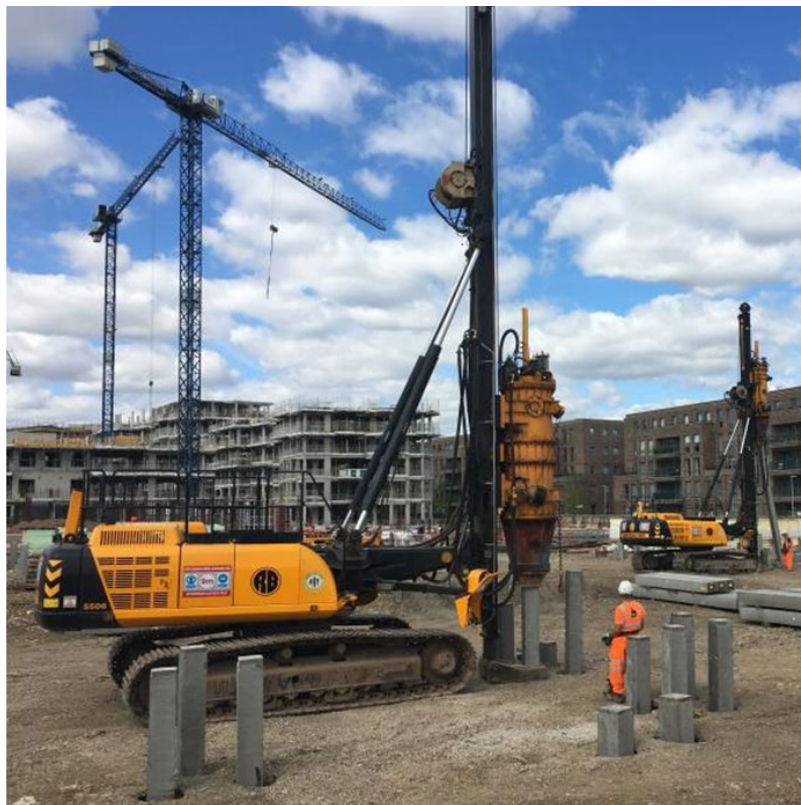


ROGER BULLIVANT

PP24/2001

Industrial Development Mardon Park, Unit B, Baglan

PILING METHOD RISK ASSESSMENT



www.roger-bullivant.co.uk

**Roger Bullivant Ltd
Unit 20 Mardon Park
Baglan Energy Park
Port Talbot SA12 7AX
01639-895641**

Executive Summary

This document aims to explain the installation process and benefits of driven precast piles for the proposed industrial building at Unit B of the Mardon Park site which is located on Baglan Burrows to the Northeast of the former BP Baglan Bay Petrochemical plant.

Indicative noise and vibration levels are also enclosed.

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1. Pile installation process
2. Advantages of the driven precast piling technique
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4. Noise & vibration levels
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1. Pile Installation process

Driven precast piles are installed using hydraulically operated piling hammers of 3-6 tonne weight, with the stroke energy being determined by the pile loading requirements and ground conditions encountered.

Pile sections are supplied in sections of various lengths and are joined to ensure the design length is reached with minimal wastage (see figures 1 and 2).

No spoil is generated during installation and groundwater does not affect the installation or performance of the piles.

The hammer stroke is variable to allow control of pile driving stresses during installation.

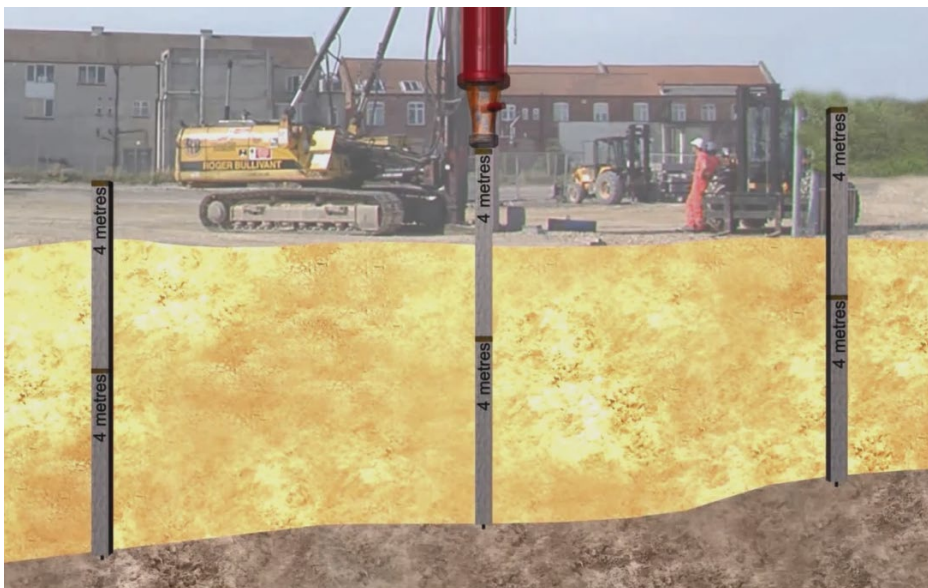


Figure 1 : Driven pile installation process

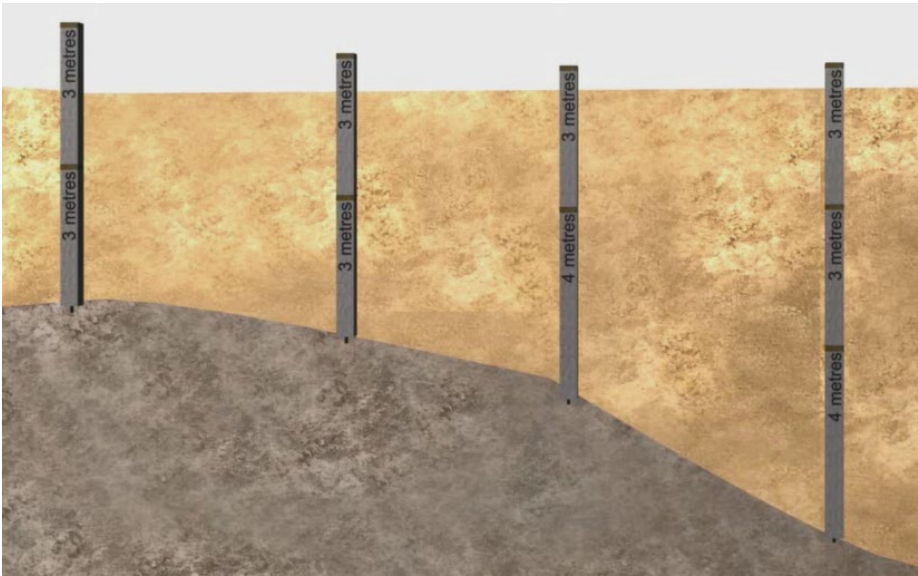


Figure 2 : Segmental pile sections reduce waste

At the Mardon Park site, the piles will be driven mainly in 4m lengths to achieve an anticipated design length of 20m however 3m and 6m units will be delivered to allow flexibility in the total pitched length should the depth of the founding strata vary. The piles will derive bearing capacity primarily in end bearing from the underlying dense gravel / sandstone bedrock.

2. Advantages of the driven precast piling technique

The precast piling technique offers a multitude of benefits over other piling and ground improvement techniques, some benefits include.

- ☐ Pile installation is quick and clean
- ☐ Piles are manufactured in factory-controlled conditions to BS EN ISO 9001:2008
- ☐ Pile lengths are fully reinforced
- ☐ Ground water does not affect the installation or performance of the piles
- ☐ Less plant and equipment required than other techniques
- ☐ As such less deliveries are required
- ☐ No spoil to remove off site

3. Piling in Contaminated Ground

We have noted from the site investigation report provided the 'made ground' is potentially contaminated and concern has been raised by the local authority regarding pollution of the underlying groundwater.

We have reviewed the site investigation report and the boreholes indicate the following soil profile: -

0 – 1m Made Ground

1-20m very soft to soft locally peaty Clay interbedded with loose to medium dense sand

9 - 10m Medium dense sandy Gravel

20m+ Dense gravel (probable bedrock)

The soils report has noted that the made ground is dominated by SAND with some man-made material namely concrete, slag and clinker.

There are two options available for piling on this project: -

- 1) CFA piling
- 2) Driven precast piling

CFA PILING

The main points of concern with CFA piling are:-

The potential of creation of pathways through the made ground due to the requirement to rebore the piles due to obstructions and /or the installation of the reinforcement cages.

Disposal of contaminated pile arisings on site.

Human contact with the contaminated arisings.

DRIVEN PRECAST PILING

The main points of concern with driven precast piling are:-

Creation of pathways alongside the piles due to displacement of the soil during the driving process.

Driving of contaminated material under the toe of the pile into the groundwater.

We would draw your attention to the following reports which deal with this issue.

Environmental Agency report Piling in Layered Ground: Risks to Ground water and Archaeology SC020074/SR.

Environmental Agency report Piling and Penetrative Ground Improvement: Methods on Land Affected by Contamination: Guidance on Pollution Prevention dated May 2001

University of Sheffield Piling in Layered Ground Annual Report 2007 – 2008

The conclusion of these reports regarding the use of displacement piles is as follows: -

Creation of pathways to strata at depth are likely to be temporary and reformation of the soils around the pile shaft through cohesive material will aid in the prevention of water penetrating or constituents migrating to depth. Considering the Environment Agency report SC020074/SR (ref 8) which states that a minimum thickness of 2 pile diameters of ductile or plastic clay above any aquifer will provide an effective seal.

With regard to contamination being trapped under the pile toe we confirm the precast piles will be close ended therefore no plugging of material will be possible and that the slenderness ratio is in excess of 1 in 50 therefore any material on the tip of the pile will be minimal

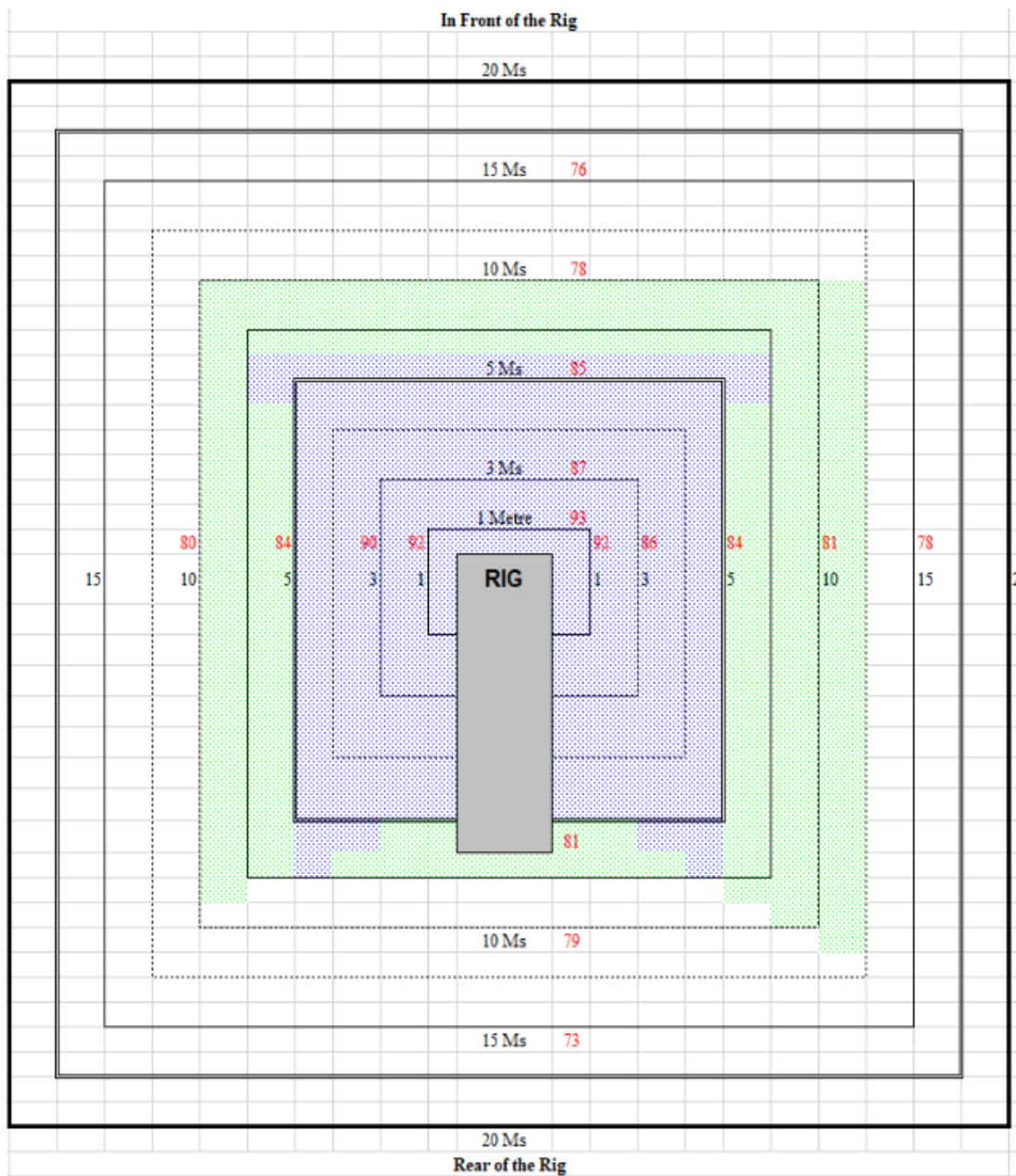
4. Indicative Noise & Vibration levels

Noise

Roger Bullivant's fleet of Driven Piling rigs are designed and manufactured in house at our plant facility in Derbyshire, the encapsulated hammers have vertical exhaust systems to reduce noise levels to a minimum. During pile installation drop heights of the hammer can be reduced to help minimise noise levels and engines can be switched off when not required using the operators remote control unit

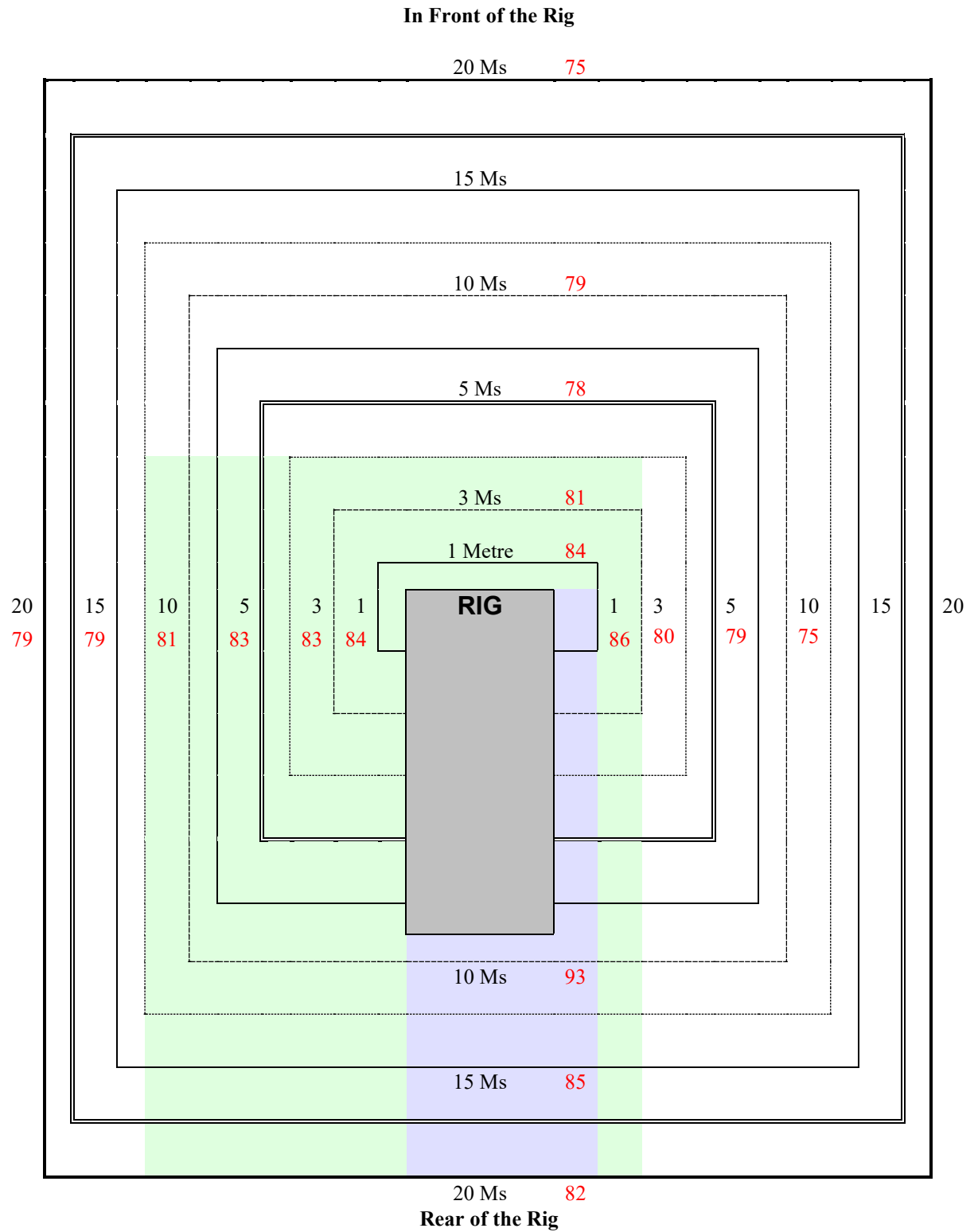
A typical noise footprint for a 5.5T piling rig, which we propose to bring to site, can be found below.

Contour Noise Output Level Map - 5.5T Driven Piling Rig



The RB fleet of CFA rigs typically produce the following noise footprint.

Contour Noise Output Level Map - 7002 Rotary CFA Rig



Whilst from the above charts it appears that both rigs produce similar noise levels it should be noted that the driven rigs will not be continuously driving, whilst the CFA rig would be running constantly during the piling process. It should also be noted that these levels do not include for the concrete pump, concrete delivery vehicles and attendant machine required by the CFA rig to pump concrete and clear the pile arisings which will have an overall impact on the noise levels.

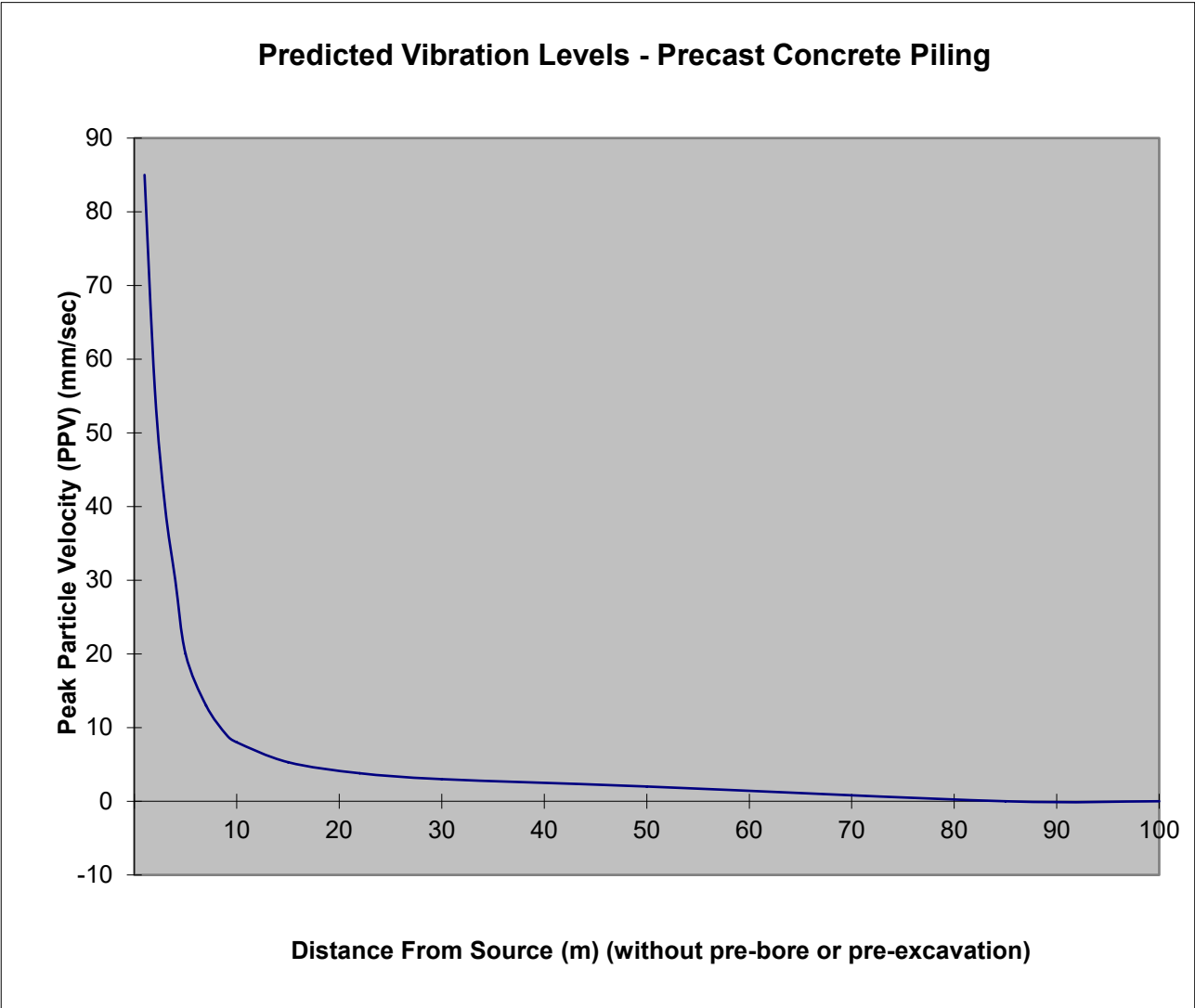
It should also be noted that the duration of the works with a driven rig would be considerably shorter than that of a CFA piled solution.

Vibration

BS5228 quoted limiting criteria for the onset of minor cosmetic damage to light framed structures of 15mm/s for transient, short duration vibration, and 7.5mm/s for continuous vibration.

The below table details typical vibration levels for an RB 5.5T piling rig taken at 5m, 10m, 20m and 30m increments.

Although these are actual field measurements small variations may occur particularly when driving through layered soils.



5. Conclusion

In conclusion based on the above RB consider driven precast piles will provide the best environmental and technical solution to the project.

D. H. Johnson

18.12.23