TECHNICAL BRIEF

August 2016
The WRC operates in terms of the Water Research Act (Act 34 of 1971) and its mandate is to support water research and development as well as the building of a sustainable water research capacity in South Africa.

Mine closure and water

The Water Research Commission (WRC) has funded work to develop a guidance manual for mine closure; by following the methodology described in the manual and the BPGs G4 and G5, the mine will have undertaken an appropriate risk management process to understand, manage and minimise its long term exposure to risk and liability associated with post-closure water impacts.

Background

Mines are often unable to obtain mine closure because of perceived unknown/unmanageable post-closure risks to the water resource. This is a complex problem with causative factors originating from both the mining industry and the regulator.

There is a need to unlock this stalemate as its continuation is bad for all parties concerned. The onus rests on the regulator to make the necessary policy and/or regulatory shifts to provide clarity on what is required for mine closure to be approved, while at the same time ensuring that it fulfils its mandate of protecting the national water resource.

Through engagement with the relevant government departments, the mining industry, and the engineering and scientific communities, this project developed out and peer reviewed a set of key questions to be answered by the mine, the answers to which will result in mitigated water risks for the closure plan.

The objective of the WRC project and resultant report and guideline was to define the technical aspects and procedures that need to be followed in order for mines to be able to manage and minimise their long term risks and liabilities and to provide the State (the regulator) with the requisite information to be able to review and approve a post-closure water management plan.

The role of a post-closure water management plan in relation to a mine closure plan is shown in Fig. 1. The mine closure plan is an overarching plan (much in the same way as an environmental management plan) which needs to integrate the outputs of various specialist studies and management plans, including the post-closure water management plan. The post-closure water management plan also feeds into the mine's Integrated Water and Waste Management Plan (IWWMP). This report develops the concept of the Post-Closure Water Management Plan.

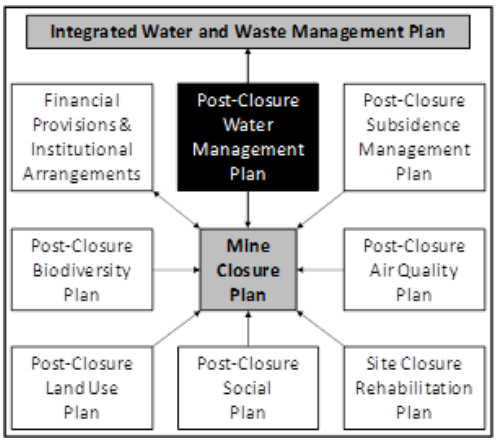

Fig 1: Role of the Post-Closure Water Management Plan within a Mine Closure Plan and an IWWMP

Solution to the problem

Based on the literature review and the content and approach advocated in the Best Practice Guidelines BPG G4 and BPG G5, it is proposed that the solution to the stalemate problem facing mine closure is to recognise and implement the following principles:

1. Planning for successful and sustainable mine closure and post-closure water management is a process that starts at the earliest stage in the mine's life and progresses in terms of certainty and clarity as the mine proceeds along its life cycle.
2. In certain cases, where high risks exist that a planned mine will not be able to close in a manner that is sustainable and acceptable, it could be appropriate to reach the decision that such a mining operation should not be started, i.e. project No Go decision.
3. The Department of Water and Sanitation needs to engage with the mines with regard to their planning for mine closure and post-closure water management throughout the mine life cycle and not only consider the mine closure question at the end of mine life.
4. The Department of Water and Sanitation must clearly state the mine closure questions to which it seeks answers at each stage of the mine life cycle and must also provide guidance on how these questions should be addressed.
5. The mines must apply the best practice risk-based impact prediction methodology as defined in the DWS Best Practice Guidelines BPG G4 and BPG G5 as it is aligned to the international best practice as shown in the literature review undertaken as part of this project.
6. The interests and views of all stakeholders must be considered in developing closure and post-closure water management objectives that the mine's closure plan must strive to meet.
7. The risk assessment and impact predictions underpinning the mine closure and post-closure water management plan must be undertaken by suitably qualified persons and must incorporate specialist independent review that is integrated throughout the whole impact prediction process in line with guidance provided in BPG G4.

Discussion and conclusions

While most of the above issues are captured in the Best Practice Guidelines, clarity is required on the mine closure related questions that the mine needs to address in each of its life cycle phases in order to meet the informational needs of the Department of Water and Sanitation.

It is therefore also important that the information routinely provided to the mine in terms of updated IWWMPs (Integrated Water and Waste Management Plan) includes the required information on the mine's closure and post closure water management plan relevant to the life cycle phase that the mine finds itself in.

While the mining life cycle can be divided into different phases in different ways, the following definition of life-cycle phases is used in this document:

1. Exploration and prospecting
2. Mine planning (ranging from pre-feasibility through to detailed and final planning)
3. Construction and commissioning
4. Mining operations
5. Last five years of mining operations before planned mine closure
6. Mine decommissioning (ending with approval of mine closure by regulators)
7. Post-closure management

While it is obvious that closure-related considerations become more important as mines progress along the life cycle path towards mine closure, there are in fact, mine closure considerations that need to be considered during most of the abovementioned life cycle phases.

The key questions that relate to the mine closure and post closure water management plan during each of the life cycle phases of the mine, and that need to be answered, are shown in Fig 2. These questions should be answered using the BPG G4 and BPG G5.

If ***all*** the questions are answered, then there should be very little new information at the time that the mine requires approval for closure. The Department of Water and Sanitation will have an information trail that leads from the start of the mine up to closure for all new mines, and will also have a clearly defined set of questions (and desired answers) for mines that are already in operation and that enter this process at some advanced stage in the mine life cycle.

The additional benefit to the mines is that the questions that are being asked and the studies that need to be undertaken to answer the questions, are fundamentally aimed at identifying and maximising the opportunity for the implementation of pollution prevention strategies. The old maxim that "prevention is better than cure" most certainly applies to mine water management, and the investment of time and resources into answering the questions will provide payback in terms of reduced costs for the mine closure and post-closure water management plan, and the surety that the final application for mine closure can be approved by the DWS.

Most importantly, by following the processes and methodology described in this report and the BPGs G4

and G5, the mine will have undertaken the appropriate risk management process to understand, manage and minimise its long term exposure to risk and liability associated with post-closure water impacts.

If the questions defined in this document are answered using the methodology set out in the relevant BPGs, then there is no technical or scientific reason for the Department of Water and Sanitation to not approve the post-closure water management plan at the end of mine life.

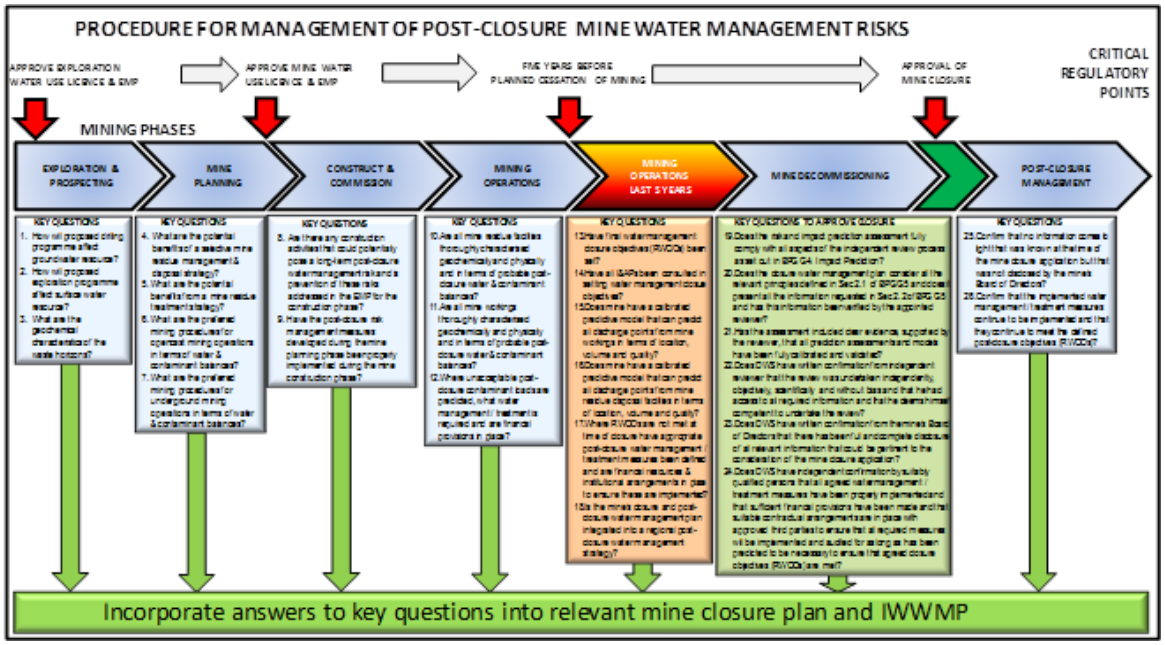

Fig. 2: Key Post-Closure Water Management Questions for each Phase of the Mine Life Cycle

Further reading:

To obtain the reports, *Developing of risk criteria for water management aspects of mine closure* (**Report No. 2127/1/14**) and *Guidance for the mining industry for the management of post-closure water* (**Report No. TT 628/14**), contact Publications at Tel: (012) 330-0340; Fax: (012) 331-2565; Email: orders@wrc.org.za or Visit: www.wrc.org.za to download a free copy.