Groundwater Stratification and the Impact on a Coal Mine Closure. A case study from a South African Mine

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To date, South Africa has mines approximately 3.2 billion tons of coal from a number of different coal reserves located in various part of the country. A number of the mines have reached the end of the productive life resulting in a number of mine closures. With closures, groundwater levels have rebounded resulting in decant of mine water into the environment.
The paper describes a case study of an closed underground coal mine, the rebound of water levels, the evolution of the groundwater quality and the impact it has had on the mamangment of the decant.

On closure of the underground Colliery in 1992, initial water quality monitoring indicated that a water treatment plant would be require to treat the mine decant. However, as the groundwater levels in the mine rebounded, the water quality in the mine void evolved from sulphate type water to sodium type water. The evolution of the water quality can be attributed to sulphate reducing bacteria, vertical recharge from the hanging aquifer and stratification.
Water level and quality monitoring has shown that the water in the old mine void will not decant to surface due to the depth mine void, hydrogeological conditions and the recharge mechanisms.
As a result the decant from the mine is not likely to require any water treatment as the decant water quality will not impact on the ambient hydrological regime.
The main applications are

- design of a correct monitoring procedure to allow for monitoring of water quality stratification in rebounding mines
- identifying the role of sulphate reducing bacteria in the evolution of groundwater quality in a methane rich coal mine void
- The role of a hanging aquifer in recharging of a coal mine void and resultant stratification
- Designing of a mine taking into consideration mine closure

The main contribution of this paper is the use of hydrogeological information in design of a coal mine so as not to decant on closure.