## APPENDIX 8.8

## VIBRATION MONITORING DETAILS

### Movement of HGVs Along Access Road

### HGV Vibration Measurements

Measurements of ground borne vibration were undertaken at site at positions close to the nearest residential property (i.e. rear garden boundary of nearest receptor). The methodology described below was employed during the vibration survey.

### Measurement Technique

Vibration measurements were made, in the three mutually perpendicular axes, during the monitoring period. The Nomis seismograph was set to the `continuous' and `trigger' mode settings (trigger level of 0.3 mm/sec) and was placed at a distance of approximately 2 metres from the garden boundary (circa 10m from kerbside). Some additional measurements were taken at a distance of 2 metres from the kerbside of the access road for additional information.
The seismograph has monitored the ground borne vibration in terms of Peak Particle Velocity (PPV).

### Results of Survey

During the vibration survey, the seismograph transducer triggered during HGV movements when certain vehicles were travelling over the speed `hump'. The maximum levels of vibration recorded ranged between 0.45mm/s to 0.83mm/s at the rear garden boundary position. Readings taken at closer distance (i.e. within 2 metres of the kerbside) showed the maximum vibration to be between 0.51mm/s and 1mm/s.

Results are provided on the following page:

**Table of Vibration Results:**

| Position | Vibration Magnitude (mm/sec) | | | Peak Frequency (Hz) | Activity |
|---|---|---|---|---|---|
| | Horizontal x | Tranverse y | Vertical z | | |
| Adjacent to nearest dwelling (in car park) | 0.445 | 0.191 | 0.318 | 512 | HGV into site |
| " " " | 0.318 | 0.191 | 0.445 | 11.6 | HGV into site |
| " " " | 0.254 | 0.254 | 0.381 | 14.2 | HGV out of site |
| " " " | 0.318 | 0.191 | 0.381 | 15.5 | HGV out |
| " " " | 0.826 | 0.191 | 0.381 | 512 | 1 x HGV in, 2 x HGVs out |
| " " " | 0.381 | 0.191 | 0.381 | 11.3/256 | HGV in |
| " " " | 0.318 | 0.254 | 0.318 | 2.8/12.4 | HGV out |
| " " " | 0.318 | 0.191 | 0.445 | 14.6 | HGV in |
| " " " | 0.254 | 0.254 | 0.318 | 15.5 | HGV out |
| " " " | 0.699 | 0.445 | 0.318 | 512 | 3 x HGVs in, 1 x HGV out |
| " " " | 0.318 | 0.191 | 0.318 | 2.9/13.4 | HGV in |
| " " " | 0.445 | 0.191 | 0.254 | 512 | HGV in |
| " " " | 0.318 | 0.191 | 0.318 | 11.9/128 | HGV out |
| " " " | 0.254 | 0.191 | 0.508 | 14.6 | HGV & skip wagon in |
| " " " | 0.254 | 0.191 | 0.445 | 11.6 | HGV out |
| " " " | 0.318 | 0.191 | 0.572 | - | Continuous mode (48 HGV movements over 1hour) |
| Within 5m of kerbside | 0.508 | 0.254 | 1.016 | 10.6 | 2 x HGVs into site |
| " " " | 0.318 | 0.127 | 0.318 | 13.1 | HGV in |
| " " " | 0.318 | 0.127 | 0.381 | 12.8 | HGV out |
| " " " | 0.381 | 0.191 | 0.572 | 10.8 | HGV in |

**Monitoring of HGVs and other vehicles at kerbside**

The seismograph only triggered when some of the vehicles passed the monitoring positions.

The following tables detail the results of the ground vibration survey.

**Position 1:**

**Ground Vibration Measurements**

| Time: | Location: | Position: | Vibration level X (m/s2) | Y (m/s2) | Z (m/s2) |
|---|---|---|---|---|---|
| 08:26 | Scawby Road (corner) (2m from kerbside) | Cars near & farside | 0.191 | 0.127 | 0.318 |
| 08:26 | Scawby Road (corner) (2m from kerbside) | HGV far side | 0.191 | 0.127 | 0.254 |
| 08:38 | Scawby Road (corner) (2m from kerbside) | Cars near & farside | 0.191 | 1.27 | 0.254 |
| 08:39 | Scawby Road (corner) (2m from kerbside) | Car far side Car near side | 0.191 | 1.27 | 0.254 |
| 08:39 | Scawby Road (corner) (2m from kerbside) | Tractor far side | 0.254 | 0.127 | 0.254 |
| 08:43 | Scawby Road (corner) (2m from kerbside) | Car near side | 0.318 | 0.127 | 0.254 |
| 08:44 | Scawby Road (corner) (2m from kerbside) | HGV near side Car near side | 0.191 | 0.127 | 0.254 |
| 08:45 | Scawby Road (corner) (2m from kerbside) | Straw Trailer (empty) | 0.318 | 0.254 | 0.508 |
| 08:46 | Scawby Road (corner) (2m from kerbside) | near side Car near side | 0.254 | 0.191 | 0.254 |
| 08:56 | Scawby Road (corner) (2m from kerbside) | HGV near side | 0.381 | 0.318 | 0.381 |
| 08:57 | Scawby Road (corner) (2m from kerbside) | HGV Double | 0.254 | 0.127 | 0.318 |
| Highest Levels | Cars | | 0.254 | 0.127 | 0.318 |
| Highest Levels | HGVs | | 0.445 | 0.254 | 0.508 |
| Highest Levels | Straw Trailer | | 0.381 | 0.318 | 0.381 |
| Highest Levels | HGV near side | | 0.381 | 0.318 | 0.508 |
| Highest Levels | HGV far side | | 0.445 | 0.191 | 0.381 |

**Position 2**
**Access Road**

| Time: | Location: | Position: | Vibration level X (m/s2) | Y (m/s2) | Z (m/s2) |
|---|---|---|---|---|---|
| 09:29 | Access Road (2-3m) | Straw Trailer (loaded) far side | 0.254 | 0.127 | 0.254 |
| 09:30 | Access Road (2-3m) | HGV (Tanker) far side | 0.318 | 0.318 | 0.254 |
| 09:31 | Access Road (1m) | Straw Trailer (loaded) near side | 0.318 | 0.318 | 0.318 |
| 09:31 | Access Road (5m) | Straw Trailer (loaded) leaving junction | 0.191 | 0.127 | 0.254 |
| 09:33 | | Car near side | 0.191 | 0.127 | 0.254 |
| | Highest levels | Cars | 0.191 | 0.127 | |
| | Highest levels | HGVs | 0.318 | 0.318 | |
| | Highest levels | Straw Trailer | 0.318 | 0.318 | |

**Position 3:**
**Scawby Road (on pavement)**

| Time: | Location: | Position: | Vibration level X | Y (m/s2) | Z (m/s2) (m/s2) |
|---|---|---|---|---|---|
| 10:59 | Pavement (1-2m from Scawby Road) | HGV Far Side | 0.254 | 0.127 | 0.254 |
| 11:02 | Pavement (1-2m from Scawby Road) | Car near side | 0.191 | 0.127 | 0.254 |
| 11:03 | Pavement | HGV Far Side | 0.254 | 0.127 | 0.254 |
| 11:05 | (1-2m from Scawby Road) | Car near side | 0.254 | 0.127 | 0.254 |
| 11:05 | Pavement | HGV (flatbed) loaded near side | 0.445 | 0.318 | 0.381 |
| 11:06 | (1-2m from Scawby Road) Pavement | Car near side | 0.191 | 0.127 | 0.254 |
| 11:07 | (1-2m from Scawby Road) | Car near side | 0.191 | 0.127 | 0.254 |
| 11:07 | Pavement (1-2m from Scawby Road) | HGV Near Side | 0.445 | 0.381 | 0.445 |
| 11:07 | Pavement (1-2m from Scawby Road) | Car near side | 0.191 | 0.127 | 0.254 |
| 11:07 | Pavement | HGV Near Side | 0.254 | 0.254 | 0.254 |
| | Highest levels | Cars | | | 0.254 |
| | Highest levels | HGVs | | | 0.445 |
| | Highest levels | HGV near side | | 0.445 | 0.381 |
| | Highest levels | HGV far side | | 0.254 | 0.127 |

***Research Data***

The New Zealand Transport Agency published a research paper entitled `Ground Vibration from Road Construction' in May 2012, which includes a table of measured PPV values for different types of plant. The results have been provided below as an extract from the paper for ease of reference.

**Vibration Levels from a Range of Construction Activities**