 to 5 years after mine closure. The assessment of long-term risks from tailings dams can at best be described as subjectively qualitative in nature.

In view of the above-mentioned facts the FSE requests that a proper quantitative assessment be conducted to include the long-term risks and the extent of the contamination plumes in the long term since latent impacts may take decades, or even centuries, to manifest themselves.

Specialist investigations should be done to identify the status of the geohydrological regime, the extent of contamination, preferential pathways and predictions regarding long – term migration, which must advise the mitigation and management options in the EMPR that specifically deal with the containment/rehabilitation of contaminated groundwater.

- Because of the hydrological interconnections between mines the application for the expansion of the Kareerand TSF cannot be considered in isolation. This calls for the development of a coherent and integrated closure planning process for the Klerksdorp-Orkney-Stilfontein-Hartebeestfontein (KOSH) area.
- The secondary source of contaminants that remain in the soil after historic TSFs have been reclaimed must be acknowledged and the impact on surface and groundwater assessed.

FINANCIAL PROVISION

In terms of National Environmental Management Act (107/1998): Regulations pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations *"an applicant or holder of right or permit must make financial provision for—*

(c) remediation and management of latent or residual environmental impacts which may become known in future, including the pumping and treatment of polluted or extraneous water."

We hereby request that the Applicant in its Final Scoping Report assesses its latent or residual environmental impacts and in its determination of its financial provision consider the following risks:

- The near certainty of contaminated water, which will require some form of decontamination treatment, decanting from closed underground mines, or from lower-lying interconnected neighbouring mines.[4]

[4] Pilson, R., Van Rensbug, H.L. and Williams, C.J. (2000). An economic and technical evaluation of regional treatment options for point source gold mine effluents entering the Vaal barrage catchment. Water Research Commission Report No. 800/1/00, Pretoria. www.wrc.org.za; Hodgson, F.D.I., Usher, B.H., Scott, R., Zeelie, S. Cruywgen, L.M. and De Necker, E (2001). Prediction techniques and preventative measures relating to the post-operational impact of underground mines on the quality and quantity of groundwater resources. Water Research Commission Report No. 699/1/01/ www.wrc.org.za

- The near certainty of sulphate, chloride, metal and naturally occurring radioactive material (NORM) and technologically enhanced naturally occurring radioactive material (TENORM) contamination of soils and sediments from its existing Kareerand tailings storage facility (TSF), tailings spillages and plant discharges, and the potential for contamination of downstream / downwind soils and sediments.[5]
- The potential for salt, sulphate, chloride, metal and TENORM contamination of crop soils irrigated with contaminated surface water or contaminated groundwater.[6]
- The concomitant loss of genetic/biodiversity and potentially ecosystem goods and services on disturbed, fragmented or polluted properties.[7]
- The potential for bioaccumulation of some metals and TENORMs by flora and fauna[8].
- The potential for acute and latent toxicity impacts of bioaccumulated pollutants on humans and the potential for radioactivity impacts from TNORMs on humans[9].
- The potential for human disease as a result of exposure to windblown dust from the existing and expanded Kareerand TSF and reclamation operations[10].

DUST

In terms of the Draft Scoping Report we are informed that:

- Only dustfall rates measured near the project site were available for analysis (page 41).

[5] Witkowski, E.T.F. and Weiersbye, I.M. (1998). Variation in geochemistry and soil features of South African gold slimes dams and adjacent soils. Plant Ecology & Conservation Series No. 6, University of the Witwatersrand Report to the Anglo-American Corporation, 111p; Rösner, T. and Van Schalkwyk, A (2000) Environmental impacts of gold mine tailings footprints in the Johannesburg region. South African Bulletin for Engineering & Geology of the Environment, p 59, pp. 137-148; Mphephu,N.F., Viljoen,M., Tutu, E., Cukrowska, E. and Govender, K. (2004). Mineralogy and geochemistry of mine tailings in relation to water pollution on the Central Rand, South Africa. In A.G. Pasamehmetoglu, A. Ozgenoglu and A.Y. Yesilay (eds). Environmental Issues and Waste Management in Energy and Mineral Production, pp 445-450; Tutu, H., Cukrowska, E.M., Govender, K., McCarthy, T.S., Viljoen, M. and Mphephu, N.F. (2004) Determination and modelling of geochemical speciation of uranium in the Central rand goldfield, South Africa. In A.G. Pasamehmetoglu, A., Ozgenoglu & A.Y. Yesilay (eds.) Environmental issues and waste Management in Energy and Mineral Production. pp. 439-444; Tutu, H., Cukrowska, E.M., Dohnal, V. and Havel, J. (2005). Application of artificial neural networks for classification of uranium distribution on the Central Rand goldfield, South Africa. Environmental Modeling & Assessment Vol. 10, pp. 143-152.

[6] MW Sutton & IM Weiersbye. South African Legislation Pertinent to Gold Mine Closure and Residual Risk. Mine Closure 2007. A. Fourie, M. Tibbett and j. Wiertz (eds). p 93.

[7] Ibid.

[8] Ibid.

[9] Ibid.

[10] Ibid.

- The current air quality in the study area is mostly influenced by farming activities, domestic fires, vehicle exhaust emissions and dust entrained by vehicles.

No reference is made to the dust fallout from the existing Kareerand TSF and its risks to human health (respiratory and cardiovascular diseases), the environment, wildlife and water*, which is surprising since it is well established in scientific literature that the dust from environmental exposure to tailings particulate matter (PM) through water, food and inhalation may present a significant risk for wildlife, ecosystems as well as for individuals living around mining areas, especially children, the elderly and individuals with existing health problems[11]. Epidemiologic studies have indicated that living near mining waste is a major risk factor for exposure to metals as a result of dust fallout.

* (Stormwater drainage systems, into which windblown dust from adjacent slimes dams is flushed by run-off from sealed surfaces are also likely to constitute a major source of potential water pollution. Based on (conservative) assumptions regarding the affected surface area and average deposition rates of dust from adjacent slimes dams, it was estimated that approx. 10 tons of (particle-bound) uranium per year are flushed by stormwater into receiving watercourses[12].)

The DSR informs us that:

- The final height of the existing and expanded facility will be 122 meters.
- The current TSF and the proposed expansion will store 837 tons of tailings.

The existing Kareerand TSF is the source of significant dust fallout according to testimonies and eyewitness accounts by mining affected communities. It can logically be inferred that the expanded facility will contribute significantly to the existing dust fallout. **Research found that fall-out - as deposition or nuisance dust - exceeds a 1000 m distance from the TSF source[13]. Because of the combined height of the existing TSF and expanded Kareerand TSF these distances can be expected to be much further.**

[11] Health and Safety Council. Adverse health impacts associated with dust emissions from gold mine tailings. Prof Mary Gulumian, Charlene Andraos, Prof Harold Annegarn, Prof Kuku Voyi. Research agency: National Institute for Occupational Health. Project number: SIM 14-08-01. Date: 15 Dec 2015 (Revised 7 February 2017)
[12] An Assessment of Sources, Pathways, Mechanisms and Risks of Current and Potential Future Pollution of Water and Sediments in Gold-Mining Areas of the Wonderfonteinspruit Catchment." Report, WRC, H Coetzee et al, Council for Geoscience. 2004. Report No 1214/1/06. 2006.
[13] A critical evaluation of the challenges facing dust management within gold mining regions of South Africa. JJ Martins 10948848. Mini-dissertation submitted in partial fulfilment of the requirements for the degree Magister in Environmental Management at the Potchefstroom Campus of the North-West University, May 2014.)

The Applicant and its EAP should, in its assessment, mitigation and management measures, recognise the significant challenges regarding dust management of gold TSFs. Research identified the following challenges[14]:

- monitoring networks;
- monitoring methods;
- deposition standards;
- financial provisions;
- technical skills and capacity;
- lack of specific dust management plans within air quality management plans;
- limited regulation and enforcement;
- limited information and participation of government,
- lack of participation of interested and affected parties as well as;
- lack of specialists' expertise.

It is common cause that dust fallout has a significant impact on human health. A large number of epidemiological studies have been conducted globally over the last two decades and associations between ambient particulate matter and excesses in daily mortality and morbidity were observed. Dust fallout furthermore has significant impacts on eco-systems and results in losses in crop and livestock productivity, and condition.

In view of the above-mentioned risks, **we call for a dust management plan** (from the commencement of the Project and not only after the standard is transgressed) and not merely a dust monitoring plan.

The 2019 proposed amendments to the 2013 National Dust Control Regulations require the use of windshields, tailored to allow for tolerance ranges for the bucket diameter (150mm ± 30mm); a minimum ratio of depth to diameter (1:2); a height of a sampler above ground (2m±0.2m uncertainty) and the method should allow for both wet and dry sampling (algae control – biocide). We would expect that the Applicant will comply with the above-mentioned requirements.

The FSE recommends the establishment of a community forum within Stilfontein/Kareerand area to report on and address exceedences because of the following identified weakness:

• Reliance on the air quality officer's action on dust sources

[14] Ibid.

• Averaging period of monitoring weakens quick response to short-term episodes/activities

• Approach not suitable to deal timeously to complaints (due to the 3 months of submission of a plan required)

• Implementation of control measures only after approval.

The findings and directives by the South African Human Rights Commission in terms of its Report on the National Hearing of the Underlying Socio-Economic Impacts of Mining Affected Communities to the DMR and the DEA also have relevance, namely:

"The DMR together with the DEA must jointly report on the measures taken to streamline the control of the cumulative air pollution impacts on mining operations. This report must outline the mechanisms that have been put in place for collation, verification and dissemination of information between stakeholders in relation to impacts reported and/or interventions undertaken in relation to air quality."

And,

• *"Overall the mining sector is riddled with challenges related to land, housing, water, the environment and the absence of sufficient participation mechanisms and access to information.*

• *"Non-compliance, the failure to monitor compliance, poor enforcement, and a severe lack of coordination amongst especially government stakeholders exacerbate the socio-economic challenges faced by mining-affected communities.*

• *"It is crucial that government ensures that communities are able to participate meaningfully in mining-related activities and influence decisions that detrimentally impact their enjoyment of constitutionally guaranteed rights and general well-being.*

• *"The State must do more to include communities in reporting and monitoring mechanisms."*

Of relevance too is the fact that the dust contains a wide spectrum of metals, in toxic concentrations as well and radioactive metals. We refer in this regard to the subjoined findings:

- *"The two major airborne risks will be due to airborne radon and windblown dust*[15].
- *"The major primary pathways by which contamination can enter the environment from a mine site are:*

[15] Radiometric Surveying in the Vicinity of Witwatersrand Gold Mines. H. Coetzee. Mine Closure 2008

- *the airborne pathway, where radon gas and windblown dust disperse outwards from mine sites[16]".*

- "T*hree main issues relating to MRAs located in Gauteng have been identified, namely:*
  - *air-quality, with particular reference to dust pollution from MRAs (including radioactive dust).*"[17]
- *"… significant radiation exposure can occur in the surroundings of mining legacies, due to:*
  - *Inhalation of Rn-222 daughter nuclides from radon emissions of desiccated water storage dams and slimes dams.*
  - *The inhalation of contaminated dust generated by wind erosion from these objects, and*
  - *The contamination of agricultural crop (pasture, vegetables) by the deposition of radioactive dust particles, which can cause considerable dose contributions via ingestion"[18].*

RADIOACTIVITY

We noticed in the Plan of Study for the EIA that there is reference to a radiation safety assessment (page 58 of the DSR). In this regard, we respond as follows:

It is well-established that:

- "*As a consequence of the uraniferous nature of the ore, Witwatersrand tailings and other mining residues often contain significantly elevated concentrations of uranium and its daughter radionuclides, with the decay series of U238 being dominant*".[19]
- "*The gold ores of the Witwatersrand contain appreciable concentrations of uranium and its radioactive progeny. Mining has resulted in the dispersal of radioactive material into the environment via windblown dust, waterborne sediment and the sorption and precipitation of radioactivity from water into sediment bodies*."[20]
- One of the *"major primary pathways by which contamination can enter the environment from a mine site* [is]*:*

[16] Land-Use after Mine Closure – Risk Assessment of Gold and Uranium Mine Residue Deposits on the Eastern Witwatersrand, South Africa. M. W. Sutton. Mine Closure. 2008

[17] GDARD: Feasibility Study on Reclamation of mine Residue Areas for Development Purposes: Phase II Strategy and Implementation Plan . 2011

[18] NNR Report – TR-RRD-07-0006 – "Radiological Impacts of the Mining Activities to the Public in the Wonderfonteinspruit Catchment Area." 12 July 2007

[19] Institute for Water Quality Studies, 1995; Institute for Water Quality Studies, 1999, Department of Water Affairs and Forestry, 2003. Radiometric Surveying in the Vicinity of Witwatersrand Gold Mines. H. Coetzee. Mine Closure. 2008.

[20] Department of Minerals and Energy (2008). Regional Mine Closure Strategy for the West Rand gold field.

- *the airborne pathway, where radon gas and windblown dust disperse outwards from mine site*s".[21]

- Two of the main issues relating to Mine Residue Areas (MRA) are:
  1) air-quality, with particular reference to dust pollution from MRAs (including radioactive dust);
  2) water-flux and water-quality, …AMD and the transport of radioactive materials associated with the exposed uranium ore[22]."

In assessing the radiation safety, it is necessary to determine the radiological exposure to the adjacent landowners, communities and occupiers of the land and to assess all exposure pathways, namely:

• Direct external gamma radiation. This is usually determined by:

- Performing a gamma survey using a sodium iodide detector on a grid over the proposed study area measuring the radiu-226 (Ra-226), radium-228 (Ra-228) and potassium-40 concentrations in the soil. This should consist of a stationary as well as continuous in-situ survey.
- Performing a dose rate survey at contact and 2 meter distance.

• Internal radiation through the inhalation and ingestion pathways – this is usually determined through the taking of soil and tailings samples for radiochemical analyses at an accredited laboratory.

• Exposure of radon. This should have been done by placing radon gas monitors at a number of representative positions (indoors and outdoors) around the community, landowners and occupiers of the land.

• A background reference site should have been chosen in the vicinity of the potentially affected parties but in an undisturbed zone. The information obtained should have be used to compare with the results obtained from the adjacent communities, landowners and occupiers of the land.

Furthermore, it is well established that the health risk posed by uranium is due to both radiotoxicity and the chemical toxicity of uranium. The chemical toxicity of the metal constitutes the primary environmental health hazard, with the radioactivity of uranium a secondary concern. The non-radiological health consequences from uranium exposure particularly with respect to kidney disease, are thoroughly documented and the long half-life (4.5 billion years) results in a low potential for radiation-induced cancer from uranium than from other decay products with much shorter half-lives including - thorium-230 - 70,000yrs, radium, 1,260 yrs., radon-222 - 3.8 days and four radon decay products decays within less than 1/2 hour of a radon decay.

[21] Land-Use after Mine Closure – Risk Assessment of Gold and Uranium Mine Residue Deposits on the Eastern Witwatersrand, South Africa. M. W. Sutton. Mine Closure. 2008

[22] GDARD: Feasibility Study on Reclamation of mine Residue Areas for Development Purposes: Phase II Strategy and Implementation Plan . 2011

The update of the toxicologic evidence[23] on uranium adds to the established findings regarding nephrotoxicity, genotoxicity, and developmental defects. Additional novel toxicologic findings, including some at the molecular level, are now emerging that raise the biological plausibility of adverse effects on the brain, on reproduction, including estrogenic effects, on gene expression, and on uranium metabolism. As much damage is irreversible, and possibly cumulative, present efforts must be vigorous to limit environmental uranium contamination and exposure.

It is therefore logical that the risk of both radioactive and chemical contamination be assessed and management measures proposed to address these risks.

In view of the above-mentioned facts, the FSE calls for a fully quantitative assessment of risk to the health of the adjacent communities as a result of the reclamation operations and the cumulative impacts from the existing Kareerand TSF and the proposed expansion. We furthermore call for a consideration of the National Nuclear Regulator's (NNR) position paper on the "*Remediation Requirements and Criteria for the remediation of land contaminated with radioactive material* " (PP0018) (September 2015) (attached) and the NNR's "*Plan for remediation of Contaminated Sites*" (PLN-SARA-15-012) in addressing the radiological risks (residual radioactivity) associated with the footprints of the reclaimed TSFs.

ECOLOGY AND WETLANDS

We request that the assessment of the project on the ecology and wetlands involves an assessment of the full hydrological cycle since the influence of seasonality on the detection of flora and fauna, and evaluation of biodiversity, ecosystem goods and services is well recognised worldwide.

SENSE OF PLACE

Since there are numerous nature reserves, national parks and potential tourism points of interests in the vicinity of the proposed TSF expansion (please refer to pate 51 of the DSR) **we request that the impacts (aesthetic and economic) on the sense of place be assessed based on the Guideline Document by Adv. Duard Barnard and the legal precedent which was established in the case of Director: Mineral Development Gauteng Region and another v. Save the Vaal Environment and others 1999 (2) SA 709 (SCA) at 715C** namely that constant noise, light, dust and water pollution resulting from mining activities may totally destroy the sense of place and the associated spiritual, aesthetic and therapeutic qualities associated with nature reserves, national parks and tourism attractions.

[23] Health Effects of Uranium: New Research Findings. Doug Brugge. Virginia Buchner. Department of Health and Community Medicine, Boston. The Weizmann Institute of Science, Rehovot, Israel.

REQUIREMENTS IN TERMS OF THE AMENDED MRDA REGULATIONS

On page 47 of the DSR we are informed that Khuma's population totalled 45 895 individuals, which totals approximately 10% of the total municipal population.

We hereby request that the Applicant in terms of the Amended MRDA Regulations consult with mining affected communities on the Social and Labour Plan (SLR) and thereafter publish the approved SLP in English and one other dominant official language commonly used within the mine community using the following avenues:

(i) Company website/s, local newspaper/s;

(ii) Hard copies of the approved Social and Labour Plan to be placed in local libraries, municipal offices, traditional authority offices, company /mine offices; and

(iii) Announcements may be made, where feasible, in local radio stations and relevant news outlets about the availability and content of the approved Social and Labour Plan.

We furthermore request that a review of the SLP must be done in consultation with affected mine communities and adjacent communities in terms of the above Regulations.

Of relevance too in this regard are the directives of the SAHRC's pertaining to SLPs pursuant to its National Hearings on the Underlying Socio-Economic Impacts of Mining Affected Communities in South Africa. Please see attached Report.

SUBMITTED BY:

Mariette Liefferink.

CEO: FEDERATION FOR A SUSTAINABLE ENVIRONMENT.

2 February 2020.