Earthquakes may increase mining risk at Julimar

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ACID mine drainage (AMD) from development of the Gonneville ore body, will become the greatest environmental risk over the life of the mine and beyond.

This risk is a direct consequence of seismic activity within the south-western WA seismic zone, formerly known as the Cape Ritchie – Yandanooka Lineament.

A seismic event is an event that causes the earth to shake, i.e. an earthquake, and such events may be triggered by a number of processes both natural and man-made.

For example, the 6.5 intensity Meckering earthquake in 1968 was triggered by a natural seismic event within the south-western Western Australian Shield.

A seismic event may also be triggered by the act of extracting ground water for use in mining and ore processing or as part of the dewatering process required during mining operations.

The long-term threat is the potential for the generation of acid mine drainage after mine closure.

This is important as seismic risk is the only component of the Gonneville Project that cannot be defined in terms of time and space until after the event, despite significant advances in the sophistication of monitoring technology.

It is also important to note that the environmental consequences of a seismic event increases after mine decommissioning and closure.

The Project Area will likely be defined using the Land Systems approach which uses physical features including geology – landform – soils – hydrology and vegetation.

Given the large range of landscape variables from coastal, urban and rural aspects of the Swan Coastal Plain, the specific landform and hydrological issues associated with the Darling Scarp and the diverse land systems present on the Darling Plateau, use of the Land Systems approach presents a well-tested uniform methodology for planning and for project area description and environmental impact assessment.

Standard treatment of potentially acid forming materials involves encapsulation within the dump, or by additional material processing prior to encapsulation.

Accordingly, the success of the encapsulation process will be dictated by the material addressing specific engineering attributes such as particle-size distribution, permeability and hydraulic conductivity.

Such an encapsulation programme will be an integral part of the mine operations and will continue for the life of the mine.

Unfortunately, the removal, transport, and stockpiling of this material will destroy the engineering characteristics of the soil thus making the material unsuitable for use.

These material characteristics will define the fate of rain falling on the dump and will have to be managed.

This invokes consideration of rainfall intensity-frequency-duration characteristics of the chosen project design storm.

It is appropriate to use a design rainfall event with a return period of 1:1,000 years for the Gonneville mining operation.

The high rainfall intensities of such an event requires engineering diligence across all aspects of mine site hydrology to ensure that the fate of rain falling on the dump is well understood.

This data must be presented in a manner that allows detailed and robust regulator and third-party scrutiny and review.

Of particular importance is internal dump hydrology, dumping techniques, and out slope segregation of dump material during mining operations.

Out slope runoff, structural slumping and consequent sediment yield, will result in long-term surface instability and pollution episodes by sediment movement to downstream environments beyond lease boundaries.

Now fast forward to a point in time where decommissioning and mine closure operations are complete.

Out of the blue and unpredicted, a seismic event is recorded adjacent to the abandoned mine site, compromising the integrity of the encapsulation envelope.

Note that over six thousand earthquakes have been recorded in the South-west Seismic Zone between 1968 and 2002.

The possible response scenarios to such an event are very limited.

At some point in post-closure time, groundwater and surface water monitoring programmes will start showing changes in the level of contaminants.

Who is accountable?

Who will announce that an acid groundwater plume is moving downstream to the Avon River and hence into the Swan River system?

In such a situation, an acid mine drainage control and remediation programme cannot be retro-fitted to a closed mine.

The scenario presented above is very real.

Project design, environmental impact assessment and management, mine closure, and decommissioning will all require a very level of scrutiny by the lawmakers.

This will ensure that stakeholders and the greater Western Australian community can be assured of success.

If this cannot be achieved, then there is a very real probability that the Gonneville Project will become an unwanted legacy.

The cost estimate, in 2024 dollars, to clean up the mess at the Rum Jungle mine site in the Northern Territory is currently at $2.7 billion.

Taxpayers are footing this bill.

Response from Chalice Mining

In relation to potential seismic events, the most critical part of the Gonneville Project is the Tailings Storage Facility (TSF).

As part of the engineering design and environmental assessment process for the Gonneville Project, the proposed mine and its infrastructure will be designed to withstand anticipated seismic events as defined by rigorous Australian and International Standards.

The Gonneville TSF facility will be designed in accordance with the Australian National Committee on Large Dams (ANCOLD 2019) *'Guidelines on Tailings Dams - Planning, Design, Construction, Operation and Closure'* and to be compliant with the Global Industry Standard on Tailings Management (GISTM).

The standard Chalice has utilised for the Gonneville TSF – and for other facilities around the Project area – will be designed to withstand a seismic event anticipated 1 in every 10,000 years, which are extremely rare events.

The TSF is based on a downstream construction design, which is the most conservative design used in construction of embankments and dam walls.

The downstream construction method builds the dam wall by placing material on the downstream face – the safest design available.

The minimum factor of safety recommended by ANCOLD for embankment stability during a 1 in 10,000-year seismic event is 1.0.

The Gonneville TSF has a factor of safety of 2.0 which is twice the minimum value recommended by the ANCOLD standard.

A seismic recording last month recorded an event in Western Australia's Wheatbelt of magnitude 3.4 on the Richter scale.

The 1 in 10,000-year event as covered in the current design is based on a magnitude of 7.3 on the Richter scale.

The safety factor of 2.0 means the Gonneville TSF embankment would be stable under a seismic event with magnitude of more than 7.3 on the Richter scale.