Chartered Consulting Engineers

ARP Geotechnical Ltd 5 & 6 Northwest Business Park, Servia Hill, Leeds, LS6 2QH
☎ 0113 245 8498 🖷 0113 244 3864 ✉ leeds@arpgeotechnical.co.uk 🌐 www.arpgeotechnical.co.uk

Mr C Ballam
MWP Planning
10 Dobroyd
Shepley
Huddersfield
HD8 8AU

BY E-MAIL

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Dear Chris

Newthorpe Aggregates Ltd
Newthorpe Quarry
Assessment of Railway Slope - Response to Network Rail Query

Following our recent letter issued on 4th May 2018, the following question was raised by Network Rail:

'It is noted that the ARP letter quotes standoff distances and corresponding charge weights to comply with a peak particle velocity (PPV) limit of 12 mm/second at the Network Rail rock slope, the values quoted are reproduced from Vibrock Report Ref: R17.9299/1/DW. ARP's justification for using a limit of 12 mm/second is that it complies with '....the typically applied Network Rail vibration criterion of 12mm/s at an at-risk asset'. In reality a range of PPV limits at the railway boundary have been specified in planning conditions for quarries blasting adjacent to Network Rail assets, some of which are lower than 12 mm/second.
Before Network rail can comment on the suitability of a safe working agreement and any proposed planning conditions we require the developer's experts to assure us that if an upper PPV limit of 12 mm/second is complied with there will be no damage to Network Rail's rock slope as a consequence of blast induced ground vibration.'

At present, the slope stability and standoff distances that have been accepted by the quarry owners are indicating that the slope in question is at low risk of minor rock fall, and negligible risk of major failure from the works conducted to date. This has been established by assessment of the blasting vibrations combined with the local rock type and apparent discontinuities (previously reviewed in a slope stability analysis for Phase 5 works at the quarry). Low risk, for slope stability assessment in quarries as per The Quarries Regulations Act 1999, is classified as:

'Generally, this element should remain stable under most conditions, medium term. Generally remedial or other works will not be required, periodic monitoring may be recommended…'

This assessment is based on the worst conceivable conditions that the slope could be exposed to, including hydrogeological flooding (maximum lubrication) and depreciation of factual ground conditions used for the modelling by a standard deviation to ensure compliance with Eurocode 7 design approach 1. As all of these worst conceivable options have been accounted for in the

modelling, it is noted that the presentation of the low risk of the slope to the effects of the blasting is a true and accurate model of the slope's failure potential. However, Network Rail's concerns about the slope and adjacent rail are considered here and, as such, the following extra considerations are being presented for the reassurance of Network Rail.

In the original submission of planning for the quarry's Phase 5, it was noted that blasting would occur up to 3 times a day. It is acknowledged by the quarry owners that blasting is likely to be less frequent and, at working capacity, such blasts would be undertaken at an average of 5 per month. This is in accordance with the historical need for blasting at the quarry.

Vibrations from the recommended targeted blasting will be in compliance with the 12mm/second vibration criteria. 12mm/second in vibrations will have a minimal effect on the slope as the discontinuities present do not generate topple blocks or wedge blocks that could be at risk of shaking from the slope. In effect, a blast producing this magnitude of response will have a similar effect on the slope to that of a passing train, if compliance with standoff is maintained. However, to assist with allaying concern, and to reduce the impact further from blasting, it is recommended that a further standoff distance of 8m (approximately 15% increase) is added to the required standoff distance. A 15% buffer is added as this will provide a dissipation band that will result in a standard deviation decrease at this distance. In total, the blasting standoff distance from the slope in question will now be 63m.

A reduction in vibration transfer towards the Network Rail asset will, in essence, mean that with the infrequency of blasting, the recommended targeted blasting practice and mechanical ripping of rock and spoil in the areas nearest to the rail in Phase 5, the effect of blasting at the quarry for Phase 5 works will have a negligible effect on the rail slope and its inherent stability. The presence of the anchored mesh, assuming satisfactory installation, will add further stability to the rail slope, over time. To assist with assurities, it is recommended that a safe working agreement has the provision for ongoing monitoring of the assets around the quarry and the rail. It is also recommended that, if the quarry uncovers a variation in geology not otherwise known, that this assessment is reviewed as it may change the ability of the rocks to transfer vibrations.

It is important to note that this letter and its contents is discussing the stability of the rail slope with respect to blasting, and is not addressing any potential issues that may arise from general wear and tear of the slope, or from any works carried out by Network Rail.

We trust the above details are acceptable. However, if you have any comments or queries, please do not hesitate to contact us at your convenience.

Yours sincerely
for ARP GEOTECHNICAL LTD

J Davey