

14 June 2017

WM Project Number: 00753
 WM Ref: SEE20170614 SD_CVIA
 Email: SEE20170614_SDCVIA@wilkinsonmurray.com.au

Part Refuse Sch.4
 Part 4 s.6 Personal
 information
Attn: SEE Civil Pty Ltd
 24A Ozone Street
 CHINDERAH NSW 2487

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 Sch.4 Part 4
 s.6 Personal
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Dear

**Re: Beaudesert Town Centre Bypass
 Construction Vibration - Impact Assessment**

INTRODUCTION

In April 2015, the Queensland Government announced funding for design and construction of the Beaudesert Town Centre Bypass to divert heavy vehicles around the town centre.

The Queensland Government is partnering with Scenic Rim Regional Council to deliver the \$27.5 million project.

The project will start at the existing Mount Lindesay Highway, near the saw mill (Helen Street), and run to the west of the town centre with an intersection at Bromelton Street (Beaudesert-Boonah Road). The bypass will be a 1.5km, two-lane, 80km/hr road, with signalised intersections at each end and a bridge over Spring Creek (refer Figure 1).

Figure 1 Location of Main Works and Surrounding Receivers



Source: Department of Transport and Main Roads website

SEE Civil Pty Ltd (SCPL) were awarded the construction contract for the bypass and began work mid-January 2017. Work is expected to be completed at the end of 2017.

SCPL are currently undertaking earthworks which includes vibration intensive activities such as:

- Vibratory compacting of base material
- Vibratory piling of steel sheet
- Driven piling of concrete piles

RELEVANT VIBRATION CONSTRUCTION GOALS

As requested by SCPL, the purpose of this letter is to assess the level of vibration impact associated with vibration intensive works identified.

For construction vibration, goals are derived from the Department of Transport and Main Roads (DTMR) document entitled, *Technical Specification - Transport and Main Roads Specifications MRTS51 Environmental Management - July 2015*.

The above Technical Specification provides vibration criteria to control damage to residential houses from construction activities including pile driving, vibratory rollers and construction traffic.

Based on this Specification, the following vibration goal is derived:

Damage Guideline Value = 5mm/s Peak Component Particle Velocity (PCPV)

In terms of general human response to vibration, guidance is obtained from *BSI British Standards – Code of practice for noise and vibration control on construction and open sites – Part 2:Vibration – BS5228-2:2009* as follows:

Table 1 Guidance on Effect of Vibration Levels

Vibration Level (mm/s – PCPV)	Effect
0.14	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3	Vibration might be just perceptible in residential environments.
1.0	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.
10	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

ASSESSMENT OF DAMAGE RISK

The following specific activities and separation distances have been provided to WMPL:

1. Compacting earth using a 20T Vibratory Roller within 50m of residential buildings.
2. Piling (up to 8m length - sheet piles) using a 475kN Vibratory Head attachment on an excavator within 240m of residential buildings.
3. Piling (up to 23m length – concrete piles) using an 80T Hammer Rig within 240m of residential buildings.

In the first instance, a desktop review based on previous measurements and data from WMPL was conducted. On this basis, the following vibration levels are estimated:

- 20T roller operating at a distance of 50m 1mm/s
- 475kN vibratory head attachment driving sheet piles at a distance of 240m <0.1mm/s
- 80T hammer rig driving concrete piles at a distance of 240m <0.1mm/s

It can be seen that the desktop study, with reference to BS5228-2, confirms a low risk of impact and that in fact the vibration levels at 240m are unlikely to be perceptible. The use of a roller at 50m may lead to complaints. A trial vibration measurement was recommended to confirm the impact of the roller. The final impact will depend on the characteristics of the roller and geotechnical strata.

Predicted vibration levels are all well below the criterion of 5mm/s for building damage.

SUMMARY OF MONITORING

Equipment Used & Setup

The monitoring equipment used is presented in Table 2.

Table 2 Equipment Used

Monitor Type	Make	Model
Vibration Logger	Texcel	GTM

The vibration logger has been setup by SCPL (with assistance from WMPL) to monitor vibration levels in all three directions simultaneously (PCPV) as well as the true peak vector sum.

Summary of Vibration Data

Due to on-site equipment malfunction, values of Peak Component Particle Velocity (PCPV) could not be obtained. However, the peak particle velocity (PPV) is available, and this represent a conservatively high estimate of PCPV.

The data in Table 3 was recorded during operation of a 20T Pad Foot Roller (AMMANN ASC200) operating normally at several distances.

Table 3 Summary of Vibration Levels at Several Distances

Distance (m)	PPV (mm/s)
5	18.54
10	13.08
15	1.57
20	1.50
40	0.43
50	0.39
60	0.28

DISCUSSION & CONCLUSION

As requested by SEE Civil Pty Ltd, a risk of damage from construction vibration due to earthworks associated with Beaudesert Town Centre Bypass has been assessed by Wilkinson Murray Pty Limited. This included a desktop study and analysis of roller vibration measurements (conducted by SCPL).

The desktop study confirmed a low risk of damage to nearby residential receivers from vibration associated with the earthworks.

Works associated with the operation of a 20T vibratory roller within 50m was identified as the most vibration intensive works and as such trial vibration measurements were conducted. The trial confirmed vibration levels in the order of 0.39mm/s (peak particle velocity). Such a vibration level is unlikely to lead to damage, even cosmetic of nearby residential buildings and is well below the DTMR Damage Guideline Value of 5mm/s.

When compared to BS5228-2, it is probable that such vibration levels would be perceptible by some people for short periods of time. Any impact can, however, be mitigated by continual engagement with nearby residential receivers of prospective works.

I trust this information is sufficient. Please contact us if you have any further queries.

Yours faithfully

WILKINSON MURRAY

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Associate