A specialist energy consultancy

Operational Noise Report

Higher Biscovillack Wind Turbine

Clean Earth Energy Ltd

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Executive Summary

TNEI Services Ltd (TNEI) has been contracted by Clean Earth Energy Ltd (CEE) to undertake a noise assessment for a proposed Wind Turbine at Higher Biscovillack.

Predictions of wind turbine noise have been made, based upon sound power level data for the Vestas V117 4.3MW Mode PO2 for the proposed Higher Biscovillack Wind Turbine. The five nearby consented single Wind Turbines at Longstones, East Karslake, Wheal Martyn, Goonamarth 2 and Burngullow have all been considered as part of a cumulative noise assessment, along with 4 other operational EWT DW54 (500 kW) wind turbines and a potential additional 2 x wind turbines at Dubbers (proposed by Clean Earth Energy at similar timescales as Higher Biscovillack).

The turbine noise prediction model used is considered to provide a realistic impact assessment and considers current good practice, inclusive of the Institute of Acoustics document 'A Good Practice Guide to the Application of ETSU-R-97 for the Rating and Assessment of Wind Turbines' (IOA GPG) issued in May 2013. The predictions were undertaken at 13 Noise Assessment Locations which are residential properties in the immediate and wider area.

For all the Noise Assessment Locations, Total ETSU-R-97 Noise Limits (also referred to as the 'cumulative limit') were already presented in the planning application noise reports of wind turbines consented at Longstones, East Karslake, Wheal Martyn, Goonamarth 2 and Burngullow.

The assessment results show that predicted cumulative wind turbine noise levels are below the Total ETSU-R-97 Noise Limits at most of the Noise Assessment Locations, however exceedances in full mode and worst-case cumulative wind direction are identified in daytime at 3 receptors south of the Higher Biscovillack wind turbine, of up to 2.3dB daytime 7-9m/s , northerly and easterly winds. Mitigation in daytime 7-9m/s in easterly and northerly winds is required for the V117 to meet the noise limits with alternative modes to that of the full mode PO2 (i.e. this model has lower noise modes which can be programmed for specific conditions). A calculation has been made to evaluate the maximum noise levels at the key receptors south of the Higher Biscovillack wind turbine so that cumulative noise can be met in these specific conditions and the results are shown in suggested planning noise condition tables found in Annex 4.

If Cornwall Council are minded to approve the Higher Biscovillack Wind Turbine, it is recommended that conditioned noise limits are specific for the Higher Biscovillack Wind Turbine operating on its own. The noise conditions mechanism found in the recent planning conditions of Longstones, East Karslake, Wheal Martyn, Goonamarth 2 and Burngullow may be used, which involves conditioning the wind turbine based on predicted noise levels. The noise predictions for the Higher Biscovillack Wind Turbine with 1 x Vestas V117 4.3MW in full mode PO2 are shown in this report and an example conditions is included in Annex 4, with an adjustment to lower more restrictive values (compared to full mode) where required to ensure that Total ETSU-R-97 Noise Limits are met by cumulative predictions in all conditions and at all receptors.

Contents

1 Introduction

1.1 Brief

To undertake predictions of the operational wind turbine noise levels from a Vestas V117 4.3MW wind turbine on a 76.5 m hub for the proposed Higher Biscovillack Wind Turbine.

To consider the concurrent operation of the Higher Biscovillack Wind Turbine with the existing operating wind turbines in the area and other turbines consented at Longstones, East Karslake, Wheal Martyn, Goonamarth 2 and Burngullow. To also consider a potential additional 2 x wind turbines at Dubbers proposed by Clean Earth Energy at similar timescales as Higher Biscovillack.

To compare the predicted noise levels at the nearest noise sensitive receptors against Total ETSU-R-97 Noise Limits and recommend noise mitigation measures for the Vestas V117, if required.

To produce a noise report presenting the results and to suggest planning noise conditions in a similar format to the recently consented Goonamarth 2 or Burngullow wind turbines.

1.2 Background

Between 2021 and 2024, the single wind turbines of Longstones (PA20/09318), East Karslake (PA21/12493), Wheal Martyn (PA21/07216), Goonamarth 2 (PA23/10069) and Burngullow PA23/09937) were separately granted planning permission by Cornwall Council for the installation of a wind turbine with a maximum blade tip height of 135 m. TNEI prepared noise reports and discussed noise conditions for these sites with Cornwall County Council. This assessment and report uses similar assumptions and considers the additional proposed wind turbine at Higher Biscovillack.

2 Methodology

2.1 Assessing Compliance with the Noise Conditions

To undertake an assessment of the operational noise to determine compliance with the Total ETSU-R-97 Noise Limits, the following steps are required:

- Identify the nearest noise sensitive receptors and select a sample of the representative Noise Assessment Locations (NAL) at which Total ETSU-R-97 Noise Limits have already been established;
- Specify the grid coordinates and noise data of each wind turbine;
- Predict the cumulative wind turbine noise levels at each of the NALs and compare predictions with the Total ETSU-R-97 Noise Limits;
- If exceedances of the limits are found to occur, suggest noise mitigation measures as required.

The operational noise limits should not be breached. Consequently, the test applied to operational noise is whether the predicted wind turbine noise levels at all noise assessment locations lie below these noise limits.

2.2 Noise Assessment Locations

Noise Assessment Locations (NALs) are defined in this report as the boundary of the curtilage of a residential property that is closest to the wind turbines. This is where noise predictions are calculated to be compared to noise limits. Noise Monitoring Locations (NMLs) are defined as the points where background noise monitoring was previously undertaken to establish prevailing background noise levels.

The NMLs and NALs assumed in this report are identical to those presented in previous TNEI noise reports. Figure A1.1 in Annex 1 shows the NMLs and NALs as well as the wind turbines considered. Table 2.1 below provides a list of the NALs, the relative distance, and which NML was chosen to represent each NAL to set background noise levels.

Table 2.1 Noise Assessment Locations

NALs	X (Easting)	Y (Northing)	Distance to Higher Biscovillack WT (m)	Representative NML	Comment
NAL1-Newgate	197946	53255	2212	B*	Same receptors NAL1-NAL14 as previously, with identical background and Total ETSU-R-97 limit assumptions.
NAL2-Prideaux	198384	53077	1979	B*	
NAL3-23 Carne Hill	198762	53393	1488	B*	
NAL4-Treglyn Gardens	199550	53677	817	B*	
NAL5-Secret Cottage (2 properties)	199152	53871	875	B*	
NAL6-Penisker Farm	199087	54161	776	B*	

NALs	X (Easting)	Y (Northing)	Distance to Higher Biscovillack WT (m)	Representative NML	Comment
NAL7-Biscovillack Farm	199576	54088	431	B*	
NAL8-Area 51 campsite and house east of Greensplat Rd	200157	54074	517	B*	
NAL10-Greystone Cottage	199823	54782	329	D**	
NAL11-Longstone Cottage	197688	55420	2328	A*	
NAL12-Longstone House	197633	55346	2349	A*	
NAL13-Carthew Farm Cottage	200287	55931	1554	C*	
NAL14-Adit (property North of Carthew)	200287	56332	1940	C*	

* A-C noise monitoring from Longstones planning application PA 20/09318 noise survey in July/August 2020
** D noise monitoring from Greensplat wind turbine planning application PA 12/12138 noise survey in May 2012

2.3 Noise Limits

The Total ETSU-R-97 Noise Limits (also referred to as the 'cumulative limit') have already been set for NAL1 to NAL14 within past noise reports from TNEI for the planning applications of Longstones, East Karslake, Wheal Martyn, Goonamarth 2 and Burngullow.

The Total ETSU-R-97 Noise Limits are summarised in Table 2.2 (Quiet Daytime) and Table 2.3 (Night-time) below.

Table 2.2 Total ETSU-R-97 Noise Limits for Quiet Daytime

Location	Wind speed standardised from 80 to 10 metre height (m/s)									
	3	4	5	6	7	8	9	10	11	12
NAL1-Newgate	40	40	40	40	40	40	40.4	42.6	44.8	44.8
NAL2-Prideaux	40	40	40	40	40	40	40.4	42.6	44.8	44.8
NAL3-23 Carne Hill	40	40	40	40	40	40	40.4	42.6	44.8	44.8
NAL4-Treglyn Gardens	40	40	40	40	40	40	40.4	42.6	44.8	44.8
NAL5-Secret Cottage (2 properties)	40	40	40	40	40	40	40.4	42.6	44.8	44.8
NAL6-Penisker Farm	40	40	40	40	40	40	40.4	42.6	44.8	44.8
NAL7-Biscovillack Farm	40	40	40	40	40	40	40.4	42.6	44.8	44.8
NAL8-Area 51 campsite and house east of Greensplat Rd	40	40	40	40	40	40	40.4	42.6	44.8	44.8
NAL10-Greystone Cottage	50	50	50	50	50	50	50	50	50	50
NAL11-Longstone Cottage	40	40	40	40	40	40.1	41.6	43.1	44.6	44.6
NAL12-Longstone House	40	40	40	40	40	40.1	41.6	43.1	44.6	44.6
NAL13-Carthew Farm Cottage	40	40.3	41.5	42.7	43.8	45	46.2	47.3	48.5	49.7
NAL14-Adit (property North of Carthew)	40	40.3	41.5	42.7	43.8	45	46.2	47.3	48.5	49.7

Table 2.3 Total ETSU-R-97 Noise Limits for Night-time

Location	Wind speed standardised from 80 to 10 metre height (m/s)									
	3	4	5	6	7	8	9	10	11	12
NAL1-Newgate	43	43	43	43	43	43	43	43	43	43
NAL2-Prideaux	43	43	43	43	43	43	43	43	43	43
NAL3-23 Carne Hill	43	43	43	43	43	43	43	43	43	43
NAL4-Treglyn Gardens	43	43	43	43	43	43	43	43	43	43
NAL5-Secret Cottage (2 properties)	43	43	43	43	43	43	43	43	43	43
NAL6-Penisker Farm	43	43	43	43	43	43	43	43	43	43
NAL7-Biscovillack Farm	43	43	43	43	43	43	43	43	43	43
NAL8-Area 51 campsite and house east of Greensplat Rd	43	43	43	43	43	43	43	43	43	43
NAL10-Greystone Cottage	50	50	50	50	50	50	50	50	50	50
NAL11-Longstone Cottage	43	43	43	43	43	43	43	43	43.5	43.5

NAL12-Longstone House	43	43	43	43	43	43	43	43	43.5	43.5
NAL13-Carthew Farm Cottage	43	43	43	43	43	43	44.2	45.5	46.7	47.9
NAL14-Adit (property North of Carthew)	43	43	43	43	43	43	44.2	45.5	46.7	47.9

2.4 Wind Shear Considerations

The noise limits refer to wind speeds which have been measured at a height of 80 m and standardised to 10 m. As such, no site specific wind shear correction is required for the predictions of wind turbine noise. The proposed wind turbine model will have a hub height slightly below 80 m hub, however these limits remain applicable and are in fact worst-case for any hub height below 80 m.

2.5 Noise Emission Characteristics of the Wind Turbines

The wind turbines modelled are summarised in Table 2.4 below.

Table 2.4 Wind Turbine Noise Modelling Parameters

Wind Turbine Name / Status	Candidate Turbine considered in this report	Maximum Sound Power Level Modelled, inclusive of uncertainties added by TNEI:
Higher Goonamarth / Operating	EWT DW54 500kW on a 50m hub	101
Greensplat / Operating		
Blackpool / Operating		
Gunheath / Operating		
Longstones / Consented	ENERCON E-115 EP3 E4-4260 kW Mode 0s 77m hub	107
East Karslake / Consented		
Wheal Martyn / Consented		
Goonamarth 2 / Consented		
Burngullow / Consented		
Higher Biscovillack / Proposed	VESTAS V117 4.3MW Mode PO2 76.5m hub	107
Dubbers 2xWT / Proposed		

Due to differences in the way in which noise levels are provided by the different manufacturers, TNEI has accounted for uncertainty in the noise data in accordance with the recommendations included within the IOA GPG.

The noise data supplied by EWT for the DW54 was adjusted by +1.5 dB to match the maximum sound power of 101 dB(LAeq) consented in the noise condition of the Higher Goonamarth Wind Turbine (PA14/12102). This results in the same sound power levels as assumed in the planning noise reports for the wind turbines at Longstones, East Karslake, Wheal Martyn, Goonamarth2 and Burngullow.

The noise data supplied by Vestas for the V117 4.3MW PO2 was adjusted by +1 dB, based on a statement on uncertainties issued by Vestas to Clean Earth Energy on 18th December 2023.

The noise data supplied by Enercon for the E-115 EP3 E4 was adjusted by +2 dB as no specific confirmation from Enercon was available. This resulted in a maximum noise output identical to the Vestas V117 however please note that the full sound power curve at various wind speed is slightly different and the octave data used is also different (specific for each turbine).

Quantification of tonal noise and subsequent calculation of any resulting penalty in accordance with ETSU-R-97 can usually only be undertaken once the turbines are operating. Independent test reports only consider tonal audibility at locations very close to a single turbine in accordance with the methodology of IEC 61400-11. This data cannot be used to determine whether an ETSU-R-97 tonal penalty would be required when undertaking noise predictions which are used to assess compliance with ETSU-R-97 limits at a distant receptor, and as such no tonal penalty was included in the predictions. This is recognised in the IOA GPG which states:

'It is highly unlikely that any specific information on tonality at representative receptor separation distances in accordance with the ETSU-R-97 methodology will be available at the planning application

stage. When such information is available, it should be appropriately applied. It is standard to control the potential presence of tones in practice through the use of suitable planning conditions.'

The sound power data used for modelling, inclusive of uncertainties, is included in Annex 2. Please note that the Vestas and Enercon data is under NDA and can not be published, it can however be obtained upon request.

2.6 Noise Propagation Parameters

The full version of the ISO 9613-2 model has been used to predict the wind turbine noise levels at the NALs.

All noise level predictions have been undertaken using a receiver height of 4.0 m above local ground level, mixed ground (G=0.5) and air absorption coefficients based on a temperature of 10°C and 70% relative humidity to provide a realistic impact assessment. These modelling parameters reflect current good practice as detailed within the IOA GPG.

A topographical assessment has been undertaken between each noise sensitive receptor and wind turbine location to determine whether any concave ground profiles exist between the source and receiver. Analysis undertaken using a combination of CadnaA and an Excel model found that, if the formula in the IOA GPG is applied directly, a +3 dB correction is required for some turbines at a number of receptors as summarised in Annex 2.

In addition, an assessment has been undertaken to determine whether any topographical screening effects of the terrain occur where there is no direct line of sight between the highest point on the turbine rotor and the receiver location. Upon analysis of each noise sensitive receptor it was found that a barrier correction of -2 dB could be applied for some turbines at a number of receptors as detailed in Annex 2.

The assessment has taken into account directivity effects in line with good practice. Directivity was applied in accordance with the IOA GPG and the worst-case cumulative wind direction was considered, that is typically wind blowing from the nearest wind turbines (in the cumulative scenario) towards the NALs. The TNEI noise model can consider the effect of directivity, and in line with current good practice the attenuation values used are in detailed in Table 2.5. These are based upon the examples given in the IOA GPG (Section 4.4.2), using interpolation where required.

Table 2.5 Wind Directivity Attenuation Factors used in Modelling

Direction (º)	0	15	30	45	60	75	90	105	120	135	150	165
Attenuation dB(A))	-10	-9.9	-9.3	-8.3	-6.7	-4.6	-2	0	0	0	0	0
Direction (º)	180	195	210	225	240	255	270	285	300	315	330	345
Attenuation (dB(A))	0	0	0	0	0	0	-2	-4.6	-6.7	-8.3	-9.3	-9.9

3 Noise Assessment Results

Figures A1.2a to A1.2n (included in Annex 1) show the cumulative noise predictions at each NAL (one figure per NAL) and on each figure a breakdown of the individual wind turbine predictions is also provided. The prediction results for cumulative and individual wind turbines are included in Table 3.1 below and the noise assessment results comparing Total ETSU-R-97 Noise Limits with cumulative predictions is included in Table 3.2 (Quiet Daytime) and Table 3.3 (Night-time). A negative exceedance level indicates that the predicted noise immission level is below the noise limit. Any exceedances are shown in **bold**.

Table 3.1 Predicted Wind Turbine Noise Levels

Id	Wind Turbines being predicted	Wind speed standardised to 10 metre height (m/s)									Wind Direction
		4	5	6	7	8	9	10	11	12	
NAL1	Existing & consented (9 WTs)	28.6	30.7	33.1	35.2	35.8	36.4	36.4	36.4	36.4	0°
	Higher Biscovillack WT (1 WT)	15.4	19.6	23.3	25.6	25.8	25.8	25.8	25.8	25.8	0°
	Existing & consented + Higher Biscovillack (10 WTs)	28.8	31.1	33.6	35.6	36.2	36.7	36.7	36.7	36.7	0°
NAL2	Existing & consented (9 WTs)	27.6	29.9	32.3	34.5	35.1	35.6	35.6	35.6	35.6	0°
	Higher Biscovillack WT (1 WT)	16.8	21	24.7	26.9	27.2	27.2	27.2	27.2	27.2	0°
	Existing & consented + Higher Biscovillack (10 WTs)	28	30.4	33	35.2	35.7	36.2	36.2	36.2	36.2	0°
NAL3	Existing & consented (9 WTs)	29.2	31.7	34.5	37	37.4	37.8	37.8	37.8	37.8	0°
	Higher Biscovillack WT (1 WT)	20.2	24.4	28.1	30.3	30.6	30.6	30.6	30.6	30.6	0°
	Existing & consented + Higher Biscovillack (10 WTs)	29.7	32.5	35.4	37.8	38.2	38.6	38.6	38.6	38.6	0°
NAL4	Existing & consented (9 WTs)	23.2	26.3	29.5	32.2	32.5	32.8	32.8	32.8	32.8	0°
	Higher Biscovillack WT (1 WT)	21.8	25.9	29.7	31.9	32.2	32.2	32.2	32.2	32.2	0°
	Existing & consented + Higher Biscovillack (10 WTs)	25.6	29.1	32.6	35.1	35.4	35.5	35.5	35.5	35.5	0°
NAL5	Existing & consented (9 WTs)	27.7	30.8	34.1	37	37.2	37.4	37.4	37.4	37.4	0°
	Higher Biscovillack WT (1 WT)	25.9	30.1	33.8	36.1	36.3	36.3	36.3	36.3	36.3	0°
	Existing & consented + Higher Biscovillack (10 WTs)	29.9	33.5	37	39.5	39.8	39.9	39.9	39.9	39.9	0°
NAL6	Existing & consented (9 WTs)	29.4	32.7	36	38.9	39.1	39.3	39.3	39.3	39.3	0°
	Higher Biscovillack WT (1 WT)	27.4	31.6	35.3	37.5	37.8	37.8	37.8	37.8	37.8	0°
	Existing & consented + Higher Biscovillack (10 WTs)	31.6	35.2	38.7	41.3	41.5	41.6	41.6	41.6	41.6	0°
NAL7	Existing & consented (9 WTs)	28.9	31.7	34.7	37.4	37.7	38	38	38	38	330°
	Higher Biscovillack WT (1 WT)	30.1	34.3	38	40.2	40.5	40.5	40.5	40.5	40.5	330°
	Existing & consented + Higher Biscovillack (10 WTs)	32.6	36.2	39.7	42	42.3	42.4	42.4	42.4	42.4	330°
NAL8	Existing & consented (9 WTs)	28.8	31.1	33.6	35.8	36.4	36.8	36.8	36.8	36.8	300°
	Higher Biscovillack WT (1 WT)	28.5	32.6	36.4	38.6	38.9	38.9	38.9	38.9	38.9	300°
	Existing & consented + Higher Biscovillack (10 WTs)	31.6	34.9	38.2	40.4	40.8	41	41	41	41	300°
NAL10	Existing & consented (9 WTs)	32.8	35	37.5	39.7	40.2	40.8	40.8	40.8	40.8	210°
	Higher Biscovillack WT (1 WT)	33	37.2	40.9	43.1	43.4	43.4	43.4	43.4	43.4	210°
	Existing & consented + Higher Biscovillack (10 WTs)	35.9	39.2	42.5	44.7	45.1	45.3	45.3	45.3	45.3	210°
NAL11	Existing & consented (9 WTs)	27.7	31.4	35.2	38.3	38.4	38.5	38.5	38.5	38.5	60°
	Higher Biscovillack WT (1 WT)	14.8	19	22.7	24.9	25.2	25.2	25.2	25.2	25.2	60°
	Existing & consented + Higher Biscovillack (10 WTs)	27.9	31.7	35.4	38.5	38.6	38.7	38.7	38.7	38.7	60°

Id	Wind Turbines being predicted	Wind speed standardised to 10 metre height (m/s)									Wind Direction
		4	5	6	7	8	9	10	11	12	
NAL12	Existing & consented (9 WTs)	27.3	31	34.7	37.8	38	38	38	38	38	60°
	Higher Biscovillack WT (1 WT)	14.7	18.9	22.6	24.8	25.1	25.1	25.1	25.1	25.1	60°
	Existing & consented + Higher Biscovillack (10 WTs)	27.9	31.7	35.4	38.5	38.6	38.7	38.7	38.7	38.7	60°
NAL13	Existing & consented (9 WTs)	29.3	32.9	36.5	39.6	39.7	39.8	39.8	39.8	39.8	270°
	Higher Biscovillack WT (1 WT)	19.7	23.9	27.6	29.8	30.1	30.1	30.1	30.1	30.1	270°
	Existing & consented + Higher Biscovillack (10 WTs)	27.6	31.3	35	38	38.2	38.2	38.2	38.2	38.2	270°
NAL14	Existing & consented (9 WTs)	31.8	35.3	38.9	41.9	42.1	42.2	42.2	42.2	42.2	330°
	Higher Biscovillack WT (1 WT)	3.7	7.9	11.6	13.9	14.1	14.1	14.1	14.1	14.1	330°
	Existing & consented + Higher Biscovillack (10 WTs)	27.6	31.3	35	38	38.2	38.2	38.2	38.2	38.2	330°

Table 3.2 Compliance Table for Quiet Daytime

Location		Wind speed standardised to 10 metre height (m/s)								
		4	5	6	7	8	9	10	11	12
NAL1	Total ETSU-R-97 Noise Limit	40	40	40	40	40	40.4	42.6	44.8	44.8
	Existing & consented + Higher Biscovillack (10 WTs)	28.8	31.1	33.6	35.6	36.2	36.7	36.7	36.7	36.7
	Exceedance Level	-11.2	-8.9	-6.4	-4.4	-3.8	-3.7	-5.9	-8.1	-8.1
NAL2	Total ETSU-R-97 Noise Limit	40	40	40	40	40	40.4	42.6	44.8	44.8
	Existing & consented + Higher Biscovillack (10 WTs)	28	30.4	33	35.2	35.7	36.2	36.2	36.2	36.2
	Exceedance Level	-12	-9.6	-7	-4.8	-4.3	-4.2	-6.4	-8.6	-8.6
NAL3	Total ETSU-R-97 Noise Limit	40	40	40	40	40	40.4	42.6	44.8	44.8
	Existing & consented + Higher Biscovillack (10 WTs)	29.7	32.5	35.4	37.8	38.2	38.6	38.6	38.6	38.6
	Exceedance Level	-10.3	-7.5	-4.6	-2.2	-1.8	-1.8	-4	-6.2	-6.2
NAL4	Total ETSU-R-97 Noise Limit	40	40	40	40	40	40.4	42.6	44.8	44.8
	Existing & consented + Higher Biscovillack (10 WTs)	25.6	29.1	32.6	35.1	35.4	35.5	35.5	35.5	35.5
	Exceedance Level	-14.4	-10.9	-7.4	-4.9	-4.6	-4.9	-7.1	-9.3	-9.3
NAL5	Total ETSU-R-97 Noise Limit	40	40	40	40	40	40.4	42.6	44.8	44.8
	Existing & consented + Higher Biscovillack (10 WTs)	29.9	33.5	37	39.5	39.8	39.9	39.9	39.9	39.9
	Exceedance Level	-10.1	-6.5	-3	-0.5	-0.2	-0.5	-2.7	-4.9	-4.9
NAL6	Total ETSU-R-97 Noise Limit	40	40	40	40	40	40.4	42.6	44.8	44.8
	Existing & consented + Higher Biscovillack (10 WTs)	31.6	35.2	38.7	41.3	41.5	41.6	41.6	41.6	41.6
	Exceedance Level	-8.4	-4.8	-1.3	**1.3**	**1.5**	**1.2**	-1	-3.2	-3.2
NAL7	Total ETSU-R-97 Noise Limit	40	40	40	40	40	40.4	42.6	44.8	44.8
	Existing & consented + Higher Biscovillack (10 WTs)	32.6	36.2	39.7	42	42.3	42.4	42.4	42.4	42.4
	Exceedance Level	-7.4	-3.8	-0.3	**2**	**2.3**	**2**	-0.2	-2.4	-2.4
NAL8	Total ETSU-R-97 Noise Limit	40	40	40	40	40	40.4	42.6	44.8	44.8
	Existing & consented + Higher Biscovillack (10 WTs)	31.6	34.9	38.2	40.4	40.8	41	41	41	41
	Exceedance Level	-8.4	-5.1	-1.8	**0.4**	**0.8**	**0.6**	-1.6	-3.8	-3.8
NAL10	Total ETSU-R-97 Noise Limit	50	50	50	50	50	50	50	50	50
	Existing & consented + Higher Biscovillack (10 WTs)	35.9	39.2	42.5	44.7	45.1	45.3	45.3	45.3	45.3
	Exceedance Level	-14.1	-10.8	-7.5	-5.3	-4.9	-4.7	-4.7	-4.7	-4.7
NAL11	Total ETSU-R-97 Noise Limit	40	40	40	40	40.1	41.6	43.1	44.6	44.6
	Existing & consented + Higher Biscovillack (10 WTs)	27.9	31.7	35.4	38.5	38.6	38.7	38.7	38.7	38.7
	Exceedance Level	-12.1	-8.3	-4.6	-1.5	-1.5	-2.9	-4.4	-5.9	-5.9
NAL12	Total ETSU-R-97 Noise Limit	40	40	40	40	40.1	41.6	43.1	44.6	44.6
	Existing & consented + Higher Biscovillack (10 WTs)	27.9	31.7	35.4	38.5	38.6	38.7	38.7	38.7	38.7

	Exceedance Level	-12.1	-8.3	-4.6	-1.5	-1.5	-2.9	-4.4	-5.9	-5.9
NAL13	Total ETSU-R-97 Noise Limit	40	40	40	40	40.1	41.6	43.1	44.6	44.6
	Existing & consented + Higher Biscovillack (10 WTs)	27.6	31.3	35	38	38.2	38.2	38.2	38.2	38.2
	Exceedance Level	-12.4	-8.7	-5	-2	-1.9	-3.4	-4.9	-6.4	-6.4
NAL14	Total ETSU-R-97 Noise Limit	40.3	41.5	42.7	43.8	45	46.2	47.3	48.5	49.7
	Existing & consented + Higher Biscovillack (10 WTs)	27.6	31.3	35	38	38.2	38.2	38.2	38.2	38.2
	Exceedance Level	-12.7	-10.2	-7.7	-5.8	-6.8	-8	-9.1	-10.3	-11.5

Table 3.3 Compliance Table for Night-time

Location		Wind speed standardised to 10 metre height (m/s)								
		4	5	6	7	8	9	10	11	12
NAL1	Total ETSU-R-97 Noise Limit	43	43	43	43	43	43	43	43	43
	Existing & consented + Higher Biscovillack (10 WTs)	28.8	31.1	33.6	35.6	36.2	36.7	36.7	36.7	36.7
	Exceedance Level	-14.2	-11.9	-9.4	-7.4	-6.8	-6.3	-6.3	-6.3	-6.3
NAL2	Total ETSU-R-97 Noise Limit	43	43	43	43	43	43	43	43	43
	Existing & consented + Higher Biscovillack (10 WTs)	28	30.4	33	35.2	35.7	36.2	36.2	36.2	36.2
	Exceedance Level	-15	-12.6	-10	-7.8	-7.3	-6.8	-6.8	-6.8	-6.8
NAL3	Total ETSU-R-97 Noise Limit	43	43	43	43	43	43	43	43	43
	Existing & consented + Higher Biscovillack (10 WTs)	29.7	32.5	35.4	37.8	38.2	38.6	38.6	38.6	38.6
	Exceedance Level	-13.3	-10.5	-7.6	-5.2	-4.8	-4.4	-4.4	-4.4	-4.4
NAL4	Total ETSU-R-97 Noise Limit	43	43	43	43	43	43	43	43	43
	Existing & consented + Higher Biscovillack (10 WTs)	25.6	29.1	32.6	35.1	35.4	35.5	35.5	35.5	35.5
	Exceedance Level	-17.4	-13.9	-10.4	-7.9	-7.6	-7.5	-7.5	-7.5	-7.5
NAL5	Total ETSU-R-97 Noise Limit	43	43	43	43	43	43	43	43	43
	Existing & consented + Higher Biscovillack (10 WTs)	29.9	33.5	37	39.5	39.8	39.9	39.9	39.9	39.9
	Exceedance Level	-13.1	-9.5	-6	-3.5	-3.2	-3.1	-3.1	-3.1	-3.1
NAL6	Total ETSU-R-97 Noise Limit	43	43	43	43	43	43	43	43	43
	Existing & consented + Higher Biscovillack (10 WTs)	31.6	35.2	38.7	41.3	41.5	41.6	41.6	41.6	41.6
	Exceedance Level	-11.4	-7.8	-4.3	-1.7	-1.5	-1.4	-1.4	-1.4	-1.4
NAL7	Total ETSU-R-97 Noise Limit	43	43	43	43	43	43	43	43	43
	Existing & consented + Higher Biscovillack (10 WTs)	32.6	36.2	39.7	42	42.3	42.4	42.4	42.4	42.4
	Exceedance Level	-10.4	-6.8	-3.3	-1	-0.7	-0.6	-0.6	-0.6	-0.6
NAL8	Total ETSU-R-97 Noise Limit	43	43	43	43	43	43	43	43	43
	Existing & consented + Higher Biscovillack (10 WTs)	31.6	34.9	38.2	40.4	40.8	41	41	41	41
	Exceedance Level	-11.4	-8.1	-4.8	-2.6	-2.2	-2	-2	-2	-2
NAL10	Total ETSU-R-97 Noise Limit	50	50	50	50	50	50	50	50	50
	Existing & consented + Higher Biscovillack (10 WTs)	35.9	39.2	42.5	44.7	45.1	45.3	45.3	45.3	45.3
	Exceedance Level	-14.1	-10.8	-7.5	-5.3	-4.9	-4.7	-4.7	-4.7	-4.7
NAL11	Total ETSU-R-97 Noise Limit	43	43	43	43	43	43	43	43.5	43.5
	Existing & consented + Higher Biscovillack (10 WTs)	27.9	31.7	35.4	38.5	38.6	38.7	38.7	38.7	38.7
	Exceedance Level	-15.1	-11.3	-7.6	-4.5	-4.4	-4.3	-4.3	-4.8	-4.8
NAL12	Total ETSU-R-97 Noise Limit	43	43	43	43	43	43	43	43.5	43.5
	Existing & consented + Higher Biscovillack (10 WTs)	27.9	31.7	35.4	38.5	38.6	38.7	38.7	38.7	38.7
	Exceedance Level	-15.1	-11.3	-7.6	-4.5	-4.4	-4.3	-4.3	-4.8	-4.8
NAL13	Total ETSU-R-97 Noise Limit	43	43	43	43	43	43	43	43.5	43.5
	Existing & consented + Higher Biscovillack (10 WTs)	27.6	31.3	35	38	38.2	38.2	38.2	38.2	38.2
	Exceedance Level	-15.4	-11.7	-8	-5	-4.8	-4.8	-4.8	-5.3	-5.3
NAL14	Total ETSU-R-97 Noise Limit	43	43	43	43	43	44.2	45.5	46.7	47.9
	Existing & consented + Higher Biscovillack (10 WTs)	27.6	31.3	35	38	38.2	38.2	38.2	38.2	38.2
	Exceedance Level	-15.4	-11.7	-8	-5	-4.8	-6	-7.3	-8.5	-9.7

NAL14	Total ETSU-R-97 Noise Limit	43	43	43	43	43	44.2	45.5	46.7	47.9
	Existing & consented + Higher Biscovillack (10 WTs)	27	29.8	32.8	35.4	35.8	36.1	36.1	36.1	36.1
	Exceedance Level	-16	-13.2	-10.2	-7.6	-7.2	-8.1	-9.4	-10.6	-11.8

The assessment results show that predicted cumulative wind turbine noise levels are below the Total ETSU-R-97 Noise Limits at most of the Noise Assessment Locations however exceedances in full mode and worst-case cumulative wind direction are identified in daytime at 3 receptors south of the Higher Biscovillack wind turbine, with details as follows:

- NAL6- Penisker Farm: Exceedance up to 1.5 dB daytime 7-9 m/s , northerly winds and easterly winds
- NAL7- Biscovillack Farm: Exceedance up to 2.3 dB daytime 7-9 m/s , northerly winds and easterly winds
- NAL8- Area 51 campsite: Exceedance up to 0.8 dB daytime 7-9 m/s , northerly winds and easterly winds

The Annex 3 details predictions in 4 wind directions (northerly, easterly, southerly, westerly) at NAL6-8 to illustrate how cumulative predictions[1] and exceedances vary depending on the wind direction. Exceedances are only observed in northerly and easterly winds so mitigation in daytime 7-9 m/s in easterly and northerly winds is required for the V117 to meet the noise limits with alternative modes to that of the full mode PO2 (i.e. this model has lower noise modes such as SO1, SO2, SO3 which can be programmed for specific conditions). A calculation has been made to evaluate the maximum noise levels at receptors from the Higher Biscovillack wind turbine so that cumulative noise can be met in these specific conditions and it was found that the Higher Biscovillack turbine must be reduced as per Table 2 of the suggested noise conditions found in Annex 4. As an example, in most conditions at property Penisker Farm, the Higher Biscovillack turbine must be limited to 37.8 dB at 8 m/s as indicated in Table 1 of the condition but as per Table 2, in daytime 285° to 15° wind direction (northerly) the value is reduced to 32.9 dB at 8m/s (achieved by using mode SO3 for the Higher Biscovillack wind turbine).

[1]Cumulative predictions in Annex3 are inclusive of the potential Dubbers turbines to consider worst-case, although as demonstrated in Figures A1.2 the Dubbers turbines are not influential at NAL6-8.

4 Conclusion

Predictions of wind turbine noise have been made, based upon sound power level data for the Vestas V117 4.3MW Mode PO2 for the proposed Higher Biscovillack Wind Turbine. The five nearby consented single Wind Turbines at Longstones, East Karslake, Wheal Martyn, Goonamarth 2 and Burngullow have all been considered as part of a cumulative noise assessment, along with 4 other operational EWT DW54 (500 kW) wind turbines and a potential additional 2 x wind turbines at Dubbers (proposed by Clean Earth Energy at similar timescales as Higher Biscovillack).

The predictions were undertaken at 13 Noise Assessment Locations which are residential properties in the immediate and wider area. For all the Noise Assessment Locations, Total ETSU-R-97 Noise Limits (also referred to as the 'cumulative limit') were already presented in the planning application noise reports of wind turbines consented at Longstones, East Karslake, Wheal Martyn, Goonamarth 2 and Burngullow.

The assessment results show that predicted cumulative wind turbine noise levels are below the Total ETSU-R-97 Noise Limits at most the Noise Assessment Locations however exceedances in full mode and worst-case cumulative wind direction are identified in daytime at 3 receptors south of the Higher Biscovillack wind turbine, of up to 2.3dB daytime 7-9m/s , northerly and easterly winds. Mitigation in daytime 7-9m/s in easterly and northerly winds is required for the V117 to meet the noise limits with alternative modes to that of the full mode PO2 (i.e. this model has lower noise modes which can be programmed for specific conditions). A calculation has been made to evaluate the maximum noise levels at the key receptors south of the Higher Biscovillack wind turbine so that cumulative noise can be met in these specific conditions and the results are shown in suggested planning noise condition tables found in Annex 4.

If Cornwall Council are minded to approve the Higher Biscovillack Wind Turbine, it is recommended that conditioned noise limits are specific for the Higher Biscovillack Wind Turbine operating on its own. The noise conditions mechanism found in the recent planning conditions of Longstones, East Karslake, Wheal Martyn, Goonamarth 2 and Burngullow may be used, which involves conditioning the wind turbine based on predicted noise levels. The noise predictions for the Higher Biscovillack Wind Turbine with 1 x Vestas V117 4.3MW in full mode PO2 are shown in this report and an example conditions is included in Annex 4, with an adjustment to lower more restrictive values (compared to full mode) where required to ensure that Total ETSU-R-97 Noise Limits are met by cumulative predictions in all conditions and at all receptors.

5 References

ETSU-R-97 'The Working Group on Noise from Wind Turbines: 'The Assessment and Rating of Noise from Wind farms', ETSU Report ETSU-R-97, 1996.

Institute of Acoustics (2013) 'Good Practice Guidance on the application of ETSU-R-97 for wind turbine noise assessment'

ISO 9613-2 'Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation', International Standards Organisation, ISO 9613-2, 1996.

6 Glossary of Terms

Broadband Noise: noise with components over a wide range of frequencies.

Decibel (dB): the ratio between the quietest audible sound and the loudest tolerable sound is a million to one in terms of the change in sound pressure. A logarithmic scale is used in noise level measurements because of this wide range. The scale used is the decibel (dB) scale which extends from 0 to 140 decibels (dB) corresponding to the intensity of the sound pressure level.

dB(A): the ear has the ability to recognise a particular sound depending on the pitch or frequencies found at the source. Microphones cannot differentiate noise in the same way as the ear, and to counter this weakness the noise measuring instrument applies a correction to correspond more closely to the frequency response of the human ear. The correction factor is called 'A Weighting' and the resulting measurements are written as dB(A). The dB(A) is internationally accepted and has been found to correspond well with people's subjective reaction to noise. Some typical subjective changes in noise levels are:

- a change of 3dB(A) is just perceptible;
- a change of 5dB(A) is clearly perceptible;
- a change of 10dB(A) is twice (or half) as loud.

Frequency: the pitch of a sound in Hz or kHz. See Hertz.

Hertz (Hz): sound frequency refers to how quickly the air vibrates, or how close the sound waves are to each other (in cycles per second, or Hertz (Hz)).

Lw: is the sound power level. It is a measure of the total noise energy radiated by a source of noise, and is used to calculate noise levels at a distant location. The LWA is the A-weighted sound power level.

Leq: is the equivalent continuous sound level, and is the sound level of a steady sound with the same energy as a fluctuating sound over the same period. It is possible to consider this level as the ambient noise encompassing all noise at a given time. The LAeq,T is the A-weighted equivalent continuous sound level over a given time period (T).

L90: index represents the noise level exceeded for 90 percent of the measurement period and is used to indicate quieter times during the measurement period. It is often used to measure the background noise level. The LA90,10min is the A-weighted background noise level over a ten minute measurement sample.

Noise emission: the noise energy emitted by a source (e.g. a wind turbine).

Noise immission: the sound pressure level detected at a given location (e.g. the nearest dwelling).

Tonal Noise: noise which covers a very restricted range of frequencies (e.g. a range of ≤20 Hz). This noise can be more annoying than broadband noise.

Annex 1 – Figures

N

Dubbers WT (T1)

Dubbers WT (T2)

NAL 14 - Adit (property North of Carthew)

Wheal Martyn WT

NML C

NAL 13 - Carthew Farm Cottage

Carthew

Penhale

NAL 11 - Longstone Cottage

NML A

NAL 12 - Longstone House

Longstone Downs

East Karslake WT

Longstones WT

Higher Goonamarth WT

Goonamarth 2 WT

Higher Ruddle Farm

Ruddlemoor

NML D

Greystones Cottage

NAL 10 - Greystone Cottage

Higher Biscovillack Farm

Colchester House

Greensplat WT

Trenance Downs

Higher Biscovillack WT

Pan Kiln House

NML B

NAL 8 - Penisker Farm

Gover Stream

Burngullow WT

NAL 7 - Biscovillack Farm

NAL 6 - Area 51 campsite and house east of Greensplat Rd

Palace Close Farm

Mount Stamper Farm

Bojea Farm

Trethowel

NAL 4 - Secret Cottage (2 properties)

Lower Biscovillack Farm

Bay View Farm

NAL 5 - Treglyn Gardens

Valley View Cottage

Blackpool WT

Little Trenance Farm

NAL 3 - Twenty three Carne Hill

Trenance Farm

Trethowel Wood

Menacuddle Farm

NAL 1 - Newgate

NAL 2 - Prideaux

Prideaux Cottage

Old Chapel House

Trevanion Farm

St Elmo

0 0.5 1 Kilometre

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LEGEND

- Noise Assessment Locations (NALs)
- Noise Monitoring Locations (NMLs)

Turbines

- Higher Biscovillack WT
- In Planning WTs
- Consented WTs
- Operational WTs

Rev.	Date	Amendment Details	Drawn	Approved
0	17/10/2025	FIRST ISSUE	MR	MC

tnei

Client: cleanearth

Drawing Status: FOR INFORMATION

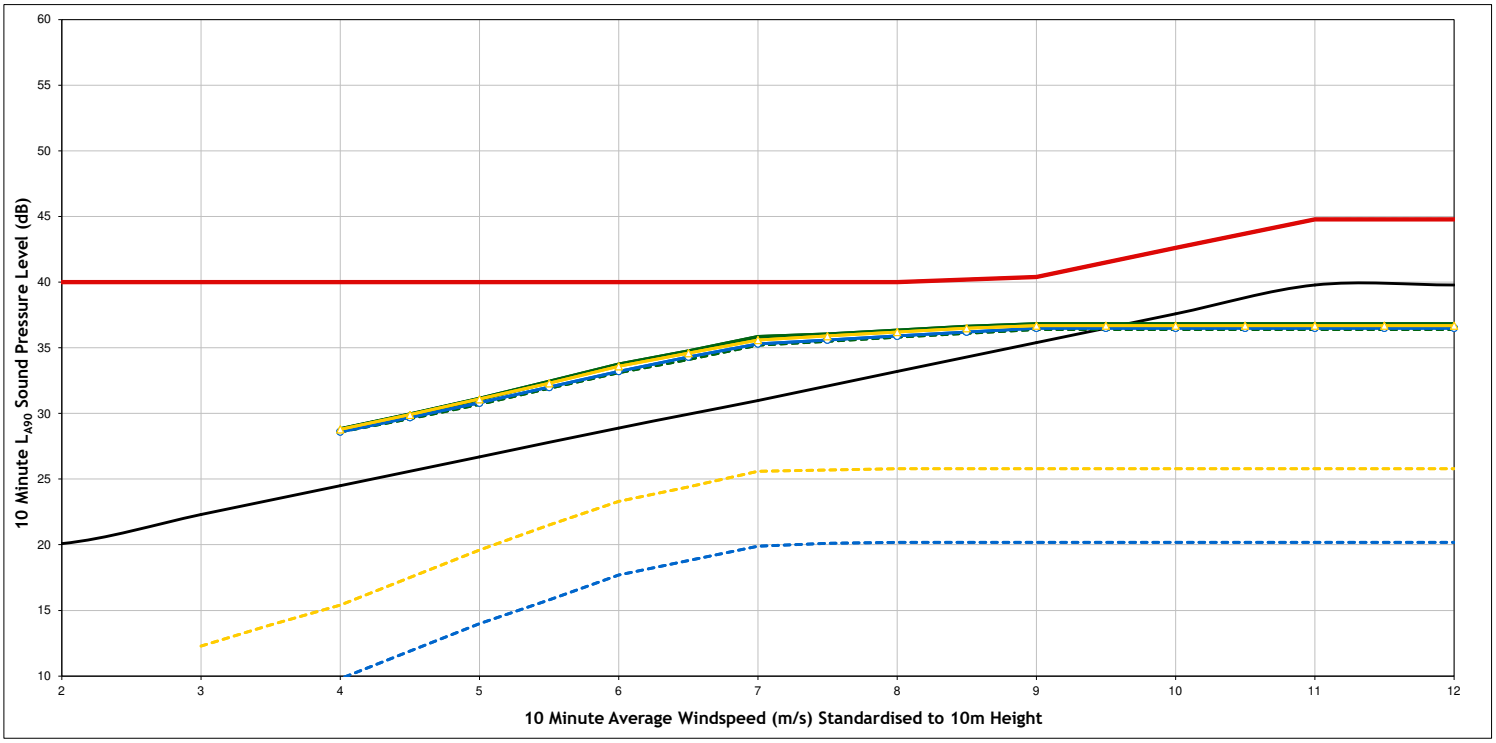
Project Title: IMERYS - HIGHER BISCOVILLACK PROPOSED WIND TURBINE

Drawing Title: FIGURE A1.1 - NOISE ASSESSMENT LOCATIONS AND WIND TURBINE LOCATIONS

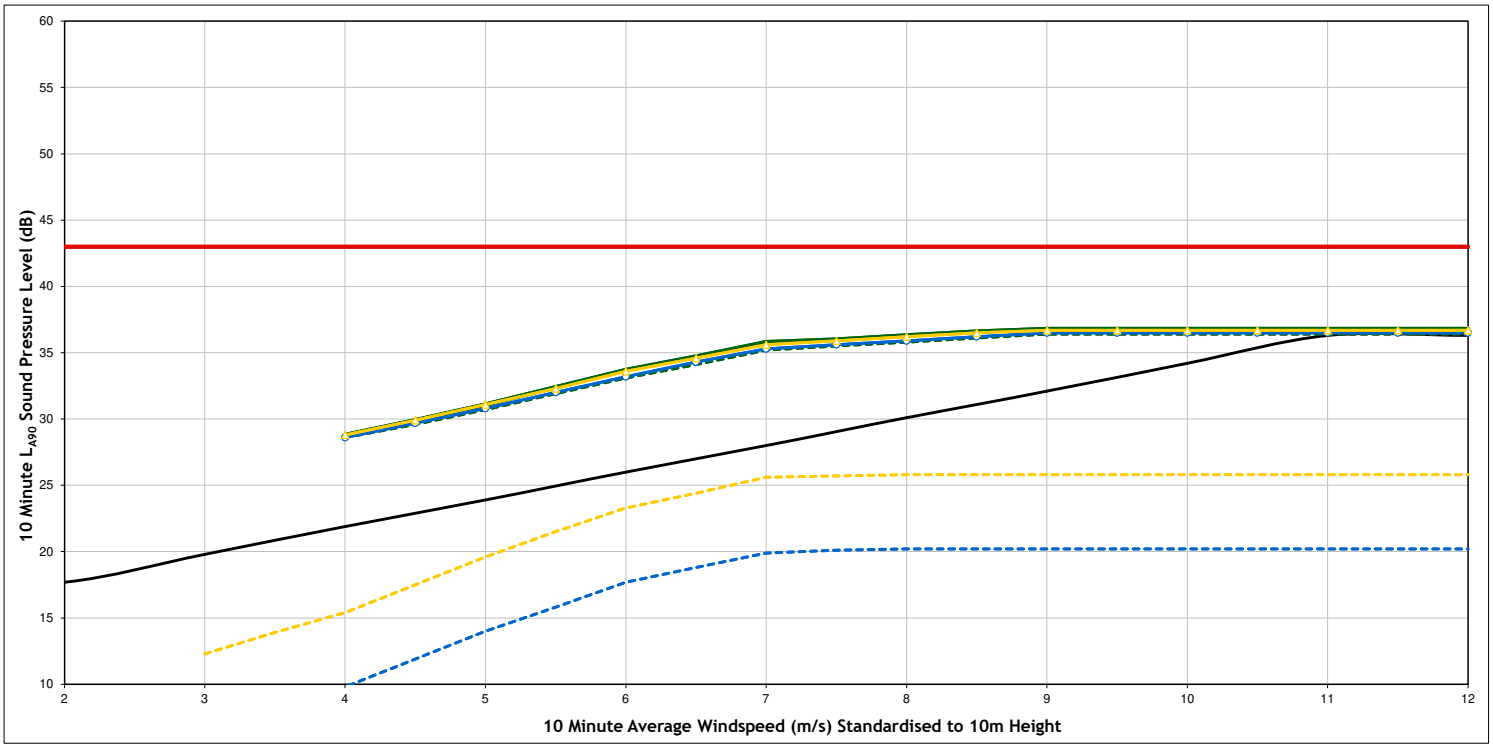
Scale:	Original Size:	Spatial Reference:
1:13,000	A3	British National Grid

Drawing Number: 16024-013b

Daytime - Newgate (NAL1 at 197946,53255)



Night Time - Newgate (NAL1 at 197946,53255)



Legend:

- Background Noise Trendline
- Total ETSU-R-97-Limit
- [A] Cumulative 4 x existing DW54 + 5 x consented E115 TES 0S [WD=0°]
- [B] Cumulative existing&consented[A] + Dubbers[E]+ Higher Biscovillack[F] [WD=0°]
- [C]Cumulative existing&consented[A] + Dubbers[E] [WD=0°]
- [D] Cumulative existing&consented[A] + Higher Biscovillack [F] [WD=0°]
- [E] 2 x Dubber V117 Serrated PO2[WD=0°]
- [F] 1 x Higher Biscovillack V117 Serrated PO2 [WD=0°]

Project	Imerys - Dubbers and Higher Biscovillack
Client	Clean Earth Energy
Title	Cumulative Noise Predictions Newgate
Fig No.	Figure A1.2a
Scale	NTS
Drawn	MR
Checked	MC
Date	25/11/2025
Doc. Ref.	16024-ETSU Model

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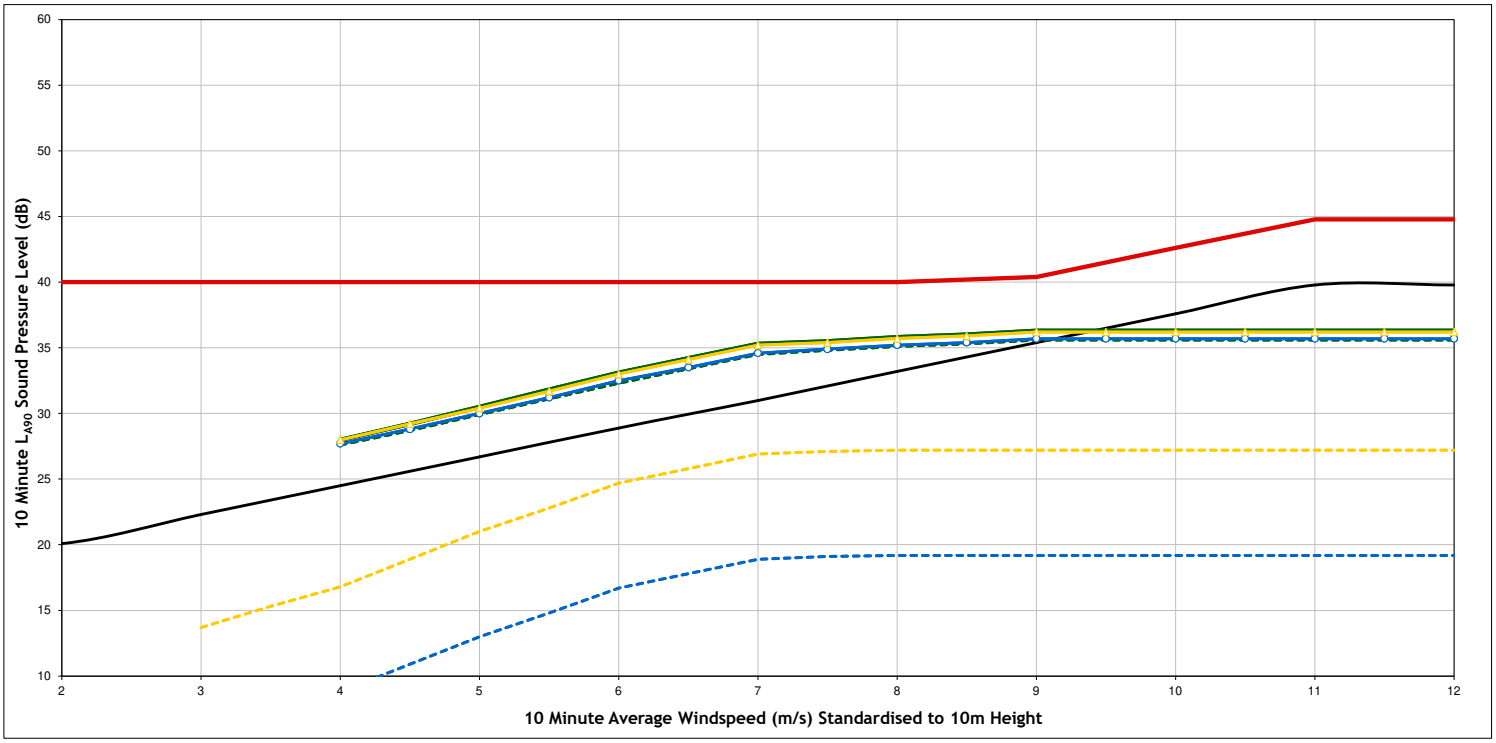
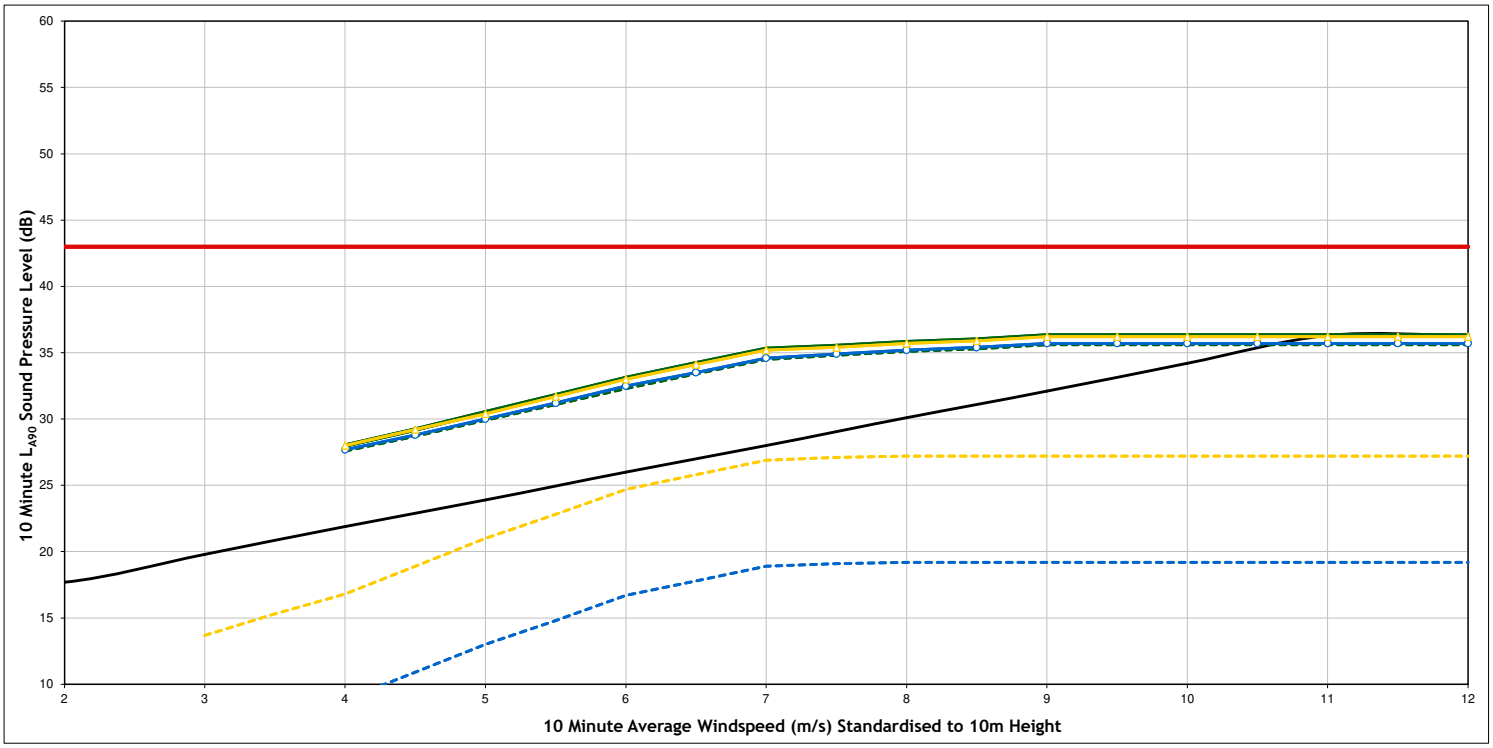
Daytime - Prideaux (NAL2 at 198384,53077)



Night Time - Prideaux (NAL2 at 198384,53077)



Legend:

- Background Noise Trendline
- Total ETSU-R-97-Limit
- [A] Cumulative 4 x existing DW54 + 5 x consented E115 TES 0S [WD=0°]
- [B] Cumulative existing&consented[A] + Dubbers[E]+ Higher Biscovillack[F] [WD=0°]
- [C]Cumulative existing&consented[A] + Dubbers[E] [WD=0°]
- [D] Cumulative existing&consented[A] + Higher Biscovillack [F] [WD=0°]
- [E] 2 x Dubber V117 Serrated PO2[WD=0°]
- [F] 1 x Higher Biscovillack V117 Serrated PO2 [WD=0°]

Project	Imerys - Dubbers and Higher Biscovillack
Client	Clean Earth Energy
Title	Cumulative Noise Predictions Prideaux
Fig No.	Figure A1.2b
Scale	NTS
Drawn	MR
Checked	MC
Date	25/11/2025
Doc. Ref.	16024-ETSU Model

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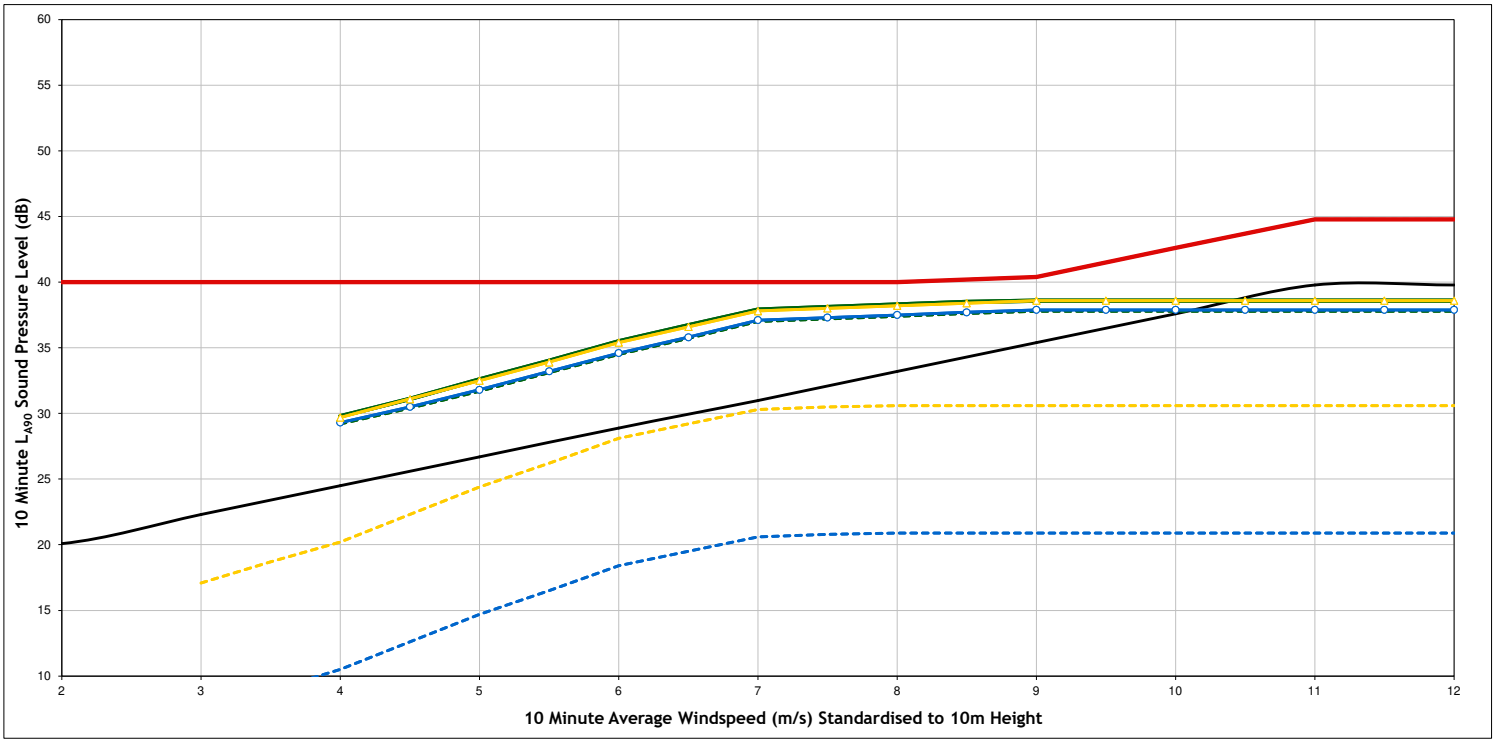
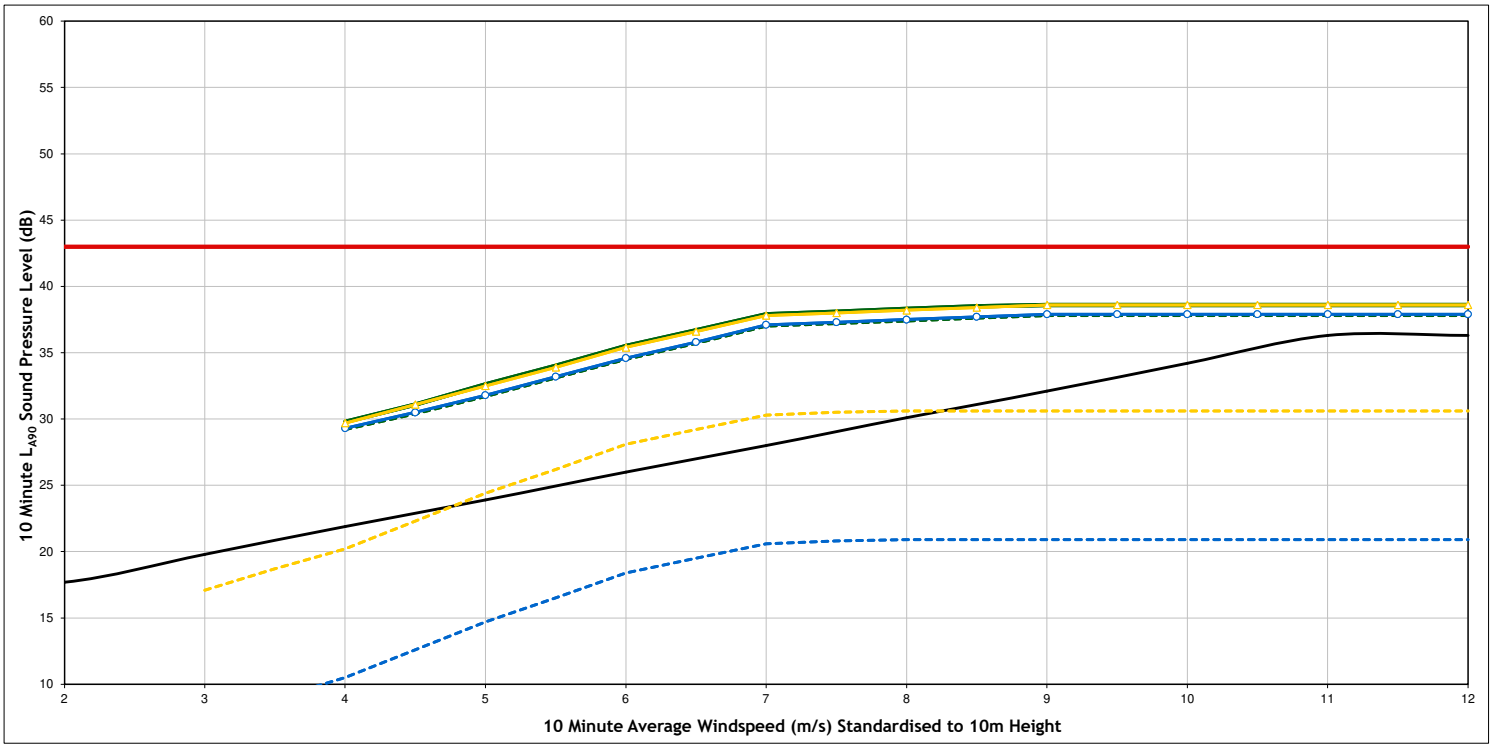
Daytime - 23 Carne Hill (NAL3 at 198762,53393)



Night Time - 23 Carne Hill (NAL3 at 198762,53393)



Legend:

- Background Noise Trendline
- Total ETSU-R-97-Limit
- [A] Cumulative 4 x existing DW54 + 5 x consented E115 TES 0S [WD=0°]
- [B] Cumulative existing&consented[A] + Dubbers[E]+ Higher Biscovillack[F] [WD=0°]
- [C]Cumulative existing&consented[A] + Dubbers[E] [WD=0°]
- [D] Cumulative existing&consented[A] + Higher Biscovillack [F] [WD=0°]
- [E] 2 x Dubber V117 Serrated PO2[WD=0°]
- [F] 1 x Higher Biscovillack V117 Serrated PO2 [WD=0°]

Project	Imerys - Dubbers and Higher Biscovillack
Client	Clean Earth Energy
Title	Cumulative Noise Predictions 23 Carne Hill
Fig No.	Figure A1.2c
Scale	NTS
Drawn	MR
Checked	MC
Date	25/11/2025
Doc. Ref.	16024-ETSU Model

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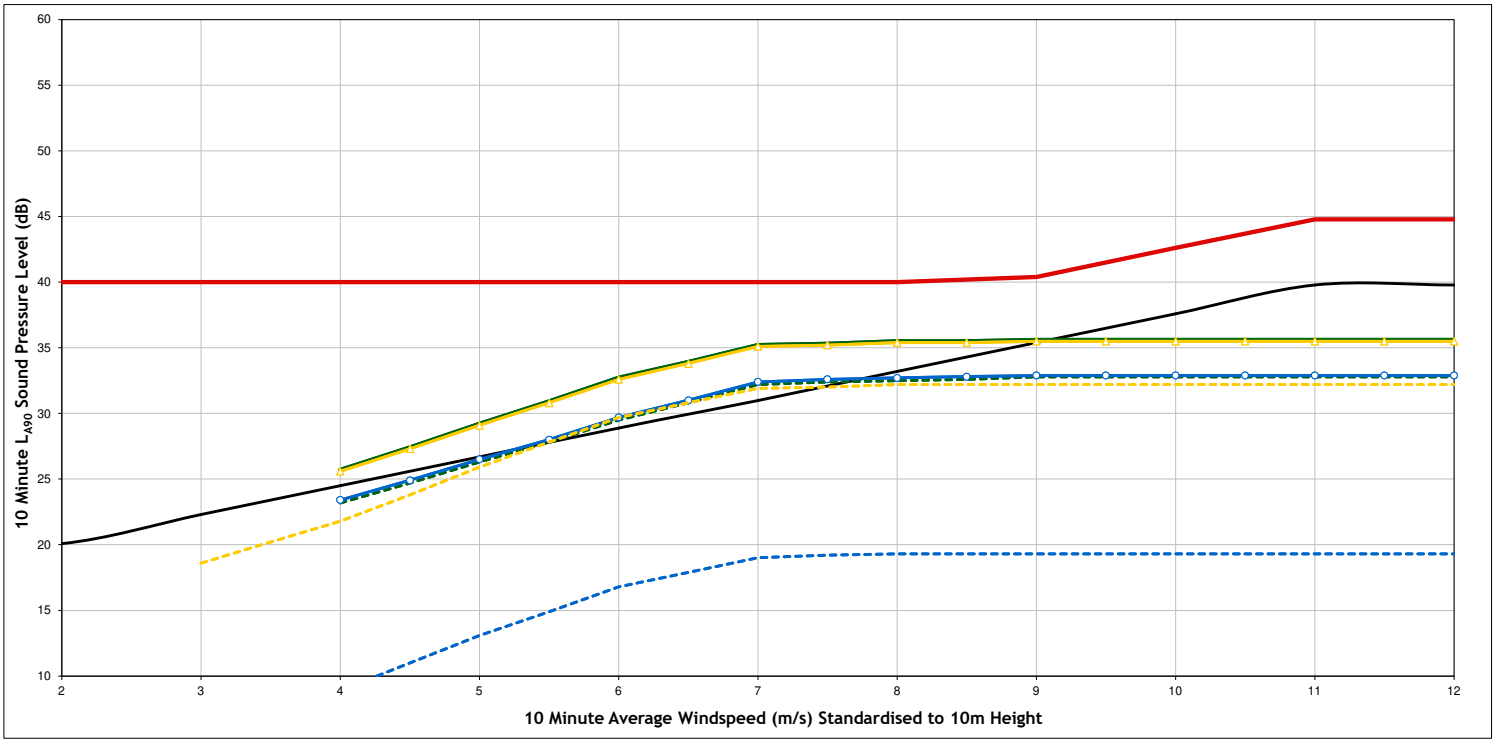
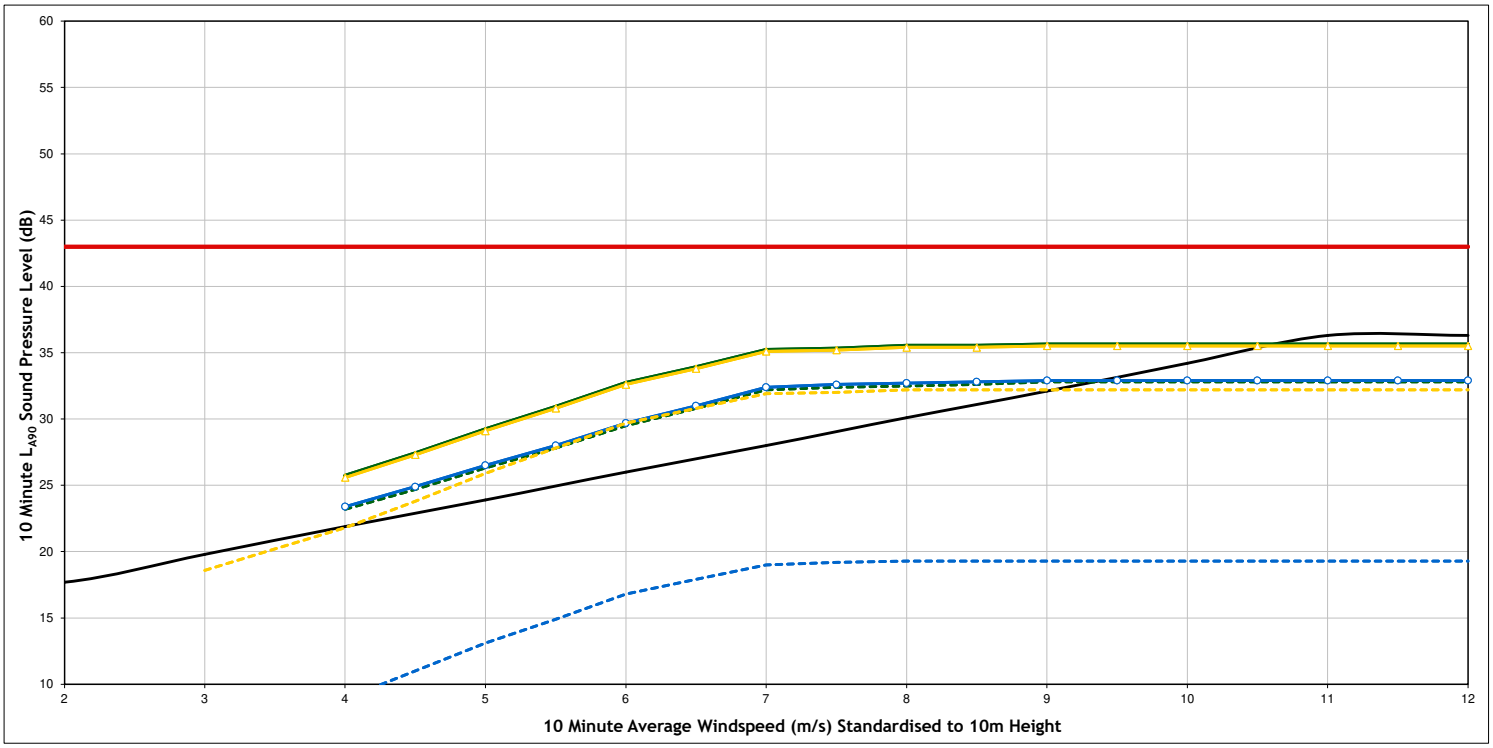
Daytime - Treglyn Gardens (NAL4 at 199550,53677)



Night Time - Treglyn Gardens (NAL4 at 199550,53677)



Legend:

- Background Noise Trendline
- Total ETSU-R-97-Limit
- [A] Cumulative 4 x existing DW54 + 5 x consented E115 TES 0S [WD=0°]
- [B] Cumulative existing&consented[A] + Dubbers[E]+ Higher Biscovillack[F] [WD=0°]
- [C]Cumulative existing&consented[A] + Dubbers[E] [WD=0°]
- [D] Cumulative existing&consented[A] + Higher Biscovillack [F] [WD=0°]
- [E] 2 x Dubber V117 Serrated PO2[WD=0°]
- [F] 1 x Higher Biscovillack V117 Serrated PO2 [WD=0°]

Project	Imerys - Dubbers and Higher Biscovillack
Client	Clean Earth Energy
Title	Cumulative Noise Predictions Treglyn Gardens
Fig No.	Figure A1.2d
Scale	NTS
Drawn	MR
Checked	MC
Date	25/11/2025
Doc. Ref.	16024-ETSU Model

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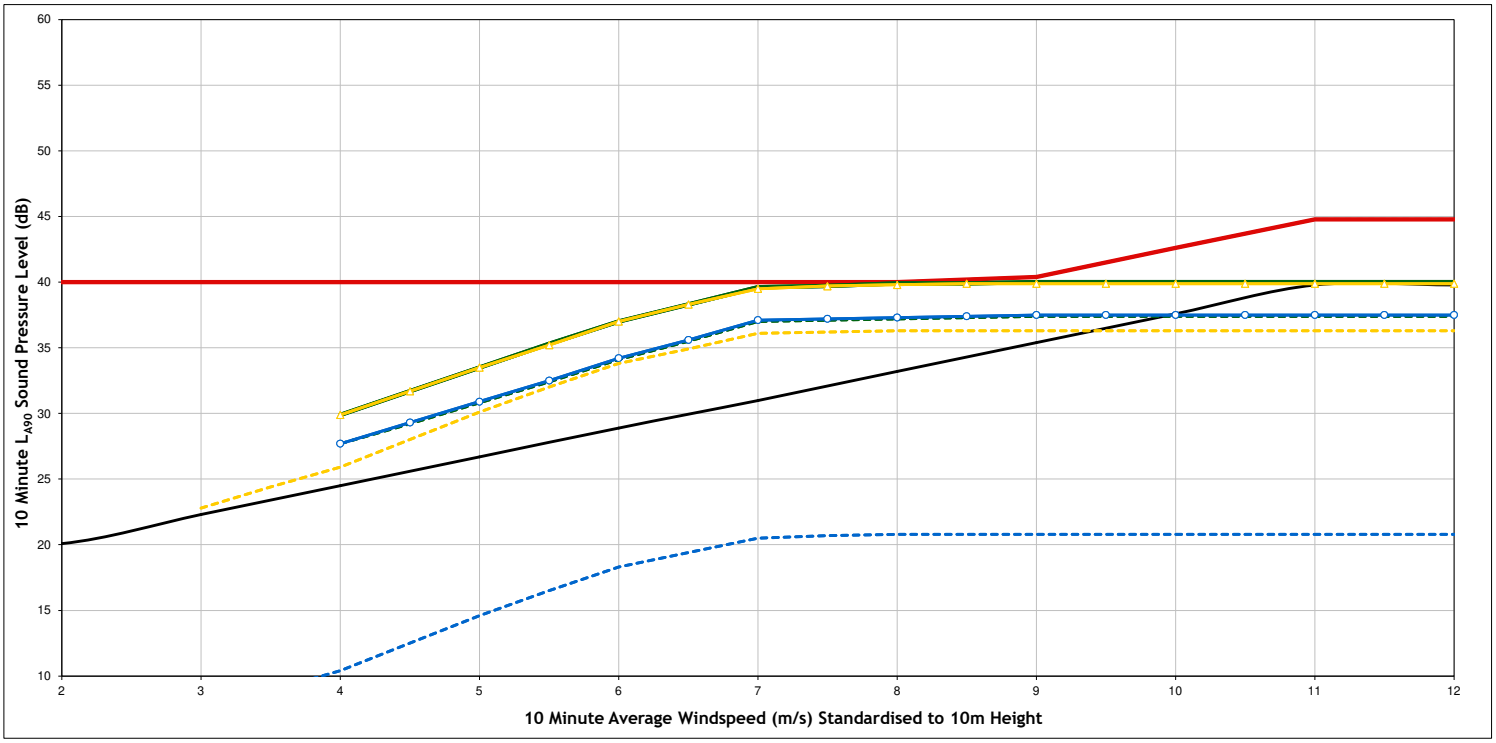
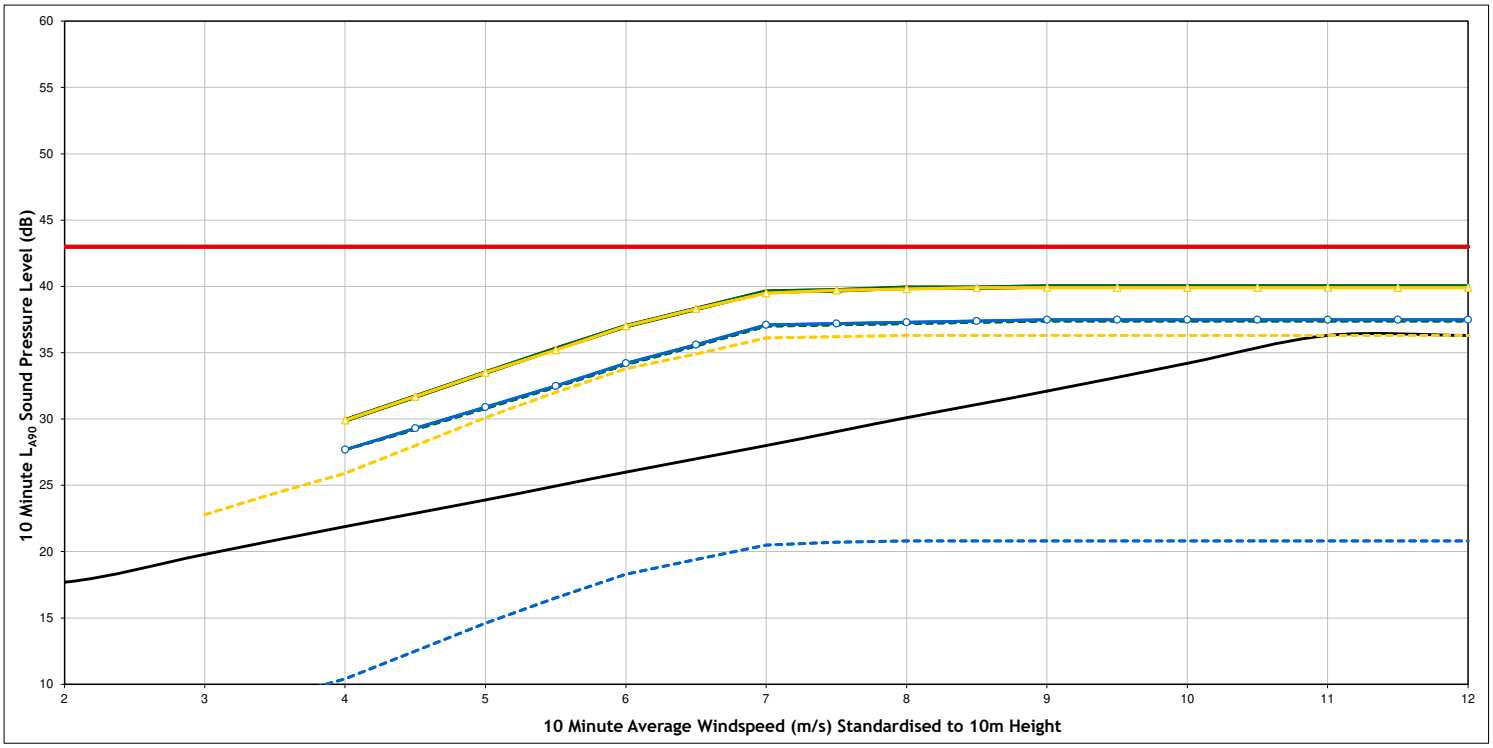
Daytime - Secret Cottage (2 properties) (NAL5 at 199152,53871)



Night Time - Secret Cottage (2 properties) (NAL5 at 199152,53871)



Legend:

- Background Noise Trendline
- Total ETSU-R-97-Limit
- [A] Cumulative 4 x existing DW54 + 5 x consented E115 TES 0S [WD=0°]
- [B] Cumulative existing&consented[A] + Dubbers[E]+ Higher Biscovillack[F] [WD=0°]
- [C]Cumulative existing&consented[A] + Dubbers[E] [WD=0°]
- [D] Cumulative existing&consented[A] + Higher Biscovillack [F] [WD=0°]
- [E] 2 x Dubber V117 Serrated PO2[WD=0°]
- [F] 1 x Higher Biscovillack V117 Serrated PO2 [WD=0°]

Project	Imerys - Dubbers and Higher Biscovillack
Client	Clean Earth Energy
Title	Cumulative Noise Predictions Secret Cottage (2 properties)
Fig No.	Figure A1.2e
Scale	NTS
Drawn	MR
Checked	MC
Date	25/11/2025
Doc. Ref.	16024-ETSU Model

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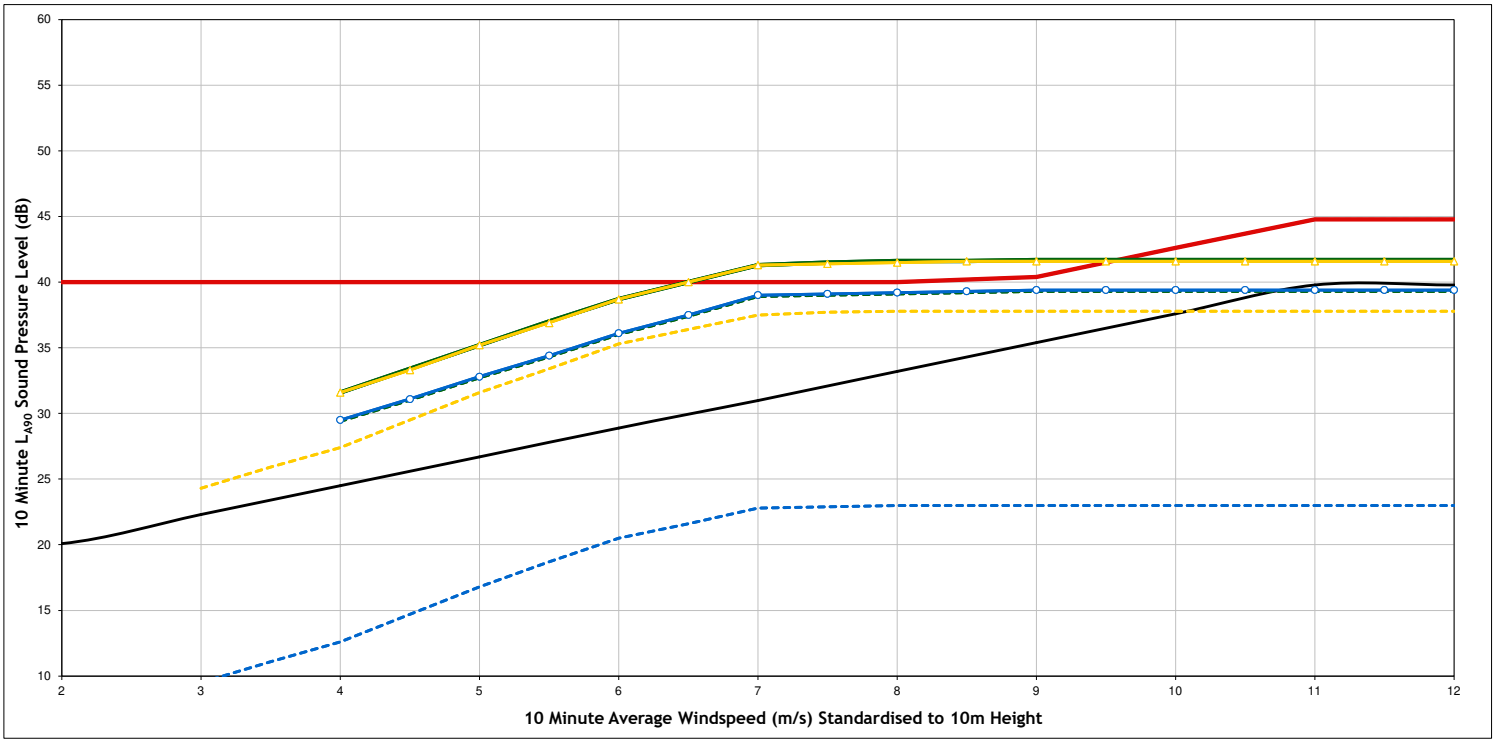
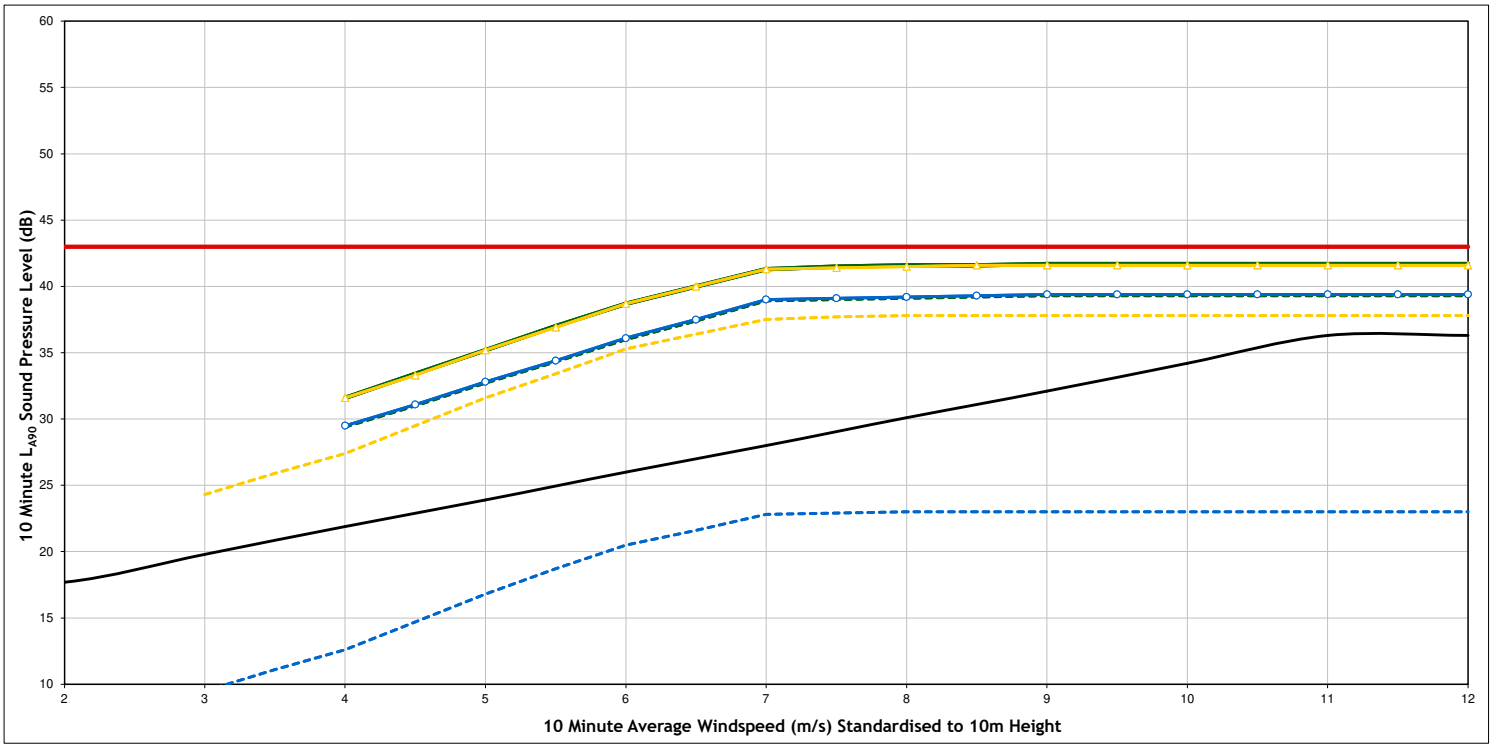
Daytime - Penisker Farm (NAL6 at 199087,54161)



Night Time - Penisker Farm (NAL6 at 199087,54161)



Legend:

- Background Noise Trendline
- Total ETSU-R-97-Limit
- [A] Cumulative 4 x existing DW54 + 5 x consented E115 TES 0S [WD=0°]
- [B] Cumulative existing&consented[A] + Dubbers[E]+ Higher Biscovillack[F] [WD=0°]
- [C]Cumulative existing&consented[A] + Dubbers[E] [WD=0°]
- [D] Cumulative existing&consented[A] + Higher Biscovillack [F] [WD=0°]
- [E] 2 x Dubber V117 Serrated PO2[WD=0°]
- [F] 1 x Higher Biscovillack V117 Serrated PO2 [WD=0°]

Project	Imerys - Dubbers and Higher Biscovillack
Client	Clean Earth Energy
Title	Cumulative Noise Predictions Penisker Farm
Fig No.	Figure A1.2f
Scale	NTS
Drawn	MR
Checked	MC
Date	25/11/2025
Doc. Ref.	16024-ETSU Model

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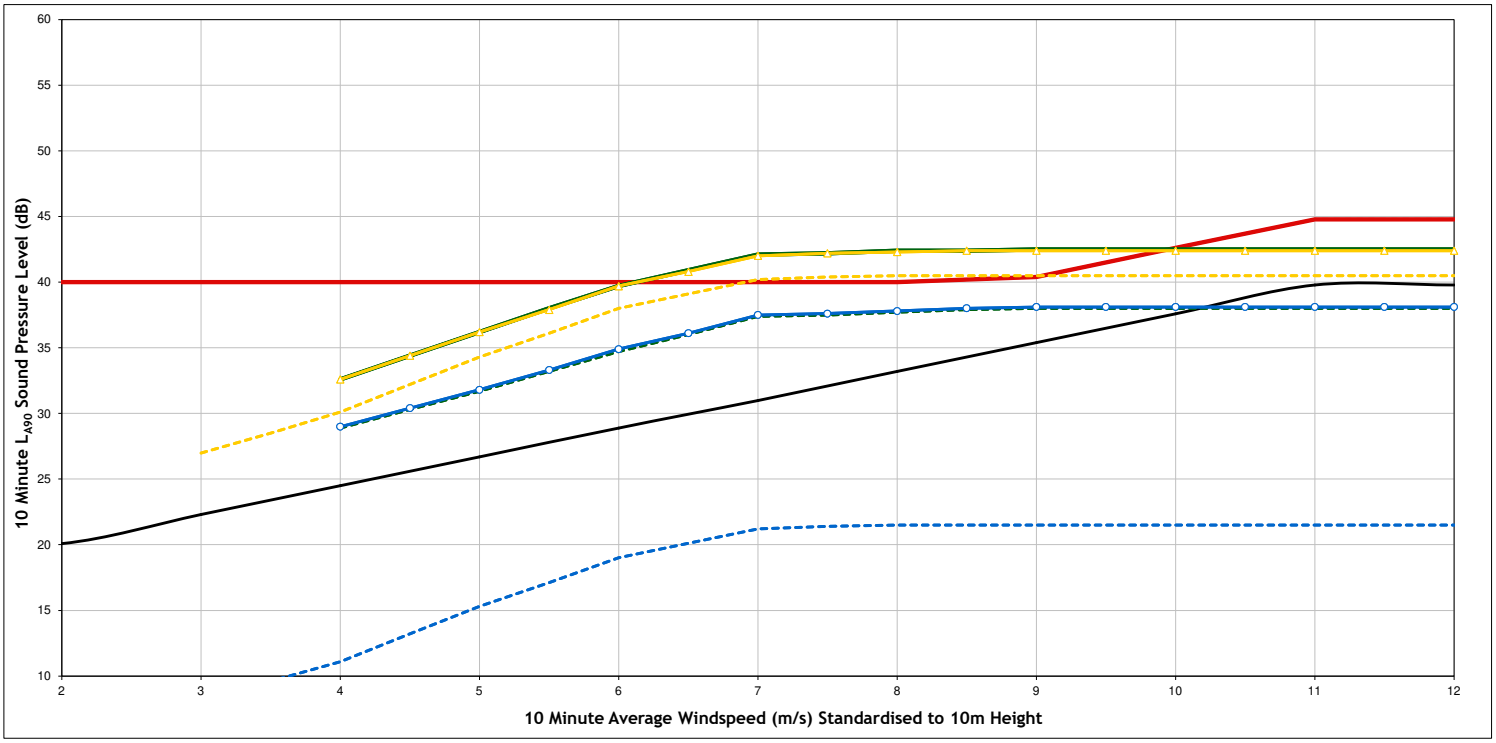
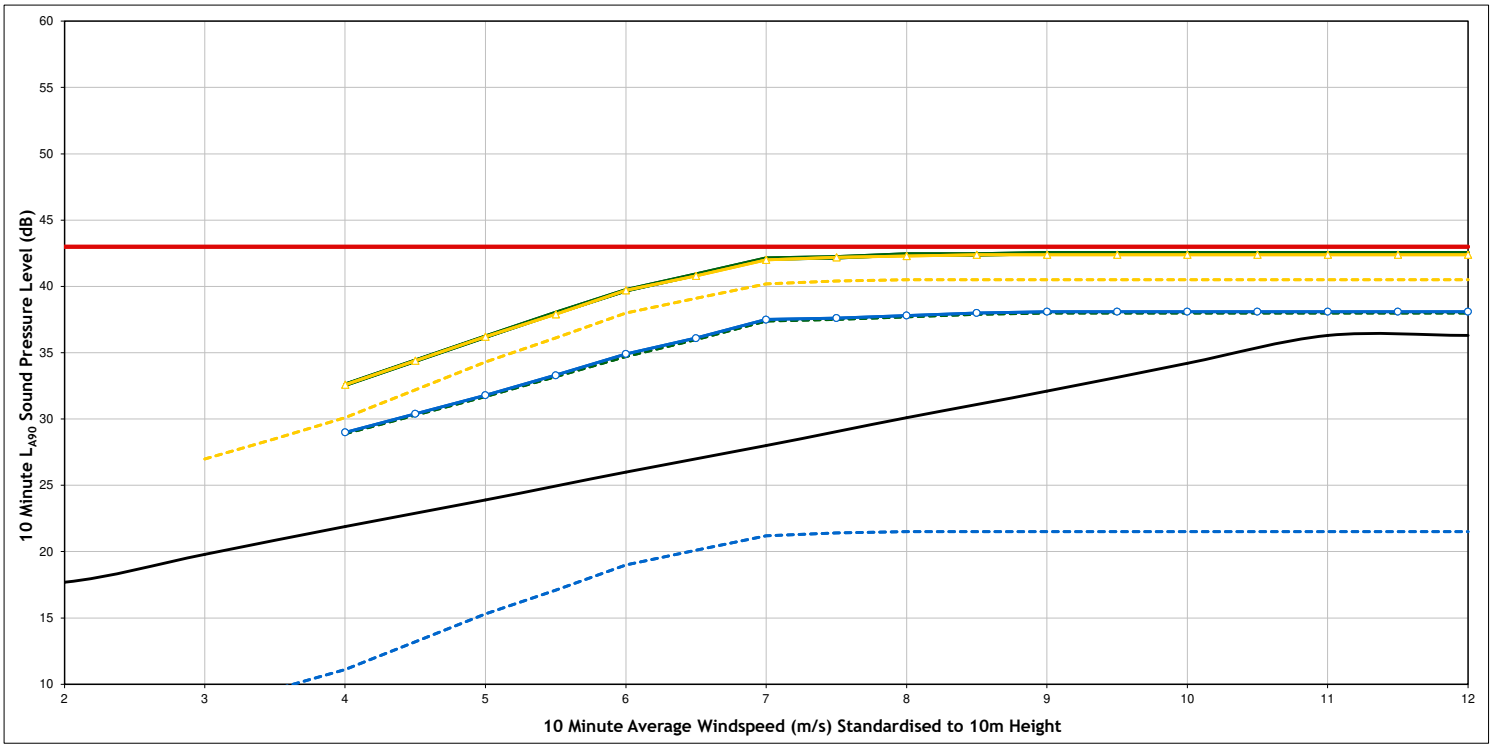
Daytime - Biscovillack Farm (NAL7 at 199576,54088)



Night Time - Biscovillack Farm (NAL7 at 199576,54088)



Legend:

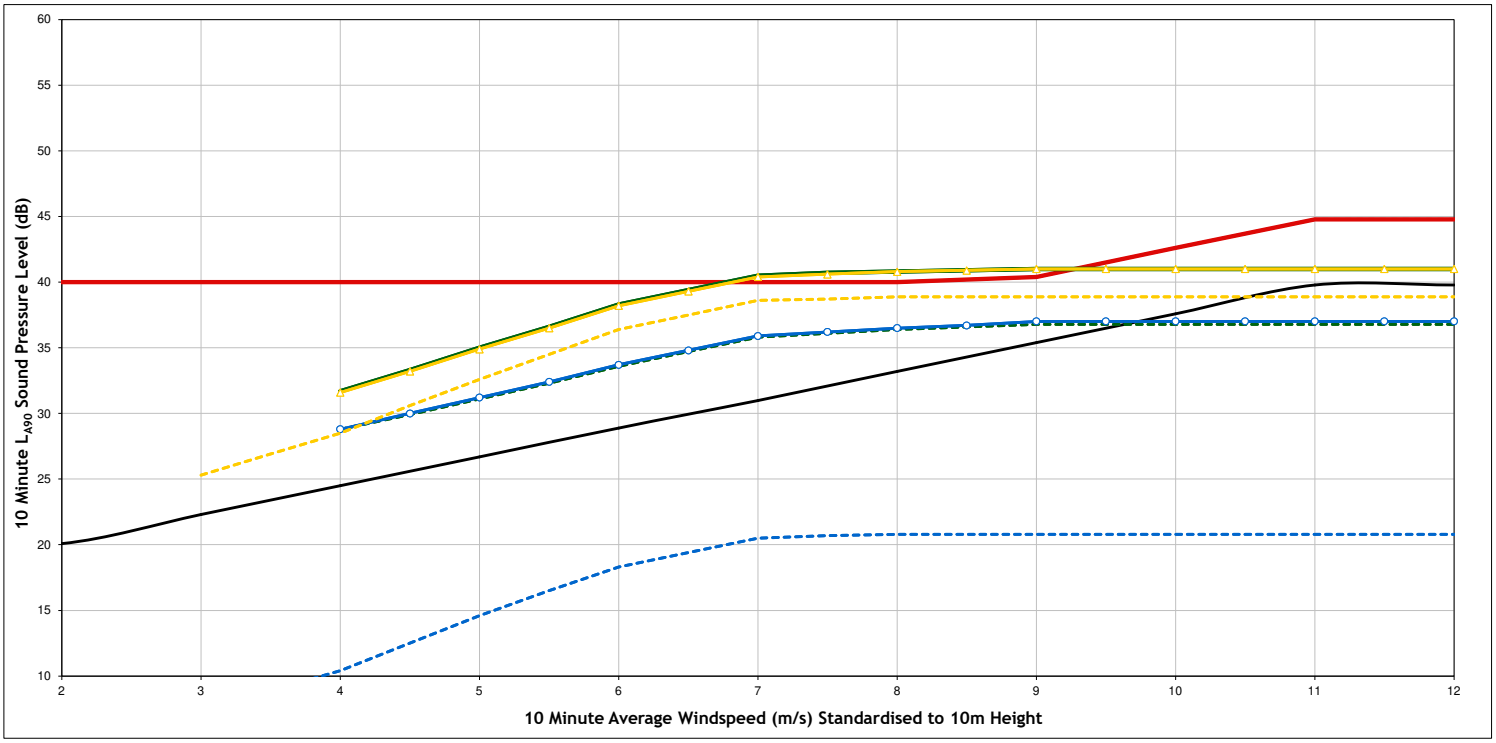
- Background Noise Trendline
- Total ETSU-R-97-Limit
- [A] Cumulative 4 x existing DW54 + 5 x consented E115 TES 0S [WD=330°]
- [B] Cumulative existing&consented[A] + Dubbers[E]+ Higher Biscovillack[F] [WD=330°]
- [C]Cumulative existing&consented[A] + Dubbers[E] [WD=330°]
- [D] Cumulative existing&consented[A] + Higher Biscovillack [F] [WD=330°]
- [E] 2 x Dubber V117 Serrated PO2[WD=330°]
- [F] 1 x Higher Biscovillack V117 Serrated PO2 [WD=330°]

Project	Imerys - Dubbers and Higher Biscovillack
Client	Clean Earth Energy
Title	Cumulative Noise Predictions Biscovillack Farm
Fig No.	Figure A1.2g
Scale	NTS
Drawn	MR
Checked	MC
Date	25/11/2025
Doc. Ref.	16024-ETSU Model

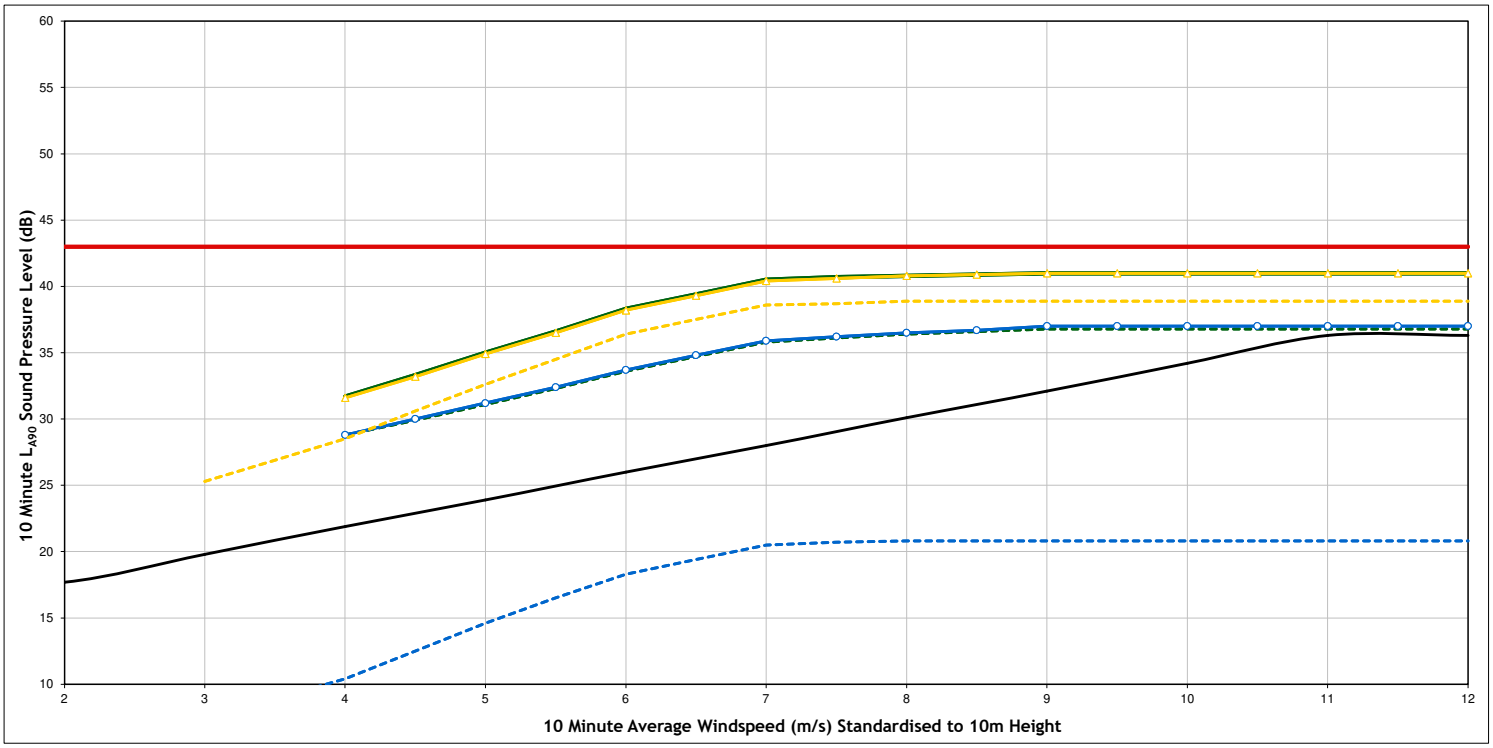
cleanearth

tnei

Daytime - Area 51 campsite and house east of Greensplat Rd (NAL8 at 200157,54074)



Night Time - Area 51 campsite and house east of Greensplat Rd (NAL8 at 200157,54074)



Legend:

- Background Noise Trendline
- Total ETSU-R-97-Limit
- [A] Cumulative 4 x existing DW54 + 5 x consented E115 TES 0S [WD=300°]
- [B] Cumulative existing&consented[A] + Dubbers[E]+ Higher Biscovillack[F] [WD=300°]
- [C]Cumulative existing&consented[A] + Dubbers[E] [WD=300°]
- [D] Cumulative existing&consented[A] + Higher Biscovillack [F] [WD=300°]
- [E] 2 x Dubber V117 Serrated PO2[WD=300°]
- [F] 1 x Higher Biscovillack V117 Serrated PO2 [WD=300°]

Project	Imerys - Dubbers and Higher Biscovillack
Client	Clean Earth Energy
Title	Cumulative Noise Predictions Area 51 campsite and house east of Greensplat Rd
Fig No.	Figure A1.2h
Scale	NTS
Drawn	MR
Checked	MC
Date	25/11/2025
Doc. Ref.	16024-ETSU Model

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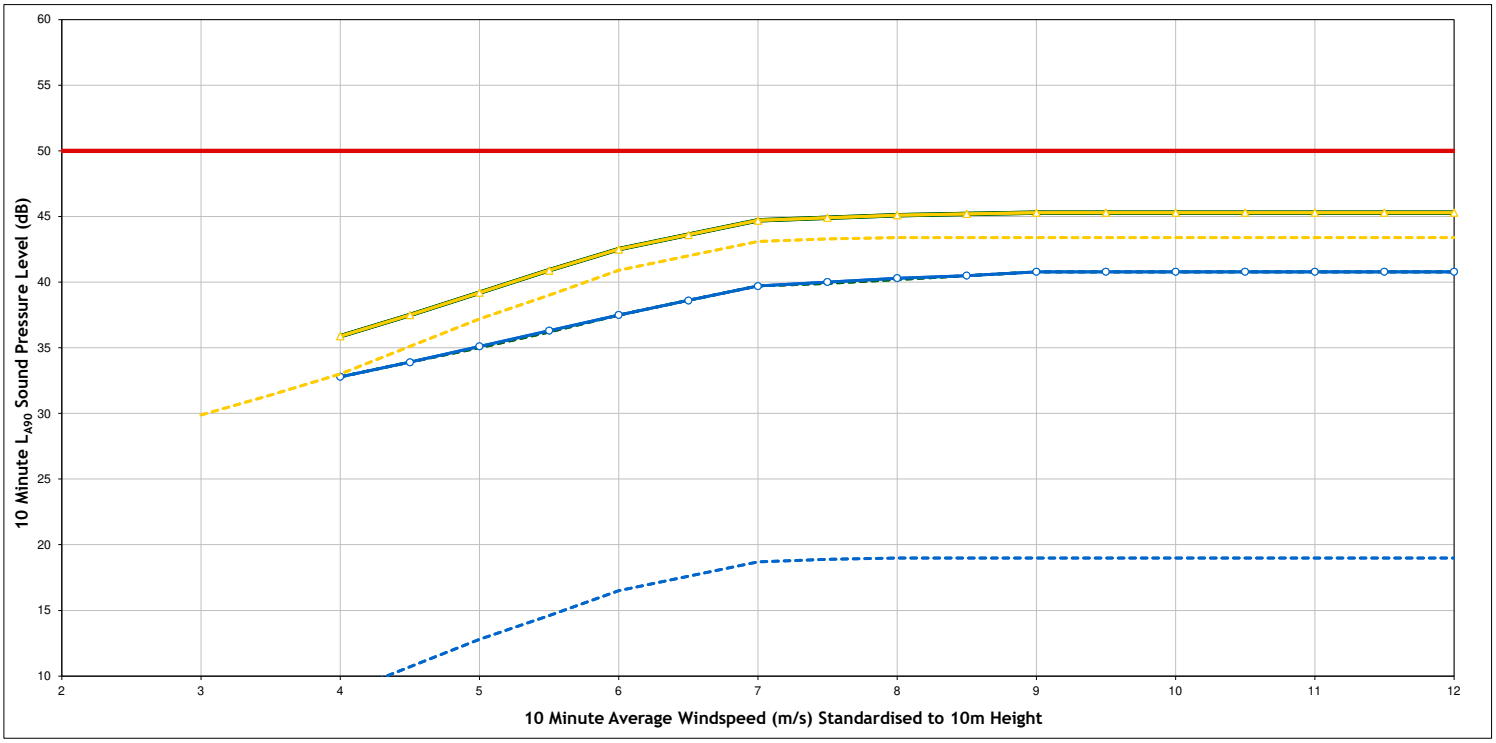
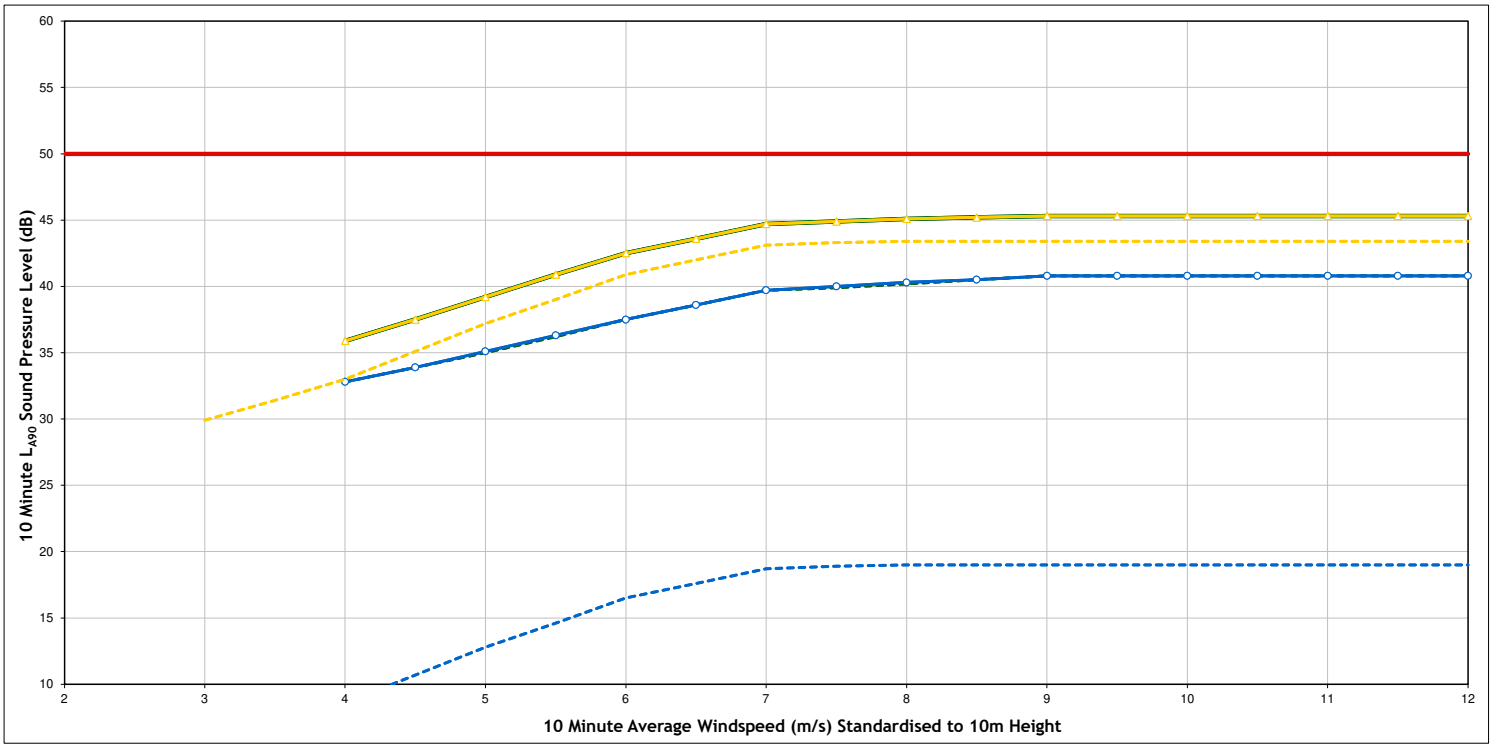
Daytime - Greystone Cottage (NAL10 at 199823,54782)



Night Time - Greystone Cottage (NAL10 at 199823,54782)



Legend:

- Background Noise Trendline
- Total ETSU-R-97-Limit
- [A] Cumulative 4 x existing DW54 + 5 x consented E115 TES 0S [WD=210°]
- [B] Cumulative existing&consented[A] + Dubbers[E]+ Higher Biscovillack[F] [WD=210°]
- [C]Cumulative existing&consented[A] + Dubbers[E] [WD=210°]
- [D] Cumulative existing&consented[A] + Higher Biscovillack [F] [WD=210°]
- [E] 2 x Dubber V117 Serrated PO2[WD=210°]
- [F] 1 x Higher Biscovillack V117 Serrated PO2 [WD=210°]

Project	Imerys - Dubbers and Higher Biscovillack
Client	Clean Earth Energy
Title	Cumulative Noise Predictions Greystone Cottage
Fig No.	Figure A1.2j
Scale	NTS
Drawn	MR
Checked	MC
Date	25/11/2025
Doc. Ref.	16024-ETSU Model

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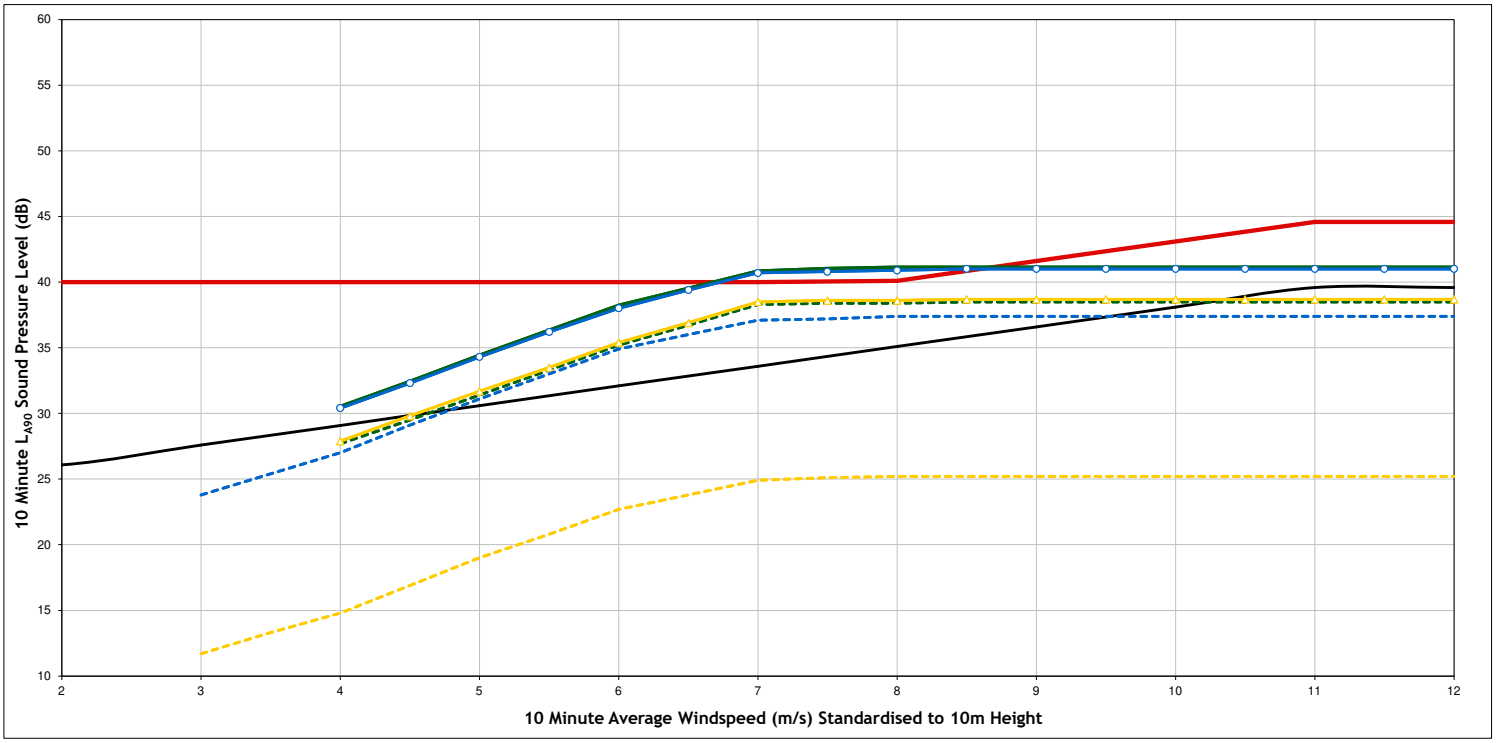
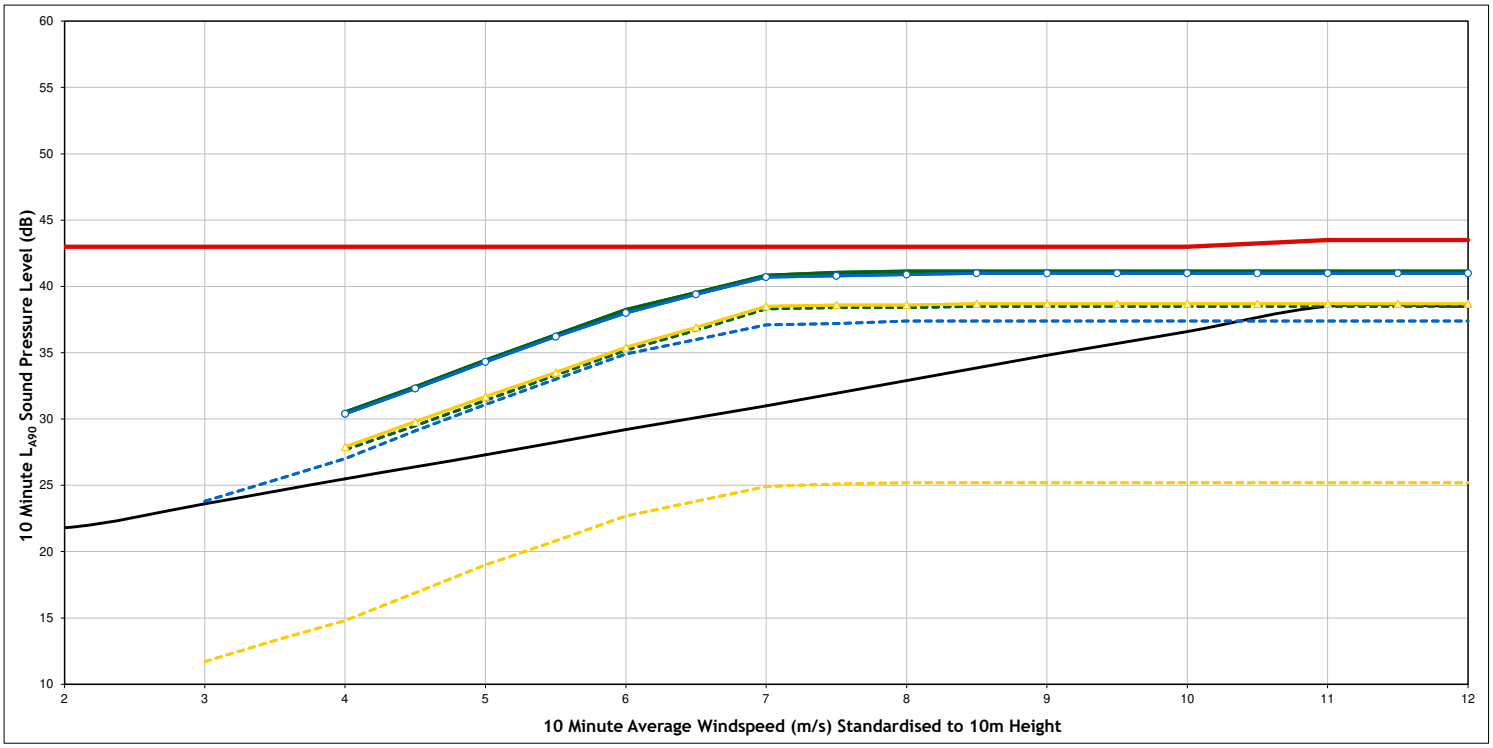
Daytime - Longstone Cottage (NAL11 at 197688,55420)



Night Time - Longstone Cottage (NAL11 at 197688,55420)



Legend:

- Background Noise Trendline
- Total ETSU-R-97-Limit
- [A] Cumulative 4 x existing DW54 + 5 x consented E115 TES 0S [WD=60°]
- [B] Cumulative existing&consented[A] + Dubbers[E]+ Higher Biscovillack[F] [WD=60°]
- [C]Cumulative existing&consented[A] + Dubbers[E] [WD=60°]
- [D] Cumulative existing&consented[A] + Higher Biscovillack [F] [WD=60°]
- [E] 2 x Dubber V117 Serrated PO2[WD=60°]
- [F] 1 x Higher Biscovillack V117 Serrated PO2 [WD=60°]

Project	Imerys - Dubbers and Higher Biscovillack
Client	Clean Earth Energy
Title	Cumulative Noise Predictions Longstone Cottage
Fig No.	Figure A1.2k
Scale	NTS
Drawn	MR
Checked	MC
Date	25/11/2025
Doc. Ref.	16024-ETSU Model

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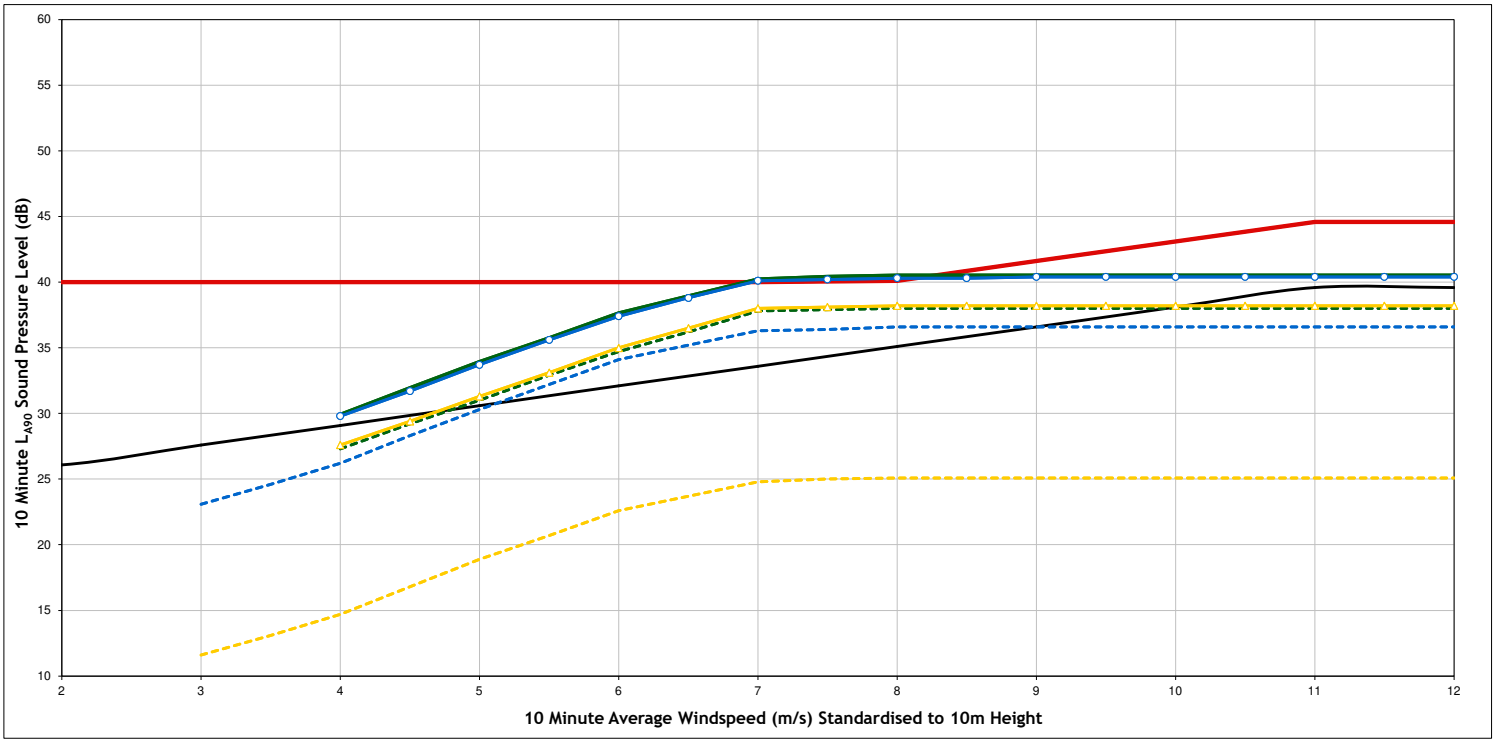
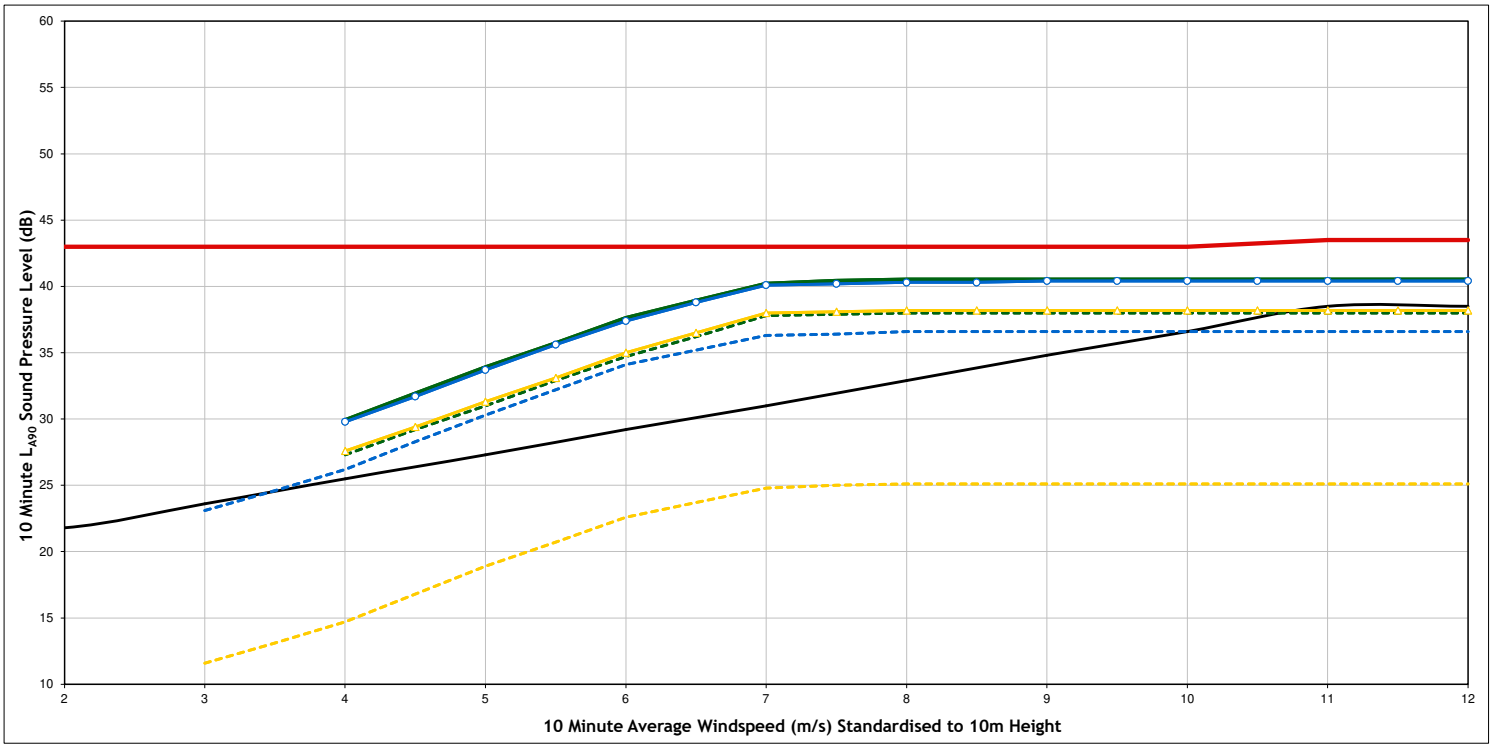
Daytime - Longstone House (NAL12 at 197633,55346)



Night Time - Longstone House (NAL12 at 197633,55346)



Legend:

- Background Noise Trendline
- Total ETSU-R-97-Limit
- [A] Cumulative 4 x existing DW54 + 5 x consented E115 TES 0S [WD=60°]
- [B] Cumulative existing&consented[A] + Dubbers[E]+ Higher Biscovillack[F] [WD=60°]
- [C]Cumulative existing&consented[A] + Dubbers[E] [WD=60°]
- [D] Cumulative existing&consented[A] + Higher Biscovillack [F] [WD=60°]
- [E] 2 x Dubber V117 Serrated PO2[WD=60°]
- [F] 1 x Higher Biscovillack V117 Serrated PO2 [WD=60°]

Project	Imerys - Dubbers and Higher Biscovillack
Client	Clean Earth Energy
Title	Cumulative Noise Predictions Longstone House
Fig No.	Figure A1.2l
Scale	NTS
Drawn	MR
Checked	MC
Date	25/11/2025
Doc. Ref.	16024-ETSU Model

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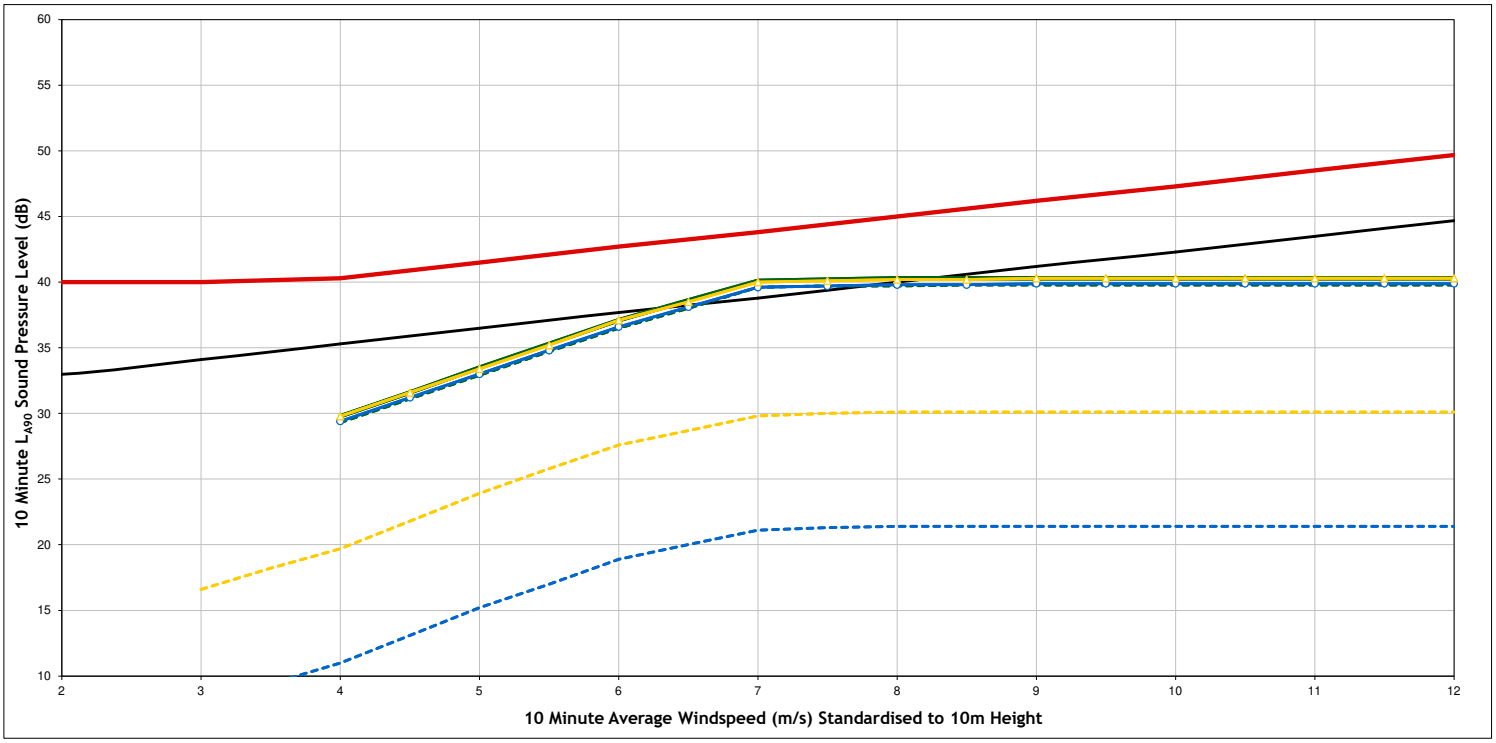
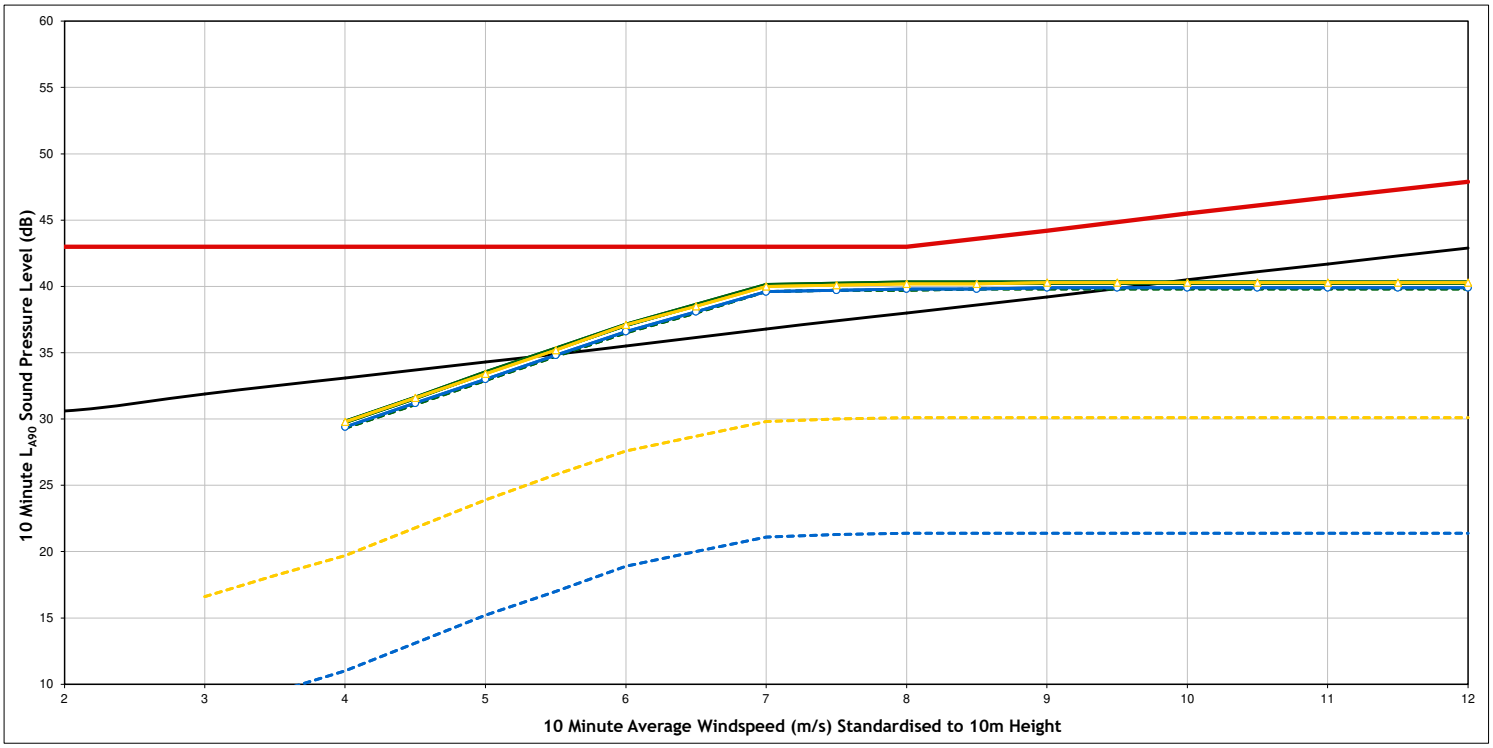
Daytime - Carthew Farm Cottage (NAL13 at 200287,55931)



Night Time - Carthew Farm Cottage (NAL13 at 200287,55931)



Legend:

- Background Noise Trendline
- Total ETSU-R-97-Limit
- [A] Cumulative 4 x existing DW54 + 5 x consented E115 TES 0S [WD=270°]
- [B] Cumulative existing&consented[A] + Dubbers[E]+ Higher Biscovillack[F] [WD=270°]
- [C]Cumulative existing&consented[A] + Dubbers[E] [WD=270°]
- [D] Cumulative existing&consented[A] + Higher Biscovillack [F] [WD=270°]
- [E] 2 x Dubber V117 Serrated PO2[WD=270°]
- [F] 1 x Higher Biscovillack V117 Serrated PO2 [WD=270°]

Project	Imerys - Dubbers and Higher Biscovillack
Client	Clean Earth Energy
Title	Cumulative Noise Predictions Carthew Farm Cottage
Fig No.	Figure A1.2m
Scale	NTS
Drawn	MR
Checked	MC
Date	25/11/2025
Doc. Ref.	16024-ETSU Model

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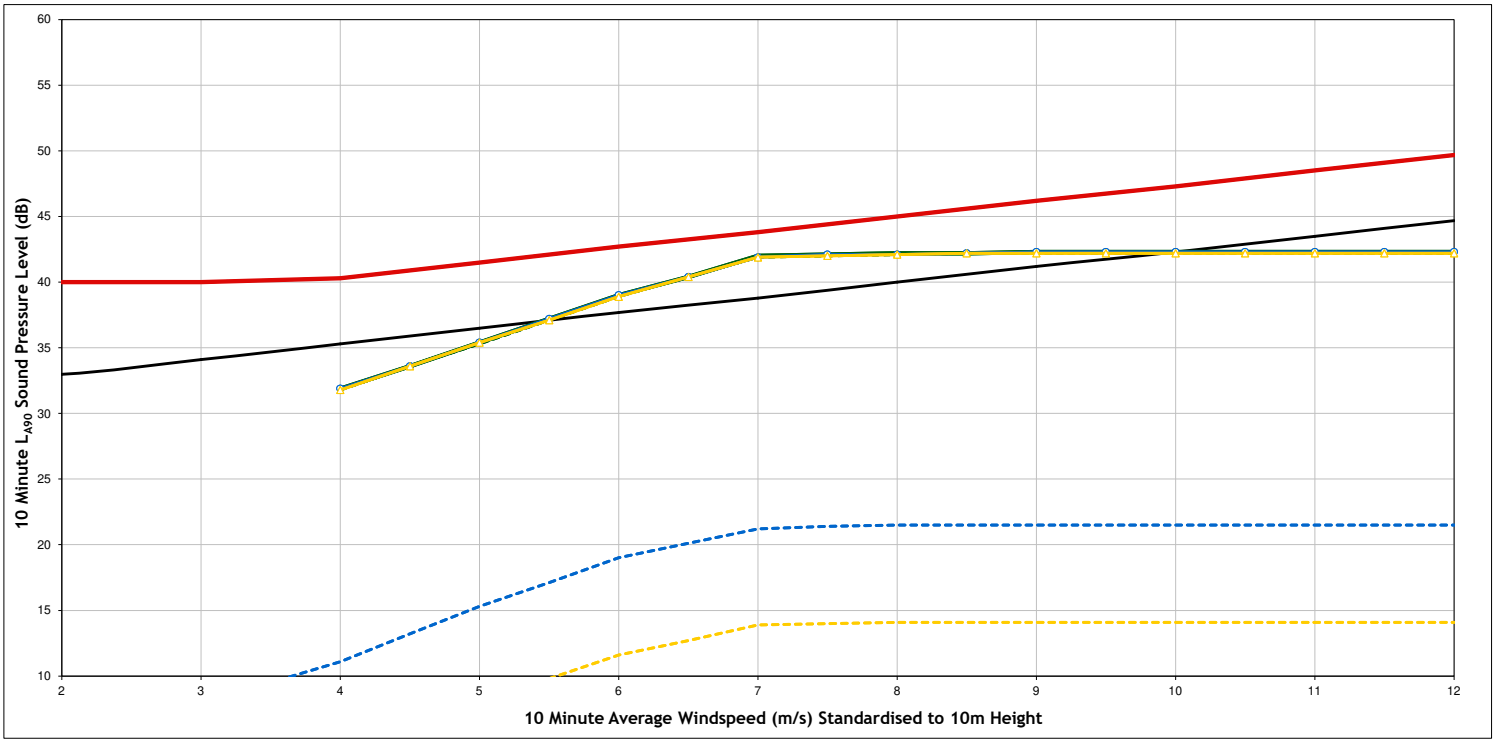
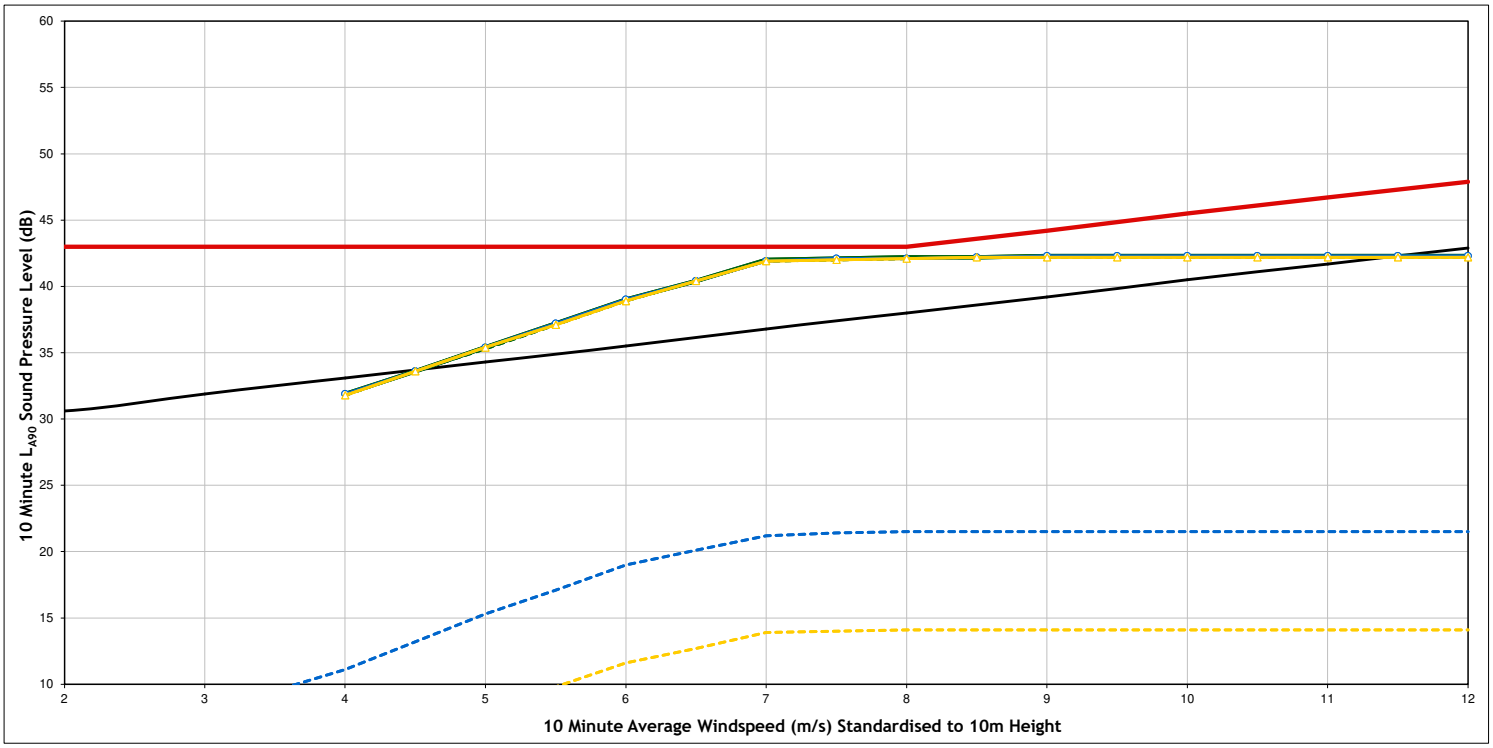
Daytime - Adit (property North of Carthew) (NAL14 at 200287,56332)



Night Time - Adit (property North of Carthew) (NAL14 at 200287,56332)



Legend:

- Background Noise Trendline
- Total ETSU-R-97-Limit
- [A] Cumulative 4 x existing DW54 + 5 x consented E115 TES 0S [WD=330°]
- [B] Cumulative existing&consented[A] + Dubbers[E]+ Higher Biscovillack[F] [WD=330°]
- [C]Cumulative existing&consented[A] + Dubbers[E] [WD=330°]
- [D] Cumulative existing&consented[A] + Higher Biscovillack [F] [WD=330°]
- [E] 2 x Dubber V117 Serrated PO2[WD=330°]
- [F] 1 x Higher Biscovillack V117 Serrated PO2 [WD=330°]

Project	Imerys - Dubbers and Higher Biscovillack
Client	Clean Earth Energy
Title	Cumulative Noise Predictions Adit (property North of Carthew)
Fig No.	Figure A1.2n
Scale	NTS
Drawn	MR
Checked	MC
Date	25/11/2025
Doc. Ref.	16024-ETSU Model

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Annex 2 – Noise data, wind turbine coordinates and topographic adjustments

Table B1: Sound Power Level Data LAeq (dB)

Wind Farm	Wind Turbine Model	Hub height of source data	Uncertainty Included	Reference Wind Speed (ms^{-1}) Standardised to 10m Height									
				3	4	5	6	7	8	9	10	11	12
	VESTAS V117 4.3 MW PO2 (serrated blades)	76.5	Restricted data, available on request. Maximum sound power as modelled is 107dB.										
Longstones, East Karslake, Wheal Martyn,Burngullow, Goonamarth 2	ENERCON E-115 EP3 E4-4260 kW Mode 0s (serrated blades)	77	Restricted data, available on request. Maximum sound power as modelled is 107dB.										
Higher Goonamarth, Greensplat, Blackpool and Gunheath	EWT DW54 500kw	50	1.2 - 1.5	-	-	96.2	97.8	98.9	100.0	101.0	101.0	101.0	101.0

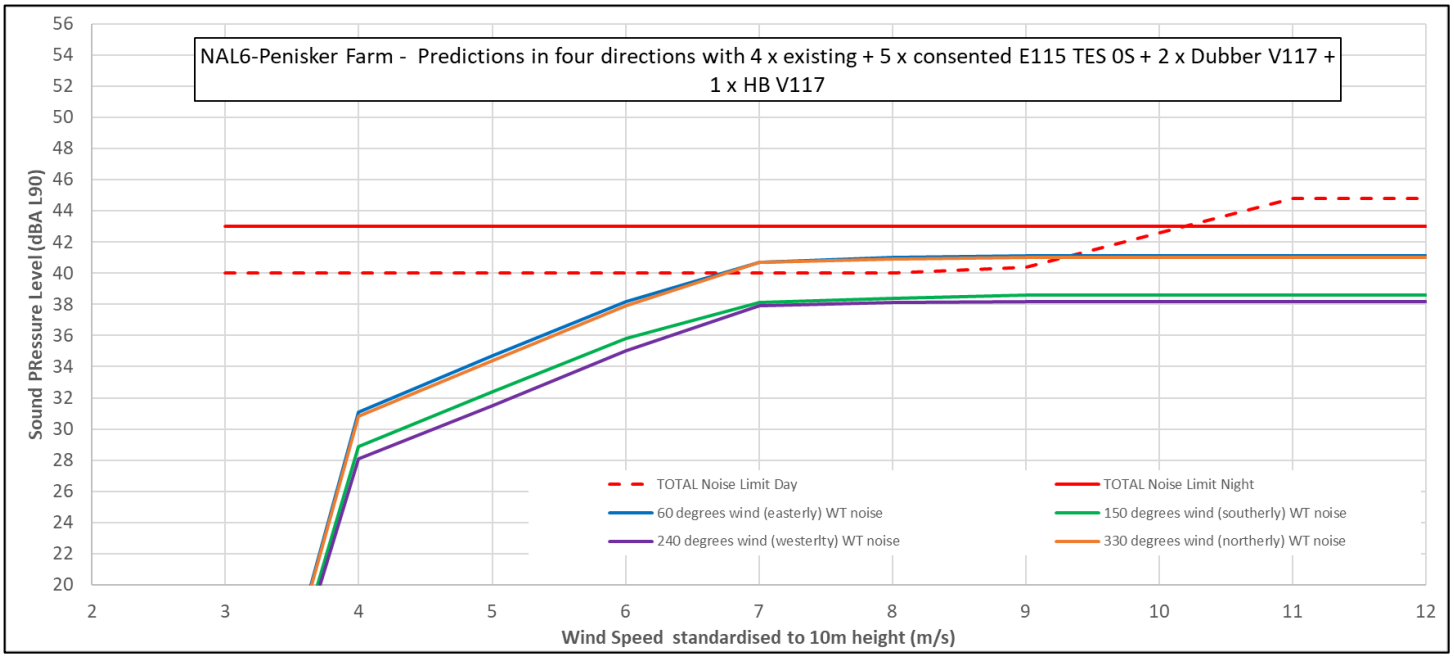
Table B2: Octave Band Data LAeq (dB)

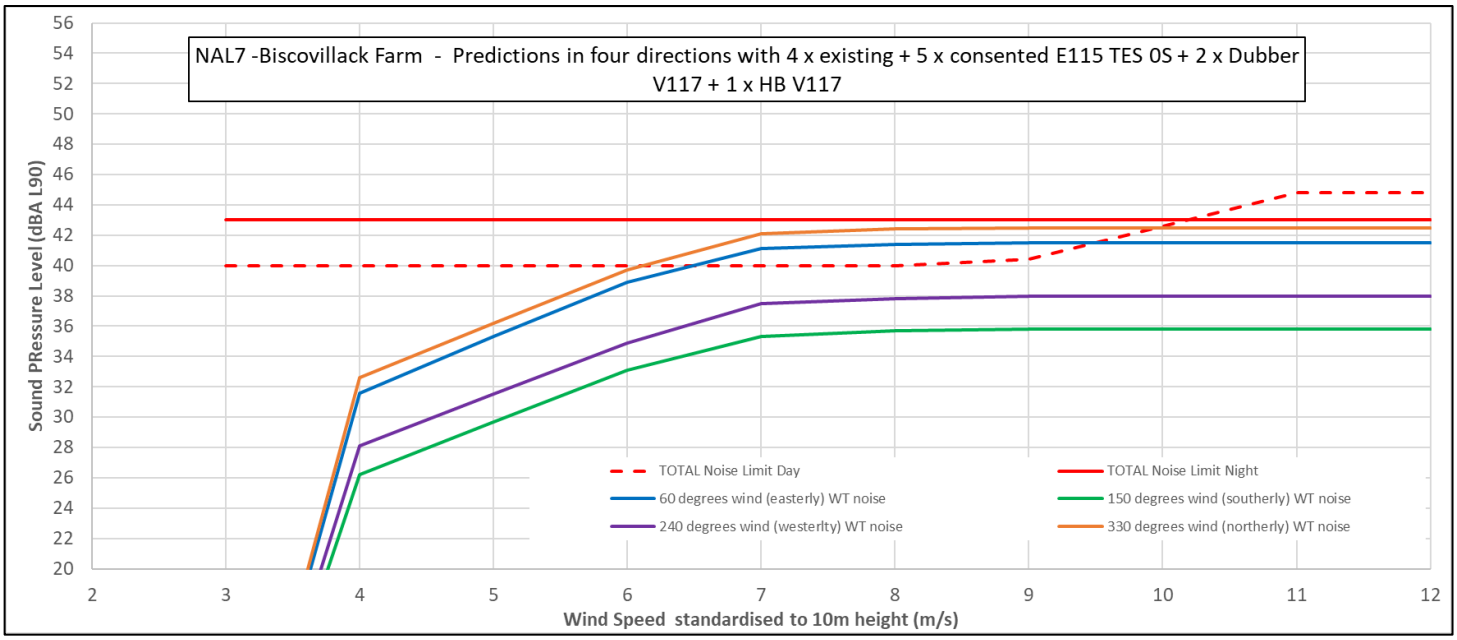
Scheme	Turbine Modelled	Octave Band (Hz)								
		63	125	250	500	1000	2000	4000	8000	Overall
Dubbers and Higher Biscovvilack	VESTAS V117 4.3 MW PO2 (serrated blades)	Restricted data, available on request.								
Longstones, East Karslake, Wheal Martyn,Burngullow, Goonamarth 2	ENERCON E-115 EP3 E4-4260 kW Mode 0s (serrated blades)	Restricted data, available on request.								
Higher Goonamarth, Greensplat, Blackpool and Gunheath	EWT DW54 500kw	83.1	89.3	94.6	95.9	94.5	92.0	85.1	73.3	101.0

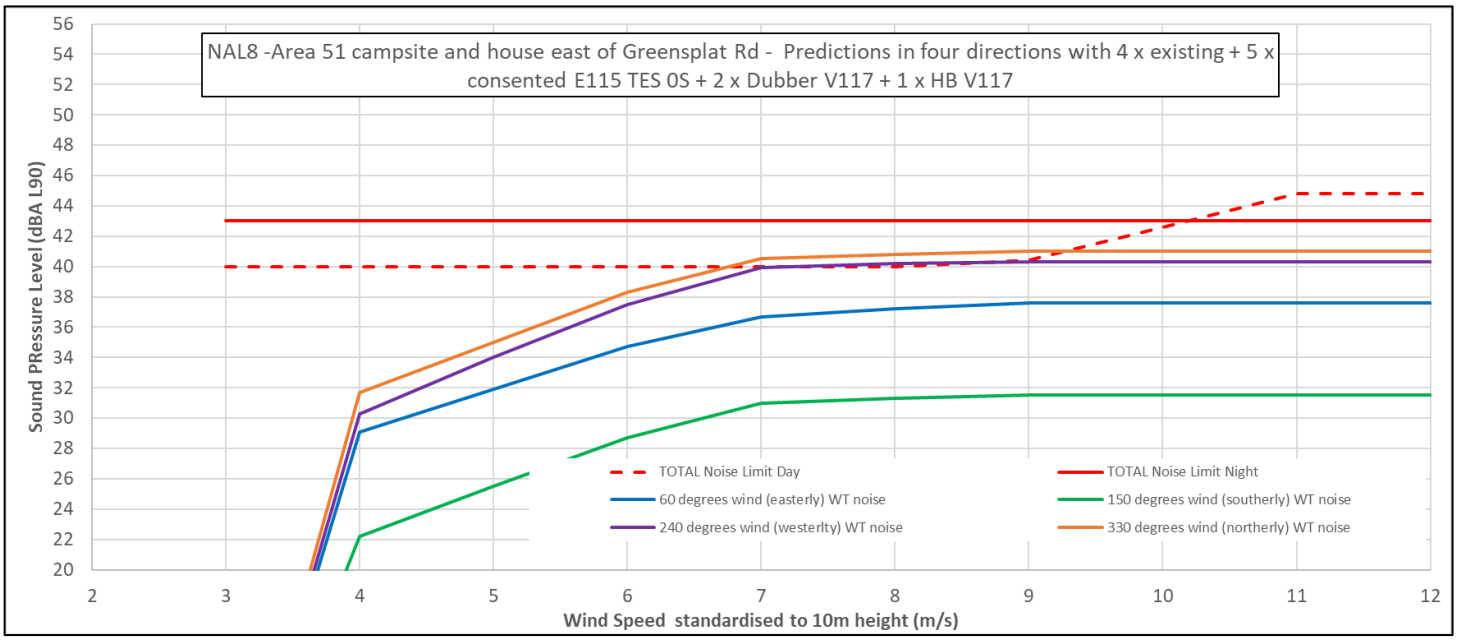
Table B3: Topographic adjustments (-2 when no line of sight and +3 when concave profile) and WT Coordinates

Wind Farm	Hub height	T ID	Assessment Locations													x	y
			1	2	3	4	5	6	7	8	10	11	12	13	14		
Higher Goonamarth WT	50	1	-2	-2	3	-2	0	0	3	3	3	0	0	3	-2	198780	54963
Greensplat WT	50	2	0	0	0	-2	0	0	3	3	3	3	3	3	-2	198270	53615
Blackpool WT	50	3	-2	3	3	-2	3	3	0	0	0	-2	3	3	-2	200059	54577
Gunheath WT	50	4	-2	-2	3	-2	-2	3	-2	-2	3	-2	-2	3	0	200613	56770
Wheal Martyn WT	77	5	-2	-2	3	-2	3	3	3	-2	3	-2	-2	0	0	199935	56269
Longstones WT	77	6	-2	-2	3	-2	0	0	0	3	3	0	0	0	-2	198316	55310
East Karslake WT	77	7	-2	-2	3	-2	0	0	3	3	0	0	0	0	-2	198647	55360
Burngullow WT	77	8	0	0	0	0	0	0	3	3	3	3	3	3	-2	198378	54117
Goonamarth 2 WT	77	9	-2	0	0	-2	0	0	0	3	3	0	0	3	-2	198925	54797
Dubbers WT1	76.5	10	-2	-2	0	-2	-2	0	0	0	-2	0	0	-2	-2	197652	56441
Dubbers WT2	76.5	11	-2	-2	-2	-2	-2	-2	-2	0	-2	0	0	-2	-2	197501	56094
Higher Biscovvilack WT	76.5	12	3	3	3	-2	3	3	0	0	0	3	3	3	-2	199806	54453

Annex 3 – Predictions in various conditions


NAL6-Penisker Farm - Predictions in four directions with 4 x existing + 5 x consented E115 TES 0S + 2 x Dubber V117 + 1 x HB V117
Sound PRessure Level (dBA L90)
Wind Speed standardised to 10m height (m/s)
TOTAL Noise Limit Day
TOTAL Noise Limit Night
60 degrees wind (easterly) WT noise
150 degrees wind (southerly) WT noise
240 degrees wind (westerlty) WT noise
330 degrees wind (northerly) WT noise


NAL7 -Biscovillack Farm - Predictions in four directions with 4 x existing + 5 x consented E115 TES 0S + 2 x Dubber V117 + 1 x HB V117
Sound PRessure Level (dBA L90)
Wind Speed standardised to 10m height (m/s)
TOTAL Noise Limit Day
TOTAL Noise Limit Night
60 degrees wind (easterly) WT noise
150 degrees wind (southerly) WT noise
240 degrees wind (westerlty) WT noise
330 degrees wind (northerly) WT noise


NAL8 -Area 51 campsite and house east of Greensplat Rd - Predictions in four directions with 4 x existing + 5 x consented E115 TES 0S + 2 x Dubber V117 + 1 x HB V117
Sound PRessure Level (dBA L90)
Wind Speed standardised to 10m height (m/s)
TOTAL Noise Limit Day
TOTAL Noise Limit Night
60 degrees wind (easterly) WT noise
150 degrees wind (southerly) WT noise
240 degrees wind (westerlty) WT noise
330 degrees wind (northerly) WT noise

Annex 4 – Suggested noise condition

Suggested Noise Conditions for Higher Biscovillack Wind Turbine

For consistency with the other consented wind turbines in this local area, the below conditions have been drafted by TNEI based on wording from PA23/10069 (Goonamarth 2 Wind Turbine) decision notice and adapted for the Higher Biscovillack Wind Turbine specific predictions and removing references to a specific turbine model (whilst still keeping an explanation how the limit values were calculated). TNEI would otherwise in general prefer the use of the suggested conditions found on the IOA GPG May 2023.

Operational Noise Conditions

1)Noise Assessment Locations are those points in which noise predictions and noise impact assessment have been calculated. The noise limit values set out below are based on assumptions of a candidate turbine in the planning application noise report and should not be exceeded by any other potential candidate wind turbine models.

a) The rating level of noise imissions from the Higher Biscovillack wind turbine *(including the application of any penalties for tonal and/or amplitude modulation components),* when determined in accordance with the attached Guidance Notes *(to this condition),* when operating in isolation shall not exceed the values for relevant integer wind speeds set out in, or derived from Table 1 and Table 2 below at the curtilage of any noise-sensitive premises lawfully existing or which has planning permission at the date of this consent.

Table 1 - Noise Limit values (dB LA90) applicable both Daytime and Night-time unless exceptions

Property	**Wind speed standardised to 10 metre height (m/s)**								
	4	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Newgate(197946,53255)	15.4	19.6	23.3	25.6	25.8	25.8	25.8	25.8	25.8
Prideaux(198384,53077)	16.8	21	24.7	26.9	27.2	27.2	27.2	27.2	27.2
23 Carne Hill(198762,53393)	20.2	24.4	28.1	30.3	30.6	30.6	30.6	30.6	30.6
Treglyn Gardens(199550,53677)	21.8	25.9	29.7	31.9	32.2	32.2	32.2	32.2	32.2
Secret Cottage(199152,53871)	25.9	30.1	33.8	36.1	36.3	36.3	36.3	36.3	36.3
Penisker Farm(199087,54161)	27.4	31.6	35.3	37.5*	37.8*	37.8*	37.8	37.8	37.8
Biscovillack Farm(199576,54088)	30.1	34.3	38	40.2*	40.5*	40.5*	40.5	40.5	40.5
Area 51 campsite and house east of Greensplat Rd(200157,54074)	28.5	32.6	36.4	38.6*	38.9*	38.9*	38.9	38.9	38.9

Greystone Cottage(199819,54849)	31.3	35.4	39.1	41.4	41.6	41.6	41.6	41.6	41.6
Longstone Cottage(197688,55420)	14.8	19	22.7	24.9	25.2	25.2	25.2	25.2	25.2
Longstone House(197633,55346)	14.7	18.9	22.6	24.8	25.1	25.1	25.1	25.1	25.1
Carthew Farm Cottage(200287,55931)	19.7	23.9	27.6	29.8	30.1	30.1	30.1	30.1	30.1
Adit (property North of Carthew)(200287,56332)	3.7	7.9	11.6	13.9	14.1	14.1	14.1	14.1	14.1

* see exceptions in Table 2.

Table 2 - Noise Limit values (dB LA90) applicable in specific time periods and wind conditions

Property	**Time / Wind Direction range**	**Wind speed standardised to 10 metre height (m/s)**								
		4	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Penisker Farm(199087,54161)	Day / 285°-15°	-	-	-	32.9	32.9	32.9	-	-	-
	Day / 15°-105°	-	-	-	34.2	34.2	34.6	-	-	-
Biscovillack Farm(199576,54088)	Day / 285°-105°	-	-	-	36.9	36.9	37.2	-	-	-
Area 51 campsite and house east of Greensplat Rd(200157,54074)	Day / 285°-105°	-	-	-	37.9	37.9	37.9	-	-	-

b) For the purpose of this condition, curtilage for domestic premises is defined as "the boundary of a lawfully existing domestic garden area". The geographical coordinate references are provided for the purpose of identifying the general location of noise sensitive receptors to which a given set of noise limits applies. It should be noted that the property Higher Biscovillack Farm (199385 ,54756) is not considered a residential receptor.

c) At the request of the Local Planning Authority (LPA), the wind turbine operator shall, at their own expense, employ a suitably competent and qualified person to measure and assess, by a method to be approved in writing by the LPA, whether noise from the turbine/s meets the specified level. The assessment shall be commenced within 21 days of the notification, or such longer time as approved by the LPA.

d) If the LPA is in the opinion that the noise is tonal, the method shall include an assessment of tonality as described in ETSU-R-97. Where a tone is identified a penalty shall be added to the measured sound levels in accordance with ETSU-R-97 and guidance note 2 attached to this condition.

e) A copy of the assessment, together with all recorded data and audio files obtained as part of the assessment, shall be provided to the LPA (in electronic form) within 60 days of the notification.

f) If the assessment requested by the LPA demonstrates that the specified level is being exceeded, the operator of the turbine/s shall take immediate steps to ensure that the noise emissions from the turbine/s are reduced to, or below, the specified noise limit. The operator shall provide written confirmation of that reduction to the LPA within a time period to be agreed with the LPA. In the event that it is not possible to achieve the specified noise limit with mitigation within a reasonable time period, then the operation of the turbine/s shall cease.

g) In the event that an alternative turbine/s to that contained in the submitted noise assessment is chosen for installation, then development shall not take place until a new desktop site specific noise assessment of the proposed turbine has been submitted to and approved in writing by the Local Planning Authority.

h) Where micro-siting of the turbine/s has been approved, the applicant shall provide the 12-figure national grid reference of the installed turbine/s to the Local Planning Authority within 4 weeks of commissioning of the turbine.

i) Within 28 days from receipt of a written request from the Planning Authority, following an excessive amplitude modulation (EAM) complaint to it from the occupant of a noise sensitive receptor, the wind turbine operator shall submit a scheme for the assessment and regulation of EAM to the Planning Authority for its written approval. The scheme shall be in general accordance with:
   - Any guidance endorsed in National or English Planning Policy or Guidance at that time, or in the absence of endorsed guidance,
   - Suitable published methodology endorsed as good practice by the Institute of Acoustics; or in the absence of such published methodology,
   - The methodology published by Renewable UK on the 16th December 2013, or any other methodology agreed in writing by the Local Planning Authority;

The approved scheme shall be implemented within 3 months of the written approval by the Planning Authority and shall thereafter be retained.

In the event that the EAM cannot be eliminated or reduced below the level specified in the agreed methodology, then the operation of the turbine/s shall permanently cease.

Guidance Note 1 – Excess Amplitude Modulation

Excess Amplitude Modulation ("Excess AM") is the modulation of aerodynamic noise produced at the frequency at which a blade passes a fixed point and occurring in ways not anticipated by ETSU-R-97, The Assessment and Rating of Noise from Wind Farms, on page 68.

Guidance Note 2

(a) If a tonal penalty is required in accordance with section d of the condition the rating level of the turbine noise at each wind speed is the arithmetic sum of the measured noise level as determined from the best fit curve described in (b) below and the penalties for tonal noise as derived in accordance with section d of the condition at each integer wind speed.

(b) For those data points considered valid, values of the LA90,10 minute noise measurements and corresponding values of the 10- minute wind speed, as derived from the standardised ten metre height wind speed averaged across all operating wind turbines using the approved methodology from part (c) of the condition, shall be plotted on an XY chart with noise level on the Y-axis and the standardised mean wind speed on the X-axis. A least squares, "best fit" curve of an order deemed appropriate by the independent consultant (but which may not be higher than a fourth order) should be fitted to the data points and define the wind turbine/s noise level at each integer speed.