Carbon storage in deep gold mines

A South African perspective

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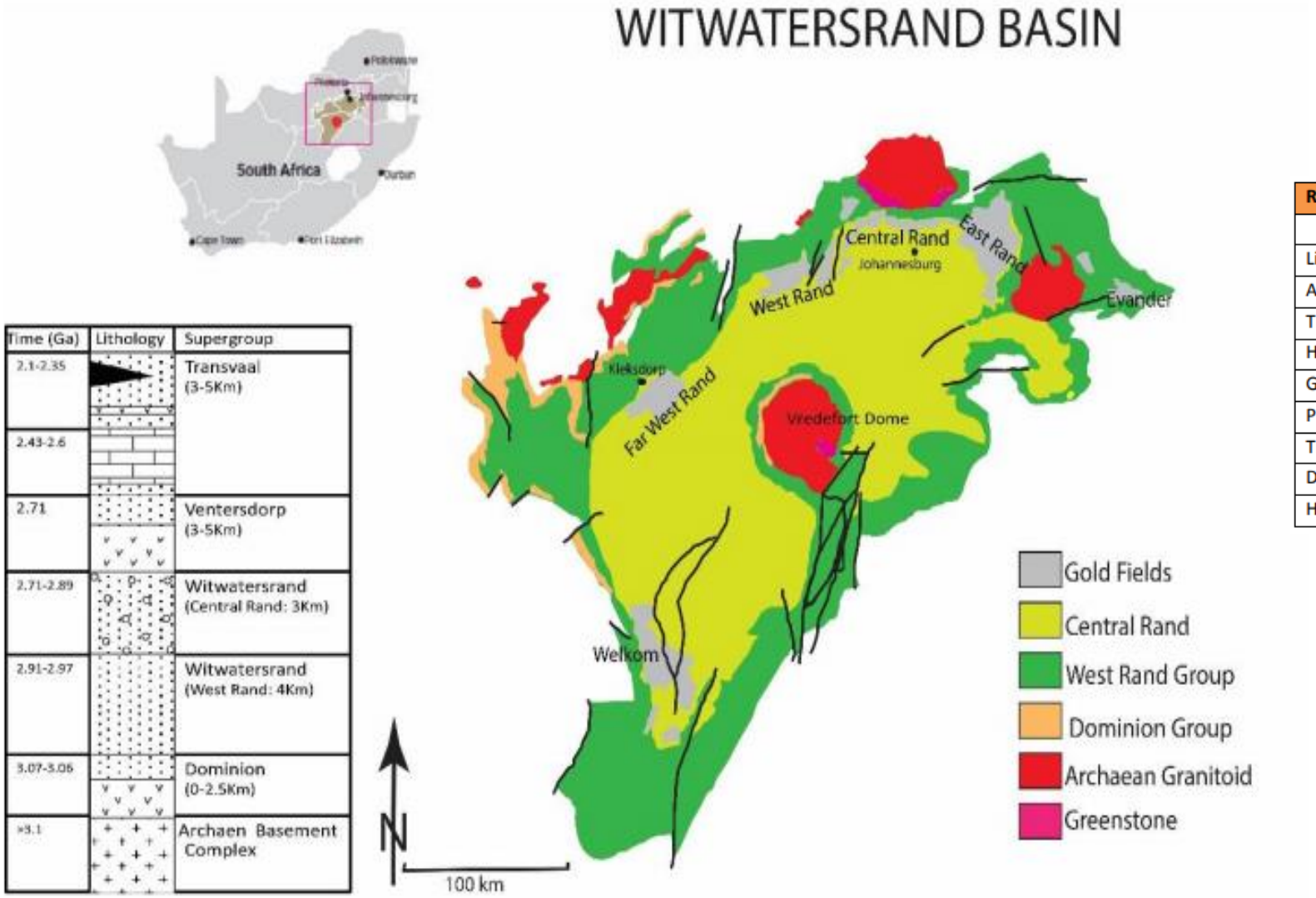
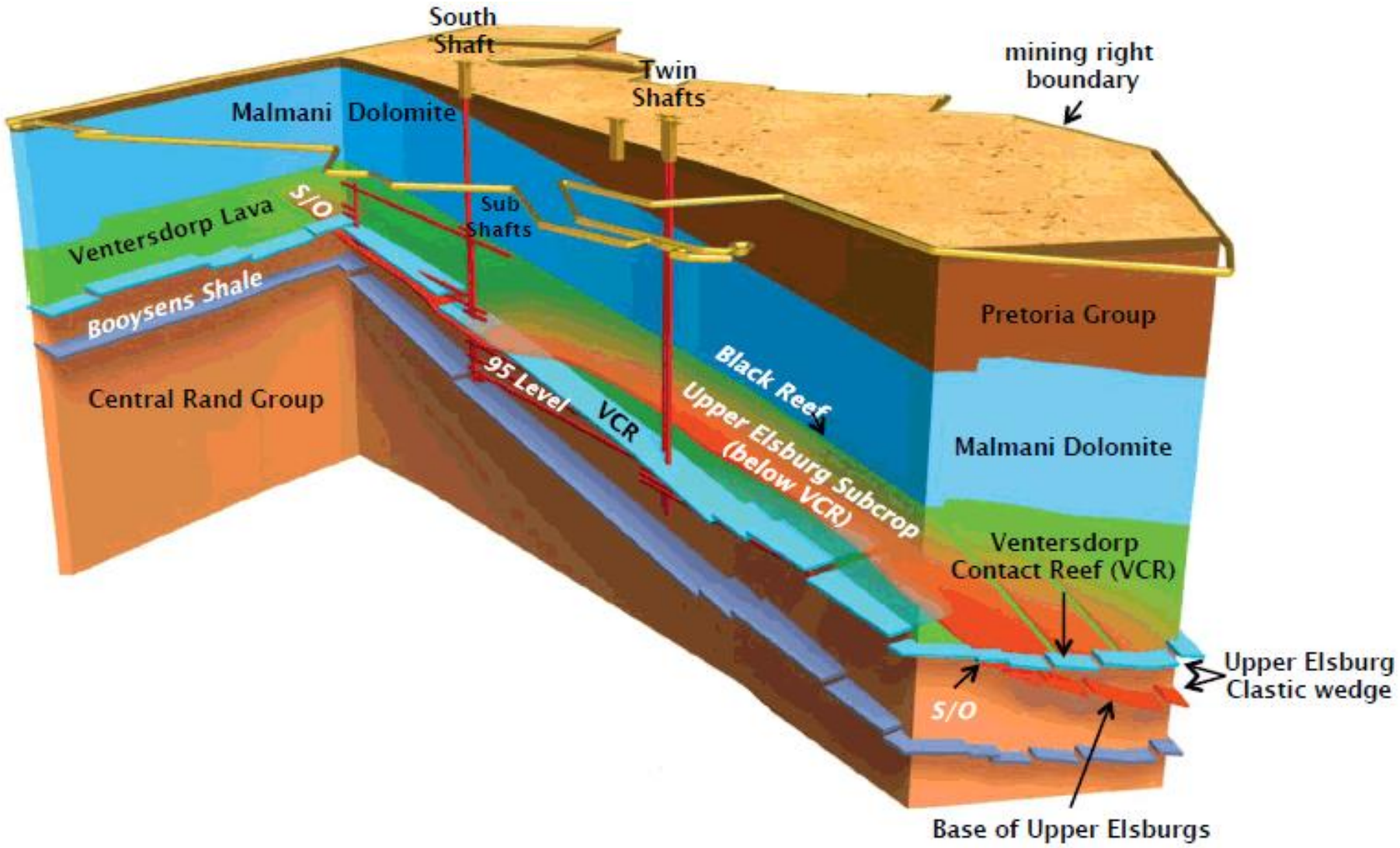
Gold mining in South Africa



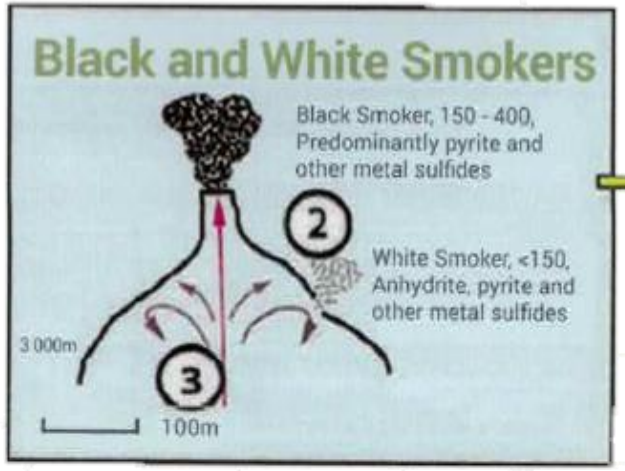
Rock properties		Units
Lithologies: Quartzite (55%) Shale (45%)		
Average geothermal gradient	0.012	°C/m
Thickness (km)	4900	m
Heat Production at 2.06 Ga , µW/m3	1.54	µW/m3
Geological Depth	4739	m
Porosity/Permeability	Data not available	
Thermal Conductivity W/mK	5.13	W/mK
Density	2700	kg/m3
Heat Capacity Jkg/K	825	Jkg/K

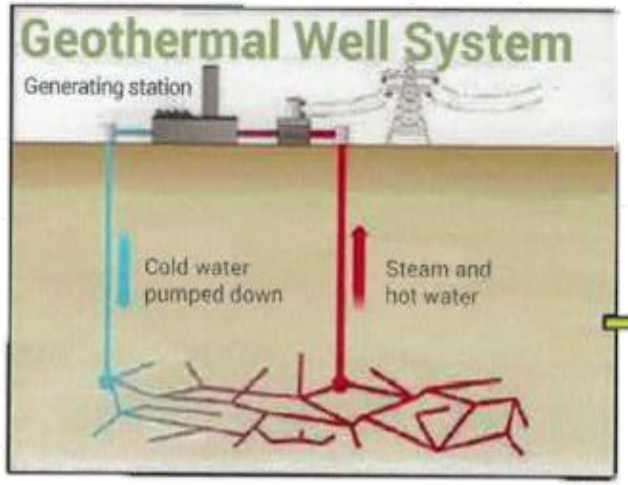
Anatomy of a deep gold mine

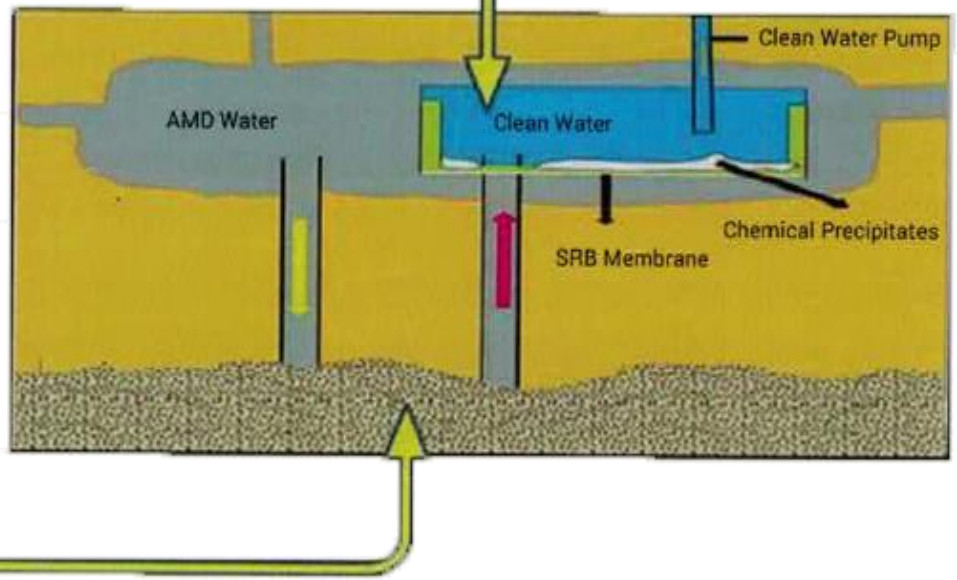


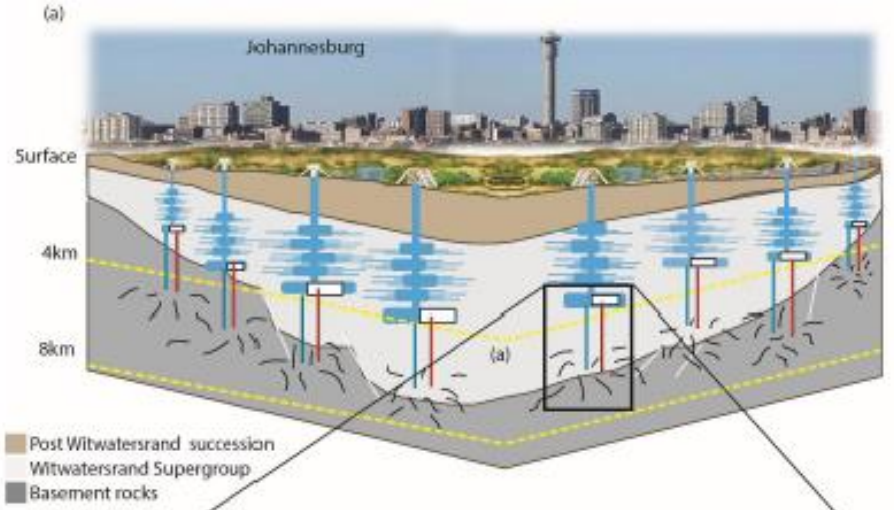
- Operation takes place at approx. depths of between 2400-2650m below surface
- Operations of this nature typically require high energy consumption
- Energy accounts for 40-60% of mining operating costs
- Infrastructure in place and shafts exist which can be leveraged on

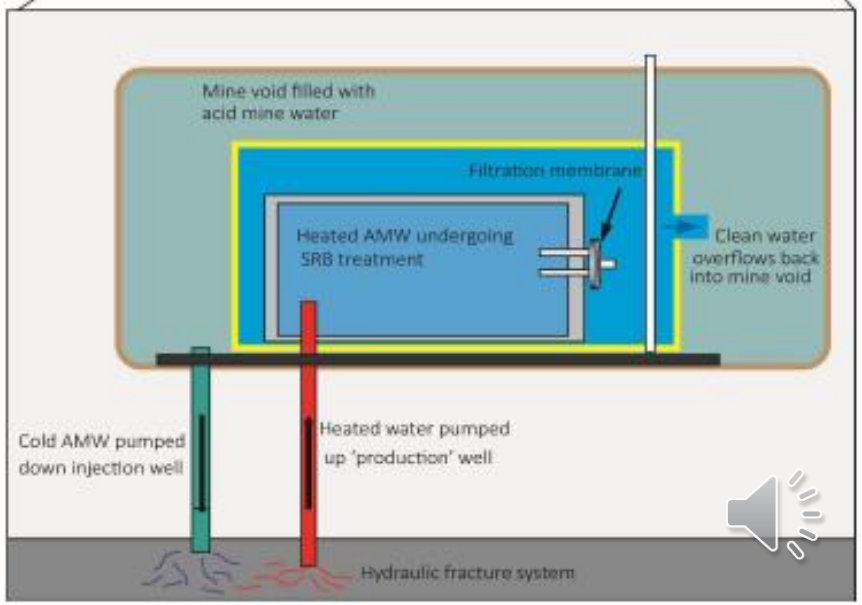
Passive Underground Mine-water Purification (PUMP) Model



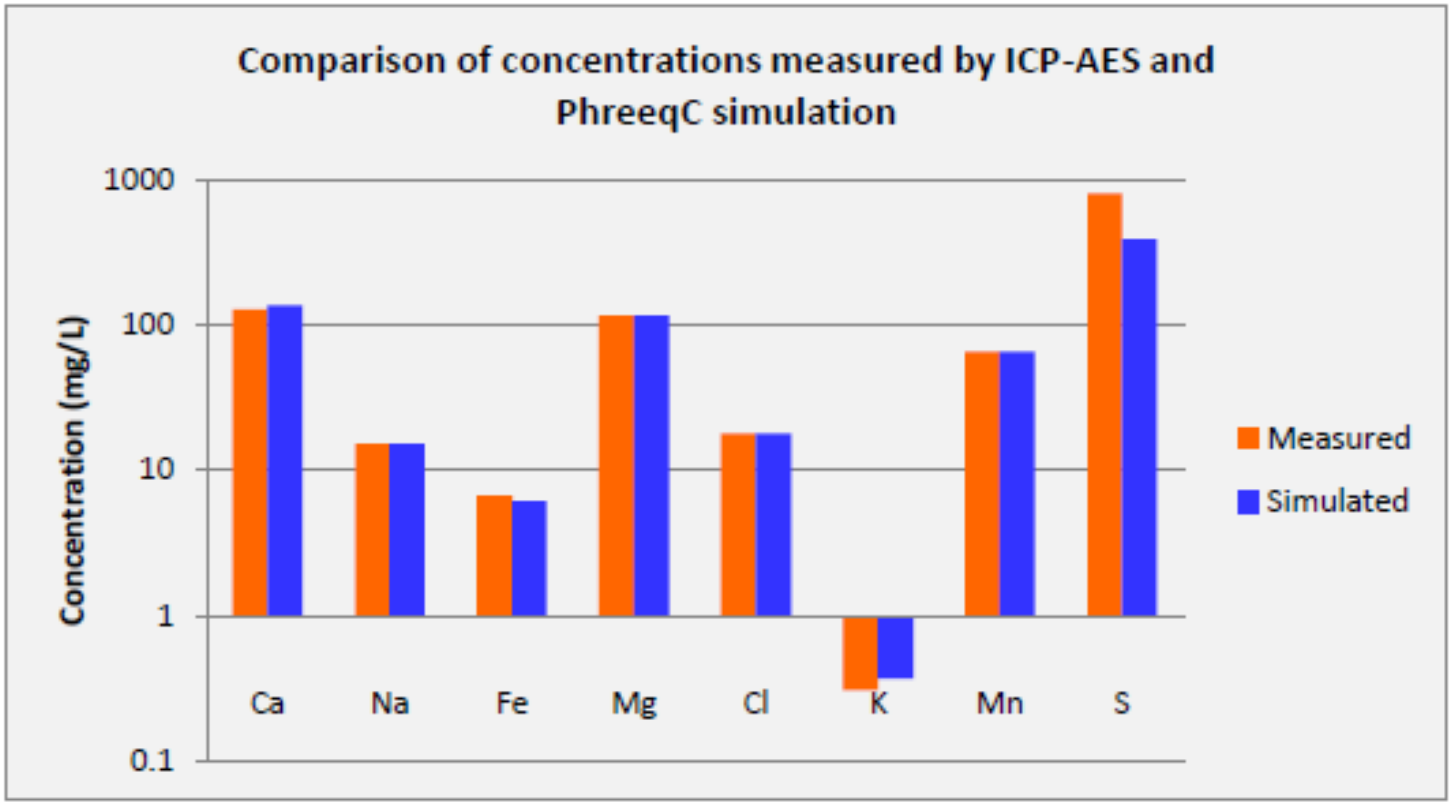




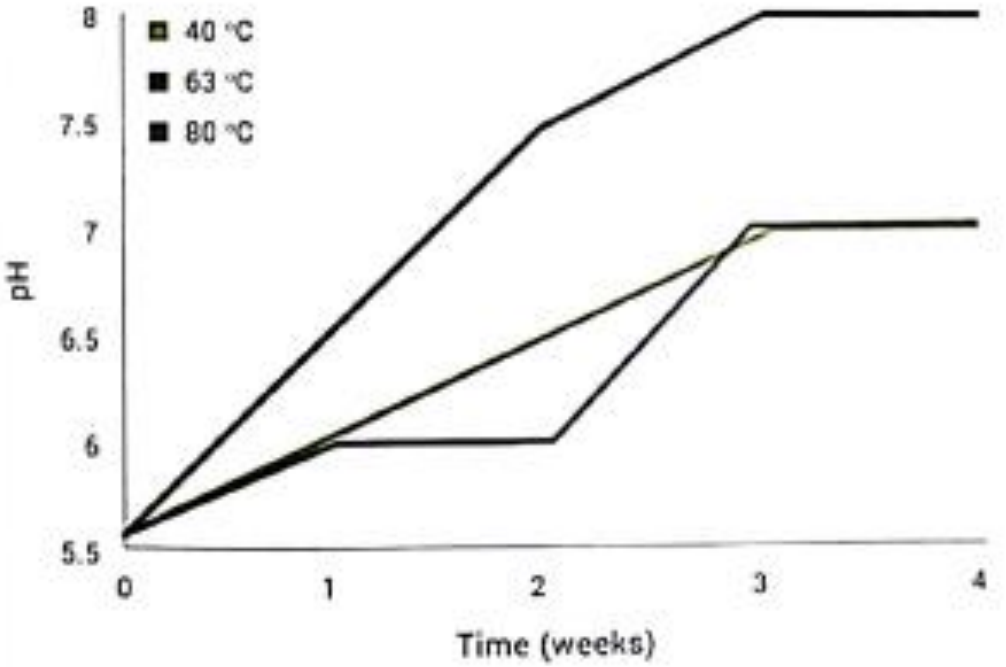




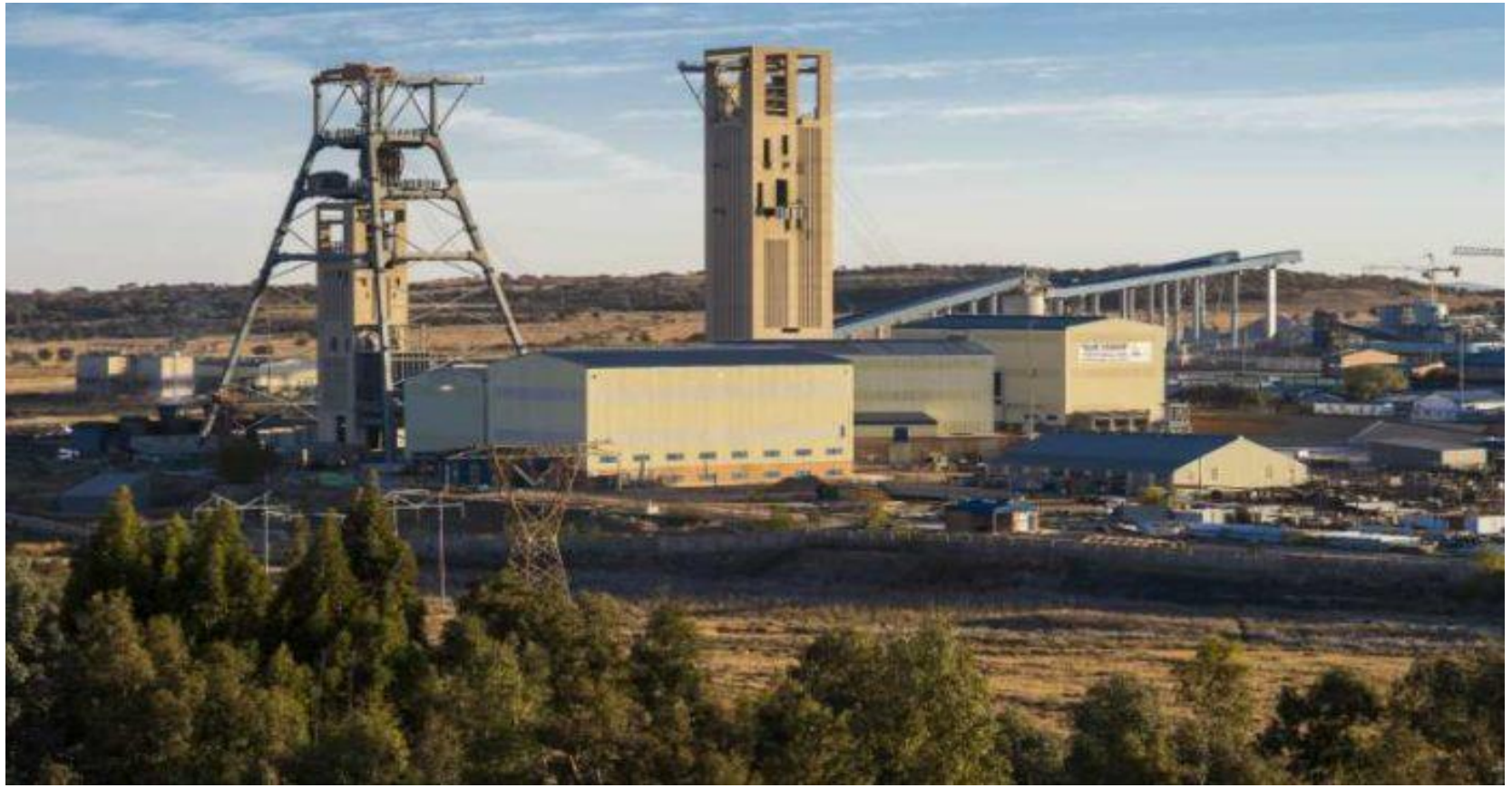
Preliminary results



Effect of bacterial sulphate reduction on pH over time



CO_2 introduction into PUMP system



- PUMPs is designed for the remediation of acid mine water in voids of abandoned gold mines in the Witswatersrand basin
- Captured carbon dioxide can be introduced into the system by bubbling it slowly through a diffuser which gently releases the gas into the water