AQUIND Limited

AQUIND INTERCONNECTOR

Environmental Statement – Volume 3 – Appendix 24.5 Noise and Vibration Assessment Assumptions

The Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 – Regulation 5(2)(a)

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

Document Ref: 6.3.24.5

PINS Ref.: EN020022

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PINS REF.: EN020022

DOCUMENT: 6.3.24.5

DATE: 14 NOVEMBER 2019

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DOCUMENT

Document	**6.3.24.5 Environmental Statement – Volume 3 – Appendix 24.5 Noise and Vibration Assessment Assumptions**
Revision	001
Document Owner	WSP UK Limited
Prepared By	T. Farmer
Date	30 October 2019
Approved By	L. Beamish
Date	30 October 2019

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APPENDIX 24.5 NOISE AND VIBRATION ASSESSMENT ASSUMPTIONS

1.1. CONSTRUCTION NOISE ASSESSMENT ASSUMPTIONS – CONVERTER STATION CONSTRUCTION PLANT

Table 1 - Converter station construction plant

General activity and location	Equipment	Sound pressure level at 10 m ($L_{Aeq,T}$)	Sound Power Level (L_W)	BS8228-1 Reference	No. of items	% on-time
Enabling works Cut/fill to create platform and drainage system at Converter Station	Excavator	76	104	C.2-15	1	80%
	Loader	76	104	C.2-28	1	80%
	Skid loader	68	96	C.2-8	1	80%
	Dozer	80	108	C.2-10	1	80%
	Wheeled Loading Shovel	76	104	C.2-28	1	80%
	Dump truck	79	107	C.2-30	1	80%
	Backhoe	69	97	C.4-66	1	80%

General activity and location	Equipment	Sound pressure level at 10 m ($L_{Aeq,T}$)	Sound Power Level (L_w)	BS8228-1 Reference	No. of items	% on-time
Enabling works Construction of main site access road	Skid loader	68	96	C.2-8	1	80%
	Dozer	80	108	C.2-10	1	80%
	Wheeled Loading Shovel	76	104	C.2-28	1	80%
	Dump truck	79	107	C.2-30	1	80%
	Road paver	77	105	C.5-31	1	80%
	Road roller	75	103	C.5-20	1	80%
Enabling works Establishment of car parking and site welfare area	Skid loader	68	96	C.2-8	1	80%
	Dozer	80	108	C.2-10	1	80%
	Wheeled Loading Shovel	76	104	C.2-28	1	80%
	Dump truck	79	107	C.2-30	1	80%
	Road paver	77	105	C.5-31	1	80%
	Road roller	75	103	C.5-20	1	80%

General activity and location	Equipment	Sound pressure level at 10 m ($L_{Aeq,T}$)	Sound Power Level (L_w)	BS8228-1 Reference	No. of items	% on-time
Enabling works Establishment of laydown area	Skid loader	68	96	C.2-8	1	80%
	Dozer	80	108	C.2-10	1	80%
	Wheeled Loading Shovel	76	104	C.2-28	1	80%
	Dump truck	79	107	C.2-30	1	80%
	Road paver	77	105	C.5-31	1	80%
	Road roller	75	103	C.5-20	1	80%
Substructure - Converter Halls, Control Buildings, Spares Building, Switchyard	Piling - Pre-cast concrete - hydraulic hammer	89	117	C.3-1	1	25%
	Concrete pump and concrete mixer truck (pumping to 5th floor)	82	110	C.4-25	1	20%

General activity and location	Equipment	Sound pressure level at 10 m ($L_{Aeq,T}$)	Sound Power Level (L_w)	BS8228-1 Reference	No. of items	% on-time
	Concrete pump and concrete mixer truck (idling)	75	103	C.4-26	1	40%
	Tracked mobile crane	67	95	C.3-28	1	20%
	Wheeled excavator	66	94	C.4-10	2	50%
	Poker Vibrator	78	106	C.4-33	1	25%
Superstructure - Converter Halls, Control Buildings, Spares Building, Switchyard	Tower Crane	76	104	C.4-48	1	80%
	Telescopic handlers	79	107	C.4-54	3	50%
	Lorry with lifting boom	77	105	C.4-53	1	50%
	Diesel scissor lift	78	106	C.4-59	2	20%
	Diesel scissor lift (idling)	70	98	C.4-60	2	80%
	Skid loader	68	96	C.2-8	1	80%

General activity and location	Equipment	Sound pressure level at 10 m ($L_{Aeq,T}$)	Sound Power Level (L_w)	BS8228-1 Reference	No. of items	% on-time
Landscaping and Re-instatement - car parking and site welfare area	Dozer	80	108	C.2-10	1	80%
	Wheeled Loading Shovel	76	104	C.2-28	1	80%
	Dump truck	79	107	C.2-30	1	80%
Landscaping and Re-instatement - laydown area	Skid loader	68	96	C.2-8	1	80%
	Dozer	80	108	C.2-10	1	80%
	Wheeled Loading Shovel	76	104	C.2-28	1	80%
	Dump truck	79	107	C.2-30	1	80%

1.2. CONSTRUCTION NOISE ASSESSMENT ASSUMPTIONS – TRENCHING AND JOINT BAYS CONSTRUCTION PLANT

Table 2 - Trenching and joint bays construction plant

General activity	Specific activity	Equipment	Sound pressure level at 10 m ($L_{Aeq,T}$)	Sound Power Level (L_w)	BS8228-1 Reference	No. of items	% on-time
Excavation and duct installation and road re-surfacing - along roads	Breaking road surface	Hand-held circular saw (petrol)	87	115	C.5-36	1	5%
	Breaking road surface	Mini excavator with hydraulic breaker	83	111	C.5-2	1	10%
	Breaking road surface	Road breaker (hand-held pneumatic)	82	110	C.5-3	1	10%
	Trenching	Mini tracked excavator (5t)	65	93	C.4-68	1	10%
	Trenching	Dumper (idling)	56	84	C.4-8	1	40%
	Trenching	Diesel water Pump	71	99	C.11-2	1	5%
	Concrete	Concrete pump + cement mixer truck (discharging)	67	95	C.4-24	1	10%
	Backfilling	Dump truck (tipping fill)	79	107	C.2-30	1	20%
	Backfilling	Telescopic handler	71	99	C.2-35	1	10%

General activity	Specific activity	Equipment	Sound pressure level at 10 m ($L_{Aeq,T}$)	Sound Power Level (L_w)	BS8228-1 Reference	No. of items	% on-time
	Welfare Van	Diesel generator	56	84	C.4-82	1	100 %
	Re-surfacing	Vibratory roller 3t	67	95	C.5-27	1	10%
	Re-surfacing	Dump truck (tipping fill)	79	107	C.2-30	1	5%
Excavation and duct installation and road re-surfacing - open ground	Trenching	Mini tracked excavator (5t)	65	93	C.4-68	1	10%
	Trenching	Dumper (idling)	56	84	C.4-8	1	40%
	Trenching	Diesel water Pump	71	99	C.11-2	1	5%
	Concrete	Concrete pump + cement mixer truck (discharging)	67	95	C.4-24	1	10%
	Backfilling	Dump truck (tipping fill)	79	107	C.2-30	1	20%
	Backfilling	Telescopic handler	71	99	C.2-35	1	10%
	Welfare Van	Diesel generator	56	84	C.4-82	1	100 %
	Breaking road surface	Hand-held circular saw (petrol)	87	115	C.5-36	1	5%

General activity	Specific activity	Equipment	Sound pressure level at 10 m ($L_{Aeq,T}$)	Sound Power Level (L_w)	BS8228-1 Reference	No. of items	% on-time
Joint bay construction	Breaking road surface	Mini excavator with hydraulic breaker	83	111	C.5-2	1	10%
	Digging	Tracked Excavator (21t)	71	99	C.4-65	1	40%
	Compaction	Vibratory plate (petrol)	80	108	C.2-41	1	40%
	Concrete	Concrete pump + cement mixer truck (discharging)	67	95	C.4-24	1	20%
	Welfare Van	Diesel generator	56	84	C.4-82	1	100 %
Cable installation at joint bay	Delivery of cables	Telescopic handler	71	99	C.2-35	1	10%
	Winch for pulling cables	Diesel generator	61	89	C.4-76	1	40%
	Welfare Van	Diesel generator	56	84	C.4-82	1	100 %
Jointing of cables	Generator for jointing cables	Diesel generator	61	89	C.4-76	1	100 %

General activity	Specific activity	Equipment	Sound pressure level at 10 m ($L_{Aeq,T}$)	Sound Power Level (L_w)	BS8228-1 Reference	No. of items	% on-time
	Water pump	Diesel water Pump	71	99	C.11-2	1	10%
	Welfare Van	Diesel generator	56	84	C.4-82	1	100 %
Jointing Bay reinstallation	Concrete	Concrete pump + cement mixer truck (discharging)	67	95	C.4-24	1	10%
	Infilling	Dump truck (tipping fill)	79	107	C.2-30	1	40%
	Infilling	Telescopic handler	71	99	C.2-35	1	10%
	Welfare Van	Diesel generator	56	84	C.4-82	1	100 %
Joint Bay re-surfacing	Re-surfacing	Vibratory roller 3t	67	95	C.5-27	1	50%
	Re-surfacing	Dump truck (tipping fill)	79	107	C.2-30	1	20%
	Welfare Van	Diesel generator	56	84	C.4-82	1	100 %

1.3. CONSTRUCTION NOISE ASSESSMENT ASSUMPTIONS – HDD CONSTRUCTION PLANT

Table 3 - HDD construction plant

General activity	Specific activity	Equipment	Sound pressure level at 10 m ($L_{Aeq,T}$)	Sound Power Level (L_w)	Data source or BS8228-1 reference	No. of items	% on-time
Site Preparation – HDD-1, HDD-2, HDD-3, HDD-5, HDD-6	Sheet piling	Excavator mounted vibrator	83	111	Watson and Hillhouse datasheet	1	3%
	Laying hardstanding	Dump truck (tipping fil)	79	107	C.2-30	1	80%
	Removing top soil and spreading hardstanding	Tracked Excavator (22t)	71	99	C.2-21	2	80%
Site Preparation – HDD-4	Vibratory piling driving	Vibratory Piling Rig	88	116	C.3-8	1	33%
		Tracked Excavator (30t)	75	103	C.2-16	1	47%

General activity	Specific activity	Equipment	Sound pressure level at 10 m ($L_{Aeq,T}$)	Sound Power Level (L_w)	Data source or BS8228-1 reference	No. of items	% on-time
	Excavation of pit	Telescopic handler	71	99	C.2-35	1	47%
Drilling - HDD-1	Drilling	Power Pack (for drilling rig). Max motor speed as worst case	66.8	94.8	Stockton spreadsheet	1	100 %
		Recycling Unit (Superclean 220DP)	68	96	PSD datasheet	1	100 %
		Mixing tank	52	80	Stockton spreadsheet	1	100 %
		Aggreko 350 kVA generator (for mixing tank and recycling unit)	66.9	94.9	Aggreko datasheet	1	100 %
		Aggreko 60KVA generator (for site offices)	64.9	92.9	Aggreko datasheet	1	100 %
		High pressure pump	59.8	87.8	Stockton spreadsheet	1	100 %
		Selwood S150 pump	61	89	Selwood datasheet	3	100 %
		Tracked Excavator (22t)	71	99	C.2-21	1	3%

General activity	Specific activity	Equipment	Sound pressure level at 10 m ($L_{Aeq,T}$)	Sound Power Level (L_w)	Data source or BS8228-1 reference	No. of items	% on-time
Drilling - HDD-2	Drilling	Aggreko 60KVA generator (for site offices)	64.9	92.9	Aggreko datasheet	1	100 %
		Aggreko 350 kVA generator (for mixing tank and recycling unit)	66.9	94.9	Aggreko datasheet	1	100 %
		Mixing tank	52	80	Stockton spreadsheet	1	100 %
		Recycling Unit (Superclean 220DP)	68	96	PSD datasheet	1	100 %
		Tracked Excavator (22t)	71	99	C.2-21	1	3%
		Midi Rig	66.8	94.8	Stockton spreadsheet	1	100 %
		Selwood S150 pump	61	89	Selwood datasheet	3	100 %
Drilling - HDD-3	Drilling	Power Pack (for drilling rig). Max motor speed as worst case	66.8	94.8	Stockton spreadsheet	1	100 %

General activity	Specific activity	Equipment	Sound pressure level at 10 m ($L_{Aeq,T}$)	Sound Power Level (L_w)	Data source or BS8228-1 reference	No. of items	% on-time
		Recycling Unit (Superclean 220DP)	68	96	PSD datasheet	1	100 %
		Mixing tank	52	80	Stockton spreadsheet	1	100 %
		Aggreko 350 kVA generator (for mixing tank and recycling unit)	66.9	94.9	Aggreko datasheet	1	100 %
		Aggreko 60KVA generator (for site offices)	64.9	92.9	Aggreko datasheet	1	100 %
		High pressure pump	59.8	87.8	Stockton spreadsheet	1	100 %
		Selwood S150 pump	61	89	Selwood datasheet	3	100 %
		Tracked Excavator (22t)	71	99	C.2-21	1	3%
Tunnelling - HDD-4	Tunnelling	Aggreko 60KVA generator (for site offices)	64.9	92.9	Aggreko datasheet	1	100 %
		Generator for TBM	80	108	Stockton spreadsheet	1	100 %

General activity	Specific activity	Equipment	Sound pressure level at 10 m ($L_{Aeq,T}$)	Sound Power Level (L_w)	Data source or BS8228-1 reference	No. of items	% on-time
Drilling - HDD-5	Drilling	Power Pack (for drilling rig). Max motor speed as worst case	66.8	94.8	Stockton spreadsheet	1	100 %
		Recycling Unit (Superclean 220DP)	68	96	PSD datasheet	1	100 %
		Mixing tank	52	80	Stockton spreadsheet	1	100 %
		Aggreko 350 kVA generator (for mixing tank and recycling unit)	66.9	94.9	Aggreko datasheet	1	100 %
		Aggreko 60KVA generator (for site offices)	64.9	92.9	Aggreko datasheet	1	100 %
		High pressure pump	59.8	87.8	Stockton spreadsheet	1	100 %
		Selwood S150 pump	61	89	Selwood datasheet	3	100 %
		Tracked Excavator (22t)	71	99	C.2-21	1	3%

General activity	Specific activity	Equipment	Sound pressure level at 10 m ($L_{Aeq,T}$)	Sound Power Level (L_w)	Data source or BS8228-1 reference	No. of items	% on-time
Drilling - HDD-6	Drilling	Aggreko 60KVA generator (for site offices)	64.9	92.9	Aggreko datasheet	1	100 %
		Aggreko 350 kVA generator (for mixing tank and recycling unit)	66.9	94.9	Aggreko datasheet	1	100 %
		Mixing tank	52	80	Stockton spreadsheet	1	100 %
		Recycling Unit (Superclean 220DP)	68	96	PSD datasheet	1	100 %
		Tracked Excavator (22t)	71	99	C.2-21	1	3%
		Midi Rig	66.8	94.8	Stockton spreadsheet	1	100 %
		Selwood S150 pump	61	89	Selwood datasheet	3	100 %
Site restoration - – HDD-1, HDD-2, HDD-3,	Removing spoil and hardstanding to landfill	Telescopic handler	71	99	C.2-35	1	80%

General activity	Specific activity	Equipment	Sound pressure level at 10 m ($L_{Aeq,T}$)	Sound Power Level (L_W)	Data source or BS8228-1 reference	No. of items	% on-time
HDD-5, HDD-6	Removing hardstanding	Dump truck (tipping fill)	79	107	C.2-30	1	80%
	Removing hardstanding and replacing topsoil	Tracked Excavator (22t)	71	99	C.2-21	2	80%
Site restoration - HDD-4	Backfilling pits	Tracked Excavator (30t)	75	103	C.2-16	1	80%
	Backfilling pits	Dump truck (tipping fill)	79	107	C.2-30	1	80%
	Backfilling pits	Telescopic handler	71	99	C.2-35	1	80%

1.4. CONSTRUCTION VIBRATION ASSESSMENT ASSUMPTIONS

Vibratory Rollers

1.4.1.1. Vibratory rollers (assumed for trenching and joint bay resurfacing) are covered in BS 5228-2, with the assessment based on a small, twin smooth drum ride-on roller, in steady state operation, and on the assumption that there is a 33% probability of the predicted PPV vibration level being exceeded (and a 67% probability that it is not), which is feature of the BS 5228-2 methodology.

Vibratory Piling

1.4.1.2. Vibratory piling (assumed for sheet piling at HDD-4) is also covered in BS 5228-2, with the assessment based on steady state operation and the assumption that there is a 33% probability of the predicted PPV vibration level being exceeded. The calculation method is valid for driver energy per cycle of between 1,200 and 10,700 Joules, whilst the pile type and toe depth are ignored as typically non-dominant factors.

Impact Piling

1.4.1.3. Impact piling (assumed for the piling at the converter station buildings) is covered in the BS 5228-2, including in terms of case history data and a prediction method. However, information on the insertion of stone columns is limited. The most relevant source of data is considered to be that under the heading 'bearing piles', where precast concrete piles (dimension 400 x 400 mm) were inserted using a drop hammer through "granular fill, lacustrine deposits, sand, sandstone". A PPV level of 13 mm s^{-1} is given at a distance of 3 m. This is not sufficient (or the correct) information for using the prediction formula within BS 5228-2 (which is perhaps more suited to other types of pile and can be used where no source data are available). However, a previous version of BS 5228 (Part 4: Code of practice for noise and vibration control applicable to piling operations (1992)) included a prediction method for percussive piling that has been used as a more suitable alternative.

HDD

1.4.1.4. HDD is not specifically covered in BS 5228-2, and therefore it has been assumed to be similar (in terms of vibration generation) with conventional rotary bored piling, and case history data is provided for this activity in BS 5228-2. However, no method is presented for accounting for different distances, and therefore, the distance propagation prediction method for percussive piling from the 1992 standard, as referenced above, has been used. From the case history data, the highest presented level of 0.4 mm s^{-1} at 10 m has been used.

Breakers and vibratory plates

1.4.1.5. Breaking works (for the trenching and joint bays) and vibratory plates (for the joint bays) are also not covered in BS 5228-2, and therefore historical measurement data obtained by WSP has been used, together with the same prediction method for percussive piling. Source levels of 2.0 $mm{\cdot}s^{-1}$ and 0.9 $mm{\cdot}s^{-1}$ at 10 m have been used for the breaking and vibratory plate sources respectively.

1.4.1.6. The distance from vibration works at which specified vibration levels may occur are presented in table 1.

Table 4 - Distance from works at which specified vibration levels may occur

Assessment Criterion, PPV (Magnitude of level)	Distance (m) from works at which specified vibration levels may occur					
	1	2	3	4	5	6
≤0.3 $mm{\cdot}s^{-1}$ (Negligible)	≥67	≥30	≥30	≥75	≥14	≥130
0.4 - 1.0 $mm{\cdot}s^{-1}$ (Small negative)	20-66	13-29	9-29	32-74	4-13	39-129
1.1 - 5 $mm{\cdot}s^{-1}$ (Medium negative)	4-19	3.5-12	2-8	10-31	<4	8-38
≥5.1 $mm{\cdot}s^{-1}$ (Large negative)	<4	<3.5	<2	<10	-*	<8

1. Breaker (road surface removal)
2. Vibratory roller (re-surfacing)
3. Vibratory plate (ground compaction)
4. Vibratory hammer (inserting sheet piles)
5. HDD (horizontal directional drilling)
6. Impact hammer (inserting stone columns)

Source not sufficiently vibration generating to exceed the criterion.

1.5. OPERATIONAL NOISE ASSESSMENT ASSUMPTIONS

1.5.1. CADNA A NOISE MODEL SETTINGS AND CONFIGURATIONS

1.5.1.1. The following Cadna A model configurations were used for the modelling of the operational assessment of the converter station and telecommunications infrastructure at landfall:

- Prediction method: ISO 9613
- Maximum order of reflections = 2
- Default ground absorption is acoustically absorbing (G = 1)
- Converter station and telecommunications compounds are modelled as acoustically reflective (G = 0)
- Surrounding buildings have been modelled as acoustically reflective and at a default height of 8 m above ground level, but heights of surrounding receptor buildings have been determined on a case by case basis.
- Location, size, layouts and elevations of converter station and telecommunications infrastructure buildings have been based on the technical drawings and specifications provided by the project team, which is in accordance with the project description.
- Topography for the available area immediately surrounding the proposed converter station is based on topographical survey data. Where a site specific topographical survey was not available, Environment Agency (EA) LiDAR data has been used. Contours are in 0.25 m intervals. The ground level at the converter station has been modelled at a height of 85.1 m AOD.
- The layout of the noise producing equipment is based on an illustrative layout provided by the project team, as shown in figure 24.4.
- Receivers at surrounding sensitive receptors are modelled at a height of 4 m above ground level to represent a typical first floor bedroom window, because the assessment is based on night-time criteria. Where sensitive receptors are clearly single storey, the receptor height has been modelled as 1.5 m above ground level.
- The noise contour plots in figures 24.4 and 24.5 are calculated at a height of 1.5 m above the ground. The converter station noise contour plot is based on a grid spacing of 10x10 m, whereas the landfall noise contour plot is based on a grid spacing of 1x1 m.

1.5.2. SOURCE AND MITIGATIONS DATA AND ASSUMPTIONS FOR CONVETER STATION OPERATIONAL NOISE MODEL.

1.5.2.1. Details of the exact equipment which will be installed at the converter station is unknown until a contractor is appointed. The information used in this assessment is based on the most robust and referenceable information available at this stage.

1.5.2.2. The data in the final row labelled 'HVAC Units - Telecomms Buildings' is the source data that has been used in the noise model of the telecommunications infrastructure at landfall.

Table 5 - source and mitigation data and assumptions used in operational noise models

Plant Equipment	Equipment quantity	Modelled height (m)	Data type Lw= sound power level SRI= sound reduction index	Octave Band frequency data (Hz)									Sound Power Level (Lw) dBA	Details
				31	63	125	250	500	1000	2000	4000	8000		
Aux Transformer	2 (1 per valve hall)	2	Lw - unmitigated	68	68	85	82	81	63	58	62	54	80	Source: NE Clean Power Link Project (based on AC valve reactor)
			SRI of mitigation	21	21	25	31	41	50	56	61	60		Acoustic enclosure around aux transformer. Data source: dB Attenuation Ltd (Standard Panels) Overall performance: 33dBA
			Lw - mitigated	47	47	60	51	40	13	2	1	-6	47	
Valve Converter Cooling Fan Banks	20 (10 fan banks per valve hall)	3	Lw - unmitigated	78	96	91	88	88	84	81	72	62	89	Source: NE Clean Power Link Project
			SRI of mitigation	3	3	3	3	3	3	3	3	3		3dB attenuation applied across frequency spectrum (E.g. by reducing fan speed)
			Lw - mitigated	75	93	88	85	85	81	78	69	59	86	
Air conditioning / handling unit	8 (4 per valve hall)	1.5	Lw - unmitigated	67	72	70	69	71	68	61	58	59	72	Source: NE Clean Power Link Project
			SRI of mitigation											No mitigation applied
			Lw - mitigated											

Plant Equipment	Equipment quantity	Modelled height (m)	Data type Lw= sound power level SRI= sound reduction index	Octave Band frequency data (Hz)									Sound Power Level (Lw) dBA	Details
				31	63	125	250	500	1000	2000	4000	8000		
Converter transformer	6 (3 per converter building)	5	Lw - unmitigated	89	89	106	103	102	84	79	83	75	101	Source: NE Clean Power Link Project
			SRI of mitigation	21	21	25	31	41	50	56	61	60		Acoustic enclosure around aux transformer. Data source: dB Attenuation Ltd (Standard Panels) Overall performance: 33dBA
			Lw - mitigated	68	68	81	72	61	34	23	22	15	68	
Converter transformer fans	6 (3 per converter building)	5	Lw - unmitigated	79	96	92	89	89	84	82	72	62	90	Source: NE Clean Power Link Project
			SRI of mitigation	4	4	7	13	19	23	23	16	13		Based on rectangular silencer 900 mm in length with 40% free area. Overall performance: 16dBA. Source: WSP's generic library for a typical silencer.
			Lw - mitigated	75	92	85	76	70	61	59	56	49	74	
AC Filter reactor	6 (3 per converter building)	5	Lw - unmitigated	68	68	85	82	81	63	58	62	54	80	Source: NE Clean Power Link Project (based on AC valve reactor)
			SRI of mitigation	10	10	10	10	10	10	10	10	10		10dB attenuation from noise enclosures with top hats on AC filter reactors. Source: WSP's estimation of mitigation based on general experience.
			Lw - mitigated	58	58	75	72	71	53	48	52	44	70	
AC Filter capacitor	6 (3 per converter building)	7	Lw - unmitigated	68	68	85	82	81	63	58	62	54	80	Source: NE Clean Power Link Project (based on AC valve reactor)
			SRI of mitigation	7	7	7	7	7	7	7	7	7		7dB attenuation from noise enclosures on AC filter capacitors. Source: WSP's

Plant Equipment	Equipment quantity	Modelled height (m)	Data type Lw= sound power level SRI= sound reduction index	Octave Band frequency data (Hz)									Sound Power Level (Lw) dBA	Details
				31	63	125	250	500	1000	2000	4000	8000		
														estimation of mitigation based on general experience.
			Lw - mitigated	61	61	78	75	74	56	51	55	47	73	
DC Valve Reactor / Smoothing reactor	4 (2 per converter building)	6	Lw - unmitigated	68	68	84	82	81	63	58	62	54	80	Located in D/C end of converter buildings. For mitigation, see sound insulation performance of buildings below.
AC Valve Reactor / Phase Reactor	6 (3 per converter building)	6	Lw - unmitigated	68	68	85	82	81	63	58	62	54	80	Located in A/C end of converter buildings. For mitigation, see sound insulation performance of buildings below.
Valve Units	2 (1 per valve hall)	n/a	Lp - unmitigated	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	81 (Lp not Lw)	Spatially averaged sound pressure level (Lp) in valve hall. No octave band data available. For mitigation, see sound insulation performance of buildings below.
Cooling plant skid / converter cooling pump	2 (1 per control building)	n/a	Lw - unmitigated	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	75	Located in control buildings. No octave band data available.

Plant Equipment	Equipment quantity	Modelled height (m)	Data type Lw= sound power level SRI= sound reduction index	Octave Band frequency data (Hz)									Sound Power Level (Lw) dBA	Details
				31	63	125	250	500	1000	2000	4000	8000		
Sound insulation performance of buildings	n/a	Valve halls, AC and DC ends = 26 m (1.75 m of which is pitch) Control Buildings = 15 m (1.75 m of which is pitch)	Average SRI of facades	15	15	15	20	28	37	43	40	40	32dB Rw	This is an estimation of the typical façade sound insulation of the buildings. At this stage, facades openings (e.g. for ventilation or access) have not been considered. Data source: CadnaA (noise modelling software) global library.
HVAC Units - Telecomms Buildings	4 (2 per building)	1.5	Lw - unmitigated	63	63	61	61	58	57	52	48	41	65	B&M advised HVAC Lw is 55-65dBA. 65dBA has been used as a reasonable worst case. Octave band spectrum is for Mitsubishi condenser unit datasheet, as suggested by building services acoustics team at WSP.

1.6. DECOMMISSIONING NOISE ASSESSMENT ASSUMPTIONS AT CONVERTER STATION

Table 6 - Equipment assumptions for decommissioning of converter station

General activity and location	Activity and equipment	Sound pressure level at 10 m ($L_{Aeq,T}$)	BS8228-1 Reference	No. of items	% on-time
Superstructure demolition of converter station	Breaking up concrete: Breaker mounted on wheeled backhoe	92.0	C.1.1.	2	50
	Breaking up concrete: Pulverizer mounted on excavator	76.0	C.1.4.	2	50
	Breaking and spreading rubble: Tracked excavator	82.0	C.1.12	2	80
	Crushing concrete/rubble: Tracked crusher	82.0	C.1.14	2	80
	Breaking up/cutting steel: Tracked excavator	82.0	C.1.16	2	30
	Breaking up/cutting steel: Gas cutter	79.0	C.1.18	2	30
	Clearing site: Tracked excavator	77.0	C.2.2	3	80

General activity and location	Activity and equipment	Sound pressure level at 10 m ($L_{Aeq,T}$)	BS8228-1 Reference	No. of items	% on-time
Substructure demolition of converter station and associated landscaping	Ground excavation/earthworks: Dozer	80.0	C.2.10	3	80
	Loading lorries: Wheeled loader	79.0	C.2.26	2	80
	Distribution of material: Telescopic handler	71.0	C.2.35	2	80
Removal of access road and associated landscaping	Breaking road surface: Backhoe mounted hydraulic breaker	88.0	C.5.1	1	10
	Removing broken road surface: Wheeled excavator	73.0	C.5.11	2	80
	Earthworks: Tracked excavator	80.0	C.5.18	2	80