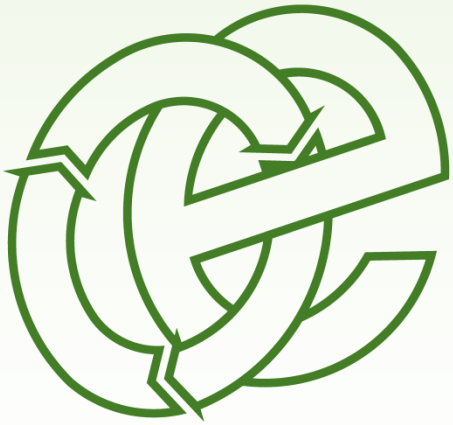
ENVIRONMENTAL NOISE ASSESSMENT

Land at Whitwick Manor, Lower Eggleton, Herefordshire, HR8 2UE

STL Energy Ltd

Version:	1.9	**Date:**	17/10/2023		
Doc. Ref:	2102-003-H	**Author(s):**	TB	**Checked:**	DY
Client No:	2102	**Job No:**	003		



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REGISTERED IN THE UK | COMPANY NO. 4850754

Document History:

Version	Issue date	Author	Checked	Description
1.0	22/07/2022	TB	DY	Internal draft
1.1	02/08/2022	TB	DY	Document issue
1.2	03/08/2022	TB	DY	Minor amendments
1.3	11/08/2022	TB	DY	Document re-issue
1.4	12/08/2022	TB	CG	Document re-issue after final amendments
1.5	07/02/2023	TB	DY	Re-issue based on amendments to Grain Store fan arrangement.
1.6	02/05.2023	TB	DY	Minor amendments
1.7	24/05/2023	TB	DY	Minor amendments
1.8	17/10/2023	TB	DY	Revision of model
1.9	17/10/2023	TB	DY	Submitted to EA

CONTENTS

List of Tables and Figures:

List of Appendices:

1 Introduction

1.1.1 Oaktree Environmental have been commissioned by STL Energy Ltd to undertake a Noise Impact Assessment for a proposed Anaerobic Digestion (AD) plant and associated grain store at Land at Whitwick Manor, Lower Eggleton, Herefordshire, HR8 2UE. The document comprises an assessment with regards to the onsite activities as per BS4142:2014 and BS8233:2014.

1.1.2 Relevant findings of the assessments are incorporated into the management plan which will outline the methods by which STL Energy Ltd will assess and minimise the potential impacts of noise generated through the operation of the site.

1.1.3 In addition, the document will inform the Environmental Statement to be submitted in support of the application. The document conforms to the guidance of a H3 noise assessment as per the comments made by the Environment Agency (EA) as part of the scoping response.

1.1.4 The report has been produced by Thomas Benson of Oaktree Environmental, an associate member of the Institute of Acoustics. Full credentials can be provided under separate cover, if requested.

1.2 Site Description and Proposed Development

1.2.1 The site is located on Land at Whitwick Manor, Lower Eggleton, Herefordshire, HR8 2UE as shown within the drawings submitted in support of the planning application. The national grid reference for the site is SO 60419 45733. The site is primarily bordered by arable land with the A417 located to the northeast.

1.2.2 The facility includes an AD plant and associated grain drying operation. The site will generate renewable energy and digestate products from various feedstocks. AD is a biological process, which breaks down organic matter within the biodegradable/agricultural wastes/products in the absence of oxygen, through the actions of a variety of micro-organisms.

1.2.3 The plant will be capable of processing up to 176,000 tonnes/annum of feedstocks. These will comprise up to 100,000 tonnes/annum poultry manure, 16,000 tonnes/annum apple pomace, 35,000 tonnes of digestate and up to 25,000 tonnes/annum of liquid wastes from dairy units and drinks industry processes etc.

1.2.4 The result of the AD process is the production of biogas, which consists predominantly of methane (CH_4) and carbon dioxide (CO_2) and a digestate product. The AD process is a 'closed and sealed' process between input of feedstocks to the process and output of digestate products.

1.2.5 In addition to the AD operation, a grain store will be created to provide a centralised facility for grain drying and storage.

1.2.6 The digestion process will operate 24 hours a day, seven days a week. Whilst operational hours will not be restricted, it is understood that certain activities including loading, sorting and deliveries are unlikely to be undertaken during the evening.

1.3 Environmental Regulation

1.3.1 An Environmental Permit (EP) will be required to be in place for the site, with day-to-day operations regulated by the EA. Potential impacts on air, land and water will be fully controlled and regulated under the EP. In accordance with paragraph 188 of the National Planning Policy Framework (NPPF) and paragraph 7 of National Planning Policy for Waste (NPPW), there should be no duplication of this control under the planning regime.

2 Planning Policy

2.1 Noise Policy Statement for England

2.1.1 The Noise Policy Statement for England (NPSE), March 2010, sets out the Government's long-term noise policy, the aims of which are:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *Avoid significant adverse effects on health and quality of life:*
- *Mitigate and minimise adverse effects on health and quality of life;*
- *Where possible, contribute to the improvement of health and quality of life."*

2.1.2 The first aim of the NPSE is to avoid significant adverse effects, considering the shared UK principles of sustainable development.

2.1.3 The second aim provides guidance on the scenario when the potential noise impact falls between the LOAEL (Lowest Observed Adverse Effect Level) and the SOAEL (Significant Observed Adverse Effect Level), in which case it is stated*, "all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development".* However, it is also stated, *"This does not mean that such adverse effects cannot occur"*.

2.1.4 With regards to the SOAEL, the document states, *"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations"*, thus acknowledging that this is very much dependent on the noise source, the receptor, and the time of day. Therefore, the NPSE provides the necessary policy flexibility until further guidance / evidence is available.

2.1.5 Other guidance will need to be taken into account when applying the principles of the NPSE, as well the nature of the proposed development and its specific circumstances.

2.2 National Planning Policy Framework

2.2.1 The National Planning Policy Framework, revised in 2021, states that Planning policies and decisions should also ensure that new development is appropriate for its location, taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- Mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
- Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

2.2.2 Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

2.2.3 The revised document also makes reference to the Noise Policy Statement for England.

2.3 Planning Practice Guidance – Noise

2.3.1 Further to the guidance set out in the NPPF, Planning Practice Guidance advises that the Local Authority should consider the following when decision making:

- Whether or not a significant adverse effect is occurring or likely to occur.
- Whether or not an adverse effect is occurring or likely to occur.
- Whether or not a good standard of amenity can be achieved.

2.3.2 As previously discussed within the NPSE, the guidance discusses the LOAEL and SOAEL and provides scenarios that could be expected for the perception level of noise, plus the associated activities that may be required to bring about the desired outcome. Again, as with the NPSE, no objective noise levels are provided for LOAEL or SOAEL.

2.3.3 It is stated that "the subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation". These factors include:

- The absolute noise level of the source and the time of day it occurs.
- Where the noise is non-continuous (intermittent), the number of noise events along with any patterns of occurrence.
- The frequency of content and acoustic characteristics (tonality etc.) of the noise.
- The effects of noise on the surrounding wildlife.
- The acoustic environment of external amenity areas provided as an intrinsic part of the overall design.
- The impact of noise from certain commercial developments such as night clubs and pubs where activities are often at their peak during the evening and night.

3 Noise Assessment Criteria

3.1 In order to assess the impacts of existing road traffic and industrial noise from the proposed development, the following documents have been used:

- BS8233:2014
- BS4142:2014
- World Health Organisation (WHO) Guidelines on Community Noise

3.2 BS8233:2014

3.2.1 This document provides guidance on the relevant level of sound insulation required by a variety of building types affected by general environmental noise and provides recommendations for appropriate internal ambient noise level criteria for a variety of different situations including residential dwellings. The table below includes the proposed noise criteria within BS8233:2014 with regards to residential properties:

Table 3.1 - BS8233:2014 Internal Criteria

Activity	**Location**	**07:00 – 23:00**	**23:00 – 7:00**
Resting	Living rooms	35 $L_{Aeq, 16hour}$	-
Dining	Dining room	40 $L_{Aeq, 16hour}$	-
Sleeping	Bedroom	35 $L_{Aeq, 16hour}$	30 $L_{Aeq, 16hour}$

3.3 BS4142:2014

3.3.1 BS4142:2014 provides a method for "assessing and rating industrial sound" of an industrial/commercial nature. The method described in the standard uses the rating level from a noise source and the existing background noise level to assess the potential effects of sound on the residential premises upon which sound is incident.

3.3.2 Using this method, the background sound level is subtracted from the rating level. The resulting figure is assessed using the following guidance from the document:

- The greater the difference between the background sound level and the rating level, the greater the impact on the receptor.
- An exceedance of the background level of around 10dB, or more, is likely to be an indication of a significant adverse impact, dependent on the context.
- An exceedance of the background level of around 5dB is likely to be an indication of an adverse impact, dependent on the context.
- The lower the rating level compared to the existing background level, the less likely an adverse impact, or a significant adverse impact. Where the rating level does not exceed the background level, this is indicative of a low impact, dependent on context.

3.3.3 The document introduces a requirement to consider and report the uncertainty in the data as well as also including guidance for applying a correction/penalty for certain adverse acoustic features such as tonality, impulsivity or intermittency. The following table summarises the corrections based on the subjective assessment of the noise.

Table 3.2 - BS4142:2014 Corrections and Penalties

	Tonality	**Impulsivity**	**Other characteristics**
Just perceptible	+ 2dB	+ 3dB	
Clearly perceptible	+ 4dB	+ 6dB	
Highly perceptible	+ 6dB	+ 9dB	
Readily Distinctive against Residual Environment			+ 3Db

3.4 WHO Guidelines for Community Noise

3.4.1 The WHO Guidelines (1999) recommends indoor night-time guidelines in order to avoid sleep disturbance, the document states these to be 30 dB (LAeq) and 45 dB (LA_{fmax}) for continuous and individual noise events respectively.

3.4.2 The document states that the number of noise events should also be considered and that individual noise events should not exceed 45 dB (LA_{fmax}) more than 10 – 15 times per night.

3.4.3 The WHO document also recommends that steady, continuous noise levels should not exceed 55 dB (LAeq) for outdoor living areas (balconies, terraces etc.). However, in order to protect the majority of individuals from moderate annoyance, external noise levels should not exceed 50 dB (LAeq).

4 Background Noise Monitoring

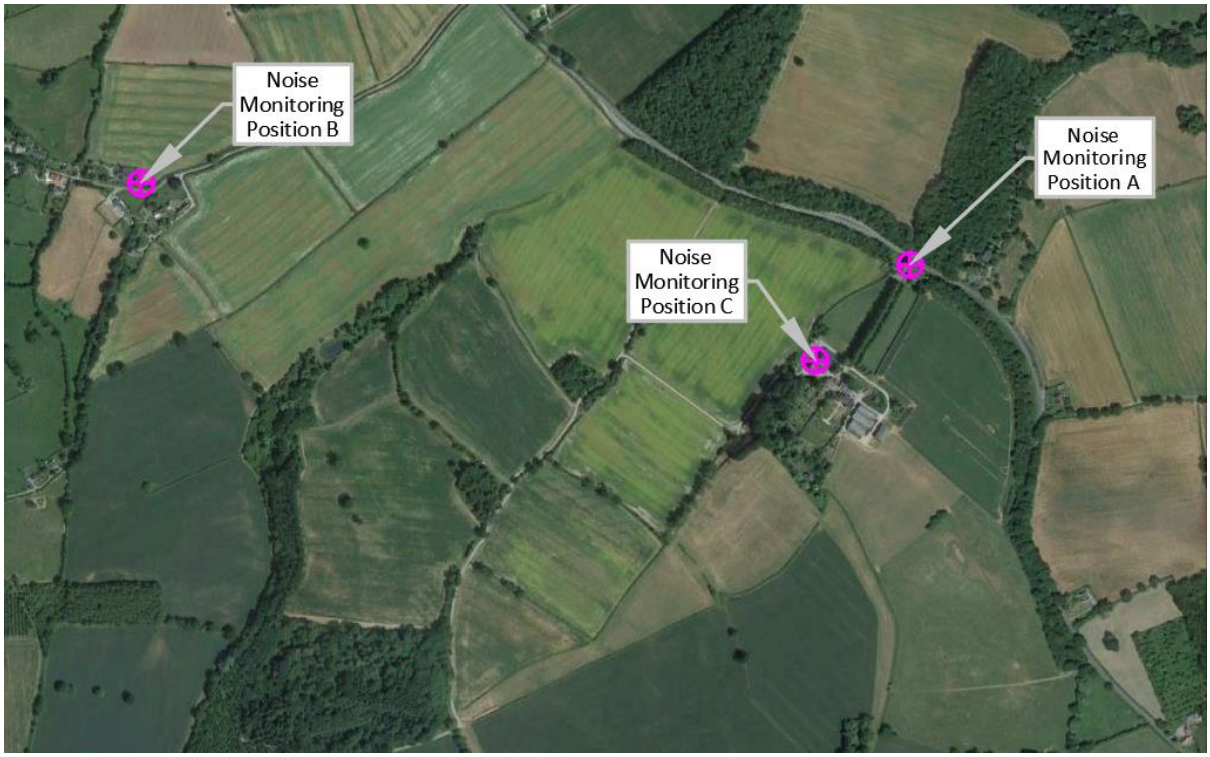
4.1 Monitoring Procedure and Monitoring Locations

4.1.1 An attended background noise survey was completed over the course of several days between September 2020 and July 2022 in accordance with BS 7445-1: 2003 by Thomas Benson of Oaktree Environmental Ltd.

4.1.2 Locations chosen were representative of the nearest noise sensitive receptors.

4.1.3 The measurement locations are shown in Figure 4.1, below:

Figure 4.1 - Site location and noise monitoring positions



4.1.4 Attended measurements were undertaken, as BS4142:2014 stresses the importance of context, stating that to *"fully understand the context in which the sound from an industrial and/or commercial source(s) is being assessed, describe and report the sources of sound which comprise the acoustic environment".* The methodology allows for a subjective impression of the acoustic environment to be made and a representative description of the area to be produced.

4.2 Equipment Used During the Survey

4.2.1 Details of the equipment used during the survey are shown in the table below:

Table 4.1 - Survey Equipment

Description	Model	Manufacturer	Serial No.	Calibration Date
Class 1 Sound Analyser	NOR 150	Norsonic	15030504	20/12/2019 - 02/10/2020
Microphone	Norsonic Type 1225	Norsonic	305208	20/12/2019 – 02/10/2020
Field Calibrator	NOR 1251	Norsonic	35205	03/03/2020 - 28/04/2022

4.3 Weather

4.3.1 The weather during the background surveys is summarised in the table below:

Table 4.2 – Weather Conditions during noise monitoring

Date	Wind Speed (max)	Cloud Cover	Temperature	Precipitation
15/10/2020	Maximum gusts up to 3.5 m/s	0-50%	5-13^{o}C	None recorded whilst onsite.
26/11/2020	Generally very still, max gusts of 0.7m/s	50-100%	3-9 ^{o}C	None recorded whilst onsite.
30/11/2020	Maximum gusts up to 4.6 m/s	25-100%	6 ^{o}C	None recorded whilst onsite.

Date	Wind Speed (max)	Cloud Cover	Temperature	Precipitation
9-10/06/2022	Maximum gusts of 4m/s	25-75%	9-12 °C	None recorded whilst onsite.
11-12/07/2022	Very still	75-100%	15-18 °C	None recorded whilst onsite.

4.3.2 Wind speed and temperature measurements were made via a handheld anemometer whilst precipitation and cloud cover was reported via onsite observation.

4.4 Results

4.4.1 The results of the background noise monitoring survey are tabulated below in Tables 4.3-4.8. Commentary on the background level and survey is included further on in Section 4.5.

Table 4.3 - Daytime Background monitoring results for NMP A

Measurement Time and date	LA_{eq}	LA_{90}	LA_{10}	LA_{max}
07:20-08:20 15/10/2020	73.1	43.5	77.6	92.6
09:40-10:40 15/10/2020	72.7	45.7	76.5	93.8
14:20-15:20 15/10/2020	72.9	43.5	77.4	95.4

Table 4.4 - Night-time Background monitoring results for NMP A

Measurement Time and date	LA_{eq}	LA_{90}	LA_{10}	LA_{max}
23:00-00:00 09/06/2022	58.3	37.3	48.7	84.5
00:00-01:00 10/06/2022	55.7	32.7	43.4	84.8
02:10-03:10 10/06/2022	53.9	35.6	42.1	80.5
02:26-03:26 11/07/2022	55.6	26.3	39.4	81.1

Table 4.5 - Daytime monitoring results for NMP B

Measurement Time and date	LA_{eq}	LA_{90}	LA_{10}	LA_{max}
08:30-09:30 15/10/2020	48.3	41.5	47.8	72.3
10:45-11:45 15/10/2020	48.7	39.2	46.0	81.5
15:25-16:25 15/10/2020	47.7	37.4	45.2	76.4

Table 4.6 – Night-time monitoring results for NMP B

Measurement Time and date	LA_{eq}	LA_{90}	LA_{10}	LA_{max}
23:20-00:20 10/07/2022	22.5	18.3	24.1	53.6
01:05-02:05 11/06/2022	28.9	25.1	30.7	54.3
01:20-2:20 11/06/2022	30.1	24.8	31.5	52.6
02:37-03:37 11/07/2022	24.6	17.7	26.5	57.3

Table 4.7 – Daytime Background monitoring results for NMP C

Measurement Time and date	LA_{eq}	LA_{90}	LA_{10}	LA_{max}
07:25-08:25 26/11/2020	48.9	44.1	50.9	74.4
10:45-11:45 26/11/2020	43.9	39.1	46.8	59.7
13:05-14:05 26/11/2020	48.4	31.1	47.9	79.4
20:30-21:30 30/11/2020	43.8	32.9	48.2	60.6

Table 4.8 – Night-time Background monitoring results for NMP C

Measurement Time and date	LA_{eq}	LA_{90}	LA_{10}	LA_{max}
23:00-00:00 10/06/2022	43.2	39.7	45.3	63.3
00:00-01:00 11/06/2022	41.7	37.8	44.3	64.1
00:28-01:28 11/07/2022	31.0	29.3	32.0	52.8
01:29-02:29 11/07/2022	31.1	29.7	32.0	57.4
04:46-05:46 11/07/2022	40.5	31.9	41.5	65.4

4.4.2 Should It be required, photographs and videos can be provided, along with the noise measurement files in order to corroborate the above observations. These are available upon request by the LA/EA.

4.5 Existing Noise Climate

4.5.1 During the attended background measurements, it was evident that the existing noise climate at the closest residential receptors on the A417 is dominated by road traffic. A survey undertaken during the 07:20-08:20 measurement revealed over 400 vehicle movements (278 cars, 86 light goods vehicles/vans, 36 heavy goods vehicles, 2 tractors, 1 bus and 1 motorbike).

4.5.2 Noise sources at NMP B appear to be less variable than those experienced at NMP A.

4.5.3 The contribution from road traffic from the surrounding road network, whilst audible, is vastly reduced. Sporadic noise sources comprise; birdsong, passing cars, movements from local residents and distant agricultural noise.

4.5.4 At NMP C, contributors to the background sound level were observed to comprise the road traffic along the A417 to the north, birdsong, movements from local residents and distant agricultural noise.

4.6 Control of Uncertainty

4.6.1 Uncertainty in this assessment was controlled via the following precautions/procedures:

- Both the sound level meter and calibrator have a traceable laboratory calibration and the meter was field-calibrated both before and after the measurements.
- The measurement locations are considered representative of the existing noise climate outside the nearest residential dwellings to the proposed development.
- Background monitoring was undertaken during favourable weather conditions (e.g. dry and under 5m/s wind speed).

5 Noise Impact Assessment

5.1 Introduction

5.1.1 It is considered the most significant noise sources associated with the development are constant noise sources associated with the digestion process (CHP, stirrers and blowers etc.) and grain storage as well as the ancillary operations (loading, deliveries etc.).

5.2 Background Levels

5.2.1 With regards to background levels, BS4142:2014 states that "*the objective is not simply to ascertain a lowest measured background sound level, but to quantify what is typical during particular time periods"* and also *"In practice there is no "single" background sound level as this is a fluctuating parameter. However, the level for the assessment should be representative of the period being assessed".*

5.2.2 In addition, it is stated; "*For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods".*

5.2.3 With this in mind, the assessment will utilise the range of levels from Tables 4.3-4.8.

5.3 BS4142: Assessment

5.3.1 The CadnaA noise models were constructed using OS mapping Opendata and Google Earth satellite imagery, whilst topographical data was downloaded from DEFRA in the form of a digital terrain model.

5.3.2 As stated previously, the digestion process will operate 24 hours a day, seven days a week. Whilst operational hours will not be restricted, it is understood that certain activities including; loading, sorting and deliveries will not routinely be undertaken during the evening. Therefore, 2no. models have been produced, these include;

- Digestion operations in lieu of delivery, sorting and loading operations (comparable with night time noise levels between 23:00-07:00),
- Digestion operations and ancillary activities such as loading, sorting etc. (comparable with day time operations between 07:00-23:00).

5.3.3 The following assumptions/parameters are made within the models:

- The intervening land between the site boundary and residential properties was modelled with G = 1.0 as it was considered that the land is predominantly acoustically absorbent.
- The calculation grid has been produced as a 5x5m spacing with noise contour receiver height modelled at 2m.
- Noise sources associated with the digestion process (including feeders, CHPs etc.) are assumed to be constant and operating in steady-state.
- Additional noise sources active between the hours of 07:00-23:00 are assumed to comprise; the loading/movement of grain via the loading shovel (with an “on-time” of 15 minutes per hour as a worst case scenario equating to 255 minutes per day), the loading of the solids feeders (15 minutes per hour equating to 255 minutes per day), unloading of liquid digestate via vacuum tanker (200 minutes per day based on 10 deliveries a day taking 20 minutes to unload), loading of liquid digestate via vacuum tanker (200 minutes per day based on 10 deliveries a day taking 20 minutes to unload) and unloading/tipping of solid digestate and feedstock (150 minutes per day based on 30 deliveries a day taking 5 minutes to tip/unload).
- Buildings were set as acoustically reflective, with a reflection loss of 1 dB. A maximum order of reflection of 3.0 has been assumed.
- Noise levels were determined at receivers representative of residential properties representing the nearest residential façade as well as grid noise levels which are free-field, A-weighted, sound pressure levels.
- Surrounding residential properties were modelled at a height of 4.0m for the majority of residential dwellings. Commercial building heights have been taken from observations and information taking from planning public access where available.

- Barrier heights and waste storage bays have also been modelled based on the proposals within this document and within documents submitted as part of relevant permitting applications. These have been modelled as being hard and reflective (I.e. concrete).
- The fabric, height and internal absorption of the onsite buildings is detailed overleaf within Table 5.1.
- Octave bands have been utilised where possible.

5.3.4 Table 5.1 below includes the measured noise levels for the anticipated activities, which have either been measured by Oaktree Environmental at an existing operational site or provided by the technology provider.

Table 5.1 – Measured levels of activities

Activity	Sound Pressure Level (LAeq)	Source	Notes on Geometry etc. within the model
Feeding tanks	58.8 at 6m	Measurement made by Oaktree Environmental at an existing site. Octave bands available.	Modelled as a point source of 2m height.
Blowers	63.3 at 1m	Measurement made by Oaktree Environmental at an existing site. Octave bands available.	Each tank is assumed to have 3no. blowers located at 1m height with the exception of the smaller pasteurisation tanks which are anticipated as having 1no. blower per tank. This is modelled as a point source.
Stirrers	53.8 at 5m	Measurement made by Oaktree Environmental at an existing site. Octave bands available.	Each tank is assumed to have 3no. stirrers located at 3m height with the exception of the smaller pasteurisation tank which is anticipated as having 1no. stirrer per tank. This is modelled as a point source.
CHP units	55 at 1m	Provided to Oaktree Environmental by the Technology provider.	Modelled as a point source of 2m height as a worst-case scenario.
Pump room	83.1 at 2.5	Measurement made by Oaktree Environmental at a similar plant. Octave bands available.	These have been modelled as a radiating building 4x4m and 2m high with attenuation commensurate to Kingspan Quadcore 1000RW as per Appendix II.

Flue	65.0 at 1m	Provided to Oaktree Environmental by the Technology provider.	Noise source assumed to be 8.3m high based on elevations provided.
Separator and Centrifuge	80 at 1m 84 at 1m	Provided to Oaktree Environmental by the Technology provider.	These have been modelled as a radiating building 13.6x18.8m and 9.6m high with attenuation commensurate to Kingspan Quadcore 1000RW as per Appendix II.
Dry Ice Plant	75 at 1m	Provided to Oaktree Environmental by the Technology provider.	These have been modelled as a radiating building 12x18m and 6m high to the eaves with attenuation commensurate to Kingspan Quadcore 1000RW as per Appendix II. Steel roller shutter (1mm) modelled on southeastern façade.
CO_2 Plant	75 at 1m	Provided to Oaktree Environmental by the Technology provider.	These have been modelled as a radiating building 18x15m and 6m high to the eaves with attenuation commensurate to 45mm trapezoidal steel sheeting and Kingspan Quadcore 1000RW as per Appendix II. 2no. Steel roller shutters (1mm) are modelled on the northern and southern facades.
Grain Store and drying	Machinery area: 80 at 3m (main dryer) 81 at 1m (pre-cleaner - internal) 6no. extraction fans on the northwestern façade, each with a noise level of 60dB at 3m. 23no. conditioning fans, each with a noise level of 46.5dB at 3m. Typically, up to 50% of the fans will operate at any one time and therefore a worst-case	Provided to Oaktree Environmental by the Technology provider.	The machinery area has been modelled as radiating building 12 high to the eaves with attenuation commensurate to 45mm trapezoidal steel sheeting. The machinery area will be lined with Kingspan Quadcore 1000RW as per Appendix II. The building is modelled as having an internal surface area of 1580.5 and a high absorption due to the proposed cladding. Steel roller shutters (1mm) are modelled across the exterior façades.

	scenario of 3no. extract fans and 12no. conditioning fans has been assumed within the model.		Extraction fans will be louvred downwards via a hood and therefore a downwards direction has been modelled. No skylights are included within the model. Conditioning fans are modelled as point sources, 0.5m in height. All fans are assumed to be operating in steady state.
Compressor	55 at 1m	Provided to Oaktree Environmental by the Technology provider.	Noise source assumed to be 1m height. Modelled as a point source.
Phosphate and nitrogen recovery	55 at 1m	Provided to Oaktree Environmental by the Technology provider.	Noise source assumed to be located to the northern edge of tanks at 1m height. Source assumed to be 55 following enclosure.
Bio methane plant	55 at 1m (compressor) 78 at 1m (CO2 blow off) 58 at 10m (chiller)	Provided to Oaktree Environmental by the Technology provider.	Noise source assumed to be 2.5m, 5m and 2.5m height respectively. Modelled as point sources.
Backup boilers	80.0 at 1m	Provided to Oaktree Environmental by the Technology provider.	Height assumed to be 2.0m
Sorting/movement of material via the onsite loading shovel	77.4 at 3m	Measurement made by Oaktree Environmental of a similar plant. Octave bands available.	Height of noise source assumed to be 1.5m. Modelled as 2no. point sources, located at the main storage clamp and to the east of the grain store.
Loading/unloading of vacuum tanker	83.7 at 10m	Measurement made by Oaktree Environmental of a similar plant. Octave bands available.	Height of noise source assumed to be 2.5m. Modelled as a point source.
Tipping/unloading of HGVs	72.6 at 8m	Measurement made by Oaktree Environmental of a similar plant.	Height of noise source assumed to be 1.5m. Modelled as a point source.

5.3.5 With regards to penalties/corrections as per BS4142:2014, it is considered that the impulsive nature of the noise associated with the sorting, tipping and general operation of

the site will be just perceptible at the nearest residential dwellings given the nature of the existing noise climate and therefore a 3dB penalty may be applied at these times.

5.3.6 With regards to the digestion process, the tonal element of the plant is likely to be just perceptible at the nearest residential dwellings during the night time when background levels are lower and therefore a 2dB penalty may be applied at these times.

5.3.7 Table 5.4 and 5.5 details the predicted noise levels (in dB A) associated with the application site at the relevant receptors. These are based on the results of the modelling provided overleaf in Figures 5.1-5.2.

5.3.8 The back-up boilers have not been included within the models as these will only run in an emergency situation such as extreme weather or urgent repair/routine maintenance. Additional documentation provided confirms that whilst these are operating, the 2no. CHPs will not result in an adverse noise impact at the closest residential receptors compared with the normal operating situation.

Figure 5.1 – Assessment of typical daytime noise sources associated with the site as per BS4142:2014

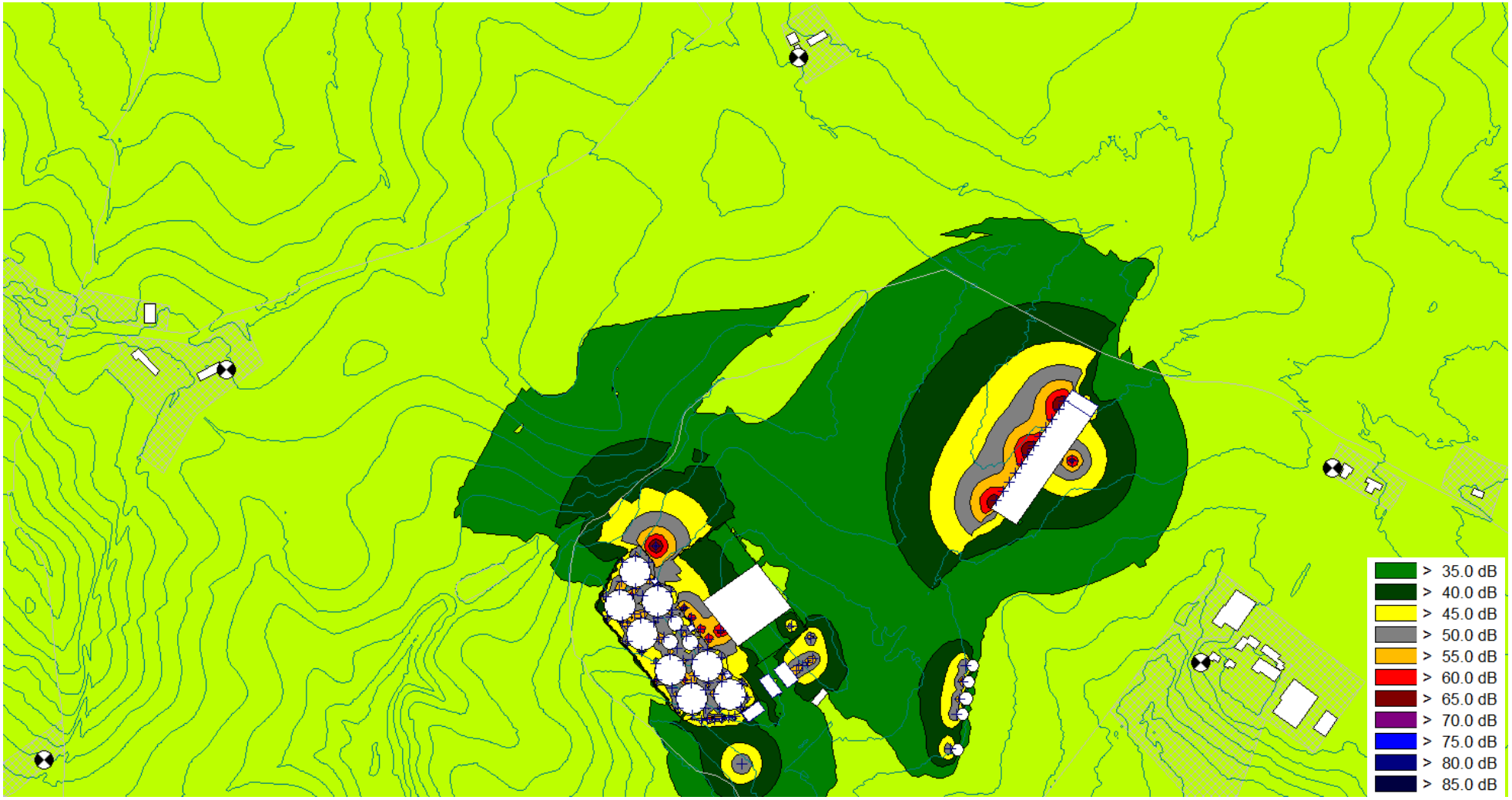


Figure 5.2 – Assessment of typical night-time (i.e. digestion process only) noise sources associated with the site

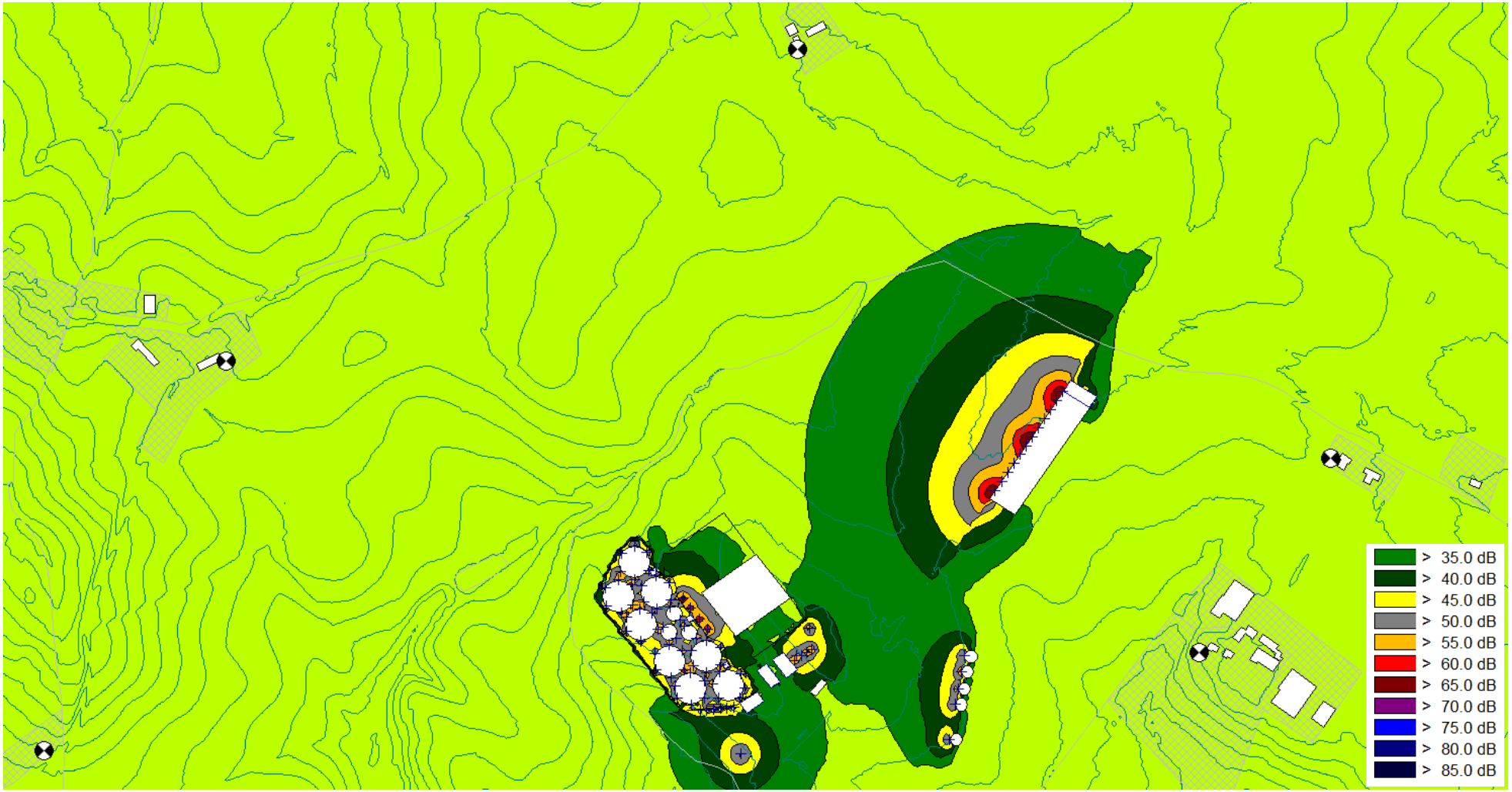


Table 5.2 – Assessment of typical daytime noise sources associated with the site as per BS4142:2014

	Calculated noise level at dwelling at Whitwick Manor to east	**Calculated noise level at Drive Cottages**	**Calculated noise level at dwellings at Ocle Pychard**	**Calculated noise level at dwelling off A road**	**Comments**
Calculated noise level as per figure 5.2	29.4	26.6	24.4	29.1	
Addition of relevant penalties as per BS4142:2014	+3 = 32.4	+3 = 29.6	+3 = 27.4	+3 = 32.1	As per Section 5.3.5-5.3.6
Comparison to background levels	32.4 - 31.1/44.1 = 11.7 below to 1.3 above	29.6 - 43.5/45.7 = 13.9 to 16.1 below	27.4 - 37.4/41.5 = 10.0 to 14.1 below	32.1 - 43.5/45.7 = 11.4 to 13.6 below	See discussion within Section 5.4.1-5.4.3

Table 5.3 – Assessment of typical night time noise sources associated with the site as per BS4142:2014

	Calculated noise level at dwelling at Whitwick Manor to east	**Calculated noise level at Drive Cottages**	**Calculated noise level at dwellings at Ocle Pychard**	**Calculated noise level at dwelling off A road**	**Comments**
Calculated noise level as per figure 5.3	23.6	20.4	21.7	28.5	
Addition of relevant penalties as per BS4142:2014	+2 = 25.6	+2 = 22.4	+2 = 23.7	+2 = 30.5	As per Section 5.3.5-5.3.6
Comparison to background levels	25.6 – 29.3/39.7 = 3.7 to 14.1 below	22.4 – 26.3/37.3 = 3.9 to 14.9 below	23.7 – 17.7/25.1 = 1.4 to 6.0 below	30.5 – 26.3/37.3 = 6.8 below to 4.2 above	See discussion within Section 5.4.1-5.4.3

5.4 Comparison to Background levels

5.4.1 As detailed within Table 5.2, the daytime rating level is below the range of LA90 figures or below the level at which an adverse impact is considered likely to occur and therefore no adverse impacts are expected as a result of the proposed operations at these times.

5.4.2 With regards to night-time levels, the rating level is also below the level at which an adverse impact is considered likely to occur (i.e. +5dB threshold) and therefore no adverse impacts are expected as a result of the proposed operations at these times.

5.4.3 It should also be noted that the assessment is a worst-case scenario and that noise levels will likely be lower than those calculated due to the application of the tonal/impulsive penalties and the "on-times" of plant likely to be lower than in the assessment. For example, the solids feeders may only be active for 20-30 minutes per hour during the evening, pump rooms may only operate for 10-20 mins an hour, stirrers for 10-15 minutes and the grain dryers during the period July - September, however these sources are assumed to be constant during the reference period and therefore the rating level may be considered worst-case and be greater than the actual operational noise levels.

5.5 Contextual and Subjective Assessment in Accordance with BS4142:2014

5.5.1 As discussed previously, BS4142 emphasises the need for the consideration of context and subjectivity in assessing commercial and/or industrial sound and that the comparison of the rating level to the background level alone is insufficient.

5.5.2 It should be observed that the calculated noise level during the night-time is between 20.4 and 28.5dB (A) at the nearest noise sensitive receptors in lieu of any corrections. This is extremely quiet and is commensurate with rustling leaves or nearby whispering. BS4142:2014 states that *"where background levels and ratings are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night".*

5.5.3 This is reflected in the recently revised Environment Agency guidance which also advises that context should be taken into account, including, but not limited to; the absolute sound level and "what the sound means – meaningful sound is one that conveys an unpleasant meaning beyond its mere acoustic content, for example noise from an abattoir".

5.5.4 As previously discussed, noise from the digestion process alone (i.e. no unloading/loading of plant or stores – corresponding to the night time noise) is present in the form of a "hum" rather than bangs, crashes or other impulsive noise with the tonal element of the plant likely to be just perceptible at the nearest residential dwellings. It can be considered that this noise is generally non-invasive and is of a nature which would be likely to cause less disturbance than would normally be the case.

5.5.5 Any impulsive properties of the noise source from loading/unloading etc. during the daytime are likely to be masked by the higher background levels and acoustic environments during these times.

5.5.6 From review of the calculated rating levels within Tables 5.2 and 5.3, the resultant impacts are likely to be very low considering the fact that not only are the rating levels below the level at which an adverse impact is considered likely to occur but that the rating level is very low in itself (which is perhaps more relevant in this case). Considering the context and nature of the noise source, this lowers the resultant impact further.

5.6 BS8233:2014

5.6.1 BS8233:2014 provides recommended guideline values for internal noise levels within dwellings which are similar in scope to guideline values contained within the World Health Organisation (WHO) guidance document.

5.6.2 Whilst BS8233 is not intended for the assessment of noise generating activities, however it does serve to give an additional layer with regards to the indication of the likelihood of noise complaints.

5.6.3 In some instances it may be more appropriate to assess night time noise levels using the internal criteria within this standard in order to give an indication of the likelihood of noise complaints given the context of the other standards (i.e. BS4142:2014 gives an indication with regards to external noise levels and is not intended to be applied to the derivation of indoor sound levels arising from external noise sources or the assessment of indoor sound levels. It is reasonable to assume that residents would not expect to be routinely utilising external amenity areas between 23:00 and 07:00).

5.6.4 Indeed, source of the noise levels aside, assuming 15dB (A) attenuation from an open window (WHO Guidelines for Community Noise) it is possible to calculate noise levels as a result of the proposals, these are provided within Table 5.4 below, It should be noted that the rating level has not been applied in this instance as penalties are typically only applied to BS4142:2014 assessments.

Table 5.4 – Comparison of internal noise levels to criterion provided within BS8283:2014

Operation	Predicted night-time façade level	Predicted internal noise level	Guideline limit (night-time bedroom/ living room value)
Dwellings at Whitwick Manor to east	23.6	-15 = 8.6	30
Drive Cottages	20.4	-15 = 5.4	30
Dwellings at Ocle Pychard	21.7	-15 = 6.7	30
Closest dwellings off A road	28.5	-15 = 13.5	30

5.6.5 Therefore, the noise levels associated with the operations within dwellings are extremely low and would be unlikely to cause annoyance to residents indoors at these times.

6 Conclusions

6.1 Summary & Recommendations

6.1.1 Oaktree Environmental Limited have undertaken a noise impact assessment for the proposed AD plant and associated grain drying operation at Whitwick Manor, Lower Eggleton, Herefordshire, HR8 2UE. The assessment was based on the guidance provided within BS4142:2014.

6.1.2 The primary receptors are considered to be the residential dwellings located at Whitwick Manor directly to the east, off the A417 including the Drive Cottages to the northeast and the dwellings located at Ocle Pychard to the northwest.

6.1.3 The noise level arising from the proposed development has been calculated by constructing noise models. The CadnaA noise models were constructed using OS mapping Opendata and Google Earth satellite imagery, whilst topographical data was downloaded from the DEFRA website in the form of a digital terrain model. The model was populated using specific noise data which was either provided by the manufacturer or measured by Oaktree Environmental Ltd at a comparable site.

6.1.4 An acoustic correction based on the nature of the noise was applied to the noise levels calculated within the model in order to give an overall rating level for the proposed development at each noise sensitive receptor.

6.1.5 The comparison of the noise level to the LA90 figures measured by Oaktree Environmental confirms that the impact of the proposed development will be low/negligible.

6.1.6 In addition, a subjective and contextual assessment has been provided as per the recommendations within BS4142:2014 which further confirms a low/negligible impact.

6.1.7 In addition, noise emissions will be controlled and regulated via the Noise Management Plan also produced by Oaktree Environmental. Therefore, considering the above, noise

levels associated with the proposed development are acceptable and noise should not be considered an impediment to the grant of planning permission or the environmental permit.

APPENDIX I

DRAWINGS

Rev No.	Revision Note.	Date	Drawn	Checked
A	Pre App Drawings	12.11.19	AW	AW
B	Wetlands system added to the site	01.04.20	AW	AW
C	Grain Store updated	02.10.20	CJB	AW
D	Red line site amended	07.09.22	AW	AW
E	Grain store and storage building revised	28.03.23	AW	AW

NUMBER - REV - CLIENT - PROJECT
01113-00 - E - N Layton - Whitwick Manor

TITLE
Site Plan

DATE	SHEET	SCALE
08.08.22	02	1:1000
DRN BY AW	CHK BY AW	PAPER SIZE A1

BOURNE VALLEY ASSOCIATES
ANDOVER LANE FARM
FABERSTOWN
ANDOVER
HAMPSHIRE
SP11 9PE
Tel: 01264 850159
Email: info@bournevalley.co.uk

APPENDIX II

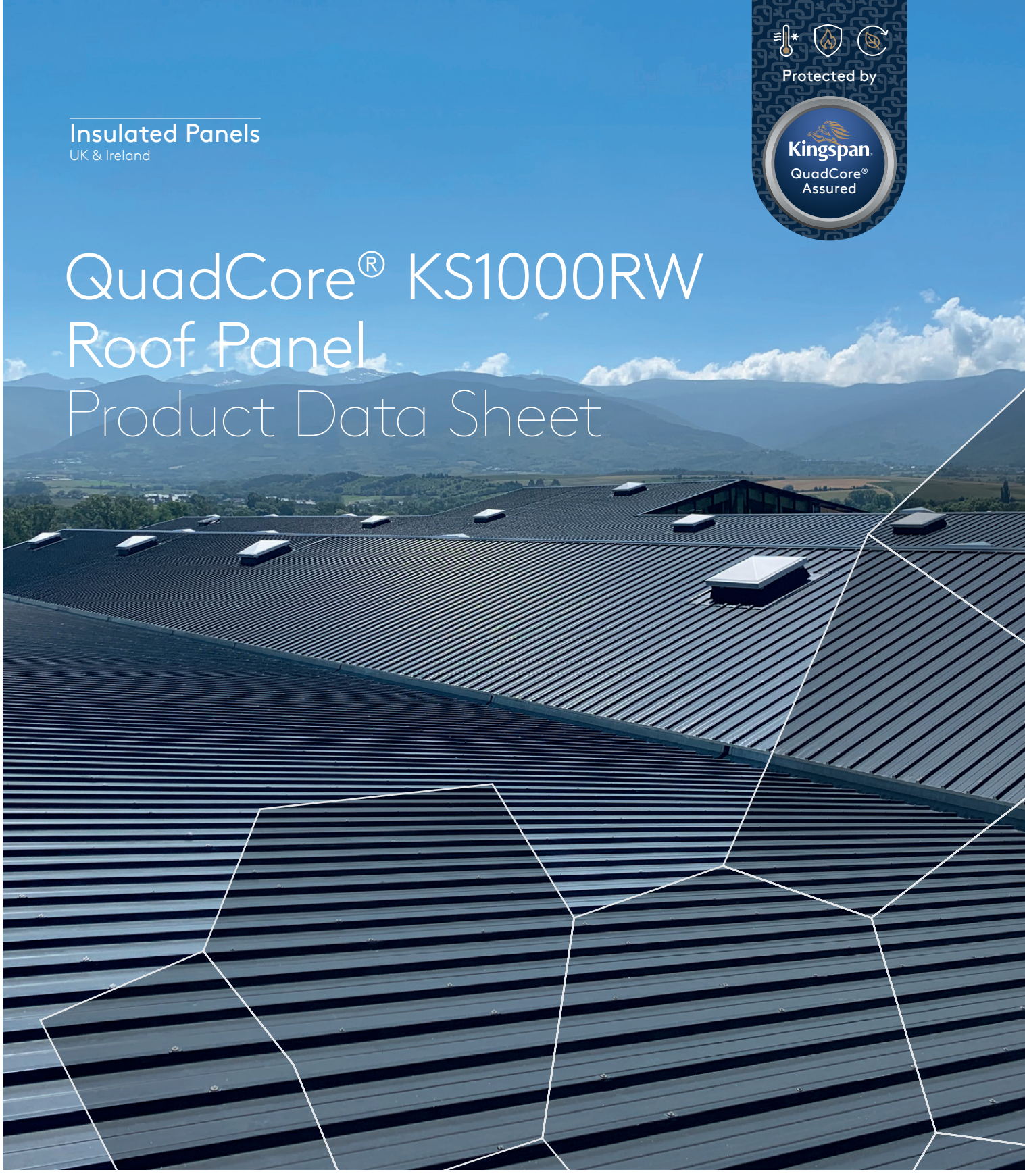
KINGSPAN CLADDING DATA SHEET

Insulated Panels
UK & Ireland

Protected by
Kingspan
QuadCore®
Assured

QuadCore® KS1000RW Roof Panel

Product Data Sheet



POWERED BY
QuadCore®
TECHNOLOGY

Kingspan®

Product Data

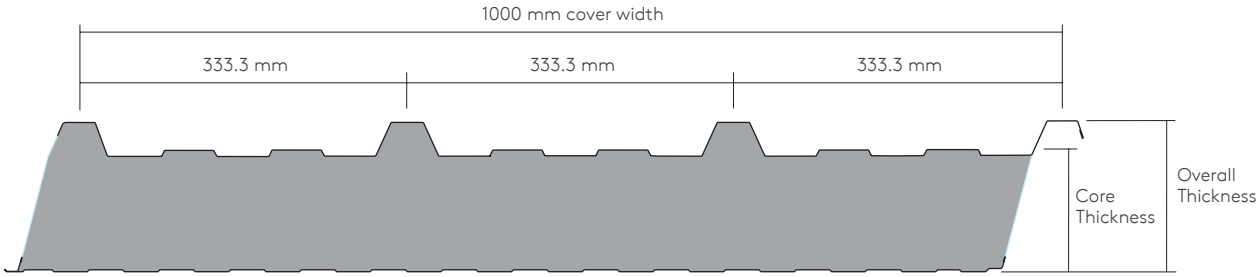
Applications

QuadCore® KS1000RW Roof Panels are through-fix, trapezoidal profiled, insulated roof panels which can be used for building applications with roof pitches of 4° or more after deflection.

Available Lengths

Standard Lengths (m)	1.8 - 14.5
Longer Lengths (non-standard) (m)	14.5 - 29.2
Shorter Lengths (non-standard) (m)	Below 1.8

Note: Additional costs and transport restrictions may apply for non-standard lengths. All lengths may change for export (outside of the UK and Ireland).



Dimensions, Weight & Thermal Performance

Core Thickness (mm)	40	53	60	73	80	91	100	115	120	137	150
Overall Thickness (mm)	71	84	91	104	111	122	131	146	151	168	181
U-Value (W/m^2K)	0.47	0.35	0.31	0.25	0.23	0.20	0.18	0.16	0.15	0.13	0.12
Weight Steel External Sheet (kg/m^2)	9.0	9.5	9.7	10.2	10.5	10.9	11.3	11.8	12.0	12.7	13.2

The QuadCore® insulation used in QuadCore® KS1000RW Roof Panels has a Thermal Conductivity (λ) of 0.018W/m.K

QuadCore® KS1000RW Roof Panels have a Thermal Transmittance (U-Value), calculated using the method required by the Building Regulations Part L2 (England & Wales), Building Standards Section 6 (Scotland), Part L (Republic of Ireland) and Part F2 (Northern Ireland).

Insulation Core

QuadCore® KS1000RW Roof Panels are manufactured with an HCFC, CFC and HFC free QuadCore® insulation core.

POWERED BY QuadCore® TECHNOLOGY

Certification and Testing

Reaction to Fire

QuadCore® KS1000RW Roof Panels are classified B-s1,d0, when tested on the internal face of the product, according to the European Reaction to Fire classification system (Euroclasses) BS EN 13501–1: 2007+A1: 2009 under the certified name KS1000/2000 RW QuadCore® and BS EN 13501-1:2018 under the certified name KS1000RW when using the following internal liners:

- CLEAN*safe* 15, CLEAN*safe* 25, CLEAN*safe* 55, CLEAN*safe* 120 and AQUA*safe* 55.

Please contact Kingspan Tech-eXchange for information relating to the external face.

Roof Applications

QuadCore® KS1000RW Roof Panels are tested to:

- BROOF(t4) to BS EN 13501-5: 2016 under the certified name KS1000RW for panel thicknesses 40 - 150mm and roof pitch of 0° - 10°.
- BROOF(t4) to BS EN 13501-5: 2016 under the certified name KS1000RW for panel thicknesses 40 - 150mm and roof pitch of >10°.

Fire Resistance

Fire resistance classifications are subject to panel thickness, orientation, method of assembly, and steel coating. Please contact Kingspan Tech-eXchange for project specific details.

Insurer Approvals

QuadCore® KS1000RW Roof Panels are tested to:

- LPS 1181 Part 1: Issue 1.2 Requirements and tests for built-up cladding and sandwich panel systems for use as the external envelope of buildings certified to:
  - LPS 1181-1 Grade EXT-B under the certified name QuadCore® KS1000RW (Roof Panel) for thicknesses 40 - 150mm.
- FM 4471 approval standard for class 1 roof panels under the certified name KS1000RW for thicknesses 80 - 150mm.
- FM 4880 approval standard for class 1 fire rating of building panels or interior finish materials under the certified name KS1000RW for thicknesses 40 - 150mm.
- FM 4882 approval standard for class 1 interior wall and ceiling materials or systems for smoke sensitive occupancies under the certified name KS1000RW for thicknesses 40 - 150mm.

Insurer approvals are large scale testing regimes that provide objective third-party testing, which is underpinned by quarterly, bi-annual and annual factory surveillance audits (depending on the region) to verify compliance. Insurer approvals are subject to panel thickness, cover width, orientation, method of assembly, steel coating and manufacturing facility. Please contact Kingspan Tech-eXchange for further information.

FM APPROVED

LPCB LOSS PREVENTION CERTIFICATION BOARD

LPS 1181-1: Issue 1.2
Cert: 186f & 260f
LPCB Ref: 186f/01 & 260f/01

Environmental

Kingspan Insulated Panels produced in the UK are certified to BES 6001 (Framework Standard for the Responsible Sourcing of Construction Products) 'Very Good'. QuadCore® Insulated Panel systems have Environmental Product Declarations in accordance with the requirements of EN 15804:2012+A1: 2013 for 100mm thickness.

All Kingspan Insulated Panels manufacturing facilities across the UK and Ireland are 100% Net Zero Energy. In addition, facilities located in Kingscourt, Holywell and Sherburn generate renewable energy onsite which contributes to that sites energy mix.

Kingspan Insulated Panels procure steel that is made from 15 – 25% recycled content. Kingspan insulated panels directly contribute to BREEAM® / LEED® credits.

Air Leakage

An air leakage rate of $3m^3/hr/m^2$ at 50Pa or less can be achieved when using Kingspan insulated roof and wall panels.

For information on detailing required to achieve lower air leakage rates please contact Kingspan Tech-eXchange.

Acoustic

Sound Reduction Index (SRI)

Frequency (Hz)	63	125	250	500	1000	2000	4000	8000
SRI (dB)	20	18	20	24	20	29	39	47

QuadCore® KS1000RW Roof Panels have a single figure weighted sound reduction R_W = 25dB. Results are based on panels of similar profile and core material.

Product Data

Materials

Substrate

Metallic protected steel to BS EN 10346: 2015.

Please contact Kingspan Tech-eXchange for information on other substrates.

Coatings – External Weather Sheet

- Kingspan XL Forté: Consists of a multi-layer organic coating, embossed with a traditional leather-grain finish.
- Kingspan Spectrum: Consists of a coated semi-gloss finish with slight granular effect.

For Reaction to Fire performance of external weather sheets please contact Kingspan Tech-eXchange.

Coatings – Internal Liner Sheet

- Kingspan CLEAN*safe* 15: The coating has been developed for use as the internal lining of insulated panels. Standard colour is "bright white" with an easily cleaned surface.
- Kingspan CLEAN*safe* 120: The coating has been developed for use as the internal lining of insulated panels where a high level of cleanliness and hygiene is required, and the panels are to be cleaned down on a regular basis.
- Kingspan AQUA*safe* 55: The coating has been developed for use as the internal lining of insulated panels to swimming pool internal environments.

For reaction to fire performance of panels with above internal liners please see Certification and Testing section.

Panel End Cut Back

Standard Cut Back Eaves	50mm, 75mm, 100mm
Class A End Lap	75mm, 150mm

For further information in relation to end laps please contact Kingspan Tech-eXchange.

Product Tolerances

Cut to Length	± 5mm
Cover Width	± 2mm
Thickness (Core ≤ 100mm)	± 2mm
Thickness (Core > 100mm)	± 2%
End Squareness	± 3mm

Handing

QuadCore® KS1000RW Roof Panels can be manufactured in both left to right handed (LH) and right to left handed (RH).

Quality & Durability

QuadCore® KS1000RW Roof Panels are manufactured from the highest quality materials, using state of the art production equipment to rigorous quality control standards, complying with BS EN ISO 9001 standard, ensuring long term reliability and service life. The panels are also being manufactured under Environmental Management System Certification BS EN ISO 14001, Energy Management System Certification BS EN ISO 50001 and Occupational Health and Safety Certification BS EN ISO 45001. QuadCore® KS1000RW Roof Panels are CE marked to BS EN 14509: 2013.

CE

Warranty

QuadCore® Assured Panel Warranty

- 25 years insurance backed thermal performance
- 25 years insurance backed fire performance
- 25 years structural performance
- 25 years environmental performance
- Up to 40 years coating performance

QuadCore® Assured System Warranty

- 25 years insurance backed thermal performance
- 25 years insurance backed fire performance
- 25 years structural performance
- 25 years environmental performance
- Up to 40 years coating performance
- 25 years warranty on system accessories*

*Please contact Kingspan Tech-eXchange or refer to the 'QuadCore® Assured' brochure for a list of accessories covered by Kingspan.

Packing

QuadCore® KS1000RW Roof Panels are stacked weather sheet to weather sheet (to minimise pack height). The top and sides are protected by either cardboard or polystyrene and spiral wrap stretch polyfilm. The number of panels in a pack will vary depending on thickness.

Core Thickness (mm)	40	53	60	73-80	91	100-120	137-150
No. of Panels per Pack	17	15	13	11	9	7	6

Note: Applies to UK pack sizes. Please contact Kingspan Tech-eXchange for export information.

Sea Freight

Fully timber crated packs are available on projects requiring delivery by sea freight shipping, at additional costs. Alternatively, steel containers can be used. Special loading charges apply.

Delivery

All deliveries (unless indicated otherwise) are by road transport to project site. Off-loading is the responsibility of the client.

Site Installation Procedure

Site assembly instructions are available from Kingspan Tech-eXchange.

Product Data: Load / Span Tables

External sheet 0.465mm (steel S280GD), internal sheet 0.32mm (steel S220GD). Load / span tables to be compared against calculated characteristic (i.e. unfactored) wind load values.

Single Span

Core Thickness (mm)	Load Type	Span (m)																																	
		Uniformly distributed imposed load (kN/m²)																																	
		0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4	4.6	4.8	5.0	5.2	5.4	5.6	5.8	6.0	6.2	6.4	6.6	6.8	7.0
40	Pressure	12.49	7.76	5.48	4.16	3.31	2.71	2.26	1.71	1.31	1.02	0.80	0.63	0.50	0.39	0.31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Suction	12.53	7.81	5.55	4.24	3.40	2.81	2.37	2.03	1.76	1.55	1.37	1.22	1.09	0.99	0.87	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
53	Pressure	13.18	8.61	6.30	4.94	4.03	3.38	2.88	2.29	1.81	1.45	1.17	0.95	0.77	0.63	0.52	0.42	0.35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Suction	13.36	8.68	6.37	5.03	4.13	3.49	3.00	2.61	2.30	2.04	1.82	1.63	1.47	1.33	1.21	1.10	0.95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
60	Pressure	13.54	9.08	6.74	5.36	4.44	3.76	3.23	2.62	2.10	1.70	1.39	1.14	0.94	0.78	0.64	0.54	0.45	0.37	0.31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Suction	13.72	9.15	6.83	5.46	4.54	3.88	3.36	2.95	2.60	2.32	2.07	1.87	1.69	1.53	1.35	1.21	1.09	0.98	0.89	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
73	Pressure	14.21	9.65	7.35	5.97	5.03	4.33	3.78	3.25	2.65	2.18	1.81	1.51	1.27	1.07	0.90	0.76	0.65	0.55	0.47	0.40	0.34	-	-	-	-	-	-	-	-	-	-	-	-	-
	Suction	14.40	10.03	7.68	6.28	5.32	4.61	4.04	3.58	3.19	2.86	2.57	2.33	2.02	1.77	1.57	1.40	1.26	1.14	1.03	0.95	0.87	-	-	-	-	-	-	-	-	-	-	-	-	-
80	Pressure	14.45	9.88	7.62	6.26	5.32	4.61	4.04	3.57	2.96	2.45	2.05	1.72	1.46	1.24	1.05	0.90	0.77	0.66	0.56	0.48	0.41	0.35	0.30	-	-	-	-	-	-	-	-	-	-	-
	Suction	14.76	10.51	8.15	6.73	5.75	5.01	4.42	3.93	3.52	3.16	2.85	2.50	2.17	1.90	1.68	1.50	1.35	1.22	1.11	1.02	0.93	0.86	0.80	-	-	-	-	-	-	-	-	-	-	-
91	Pressure	14.86	10.37	8.14	6.77	5.82	5.09	4.50	4.01	3.45	2.89	2.44	2.07	1.76	1.51	1.30	1.12	0.97	0.84	0.72	0.63	0.54	0.47	0.41	0.35	0.30	-	-	-	-	-	-	-	-	-
	Suction	15.33	11.27	8.89	7.44	6.43	5.66	5.03	4.50	4.04	3.65	3.18	2.73	2.37	2.08	1.84	1.64	1.48	1.34	1.22	1.11	1.02	0.94	0.87	0.81	0.76	-	-	-	-	-	-	-	-	-
100	Pressure	15.19	10.76	8.54	7.18	6.22	5.48	4.87	4.35	3.86	3.25	2.76	2.36	2.03	1.75	1.51	1.31	1.14	0.99	0.86	0.75	0.66	0.58	0.50	0.44	0.38	0.33	-	-	-	-	-	-	-	-
	Suction	15.61	11.74	9.41	7.86	6.75	5.92	5.27	4.76	4.33	3.98	3.39	2.91	2.53	2.22	1.97	1.76	1.58	1.43	1.30	1.19	1.09	1.01	0.93	0.87	0.81	0.76	-	-	-	-	-	-	-	-
115	Pressure	15.40	11.36	9.19	7.65	6.54	5.71	5.06	4.55	4.12	3.77	3.32	2.86	2.48	2.15	1.88	1.64	1.44	1.27	1.11	0.98	0.87	0.77	0.68	0.60	0.53	0.47	0.41	0.36	0.32	-	-	-	-	-
	Suction	15.62	11.74	9.41	7.86	6.75	5.92	5.28	4.76	4.34	3.98	3.69	3.21	2.79	2.45	2.17	1.94	1.74	1.58	1.43	1.31	1.20	1.11	1.03	0.96	0.89	0.83	0.78	0.74	0.69	-	-	-	-	-
120	Pressure	15.40	11.52	9.20	7.65	6.54	5.71	5.06	4.54	4.12	3.77	3.47	3.03	2.63	2.29	2.00	1.76	1.55	1.36	1.20	1.06	0.94	0.83	0.74	0.65	0.58	0.51	0.46	0.40	0.36	0.31	-	-	-	-
	Suction	15.62	11.74	9.42	7.86	6.76	5.93	5.28	4.76	4.34	3.99	3.69	3.30	2.87	2.52	2.23	2.00	1.79	1.62	1.48	1.35	1.24	1.15	1.06	0.99	0.92	0.86	0.81	0.76	0.72	0.68	-	-	-	-
137	Pressure	15.40	11.52	9.19	7.64	6.53	5.70	5.05	4.54	4.11	3.76	3.46	3.21	2.99	2.78	2.45	2.16	1.91	1.70	1.51	1.34	1.20	1.07	0.95	0.85	0.76	0.68	0.61	0.55	0.49	0.44	0.39	0.35	0.31	
	Suction	15.63	11.75	9.42	7.87	6.76	5.93	5.29	4.77	4.35	3.99	3.69	3.44	3.15	2.76	2.45	2.19	1.97	1.78	1.62	1.48	1.36	1.26	1.16	1.08	1.01	0.94	0.88	0.83	0.78	0.74	0.70	0.67	0.63	
150	Pressure	15.39	11.51	9.19	7.64	6.53	5.70	5.05	4.53	4.11	3.76	3.46	3.20	2.98	2.79	2.62	2.47	2.20	1.97	1.75	1.57	1.41	1.26	1.13	1.02	0.91	0.82	0.74	0.67	0.60	0.54	0.49	0.44	0.39	
	Suction	15.63	11.75	9.43	7.88	6.77	5.94	5.29	4.77	4.35	4.00	3.70	3.44	3.22	2.94	2.61	2.33	2.09	1.90	1.72	1.58	1.45	1.34	1.24	1.15	1.07	1.00	0.94	0.88	0.83	0.79	0.75	0.71	0.67	

1 Values have been calculated using the method described in BS EN 14509: 2013, for medium coloured panels.

2 The following deflection limits have been used:
- Short term pressure loading $^{L}/_{200}$.
- Short term suction loading $^{L}/_{150}$.
- Long term loading $^{L}/_{100}$.

3 All panel thicknesses have been calculated with a minimum end support width of 50mm and intermediate support width of 50mm. Larger support widths are possible.

4 The actual wind suction resisted by the panel is dependent upon the number of fasteners and the material of the supporting element.

5 The fastener calculation should be carried out in accordance with the appropriate standards.

6 For intermediate values linear interpolation may be used.

7 The allowable steelwork tolerance between bearing planes of adjacent supports is ±5mm.

Product Data: Load / Span Tables

External sheet 0.465mm (steel S280GD), internal sheet 0.32mm (steel S220GD). Load / span tables to be compared against calculated characteristic (i.e. unfactored) wind load values.

Double Span

Core Thickness (mm)	Load Type	Span (m)																																
		Uniformly distributed imposed load (kN/m²)																																
		0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4	4.6	4.8	5.0	5.2	5.4	5.6	5.8	6.0	6.2	6.4	6.6	6.8	7.0
40	Pressure	9.59	7.12	5.48	4.16	3.31	2.71	2.26	1.92	1.62	1.38	1.20	1.05	0.92	0.82	0.73	0.65	0.59	0.53	0.48	0.44	0.39	0.34	-	-	-	-	-	-	-	-	-	-	-
	Suction	9.94	7.45	5.55	4.24	3.40	2.81	2.37	2.03	1.76	1.54	1.36	1.21	1.09	0.99	0.89	0.81	0.75	0.69	0.63	0.59	0.55	0.51	-	-	-	-	-	-	-	-	-	-	-
53	Pressure	10.55	7.84	6.24	4.94	3.93	3.12	2.55	2.13	1.81	1.56	1.36	1.19	1.06	0.94	0.85	0.76	0.69	0.63	0.57	0.52	0.48	0.42	0.36	0.31	-	-	-	-	-	-	-	-	-
	Suction	10.93	8.19	6.37	5.03	4.04	3.24	2.68	2.27	1.96	1.72	1.53	1.37	1.24	1.13	1.03	0.95	0.88	0.82	0.77	0.72	0.68	0.64	0.59	0.55	-	-	-	-	-	-	-	-	-
60	Pressure	11.08	8.24	6.55	5.33	4.09	3.26	2.67	2.24	1.91	1.65	1.44	1.27	1.13	1.01	0.91	0.82	0.75	0.68	0.62	0.57	0.52	0.47	0.40	0.35	-	-	-	-	-	-	-	-	-
	Suction	11.46	8.60	6.83	5.42	4.20	3.38	2.81	2.39	2.06	1.81	1.61	1.45	1.31	1.20	1.10	1.02	0.94	0.88	0.82	0.77	0.73	0.69	0.64	0.60	-	-	-	-	-	-	-	-	-
73	Pressure	12.07	8.99	7.15	5.65	4.37	3.50	2.89	2.43	2.08	1.81	1.58	1.40	1.25	1.12	1.01	0.92	0.84	0.77	0.70	0.65	0.60	0.55	0.49	0.42	0.36	0.31	-	-	-	-	-	-	-
	Suction	12.47	9.36	7.50	5.75	4.49	3.64	3.04	2.59	2.25	1.98	1.77	1.59	1.45	1.32	1.22	1.13	1.05	0.98	0.92	0.86	0.81	0.77	0.73	0.69	0.65	0.60	-	-	-	-	-	-	-
80	Pressure	12.61	9.39	7.47	5.81	4.51	3.63	3.00	2.53	2.17	1.89	1.66	1.47	1.31	1.18	1.07	0.97	0.89	0.81	0.75	0.69	0.63	0.59	0.53	0.46	0.40	0.34	-	-	-	-	-	-	-
	Suction	13.01	9.78	7.84	5.92	4.64	3.77	3.16	2.70	2.35	2.07	1.85	1.67	1.51	1.39	1.28	1.18	1.10	1.03	0.97	0.91	0.86	0.81	0.77	0.73	0.69	0.65	-	-	-	-	-	-	-
91	Pressure	13.46	10.04	7.99	6.07	4.74	3.83	3.18	2.69	2.31	2.01	1.77	1.58	1.41	1.27	1.15	1.05	0.96	0.88	0.81	0.75	0.69	0.64	0.60	0.55	0.52	0.48	0.42	0.36	0.32	-	-	-	-
	Suction	13.87	10.43	8.28	6.19	4.87	3.98	3.34	2.86	2.50	2.21	1.97	1.78	1.62	1.48	1.37	1.27	1.18	1.11	1.04	0.98	0.92	0.88	0.83	0.79	0.76	0.71	0.67	0.63	0.59	-	-	-	-
100	Pressure	13.89	10.36	8.25	6.27	4.91	3.98	3.31	2.81	2.42	2.11	1.86	1.66	1.48	1.34	1.21	1.11	1.01	0.93	0.86	0.79	0.73	0.68	0.63	0.59	0.55	0.52	0.48	0.45	0.41	0.36	0.32	-	-
	Suction	14.30	10.77	8.52	6.40	5.06	4.15	3.49	2.99	2.61	2.31	2.07	1.87	1.70	1.56	1.44	1.34	1.25	1.17	1.10	1.03	0.98	0.93	0.88	0.84	0.80	0.76	0.71	0.67	0.63	0.60	0.56	-	-
115	Pressure	13.93	10.40	8.28	6.60	5.20	4.24	3.54	3.01	2.60	2.27	2.01	1.79	1.61	1.45	1.32	1.20	1.10	1.01	0.94	0.87	0.80	0.75	0.70	0.65	0.61	0.57	0.54	0.50	0.47	0.44	0.42	0.39	0.37
	Suction	14.36	10.82	8.69	6.74	5.36	4.41	3.72	3.20	2.80	2.48	2.22	2.01	1.83	1.68	1.56	1.44	1.35	1.26	1.19	1.12	1.06	1.00	0.96	0.91	0.87	0.83	0.78	0.74	0.69	0.66	0.62	0.59	0.56
120	Pressure	13.94	10.41	8.29	6.70	5.29	4.32	3.61	3.07	2.66	2.32	2.05	1.83	1.64	1.49	1.35	1.23	1.13	1.04	0.96	0.89	0.83	0.77	0.72	0.67	0.63	0.59	0.55	0.52	0.49	0.46	0.43	0.41	0.38
	Suction	14.38	10.84	8.70	6.85	5.46	4.49	3.80	3.27	2.86	2.54	2.28	2.06	1.88	1.72	1.59	1.48	1.38	1.29	1.22	1.15	1.09	1.03	0.98	0.93	0.89	0.86	0.81	0.76	0.72	0.68	0.64	0.61	0.58
137	Pressure	13.99	10.45	8.32	6.89	5.60	4.58	3.84	3.28	2.84	2.49	2.21	1.97	1.77	1.60	1.46	1.33	1.22	1.13	1.04	0.97	0.90	0.84	0.78	0.73	0.68	0.64	0.60	0.57	0.53	0.50	0.48	0.45	0.42
	Suction	14.44	10.90	8.75	7.22	5.78	4.78	4.05	3.50	3.07	2.72	2.44	2.21	2.02	1.86	1.72	1.59	1.49	1.40	1.31	1.24	1.17	1.11	1.06	1.01	0.97	0.93	0.88	0.83	0.78	0.74	0.70	0.67	0.63
150	Pressure	14.03	10.48	8.34	6.90	5.82	4.78	4.02	3.43	2.98	2.61	2.32	2.07	1.86	1.69	1.54	1.41	1.29	1.19	1.10	1.02	0.95	0.89	0.83	0.78	0.73	0.68	0.64	0.60	0.57	0.54	0.51	0.48	0.45
	Suction	14.49	10.94	8.78	7.33	6.02	4.99	4.24	3.66	3.21	2.86	2.57	2.33	2.12	1.95	1.81	1.68	1.57	1.47	1.38	1.31	1.24	1.18	1.12	1.07	1.02	0.98	0.94	0.88	0.83	0.79	0.75	0.71	0.67

1 Values have been calculated using the method described in BS EN 14509: 2013, for medium coloured panels.

2 The following deflection limits have been used:
- Short term pressure loading $^{L}/_{200}$.
- Short term suction loading $^{L}/_{150}$.
- Long term loading $^{L}/_{100}$.

3 All panel thicknesses have been calculated with a minimum end support width of 50mm and intermediate support width of 50mm. Larger support widths are possible.

4 The actual wind suction resisted by the panel is dependent upon the number of fasteners and the material of the supporting element.

5 The fastener calculation should be carried out in accordance with the appropriate standards.

6 For intermediate values linear interpolation may be used.

7 The allowable steelwork tolerance between bearing planes of adjacent supports is ±5mm.

Product Data: Load / Span Tables

External sheet 0.465mm (steel S280GD), internal sheet 0.32mm (steel S220GD). Load / span tables to be compared against calculated characteristic (i.e. unfactored) wind load values.

Triple Span

Core Thickness (mm)	Load Type	Span (m)																																
		Uniformly distributed imposed load (kN/m²)																																
		0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4	4.6	4.8	5.0	5.2	5.4	5.6	5.8	6.0	6.2	6.4	6.6	6.8	7.0
40	Pressure	11.31	7.76	5.48	4.16	3.31	2.71	2.26	1.92	1.64	1.42	1.24	1.09	0.96	0.85	0.76	0.68	0.61	0.55	0.49	0.45	0.39	0.33	-	-	-	-	-	-	-	-	-	-	-
	Suction	11.40	7.81	5.55	4.24	3.40	2.81	2.37	2.03	1.76	1.55	1.37	1.22	1.09	0.99	0.89	0.81	0.75	0.69	0.63	0.59	0.55	0.51	-	-	-	-	-	-	-	-	-	-	-
53	Pressure	12.36	8.61	6.30	4.94	4.03	3.38	2.88	2.49	2.17	1.90	1.67	1.48	1.32	1.19	1.07	0.96	0.87	0.79	0.72	0.65	0.59	0.52	0.46	0.41	0.36	0.31	-	-	-	-	-	-	-
	Suction	12.45	8.68	6.37	5.03	4.13	3.49	3.00	2.61	2.30	2.04	1.82	1.63	1.47	1.33	1.21	1.11	1.00	0.90	0.82	0.75	0.69	0.64	0.59	0.55	0.52	0.48	-	-	-	-	-	-	-
60	Pressure	12.93	9.08	6.74	5.36	4.44	3.76	3.19	2.69	2.31	2.00	1.76	1.56	1.40	1.26	1.14	1.03	0.94	0.86	0.79	0.73	0.68	0.62	0.56	0.50	0.44	0.40	0.35	0.31	-	-	-	-	-
	Suction	13.02	9.15	6.83	5.46	4.54	3.88	3.34	2.85	2.48	2.18	1.95	1.75	1.59	1.46	1.34	1.21	1.09	0.98	0.89	0.82	0.75	0.69	0.64	0.60	0.56	0.52	0.49	0.46	-	-	-	-	-
73	Pressure	13.99	9.65	7.35	5.97	5.03	4.10	3.40	2.88	2.48	2.17	1.91	1.70	1.53	1.38	1.25	1.14	1.05	0.96	0.89	0.82	0.76	0.71	0.66	0.61	0.56	0.50	0.46	0.41	0.37	0.34	0.31	-	-
	Suction	14.10	10.03	7.68	6.28	5.23	4.25	3.56	3.05	2.66	2.36	2.11	1.90	1.73	1.59	1.47	1.36	1.26	1.14	1.03	0.95	0.87	0.80	0.74	0.69	0.65	0.60	0.57	0.53	0.50	0.48	0.45	-	-
80	Pressure	14.45	9.88	7.62	6.26	5.23	4.22	3.51	2.98	2.57	2.25	1.99	1.77	1.59	1.44	1.31	1.20	1.10	1.01	0.93	0.86	0.80	0.75	0.70	0.65	0.60	0.54	0.49	0.44	0.40	0.37	0.33	0.31	-
	Suction	14.68	10.51	8.15	6.73	5.37	4.38	3.67	3.16	2.76	2.45	2.19	1.98	1.81	1.66	1.53	1.42	1.33	1.22	1.11	1.02	0.93	0.86	0.80	0.74	0.69	0.65	0.61	0.57	0.54	0.51	0.49	0.46	-
91	Pressure	14.86	10.37	8.14	6.77	5.44	4.41	3.67	3.13	2.71	2.37	2.10	1.88	1.69	1.54	1.40	1.28	1.18	1.09	1.00	0.93	0.87	0.81	0.75	0.71	0.66	0.62	0.58	0.55	0.50	0.46	0.42	0.38	0.35
	Suction	15.33	11.27	8.89	7.10	5.58	4.57	3.85	3.31	2.90	2.58	2.32	2.10	1.92	1.76	1.63	1.52	1.41	1.33	1.22	1.11	1.02	0.94	0.87	0.81	0.76	0.71	0.67	0.63	0.59	0.56	0.53	0.50	0.48
100	Pressure	15.19	10.76	8.54	7.16	5.60	4.55	3.80	3.24	2.81	2.47	2.19	1.96	1.77	1.61	1.47	1.34	1.24	1.14	1.06	0.98	0.91	0.85	0.80	0.75	0.70	0.66	0.62	0.58	0.55	0.52	0.49	0.45	0.41
	Suction	15.61	11.74	9.41	7.30	5.75	4.72	3.99	3.44	3.02	2.69	2.42	2.19	2.00	1.85	1.71	1.59	1.48	1.39	1.30	1.19	1.09	1.01	0.93	0.87	0.81	0.76	0.71	0.67	0.63	0.60	0.56	0.54	0.51
115	Pressure	15.40	11.36	9.19	7.47	5.87	4.79	4.01	3.43	2.99	2.63	2.34	2.10	1.90	1.72	1.58	1.45	1.33	1.23	1.14	1.06	0.99	0.93	0.87	0.82	0.77	0.72	0.68	0.64	0.61	0.57	0.54	0.51	0.49
	Suction	15.62	11.74	9.41	7.61	6.03	4.97	4.21	3.64	3.20	2.85	2.57	2.34	2.14	1.97	1.83	1.70	1.59	1.50	1.41	1.31	1.20	1.11	1.03	0.96	0.89	0.83	0.78	0.74	0.69	0.66	0.62	0.59	0.56
120	Pressure	15.40	11.52	9.20	7.56	5.95	4.86	4.08	3.49	3.04	2.68	2.38	2.14	1.94	1.76	1.61	1.48	1.36	1.26	1.17	1.09	1.02	0.95	0.89	0.84	0.79	0.74	0.70	0.66	0.62	0.59	0.56	0.53	0.50
	Suction	15.62	11.74	9.42	7.71	6.12	5.05	4.28	3.71	3.26	2.91	2.62	2.38	2.18	2.01	1.87	1.74	1.63	1.53	1.44	1.35	1.24	1.15	1.06	0.99	0.92	0.86	0.81	0.76	0.72	0.68	0.64	0.61	0.58
137	Pressure	15.40	11.52	9.19	7.64	6.24	5.11	4.30	3.69	3.22	2.84	2.53	2.28	2.06	1.88	1.72	1.58	1.46	1.35	1.26	1.17	1.10	1.03	0.96	0.91	0.85	0.80	0.76	0.72	0.68	0.64	0.61	0.58	0.55
	Suction	15.63	11.75	9.42	7.87	6.42	5.31	4.52	3.92	3.46	3.09	2.79	2.54	2.33	2.15	2.00	1.86	1.74	1.64	1.55	1.46	1.36	1.26	1.16	1.08	1.01	0.94	0.88	0.83	0.78	0.74	0.70	0.67	0.63
150	Pressure	15.39	11.51	9.19	7.64	6.45	5.30	4.47	3.84	3.35	2.96	2.64	2.38	2.16	1.97	1.80	1.66	1.53	1.42	1.32	1.23	1.15	1.08	1.02	0.96	0.90	0.85	0.80	0.76	0.72	0.68	0.65	0.61	0.58
	Suction	15.63	11.75	9.43	7.88	6.64	5.51	4.69	4.08	3.60	3.22	2.91	2.65	2.43	2.25	2.09	1.95	1.83	1.72	1.62	1.54	1.45	1.34	1.24	1.15	1.07	1.00	0.94	0.88	0.83	0.79	0.75	0.71	0.67

1 Values have been calculated using the method described in BS EN 14509: 2013, for medium coloured panels.

2 The following deflection limits have been used:
- Short term pressure loading $^{L}/_{200}$.
- Short term suction loading $^{L}/_{150}$.
- Long term loading $^{L}/_{100}$.

3 All panel thicknesses have been calculated with a minimum end support width of 50mm and intermediate support width of 50mm. Larger support widths are possible.

4 The actual wind suction resisted by the panel is dependent upon the number of fasteners and the material of the supporting element.

5 The fastener calculation should be carried out in accordance with the appropriate standards.

6 For intermediate values linear interpolation may be used.

7 The allowable steelwork tolerance between bearing planes of adjacent supports is ±5mm.

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For the product offering in other markets please contact your local sales representative or visit www.kingspanpanels.com

Fifth Issue | 05/2022

APPENDIX III

15 MINUTE LA90 FIGURES

Background Data

NMP A - Drive Cottages

Time	Date	LA90
07:20-07:35	15/10/2020	41.9
07:35-07:50	15/10/2020	42.6
07:50-08:05	15/10/2020	43.2
08:05-08:20	15/10/2020	46.1
09:40-09:55	15/10/2020	42.5
09:55-10:10	15/10/2020	45.0
10:10-10:25	15/10/2020	49.7
10:25-10:40	15/10/2020	46.6
14:20-14:35	15/10/2020	47.5
14:35-14:50	15/10/2020	39.5
14:50-15:05	15/10/2020	51.7
15:05-15:20	15/10/2020	39.3
23:00-23:15	09/06/2022	39.9
23:15-23:30	09/06/2022	36.7
23:30-23:45	09/06/2022	36.8
23:45-00:00	09/06/2022	37.5
00:00-00:15	10/06/2022	32.5
00:15-00:30	10/06/2022	30.6
00:30-00:45	10/06/2022	33.2
00:45-01:00	10/06/2022	37.3
02:10-02:25	10/06/2022	34.5
02:25-02:40	10/06/2022	35.4
02:40-02:55	10/06/2022	37.8
02:55-03:10	10/06/2022	36.4
02:26-02:41	11/06/2022	26.9
02:41-2:56	11/06/2022	24.9
02:56-03:11	11/06/2022	27.0
03:11-03:26	11/06/2022	26.3

NMP B - Ocle Pychard

Time	Date	LA90
08:30-08:45	15/10/2020	42.5
08:45-09:00	15/10/2020	41.9
09:00-09:15	15/10/2020	41.5
09:15-09:30	15/10/2020	40.7
10:45-11:00	15/10/2020	38.3
11:00-11:15	15/10/2020	40.1
11:15-11:30	15/10/2020	39.3
11:30-11:45	15/10/2020	40.3
15:25-15:40	15/10/2020	37.8

15:40-15:55	15/10/2020	37.6
15:55-16:10	15/10/2020	37.0
16:10-16:25	15/10/2020	37.4
01:05-01:20	10/06/2022	27.5
01:20-01:35	10/06/2022	27.3
01:35-01:50	10/06/2022	25.0
01:50-02:05	10/06/2022	24.2
01:20-01:35	11/06/2022	26.5
01:35-01:50	11/06/2022	26.9
01:50-02:05	11/06/2022	24.9
02:05-02:20	11/06/2022	23.7
23:20-23:35	10/07/2022	19.5
23:35-23:50	10/07/2022	19.3
23:50-00:05	10/07/2022	18.2
00:05-00:20	10/07/2022	17.7
02:37-02:52	11/07/2022	17.8
02:52-03:07	11/07/2022	17.7
03:07-03:22	11/07/2022	17.6
03:22-03:37	11/07/2022	17.7

NMP C - Whitwick Manor

Time	**Date**	**LA90**
07:25-07:40	26/11/2020	44.7
07:40-07:55	26/11/2020	46.2
07:55-08:10	26/11/2020	43.8
08:10-08:25	26/11/2020	43.2
10:45-11:00	26/11/2020	39.2
11:00-11:15	26/11/2020	40.3
11:15-11:30	26/11/2020	38.8
11:30-11:45	26/11/2020	38.7
13:05-13:20	26/11/2020	39.5
13:20-13:35	26/11/2020	30.0
13:35-13:50	26/11/2020	30.6
13:50-14:05	26/11/2020	36.6
20:30-20:45	30/11/2020	36.7
20:45-21:00	30/11/2020	35.2
20:00-20:15	30/11/2020	31.4
20:15-20:30	30/11/2020	31.7
23:00-23:15	10/06/2022	40.2
23:15-23:30	10/06/2022	41.5
23:30-23:45	10/06/2022	40.3
23:45-00:00	10/06/2022	38.8
00:00-00:15	11/06/2022	36.7
00:15-00:30	11/06/2022	39.4

00:30-00:45	11/06/2022	39.3
00:45-01:00	11/06/2022	38.6
00:28-00:43	11/07/2022	29.8
00:43-00:58	11/07/2022	29.3
00:58-01:13	11/07/2022	29.2
01:13-01:28	11/07/2022	29.4
01:29-01:44	11/07/2022	29.5
01:44-01:59	11/07/2022	29.7
01:59-02:14	11/07/2022	29.8
02:14-02:29	11/07/2022	30.0
04:46-05:01	11/07/2022	31.5
05:01-05:16	11/07/2022	31.3
05:16-05:31	11/07/2022	33.3
05:31-05:46	11/07/2022	32.9