

J HEILG

I understand that you have had the opportunity to read my evidence and as such there is no further requirement to again relay this information to you. I have also had the opportunity to review several related documents, including the HDC S42 report (with the technical report prepared by their advisor Dr McKenzie), the proposed HDC conditions should the Martha Project proceed, and a question raised by the Commissioners. I note that whilst the matters raised in each of these documents are important, there are however some matters where elaboration is appropriate.

The matters of concern raised in the S42A report and the HDC proposed conditions are similar.

These relate to:

1. Differentiating development and production blasts for the purpose of calculating the compliance statistics
2. Calculation of the average levels of vibration
3. Anomalous vibration results
4. Vibration monitoring locations
5. Flyrock estimates
6. Pumphouse condition

I shall address each of these separately

Separation of Development and Production

The scale of blasting that is considered feasible for Project Martha will vary from less than 2 kilograms through to potentially more than 30 kilograms. For the Rex production stoping, it is modelled to vary between less than 2.5 kilograms through to possibly greater than 10 kilograms in the deeper sections of Rex.

The modelling indicates that compliance with 5mm/s in some areas will require low explosive weights. This occurs irrespective of whether the blasting is development, cut and fill or conventional small-scale production.

OGNZL employ a rigorous method of designing and reviewing blast patterns to ensure that the blast activities comply with a 5mm/s vibration limit. On no occasions, are blasts designed to produce more than 5mm/s with a degree of certainty less than 95% confidence, that is, irrespective of OGNZL's present blasting performance or the type of blast, all blasts are similarly designed. Whilst some blasts may be cautiously adjusted downward in their explosive weight because of a previous unexplainably elevated level of vibration, no blasts are ever overdesigned on the basis that "the company is comfortably compliant with 5mms".

All blasts for the project are designed with respect to their ability to comply with 5mm/s. Combining, or separating, the measured levels of vibration from underground production or development activities will not change the current method of design and assessment. Similarly, each blast is designed to

comply with 5mm/s with a 95% degree of certainty, irrespective of its type, location or current compliance statistics.

Whilst I do not see any benefit in adopting a condition that separates development and production blasting as the levels of vibration will not differ from a schedule that combines the two types of blasting, I appreciate that both the HDC and OGNZL are familiar with the same condition that has been shown to be effective for Correnso. I therefore agree with the OGNZL position of accepting the separation of the blasting activities when calculating the compliance statistics.

Averaging of Vibration Levels

Aside from Waihi, to my knowledge an averaging condition is not imposed on blasting activities anywhere in the world. The intent of the averaging condition is to limit repeated blasting within a small footprint. Within a 6-month period, the Correnso condition requires that the average level of vibration from development and production blasting is limited to 2mm/s and 3mm/s respectively. To date, the condition has not caused OGNZL to adjust its mining schedule in order to comply. The variable mining areas inherent in underground mining schedule for a large orebody like Correnso necessarily results in adequate separation between blasting areas to promote compliance with the average vibration conditions.

The Rex orebody however is limited in its geographical spread, effectively prohibiting the opportunity to blast within different areas to lower the average level of vibration. Based upon a constrained mine schedule with few options for adjusting the blasting location because of the small size of the orebody, compliance with the average development or production criteria is unlikely to be achieved by selective blasting with Rex. A possible option for compliance is to maintain the existing Rex blasting schedule, but incorporate additional blasting activities within the other, more distant, underground orebodies to effectively reduce the average levels of vibration. Although I have not undertaken any modelling of the effect, it is expected to require amendments to the mining schedule, possibly extending the duration of the mine due to the resulting lower productivity.

Therefore in my view, averaging does not provide any additional protection of amenity.

Despite these comments, as per my views regarding the separation of development and production blasting activities where I also believed there to be no benefits in terms of amenity, I appreciate that both the HDC and OGNZL are familiar with the same condition that has been shown to be effective for Correnso. I therefore agree with the OGNZL position of accepting the proposed averaging criteria.

Vibration Anomalies

Concerns about the assessment of anomalous vibration readings and how these are addressed have been raised, particularly the time taken to complete the assessment. It is accepted that the recent review was lengthy, partly attributable to attempting to define a set of workable procedures that define an anomalous area, and secondly how the area would be treated. Given that this is the first anomaly that has been identified in 30 years of mining at Waihi, the various phases of identifying, confirming

and classifying the anomalous area, plus establishing guidelines as to how any future anomalies should be identified and treated is a complex task. A policy has now been prepared to address anomalous vibration zones which can be applied in future to identify anomalous zones and manage vibration monitoring within such areas.

Vibration Monitoring Locations

The proposed vibration monitoring locations have been identified and presented in the Heilig & Partners report.

This proposed monitoring locations have been since updated and I note the suggested locations are consistent with the positions shown in the HDC revised condition presented to me on the 9th November. The changes include:

- Deletion of the core shed monitor in Barry Rd; this monitor relates to the Correnso and Trio mines so these locations are not considered a necessary or suitable compliance monitor for Project Martha, although it is expected to be retained at the current site for as long mining occurs in either of these two mines;
- Deletion of four remote locations lying west of the Mangatoetoe Stream and south of the CBD. As monitors become free from other projects, e.g. Correnso, these sites may be established for the purpose of assisting manage the AEP. But as there are proposed compliance monitors between each of these four locations and the blast vibration source, they serve no compliance purpose; and
- The addition of another monitor to the south east of Rex and Kenny St following identification of a "gap" in the monitoring network (the same gap is identified in the s42A report). While shown in the attached figure on the south east corner of Gilmour and Kenny streets, the final, exact location for this monitor may depend on constraints around access, extraneous vibration sources, and power/telephone connections. For now it is presumed that a suitable location close to that indicated can be found.

Flyrock

I agree that that blasting that is undertaken near to occupied premises or public spaces should follow best practices to ensure the possibility of flyrock is minimised. This necessarily ensures best practices with respect to blast design, as well as very careful attention to loading methods and stemming procedures. Previous practices for blasting along the northern wall have demonstrated the procedures are aligned with best practices regarding controlling any incidences of flyrock and have demonstrated OGNZL's capability in this regard.

I agree with the S42 report that various blast parameters and rock mass factors, in addition to those possibly introduced by human error, can increase the extent of any flyrock. It is however important to acknowledge that whilst there will generally be agreement on those factors that could affect either the likelihood or range of flyrock, agreement on the contributing importance of each parameter is less likely. Just as the relevance of the factors will vary, so too will the estimated travel distance of any

flyrock, and therefore the factor of safety. The same blast design could yield different factors of safety depending upon who undertook the analyses.

Unlike other flyrock assessments, the probabilistic modelling approach adopted in my technical report incorporates variations in many of these parameters, that is it considers a 400 mm tolerance in the stemming length, includes a 5% variability in the explosive density, incorporates a 25% variability in the rock mass density, contains a 100% variability in the drag co-efficient and with a full 360 degree projection and 90 degree vertical ejection angle. Because of the detail in the model I have used it is too conservative to simply require. Other models tend to consider only the nominal value for each parameter and it would therefore be reasonable to adopt a greater factor of safety, such as 2 or 3, to offset some of the variations that have been incorporated into the modelling presented in this document. These simpler flyrock assessments tend to show that rock fragments will be projected much shorter distances. As an example, a simplified approach would report flyrock extending not more than 50 metres for a 60-kilogram explosive charge loaded into an 89mm with a 2.5 metre uncharged collar. A higher factor of safety, such as 2 or 3, or some other value, could justifiably be applied to these modelling results.

It is also important to note that these flyrock models are detailed and should generally be applied with some caution and experience, and are unlikely to be effectively used by members of the blast crew. My suggested approach is the risk assess each blast, identifying the contributing factors to flyrock and determine whether any mitigation measures are necessary to achieve an acceptable controlled risk. This is consistent other blasting operations where each blast is assessed based on the observed blasting conditions. The details of the risk assessment could be listed in the Vibration Management Plan.

Pumphouse Condition

The 25mm/s limit previously applied to the pumphouse sets a conservative limit to guard against structural damage. Whilst the condition was relevant for the initial stages of Martha mining where the original location of the pumphouse was well removed from other sensitive areas requiring vibration compliance, the current location of the pumphouse and its proximity to other sensitive receivers along Seddon Street indirectly affect the vibration at the pumphouse. For Project Martha, the nearest blasting is greater than 100 metres from the pumphouse. My analyses show the levels of vibration are limited by the need to meet 5mm/s at the nearest receivers that are a comparable distance from the proposed blasting activity. I have modelled that the maximum level of vibration at the pumphouse from all the planned Project Martha blasting is approximately 9mm/s. Setting a 25mm/s limit at the pumphouse and then monitoring to confirm compliance would appear to serve no purpose.

Although my analyses show no benefit in maintaining the condition, should it be retained, I recommend clarification of the proposed limits. It is noted that the proposed condition requires compliance at the pumphouse with 25mm/s for vibration in the frequency range 20 to 30Hz. If

retained, it is recommended that the proposed Condition is adjusted to simply refer to 25mm/s, irrespective of the frequency content. Otherwise, permissible vibration levels for frequencies outside of the 20 to 30Hz should also be specified.

In reviewing my evidence, I note that a commissioner has sought comment on the outcome of the meeting that I had with the Gentil's regarding their concerns about any impact of the blasting on the operation of their radio broadcast facility in Seddon Street.

Following on from my evidence, discussions with Gold FM were undertaken to assess the proposed Martha Project blasting and its possible impact on the operation of their broadcast studio. The Gold FM studio building is classified as a sensitive receiver as a result of the possible residential occupancy on the first floor. The maximum level of vibration is 5mm/s. It has been confirmed that whilst the studio houses electronic equipment (computers and transmitters) that are necessary to relay the daily broadcasts, based upon a comparison with other projects where blasting has been completed nearer to similarly sensitive electronic equipment, it is not expected that any impact on the continued operation of the equipment would occur. As an example, a blast generating 5mm/s equates to round 20% of the suggested operating limits for a computer hard drive. The exact vibration tolerance specifications of the transmitter are unknown, but expected to be no more significant than other electronic hardware which has similar limits to the hard disk drive. Vibration isolation devices for key hardware could be considered in the unlikely event that vibration was shown to impact upon the equipment operation.

Any noise from blasting would be minor and not considered to impact on their broadcast quality. Elevated background noise can occasionally impact on broadcast quality, although the effects are generally limited to TV studios where omni-directional lapel microphones capable of detecting low levels of background noise are used. The short duration noise from blasting could under some conditions be discernible in a quiet ground floor studio, but unlikely to impact upon radio broadcast quality in a first floor room such as Gold FM.

The requirements of the Gold FM studio are noted but are not anticipated to be impacted upon the proposed Project Martha blasting.

