

Friday, 12th March 2021

REF: Ensham21 - R5

Mr G Gough
Project Manager
Idemitsu Australia Resources Pty Ltd
Level 9/175 Eagle Street
BRISBANE QLD 4000

Dear Garry,

Re: Increase in Pillar Load during a Flood Event

1 INTRODUCTION

As requested, this technical memorandum provides a discussion on the temporary increase in load on the underground workings during a flood event and is an addendum to the subsidence assessment report for the Ensham life of mine extension project (Gordon Geotechniques Pty Ltd, 2020¹).

Both the depth of water in the Nogoa River channel, as well as on the flood plain need to be considered during these events. The temporary increase in density due to saturation of the river alluvium should also be considered. For this discussion, a worst case 1:1000 (0.1% AEP) year flood event has been assessed.

1.1 Nogoa River Channel

1.1.1 Increase in Load

In a 1:1000 flood event, a temporary maximum 10 m flood depth is predicted within the Nogoa River channel above the Zone 1 bord and pillar mining area (Hydro Engineering and Consulting, 2020²). Assuming a density for the water of 1.1 t/m³, to conservatively allow for some sediment load, the increase in the effective depth of cover for a 10 m deep flood would be 4.5 m.

The Nogoa River alluvium averages 20 m thick and when saturated is assessed to have an upper bound density of 2.8 t/m³. This temporary increase in density equates to an additional 2.9 m depth of cover and a total effective depth of cover increase below the channel of 7.4 m.

¹ Gordon Geotechniques Pty Ltd. (2020). Subsidence Report for the Ensham Life of Mine Extension Project.

² Hydro Engineering and Consulting. (2020). Ensham Life of Mine Extension Project Appendix E3: Hydrology and Flooding Assessment.

1.1.2 Impact on Factor of Safety (FoS)

In the Zone 1 area, the Nogoia River flows over thicker Aries-Castor Seam (typically 5-5.2 m) in the shallower (130-170 m) eastern part of the area. In the deeper (170-190 m), western part of Zone 1, the Aries-Castor Seam thins to 3 m. The factor of safety of the pillars below the Nogoia channel has been conservatively assessed in the deepest parts of these two areas where the pillar load is the highest. The upper bound seam thickness, flood depth and alluvium density have also been assumed.

In the deeper western part of the area, increasing the depth of cover from 190 m to 197.4 m, above the standard 24 m x 28 m (centre dimension) pillars at 3 m high, temporarily decreases the factor of safety (FoS) from 1.91 to 1.84, still significantly above the minimum FoS of 1.6.

Whilst mining in the eastern, shallower part of the Project area it is anticipated, based on experience in the current underground workings, that 0.8 m of roof coal would be left in place. The maximum pillar height would therefore be 4.4 m.

At 170 m depth of cover, the factor of safety for the standard pillar configuration (24 m x 28 m) temporarily decreases in a 1:1000 (0.1 percent AEP) flood event to 1.42. As these FoS values are less than 1.6, the standard pillar configuration will be increased to 26 m x 30 m (centre dimension) or the mining height would be reduced to approximately 3.87 m to ensure the FoS is maintained above 1.6. This mining methodology has been shown to be effective in the current Ensham underground workings in controlling the FoS.

1.2 Flood Plain

1.2.1 Increase in Load

Over the remainder of the flood plain, the predicted maximum flood depth is 2-4 m (Hydro Engineering and Consulting, 2020). At a conservative 4 m flood depth, the increase in the effective depth of cover is 1.8 m. Similarly, the soil cover on the flood plain is typically <2 m and when saturated would account for an additional 0.29 m depth of cover.

1.2.2 Impact on Factor of Safety (FoS)

The temporary maximum effective depth of cover increase of 2.09 m over the flood plain is therefore not considered significant based on the commentary above for flooding along the Nogoia River channel.

1.3 Synopsis

Based on the estimated additional loads under a potential 1 in 1000 (0.1% AEP) flood event, where temporary additional loading from flood waters within the main river channel may be expected, the pillar sizing would be increased or the mining

height reduced to 3.87 m to mitigate additional loading under the river and maintain a 1.6 FoS at the temporary effective 177.4 m depth of cover.

No additional mitigation for mined areas under the floodplain with shallower flood depth is required.

Yours truly,



Nick Gordon
RPEQ No. 9855