



the federation for a sustainable environment

# **Comments on the Implementation of National Waste Management Strategy, 2011**

**Mariette Liefferink**

- This presentation argues that abandoned mining waste and mining waste outside of mine properties should be classified as priority wastes in terms of the NWMS and this waste should be remediated as a matter of priority and urgency.
- Not all mining waste is excluded by section 4(1)(b) of the Waste Act. Only waste for reuse or sustainably disposed of waste is excluded ( MPRDA 2002 definition of residue stockpiles).
- This presentation deals with mining wastes apart from these 2 categories

As early as 1987, the US Environmental Protection Agency recognised that “.....*problems related to mining waste may be rated as second only to global warming and stratospheric ozone depletion in terms of ecological risk.*

*The release to the environment of mining waste can result in profound, generally irreversible destruction of ecosystems.”*

*Reference:s CSIR. Briefing Note August 2009. Acid Mine Drainage in South Africa. Dr. Pat Manders. Director, Natural Resources and the Environment.*

*European Environmental Bureau (EEB). 2000. The environmental performance of the mining industry and the action necessary to strengthen European legislation in the wake of the Tisza-Danube pollution. EEB Document no 2000/016.*

# WITWATERSRAND MINING BASIN

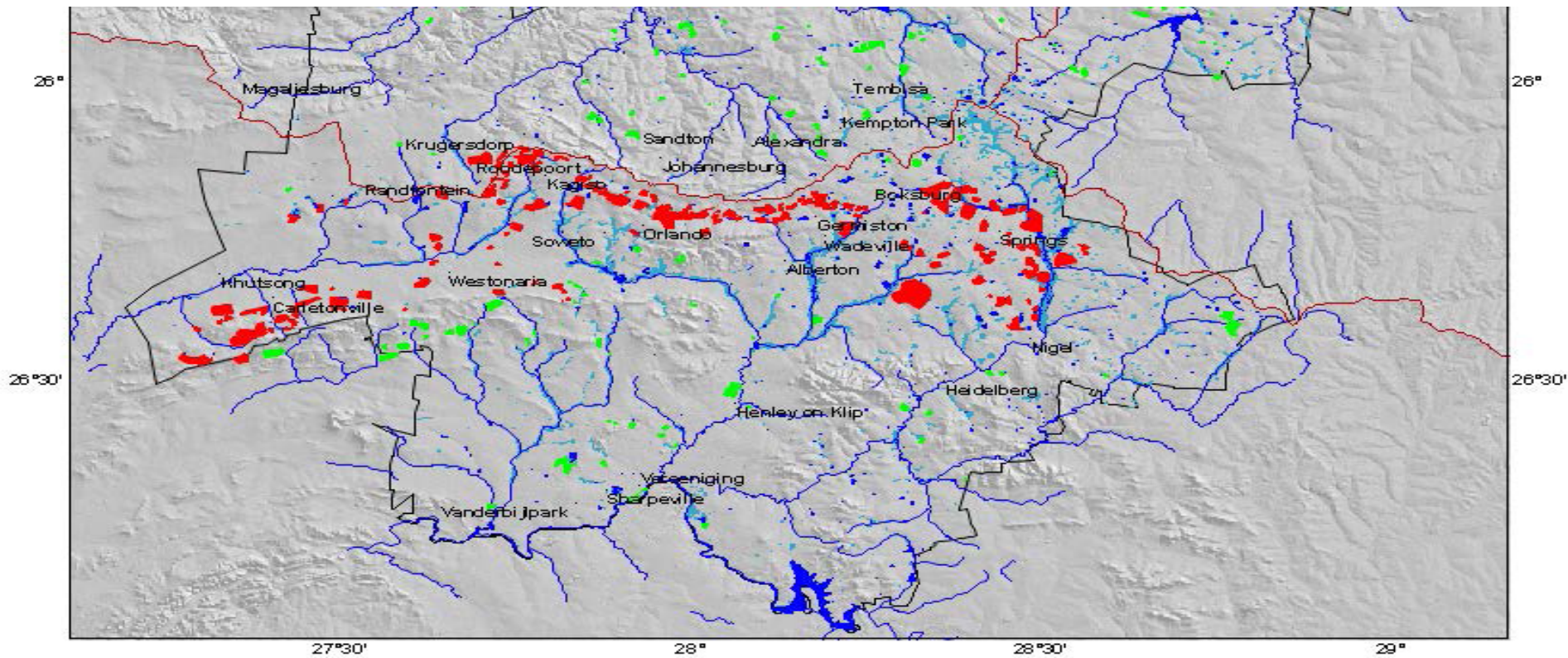
- **The world's largest gold and uranium mining basin (1600 km<sup>2</sup>)**
- **More than 120 years**
- **More than 120 mines**
- **Extraction: 43 500 tons of gold in one century and 73 000 tons of uranium between 1953 and 1995.**
- **400 km<sup>2</sup> of mine tailings dams (270 tailings dams and 380 MRDs)**
- **6 billion tons of pyrite tailings**
- **430 000 tons low-grade uranium.**
- **6000 km<sup>2</sup> of soils are significantly impacted by gold mining**

- Waste from gold mines constitutes the **largest single source of waste and pollution in South Africa** and there is wide acceptance that **Acid Mine Drainage (AMD)** is responsible for the most costly environmental and socio-economic impacts.
- **Gold mining waste** was estimated to account for **47 % of all mineral waste** produced in South Africa, making it the largest, single source of waste and pollution (DWAF, 2001).
- The 270 tailings dams are mostly **unlined** and many are not vegetated, providing a source of extensive dust, as well as soil and water (surface and groundwater) pollution (AngloGold Ashanti, 2004).

There are approximately 380 MRAs in Gauteng, most of which are the residues of gold-mining.

MRA's refers generally to the following entities (GDARD, 2009):

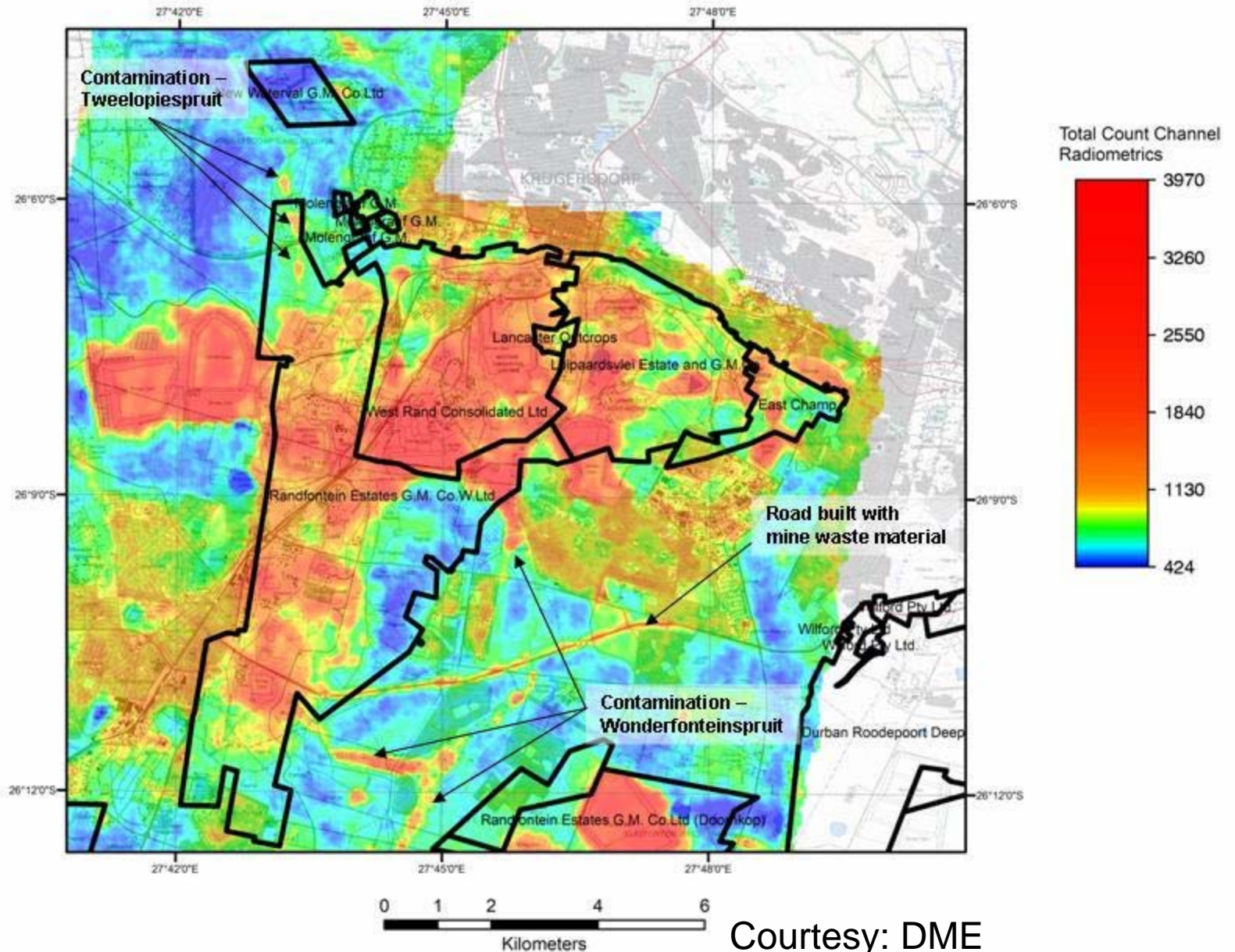
- tailings disposal facilities (TDFs)
- waste rock dumps; open cast excavations and quarries;
- water storage facilities and return water dams;
- tailings spillage sites
- footprints left after the re-mining of TDFs
- mixtures of building material, mine waste, urban waste, spillage, industrial waste, etc, within the boundaries of former mine properties.



- 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.

(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)







NATIONAL STRATEGY UNDERTAKEN BY:



the dme

Department:  
Minerals and Energy  
REPUBLIC OF SOUTH AFRICA



Council for Geoscience



IN COOPERATION WITH:

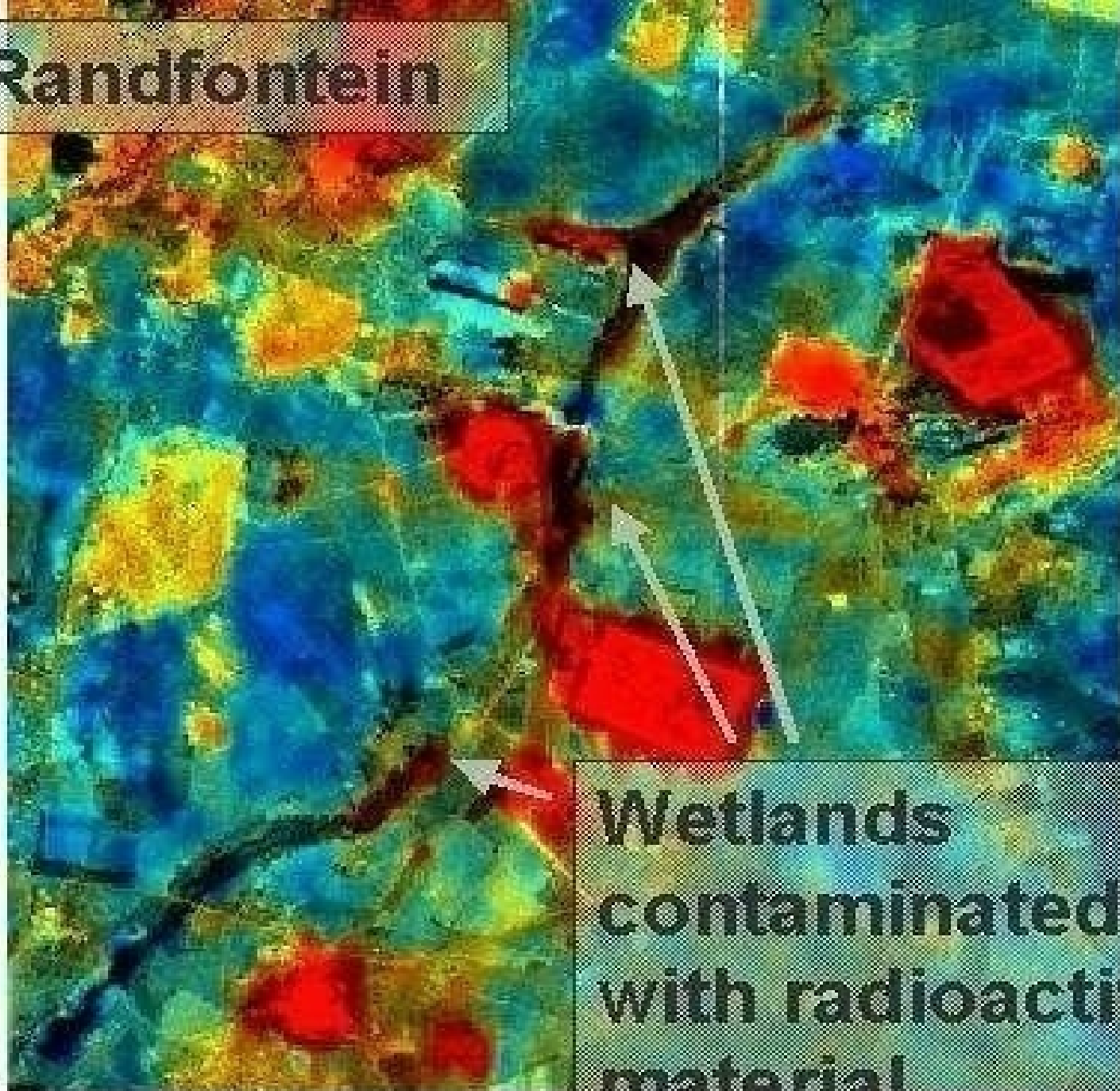


# Draft Regional Mine Closure Strategy for the West Rand Goldfield

- An airborne radiometric survey of the WR and FWR was done for DWAF
- Interpretation of the data show many of the residential areas (Carletonville, Westonarea, Khutsong, Kagiso, Randfontein) fall within areas of high risk of **radioactivity contamination.**

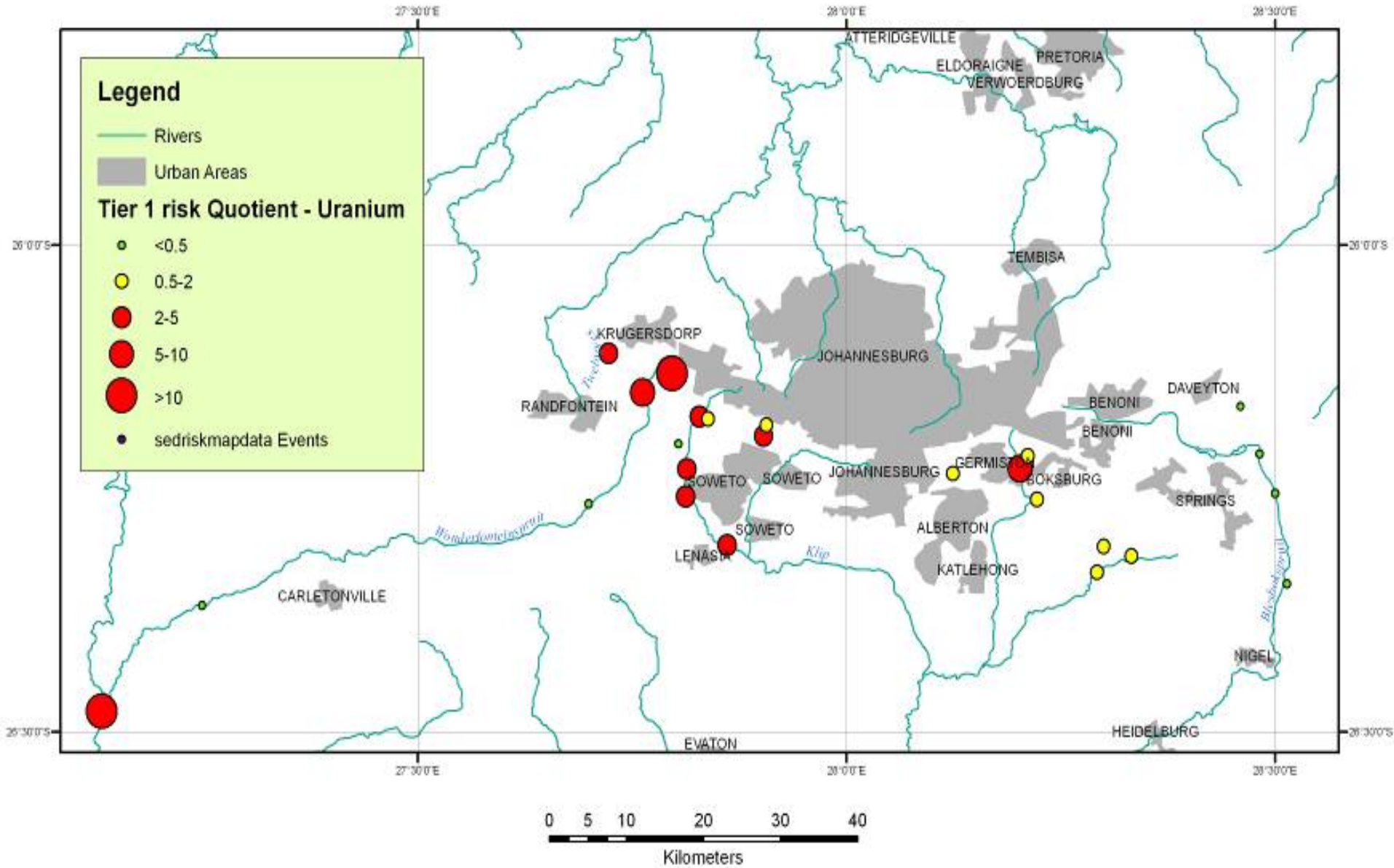
Department of Minerals and Energy. 2008.

# Randfontein

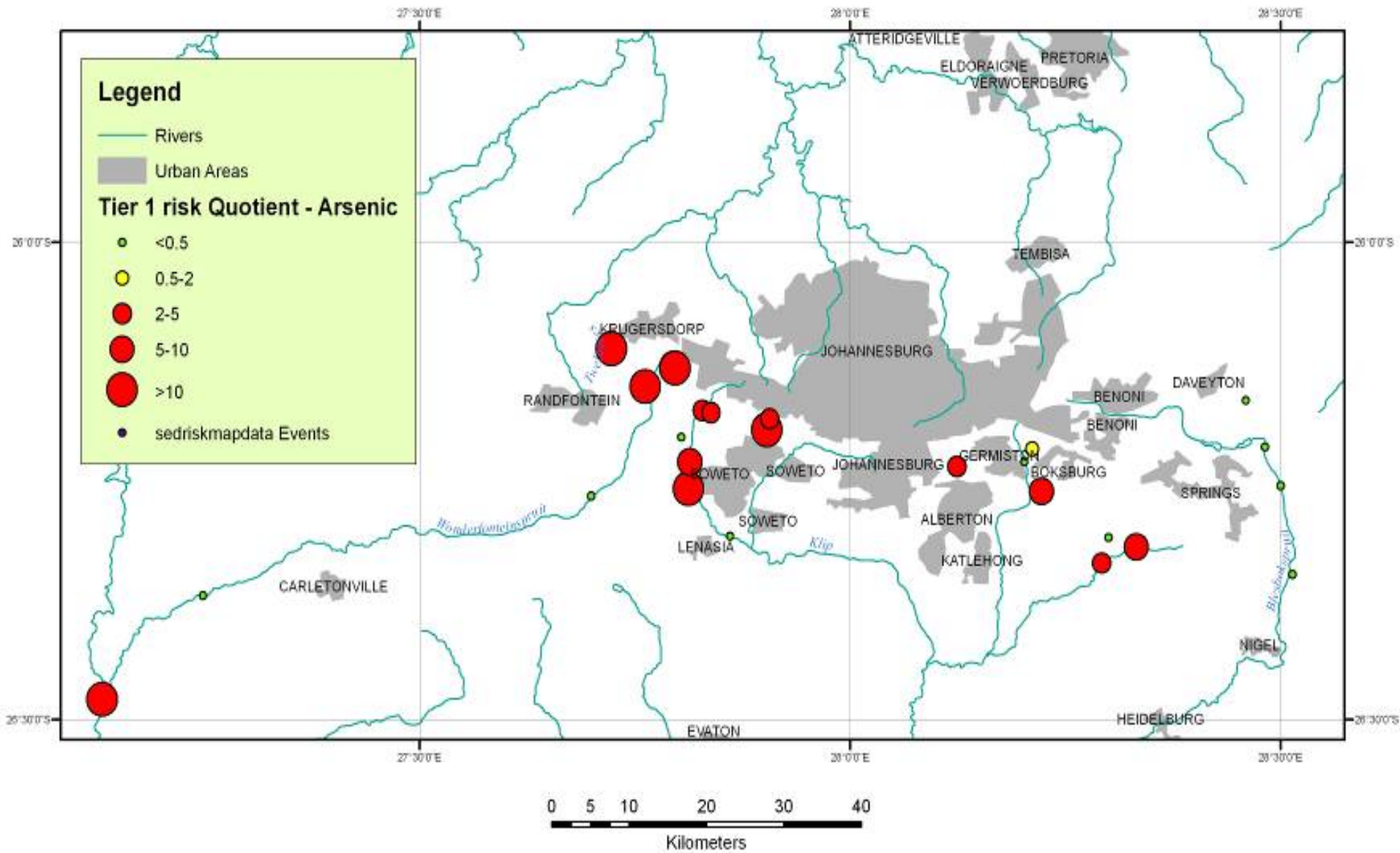


Wetlands  
contaminated  
with radioactive  
material

# Uranium Concentration



# Arsenic Concentration



# Air Pollution









# The health effects of uranium particles inhaled:

- **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.

# KAGISO



Catchment Dams - trespassing problem area

IL15

Kagiso Municipal Swimming Pool



© 2009 Europa Technologies  
Image © 2009 DigitalGlobe  
© 2009 AND

Google

935 m

26°08'32.35" S 27°47'07.79" E

elev 1728 m

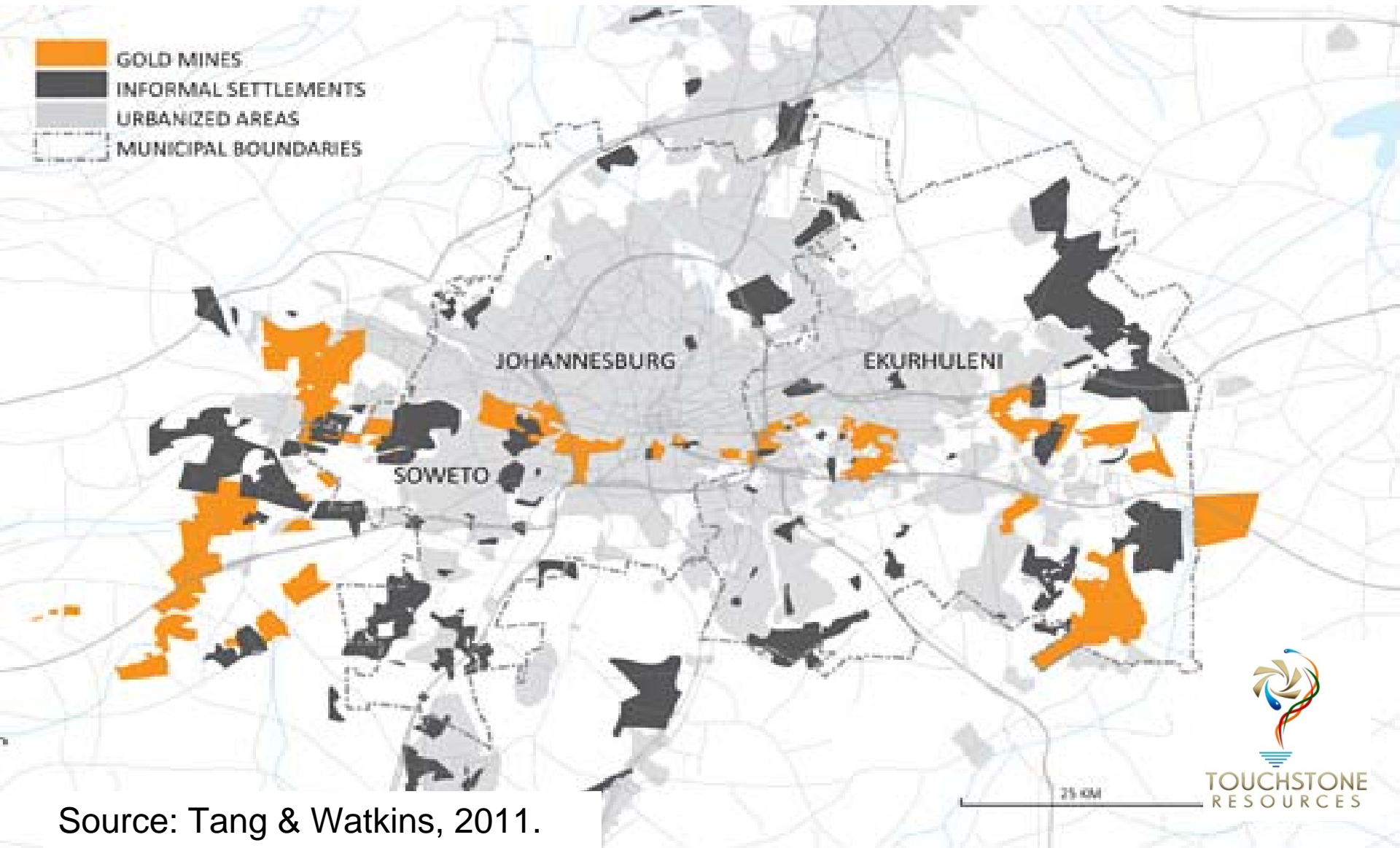
May 2, 2007

Eye alt 4.91 km





# 1.6 Million people live in informal settlements close to MRA's



Source: Tang & Watkins, 2011.

To limit the risk due to external gamma radiation, the Chamber of Mines uses a guideline that each tailings deposit should have a 500 m buffer zone surrounding it, where no human settlement is allowed. In many cases, however, this guideline has not always been adhered to in the development of new settlements.

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





NEPR  
NAMED REACTION  
0861 492 193





- Airborne gamma ray survey data have been collected by the Council of Geoscience covering the Central Rand Goldfield.
- These data identify areas of elevated radioactivity.
- Elevated radioactivity levels
- Historical migration of generally elevated radioactive levels to the urban areas of Johannesburg central business district (CBD) indicating the **use of dump** and **waste material** for **building purposes** as well as downstream **plumes in wetlands** areas.

# **Uraniferous Tailings Spillages**



# **Tudor Dam -Elevated levels of radioactivity**

**10 000 – 100 000 Bq/kg**

**Regulatory Limits: 500Bq/kg**



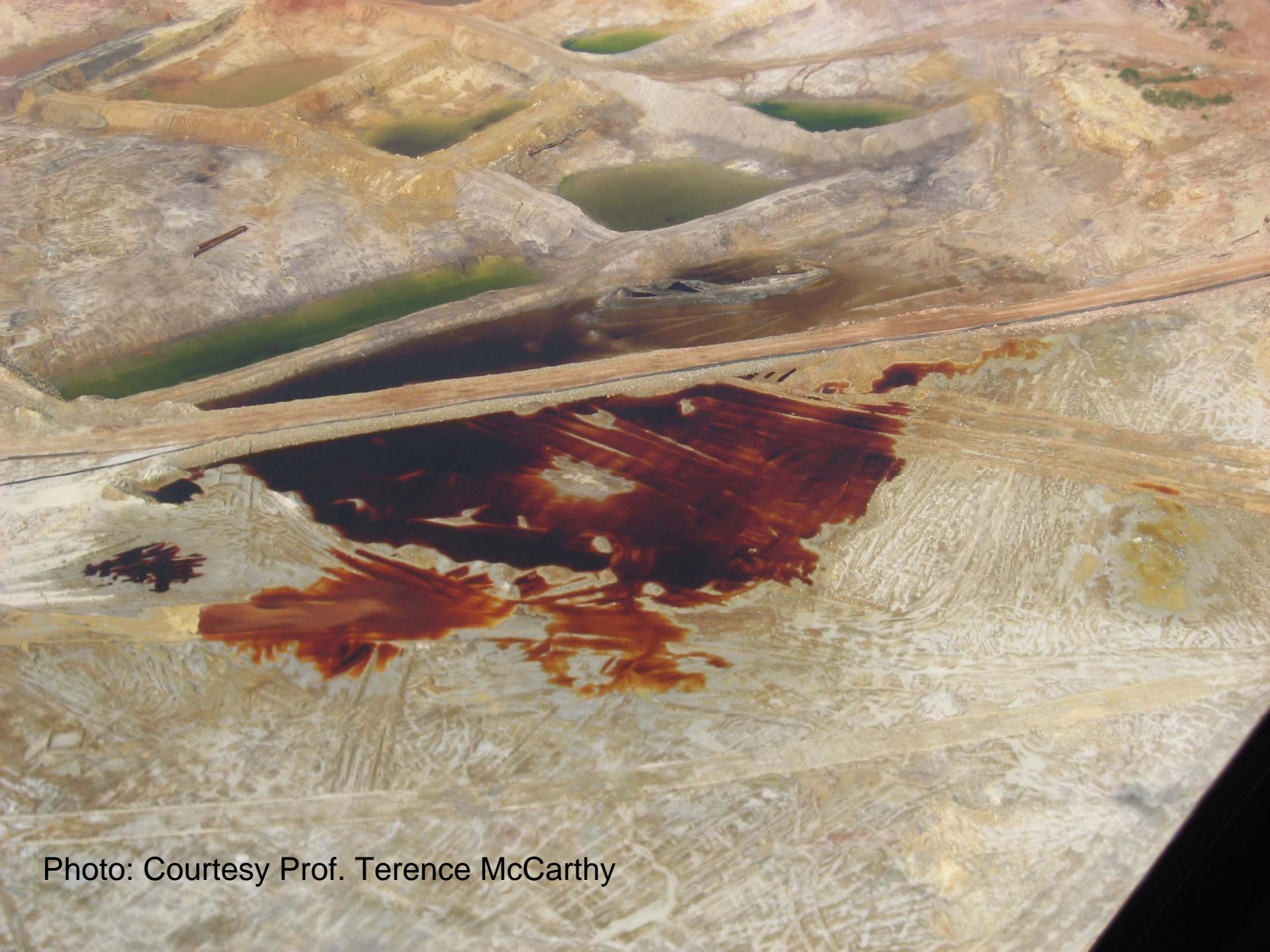


Photo: Courtesy Prof. Terence McCarthy









Precipitated Heavy Metals





CPS Pit



West Wits Pit

# CONCLUSION

NWMS priority wastes: DWEA should identify and develop plans for safe disposal of these wastes and/or remediation in conjunction with other relevant departments.