

MEMORANDUM #3

TO: Cristal Heintzman **VIA E-MAIL**

FROM: Rabih Alkhatib/John Emeljanow

DATE: June 26, 2017

RE: Peer Review of Blast Impact Analysis
Freymond Quarry
Township of Faraday

FILE: 117-0167

INTRODUCTION

We have reviewed the Blast Impact Analysis (BIA) report prepared by Explotech Engineering Ltd. in support of the Freymond Lumber Ltd. application for an aggregate license in the Township of Faraday, County of Hastings, Ontario. The following is our technical review of the report.

BACKGROUND

Freymond Lumber Ltd. is proposing to operate a Category 2 Class A quarry under the Aggregate Resources Act. The subject land is located at 2287 Bay Lake Road and is legally described as Part of Lots 51 and 52, Concession WHR in the Township of Faraday, County of Hastings. Freymond Lumber Ltd. owns approximately 128 ha of land, of which 33.3 ha is proposed to be licensed under the Aggregate Resources Act to permit the proposed quarry. Only 27.5 ha of the 33.3 ha is proposed for extraction. The remainder of the applicant's property consists of an existing Class B sand and gravel pit, a lumber mill and forested lands.

Freymond Lumber Ltd. retained Explotech Engineering Ltd. to prepare a BIA for the proposed quarry. The BIA is documented in the BIA report titled "Blast Impact Analysis Freymond Quarry, Part of Lots 51 & 51, Concession W.H.R., Township of Faraday, County of Hastings" and dated December 13, 2016.

The extraction will proceed in four distinct phases utilizing one or two benches as needed. The anticipated number of blasts will be between 3 and 5 per year which will vary with production requirements.

The BIA report was prepared according to the Aggregate Resources Act (ARA) requirements in order to identify the potential environmental impacts from the required blasting operations. Our comments are restricted to reviewing the report as it relates to the impact of the ground vibration and air overpressure effects from the blasting operations within the proposed quarry area.

BLAST IMPACT ANALYSIS

The BIA report presents an assessment of the potential impact of blasting operations within the proposed Freymond Quarry on the surrounding area. The analysis seeks to establish compliance with the Ontario Ministry of the Environment and Climate Change (MOECC) ground vibration and air overpressure guideline limits found in NPC 119. The standard limits of 12.5 mm/s and 128 dBL would apply at the nearest sensitive receptors assuming a routine monitoring program will be carried out at the proposed Freymond Quarry. The quarry is proposed to proceed in four distinct phases. In each phase, the separation distance between the closest sensitive receptors and the required blasting operations would change with extraction progress. The BIA report indicates that the minimum separation distance between the closest sensitive receptors and the extraction limits for the proposed quarry would be 100 m in Phase 2 of the extraction. The BIA report identified a sensitive receptor located at 342 Gaebel Road (northwest corner of the proposed quarry) at 100 m from the proposed extraction limit.

The BIA report includes:

- Initial blast design parameters for the proposed Freymond Quarry (page 11);
- Empirical formulas and calculation examples for the prediction of ground vibration and air overpressure levels at the nearest sensitive receptors based on assumed loading conditions at the initial blasting operations (page 13 —16);
- Discussion on the impact of vibration on residential water wells (page 17 — 18); and
- A list of recommendations for blasting operations at the proposed quarry site, including developing site specific attenuation formulas to improve the predictions of ground vibration and air overpressure and instituting a monitoring program of all blasts to demonstrate compliance with the MOECC guideline limits (page 19).

The report concludes the following:

"Blasting operations required for operations at the proposed Freymond Quarry site can be carried out safely and within governing guidelines set by the Ministry of the Environment."

DISCUSSION

The Blast Impact Analysis (BIA) report aims at establishing that blasting operation can be implemented in compliance with the MOECC recommended ground vibration and air overpressure guideline limits at the closest sensitive receptors as set in the NPC 119 document.

The BIA report provides two formulas to estimate the allowable maximum explosive charge per delay to comply with the MOE guideline limits for ground vibrations and air overpressure (page 14 for vibration prediction and page 15 for air overpressure prediction). According to the report, these were generated through the analysis of data collected from monitoring performed in Ontario quarries with comprehensive material characteristics and are used for "initial prediction purposes" and providing guidelines for the blasting operations in the absence of data for the proposed aggregate extraction operation. Analysis and discussion was limited to start-up blasting at Phase 1. According to the BIA report, 10 kg is the maximum explosive charge per delay to comply with the MOECC guideline limits. It is noted that as the extraction progresses toward the northwest side of the site, the separation distance between the blast and the receptors on the east side of the property will increase but the blasting setback from the receptors on the

west side will decrease. In Phase 2 as the extraction progress toward the west, the separation distance between blasting and the sensitive receptors will be less than the 250m separation at the initial blast as presented in the report. There is no discussion in the BIA report on the maximum explosive charge per delay to comply with the MOECC guideline limits for such cases where separation distance will be below 250 m.

Table 1 below was created using formulae developed in the BIA report. The two critical parameters in controlling ground vibration and air overpressure effects are distance from the blast and amount of explosive detonated per delay period. According to the empirical formulas presented in the report, as indicated in Table 1, to comply with the MOECC guideline limits, allowable explosives per period delay should be as low as 1 kg per period delay at the 100 m setback distance. It is recommended that the BIA report should include discussion, in general terms, of feasible methods to reduce blasting impacts as extraction progresses toward the northwest boundaries of the site. It is understood that the empirical formulas are approximations and require confirmation through the establishment of site specific attenuation analysis and compliance monitoring program, however, it is important to anticipate mitigation requirements and their feasibility including consideration to the point of termination of blasting.

Table 1
Maximum Explosive Loading To Meet The NPC 119 Guideline Limits According To The BIA Empirical Formulas

Distance to Receptor (m)	Allowable Explosives per Period (kg)	
	Blast Vibration Limit 12.5 mm/sec	Blast Air Overpressure Limits 128 dBL
100	11	1
150	24	2
200	42	5
250	66	10
300	96	17
400	170	41
500	266	80
600	382	115
750	597	137
800	680	268
900	860	326
1000	1062	464

The Department of Fisheries and Oceans Canada (DFO) has developed a set of guidelines for the use of explosives in or near Canadian fisheries waters and includes limits on ground vibration and air overpressure. There was no discussion in the BIA report regarding the potential impact of the blasting on fish habitat or spawning beds which may exist in the area adjacent the site. It is recommended that the

potential impact of the blasting operations on the local fisheries waters in area adjacent to the site should be investigated.

It is recommended that vibration and overpressure monitoring should be carried out by an engineering firm with specialization in blasting and monitoring. It is also recommended that detailed blast records must be maintained. The following information as stipulated in the "Guidelines on Information Required for the Assessment of Blasting Noise and Vibration" (MOE, December 1985) should be contained in the body of all blast reports:

- (a) Location, date and time of the blast.
- (b) Dimensional sketch including photographs, if necessary, of the location of the blasting operation, and the nearest point of reception.
- (c) Physical and topographical description of the ground between the source and the receptor location.
- (d) Type of material being blasted.
- (e) Sub-soil conditions, if known.
- (f) Prevailing meteorological conditions including wind speed in m/s, wind direction, air temperature in °C, relative humidity, degree of cloud cover and ground-moisture content.
- (g) Number of drill holes.
- (h) Pattern and pitch of drill holes.
- (i) Size of holes.
- (j) Depth of drilling.
- (k) Depth of collar (or stemming).
- (l) Depth of toe-load.
- (m) Weight of charge per delay.
- (n) Number and time of delays.
- (o) The result and calculated value of Peak Pressure Level in dB and Peak Particle Velocity in mm/s.
- (p) Applicable limits.
- (q) The excess over the prescribed limit.

The report is missing the references to the studies cited in the body of the report that deals with blast and vibration impact on water wells. It is recommended that the references quoted in the body of the BIA report be listed in the report for completeness.

The remainder of the report's recommendations are reasonable and acceptable.

Please do not hesitate to contact us if you have any question or if further clarification is needed on any issue.

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