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## **14. Noise**

### **14.1. Introduction**

- 14.1.1. This Chapter does not repeat the information set out in *Chapter 14: Noise* of the Shepherds' Rig EIA Report (November 2018) where that information remains valid in the context of the reduced number of turbines now proposed as the Revised Development (AEI Figure 4.1). As such, the Additional Environmental Information (AEI) supplements Chapter 10 of the EIA Report (November 2018) and should be read in conjunction with it.
- 14.1.2. No post-submission consultation responses were received in regards to the noise assessment.

### **14.2. Methodology**

- 14.2.1. There are no changes to legislation, policy and guidance since the EIA Report (November 2018). The information presented in Section 14.2 of the EIA Report (November 2018) remains valid.
- 14.2.2. With regard to construction noise, there are no changes to the methodology and approach presented in Section 14.3 of the EIA Report (November 2018) .
- 14.2.3. With regard to operational noise, the candidate turbines have not changed. As such, there are no changes other than the Revised Development layout (see **AEI Figure 14.1**), and the refusal of Longburn Wind Farm. As such, the only cumulative development considered in this assessment is Windy Rig.
- 14.2.4. Details of the noise emission data for the cumulative development considered in this assessment are presented in Section 14.5 of the EIA Report (November 2018).

### **14.3. Baseline Conditions**

- 14.3.1. There is no change to baseline conditions reported in the EIA Report (November 2018), other than a change in the predicted noise levels arising from the existing cumulative scenario described in Section 14.2 of this chapter.
- 14.3.2. As described in Section 14.3 of the EIA Report (November 2018), cumulative noise effects have been addressed through the derivation of apportioned noise limits. Apportioned noise limits are created by logarithmically subtracting the cumulative noise scenario (i.e. excluding noise from the Revised Development), from the cumulative noise limits. The result is the remaining noise budget available to the Revised Development.
- 14.3.3. In the interest of clarity, AEI Table 14.1 presents the cumulative noise limits, reproduced from Table 14.7 of the EIA Report (November 2018). It should be noted that previously, Stroanpatrick was financially involved with Longburn, and the cumulative noise limits for this property were increased in line with the recommendations of ETSU-R-97. However, as Longburn is no longer part of the cumulative scenario, cumulative noise limits at Stroanpatrick have been updated to reflect lower limits in line with a non-financially involved property, as recommended in ETSU-R-97.

**AEI Table 14.1: Cumulative Noise Limits**

Receptor	Standardised Wind Speed at 10 m AGL, ms <sup>-1</sup>								
	4	5	6	7	8	9	10	11	12
	Cumulative Noise Limit, dB, L <sub>A90,10min</sub>								
<b>Quiet Daytime</b>									
1 Muirdrochwood	35.0	35.0	35.8	38.1	40.3	42.3	44.0	45.2	46.0
2 Muirdrochwood	35.0	35.0	35.8	38.1	40.3	42.3	44.0	45.2	46.0
Blackmark	35.7	37.6	39.9	42.5	45.4	48.7	52.3	52.3	52.3
Craigengillan	44.6	45.4	46.3	47.2	48.3	49.5	50.8	52.4	54.2
Craigengillan Cottage	44.6	45.4	46.3	47.2	48.3	49.5	50.8	52.4	54.2
Furmiston	36.3	38.6	40.9	43.1	45.3	47.4	49.3	51.1	52.7
Marbrack	41.9	43.6	45.4	47.3	49.2	51.2	53.2	55.3	57.6
Marscalloch Cottage	38.1	39.1	40.2	41.2	42.4	43.6	44.9	46.3	47.8
Moorbrock	45.0	45.0	45.0	45.0	45.0	45.0	46.4	47.5	48.1
Nether Loskie	38.1	39.1	40.2	41.2	42.4	43.6	44.9	46.3	47.8
Smittons	37.2	38.2	39.2	40.2	41.3	42.5	43.7	45.1	46.6
Strahanna Farm	36.1	38.0	39.8	41.7	43.5	45.0	46.4	47.5	48.1
Stroanpatrick	35.7	37.6	39.9	42.5	45.4	48.7	52.3	52.3	52.3
<b>Night-time</b>									
1 Muirdrochwood	43.0	43.0	43.0	43.0	43.0	43.0	44.3	46.2	47.6
2 Muirdrochwood	43.0	43.0	43.0	43.0	43.0	43.0	44.3	46.2	47.6
Blackmark	43.0	43.0	43.0	43.4	46.6	49.9	53.6	53.6	53.6
Craigengillan	44.3	45.2	46.3	47.5	48.8	50.2	51.6	53.1	54.7
Craigengillan Cottage	44.3	45.2	46.3	47.5	48.8	50.2	51.6	53.1	54.7
Furmiston	43.0	43.0	43.0	43.0	43.6	46.2	48.6	50.8	52.6
Marbrack	43.0	43.0	44.5	46.7	49.0	51.3	53.4	55.3	56.8
Marscalloch Cottage	43.0	43.0	43.0	43.0	43.0	43.3	44.4	45.5	46.5
Moorbrock	45.0	45.0	45.0	45.0	45.0	45.0	45.9	47.1	48.0
Nether Loskie	43.0	43.0	43.0	43.0	43.0	43.3	44.4	45.5	46.5
Smittons	43.0	43.0	43.0	43.0	43.0	43.0	43.7	45.1	46.6
Strahanna Farm	43.0	43.0	43.0	43.0	43.0	44.4	45.9	47.1	48.0
Stroanpatrick	43.0	43.0	43.0	43.4	46.6	49.9	53.6	53.6	53.6

- 14.3.4. AEI Table 14.2 details the predicted cumulative noise level (excluding noise due to the Revised Development) for each of the assessment locations and using the adjusted sound power levels detailed in Table 14.8 of the EIA Report (November 2018).

**AEI Table 14.2: Cumulative Noise Levels Due to Other Developments.**

Receptor	Standardised Wind Speed at 10 m AGL, ms <sup>-1</sup>								
	4	5	6	7	8	9	10	11	12
	Predicted Cumulative Noise, dB, L <sub>A90,10min</sub>								
1 Muirdrochwood	10.4	12.4	16.7	18.3	18.9	19.4	19.4	19.4	19.4
2 Muirdrochwood	10.4	12.4	16.7	18.3	18.9	19.4	19.4	19.4	19.4
Blackmark	13.6	15.6	19.9	21.5	22.1	22.6	22.6	22.6	22.6
Craigengillan	19.9	21.9	26.2	27.8	28.4	28.9	28.9	28.9	28.9
Craigengillan Cottage	20.0	22.0	26.3	27.9	28.5	29.0	29.0	29.0	29.0
Furmiston	11.3	13.3	17.6	19.2	19.8	20.3	20.3	20.3	20.3
Marbrack	12.4	14.4	18.7	20.3	20.9	21.4	21.4	21.4	21.4
Marshallloch Cottage	9.4	11.4	15.7	17.3	17.9	18.4	18.4	18.4	18.4
Moorbrock	24.8	26.8	31.1	32.7	33.3	33.8	33.8	33.8	33.8
Nether Loskie	9.8	11.8	16.1	17.7	18.3	18.8	18.8	18.8	18.8
Smittons	13.0	15.0	19.3	20.9	21.5	22.0	22.0	22.0	22.0
Strathanna farm	19.9	21.9	26.2	27.8	28.4	28.9	28.9	28.9	28.9
Stroanpatrick	13.0	15.0	19.3	20.9	21.5	22.0	22.0	22.0	22.0

- 14.3.5. As described above, the adjusted cumulative wind turbine noise levels (AEI Table 14.2) have been logarithmically subtracted from the total cumulative ETSU-R-97 noise limits to determine apportioned noise limits applicable to the Revised Development in isolation. The daytime apportioned limits have then been corrected to ensure they do not exceed the limit for the Revised Development in isolation of 35 dB L<sub>A90,10min</sub>, or 5 dB above background.
- 14.3.6. The resulting apportioned limits applicable to the Revised Development in isolation are presented in AEI Table 14.3. These limits may be presented in the planning conditions of any consent of the Revised Development and will ensure the Revised Development's compliance with ETSU-R-97 when considered both individually and cumulatively.

**AEI Table 14.3: Apportioned Limits**

Receptor	Standardised Wind Speed at 10 m AGL, ms <sup>-1</sup>								
	4	5	6	7	8	9	10	11	12
	Apportioned Noise Limits, dB, L <sub>A90,10min</sub>								
<b>Quiet Daytime</b>									
1 Muirdrochwood	35.0	35.0	35.7	38.1	40.3	42.3	44.0	45.2	46.0
2 Muirdrochwood	35.0	35.0	35.7	38.1	40.3	42.3	44.0	45.2	46.0
Blackmark	35.7	37.6	39.9	42.5	45.4	48.7	52.3	52.3	52.3
Craigengillan	44.6	45.4	46.3	47.1	48.3	49.5	50.8	52.4	54.2
Craigengillan Cottage	44.6	45.4	46.3	47.1	48.3	49.5	50.8	52.4	54.2
Furmiston	36.3	38.6	40.9	43.1	45.3	47.4	49.3	51.1	52.7
Marbrack	41.9	43.6	45.4	47.3	49.2	51.2	53.2	55.3	57.6
Marshalloch Cottage	38.1	39.1	40.2	41.2	42.4	43.6	44.9	46.3	47.8
Moorbrock	35.8	37.7	39.2	41.1	43.1	44.7	46.2	47.3	47.9
Nether Loskie	38.1	39.1	40.2	41.2	42.4	43.6	44.9	46.3	47.8
Smittons	37.2	38.2	39.2	40.1	41.3	42.5	43.7	45.1	46.6
Strathanna farm	36.0	37.9	39.6	41.5	43.4	44.9	46.3	47.4	48.0
Stroanpatrick	35.7	37.6	39.9	42.5	45.4	48.7	52.3	52.3	52.3
<b>Night-time</b>									
1 Muirdrochwood	43.0	43.0	43.0	43.0	43.0	43.0	44.3	46.2	47.6
2 Muirdrochwood	43.0	43.0	43.0	43.0	43.0	43.0	44.3	46.2	47.6
Blackmark	43.0	43.0	43.0	43.4	46.6	49.9	53.6	53.6	53.6
Craigengillan	44.3	45.2	46.3	47.5	48.8	50.2	51.6	53.1	54.7
Craigengillan Cottage	44.3	45.2	46.3	47.5	48.8	50.2	51.6	53.1	54.7
Furmiston	43.0	43.0	43.0	43.0	43.6	46.2	48.6	50.8	52.6
Marbrack	43.0	43.0	44.5	46.7	49.0	51.3	53.4	55.3	56.8
Marshalloch Cottage	43.0	43.0	43.0	43.0	43.0	43.3	44.4	45.5	46.5
Moorbrock	42.9	42.9	42.7	42.6	42.5	44.0	45.6	46.9	47.8
Nether Loskie	43.0	43.0	43.0	43.0	43.0	43.3	44.4	45.5	46.5
Smittons	43.0	43.0	43.0	43.0	43.0	43.0	43.7	45.1	46.6
Strathanna farm	43.0	43.0	42.9	42.9	42.8	44.3	45.8	47.0	47.9
Stroanpatrick	43.0	43.0	43.0	43.4	46.6	49.9	53.6	53.6	53.6

#### 14.4. Change in Effects

14.4.1. AEI Table 14.4 details the predicted noise immission levels due to the operation of the Revised Development, following the methodology and using the noise emission data presented in the EIA Report (November 2018).

**AEI Table 14.4: Predicted Operational Noise Levels due to the Revised Development**

Receptor	Standardised Wind Speed at 10 m AGL, ms <sup>-1</sup>								
	4	5	6	7	8	9	10	11	12
	Predicted Noise Level, dB, LA90,10min								
1 Muirdrochwood	25.7	29.9	33.7	35.6	35.7	35.7	35.7	35.7	35.7
2 Muirdrochwood	25.4	29.6	33.4	35.3	35.4	35.4	35.4	35.4	35.4
Blackmark	22.5	26.7	30.5	32.4	32.5	32.5	32.5	32.5	32.5
Craigengillan	29.2	33.3	37.1	39.1	39.3	39.3	39.3	39.3	39.3
Craigengillan Cottage	29.7	33.8	37.6	39.6	39.9	39.9	39.9	39.9	39.9
Furmiston	26.2	30.4	34.2	36.1	36.2	36.2	36.2	36.2	36.2
Marbrack	24.4	28.6	32.4	34.3	34.4	34.4	34.4	34.4	34.4
Marshalloch Cottage	22.8	27.0	30.8	32.7	32.8	32.8	32.8	32.8	32.8
Moorbrock	25.8	29.9	33.7	35.7	36.0	36.0	36.0	36.0	36.0
Nether Loskie	23.1	27.2	31.0	33.0	33.1	33.1	33.1	33.1	33.1
Smittons	26.5	30.7	34.5	36.4	36.5	36.5	36.5	36.5	36.5
Strathanna farm	23.9	27.9	31.8	33.8	34.0	34.0	34.0	34.0	34.0
Stroanpatrick	23.2	27.4	31.2	33.1	33.2	33.2	33.2	33.2	33.2

14.4.2. AEI Table 14.5 details the difference (margin) between predicted noise immission levels (AEI Table 14.4) and the apportioned noise limits (AEI Table 14.3) for the assessed receptors. A negative margin indicates that the predicted noise level is below the derived noise limit.

**AEI Table 14.5: Margin between Predicted Turbine Noise and Noise Limits**

Receptor	Standardised Wind Speed at 10 m AGL, ms <sup>-1</sup>								
	4	5	6	7	8	9	10	11	12
	Margin, dB, L <sub>A90,10min</sub>								
<b>Quiet Daytime</b>									
1 Muirdrochwood	-9.3	-5.1	-2.0	-2.5	-4.6	-6.6	-8.3	-9.5	-10.3
2 Muirdrochwood	-9.6	-5.4	-2.3	-2.8	-4.9	-6.9	-8.6	-9.8	-10.6
Blackmark	-13.2	-10.9	-9.4	-10.1	-12.9	-16.2	-19.8	-19.8	-19.8
Craigengillan	-15.4	-12.1	-9.2	-8.0	-9.0	-10.2	-11.5	-13.1	-14.9
Craigengillan Cottage	-14.9	-11.6	-8.7	-7.5	-8.4	-9.6	-10.9	-12.5	-14.3
Furmiston	-10.1	-8.2	-6.7	-7.0	-9.1	-11.2	-13.1	-14.9	-16.5
Marbrack	-17.5	-15.0	-13.0	-13.0	-14.8	-16.8	-18.8	-20.9	-23.2
Marshalloch Cottage	-15.3	-12.1	-9.4	-8.5	-9.6	-10.8	-12.1	-13.5	-15.0
Moorbrock	-10.0	-7.8	-5.5	-5.4	-7.1	-8.7	-10.2	-11.3	-11.9
Nether Loskie	-15.0	-11.9	-9.2	-8.2	-9.3	-10.5	-11.8	-13.2	-14.7
Smittons	-10.7	-7.5	-4.7	-3.7	-4.8	-6.0	-7.2	-8.6	-10.1
Strathanna farm	-12.1	-10.0	-7.8	-7.7	-9.4	-10.9	-12.3	-13.4	-14.0
Stroanpatrick	-12.5	-10.2	-8.7	-9.4	-12.2	-15.5	-19.1	-19.1	-19.1
<b>Night-time</b>									
1 Muirdrochwood	-17.3	-13.1	-9.3	-7.4	-7.3	-7.3	-8.6	-10.5	-11.9
2 Muirdrochwood	-17.6	-13.4	-9.6	-7.7	-7.6	-7.6	-8.9	-10.8	-12.2
Blackmark	-20.5	-16.3	-12.5	-11.0	-14.1	-17.4	-21.1	-21.1	-21.1
Craigengillan	-15.1	-11.9	-9.2	-8.4	-9.5	-10.9	-12.3	-13.8	-15.4
Craigengillan Cottage	-14.6	-11.4	-8.7	-7.9	-8.9	-10.3	-11.7	-13.2	-14.8
Furmiston	-16.8	-12.6	-8.8	-6.9	-7.4	-10.0	-12.4	-14.6	-16.4
Marbrack	-18.6	-14.4	-12.1	-12.4	-14.6	-16.9	-19.0	-20.9	-22.4
Marshalloch Cottage	-20.2	-16.0	-12.2	-10.3	-10.2	-10.5	-11.6	-12.7	-13.7
Moorbrock	-17.1	-13.0	-9.0	-6.9	-6.5	-8.0	-9.6	-10.9	-11.8
Nether Loskie	-19.9	-15.8	-12.0	-10.0	-9.9	-10.2	-11.3	-12.4	-13.4
Smittons	-16.5	-12.3	-8.5	-6.6	-6.5	-6.5	-7.2	-8.6	-10.1
Strathanna farm	-19.1	-15.1	-11.1	-9.1	-8.8	-10.3	-11.8	-13.0	-13.9
Stroanpatrick	-19.8	-15.6	-11.8	-10.3	-13.4	-16.7	-20.4	-20.4	-20.4

## 14.5. Assessment of Cumulative Effects

- 14.5.1. Cumulative effects from wind farms presented in Table 2.1 of the AEI Report have been taken into consideration in the assessment presented above with an updated cumulative noise study area shown in **AEI Figure 14.2**.

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- 14.5.2. Given that no significant effects were predicted in the EIA Report (November 2018) and the cumulative scenario remains valid, no significant cumulative effects are predicted to occur as a result of the Revised Development.

#### **14.6. Summary**

- 14.6.1. An assessment of potential noise effects associated with the Revised Development has been carried out. The assessment takes into account changes to the design of the Revised Development and to the cumulative scenario since the preparation of the EIA Report (November 2018).
- 14.6.2. Operational noise has been assessed in accordance with ETSU-R-97 and in line with current best practice. It has been shown that the Revised Development would comply with the requirements of ETSU-R-97 at all receptor locations.
- 14.6.3. The cumulative effects of the Revised Development in conjunction with nearby wind energy developments either operational, consented or subject to a current planning application were taken into consideration in the above assessment, in accordance with ETSU-R-97 and the GPG.
- 14.6.4. As noted in the EIA Report (November 2018), construction noise will be limited in duration and confined to working hours as specified by the Council and can be adequately controlled through the application of good practice measures and secured by planning condition. This will ensure that noise from the Revised Development site during construction will be adequately controlled.
- 14.6.5. Noise during decommissioning will be of a similar nature to that of construction, and will be managed through best practice or other guidance or legislation relevant at the time.

#### **14.7. Statement of Significance**

- 14.7.1. Effects on operational noise associated with the Revised Development are considered to be not significant. This represents no change to the conclusions outlined in the EIA Report (November 2018).