TECHNICAL MEMORANDUM

DATE December 15, 2020 **Project No.** 20439438

TO Doug Munro
Tordar Investments Ltd.

CC Jeremy Schmitt, Daniel Corkery

FROM Mohammad Abushanab **EMAIL mohammad_abushanab@golder.com**

SITE-SPECIFIC BLAST IMPACT STUDY ON STRUCTURES AT NIPISSING COURT, BLOCK 7, ADJACENT TO THE KARSON AGGREGATES' HUNTLEY QUARRY KANATA, ONTARIO

The following technical memorandum summarizes the potential impact of ground and air vibrations from the nearby quarry on the proposed structure and infrastructure to be constructed by Tordar Investments Ltd. at Block 7 of the development noted above. The purpose of this assessment is to satisfy the City of Ottawa (the City) request for a study to lift the "H" (holding) zone on Block 7 (required by the zoning by-law).

1.0 INTRODUCTION

West Ottawa Land Holdings Ltd. (WOLHL) is developing a property, known as Nipissing Court, near Karson Aggregates' (Karson) Huntley Quarry (the Quarry) located north of Stittsville, Ontario. WOLHL previously retained Golder Associates Ltd. (Golder) to assess potential impacts from blast-induced ground and air vibration from the Quarry on Nipissing Court using data provided by Karson. The results of the study (Golder 2014) indicated that minor changes in the blasting operations would allow continued aggregate extraction at reduced setback distances with minimal impact on the WOLHL proposed development and remain compliant with proposed vibration limits.

Tordar Investments Ltd. (Tordar) intends to develop a warehouse facility to be located on Block 7 of the Nipissing Court development in Kanata, Ontario (the Site). The Site forms part of the Kanata West Business Park, located north of Highway 417 and west of Huntmar Drive, approved through Official Plan and Zoning By-law Amendments (D01-01-14-0001 & D02-02-14-0018) in 2014. A Plan of Subdivision (D07-16-14-003) was draft approved in 2015 and phases 1 through 5 have now been registered. The subject property is within Phase 5, defined as Block 7 on Plan 4M-1649 and is known municipally as 8800 Campeau Drive. The building will contain a one (1) storey shipping and receiving warehouse and a two (2) storey office space. Based on the provided information, the Site's warehouse will be located 100 m from the western property boundary. Tordar has retained Golder through Realinc-SCS (Realinc) to prepare a site-specific blasting impact study for the Site. The Site location and distance from both the Quarry eastern extraction limit and western property boundary are illustrated in Figure 1.

Golder Associates Ltd.
6925 Century Avenue, Suite #100, Mississauga, Ontario, L5N 7K2, Canada T: +1 905 567 4444 F: +1 905 567 6561

LEGEND

- PROPERTY LINE
- HUNTLEY QUARRY EXTRACTION LIMIT
- PROPOSED BUILDINGS

0 50 100

1:2,000 METRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE.

REFERENCE(S)

1. BASE DATA - MNRF, 2019
2. BASE IMAGERY SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
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3. PROJECTION: TRANSVERSE MERCATOR NAD 1983 UTM ZONE 18

CLIENT
TORDAR INVESTMENTS LTD

PROJECT
VIBRATION ASSESSMENT
KANATA, ONTARIO

TITLE
SITE LOCATION PLAN

CONSULTANT
GOLDER

YYYY-MM-DD	2020-11-26
DESIGNED	ST
PREPARED	ST
REVIEWED	MA
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
20439438	0001	A	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25mm

PATH: S:\Clients\Tordar_Investments_Ltd\Kanata\99_PROJ\20439438.40_PROD\0001_Vibration_Assessment\20439438-0001-HIS-0001.mxd PRINTED ON: 2020-11-26 AT: 11:45:29 AM

As shown in Figure 1, UPS currently has a facility located to the south of the proposed Site. It is understood the UPS facility is a mail distribution services building, which is not sensitive to noise and vibration emissions from the Quarry.

2.0 AIR AND GROUND VIBRATION LIMITS

The Peak Particle Velocity (PPV) is the most commonly used measure of the intensity of the ground vibration due to blasts. For the purposes of this report, PPV is measured in mm/s.

The ground and air vibration effects produced at Points of Reception (PORs) as defined by the Ministry of Environment, Conservation and Parks (MECP) (i.e., dwellings, hotels, schools etc.) adjacent to mines and quarries are subject to guidelines contained in Noise Pollution Control (NPC) publication 119 of the Model Municipal Noise Control Bylaw, dated August 1978, published by MECP. Under conditions where monitoring of the blasting operations is routinely carried out, NPC 119 stipulates that the ground and air vibration limits at the nearest POR to the quarry will be 12.5 mm/s and 128 dBL, respectively.

However, the structures to be developed at Block 7 are not PORs. That is, they will not be noise and vibration sensitive receptors and, thus, will not meet the definition of a POR in accordance with MECP guidelines. The Ontario Provincial Standard Specification (OPSS) 120, General Specification Use of Explosives, covers the requirements for the use of explosives and has been developed for use in provincial and municipal-oriented contracts. Where blasts are not covered by NPC 119, the OPSS is often used in blasting contracts. In Golder's 2014 study, the ground vibration limits for OPSS 120 were used. However, the current ground vibration limits related to blasting operations as established in the City By-law F-1201 are currently applicable. It is noteworthy that the ground vibration guideline limits for F-1201 are the same as OPSS 120. By-law F-1201 does not provide limits for the peak sound pressure levels (PSPL). Golder's 2014 study proposed a PSPL limit of 134 dBL and provided justification for the recommendations.

The Peak Particle Velocity (PPV) limits specified by F-1201 and the proposed PSPL are shown in Table 1

Table 1: Proposed Ground and Air Vibration Limits

Proposed Limit		Limit Value
PPV F-1201	≤ 40 Hz	20 mm/s
PPV F-1201	> 40 Hz	50 mm/s
PSPL		134 dBL

The blast-induced vibrations listed above are intended to prevent cosmetic cracking in sensitive building materials (i.e., drywall and plaster). Vibrations at these levels will be perceptible to the building occupants. The air vibration limit is intended to prevent damage to windows, which are typically the most sensitive element proposed structures to an air pressure pulse from a quarry blast. The results of the initial study indicated that minor changes in the blasting operations would allow continued aggregate extraction at reduced setback distances with minimal impact on the WOLHL proposed development and remain compliant with proposed vibration limits.

3.0 MITIGATIVE MEASURES

An agreement between West Carleton Sand & Gravel Inc. (WCS&G), the owners of Karson, and WOLHL was reached regarding, among other items, the blast-induced vibrations from the Quarry. WCS&G agreed to design blasts to limit the ground and air vibrations to 20.0 mm/s and 134 dBL at 100 m from the western boundary of the WOLHL property. The Tordar Site is located 120 m east of the eastern extraction limit for the Quarry and 100 m east of the western boundary of the property. We have assumed that Karson is able to design the blast to meet the ground vibration limits contained within the agreement and that Karson shall monitor the vibrations and overpressure for all their quarry blasts. The City had agreed with this approach as a part of the subdivision process. Karson's agreement to these mitigative measures indicates the implementation of the measures shall not adversely impact the operation of the quarry. Beyond the modification to the blast designs, no other impact to the quarry is envisioned.

4.0 POTENTIAL IMPACT ON STRUCTURE AND INFRASTRUCTURE AT BLOCK 7

Ground vibration guidelines are typically established for blasting sites to prevent damage to adjacent facilities or infrastructure. Exceeding these levels does not, in itself, imply that damage has occurred but only increases the potential that damage might occur. For comparison, Siskind and Stagg (1993) suggested a PPV limit for Class B or better steel pipelines (or Class 6 or better PVC pipelines) at 127 mm/s. Currently, many pipeline companies in Canada impose the limit of 50 mm/s. Ground vibration limits for stronger materials, such as concrete, may be set as high as 150 to 200 mm/s. Richards and Moore (2007) provided a review of the damage potential from blast-induced vibrations from open pit coal mines. A blast vibration limit of 50 mm/s is often recommended for modern industrial/commercial buildings (CALTRANS 2013). Table 2 provides a summary of PPV limits for a variety of structural elements including the limits for 'Modern industrial/commercial buildings', which would be representative of the Tordar facility. Ground vibration levels which comply with the limit of 20 mm/s would meet the limits shown in Table 2 and should prevent potential impacts at structures proposed by Tordar.

Table 2: Vibration Limits for Various Infrastructure Types

Infrastructure Type	PPV Limit (mm/s)	Comments
Power Transmission Towers *	100	Concrete footings
Wooden Hydro Poles *	240	
Electrical Sub-stations *	10-30	Depending on switch type. Manufacturer should be consulted
Railway Tracks *	100	
Buried Pipelines **	127	
Underground Fibre Optics Line *	100	
Modern industrial/commercial buildings ****	50	From transient sources such as blasting.

* Suggested by Richards and Moore (2007)
** Siskind and Stagg (1993)
*** F-1201
**** CALTRANS (2013)

As mentioned above, the air vibration limit is intended to prevent damage to windows, which are typically the most sensitive element of a structure exposed to an air pressure pulse from a quarry blast. Maintaining the induced air vibrations to within the proposed limit of 134 dBL should prevent damage to infrastructure at Block 7.

If Karson continues to meet the requirements set out in the above-mentioned agreement, based on available information, it is not expected the Tordar facility will be noise or vibration sensitive that it would affect the ongoing operations of the Quarry.

5.0 CLOSURE

Golder was retained by Tordar to assess the potential impact of blast-induced ground and air vibrations from the nearby rock quarry on the proposed development at Nipissing Court Block 7. Based on the results presented in this report and assuming the ground and air vibrations are controlled as described in the WOLHL - WCS&G agreement, the blast vibrations from the blasting operations at the Huntley Quarry should not negatively impact the proposed structures at Nipissing Court, Block 7. Since the blast air and ground vibrations levels described in that agreement are within the City (By-law F-1201) guidelines, limits proposed for the various structural elements at Block 7 and accepted damage thresholds, the proposed warehouse development space to be constructed for Block 7 appears suitable for the location and the proposed vibration limits. There is also an existing industrial building, owned by UPS, located by the eastern quarry extraction limit and south of the proposed Tordar facility. Further, based on the above noted information, Tordar operations should not negatively affect the Quarry operations. We have reviewed the proposed site plan application for Tordar and we have no concerns with the potential vibration and noise impacts on the structure. However, as we have not been provided with the sensitivity of the equipment within the structure, we cannot make any assurances on the potential vibration effects on the operation of the equipment within the structure, and this is the responsibility of Tordar to know and accept the risk.

Based on the results presented in this memorandum, the proposed development can meet ground and air vibration limits specified in City of Ottawa Provision F-1201.

6.0 REFERENCES

California Department of Transportation (CALTRANS), 2013. Transportation and Construction Vibration Guidance Manual, Report No. CT-HWANP-RT-13-069.25.3, 190 pp.

City of Ottawa, 2015. “Blasting Specifications F-1201”.

Golder Associates Ltd. 2014. “Ground Vibration Attenuation Analysis of Huntley Quarry Blasting”, 13-1127-0133. Report presented to West Ottawa Land Holdings Ltd.

Ontario Provincial Standard Specification (OPSS) 120, 2014. “General Specification for the Use of Explosives”, November 2014.

Ontario Ministry of the Environment, 1978. “Model Municipal Noise Control By-Law – NPC100” This contains several publication documents, including NPC 101, NPC 103 and NPC 119.

Richards, A.B. and Moore, A.J., 2007. “Effect of Blasting on Infrastructure”, in Proceedings of Explo 2007, Wollongong, New South Wales, Australia, p. 45-50.

Siskind, D.E. and Stagg, M.S., 1993. “Response of Pressurized Pipelines to Production-Size Mine Blasting”, in Proc. 9th Annual Symposium on Explosives and Blasting Research, International Society of Explosives Engineers, p. 129-148.

We trust this letter is sufficient for your current needs. If you have any questions, please do not hesitate to contact this office.

Golder Associates Ltd.

Mohammad Abushanab, M.Eng.
Acoustics, Noise and Vibration EIT

Daniel Corkery, B.Sc., P.Eng.
Associate, Senior Blasting/Vibration Consultant

MA/JS/DC/ng

https://golderassociates.sharepoint.com/sites/137638/project files/6 deliverables/20439438-tm-rev0 tordar vibration 14dec2020.docx