the federation for a sustainable environment

(Reg. No. 2007/003002/08)
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COMMENTS ON THE URANIUM MINING RIGHTS APPLICATION BY TASMAN RSA MINES, 2016
Ref: DMR References EC30/5/1/2/2/10029MR , WC30/5/1/2/2/10072MR, WC30/5/1/2/2/10073MR, WC30/5/1/2/2/10074MR, WC30/5/1/2/2/10075MR,

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 apologise for the belated submission. We request that the FSE's concerns be addressed and incorporated into the above mentioned Report. In justification: The FSE is listed as the most prominent of the environmental activist stakeholders in the mining industry - http://www.miningmx.com/pls/cms/mmx_rain.profile_detail?p_nid=372) and its directors as amongst the 100 most influential people in Africa's Mining Industry (MiningMX 2013 – "Rainmakers and Potstirrers) and its interests and concerns regarding uranium and uraniferous waste are internationally and nationally very well known and widely published. However, the FSE was not notified by the EAP and was only notified of the application a day prior to the termination date for public comments by a third party. The FSE only received the contact details of the EAP on the 15th of March, 2016.

Our comments are grounded upon the legacy of gold and uranium mining within the Witwatersrand goldfields and the findings and recommendations of peer reviewed academic reports and governmental reports.

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. 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.[1]

It is necessary to look at the future impacts of the proposed project in the context of the past management of uraniferous waste within the Witwatersrand goldfields. The legacy of 130 years of gold and uranium mining the Witwatersrand has resulted in the largest gold and uranium mining basin in the world and 270 tailings storage facilities containing 600 000 tons of uranium.

The most important lesson learnt from the studies in the Witwatersrand goldfields is that no short-cuts exist which would allow certain pathways to be ignored in a study of radioactive contamination.

The current risks and hazards associated with the gold and U tailings storage facilities provide prima facie evidence of gaps in the National Nuclear Regulator Act (47 1999) (NNRA); a cavalier approach to the risks or hazards of uranium and its progeny, and a systemic failure by the responsible organs of state to enforce contraventions of the NNRA, the National Water Act, the Mineral and Petroleum Resources Development Act and the National Environmental Management Act.

To exemplify:

- Results indicate that U-levels in water resources of the Wonderfonteinspruit catchment (WFS) increased markedly since 1997 likely because the contribution of acid mine drainage, containing radioactive metals decanting from the flooded mine

[1] Reference: 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; Department of Minerals and Energy (2008). Regional Mine Closure Strategy for the West Rand gold field.
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void in the West Rand. It was found that 800kg of U per year flows into Boskop Dam as Potchefstroom's main water reservoir. Of particular concern is the fact that U-levels in the WFS are comparable to those detected in the Northern Cape which had been geostatistically linked to abonormal haematological values related to increased incidences of leukaemia observed in residents of the area.[2]

The mean values for the Wonderfonteinspruit samples were found to exceed not only natural background concentrations, but also levels of regulatory concern for cobalt, zinc, arsenic, cadmium and uranium, with uranium and cadmium exhibiting the highest risk coefficients." (Ref. WRC 1214/1/06)

- An airborne radiometric survey of the West and Far West Rand goldfields was done for DWAF in 2007. Interpretation of the data show many of the residential areas fall within areas of high risk of radioactivity contamination.[3]
- Pollution related to Witwatersrand mines poses a number of hazards to surrounding communities. The major primary pathways by which contamination can enter the environment from a mine site are:
    - the airborne pathway, where radon gas and windblown dust disperse outwards from mine sites,
    - the waterborne pathway, either via ground or surface water or due to direct access, where people are contaminated,
    - or externally irradiated after unauthorized entry to a mine site,
    - by living in settlements directly adjacent to mines or in some cases, living in settlements on the contaminated footprints of abandoned mines.[4]
- 380 Mine Residue Areas (MRAs) have been identified in the Witwatersrand goldfields. The majority of MRAs are radioactive. It is estimated that 1.6 million persons live on MRAs[5].

[2] Reference: Prof. Dr. Frank Winde. North West University. "Uranium Pollution of Water resources in Mined-Out and Active Goldfields of South Africa – A Case Study in the Wonderfonteinspruit Catchment on Extent and Sources of U- Contamination and Associated Health Risks."

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[4] (Reference: 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

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

- The use of contaminated material and mine residues in construction has also been identified as a means of dispersal of radioactive material into the environment.[6]
- Wetlands downstream of mining activities within the Witwatersrand goldfields contain elevated levels of uranium[7] which can be mobilised under plausible environmental conditions e.g. the measured uranium content of many of the fluvial sediments in the Wonderfonteinspruit, including those off mine properties and therefore outside the boundaries of licensed sites, exceeds the exclusion limit for regulation by the National Nuclear Regulator.

In view of the aforesaid, the FSE requests that the following issues be addressed in the EIA Report, namely:

1. The economic and social justifiability and ecological sustainability of the proposed project in view of the fact that gold mining companies within the West and Far West Rand goldfields of the Witwatersrand are of the intention to re-mine the historic tailings storage facilities and extract uranium. 1.3 million tons of waste (residue) will be deposited on a single regional tailings storage facility within the West Rand Municipal District. That will fall under comparative alternatives in the EIA requirements.
2. An assessment of the health risk due to the radioactivity of uranium and the decay products of uranium, and the chemical toxicity of uranium including the health risks due to long term exposure to low levels of radioactivity in order to quantify the health risks.

   <u>Chemical toxicity risks</u>

   The chemical toxicity of the metal constitutes the primary environmental health hazard, with the radioactivity of uranium a secondary concern.The update of the toxicologic evidence 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.[8]

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[6] Reference: Department of Mineral Resources. Regional Closure Strategy for the West Rand Goldfield. 2008.

[7] Reference: Council of Geoscience: Contamination of Wetlands Report. 2005

[8] 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

In line with the premise that U is mainly problematic because of chemical toxicity, the U- guideline limit for drinking water of the World Health Organisation (WHO) was based on the nephrotocicity of U as determined by exposing rats and rabbits to water spiked with uranyl nitrate during 28-91 days lab trials (Gilman et al. 1998 a/b). It was found that the limit for a tolerable daily intake (TDI) of U was at 6 µg/kg body weight (b.w.) and day. Divided by a safety factor of 10 the official TDI for U was finally set by the WHO at 0.6µ g U/ kg b.w. x d. Assuming that 10% of the U is ingested by
drinking water a guideline value of 2 µg/l U for drinking water was determined (WHO 1998). The same value is used by the German 'Mineral- and Tafelwasserverordnung' regulating the U-concentration in mineral waters used for the preparation of baby food (Konietzka et al. 2005,Von Soosten 2008, BfR and BfS 2006). The DWS regulatory limit for irrigation is 0.01mg/l and 0.07mg/l for domestic use.)

The airborne pathway

The NNR Report – TR-RRD-07-0006 – "R*adiological Impacts of the Mining Activities to the Public in the Wonderfonteinspruit Catchment Are*a" dated the 12 July 2007 found that 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.

In this regard it is necessary to refer to the well-established risks of uranium and in particular the risks pertaining to the inhalation and ingestion of large alpha particles (consisting of two protons and two neutrons) which are considered to be 20 times more biologically damaging than the two other types of ionising radiation (beta and gamma radiation).

While cognisance is taken that the extreme low penetration depth of alpha radiation (it cannot pass through the outer skin of humans) renders alpha emitters (but not their progeny) harmless, however, once deposited inside the body alpha emitters are potentially dangerous as adjacent tissue can be irreparably damaged by energy rich particles resulting in mutagenic defects and other malign transformations (ATSDR 2001, UBA 2008).

The health effects of uranium particles inhaled are widely known namely:

- Small particles are carried by the inhaled air stream all the way into the alveoli. Here the particles can remain for periods from weeks up to years depending on their solubility.

- Highly insoluble uranium compounds may remain in the alveoli, whereas soluble uranium compounds may dissolve and pass across the alveolar membranes into the bloodstream, where they may exert systemic toxic effects.

- In some cases, insoluble particles are absorbed into the body from the alveoli by phagocytosis into the associated lymph nodes.
- "Insoluble" particles may reside in the lungs for years, causing chronic radiotoxicity to be expressed in the alveoli.[9]

The Sediment pathway

Furthermore, the pathway sediment→SPM →cattle→milk/meat→person ("SeCa") can cause radioactive contamination of livestock products (milk, meat) resulting in effective doses of the public in some orders of magnitude above those resulting via the pathway "WaCa".[10]

There is currently little publicly available data on either of the above-mentioned contamination pathways. In any pollution scenario, it is important to understand the risk posed by the pollution to the local human population[11]. The need for comprehensive monitoring and study as well as epidemiological studies in potentially affected and affected communities are imperative.

3. We furthermore refer to the Department Of Environmental Affairs GN NO. R. 1147 dated the 20th November 2015 titled "Regulations pertaining to the Financial Provisions for Prospecting, Exploration, Mining or Production Operations" and

[9] WRC Report No 1214/1/06, P Wade, F Winde, H Coetzee (compiler), "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," 2004, pp. 119-165

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

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

request that the EIA includes an assessment on the financial viability of the proposed project since the residual and latent impacts, which may become known in future, have to be financially provided for.

The latent impacts on biota, including humans, of bioaccumulation and exposure to elevated levels of technologically enhanced naturally occurring radioactive materials (uranium and its progeny) are established in the international scientific literature.

The authorising authorities and the proponent should have gained enough experience from the asbestosis and silicosis catastrophes in South Africa to justify application of precautionary principles in respect of other suspected latent impacts.

The following risks should be considered when determining the financial provision:

- The near certainty of contaminated water, which will require some form of decontamination treatment (Pilson et al., 2000; Hodgson et al., 2001);
- The near certainty of s NORM contamination of soils and sediments by seepage from tailings storage facility/facilities, tailings spillages and plant discharges and the potential for contamination of downstream / downwind soils and sediments (Witkowski and Weiersbye, 1998; Rosner and Van Schalkwyk, 2000. Rosner et al, 2001; Mphefu et al., 2004, Tutu et al., 2003; 2004; 2005; (Cogho et al., 1992; Coetzee, 1995; Pulles et al., 1996; Hodgson et al., 2001; Winde, 2001; Coetzee et al., 2004; Winde et al., 2004a; b; c).
- In addition the potential contamination of surface soils overlying shallow polluted groundwater via evaporative pathways during dry seasons (Naiker et al., 2003., Tutu et al., 2004).
- The potential for NORM contamination of crop soils irrigated with contaminated surface water or contaminated groundwater (Sutton et al., 2006; Philips, 2007);
- The concomitant loss of genetic /biodiversity and potentially ecosystem goods and services on disturbed, fragmented or polluted properties (Angus, 2005; O'Connor and Kuyler, 2007; Weiersbye and Witkowski, 2007);
- The potential for bioaccumulation of s NORMs by flora and fauna (Weiersbye et al., 1999; Weiersbye and Witkowski, 2003; Cukrowska and Tutu, 2004; Steenkamp et al., 2005b; McIntyre et al., 2007);
- The potential for exposure of fauna and humans to bioaccumulated pollutants (Steenkamp et al., 1999; Weiersbye and Cukrowska, 2007);
- The potential for acute and latent toxicity impacts of bioaccumulated pollutants on humans (Steenkamp et al., 2005a); and the potential for radioactivity impacts from NORMs on humans (Philips, 2007);
- The potential for human disease as a result of exposure to windblown dust from tailings storage facilities (CoM, 2001);

- The potential for uncontrolled future land uses on or within the zone of influence of TSFs, footprints and mineral processing facilities, such as human settlements and recreation, food crops and home vegetable gardens, livestock grazing and informal re-mining and scavenging. (Sutton, 2007; Reichardt and Reichardt, 2007).

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24 March 2016.