Appendix 11.2: Calculations, Modelling and Assessment Techniques

Construction Noise

Assumptions

No construction information in terms of numbers and types of fixed plant was available. Therefore, the assessment has been based on the assumptions set out below.

The underlying basis for making the assumptions has been to estimate a realistic worst-case scenario that would be reasonably likely to occur.

Six processes were identified that may typically be associated with residential construction sites, following the additional enabling works. These are considered to be:

1. Earthworks and Infrastructure
2. Foundations and Substructure
3. Superstructure
4. Cladding and Facades
5. Fit-out
6. Public Realm & Landscaping

Of those processes, processes 1 through 4 are considered likely to have the greatest numbers of plant and equipment associated with them, and are therefore likely to have the highest noise emissions associated with them.

Estimations assumed that processes 1 through 4 would be active simultaneously in different areas of the site. The construction traffic data supplied by the applicants traffic consultant indicates there may be approximately 30 construction workers on-site. This would allow for processes 1 through 4 to be active simultaneously, based on estimates of the quantities and types of plant and equipment that have been estimated to be associated with each process.

To arrive at a realistic worst-case scenario that would be reasonably likely to occur, the likely sound levels from each process 1 through 4 were calculated, respectively, based on data contained within BS 5228-2. Based on those calculations, Process 1 and Process 2 are considered likely to have the highest noise emissions associated with them.

Therefore, it has been considered that Process 1 and Process 2 are the worst-case processes in terms of noise emissions.

In terms of a reasonably likely worst-case, it has been assumed that each process may be undertaken within a 900m^2 work area, representing a 4-dwelling plot. Based on the build-out rate estimated by the applicant, it has been estimated that it is reasonably likely that each 900m^2 work area may be occupied by all plant and equipment associated with the respective process, for a temporary period.

Based on this, the impact of Process 1 and Process 2 occurring simultaneously in two adjacent work areas has been assessed, in order to represent the reasonably likely worst-case scenario.

The worst-case scenario has been modelled in worst-case locations adjacent to the site boundary, in the proximity of the respective off-site receptors, that have been identified in **Chapter 11 Noise and Vibration**.

Calculations and Modelling

Construction noise is assessed based on modelling the impact of Process 1 and Process 2 occurring simultaneously in two adjacent work areas.

The work areas are modelled as horizontal area sources at a height of 1.5m above ground, and represent the combined, spatially average sound power level from all plant associated with that work area and combined assessment process.

This scenario has been modelled in worst-case locations adjacent to the site boundary in the proximity of the respective noise sensitive receptors, that have been identified around the site.

The prediction of noise levels generated by the assumed construction activities have been calculated using the proprietary noise modelling software CadnaA. The ISO 9613-2 calculation method was used for assessing construction noise in accordance with the methodology in Annex F of BS 5228-1:2009+A1:2014, and the Calculation of Road Traffic Noise (CRTN) standard was used for predicting operational road traffic noise levels. The general horizontal plan information of the area surrounding and including the Site was imported from Google Earth and OpenStreetMap. This was used to determine road positions, building footprint areas, receptor locations and relative locations. Specific model parameters were applied as follows:

- Default ground absorption G = 0.2 (mix of hard and soft ground to the west of the Cefn Road; G = 0.8 (agricultural land to the east of Cefn Road)
- No adverse meteorological effects;
- Two orders of reflection; and
- Topographical data for the Site was included.

The items of plant, assumed on-times, octave band and dB(A) sound pressure levels at 10 m, total octave band and dB(A) sound pressure level at 10m, and calculated total sound power level, associated with each process are set out in **Table A11.2.1.** The total sound power level is entered into the model for work areas representing the respective processes. All sources are modelled at a height of 1.5 m above ground as a simplified worst-case assumption.

Output from the noise model has been presented and assessed in **Chapter 11. Noise and Vibration** in terms of the resultant façade noise levels at receiver heights of 1.5 m, to represent ground floor living spaces likely to be occupied during daytime construction hours.

Table A11.2.1: Calculated computer noise model input parameters for Assessment of Construction Activity Noise

Plant	Worst-Case Processes				SPL @ 10m **Process 1**									SPL @ 10m **Process 2**								
	Process 1		Process 2		Octave Band Centre Frequency									Octave Band Centre Frequency								
	Earthworks and Infrastructure		Foundations and Substructure																			
	Number Active Plant per Work Area	Percentage On-time per Plant	No. Active Plant per Work Area	Percentage On-time per Plant	63	125	250	500	1k	2k	4k	8k	dB (A)	63	125	250	500	1k	2k	4k	8k	dB (A)
Tracked excavator	1	75%	1	75%	83	78	72	70	67	65	63	58	74	83	78	72	70	67	65	63	58	74
Cutting Tools	1	30%	1	30%	80	69	67	65	67	71	77	72	80	80	69	67	65	67	71	77	72	80
Hand-held tools	1	30%	1	30%	68	77	70	69	69	71	74	73	79	68	77	70	69	69	71	74	73	79
HGVs	1	25%	1	25%	86	78	72	72	73	70	66	60	77	86	78	72	72	73	70	66	60	77
Bulldozer	1	75%	n/a	n/a	80	83	74	75	81	76	69	63	83	0	0	0	0	0	0	0	0	0
Compaction plant	1	50%	1	50%	79	75	73	72	69	68	61	55	75	79	75	73	72	69	68	61	55	75

Plant	Worst-Case Processes				SPL @ 10m **Process 1**									SPL @ 10m **Process 2**								
	Process 1		Process 2		Octave Band Centre Frequency									Octave Band Centre Frequency								
	Earthworks and Infrastructure		Foundations and Substructure																			
	Number Active Plant per Work Area	Percentage On-time per Plant	No. Active Plant per Work Area	Percentage On-time per Plant	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**dB (A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**dB (A)**
Dumper truck	1	25%	1	25%	79	76	68	67	63	62	57	50	70	79	76	68	67	63	62	57	50	70
Generator	n/a	n/a	1	100%	-	-	-	-	-	-	-	-	-	74	70	68	62	60	57	52	46	66
Water pump	n/a	n/a	1	100%	-	-	-	-	-	-	-	-	-	78	76	69	69	69	68	62	58	74
Concrete mixers and pumps	n/a	n/a	1	100%	-	-	-	-	-	-	-	-	-	80	75	73	73	72	72	65	60	77
Loader / fork lift truck	n/a	n/a	1	50%	-	-	-	-	-	-	-	-	-	82	80	83	72	71	67	63	55	78
Mortar mixing	1	100%	1	100%	61	65	58	58	57	53	51	49	62	61	65	58	58	57	53	51	49	62

Plant	Worst-Case Processes				SPL @ 10m **Process 1**									SPL @ 10m **Process 2**								
	Process 1		Process 2		Octave Band Centre Frequency									Octave Band Centre Frequency								
	Earthworks and Infrastructure		Foundations and Substructure																			
	Number Active Plant per Work Area	Perce-ntage On-time per Plant	No. Active Plant per Work Area	Perce-ntage On-time per Plant	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**dB (A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**dB (A)**
Asphalt paving	1	75%	n/a	n/a	81	79	76	75	74	72	69	63	79	0	0	0	0	0	0	0	0	0
				Total Sound Pressure Level at 10m, dB	90	87	81	81	83	80	80	76	87	91	86	85	80	79	79	79	76	86
				Total Sound Power Level, dB	118	115	109	109	111	108	108	104	115	119	114	113	108	107	107	107	104	114

Operational Road Traffic Noise

The guidance in DMRB LA111 Revision 2 has been used as the basis for the quantitative assessment of operational stage road traffic noise. LA111 provides a methodology for the assessment of road traffic noise during the operational stage of the Proposed Development.

The methodology adopted for this assessment is based on a comparison between the modelled noise level at receptors under a reference scenario without the development to a future scenario with the development.

The 18 hour Annual Average Weekday Traffic (AAWT) traffic flows with % HVs (> 3.5 T unladen) have been supplied by the applicant's transport consultant. This data has been provided for the following scenarios:

- Baseline Year 2023
- Opening Year 2026 – including committed development, without the Proposed Development (DMOY1)
- Opening Year 2026 – including committed development, with Phase 1 of the Proposed Development fully operational (DSOY1)
- Assessment Year 2035 – including committed development, without the Proposed Development (DMOY2)
- Assessment Year 2035 – including committed development, with Phase 1 + Phase 2 of the Proposed Development fully operational (DSOY2)

It is understood that the traffic data for the 2026 Opening Year with the Proposed Development includes predicted operational traffic data for Phase 1 of the development with up to 600 dwellings fully operational. In DMRB LA111 terminology, this is considered to be the opening year for Phase 1 of the development, the 'do something opening year' (DSOY1). In comparison, the traffic data for the Opening Year without the Proposed Development is considered to be the 'do minimum opening year' with reference to Phase 1 (DMOY1), in DMRB LA111 terminology.

It is understood that the traffic data for the Assessment Year with Phase 1 + Phase 2 of the Proposed Development includes predicted operational traffic data for Phase 2 of the Proposed Development with of up to 900 dwellings fully operational. In DMRB LA111 terminology, this is considered to be the opening year for Phase 2 of the Proposed Development, the 'do something opening year' (DSOY2). In comparison, the traffic data for the Assessment Year without the Proposed Development is considered to be the 'do minimum opening year' with reference to Phase 2 (DMOY2), in DMRB LA111 terminology.

10.1 Based on DMRB LA 111 guidance, the assessments for Phase 1 and Phase 2 are based on predicting the change in noise level for the following scenarios to determine the likely magnitude of impact:

- Opening Year 2026. DSOY1 vs. DMOY1. Phase 1 assessment.

- Assessment Year 2035. DSOY2 vs. DMOY2. Phase 2 assessment.

10.2 The noise levels generated by operational road traffic have been calculated for each road traffic scenario using the proprietary noise modelling software CadnaA. The Calculation of Road Traffic Noise (CRTN) calculation method was used for predicting operational road traffic noise levels. The general horizontal plan information of the area surrounding and including the Site was imported from Google Earth and OpenStreetMap. This was used to determine road positions, building footprint areas, receptor locations and relative locations. Specific model parameters were applied as follows:

- Default ground absorption G = 0.2 (mix of hard and soft ground to the west of the Cefn Road; G = 0.8 (agricultural land to the east of Cefn Road)
- No adverse meteorological effects;
- Two orders of reflection; and
- Topographical data for the Site was included.

10.3 **Table A11.2.2** presents the absolute noise levels predicted in the model, in terms of the resultant façade noise levels at receiver heights of 1.5 m. The level predicted at measurement position MP9 is also included in the table.

10.4 In order to validate the baseline noise model, road traffic noise levels in terms of $L_{A10,18hour}$ (dB) have been predicted in the computer noise model and compared with measured data from the environmental noise survey undertaken at the site. The predicted and measured level at measurement position MP9 are within 0.9 dB. Measurement of the absolute noise level at other road links has not been undertaken, as based on the negligible or minor impacts predicted at all road links, it is not considered proportionate or necessary to undertake further validation of the noise model.

10.5 The data in **Table A11.2.2** is used to calculate the change in noise level for the assessed scenarios as described above and as presented in **Chapter 11. Nosie and Vibration**.

Table A11.2.2: Predicted Operation la road traffic noise levels

Receptor		Baseline	Phase 1		Phase 2	
Ref	Description		DMOY	DSOY	DMOY	DSOY
		2023	2026	2026	2035	2035
		dB $L_{A10,18hour}$	dB $L_{A10,18hour}$	dB $L_{A10,18hour}$	dB $L_{A10,18hour}$	dB $L_{A10,18hour}$
NSR1	Dwelling on Cefn Road	60.9	61.0	62.4	60.6	60.7
NSR2 (West)	Dwelling on Cefn Road	67.0	66.7	68.1	66.3	66.1
NSR3	Dwelling on Cefn Road	62.3	62.1	63.2	61.8	61.7
NSR7	Dwelling adjacent to Bryn Estyn Road	53.7	53.6	53.6	52.9	52.8
NSR10	Morgan Llwd School	46.6	46.4	47.6	46.0	45.8
NSR13	Dwelling adjacent to Greyhound Roundabout	67.8	67.7	68.3	67.4	67.6
NSR14	Dwelling on Hullah Lane	58.8	58.6	58.0	56.5	57.8
NSR15	Dwelling on Hullah Lane	61.0	61.2	61.1	60.6	61.1
NSR16	Dwelling on Stryt Holt	58.8	58.7	59.2	58.8	59.4
NSR17	Dwelling on Stryt Holt	63.0	62.9	63.4	62.8	63.6
NSR18	Dwelling on Dean Road	66.6	66.8	67.2	66.1	67.4
NSR19	Dwelling on Stryt Holt	68.4	68.2	68.9	68.3	67.8
NSR20	Dwelling on Stryt Holt	64.6	64.5	65.2	64.8	64.2
NSR21	Dwelling on Cefn Road	59.5	59.5	59.8	59.1	60.5
MP9	Measurement Position 10m from Cefn Road	65.1	n/a	n/a	n/a	n/a