

APPENDIX 11A: BASELINE NOISE MONITORING RESULTS

Table 11.A.1: Summary of daytime noise measurements

Location	Time	Measured Noise Levels (dB re. 2×10^{-5} Pa)		
		L _{Aeq}	L _{A10}	L _{A90}
S01	12:59 - 13:14	64	67	56
	14:29 - 14:44	63	66	57
	20:20 - 20:35	63	66	56
	00:07 - 00:22	61	65	51
S02	13:20 - 13:35	52	53	49
	14:47 - 15:02	52	54	50
	20:41 - 20:56	55	56	52
	00:25 - 00:35	53	55	49
S03	14:11 - 14:26	67	72	50
	15:10 - 15:25	68	72	50
	21:01 - 21:16	67	72	51
	00:40 - 00:55	59	62	50
S04	13:42 - 13:57	52	52	47
	15:32 - 15:47	50	52	45
	21:34 - 21:49	55	58	50
	01:35 - 01:50	51	54	46
S05	14:06 - 14:21	55	58	48
	15:10 - 15:25	51	52	48
	21:53 - 22:08	51	52	49
	01:55 - 02:10	47	49	44
S06	13:46 - 14:01	53	55	51
	14:51 - 15:06	59	55	50
	22:14 - 22:29	49	50	47
	02:15 - 02:20	48	51	44
S07	13:25 - 13:40	52	53	51
	14:32 - 14:47	53	54	51
	22:34 - 22:49	50	51	48
	02:21 - 02:36	47	49	45
S08	15:41 - 15:56	54	56	52
	18:06 - 18:21	56	57	54
	22:53 - 23:08	49	50	46
	02:46 - 03:01	45	47	43
S09	16:05 - 16:20	57	59	54
	17:09 - 17:24	58	60	54
	23:13 - 23:28	51	54	48
	00:10 - 00:25	54	57	50
S010	16:31 - 16:46	61	64	56
	17:28 - 17:43	61	63	55
	23:32 - 23:47	52	54	48
	00:42 - 00:57	52	54	48
S011	16:51 - 17:06	61	64	57
	17:46 - 18:01	62	64	57
	23:50 - 00:05	49	51	45
	01:00 - 01:15	57	57	48

Table 10.A2 Summary of background concentrations used in the air dispersion model.

Ref.	Notes	SEL (dB)	LAeq(dB)
1	Luas arrival at stop	77	52
2	Luas departure from stop	79	54
3		77	52
4	Luas movement 150m from stop along straight - arrival	87	62
5		88	63
6	Luas movement on straight full speed	90	65
7	Luas movement on corner (brakes)	86	61
8		84	59
9	Luas movement on straight full speed	88	63
10	Luas arrival at stop	80	56
11	Luas departure at stop	80	56
12		80	56
13	Luas movement 150m from stop along straight - departure under acceleration	88	64
14		90	66
15	Luas movement on straight full speed	85	61
16	Luas movement on corner (brakes)	87	62
17		87	62
18	Luas movement on straight full speed	87	62
19		87	62
20		85	61
21		82	57
22		83	58

APPENDIX 11.B: REVIEW OF CALCULATION OF RAILWAY NOISE

The noise predictions have been carried out using a noise prediction template implementing calculation routines based on the Calculation of Railway Noise (CRN) procedure. The source noise levels were based on measurements taken on equivalent sections of existing Luas lines as detailed in Section 11.2.7.

In general, the tram noise level is calculated taking into account a range of factors affecting the propagation of sound, including:

- the magnitude of the noise source;
- the distance between the source and receiver;
- the presence of obstacles such as screens or barriers in the propagation path;
- the presence of reflecting surfaces;
- the hardness of the ground between the source and receiver.

The CRN method of predicting noise from a rail scheme consists of the following five elements:

- divide the track into segments so that the variation of noise within this segment is small;
- calculate the basic noise level at a reference distance of 12.5 metres from the nearside track edge for each segment;
- assess for each segment the noise level at the reception point taking into account distance attenuation and screening of the source line;
- correct the noise level at the reception point to take account of site layout features including reflections from buildings and facades, and the size of source segment;
- combine the contributions from all segments to give the predicted noise level at the receiver location for the entire development.

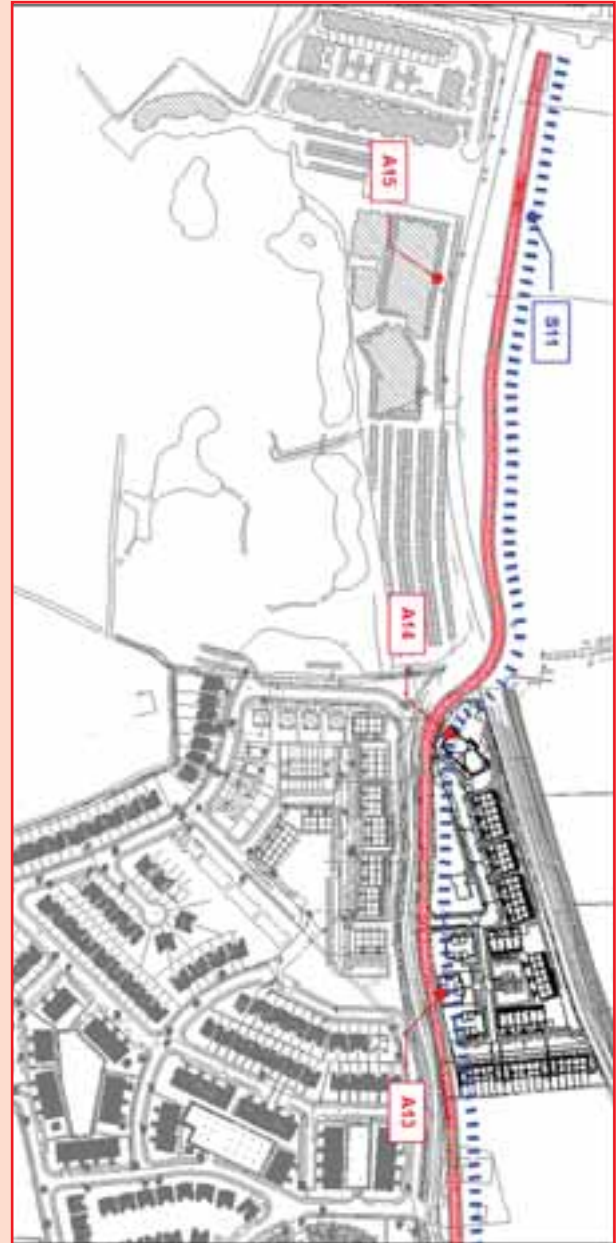
Note that all calculations are performed to one decimal place. For the purposes of comparison with the design goals, the relevant noise level is rounded to the nearest whole number.

The noise calculations were prepared using the following data:

- development alignments, topographical data (including existing boundary walls and new boundary walls proposed as part of the scheme) and Ordnance Survey mapping supplied by Brian Meehan & Associates;
- timetable data from existing Luas line operations.

APPENDIX 11.C: NOISE AND VIBRATION MONITORING AND ASSESSMENT LOCATIONS





APPENDIX 11.D: BASELINE VIBRATION MONITORING RESULTS

Table 11.D.1 Measured Vibration Levels at Location S01

Time	Tran PPV (mm/s)	Tran Freq (Hz)	Vert PPV (mm/s)	Vert Freq (Hz)	Long PPV (mm/s)	Long Freq (Hz)	Geo PVS (mm/s)
20:47:48	0.254	>100	0.254	>100	0.127	>100	0.284
20:48:48	0.254	>100	0.254	>100	0.127	>100	0.311
20:49:48	0.254	>100	0.127	>100	0.127	>100	0.311

Note: A value of 0.127 relates to the lower limit of detection of the vibration meter. A freq of >100 indicates that the maximum frequency is above 100Hz. Typically where these items are noted no significant vibration event has occurred with the period under review.

Table 11.D.2 Measured Vibration Levels at Location S02

Time	Tran PPV (mm/s)	Tran Freq (Hz)	Vert PPV (mm/s)	Vert Freq (Hz)	Long PPV (mm/s)	Long Freq (Hz)	Geo PVS (mm/s)
20:55:48	0.254	>100	0.254	>100	0.127	N/A	0.284
20:56:48	0.254	>100	0.127	>100	0.127	>100	0.311
20:57:48	0.254	>100	0.127	>100	0.127	>100	0.311
20:58:48	0.254	>100	0.127	>100	0.127	>100	0.311
20:59:48	0.254	>100	0.127	>100	0.127	>100	0.311
21:00:48	0.254	>100	0.127	>100	0.127	>100	0.311
21:01:48	0.254	>100	0.254	>100	0.127	>100	0.311
21:02:48	0.254	>100	0.254	>100	0.127	>100	0.311
21:03:48	0.254	>100	0.127	>100	0.127	>100	0.311
21:04:48	0.254	>100	0.127	>100	0.127	>100	0.311
21:05:48	0.254	>100	0.127	>100	0.127	>100	0.311
21:06:48	0.254	>100	0.127	>100	0.127	>100	0.311
21:07:48	0.254	>100	0.254	>100	0.127	>100	0.311
21:08:48	0.254	>100	0.127	>100	0.254	>100	0.311

Table 11.D.3 Measured Vibration Levels at Location S03

Time	Tran PPV (mm/s)	Tran Freq (Hz)	Vert PPV (mm/s)	Vert Freq (Hz)	Long PPV (mm/s)	Long Freq (Hz)	Geo PVS (mm/s)
21:16:30	0.254	>100	0.127	N/A	0.254	>100	0.311
21:17:30	0.254	>100	0.127	>100	0.127	>100	0.311
21:18:30	0.254	>100	0.127	>100	0.127	>100	0.311
21:19:30	0.254	>100	0.254	>100	0.127	>100	0.311
21:20:30	0.254	>100	0.127	>100	0.127	>100	0.311
21:21:30	0.254	>100	0.127	>100	0.127	>100	0.311
21:22:30	0.254	>100	0.254	>100	0.127	>100	0.311
21:23:30	0.254	>100	0.127	>100	0.127	>100	0.311
21:24:30	0.254	>100	0.127	>100	0.127	>100	0.311
21:25:30	0.254	>100	0.254	>100	0.127	>100	0.311
21:26:30	0.254	>100	0.127	>100	0.127	>100	0.311
21:27:30	0.254	>100	0.254	>100	0.127	>100	0.311
21:28:30	0.254	>100	0.254	>100	0.254	>100	0.311
21:29:30	0.254	>100	0.127	>100	0.127	>100	0.311
21:30:30	0.381	>100	0.254	>100	0.254	>100	0.421

Table 11.D.5 Measured Vibration Levels at Location S05

Time	Tran PPV (mm/s)	Tran Freq (Hz)	Vert PPV (mm/s)	Vert Freq (Hz)	Long PPV (mm/s)	Long Freq (Hz)	Geo PVS (mm/s)
14:21:15	0.127	N/A	0.127	>100	0.127	>100	0.22
14:22:15	0.127	>100	0.127	>100	0.127	>100	0.22
14:23:15	0.127	>100	0.127	>100	0.127	>100	0.22
14:24:15	0.127	>100	0.127	>100	0.127	>100	0.22
14:25:15	0.127	>100	0.127	>100	0.127	>100	0.22
14:26:15	0.127	>100	0.127	>100	0.127	>100	0.22
14:27:15	0.127	>100	0.127	>100	0.127	>100	0.22
14:28:15	0.127	>100	0.127	>100	0.127	>100	0.22
14:29:15	0.127	>100	0.127	>100	0.127	>100	0.22
14:30:15	0.635	43	0.889	34	0.635	64	0.933
14:31:15	0.127	>100	0.127	>100	0.127	>100	0.22
14:32:15	0.127	>100	0.127	>100	0.127	>100	0.22
14:33:15	0.127	>100	0.127	>100	0.127	>100	0.22
14:34:15	0.127	>100	0.127	>100	0.127	>100	0.22

Table 11.D.6 Measured Vibration Levels at Location S06

Time	Tran PPV (mm/s)	Tran Freq (Hz)	Vert PPV (mm/s)	Vert Freq (Hz)	Long PPV (mm/s)	Long Freq (Hz)	Geo PVS (mm/s)
15:06:11	0.127	N/A	0.127	N/A	0.127	>100	0.22
15:07:11	0.127	>100	0.127	>100	0.127	>100	0.22
15:08:11	0.127	>100	0.127	>100	0.127	>100	0.22
15:09:11	0.254	>100	0.127	>100	0.127	>100	0.254
15:10:11	0.127	>100	0.127	>100	0.127	>100	0.22
15:11:11	0.127	>100	0.127	>100	0.127	>100	0.22
15:12:11	0.127	>100	0.127	>100	0.127	>100	0.22
15:13:11	0.127	>100	0.127	>100	0.127	>100	0.22
15:14:11	0.127	>100	0.127	>100	0.127	>100	0.22
15:15:11	0.127	>100	0.127	>100	0.127	>100	0.22
15:16:11	0.127	>100	0.127	>100	0.127	>100	0.22
15:17:11	0.127	>100	0.127	>100	0.127	>100	0.22
15:18:11	0.127	>100	0.127	>100	0.127	>100	0.22
15:19:11	0.127	>100	0.127	>100	0.127	>100	0.22
15:20:11	0.127	>100	0.127	>100	0.127	>100	0.22

Table 11.D.7 Measured Vibration Levels at Location S07

Time	Tran PPV (mm/s)	Tran Freq (Hz)	Vert PPV (mm/s)	Vert Freq (Hz)	Long PPV (mm/s)	Long Freq (Hz)	Geo PVS (mm/s)
14:47:26	0.127	>100	0.127	>100	0.127	>100	0.22
14:48:26	0.127	>100	0.127	>100	0.127	>100	0.22
14:49:26	0.127	>100	0.127	>100	0.127	>100	0.22
14:50:26	0.127	>100	0.127	>100	0.127	>100	0.22
14:51:26	0.127	>100	0.127	>100	0.127	>100	0.22
14:52:26	0.127	>100	0.127	>100	0.127	>100	0.22
14:53:26	0.127	>100	0.127	>100	0.127	>100	0.22
14:54:26	0.127	>100	0.127	>100	0.127	>100	0.22
14:55:26	0.127	>100	0.127	>100	0.127	>100	0.22
14:56:26	0.127	>100	0.127	>100	0.127	>100	0.22
14:57:26	0.254	>100	0.127	>100	0.127	>100	0.284
14:58:26	0.127	>100	0.127	>100	0.127	>100	0.22
14:59:26	0.127	>100	0.127	>100	0.127	>100	0.22
15:00:26	0.127	>100	0.127	>100	0.127	>100	0.22

Table 11.D.8 Measured Vibration Levels at Location S08

Time	Tran PPV (mm/s)	Tran Freq (Hz)	Vert PPV (mm/s)	Vert Freq (Hz)	Long PPV (mm/s)	Long Freq (Hz)	Geo PVS (mm/s)
15:59:24	0.127	>100	0.127	>100	0.127	>100	0.22
16:00:24	0.127	>100	0.127	>100	0.127	>100	0.22
16:01:24	0.127	>100	0.127	>100	0.127	>100	0.22
16:02:24	0.127	>100	0.127	>100	0.127	>100	0.22
16:03:24	0.127	>100	0.127	>100	0.127	>100	0.22
16:04:24	0.127	>100	0.127	>100	0.127	>100	0.22
16:05:24	0.127	>100	0.127	>100	0.127	>100	0.22
16:06:24	0.127	>100	0.127	>100	0.127	>100	0.22
16:07:24	0.254	>100	0.127	>100	0.127	>100	0.311
16:08:24	0.127	>100	0.127	>100	0.127	>100	0.22
16:09:24	0.127	>100	0.127	>100	0.127	>100	0.22
16:10:24	0.254	>100	0.127	>100	0.127	>100	0.284

Table 11.D.9 Measured Vibration Levels at Location S09

Time	Tran PPV (mm/s)	Tran Freq (Hz)	Vert PPV (mm/s)	Vert Freq (Hz)	Long PPV (mm/s)	Long Freq (Hz)	Geo PVS (mm/s)
16:20:12	0.127	N/A	0.127	>100	0.127	>100	0.22
16:21:12	0.254	>100	0.127	>100	0.127	>100	0.254
16:22:12	0.127	>100	0.127	>100	0.127	>100	0.22
16:23:12	0.127	>100	0.127	>100	0.127	>100	0.22
16:24:12	0.127	>100	0.127	>100	0.127	>100	0.22
16:25:12	0.127	>100	0.127	>100	0.127	>100	0.22
16:26:12	0.127	>100	0.127	>100	0.127	>100	0.22
16:27:12	0.127	>100	0.127	>100	0.127	>100	0.22
16:28:12	0.254	>100	0.127	>100	0.127	>100	0.254
16:29:12	0.127	>100	0.127	>100	0.127	>100	0.22
16:30:12	0.254	>100	0.127	>100	0.127	>100	0.311
16:31:12	0.127	>100	0.127	>100	0.127	>100	0.22
16:32:12	0.254	>100	0.127	>100	0.127	>100	0.284
16:33:12	0.127	>100	0.127	>100	0.127	>100	0.22
16:34:12	0.127	>100	0.127	>100	0.127	>100	0.22

Table 11.D.10 Measured Vibration Levels at Location S10

Time	Tran PPV (mm/s)	Tran Freq (Hz)	Vert PPV (mm/s)	Vert Freq (Hz)	Long PPV (mm/s)	Long Freq (Hz)	Geo PVS (mm/s)
16:47:53	0.254	>100	0.127	>100	0.127	>100	0.284
16:48:53	0.254	>100	0.127	>100	0.127	>100	0.254
16:49:53	0.127	>100	0.127	>100	0.127	>100	0.22
16:50:53	0.254	>100	0.127	>100	0.127	>100	0.254
16:51:53	0.254	>100	0.127	>100	0.127	>100	0.311
16:52:53	0.254	>100	0.127	>100	0.127	>100	0.284
16:53:53	0.254	>100	0.127	>100	0.127	>100	0.311
16:54:53	0.254	>100	0.127	>100	0.127	>100	0.284
16:55:53	0.254	>100	0.127	>100	0.127	>100	0.311
16:56:53	0.127	>100	0.127	>100	0.127	>100	0.22
16:57:53	0.254	>100	0.127	>100	0.127	>100	0.284
16:58:53	0.254	>100	0.127	>100	0.127	>100	0.284

Table 11.D.11 Measured Vibration Levels at Location S11

Time	Tran PPV (mm/s)	Tran Freq (Hz)	Vert PPV (mm/s)	Vert Freq (Hz)	Long PPV (mm/s)	Long Freq (Hz)	Geo PVS (mm/s)
17:07:09	0.254	>100	0.127	>100	0.127	>100	0.311
17:08:09	0.254	>100	0.127	>100	0.127	>100	0.311
17:09:09	0.254	>100	0.127	>100	0.127	>100	0.311
17:10:09	0.254	>100	0.254	>100	0.127	>100	0.311
17:11:09	0.254	>100	0.127	>100	0.127	>100	0.311
17:12:09	0.254	>100	0.127	>100	0.127	>100	0.311
17:13:09	0.254	>100	0.127	>100	0.127	>100	0.284
17:14:09	0.254	>100	0.127	>100	0.127	>100	0.311
17:15:09	0.254	>100	0.127	>100	0.127	>100	0.311
17:16:09	0.254	>100	0.254	>100	0.127	>100	0.311
17:17:09	0.254	>100	0.127	>100	0.127	>100	0.284
17:18:09	0.254	>100	0.127	>100	0.127	>100	0.311

APPENDIX 11.E: LUAS VIBRATION MONITORING RESULTS

Location V01

Belgard Stop - monitor on concrete platform, 5.5m from edge of line, Luas departure.

Table 11.E.1 Measured Vibration Levels at Location V01

Time	Tran PPV (mm/s)	Tran Freq (Hz)	Vert PPV (mm/s)	Vert Freq (Hz)	Long PPV (mm/s)	Long Freq (Hz)	Geo PVS (mm/s)
10:49:34	0.127	>100	0.127	>100	0.127	>100	0.22
10:49:36	0.254	>100	0.254	>100	0.127	>100	0.284
10:49:38	0.254	>100	0.381	>100	0.254	>100	0.421
10:49:40	0.254	>100	0.254	>100	0.254	>100	0.44
10:49:42	0.127	>100	0.127	>100	0.127	>100	0.22

Location V02

Belgard Stop - monitor on concrete platform, 2m from edge of line, Luas arrival.

Table 11.E.2 Measured Vibration Levels at Location V02

Time	Tran PPV (mm/s)	Tran Freq (Hz)	Vert PPV (mm/s)	Vert Freq (Hz)	Long PPV (mm/s)	Long Freq (Hz)	Geo PVS (mm/s)
10:49:54	0.127	>100	0.127	>100	0.127	>100	0.22
10:49:56	0.127	>100	0.127	>100	0.127	>100	0.22
10:49:58	0.254	>100	0.254	>100	0.127	>100	0.311
10:50:00	0.254	>100	0.508	>100	0.254	>100	0.568
10:50:02	0.254	>100	0.381	>100	0.254	>100	0.402
10:50:04	0.254	>100	0.254	>100	0.127	>100	0.284
10:50:06	0.127	>100	0.127	>100	0.127	>100	0.22

Location V03

Belgard Stop - monitor on concrete platform, 2m from edge of line, Luas departure.

Table 11.E.3 Measured Vibration Levels at Location V03

Time	Tran PPV (mm/s)	Tran Freq (Hz)	Vert PPV (mm/s)	Vert Freq (Hz)	Long PPV (mm/s)	Long Freq (Hz)	Geo PVS (mm/s)
10:52:48	0.127	>100	0.127	>100	0.127	>100	0.22
10:52:50	0.127	>100	0.127	>100	0.127	>100	0.22
10:52:52	0.254	>100	0.254	>100	0.127	>100	0.311
10:52:54	0.254	>100	0.254	>100	0.254	>100	0.381
10:52:56	0.127	>100	0.127	>100	0.127	>100	0.22

Location V04

Belgard Stop - monitor on concrete platform, 5.5m from edge of line, Luas arrival.

Table 11.E.4 Measured Vibration Levels at Location V04

Time	Tran PPV (mm/s)	Tran Freq (Hz)	Vert PPV (mm/s)	Vert Freq (Hz)	Long PPV (mm/s)	Long Freq (Hz)	Geo PVS (mm/s)
10:58:00	0.127	>100	0.127	>100	0.127	>100	0.22
10:58:02	0.127	>100	0.127	>100	0.127	>100	0.22
10:58:04	0.127	>100	0.254	>100	0.127	>100	0.311
10:58:06	0.381	>100	0.254	>100	0.254	>100	0.524
10:58:08	0.254	>100	0.254	>100	0.127	>100	0.311
10:58:10	0.254	>100	0.127	>100	0.127	>100	0.254
10:58:12	0.127	>100	0.127	>100	0.127	>100	0.22
10:58:14	0.127	>100	0.127	>100	0.127	>100	0.22

Location V05

150m from Belgard Stop along straight section - monitor on soft ground, 2m from edge of line, Luas under acceleration.

Table 11.E.5 Measured Vibration Levels at Location V05

Time	Tran PPV (mm/s)	Tran Freq (Hz)	Vert PPV (mm/s)	Vert Freq (Hz)	Long PPV (mm/s)	Long Freq (Hz)	Geo PVS (mm/s)
11:03:03	0.127	>100	0.127	>100	0.127	>100	0.22
11:03:05	0.254	>100	0.381	85	0.127	>100	0.458
11:03:07	0.762	73	1.78	73	1.14	85	2.05
11:03:09	0.889	73	1.9	73	1.27	85	2.24
11:03:11	0.127	>100	0.254	>100	0.127	>100	0.284
11:03:13	0.127	>100	0.127	>100	0.127	>100	0.22

Location V06

150m from Belgard Stop along straight section - monitor on soft ground, 5.5m from edge of line, Luas under breaking.

Table 11.E.6 Measured Vibration Levels at Location V06

Time	Tran PPV (mm/s)	Tran Freq (Hz)	Vert PPV (mm/s)	Vert Freq (Hz)	Long PPV (mm/s)	Long Freq (Hz)	Geo PVS (mm/s)
11:05:37	0.127	>100	0.127	>100	0.127	>100	0.22
11:05:39	0.254	>100	0.381	85	0.254	>100	0.475
11:05:41	0.508	>100	1.27	73	0.889	85	1.43
11:05:43	0.508	85	1.02	73	1.02	85	1.26
11:05:45	0.127	>100	0.127	>100	0.127	>100	0.22

Location V07

Luas movement along corner section - monitor on concrete, 2m from edge of line.

Table 11.E.7 Measured Vibration Levels at Location V07

Time	Tran PPV (mm/s)	Tran Freq (Hz)	Vert PPV (mm/s)	Vert Freq (Hz)	Long PPV (mm/s)	Long Freq (Hz)	Geo PVS (mm/s)
11:12:09	0.127	>100	0.127	>100	0.127	>100	0.22
11:12:11	0.127	>100	0.127	>100	0.127	>100	0.22
11:12:13	0.254	>100	0.254	>100	0.254	>100	0.311
11:12:15	0.254	>100	0.381	>100	0.254	>100	0.475
11:12:17	0.127	>100	0.127	>100	0.127	>100	0.22

Location V08

Luas movement along corner section - monitor on concrete, 5.5m from edge of line.

Table 11.E.8 Measured Vibration Levels at Location V08

Time	Tran PPV (mm/s)	Tran Freq (Hz)	Vert PPV (mm/s)	Vert Freq (Hz)	Long PPV (mm/s)	Long Freq (Hz)	Geo PVS (mm/s)
11:13:03	0.127	>100	0.127	>100	0.127	>100	0.22
11:13:05	0.254	>100	0.254	>100	0.254	>100	0.44
11:13:07	0.381	>100	0.381	85	0.254	>100	0.524
11:13:09	0.254	>100	0.127	>100	0.127	>100	0.254
11:13:11	0.127	>100	0.127	>100	0.127	>100	0.22

Location V09

Luas movement along straight section - monitor on soft ground, 5.5m from edge of line, Luas at full speed.

Table 11.E.9 Measured Vibration Levels at Location V09

Time	Tran PPV (mm/s)	Tran Freq (Hz)	Vert PPV (mm/s)	Vert Freq (Hz)	Long PPV (mm/s)	Long Freq (Hz)	Geo PVS (mm/s)
11:19:20	0.127	>100	0.127	>100	0.127	>100	0.22
11:19:22	0.381	85	0.635	85	0.508	85	0.762
11:19:24	0.381	85	0.889	73	1.14	>100	1.23
11:19:26	0.381	>100	0.508	85	0.762	73	0.803
11:19:28	0.127	>100	0.127	>100	0.127	>100	0.22

Location V10

Luas movement along straight section - monitor on soft ground, 2m from edge of line, Luas at full speed.

Table 11.E.10 Measured Vibration Levels at Location V10

Time	Tran PPV (mm/s)	Tran Freq (Hz)	Vert PPV (mm/s)	Vert Freq (Hz)	Long PPV (mm/s)	Long Freq (Hz)	Geo PVS (mm/s)
11:21:10	0.127	>100	0.127	>100	0.127	>100	0.22
11:21:12	0.508	85	0.762	85	1.4	85	1.42
11:21:14	0.762	85	1.4	73	1.52	>100	2.05
11:21:16	0.127	>100	0.127	>100	0.127	>100	0.22

Location V11

Luas movement along straight section - monitor on soft ground, 8m from edge of line, Luas at full speed.

Table 11.E.11 Measured Vibration Levels at Location V11

Time	Tran PPV (mm/s)	Tran Freq (Hz)	Vert PPV (mm/s)	Vert Freq (Hz)	Long PPV (mm/s)	Long Freq (Hz)	Geo PVS (mm/s)
11:26:39	0.127	>100	0.127	>100	0.127	>100	0.22
11:26:41	0.254	>100	0.127	>100	0.254	>100	0.311
11:26:43	0.381	85	0.381	73	0.508	85	0.622
11:26:45	0.381	85	0.381	51	0.508	85	0.568
11:26:47	0.254	>100	0.254	>100	0.127	>100	0.311
11:26:49	0.127	>100	0.127	>100	0.127	>100	0.22

Location V12

Luas movement along straight section - monitor on soft ground, 4m from edge of line, Luas at full speed

Table 11.E.12 Measured Vibration Levels at Location V12

Time	Tran PPV (mm/s)	Tran Freq (Hz)	Vert PPV (mm/s)	Vert Freq (Hz)	Long PPV (mm/s)	Long Freq (Hz)	Geo PVS (mm/s)
11:30:53	0.127	>100	0.127	>100	0.127	>100	0.22
11:30:55	0.508	85	0.508	64	0.635	73	0.696
11:30:57	0.508	85	0.508	64	0.635	73	0.813
11:30:59	0.127	>100	0.127	>100	0.127	>100	0.22

Location V13

Luas movement along straight section - monitor on soft ground, 14m from edge of line, Luas at full speed.

Table 11.E.13 Measured Vibration Levels at Location V13

Time	Tran PPV (mm/s)	Tran Freq (Hz)	Vert PPV (mm/s)	Vert Freq (Hz)	Long PPV (mm/s)	Long Freq (Hz)	Geo PVS (mm/s)
11:33:05	0.127	>100	0.127	>100	0.127	>100	0.22
11:33:07	0.254	>100	0.254	>100	0.254	>100	0.311
11:33:09	0.254	>100	0.127	>100	0.254	>100	0.311
11:33:11	0.127	>100	0.127	>100	0.127	>100	0.22

Location V14

Luas movement along straight section - monitor on soft ground, 10m from edge of line, Luas at full speed.

Table 11.E.14 Measured Vibration Levels at Location V14

Time	Tran PPV (mm/s)	Tran Freq (Hz)	Vert PPV (mm/s)	Vert Freq (Hz)	Long PPV (mm/s)	Long Freq (Hz)	Geo PVS (mm/s)
11:37:05	0.127	>100	0.127	>100	0.127	>100	0.22
11:37:07	0.381	73	0.254	>100	0.254	>100	0.402
11:37:09	0.254	>100	0.254	>100	0.254	>100	0.311
11:37:11	0.127	>100	0.127	>100	0.127	>100	0.22

Location V15

Luas movement along straight section - monitor on soft ground, 24m from edge of line, Luas at full speed.

Table 11.E.15 Measured Vibration Levels at Location V15

Time	Tran PPV (mm/s)	Tran Freq (Hz)	Vert PPV (mm/s)	Vert Freq (Hz)	Long PPV (mm/s)	Long Freq (Hz)	Geo PVS (mm/s)
11:38:29	0.127	>100	0.127	>100	0.127	>100	0.22
11:38:31	0.127	>100	0.127	>100	0.127	>100	0.22
11:38:33	0.127	>100	0.127	>100	0.127	>100	0.22
11:38:35	0.127	>100	0.127	>100	0.127	>100	0.22
11:38:37	0.127	>100	0.127	>100	0.127	>100	0.22

Location V16

Luas movement along straight section - monitor on soft ground, 20m from edge of line, Luas at full speed.

Table 11.E.16 Measured Vibration Levels at Location V16

Time	Tran PPV (mm/s)	Tran Freq (Hz)	Vert PPV (mm/s)	Vert Freq (Hz)	Long PPV (mm/s)	Long Freq (Hz)	Geo PVS (mm/s)
11:45:13	0.127	>100	0.127	>100	0.127	>100	0.22
11:45:15	0.127	>100	0.127	>100	0.127	>100	0.22
11:45:17	0.127	>100	0.127	>100	0.127	>100	0.22
11:45:19	0.127	>100	0.127	>100	0.127	>100	0.22
11:45:21	0.127	>100	0.127	>100	0.127	>100	0.22