Our Ref: 3223-01-TN01

09 July 2024

By email only: planningpink@baberghmidsuffolk.gov.uk

Development Management
Babergh District Council
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Proposed development of a solar farm (up to 40MW export capacity) with ancillary infrastructure and cabling, DNO substation, customer substation and construction of new and altered vehicular accesses

This letter provides a response to comments raised on the planning application for the construction of a solar farm (up to 40MW export capacity) with ancillary infrastructure and cabling, DNO substation, customer substation and construction of new and altered vehicular accesses (Babergh District Council Application Reference DC/23/05656).

The letter is structured under the following headings:

i. Response to queries received from the Case Officer
ii. Response to specific queries on the operational development;
iii. Response on whether the Proposed Development is 'Temporary';
iv. Updates with regards National Policy;
v. Landscape and Visual;
vi. Cultural Heritage;
vii. Noise and Vibration;
viii. Other Matters; and
ix. Conclusion.

Response to queries received from the Case Officer

The following queries set out in Table 1 have been received from the Case Officer during the course of consultation on the application:

Table 1: Response to queries received from the Case Officer

Case Officer Query	Applicant Response
Please could you provide details of Green Switch's connection agreement?	The connection agreement is with UK Power Networks and has a connection date of no later than the year 2031.
Please could you tell me if Green Switch are proposing to offer any kind of community benefit fund?	The Applicant has recently committed to a community benefit fund of £10,000 per annum whilst the scheme is operational.

	The Applicant would engage with Bentley Parish Council on the best delivery mechanism for providing the fund, with an initial proposal that www.actionfunder.org is used. The Parish Council would then be able to manage the fund as they see fit. The Applicant is clear that the proposed Community Benefit Fund should not be a material consideration in the determination of the planning application, and it should therefore not sit in the planning balance for the case. Nonetheless, Green Switch Capital are committed to providing the Community Benefit Fund should the application be approved.
Please could you tell me the estimated annual CO_2 saving and equivalent average household energy needs the development would meet?	The Proposed Development will typically generate 43.3 GWh of renewable electricity per annum during operation, based on a 40 MW export capacity. **CO_2 emissions:** Based on the Greenhouse Gas Conversion Factors 2023[1], the total kg CO_2 equivalent per kWh of electricity is 0.207. A solar farm generating 43.3 GWh of electricity is generating 43,300,000 kWh. 43,300,000 x 0.207 = 8,963,100 kg = 8,963 tonnes of CO_2 per annum. **Household energy needs:** Based on the Regional and Local Authority Electricity Consumption Statistics[2] the average household electricity usage in Babergh District is 4,000.5 kWh per annum. The Proposed Development would therefore theoretically meet the electricity needs of 10,823 houses.
Please could you let me know if there is any concurrent agricultural use proposed for the site during the operation of the development such as grazing?	It is proposed that the parts of the site within the fenceline where solar development is proposed would be grazed by sheep, and the Applicant and landowner have had discussions with a local sheep farmer that has the infrastructure to support this. Provision of a Grazing Management Plan could be a condition of the grant of planning consent, to be approved prior to first operation.
The customer substation has the all-important transformer which converts the power to correspond to the requirements of the grid (there is no transformer on the DNO substation site). It doesn't make sense; a wire from the customer substation transformer directly to the grid would be far easier and cheaper and would result in less impact.	The Applicant has engaged an experienced electrical engineering company that has advised on the design and layout of the Proposed Development. The Proposed Development as applied for is what is required to operate the facility.

[1] https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2023
[2] https://www.gov.uk/government/statistics/regional-and-local-authority-electricity-consumption-statistics

Also, there is much duplication of equipment with 2 disconnectors on the DNO substation compound and a further disconnector on the customer substation compound (and other duplicated plant). There cannot be a need for three 'switches' in one electrical line! You will appreciate that concentrating this plant into the customer substation compound would obviate concerns from several residents close to the DNO substation.	

Response on whether the Proposed Development is 'Temporary'

The Stop Grove Solar group response sets out that the Proposed Development should be considered a *de facto* permanent installation. This is not the way the planning system is operated; the Proposed Development is applied for based on a 40-year operational period, at which point it would be decommissioned and removed unless consent is secured for future operational use. On this basis the Proposed Development should be determined as a temporary development, which is also in accordance with Government policy at Paragraph 2.10.66 in the National Policy Statement for Renewable Energy Infrastructure (EN-3)[3].

It is not possible to predict the requirement for the Proposed Development in 40 years' time. At the current time there is a *critical national need* for renewable energy infrastructure in order to meet Government targets to decarbonise the electricity system by 2035 and increase energy security by reducing reliance on international fossil fuel markets. The majority of this generation is likely to come from wind and solar, and significant increases in the deployment of both technologies are required. In 40 years' time it is possible that solar and wind technologies will be significantly more efficient than currently available technologies, meaning less solar farms or wind turbines are required to deliver the same level of generation. In addition it is feasible that emerging technologies such as small-scale nuclear could become a more prominent part of the UK energy mix by 2065, reducing the requirement for solar and wind.

The National Planning Policy Framework (NPPF) does currently state that significant weight should be given to the benefits of re-powering or extending the life of an established site, but that simply reflects the Government position at the current point in time, where renewable electricity generation is a *critical national priority* in order to achieve Net Zero and mitigate the worst possible impacts of climate change. The Government position and weight to be given in 40 years' time on re-powering or extending the life of an established solar farm cannot be predicted.

The Proposed Development would have a time-limited consent with commitments in place to decommission at the end of its operational life and revert the land back to existing uses. The requirement to decommission the Proposed Development could be easily secured via an appropriate planning condition. The temporary nature of the development can and should therefore be given weight by the Council.

[3] Para 2.10.66, https://assets.publishing.service.gov.uk/media/65a7889996a5ec000d731aba/nps-renewable-energy-infrastructure-en3.pdf

Response on Output from the Development

The Stop Grove Solar group response incorrectly sets out that due to the 12% efficiency factor applied to solar developments, it would only generate 4.8 MW per annum. This is not the correct approach to calculating the export of a solar development.

The 12% efficiency (or 'capacity factor') provides for an anticipated average electricity generation across a full year, accounting for seasonal variations in daylight hours, and potential limitations from weather.

If the Proposed Development was generating at full capacity across a full year (365 days), 24 hours a day, it would generate approximately 350.4 GWh of electricity (40MW x 24 x 365). The actual forecast output capacity from the Proposed Development is 43.3 GWh (as set out in Table 1), which is approximately 12% of the capacity.

Updates with regards National Policy

The Government designated the revised Overarching National Policy Statement (NPS) for Energy (EN-1)[4] and the revised NPS for Renewable Energy Infrastructure (EN-3)[5] in January 2024.

Overarching National Policy Statement for Energy (EN-1) states at paragraph 1.2.1 and 1.2.2 that:

"In England, this NPS, in combination with any relevant technology specific NPSs, may be a material consideration in decision making on applications that fall under the Town and Country Planning Act 1990 (as amended).

Whether the policies in this NPS are material and to what extent, will be judged on a case-by-case basis and will depend upon the extent to which the matters are already covered by applicable planning policy."

The Applicant does not contest that the Proposed Development should be determined in accordance with the Local Development Plan, with the Babergh and Mid Suffolk Joint Local Plan adopted in November 2023. However this does not mean that the National Planning Policy Framework (NPPF) or NPSs are not material considerations.

The extent to which the policies of the NPSs are considered material is a matter for the decision maker, and as the NPS notes, this will depend upon the extent to which the matters are already covered by applicable planning policy. Babergh District Council has a recently adopted Local Plan which includes specific support for renewable energy projects, however NPS EN-1 and EN-3 have been designated subsequent to the adoption of the Local Plan (in January 2024), and present the Government's latest national policy and advice specifically for energy and renewable energy projects. The scope of NPS EN-3 now also includes detailed Government policy and guidance in relation to solar development for the first time. The Applicant's position is that weight can be given to policies and guidance set out in the NPSs, particularly where this is tailored to the specifics of solar development.

Landscape and Visual

The Applicant submitted a Landscape and Visual Impact Assessment (LVIA) as Appendix B of the Planning, Design and Access Statement (PDAS). The LVIA set out that the visual effects resulting from the Proposed Development would be experienced over a highly localised area in very close proximity to the Site. This is as a result of the pattern of landform and mature vegetation in the

[4] https://assets.publishing.service.gov.uk/media/65bbfbdc709fe1000f637052/overarching-nps-for-energy-en1.pdf
[5] https://assets.publishing.service.gov.uk/media/65a7889996a5ec000d731aba/nps-renewable-energy-infrastructure-en3.pdf

landscape, such that clear visibility of the solar arrays and associated infrastructure would be relatively restricted due to their low height. In the long-term there would be no unacceptable adverse landscape or visual effects resulting from the Proposed Development.

In their review of the submitted application, the Council's Landscape Officer at Place Services states that *'Generally, we consider that the site has the capacity to assimilate the proposed development subject to the delivery of its key principles and our recommendations below embedded into the detail design stages* [set out in Table 2 along with Applicant response]:

Table 2: Landscape Officer Recommendations

Landscape Officer Comment	Applicant Response
'The landscaping around the DNO substation needs to be reviewed and a long-term planting design solution that better responds to the existing landscape fabric and character is proposed instead.'	It is suggested that the specification of the planting design is agreed with the Council by way of planning condition. The restoration of the land at the DNO Substation at the time it is removed could also be subject to a planning condition in accordance with a Decommissioning and Restoration Plan.
'The spacing and rhythm of new hedgerow trees needs to be consider carefully to avoid regular spacing and to reflect the landscape character.'	It is suggested that the specification of the planting design is agreed with the Council by way of planning condition.
'To reinstate the characteristics of the former landscape at post-decommissioning, the short sections of hedgerow at access points to limit glimpsed views into the site from Church Lane could be translocated elsewhere to the established field boundaries within the site.'	The Applicant would commit to translocating the short sections of hedgerow at the site entrances in accordance with a Decommissioning and Restoration Plan that could be secured by an appropriately worded planning condition.
'Generally, any buildings (transformer station unit, control building, spares container, substations and other units) should be of a sensitive colour to blend in with the surrounding landscape.'	The Applicant expects the buildings to be finished in a colour and tone suitable for the receiving landscape, however the colour could be controlled by an appropriately worded planning condition.
'A more sensitive fencing alternative to palisade fencing should be consider. For example, a welded mesh fence will be more appropriate.'	The palisade fencing is only proposed around the two Substation compounds and is required for safety purposes. Deer / stock fencing is proposed around the areas of solar panels. Each of the Substation compounds is in a relatively discrete location and therefore the palisade fencing would not be prominent in any views. The palisade fencing could be coated with a suitable colour subject to an appropriately worded planning condition.

The Council Landscape Officer at Place Services concludes by recommending two planning conditions should the application be granted. The Applicant has identified additional possible planning conditions in Table 2 (above) that would also be appropriate.

The Stop Grove Solar Group has identified that Policy LP18(3) of the recently adopted Joint Local Plan states that "*Development within the AONB Project Areas should have regard to the relevant Valued Landscape Assessment.*"

The spatial extent of the 'AONB Project Areas' are not identified on the Joint Local Plan Policies Map, but are seemingly identified as an 'Additional Project Area' within a Valued Landscape Assessment[6] document that is part of the evidence base from examination of the Local Plan. The emerging AONB Project Area designation was not highlighted by the Council in the Pre-Application Advice given in August 2022, despite its possible material relevance in a Local Plan that had been through initial examination. The Applicant therefore did not make reference to the Site's location within an AONB Project Area, and this was also not raised as a concern by the Council's Landscape Officer at Place Services.

Policy LP18(3) requires development within the AONB Project Areas to 'have regard' to the relevant Valued Landscape Assessment. This Policy does not set any threshold by which development will be supported or refused in these areas, only that a development should have regard to the relevant landscape assessment.

The NPPF states at Paragraph 180(a) that:

'Planning policies and decisions should contribute to and enhance the natural and local environment by:

a) protecting and enhancing valued landscapes … (in a manner commensurate with their statutory status or identified quality in the development plan)'

The Site is within the Suffolk Coast and Heaths Additional Project Area which is an extensive area broadly covering the landscape between the northern and southern parts of the Suffolk Coast and Heaths National Landscape, and extending further west towards the A12, which demarcates the western boundary. The Additional Project Area is sub-divided into three 'Broad Assessment Areas' of which the Site is located within the 'Western Wooded Plateau'.

The Western Wooded Plateau Assessment Area covers the western fringes of the Shotley Peninsula and comprises predominantly open farmland and areas of woodland. It includes a tributary valley to the Samford Valley and the northern slopes of the Belstead Brook valley.

The following special qualities are identified for the Western Wooded Plateau:

- *'Hall/church complexes' along with ancient woodland and rural lanes reflect patterns of the medieval landscape.*
- *'Remnant areas of parkland' and notable veteran trees throughout area impart an established character.*
- *'Sinuous lanes and patterns' created by wavey edges to ancient woodland, rural winding lanes and old park boundaries and enclosure patterns.*
- *'Wooded skylines defined by ancient woodlands' and highly valued for biodiversity.*
- *'Attractive open views across rural farmland' to individual or clusters of vernacular buildings.*

The special qualities are noted as being particularly well expressed around Bentley Hall and Church, and in the northern half of the area around Belstead Brook Valley.

[6] https://www.babergh.gov.uk/documents/d/asset-library-54706/suffolk-coast-and-heaths-additional-project-area-valued-landscape-assessment-march-2020

The Site is located to the south of Bentley Hall and Church which are enclosed within areas of woodland, ancient woodland and mature trees. This creates an intimate landscape around the Hall to the north of the Site. The Site is within the wider rural landscape to the south of this more intimate landscape setting.

The Site itself is formed of medium/large arable fields and therefore does not directly exhibit the characteristics of the hall/church complex. The reduction in hedgerow cover has also reduced the characteristics of the medieval landscape at the Site. The 'landscape quality' section of the VLA notes that in the south of the Western Wooded Plateau area (in which the Site is located) the landscape pattern has been disrupted by field boundary loss, post 1950s.

As noted at paragraph 5.2.4 of the planning, design and access statement, '*Remnant parkland in the north of the* [LVIA] *study area is associated with the grounds of Bentley Park, Bentley Hall and Bentley Manor. There has been a decline in hedgerow cover across the central part of the study area (which includes the Site) which has reduced the small-scale pasture of the historic landscape and resulted in a larger-scale open arable field pattern.*'

The Site does not exhibit the characteristics of remnant parkland, with the Bentley Hall and church complex having a greater landscape connection with the landscape to the north and Bentley Old Hall. The north-west edge of the Site to Engry Wood has a somewhat sinuous pattern, but the other boundaries around the Site are more linear. By comparison the landscape pattern to the east, west and north of the Bentley Hall and Church complex is notably more sinuous.

The Site does exhibit the characteristics of wooded skylines, including skylines of ancient woodland, and allows for intermittent views across farmland.

Overall, the Site does therefore exhibit the characteristics of some of the special qualities of the valued landscape area, and can be considered to make a contribution. It is considered however that in relation to the Bentley Hall and Church complex referenced within the VLA, the landscape west, north and east of the area more evidently displays the special qualities for which the AONB Project Area is recognised, and has a more direct relationship with the landscape setting of Bentley Hall. The susceptibility of the Site as part of the VLA is therefore reduced, but the overall sensitivity of the Site would remain between medium-high and high as reported in the LVIA.

The VLA identifies the following opportunities for conservation and enhancement of the area:

- *Improve landscape structure of arable farmland through improved management of hedgerows with associated field margins.*
- *Reinstate hedgerows to improve biodiversity networks especially where they can link areas of ancient woodland.*
- *Avoid development on the edges of settlement where it is visually prominent especially on the margins of river valleys (see detailed settlement assessments).*
- *Avoid development along major routes especially A12 and A137 where it creates visual clutter and may be visually intrusive across wide areas*
- *Undertake rural lane assessment to identify quiet lanes and protected lane status where appropriate.*
- *Selectively fell areas of conifer plantation and restore sinuous boundaries to woodland where they have been lost.*

The above opportunities for 'conservation and enhancement' can be taken as measures to 'protect and enhance valued landscapes' in accordance with the NPPF. The layout and landscape design response of the Proposed Development responds to the above points by improving the landscape structure through the sub-division of the fields that form the Site into smaller parcels that reflect the historic landscape pattern, with the inclusion of significant lengths of proposed hedgerow linking blocks of woodland (including ancient woodland) and creating a greater number of field margins that will enhance the local biodiversity network (as acknowledged in the response of the Ecology Officer at Place Services).

The layout of the Proposed Development has taken setbacks from the bridleway and from Church Road in order to avoid development in a prominent location, and the Site is not referenced within the detailed settlement assessment for Bentley. The access strategy avoids taking traffic along Church Road which is a recognised quiet lane.

Overall, the Site would therefore not directly conflict with the identified opportunities for conservation and enhancement of the AONB Project Area, and would provide support to enhancing landscape structure. This is also the conclusion of the LVIA submitted with the application; that the Proposed Development "*would result in landscape effects ranging from major/moderate adverse to moderate adverse as a result of the change in land use across part of the Site from arable field to solar electricity generation. In the medium- and long-term the proposed planting would provide a greater level of landscape integration and visual screening such that the Proposed Development would sit within an established landscape framework and would be of very limited visibility. The landscape effects would reduce to moderate/minor adverse and minor adverse. The landscape effects resultant from the solar development are temporary, but over a long period of time. At the point of decommissioning the Proposed Development can be removed and the landscape restored, albeit with the permanent beneficial change resulting from the proposed landscaping*."

This is also the conclusion reached by the Council's Landscape Officer who notes that the Proposed Development has taken positive steps in terms of its layout to mitigate effects on surrounding properties and the landscape setting of St Mary's Church. The Officer notes that the material submitted with the application *'demonstrates how the proposed landscaping is able to mitigate the adverse visual effect of the proposed development'*.

As set out earlier the position of the Landscape Officer is that '*the site has the capacity to assimilate the proposed development subject to the delivery of its key principles and our recommendations* [covered in Table 2 above] *… embedded into the detail design stages*'. This is also the position of the Applicant and having regard to the characteristics and special qualities of the local landscape and the Site's position and contribution to the valued landscape, it is clear the design response of the Proposed Development is positive and does enable the Proposed Development to be integrated into the landscape.

Having regard to the VLA for the AONB Project Area as required by Policy LP18(3), it is clear this previous omission does not affect the overall conclusion of the LVIA that the Proposed Development can be successfully implemented on the Site without unacceptable landscape and visual effects.

Cultural Heritage

The Applicant has prepared a response to comments raised by Historic England, the Council's Heritage Officer, and the Stop Grove Solar Farm group. The response is included as Appendix A of this submission.

Noise and Vibration

The Applicant has prepared a response to comments raised by the Council's Environmental Protection Officer and the Stop Grove Solar Farm group. The response is included as Appendix B of this submission.

Other Matters

Agricultural Land

The Secretary of State for Energy Security and Net Zero provided a Written Ministerial Statement (WMS) on 15th May 2024 in relation to solar on agricultural land. This latest WMS makes direct reference to NPS EN-3 which was designated in January 2024, which states that *"applicants should, where possible, utilise suitable previously developed land, brownfield land, contaminated land and industrial land. Where the proposed use of any agricultural land has been shown to be necessary, poorer quality land should be preferred to higher quality land avoiding the use of "Best and Most Versatile" agricultural land where possible".* The repeated references in the WMS to NPS EN-3 confirm that the WMS does not change existing policy in relation to best and most versatile agricultural land.

The WMS goes on to state that: '*due weight needs to be given to the proposed use of Best and Most Versatile land when considering whether planning consent should be granted for solar developments. For all applicants the highest quality agricultural land is least appropriate for solar development and as the land grade increases, there is a greater onus on developers to show that the use of higher quality land is necessary*'. This would suggest a sliding scale and that as the land grade increases from Grade 3a, to Grade 2, to Grade 1, greater weight should perhaps be applied to its protection in the planning balance. As set out in the PDAS, the Site comprises 7.1% Grade 2 land, 55.7% Grade 3a land, and 37.2% Grade 3b land. Of the parts of the Site that are Best and Most Versatile (BMV) land, the soils are therefore predominantly at the lowest end of the BMV land grading scale (Grade 3a).

The Applicant has taken positive measures to seek to avoid the development of BMV land, and where the development of BMV land has been found to be necessary, has taken the positive step of limiting the impact on the higher quality Grade 2 land. Since the submission of an original pre-application enquiry and then subsequently an EIA Screening Request, the Applicant reduced the Site footprint to reduce impacts on Grade 2 agricultural land, which was the highest grade of land found at the Site. This involved removing approximately 6 hectares of the west of the Site from the Application such that it could remain in agricultural use.

There is no current Government policy or initiative that requires farmers to retain land in productive arable use, including if it is Best and Most Versatile land. Government policy is only that development should where possible avoid the loss of BMV land, which is taken to mean that the land could not realistically be productively farmed for arable use again in the future (for example following the development of housing).

The Proposed Development would result in the temporary loss of approximately 27 hectares of BMV land, but this would not be a permanent loss, and the Applicant is proposing to graze sheep between the solar arrays to retain a level of agricultural productivity, albeit not from crop production. The Applicant maintains that the Proposed Development will not harm UK Food Security, and that there is no Government position that the UK faces a food security crisis.

Biodiversity

The Stop Grove Solar group dispute and challenge the use of the Biodiversity Net Gain (BNG) Metric 4.0 calculation for the Proposed Development. The calculation was undertaken by ecologists at Avian Ecology who are competent experts, and a review of the BNG calculation by the Council's Ecology Officer at Place Services supports the use of the metric. The Ecology Officer states that '*We also support the biodiversity metrics 4.0 – calculation tool submitted with the application. This has been completed appropriately with realistic and deliver habitats for the post-implementation habitat creation / enhancement. The proposals will deliver a net biodiversity gain of 97.51 habitats units (106.5%) and 32.91 hedgerows units (102.65%).'*

The Ecology Officer goes on to state that: '*The biodiversity metrics 4.0 – calculation tool has also been completed in line with the landscape Proposals (Axis Ltd, July 2023). We welcome the design of the landscape proposals, which creates a number of new hedgerows and 'other neutral grassland' throughout the site, thus creating a more historic farming landscape that will benefit Hazel Dormouse, birds, invertebrates and other wildlife. As a result, we are satisfied the proposals will deliver measurable biodiversity net gains, in line with paragraph 180d and 186d of the NPPF 2023 and LP16 of the B&MS JLP.*'

Traffic and Transport

The Stop Grove Solar group has raised a number of objections in relation to traffic and transport, however the Applicant's own professionally prepared Transport Statement has concluded that access to the Site is achievable, and can be done in a safe manner. Suffolk Couty Council as the Highways Authority has responded to the application and confirmed they have no objection to the application subject to planning conditions. The Applicant would have no objection to the proposed conditions which are appropriate and reasonable.

Trees

The Applicant notes the objection from the Woodland Trust dated 31st January 2024. The objection relates to the potential loss of T31 which is identified in the Arboricultural Impact Assessment as an ancient tree. The Applicant had previously committed to a minimum drill depth of 600mm such that works avoid the soil rhizosphere beneath all trees including T31. The Applicant does however note the Woodland Trust's position that tree roots can extend up to 2m below ground level and is therefore willing to commit that the horizontal directional drill would be undertaken at a minimum depth of 2.5m below ground level as it passes beneath the trees. This could be satisfied by suitably worded planning condition requiring an Arboricultural Method Statement.

The Woodland Trust has also raised concern that *'the applicant has not provided information in relation to any maintenance works that may be required in the future. It is not clear whether future maintenance work would require direct access to the cable, or whether works could be undertaken remotely from the surface as a result of this technique'*. The HDD process does not require excavation along the alignment of the cable and allows for the installation of ducting that acts as a conduit for the cable to be pulled through. Should there be any future maintenance the cable would be pulled out from the ducting via winch; there would be no maintenance or other excavation works in the root protection areas of the trees.

The Applicant trusts that the above is clear and enables the Woodland Trust to remove their objection.

Alternative Sites

The Stop Grove Solar group presents criticism of the Alternative Site Assessment (ASA) exercise undertaken in relation to Policy LP25 of the Joint Local Plan. The ASA was undertaken retrospectively in order to provide evidence in relation to Policy LP25(3) and therefore the approach taken with

regards to agricultural land is considered reasonable – whilst the Site is identified as Grade 2 agricultural land on the Provisional Agricultural Land Classification, survey work and site refinement has found in reality the Site is predominantly Grade 3 land, being 92.8% Grade 3a and 3b land. It is therefore considered proportionate that in this knowledge, a retrospective ASA should focus on the potential for alternative sites that would be of a higher grading than Grade 3 on the Provisional Agricultural Land Classification. The ASA is clear that there are limitations to the level of analysis that can be reasonably undertaken as part of any ASA, and the Applicant maintains that within the Area of Search there are not necessarily any better alternative sites that could accommodate the Proposed Development.

The Area of Search used for the ASA considered alternative locations within the District that could utilise the same point of connection as the Proposed Development. This approach is considered reasonable and proportionate, and in the Applicant's opinion is in accordance with the intent of Item 3 of Policy LP25. The Stop Grove Solar group challenge this approach on the basis that all possible alternative sites within the District should be reviewed. This is not considered feasible by the Applicant as alternative sites beyond 3km from the point of connection would not be viable, therefore, any possible alternative site beyond 3km that is within Babergh District can be ruled out as an alternative. Paragraphs 2.10.22 to 2.10.25 and Footnote 84 of the recently designated NPS EN-3 are a relevant material consideration here.

Micro Siting

The PDAS submitted with the planning application incorrectly requested a micro-siting condition of 25m be applied to any grant of planning condition; this was intended to read as 2.5m. The Applicant has since reviewed this request for a micro-siting condition and concluded that it is highly unlikely to be required. The Case Officer can therefore disregard the request for a micro-siting allowance.

Conclusion

This letter sets out the Applicant's response to matters raised during consultation on the planning application.

Should you have any questions regarding the above, please do not hesitate to contact the undersigned at our Chester office.

Yours sincerely

[redacted]

Senior Consultant on behalf of Axis

CC: Paul Dempster – Green Switch Capital Ltd
Tom Poole – Green Switch Capital Ltd

Appendix A – Supplementary Heritage Assessment

Grove Farm Solar Farm

Supplementary Heritage Assessment

AOC Project Number: 27728

Date: June 2024

AOC Archaeology Group

ARCHAEOLOGY | HERITAGE | CONSERVATION

Grove Farm Solar Farm
Supplementary Heritage Assessment

On Behalf of:	AXIS Well House Barns Bretton Chester CH4 0DH
National Grid Reference (NGR):	TM 11610 37869 (centred)
AOC Project No:	27728
Prepared by:	Lisa Bird Juan Chacon
Date of Report:	June 2024

This document has been prepared in accordance with AOC standard operating procedures.

Author: Lisa Bird	**Date:**	**June 2024**
Approved by: Lynne Roy / Gary Millward	**Date:**	**June 2024**
Draft/Final Report Stage: Final	**Date:**	**June 2024**

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1 NON-TECHNICAL SUMMARY

1.1 AOC Archaeology Group were commissioned by Axis to undertake a Supplementary Heritage Assessment (SHA) which reviews and addresses the comments received from Historic England (HE reference: P01570041), the Heritage Officer, Babergh Heritage Service Team heritage advisors to at Babergh District Council and the Stop Grove Solar Farm Group in relation to the proposed solar farm at Land At Grove Farm And Land East Of The Railway Line, Bentley (hereafter referred to as "the Site") (NGR: TM 11610 37869; Mid-Suffolk Planning Reference: DC/23/05656).

1.2 This assessment reviews the comments received and also presents a reassessment of effects based upon the changes to the baseline surrounding the Proposed Development as a consequence of recent tree felling. This assessment focuses on 14 heritage assets; Grade I Bentley Hall Barn (Asset 2), Grade II* Listed Bentley Hall (Asset 3), Grade II* Listed Church of St Mary (Asset 6), Grade II Listed Maltings House (Asset 14); Grade II Listed Maltings Farm (Asset 13), Grade II Listed Maltings Cottage (Asset 12), Red Cottages and Potash Cottages (Asset 88), Falstaff Manor (Asset 69), Uplands (Asset 92) Little House (Asset 89) Glebe Cottage (Asset 91) Bentley House (Asset 90); Grove Farm (Asset 70) and Church Farm (Asset 68). Additionally, potential for impacts on the Ancient Woodland Inventory (AWI) Engry Wood are also considered.

1.3 The change to the baseline setting of surrounding heritage assets will result in increased visibility of the Church when seen from within the Site and accordingly increase visibility of the Proposed Development in views towards the Church from a limited number of locations within the wider landscape. Further research into historic landownership and land use has also been undertaken to better understand how the designated assets relate to the land within the Site. It is acknowledged that the Proposed Development would change the character of land use from agricultural to power generation, which may be considered a sub-type of an "industrial" character, but it is maintained in each case that the Proposed Development would have a neutral or limited (Low to Medium) adverse impact on the significance of the surrounding non-designated heritage assets (including Buildings of Local Significance) and the way in which they can be understood in their current settings. These non-designated heritage assets and Buildings of Local Significance are not subject to the harm test applied in the NPPF.

1.4 It is maintained that the Proposed Development would have a Neutral impact on the setting of the Bentley Hall group of assets, the Grade I Listed Barn (Asset 2) and the Grade II* Listed Bentley Hall and Stables (Asset 3 and 4) and upon the setting of the Grade II Listed Maltings Farm (Asset 13) and the Grade II Listed Maltings Cottage (Asset 12). Neutral impacts are considered to be "perceptible change[s] [that do] not diminish or enhance the significance of the asset or the ability to appreciate its significance". The Proposed Development is judged to result in 'less than substantial harm' to the settings of the Grade II* Listed Church of St Mary (Asset 6) and the Grade II Listed Maltings House (Asset 14).

1.5 Paragraph 202 of the NPPF states that 'where a development proposal will lead to less than substantial harm to the significance of a designated heritage asset, this harm should be weighed against the public benefits of the proposal'. As such, the less than substantial harm to the heritage assets must be weighed against the public benefits of the Proposed Development as set out in the planning submission.

2 INTRODUCTION

2.1. AOC Archaeology Group were commissioned by Axis to undertake a Supplementary Heritage Assessment (SHA) which reviews and addresses the comments received from Historic England (HE reference: P01570041), the Heritage Officer, Babergh Heritage Service Team heritage advisors to at Babergh District Council and the Stop Grove Solar Farm Group in relation to the proposed solar farm at Land At Grove Farm And Land East Of The Railway Line, Bentley (hereafter referred to as "the Site") (NGR: TM 11610 37869; Mid-Suffolk Planning Reference: DC/23/05656).

2.2. AOC Archaeology Group prepared a Heritage Impact Assessment (HIA- DC_23_05656-HERITAGE_IMPACT_ASSESSMENT-8437278) in July 2023, and this was submitted alongside the planning application for the proposed solar farm (the Proposed Development). Concerns regarding the impact of the Proposed Development on the settings of following nearby heritage assets have been raised;

Grade I Bentley Hall Barn (Asset 2: List Entry 1351965);

Grade II* Listed Bentley Hall (Asset 3; List Entry 1351964);

Grade II* Listed Church of St Mary (Asset 6; List Entry 1193823);

Grade II Listed Maltings House (Asset 14; List Entry 1033427);

Grade II Listed Maltings Farm (Asset 13; List Entry 1033426);

Grade II Listed Maltings Cottage (Asset 12; List Entry 1351929);

Buildings of Local Significance:

- Red Cottages and Potash Cottages (Asset 88);
- Falstaff Manor (Asset 69);
- Uplands (Asset 92);
- Little House (Asset 89);
- Glebe Cottage (Asset 91);
- Bentley House (Asset 90);

Non-designated heritage assets:

- Grove Farm (Asset 70);
- Church Farm (Asset 68); and

Ancient Woodland Inventory (AWI) Engry Wood (centred Asset 54).

2.3. This report assesses the potential for setting impacts on the identified nearby heritage assets by these Consultees against the Proposed Development as well as the general historic landscape. This assessment should be read in conjunction with the HIA and the LVIA assessment. The archaeological and historic baseline described in the HIA has not been repeated as part of this assessment. Asset numbers used in the HIA and detailed in Appendix 2 of the HIA have been retained within this assessment for ease of cross reference. Landscape and Visual Impact Assessments (LVIA) and heritage assessments considering the impact of proposed developments on the setting on heritage assets are often complimentary and undertaken in tandem, however they focus on two different things (HE, 2021). LVIA assessments are "usually based on publicly accessible viewpoints" and thus where buildings or

elements of the landscape can be appreciated by members of the public, whereas the contribution that setting makes to the significance of the heritage asset or historic landscape does not depend on there being public rights or an ability to access or experience that setting in person (HE, 2021:13).

3 GOVERNMENT AND LOCAL PLANNING POLICIES

3.1 Since the production of the HIA in July 2023, there have been some minor changes to legislative, national and local planning policy and policy guidance. The changes and policies most relevant to his assessment are detailed below.

Legislative Framework

3.2 Parliamentary legislation for Listed Buildings is provided by the Planning (Listed Building and Conservation Areas) Act 1990, whilst specific legislation for Scheduled Monuments is provided by the Ancient Monuments and Archaeological Areas Act 1979. The most recent legislation, the Levelling Up and Regeneration Act 2023, includes provision for designated heritage assets including Scheduled Monuments, Listed Buildings and Registered Parks and Gardens, as well as placing a Statutory duty on Local Planning Authorities to maintain Historic Environment Records (HERs). With regard to World Heritage Sites, Scheduled Monuments, Registered Parks and Gardens, Protected Wrecks and 'other area[s] of land included in a register maintained by the Historic Buildings and Monuments Commission for England [Historic England]' Section 102 of the 2023 Act amends Section 58 of the Town and Country Planning Act 1990 include a new section, Section 58B which states that:

> "In considering whether to grant planning permission or permission in principle for the development of land in England which affects a relevant asset or its setting, the local planning authority or (as the case may be) the Secretary of State must have special regard to the desirability of preserving or enhancing the asset or its setting" (TCPA 1990, Section 58 as amended by LURA 2023, Section 102).

3.3 The Public Services (Social Value) Act 2013 (England), requires contractors, and their supply chains, to consider not only cost when commissioning or procuring services but also how they can make a positive economic, social and / or environmental impact and suppliers are required to set out their proposals for delivering social value that results in positive benefits to communities through a development. In terms of heritage and archaeology, social value can also referred to as "public benefit" (MCHLG, Live Document, PPG and CiFA, 2021a & b).

3.4 A review of how the policies within Chapter 16 of the NPPF apply to the Proposed Development is presented in the HIA. Of most relevance to this supplementary assessment is Paragraph 207 which states that 'local planning authorities should refuse consent, unless it can be demonstrated that the substantial harm or total loss is necessary to achieve substantial public benefits that outweigh that harm or loss' (DLUHC, 2023: Para 207). Where 'a development proposal will lead to less than substantial harm to the significance of a designated asset" Paragraph 208 states that "this harm should be weighed against the public benefits of the proposal including, where appropriate, securing its optimum viable use' (DLUHC, 2023: Para 208).

3.5 Impacts upon non-designated heritage assets are also pertinent; Paragraph 209 states that 'In weighing applications that directly or indirectly affect non-designated heritage assets, a balanced judgement will be required having regard to the scale of any harm or loss and the significance of the heritage asset' (DLUHC, 2023: Para 209).

3.6 NPPF sets out three objectives to achieving sustainable development: economic, social; and environmental (DLUHC, 2023, Para 8). Proposals for social value/public benefit can contribute to developments achieving these objectives. In terms of heritage and archaeology, 'Plans should set out a positive strategy for the conservation and enjoyment of the historic environment, including heritage assets most at risk through neglect, decay or other threats.' (DLUHC, 2023 Para 196). Any proposal for a social value/public benefit 'strategy should take into account:

a) the desirability of sustaining and enhancing the significance of heritage assets, and putting them to viable uses consistent with their conservation;

b) the wider social, cultural, economic and environmental benefits that conservation of the historic environment can bring;

c) the desirability of new development making a positive contribution to local character and distinctiveness; and

d) opportunities to draw on the contribution made by the historic environment to the character of a place.' (DLUHC, 2023 Para 196).

3.7. The DLUHC and MHCLG published Planning Practice Guidance in April 2014 to expand upon the NPPF; it is a live document and the section on the historic environment was last updated in July 2019. PPG (MCHLG Live Document: para 18) requires assessments to consider the potential for harm of a Proposed Development on heritage assets in order to understand the impact on the significance of the heritage asset. Where designated heritage assets will be impacted upon, the PPG requires the assessment to clearly state whether that harm will be substantial or less than substantial.

3.8. PPG (MCHLG Live Document) provides a definition and guidance for public benefit where a development can achieve sustainable objectives (DLUHC, 2023, Para 8) and where there is the potential for harm to heritage assets. PPG states that that 'Public benefits should flow from the proposed development' and that benefits 'should be of a nature or scale to be of benefit to the public at large and not just be a private benefit. However, benefits do not always have to be visible or accessible to the public in order to be genuine public benefits' (MCHLG Live Document: 020 Reference ID: 18a-020-20190723).

3.9. The relevant policies included in the Babergh Local Plan 2011-2031 Core Strategy and Policies was adopted on the 25th February 2014. Saved policy CN06 is relevant to this assessment.

3.10. The Bentley Neighbourhood Plan was adopted in December 2022. Policy 9 and its relevant sub-policies relate to the Historic Environment.

3.11. Historic England published guidance on setting in 2017. This guidance sets out a staged approach to assessing the setting of heritage assets:

'Step 1: Identify which heritage assets and their settings are affected;

Step 2: Assess the degree to which these settings make a contribution to the significance of the heritage asset(s) or allow significance to be appreciated;

Step 3: Assess the effects of the Proposed Development, whether beneficial or harmful, on that significance or on the ability to appreciate it;

Step 4: Explore ways to maximise enhancement and avoid or minimise harm;

Step 5: Make and document the decision and monitor outcomes' (HE, 2017).

3.12. This approach was used in the HIA to assess the potential impacts of the Proposed Development upon the setting of designated heritage assets and is also used to assess impacts in this SHA.

3.13. HE's (2021) Commercial Renewable Energy Development and the Historic Environment (HEAN15) guidance is also relevant to this assessment.

4 CONSULTEE COMMENTS

4.1 Historic England

4.1.1 Historic England (HE) were consulted on the Proposed Development by Babergh and Mid Suffolk District Councils in December 2023. HE's Inspector of Historic Buildings and Areas provided comment on the Proposed Development in January 2024 (Historic England Reference P01570041).

4.1.2 HE noted the proximity of the Grade II* Listed Church of St Mary (Asset 6; List Entry 1193823) to the Proposed Development. HE's comments in relation to the historical and architectural interest are reproduced below:

*"*a building with origins in the 12th century as shown by the construction of the nave with considerable work of later centuries including the 14th century west tower.*"*

4.1.3. HE stated that the tower of the Church can be seen from the Site and from Potash Lane to the south, from the *"*undeveloped field*"* which HE considers *"*contribute[s] to the historic significance of the church*"*. With regard to the setting of St Mary's Church the HE response concluded that development on the Site would *"*... fundamentally change that character and so reduce that contribution*"* to the cultural significance.

4.1.4. The group value of the Grade II* Listed Church, along with two Listed Buildings to the north; the 15th century Grade II* Listed Bentley Hall (Asset 3; List Entry 1351964) and late 16th century Grade I Listed Barn (Asset 2: List Entry 1351965), formerly an associated farm building is also identified by HE. HE noted that this group *"*forms an important group set away from the centre of the present village of Bentley...*"*.

HE's comments in relation to the group setting of the Listed Buildings are reproduced below:

"...the church, Hall and barn [are] in a largely rural landscape setting. This setting contributes to their significance by both illustrating this historical development and showing that the listed buildings were built in agricultural land and as a result of the wealth and role they played in an agricultural community. The application site may very well have been in the ownership of Bentley Hall in the past, used as farmland for much of the time but latterly as parkland. This possible historical association which could add to its significance."

4.1.5. HE acknowledges that there is no intervisibility between the Grade I Listed Barn and Grade II* Listed Bentley Hall, however they note that there is a potential historical link, and thus historical interest between the Site and these Listed Buildings. However, HE notes that historical research is beyond their remit, stating that this is *"*something the Council might explore further and give due weight to in terms of the proposed change of land use*"*.

4.1.6. Overall, HE concluded that the Proposed Development *"*could result in harm to the church of St Mary by developing part of its setting which contributes to its historic significance and so not preserve those elements of setting that make a positive contribution to the heritage assets and better reveal their significance in terms of the NPPF, paragraphs 199 and 206*"* although that harm would be considered to be *"*less than substantial*"*.

4.2 Heritage Officer, Heritage Team, Babergh and Mid Suffolk District Councils

4.2.1. The Heritage Officer, part of the Heritage Team at Babergh and Mid Suffolk District Councils provides advice on the historic environment to Babergh and Mid Suffolk District Councils and issued a consultation response in January 2024. The Heritage Officer put forward two conclusions:

*"*1. ...the proposal would cause a low to medium level of less than substantial harm to the significance and setting of designated and non-designated heritage assets due to the change of character of the site from rural to industrial. (emphasis added)

2. The Heritage Officer requested "clarification on the historic relationship between the site and the Bentley Hall group…"

Point 1

4.2.2. The Heritage Officer has indicated in relation to Point 1 the proximity of the Grade II* Listed Church to the Site. The historical and architectural interest of the Church was summed up as follows "a parish church with a nave of 12th Century origin, a 14th Century west tower and south porch, and a chancel of approximately 14th Century date. Various restorations were carried out in the 19th Century".

4.2.3. In relation to the Church's setting the Heritage Officer has stated that "the church yard associated with the Church of St Mary is surrounded by dense planting, and the church tower can be seen as a landmark feature from the bounds of the site and within it.".

4.2.4. The Heritage Officer noted the presence of two other Listed Buildings to the north, namely the Grade II* Listed Bentley Hall (Asset 3; List Entry 1351964) and Grade I Listed Barn (Asset 2: List Entry 1351965). In relation to the historic, architectural and group interest of these buildings the Heritage Officers commented as follows:

"Bentley Hall and its associated outbuildings are one of the best preserved and historically significant Tudor manorial complexes in Britain. The Hall was the medieval seat of the Tollemache family, which established their seat at Helmingham Hall in the 16th Century where the family remains. The earliest part of Bentley Hall dates to the early 15th Century, but most of the building dates to the late 16th Century when it was refurbished as a dower house. The stables, originally a brewhouse, are early 16th Century, and the barn dates to the late 16th Century."

4.2.5. The Heritage Officer further commented on the historic and modern setting of the Bentley Hall group, which is assumed to include the Grade II* Hall and Grade I Barn as well as other non-designated buildings (the Heritage Officer does not expand further on this issue):

"The landscape setting of the Bentley Hall group is known to be closely related to the historic seigneurial landscape of the Hall, with a grand avenue approach to the Hall from the north, flanked by the large barn which would have been replicated on the western side of the road. This avenue is now Old Hall Lane. The group is highly significant, and the landscape setting makes a positive contribution to their significance. The landscape north of the site is also identified as parkland associated with Bentley Park on historic, 19th Century, OS maps."

4.2.6. The landscape setting of the Bentley Hall group, the Church as well as the Grade II Listed Maltings House (Asset 14; List Entry 1033427); Maltings Farm (Asset 13; List Entry 1033426); and Maltings Cottage (Asset 12; List Entry 1351929) is also considered by the Heritage Officer whose comments on how their collective setting can be appreciated in the current landscape are as follows:

"The addition of the railway in the mid-19th Century effectively cut off Bentley Hall from the Church. The section of rail connecting Bentley to Hadleigh was made redundant in the Beeching cuts, however its route and interchange can be seen on the ground, and the public footpath north of the site to the west of Church Road partly follows the route of the dismantled railway line. A bridleway bounds the west side of the western site, and the network is connected to rights of way moving through the landscapes of Bentley Park and Bentley Hall. The network carries through to the road network and across the current railway line to Maltings House to the east, and a loose group of Grade II listed buildings including Maltings Farm and Maltings Cottage. It is therefore highly likely that the application site(s) will be widely experienced in the context of the historic landscape settings of the listed assets whilst using the public right of way network."

4.2.7. The Heritage Officer also identifies six Buildings of Local Significance (Assets 69 & 88-92) identified within the Bentley Neighbourhood Plan, which are acknowledged in the HIA, as being very close to the Site and notes that the HIA also identified the non-designated Grove Farm (Asset 70) and Church Farm (Asset 68) and the AWI Engry Wood (centred Asset 58).

4.2.8. The Heritage Officer notes that "The presence of these designated and non-designated assets within the surrounding agricultural landscape adds to their historic significance, and the loss of the rural character of the landscape [through the construction of the proposed Development] would therefore be to their detriment."

4.2.9. The Heritage Officer concluded that "The proposal is likely to cause harm to the significance and setting of the Church of St Mary, the manorial group of highly graded listed buildings associated with Bentley Hall, and the various nearby non-designated assets" and that "at this stage I am not convinced that there is any scope for the proposed solar farm in this location, due to the potential for harm to the significance and setting of several heritage assets". The Heritage Officer concludes that there would be "a low to medium level of less than substantial harm to the significance and setting of designated and non-designated heritage assets".

Point 2

4.2.10. The Heritage Officer stated that "for a more precise assessment of the potential harm, a more exact understanding of the relationship between the sites [assets] and Bentley Hall is needed".

Points of Clarification

4.2.11. Further discussion on the points raised in relation to specific heritage assets is provided below. However, further points of clarification are required in relation to comments made by the Heritage Officer in relation to elements of the Proposed Development and/or information provided in the HIA. The Heritage Officer stated that:

"The proposed infrastructure, fence, gateways and substation, as well as the solar arrays (which are described as up to 3 metres high) are likely to transform the field sites from a rural into a more industrial landscape. The harsh reflective materials, angular support structures, security fencing, and any hard surfacing would contrast sharply with the current character of the open farmland. This will have an adverse impact on the tranquillity and agrarian character of the surrounds in which the heritage assets are experienced, and could reduce the contribution the setting makes to these heritage assets to the detriment of their significance.".

4.2.12. Whilst it is acknowledged that a change in land use should be considered in terms of heritage and the settings of heritage assets the majority of this statement relates to an assessment of landscape character and experience (HE, 2021: 13). The agrarian character of the landscape is considered in so far as it is relevant to the setting of heritage assets but issues such as tranquillity are more appropriately considered in the LVIA and are not considered in detail either by the HIA or this SHA.

4.2.13. The Heritage Officer also noted potential impacts of lighting on the setting of heritage assets. The Proposed Development would not include any night time lighting and as such this comment is not relevant.

4.2.14. Further the HIA is noted as being contradictory in its conclusions on settings impacts. However the paragraph quoted as evidencing this apparent contradiction has not been presented in terms of its broader context and conclusions in relation to different heritage assets. The conclusions summarised in the Non-Technical Summary (NTS) are not contradictory, but refer to the varied levels of impact identified on a range of assets. For clarity, the first sentence of paragraph 1.8 of the HIA is concerned with most of the designated heritage assets and states:

*"*Site visits undertaken for this assessment suggest that the Proposed Development would not be clearly visible from most of the designated heritage assets and buildings of local significance within the surrounding area and, consequently there would be no effects upon their setting.*"*

4.2.15. The second sentence of Paragraph 1.8 states that: "Potential Low effects upon the settings of the Grade II* Listed Church of St Mary (Asset 6) and Maltings House (Asset 14) have been identified during this assessment."

4.2.16. The third sentence of paragraph 1.8 states that "Potential Neutral effects upon the settings of the Grade I Listed Bentley Hall Barn (Asset 2), and the Grade II* Listed Bentley Hall (Asset 2) and its adjacent Meeting Hall Stables (Asset 4) have been identified during this assessment.".

4.2.17. The following sentences of Paragraph 1.8 then refer to "six buildings of local significance" and again are separated by identified level of effect.

4.2.18. The NTS concludes by stating that where harm has been identified it would be considered less than substantial in all cases. Further detailed information about how the level of harm has been identified and assessed is provided within Section 6.2 of the main HIA report.

4.3. STOP GROVE FARM

4.3.1. The local group known as STOP GROVE FARM (hereafter the "Group") provided comments on the application. The comments include those related to heritage which will be summarised and discussed further as part of this SHA, as well as questions and comments on other topic matters which are not related to heritage and thus fall beyond the scope of this assessment and will not be discussed further.

4.3.2. The Group note that they agree with the conclusions of the Heritage Officer's statement that they are "not convinced that there is any scope for the proposed solar farm in this location".

4.3.3. The Group assert that the submitted HIA is superficial and suffers owing to a lack of critical winter views which they consider has led to 'erroneous and incomplete conclusions'. The Group also note that the setting of a heritage asset is not dependent on intervisibility and that views 'across land to a heritage asset or a progressive approach to a heritage asset are perfectly capable of being directly relevant to the setting of that asset.' The HIA does include a statement in relation to the likelihood of increased visibility in winter months and included that allowance as part of the assessment of impacts upon the settings of nearby designated and non-designated assets (AOC, 2023, Section 6). The HIA also includes discussions of the wider settings of designated and non-designated heritage assets, including approach routes and the character of the surrounding landscape, as part of the assessment of the contribution that these elements make to importance of the assets (ibid).

4.3.4. With regards to the ancient woodlands the Group acknowledge that they are mentioned in the HIA but note that the rarity of their survival is not assessed. They provide detail on the historical ownership in relation to fifteen woodlands includes on the Ancient Woodland Inventory (AWI), the named one being Engry Wood (centred Asset 54) and conclude that 'Open views to Engry Wood cross the western part of the site will be lost forever'.

4.3.5. The Group note the location of designated and non-designated buildings within the vicinity of the Site and provide an analysis of the settings of the Church (Asset 6), the Bentley Hall Group (Assets 2 & 3), the Grade II Listed Malting House (Asset 14), as well as the Buildings of Local Significance (Assets 88-92) mentioned above and the non-designated Falstaff Manor (Asset 69) and Church Farm complex (Asset 68).

4.3.6. The Group highlight that Church Farm and Barn (Asset 68) are not included within the assessment of Buildings of Local Significance within the HIA. However the buildings are not included on the list detailed in the published Neighbourhood plan (https://prod-

babergh.baberghmidsuffolk.dp.placecube.com/documents/d/babergh/bentley-np-ref-version) and thus were assessed and referred to as non-designated assets in the HIA.

4.3.7. With reference to the setting of the Church, the Group have provided further information regarding the vegetation that obscured visibility of the Church in views from the south at the time of the site visit that informed the HIA. They note that that much of this vegetation comprises overgrown conifers and other ornamental garden trees which were planted in the 1970's. It is understood that some of the trees have since been felled and vegetation reduced and that the setting of the church has now changed, and this will be addressed within this SHA.

4.3.8. The comments in relation to the HIA also focus on what the Group sees as an omission of an assessment of the impact of the Proposed Development on ancient woodland and the woodlands association to the Tollemache family associated with the Bentley Hall group of assets; and an omission of consideration of assets and their settings being appreciated from public rights of way. While it is acknowledged that some further detail regarding the setting of heritage assets would have been beneficial to the HIA (and is accordingly provided below) it is noted that some of the comments from the Group relate to how the designated heritage assets in the vicinity of the Proposed Development will be viewed from public rights of way. As explained within HE's 2021 guidance, the impact of how the landscape, and elements thereof, are appreciated from public rights of falls largely under the remit of an LVIA assessment (HE, 2021:13) and thus has not formed the focus of the heritage assessment.

5 SETTINGS ASSESSMENT

5.1 Grade II* Listed Church of St Mary (Asset 6; List Entry 1193823)

5.1.1 The Grade II* Listed Church of St Mary (Asset 6; List Entry 1193823) is located c. 100m north of the Site. The List Description is contained within Appendix 2 of the HIA and is thus not repeated here in full. In summary the Church is of 12th century origin within 14th century additions including a square tower and later 19th century alterations. Based on the Listing Description the Church's significance relates to its exceptional historic and architectural interest, although some significance relates to its setting, however this is not explained within the Listing Description.

5.1.2 The Church is located within the centre of a churchyard which is bordered on all sides by mature trees and vegetation. Historically, this churchyard is documented extending c. 65m north of the Site on both the tithe map and Ordnance Survey maps. Historic maps indicate that the churchyard was likely occupied by trees and vegetation and was treelined by the 19th century, possibly by the end of the 18th century (Hodkinson's 1783 map of Suffolk). HE's guidance on churchyards (HE, 2023) suggests that medieval churchyard remains are limited and what remains of churchyards largely reflects the post-medieval plan and design of these spaces as gardens of the dead and memorials often with uniformity of monument design, choice of stone and architecture which reflects the local population, thus providing a key historical resource, which are now "valued as places for quiet reflection, as green spaces, and for their wildlife interest". The HIA stated that "churchyard, monuments and enclosed plot of land contribute to the aesthetic value [of the Church] by creating a space within which the architectural detailing and materials can be appreciated, as well as enhancing the experience of the church as a sanctuary and enclosed retreat from the wider environment". This is the near setting of the Church and allows for an appreciation of its main function, as an ecclesiastical and religious structure associated with burial and for an appreciation of its historic and architectural interest.

5.1.3 The trees along the southern edge of the churchyard, along the northern side of Church Farm Road and the hedgerows to the south of the Church were reduced in height in February 2024 (per comms, 2024). The reduction

in the height of the vegetation to the south of the Church and churchyard has an adverse impact on the enclosed religious and memorial space which was historically created around the Church.

5.1.4 HE note that the Church is part of a group of Listed Buildings associated with the hamlet of Bentley, which is annotated as "Bentley" on historic mapping to the north of the Site and should not be confused with the modern settlement of Bentley to the south. This indicates group value with the Bentley Hall group of assets, which originated in the Tudor period as the medieval seat of the Tollemache family. The Church, which has been standing since the 12th century appears to have been appropriated and altered by the family rather being constructed for the family and the core group of estate buildings. Churches and chapels are common features of medieval and post-medieval estates complexes in England, and it is likely that following the development of the Bentley Hall group of assets the Church was appropriated in part as a familial church, rather than being solely associated with the wider area and population. This grouping is depicted to the north of the Site on historic mapping, with these three structures, as well as other ancillary buildings, being depicted within a defined area, illustrated as being something resembling a planned garden which extended to the north, since at least the late 18th century (Hodkinson's 1783 map of Suffolk reproduced by AFA, 2019: Map 1). The garden and landscaping around this group of buildings is still, in part, in existence , even though a railway once cut the Church from the Tudor manor in the late 19th and early 20th century. The familial relationship of the Tollemache family between the Church, churchyard and Bentley Hall group is also well established by the presence of burials within the Church and churchyard. As such there is a well defined and easily appreciable relationship between the Church and the Bentley Hall group of assets to the north.

5.1.5 The Site is located in agricultural land which would have surrounded the planned gardens and extent of the Bentley Hall group of assets. This a common feature of manorial estates in England, with the productive land associated with estates often found to encircle or be screened from view from the core of the estate. In the Romantic era of the late 18th and early 19th century, landscape designers moved away from the more formal grandeur of classical gardens and aimed to capture more open views of "nature" which often extended to include elements of the agrarian landscape such as sheep pastures. However these features remained divided from the core of the estate by design features such as ha-has and the design of most landscaping around the core of estates took cognisance of the need or desire to screen or block views of the "working" environment. As such, whilst the Site can be understood as land historically associated with the Bentley Hall group of assets, it was likely never intended to be seen from those assets. The historical association between the assets is thus best understood through study of land registers and ownership awards within archival material and on historic mapping.

5.1.6 The setting of the Church (prior to the development of the Bentley Hall group of assets) when originally constructed is in part unclear. Church towers are often thought to have been designed to be seen beyond the churchyard boundary, in part to be seen by local populations to remind them of the presence and importance of the church in daily life (Gerrard and Gutiérrez 2018), although when initially constructed in the 12th century the tower would not have been present. The Church originated as a parish church, likely on the roadside and would have been an ecclesiastical and administrative foci for the local likely agrarian community prior to the 14th century. The addition of the tower, whilst not uncommon, would have increased the prominence of the religious structure in the landscape. However, to what extent portion of the structure would have been visible, in all compass directions, would have depended entirely on the surrounding vegetation at the time, of which there is little information. It can be concluded that the Church may have been more visible from the 14th century onwards but from what directions is unclear. The Site was likely part of the agrarian land which surrounded the Church. However, it is unlikely that this was ever considered a design feature when the Church was initially constructed. The construction

of the Bentley Hall group of assets makes it difficult to appreciate and understand how the Church was once viewed from the north prior to their construction and the development of landscaping.

5.1.7 The Proposed Development would be located in agricultural land close to the southern boundary of the churchyard, which has been agrarian in nature likely since the construction of the Church. However, when initially constructed the surrounding land is unlikely to have been considered part of the design of the Church. Over time the Church became associated with the Bentley Hall group of assets to the north and the Tollemache family, who owned the surrounding land, including Falstaff Manor and the Site. This association thus postdates the establishment of the Church and is largely focussed on land and properties set to its north. Being of a later date does not make the historical associations any less important but does, however, allow us to appreciate that the setting of the Church and its associations with surrounding land have changed over time.

5.1.8 The Church tower and its visibility from the wider area is part of the wider setting of the Church. The HIA found that the Church tower was not visible from within the Site during a walkover survey. However, it was acknowledged that there may be intervisibility during winter months when vegetation is not as mature or dense. The HIA acknowledged, therefore, that the Proposed Development would be an appreciable change in land use in the setting of the Church, and that the Proposed Development would be visible in views northwards from breaks in the vegetation lining the northern side of Potash Lane providing vehicular access into the Site, towards the Church (Axis, 2023: LVIA Figure 11d(ii)). Figure 11d(ii) also shows that the top of the tower would still be visible from Potash Lane beyond the extent of the proposed solar panels in the case that the breaks in the vegetation along the northern side of Potash Lane are maintained. Figure 11d(iii) does indicate that if the breaks are filled in the visibility towards the Church from the breaks along the northern side of Potash Lane would indeed be lost. It might be considered that breaks are maintained to allow for visibility, however, the vegetation along Potash Lane has likely altered and changed over time and the current break and intervisibility may only be representative of a short period of time in the Church's history. Based on historic mapping, Potash Lane itself may only be of late 18th or early 19th century date and thus was not an appreciable viewpoint for the Church and its tower when the church or indeed the tower was constructed. From within the vegetation line, within the Site, within historically agrarian land in Figure 11d(iii) there are likely to still be views of the church tower.

Extract from LVIA Figure 11d(i) highlighting the top of the Church tower (purposefully not zoomed in)

5.1.9 The site visit in May 2024 confirmed that the Church tower is visible from some areas in the eastern portion of the western field (Plates 1-2) of the Site, and that the Church (Plates 4-5) is visible from opposite the Church on Church Farm Road (Plate 8) and the road leading to Little House (Asset 89), Bentley House (Asset 90) and Glebe Cottage (Asset 91) with some restricted views from outside the churchyard on Church Road (Plate 3). The Church tower could not be seen from the eastern field (Plate 10), around the Site (Plates 7, 9, 11-12), or from nearby public footpaths (Plates 13-15). Also, while the grounds of Bentley Hall (Asset 3) were not accessible during the Site visit

no visibility of the Church tower was found from Church Road outside Bentley Hall, from Bentley Hall Barn (Plate 16) or from the entrance to Bentley Hall (Plate 17). Therefore, this assessment has confirmed that the Church is not a prominent feature in the wider landscape nor do there appear to be any key or planned views of either the Church or its tower from across the landscape. The Church is currently located within a private/intimate setting, and even allowing for increased visibility in winter months, when trees are not in leaf, there are only a few views locations in the immediate vicinity of the Church, including Church Farm Road and Church Road from which the architectural form of the Church can be appreciated. The recent felling of trees in the vicinity of the Church has increased visibility of it from the eastern portion of the western field within the Site. This recently opened view would be changed as a consequence of the Proposed Development as the Church would be viewed across and beyond the modern solar array. This would change the experience of the view of the Church tower from this location within the Site. However, it is important to consider that this view is from within a large scale agricultural field and not readily accessible or identifiable as a key view towards the Church from the surrounding area. Despite the recent felling of trees in the vicinity of the Church the remaining vegetation and trees blocking the views of the Church in the wider landscape continue to limit the ability to appreciate its historical medieval setting as well as the relationship of the Church with the Bentley Hall Group during the post-medieval period. Outwards views at ground level from the churchyard towards Bentley Hall are blocked by trees, vegetation and Little House (Asset 89) (Plate 19).

5.1.10 The HIA concluded that there would be "at worst, Low effect upon the setting of the Church of St Mary. This Low effect would cause a level of harm that is considered to be 'less than substantial' in NPPF terms. The less than substantial harm will require to be weighed against the public benefits of the Proposed Development in line with Paragraph 202 of the NPPF.". The recent felling of trees has resulted in a slight increase visibility of the Church from across the surrounding landscape. However this increase in visibility does not change the way in which the Church is understood, appreciated and experienced within the modern landscape. The conclusion reached in the HIA that the Proposed Development would result in 'less than substantial harm' is maintained within this assessment and it is concluded that the level of less than substantial harm would be towards the lower end of the scale.

5.2 Bentley Hall Group

5.2.1 The Bentley Hall Group of assets includes the Grade I Listed Barn and the Grade II* Listed Bentley Hall and together they have been described as "represent[ing] one of the best preserved and historically significant Tudor manorial complexes in Britain" (DC/22/03371, 02 August 2022).

5.2.2 In addition to their intrinsic evidential and aesthetic value, The Bentley Hall Group of assets derive a large proportion of their significance from their immediate setting within the manorial complex and group of associated buildings (including the barn and the Church), in which their historical role at the centre of the manorial estate is best understood. The 12th century Grade II* Listed Church of St Mary to the south appears to have been associated with the Tollemache family, owners of the Bentley Hall group of assets from the 15th century. The Church, which likely originated as a parish church, appears to have been appropriated into the manorial complex from the late medieval period and is shown within the southern extent of planned gardens on historic maps from the 18th and 19th centuries. Thus, the Church and the manorial complex have an associative historic relationship.

5.2.3 It is currently very difficult to experience or understand these relationships directly from the direction of the Site, due to the lack of public access to, or visibility of the asset, within its primary setting. The HIA noted that by at least the 19th century the manorial complex was located within a landscape setting, which based on historic maps appears to have been in part formed by planned gardens within a defined area (which is shown on late 18th century

cartography although this is somewhat schematic in nature). Ordnance Survey mapping from the 19th century shows a railway adjacent to the complex.

5.2.4 The main entrance to the manorial complex followed an avenue, what is now known as Old Hall Lane, which suggests that the designed entrance to the complex was from the north and north-east. The architecture and plan of the manor complex further demonstrate that this was designed as the primary direction for interaction with the building. The asset is considered to be most sensitive to changes to elements of its setting comprising the immediate surroundings of the manorial complex and its designed entrance to the north. Despite geographical proximity, the Site lies beyond these 'nested' settings and, while forming part of its broader landscape context, is considered to make a relatively modest contribution to the significance of the asset and the way in which this significance is understood and experienced.

5.2.5 None of the Bentley Hall Group of assets are visible from the Site and indeed the land within the Site is unlikely to have been designed or framed to have been seen from within the manorial complex, the opposite more likely being true. The site visit could not confirm views of the Church or the church tower from Bentley Hall as it was not publicly accessible. However, no views of the Church or the Church tower were confirmed from either outside Bentley Hall and Bentley Hall Barn (Plates 16-18) as outward views towards the Church and the Site are blocked by mature trees and vegetation. The visit did not identify any legible physical relationships between the Site and Bentley Hall (Plates 1-2) or between the Church and Bentley Hall (Plate 18).

5.2.6 Pre-application advice received from the Heritage and Design Officer at Babergh and Mid Suffolk District Council in relation to the Proposed Development dated 2nd August 2022 noted that 'The extent of the assessed impact of the proposal upon the setting of the manorial group at Bentley Hall will depend upon the role or connection of the site with these buildings'. A review of historic landownership has indicated that the land within the Site was originally associated with the owners of Bentley Hall but that by the late 19th century it was owned by and farmed in association with Falstaff Manor. While Falstaff Manor was historically owned by the Tollemache family, it appears to have operated as a satellite farm and was a separate entity by the 1830's. As such while the land within the Site has historical associations with the owners of the Bentley Hall group of assets, this relationship is best appreciated through a study of land registers and ownership awards within archival material and historic mapping. The role of the site as agricultural land controlled and operated by Falstaff Manor from the 19th century onwards remains appreciable and legible on the ground.

5.2.7 The Proposed Development would be located within agricultural land, which was once owned by the Tollemache family; but which has been farmed and controlled since the 19th century by the owners of Falstaff Manor and is not readily legible in the modern landscape as land directly associated with the Bentley Hall group of assets.

5.2.8 The Proposed Development would occupy land within one direction (south) from the manorial complex, with no intervisibility with the Site, the HIA judged the Proposed Development to have a Neutral impact on the setting of the Bentley Hall group of assets. Neutral impacts are considered to be "perceptible change[s] [that do] not diminish or enhance the significance of the asset or the ability to appreciate its significance". Indeed, the Proposed Development would be a perceptible change to the wider landscape as a result of a change in land use, however the wider physical and historic relationship of the Site to the Bentley Hall group of assets will survive on historic mapping and archival materials. It is maintained that the Proposed Development would not result in harm to the setting of the Bentley Hall assets.

5.3 Maltings House (Assets 14) Maltings Farm (Asset 13) and Maltings Cottage (Asset 12)

5.3.1 The Grade II Listed Maltings House (Asset 14) is a 16th century timber framed house. The HIA considered the House to "derive a great deal of its significance from its historical and architectural value (as it retains elements of its original 16th century construction)" as detailed in the Listed Description and was "also considered to derive significance from its rural setting adjacent to the winding Church Road".

5.3.2 When constructed the House would have been one of several dispersed, roadside dwellings in the wider landscape. Historic mapping illustrates the House on the western side of a road to the east of the hamlet of Bentley, to the north of the Site, centred on the Bentley Hall Group of assets in an agrarian landscape occupied by roadside settlements. The House is described as a "Cottage Garden and Yards" in the tithe apportionment and the immediate surrounding land in all compass directions is recorded under the same ownership and tenants indicating that land under control of the House extended up to the railway to the west. Maltings Farm (Asset 13) and Cottages (Asset 12) are located to the east and together form a small and loose group of Listed Buildings associated with Maltings House. The Ordnance Survey map illustrates the House within a polygonal area with pictograms of tree suggesting that the House was surrounded by a planned garden. The House is currently located within a rectangular plot of land defined by a hedgerow.

5.3.3 While parts of their surrounding agricultural setting contribute a proportion of the significance of the assets, the majority is derived from the intrinsic evidential value of their surviving architectural fabric and the buildings are important as examples of the local diversity of style typically seen in farmstead forms (HE 2014). In accordance with the general principles applied to the selection of Listed Buildings (i.e. buildings of demonstrable special interest), buildings of this age that retain a significant proportion of their original fabric are recognised as significant due to limited survival rates and therefore rarity. The site visit established that the Malting House is set within a garden plot on the top of a slope with long southward and south-westward views which include the Site and modern infrastructure in the form of electric pylons and overhead cables. While the visibility of the Site at ground level from the footpath leading from the Malting House towards the Railway Line was somewhat screened by a mature oilseed rape crop at the time of the visit (Plate 23), Maltings House is clearly visible from the eastern field as demonstrated by Plate 24. There is no visibility of the Site from Maltings Farm (Asset 13) or Cottages (Asset 12), or on approach to these assets along the road.

5.3.4 The Proposed Development would not be located immediately adjacent to the House, and thus the garden and near surrounding agricultural landscape setting of the House would be maintained. Modern service infrastructure is already visible from the House, Farm and Cottages, and these additions to the landscape are often considered as necessary for modern day life and accepted into the settings of designated heritage assets. The Proposed Development as shown on LVIA Figure 11l Viewpoint 12 from a footpath to the west of the House illustrates the agricultural land around the House. The Proposed Development in this view would be limited to one element of the Proposed Development, the DNO substation, which would be seen in association with a modern overhead line, with the remaining elements being screened by mature vegetation and a change in topography to the west (see LVIA Figure 5). Whilst this would be a new addition to agricultural landscape in one direction, the DNO substation would be located along the tree line, thus preserving the immediate surrounding agricultural land around the House. The land to the north, east and south would be unchanged and would continue to contribute to the historic and modern agricultural setting of the House. There would be no visibility of the proposed Development from Malting Farm and Cottages or on the approaches to these assets and as such a neutral effect is anticipated.

5.3.5 The HIA judged there to be "at worst, Low level of effect upon the setting of the Maltings House (Asset 14)…" which would lead to a "level of harm that is considered to be 'less than substantial". Whilst one element of the Proposed

Development would be intervisible with Maltings House, the elements of setting which provides significance to the House would survive and remain legible in the landscape and on historic mapping. It is maintained that the impact of the Proposed Development on the House would result in 'less than substantial harm', and if considered on a sliding scale would be towards the lower end of that scale.

5.4 Red Cottages and Potash Cottages (Asset 88)

5.4.1 Red Cottages and Potash Cottages (Asset 88) are noted in the HIA to be the only Buildings of Local Significance to have intervisibility with the Site. The Bentley Neighbourhood Plan and HER entry states that these buildings "are a run of charming red-brick houses at right-angles to each other on Potash Lane, possibly attached to Falstaff Manor. Red Cottages were named for the startling colour of their new bricks, and the centre cottage has a brick dated 1818 in the fireplace. Potash Cottages are potentially earlier, 17thC, but have been much altered over the years".

5.4.2 Based on this description, the Cottages' significance relates primarily to their architectural and historical value as well as their group value. Their potential association with Falstaff Manor (Asset 69) is noted and their setting does provide some value to the Cottages local significance.

5.4.3 The Cottages are located on Potash Lane, and likely originated as post-medieval roadside dwellings, common to the wider landscape such as Malting House (Asset 14). Potash Lane itself, based on historic mapping is likely to date from the late 18th or early 19th century.

5.4.4 The Cottages are not well documented on pre-tithe mapping. The tithe map and apportionment depict the Cottages and documents them within Plots 205 and 206, as "Cottage garden" and "yard and garden" respectively. These gardens form the immediate setting of the Cottages. The owners and tenants for both plots are different, indicating different occupation in the mid-19th century. Indeed, the Cottages may never have had the same owner. Based on the tithe apportionment the Cottages were not associated with Falstaff Manor in the mid-18th century with the immediate surrounding land having mixed ownership encircled by land documented as being owned by the owner of Falstaff Manor.

5.4.5 The Cottages were constructed in an agricultural landscape, occupied by dispersed and roadside dwellings. This wider setting is largely retained in the modern landscape, with the land use having undergone very little change in the post-medieval and modern periods. A site visit found that Red Cottage and Potash Cottage were not identifiable from the eastern field (Plate 25) as they are well screened by tall trees and vegetation along Potash Lane, although there would likely be limited views of the Proposed Development through the vegetation breaks from the top floor of the north facing elevations (Plate 26).

5.4.6 The Proposed Development would be an appreciable and perceptible change to the land to the north of the Cottages, although in the long term as indicated by LVIA Figure 11d(iii), taken from the north-west of the Cottages along Potash Lane, and which shows that the Proposed Development would be screened from view by mature vegetation. The Proposed Development would not alter the land use to the east, south or west of the Cottages and thus the wider historic setting of the Cottages would be preserved in those directions.

5.4.7 The HIA acknowledges that the Proposed Development would have a Medium impact on the setting of the Buildings of Local Significance. Buildings of Local Significance are not designated heritage assets and thus are not subject to the NPPF policy test (DLUHC, 2023: Para 208). However, impacts to local designations and non-designated heritage assets should have 'regard to the scale of any harm or loss and the significance of the heritage asset' (DLUHC, 2023: Para 209). The HIA concluded that the main elements of significance associated with the Cottages would not be impacted by the Proposed Development. This SHA agrees with the findings of the HIA which

indicated that the proposed development would result in a medium adverse impact to the wider setting of these non-designated assets. The Cottages are not designated assets and therefore the NPPF policy test in relation to harm does not apply.

5.5 Little House (Asset 89), Bentley House (Asset 90) and Glebe Cottage (Asset 91)

5.5.1 Little House (Asset 89), Bentley House (Asset 90) and Glebe Cottage (Asset 91) are each identified as Buildings of Local Significance described in the Historic Environment Record (HER) as having group value as a 'cluster of dwellings focussed on the church'. The HIA states that the settings element which provides these building with significance is their relationship to the Grade II* Listed Church (Asset 6; List Entry 1193823). This relationship is also highlighted along with the building relationship to the Bentley Hall Group of assets by the STOP GROVE FARM Group. Whilst the Proposed Development may or may not be visible from these Buildings of Local Significance (no intervisibility noted during the Site visit due to intervening vegetation and the Church – Plates 27-29) the Proposed Development would not impede the way in which this relationship is understood and thus their significance would not be impacted.

5.5.2 This SHA agrees with the conclusion of the HIA that "The level of effect upon these buildings is assessed to be, at worst, Neutral due to them deriving most of their significance from their architectural, historical and communal value with each other and the church". It is also noted that as these buildings are not designated assets the NPPF policy test does not apply.

5.6 Uplands Farmhouse (Asset 92)

5.6.1 Uplands Farmhouse (Asset 92) is identified as a Building of Local Significance. The original structure is not depicted on the Ordnance Survey map published in 1904 but is annotated and depicted on the OS map published in 1928, suggesting that the core of the building is early 20th century in date.

5.6.2 The building is described in the Bentley Neighbourhood Plan (BPC, 2022) as having "won awards for its Contemporary modernist architecture. Its Pevsner[1] entry reads: Traditional materials (red brick ground floor, first floor clad in oak and tile), less traditional form (bedrooms as separate elements under their own mono pitch roofs; full-height glazing, partially screened). Pergola link to Japanese tea house on east side.". Based on this, the significance of the building relates to its architectural and aesthetic value. Its significance in terms of its setting would relate to its immediate surroundings.

5.6.3 The Proposed Development would be located to the south and may at times (dependant on variable levels of vegetation cover) be intervisible with Uplands Farmhouse. It is assessed, however, that the visibility of the Proposed Development would not inhibit the ability to understand and appreciate the elements of value (i.e. primarily its architectural value) which provide the building with significance. The conclusions of the HIA of a Neutral impact are maintained and it is also noted that as this building is not a designated asset the NPPF policy test does not apply.

[1] Refers to Nikolaus Pevsner who produced architectural guides in the 20th century- https://www.britannica.com/biography/Nikolaus-Pevsner

5.7 Falstaff Manor (Asset 69)

5.7.1 Falstaff Manor (Asset 69) is identified as a Building of Local Significance and is described in the Bentley Neighbourhood Plan (BPC, 2022) as "one of the original manors in Bentley, mentioned in the Domesday Book as being owned by the King; after the Conquest, it was gifted to Count Alan. The house and its setting is clearly mediaeval." The HER entry for Falstaff Manor describes it as a farmstead inclusive of detached farmhouse, and notes that there has been significant loss of historic working buildings in favour of modern structures. The buildings at Falstaff Manor are assessed collectively as part of a farmstead complex.

5.7.2 Falstaff Manor is recorded as being owned by the Nacton family prior to the Tollemache family, of the Manor of Bentley Hall in at least the early 17th century. As such Falstaff Manor was likely a subsidiary or associated farmhouse associated with the Bentley Manorial complex from at least that date. Documentary evidence detailed in the HIA indicates that the land within the Site was associated with Falstaff Manor in the late 19th century (HE402/1/1879/69) though the tithe apportionment indicates that by the 1830's Bentley Hall and Falstaff Manor may have had different owners and were different landholdings.

5.7.3 Verron's map of 1796 depicts Falstaff Manor as a building within a polygonal plot of land to the east of a north-south road, likely Church Road to the south-east of "Bentley" hamlet. The buildings at Falstaff Manor, are illustrated on the parish tithe map (1838) and are recorded as "Yards and Garden" (Plot 223) owned by Benjamin Keene who is also documented as owning the surrounding agricultural land. The buildings depicted on the tithe map include four rectangular structures within a polygonal plot south and north of roads. One structure is aligned east-west, parallel to the road to the north, associated with two north-south aligned structures and a T-shaped building.

5.7.4 The Ordnance Survey map published in 1882 depicts the largest structure (Reference no. 151) as a polygonal structure with an additional (identified by its different colour) l-shaped extension, which appears to face southward with two southward facing courtyards associated with at least three ancillary structures to the east, one of which is annotated Reference no. 152. A road, Church Road, is depicted to the west and Falstaff Manor appears to have its own entrance drive, which extends in an east-west alignment from Church Road, opposite to Potash Lane which also provided access to another building to the east annotated as "Frog Hall". A pond is depicted at the road junction to the south-west of the main house and pictograms of trees around the main house, and road to Frog Hall indicate that the immediate surroundings of the buildings were once landscaped. The depiction of the buildings in 1882 is dissimilar to that depicted in 1838. This might suggest the buildings underwent considerable alteration in the intervening period, or that the buildings were entirely demolished and replaced in the same period.

5.7.5 An archival reference to "Falstaff Manor Farm", likely Asset 69 dated 1910 (HE402/1/1910/50) describes the building therein as "comprising residence, agricultural buildings. four cottages".

5.7.6 Ordnance Survey maps of the 20th century indicate that the largest building at Falstaff Manor underwent very little change in that period, although several later buildings are depicted on the north and west on maps from the 1970's. These may include the modern agricultural buildings identified from satellite view and detailed in the HIA.

5.7.7 Falstaff Manor (Plate 32) was visited on the 2nd May 2024. Visibility towards the Site from the grounds and top floors of the Manor House was found to be very limited due to the presence of intervening trees and vegetation. Although the visit was undertaken during the summer months when vegetation was in leaf, the density of vegetation when viewed from Falstaff Manor is such that it would also likely block visibility in winter months. The landscape when viewed from Falstaff Manor can also be seen to have altered by modern infrastructure such as

electric pylons, overhead cables and modern agricultural buildings (Plates 29-31). Views toward the Site at ground level are blocked by buildings and vegetation.

5.7.8 The historic setting of Falstaff Manor is two-fold and consists of a core and wider setting. The core setting includes the surviving historic buildings, their inter-relationship, surviving planned features such as ponds and surrounding planned gardens as well as access routes, though it is noted that the historic access to Falstaff Manor has been altered to focus on the extant buildings, rather than providing additional access to Frog Hall. These elements of the near landscape enable an appreciation of how the buildings were used and functioned. The immediate surrounding agricultural land and the proximity of a routeway also forms part of the core setting as these landscape features are key to understanding the rural and agricultural nature of Falstaff Manor in the post-medieval, and likely in the medieval, period. The wider historic setting of Falstaff Manor relates to the rural, agrarian and dispersed settlement pattern in the wider landscape and historic associations to nearby landholdings. At present the wider landscape, which survives as a relatively unchanged agricultural landscape, echo's the historic landscape and thus the location of Falstaff Manor within the wider rural landscape is easily appreciable. However, without archival documentation the association between Falstaff Manor and the Bentley Hall manorial complex is not well appreciable on the ground other than by their proximity to one another, which is not wholly legible as both are screened from view from the roadways.

5.7.9 LVIA Figure 11a(i) indicates that from the entrance to Falstaff Manor, a break in the adjacent hedgerow would allow for visibility of the Proposed Development in the short term. The Proposed Development includes plans to replant and consolidate the hedgerow and Figure 11a(ii) indicates that once that hedge is mature, the Proposed Development would be screened from view in the longer term.

5.7.10 The Proposed Development would have no impact on the core setting of Falstaff Manor. The Proposed Development would be located to the west and north of Falstaff Manor and thus change the land use in two directions. The land to the east and south will retain its agricultural land use and the historic setting would be unchanged in these direction. The HIA concluded that the "level of effect upon [Falstaff Manor] is assessed to be, at worst, Low due to it deriving most of its significance from its historical value and architectural value with the wider landscape beyond its immediate enclosed setting deemed to be of lower importance". This assessment concurs with the conclusion reached in the HIA. Buildings of Local Significance are not designated heritage assets and thus are not subject to the NPPF policy test (DLUHC, 2023: Para 208).

5.8 Church Farm and Church Farm Barn (Asset 68)

5.8.1. The HIA identified Church Farm as a non-designated heritage asset which had been recorded as an historic farmstead during the 'Farmsteads in the Suffolk Countryside Project'. The STOP GROVE FARM Group has stated that the Farm and associated Barn are listed as Buildings of Local Significance, however, unless the buildings are known by a different name, not disclosed, then neither Church Farm or Barn are listed by Bentley Parish Council as Buildings of Local Significance. The buildings were assessed in the HIA as non-designated heritage assets and it is maintained that this was correct and appropriate.

5.8.2. Church Farm and Barn appear to have been built sometime between the publication of the tithe map of 1832 and the Ordnance Survey map of 1882, indicating a mid to late 19th century date of construction. When constructed the buildings were bound to the west by Engry Wood (centred Asset 54) to the north and south by agricultural fields, which are bound to the north by a railway is depicted bounding the southern extent of the planned gardens around the Bentley Hall group of assets; and to the east by a portion of planned gardens associated with the Bentley Hall group of assets which extended south of the railway. A roughly north-west, south-east aligned road is depicted to the south which provided access to the buildings.

5.8.3. The HER entry for the buildings comes from the 'Farmsteads in the Suffolk Countryside Project' which described the farmstead as a regular courtyard full-plan farmstead with detached main house. The record states that there has been a loss of working buildings with the remaining structures being converted to residential dwellings. The core setting of the buildings is considered to be associated with the courtyard farmstead which enables an observer to appreciate and experience the original plan form of the farmstead.

5.8.4. While this group of buildings was not publicly accessible, the site visit confirmed that visibility of Church Farm from the Site is limited to a glimpse of the rooftop in the breaks in vegetation from the western field (Plate 33). The buildings surviving within a plot of land defined to the west by Engry Woods and to the north, east and south by agricultural land. A portion of woodland to the east, in the vicinity of the southern extent of the planned gardens around the Bentley Hall group of assets, appears to be a surviving element of the southern extent of those gardens, now divided from the other landscaping.

5.8.5. The Proposed Development would be an appreciable and perceptible change of land use to the south of the buildings. However, the land use to the north would remain unchanged (see LVIA Figure 11i) and thus provide an agricultural outlook in part preserving the original setting of the buildings. The historic setting of the barns is considered to be best preserved on historic mapping, with modern changes to the farm complex making those historic farming associations with the surrounding land less obvious in perceptible in modern day views. The buildings all now appear to be residential in nature thus limiting the extent to which the building complex and be understood as a working farm associated with adjacent farmland.

5.8.6. In line with the HIA assessment the impact of the Proposed Development on the setting of Church Farm and Barn is considered to be Low being a change to the wider setting of these non-designated buildings. This SHA agrees with the conclusions of a Low impact on the setting of this non-designated asset. Church Farm and Church Farm Barn are not designated and as such the NPPF policy with regard to harm test does not apply.

5.9 Grove Farm (Asset 70)

5.9.1. Grove Farm (Asset 70) was recorded during the 'Farmsteads in the Suffolk Countryside Project' as a loose courtyard plan farmstead with attached farmhouse. The records note that the farm is located on a public road in an isolated location and that the plan form survives well with the introduction of large modern sheds. Grove Farm is a non-designated heritage asset located to the south-west of the Site at the western terminal end of Potash Lane.

5.9.2. The Farm is depicted on modern maps as a u-shaped courtyard farmstead open to the north. However the 1838 Tithe map shows the northern side of the courtyard to be occupied by a building, likely creating a central courtyard and documented as Plot 210 "gardens and yards". Land to the south and west is recorded as being in the same ownership and tenants as the Farm. The depiction of the Farm on the Ordnance Survey map of 1882 is different to the tithe map, being depicted as a u-shaped courtyard farm open to the west. This may indicate that the Farm was remodelled in the intervening years. The surrounding land is depicted as agricultural fields and Potash Lane is illustrated as continuing westward past Grove Farm before changing direction to be aligned north-south to join with a road to the south (Case Lane) through the village of Bentley (this section of the route survives as farm access tracks and field boundaries). The roadside setting of the Farm would have provided direct communication and transport links with the wider area.

5.9.3. Grove Farm survives as a red brick courtyard plan farmstead at the western end of Potash Lane, with internal fence divisions which may indicate sub-division of the buildings. The surviving courtyard plan enables an appreciation of the late 19th century plan form of the Farmstead. The surrounding land is currently agricultural in nature, thus

preserving a sense of the landscape in which the Farm was constructed. Large modern agricultural barns are located to the north-west and west of the Farmstead.

5.9.4. LVIA Figure 11e illustrates that from Grove Farm the Proposed Development would be visible and that the agricultural land to the north-east of the Farm would undergo a change in land use. The Proposed Development would thus be legible as a change in the wider land use in one direction from the non-designated Farm and in line with the HIA assessment this would be a Low level of effect. As a locally listed building Grove Farm is not subject to the harm test applied in the NPPF.

5.10 Ancient Woodland

5.10.1 The Ancient Wood Inventory (AWI) does not record any area of ancient woodland extending into the Site. Whilst it is acknowledged that the AWI is not a comprehensive list (NE & Forestry Commission, 2022), there are no areas of upstanding woodland within the Site and thus no woodland which may be considered to be Ancient Woodland within the Site. A buffer of more than 15m has been designed around Engry Wood (centred Asset 54) which bounds the Site to the north-west to protect its roots (Axis, 2023 para 5.1.3). As such the Proposed Development is not anticipated to have any direct impact on any portion of Ancient Woodland within or adjacent to the Site.

5.10.2 Engry Wood is noted in the LVIA para 4.2.3 ad 4.2.26 and ancient woodlands are noted as being common features of the Local Character Types (LCT) within and around the Site. The impact of the Proposed Development on the wider landscape form is considered in the LVIA assessment (Axis, 2023).

5.10.3 Ancient Woodlands are not considered as designated heritage assets in term of NPPF (2023, para 206). Thus, in terms of Heritage, Ancient Woodlands are considered as noted in the HIA as non-designated heritage assets. Paragraph 209 of NPPF (2023) states that "The effect of an application on the significance of a non-designated heritage asset should be taken into account in determining the application. In weighing applications that directly or indirectly affect non-designated heritage assets, a balanced judgement will be required having regard to the scale of any harm or loss and the significance of the heritage asset."

5.10.4 When assessing the indirect impact of development on Ancient Woodland the impact of "changing the landscape character of the area" should be taken into account (NE, and Forestry Commission, 2022).

5.10.5 The indirect or settings effect of the Proposed Development on Engry Woods (centred Asset 54) has been undertaken in terms of the impact on the historic landscape detailed below in section 5.11.

5.11 Historic Landscape

5.11.1 Conservation Principles (EH, 2008) remarks on the "historic environment" rather than individual assets and notes that "significance of place" embraces both natural and cultural heritage assets (EH, 2008: 21). It is stated that any decisions about change in the historic environment should be "proportionate to the significance of the place and the impact of the proposed change on that significance" (EH, 2008: 23).

5.11.2 Historic Landscape bridges the understanding of a landscape compared to individual heritage assets (HE, 2024). HE note that landscape characterisation "reveals the patterns and connections within a landscape, spatially and through time" and "enables consideration of inter-relationships between places, and it provides a framework for the recording and evaluation of the views and perceptions of people, such as their experiences and memories." (HE, 2024).

5.11.3 Rural Heritage as defined by HE (2024b) includes a "great range of heritage assets" and it is stated that "historic patterns of settlement and land use continue to influence the character of the whole rural historic environment, and the survival and development of this rural heritage." HE note that in terms of historic estates that trees, hedges,

woodland, parkland and associated agricultural land all contribute to the historic value of the estate as a whole along with buildings with these elements contributing to peoples experience over time of the rural heritage and landscape.

5.11.4 As heritage alone is within the remit of this SHA, Historic Landscape Characterisation (HLC) will be used in the first instance to assess the impact of the Proposed Development on the historic landscape. The impact of the Proposed Development on landscape character falls within the remit of the LVIA (Axis, 2023).

5.11.5 The HIA reported that the Suffolk HLC characterised the western side of Church Road within land associated with *"*18th century and later enclosure*"* and *"*former common arable or heathland*"* (AOC Archaeology Group, 2023: para 5.1.2). The land on the east side of Church Road is characterised as *"*pre-18th century enclosure*"* and *"*long coaxial fields*"* (AOC Archaeology Group, 2023: para 5.1.3). As such the land within the Site, as characterised by the HLC, reflects the post-medieval agrarian landscape.

5.11.6 The Proposed Development would have a direct impact on how the historic landscape within the Site is understood, as it would change the landscape character of the Site from agriculture to power generation which may be considered a sub-type of an "industrial" character.

5.11.7 The HIA states that documentary evidence indicates that by the end of the 19th century the majority of the Site was located within the estate of Falstaff Manor (Suffolk Archive Ref: HE402/1/1879/69). Falstaff Manor was part of the Bentley Hall Estate, within the ownership of the Tollemache family from at least the 17th century, although tithe apportionments indicates that that association may have been terminated by the mid-19th century.

5.11.8 A railway was constructed to the north and north-east of the Site in the post-medieval period. In the short term, the railway physically divided the Site from the land to the north and east, but to what extent this physical division would have been understood in terms of land ownership in the local area is unknown. The majority of the Site appears to have been sold off from the Bentley Estate in the late 19th century (Suffolk Archive Ref: HE402/1/1879/69) and after this time the association between the Estate and the Site may have been less appreciable without local historical knowledge, however its historical association survives in documentary records. The removal of the railway has largely reinstated the historic landscape character to agricultural.

5.11.9 Portions of Ancient Woodland, surviving relicts of woodland thought to have been planted by the Tollemache family between 1200 and 1540 are located in the wider landscape, the closest by Engry Wood (centred Asset 54) to the north-west of the Site. In a largely agricultural landscape, which retains field patterning of the post-medieval a period, it is not uncommon for parcels of Ancient Woodland to survive. These woodlands often add to the sense of longevity of the land use within a landscape. However, the association between the woodland, the Tollemache family and the Bentley Hall Group of assets is less well understood in the landscape without prior knowledge and survives primarily in archival and documentary materials.

5.11.10 In the modern landscape the Site appears to be located in large, amalgamated agricultural fields to the north of two settlements; Potash and Bentley. The post-medieval agrarian nature of the landscape as well as the manorial complex around Bentley Hall and the dispersed, roadside built settlement pattern of that landscape can still be appreciated in the wider area. Any sense of an earlier landscape, such as the medieval one in which the Church of St Mary (Asset 6) was constructed is difficult to appreciate on the ground and is best understood on historic mapping and within documentary evidence. The Proposed Development would be a perceptible change to the post-medieval and modern land use, however, the overall character of the wider area will be retained allowing for an appreciation of the post-medieval landscape and its character.

6 CONCLUSIONS

6.1 This Supplementary Heritage Assessment provides a detailed assessment of the setting of 14 individual heritage assets and the wider historic landscape identified during consultation for the Proposed Development in light of comments received from Historic England, Heritage Officer, part of the Heritage Team at Babergh and Mid Suffolk District Councils and the STOP GROVE SOLAR FARM Group.

6.2 In general, the conclusions of the HIA that, at worst, the level of predicted harm would be considered to be *"*less than substantial*"* was confirmed by Historic England and the Heritage Officer.

6.3 This assessment has concluded that the Proposed Development would be visible as a modern development in the wider agricultural environment in which these assets are located. Recent tree felling has resulted in an increase in visibility of the Church from across the landscape, although it still remains as a relatively subtle landscape feature appreciable only at close distances. The removal of trees around the churchyard boundary has resulted in likely increased visibility of the Proposed Development in views to and from the Church but this does not change the overall level of effect and harm identified in the HIA and maintained in this SHA. The rural, agricultural nature of the surrounding landscape likely echoes the earlier landscape but has been altered in the modern era and these previous modern additions have not impeded the way in which the assets are understood in their current settings.

6.4 It is acknowledged that the Proposed Development would change the character of land use from agricultural to power generation which may be considered a sub-type of an "industrial" character, but it is maintained in each case that the Proposed Development would have a neutral or limited (Low to Medium) adverse impact on the significance of the surrounding non-designated heritage assets (including Buildings of Local Significance) and the way in which they can be understood in their current settings. These non-designated heritage assets and Buildings of Local Significance are not subject to the harm test applied in the NPPF.

6.5 It is maintained that the Proposed Development would have a Neutral impact on the setting of the Bentley Hall group of assets, the Grade I Listed Barn (Asset 2) and the Grade II* Listed Bentley Hall and Stables (Asset 3 and 4) and upon the setting of the Grade II Listed Maltings Farm (Asset 13) and the Grade II Listed Maltings Cottage (Asset 12). Neutral impacts are considered to be *"*perceptible change[s] [that do] not diminish or enhance the significance of the asset or the ability to appreciate its significance*"*. The Proposed Development is judged to result in *'*less than substantial harm*'* to the settings of the Grade II* Listed Church of St Mary (Asset 6) and the Grade II Listed Maltings House (Asset 14).

6.6 Paragraph 202 of the NPPF states that *'*where a development proposal will lead to less than substantial harm to the significance of a designated heritage asset, this harm should be weighed against the public benefits of the proposal*'*. As such, the less than substantial harm to the heritage assets must be weighed against the public benefits of the Proposed Development as set out in the planning submission.

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Plate 1: North facing view of the Church tower from the eastern portion of western field

Plate 2: North facing view of the Church tower from the eastern portion of western field (zoomed in)

Plate 3: West facing view of Church of St Mary (Asset 6) from Church Road

Plate 4: West facing view of Church of St Mary (Asset 6) from churchyard

Plate 5: North facing view of Church of St Mary (Asset 6) from churchyard

Plate 6: South facing view looking towards the Site from the churchyard

Plate 7: East facing view from the Church car park on the southern side of Church Road

Plate 8: North Facing view of the Church from Church Farm Road

Plate 9: East facing view from the central part of Church Farm Road looking towards the Church

Plate 10: South facing view from central part of eastern field

Plate 11: South facing view from Church Road to north of the Church

Plate 12: North facing view looking towards the Church from the Potash Lane and Church Road cross-roads.

Plate 13: North facing view from footpath off Church Road near Bentley Primary School looking towards the Church to the south of the Site

Plate 14: South-east facing view looking toward the Church from footpath off Caple St Mary to the north of the Site

Plate 15: South-west facing view from the railway bridge looking towards the Church and the Site

Plate 16: South facing view looking from Bentley Hall (Asset 3) Bentley Hall Barn (Asset 2) looking towards the Site

Plate 17: South facing view from Bentley Hall entrance

Plate 18: South-east view of Bentley Hall from Church Road

Plate 19: North facing view looking from churchyard towards Bentley Hall

Plate 20: West facing view of the Malting House

Plate 21: East facing view of the Malting House

Plate 22: West facing view of the public footpath from Malting House towards railway line

Plate 23: South-west facing view from footpath to the west of the Malting House looking towards the Site

Plate 24: North-west facing view of Malting House from the eastern field

Plate 25: South-west facing view from the northern edge of the western field

Plate 26: South-east facing view of Red Cottages

Plate 27: North facing view of Little House (Asset 89) from Churchyard

Plate 28: South facing view from the churchyard to the north of Little House (looking towards the Site Asset 89)

Plate 29: West facing view of western area from Falstaff Manor House

Plate 30: North-east facing view of eastern field from Falstaff Manor House

Plate 31: North facing view looking towards eastern field from Falstaff Manor House

Plate 32: North facing view of Falstaff Manor House

Plate 33: North facing view of the rooftop of Church Farm house from the western field









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Appendix B – Noise and Vibration Technical Note

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Axis
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Date: 3rd June 2024
Our Ref: TN24.0502/DRK

For the Attention of Tom Roseblade

Re: Noise Impact Assessment _Proposed Construction of Photovoltaic Solar Array, Ancillary Infrastructure, DNO Substation, Customer Substation, Grid Connection and Landscaping
NVC Noise Impact Assessment (R23.0708/DRK) dated 31st August 2023
Planning Ref: DC/23/05656

We understand that the Senior Environmental Protection Officer at Babergh and Mid Suffolk District Council ("BMSDC") has provided comments in respect of the noise impact assessment and conditions. NVC provided the noise assessment as part of the planning submission, and therefore we have been asked to review the comments and provide our feedback.

Technical Note

We have considered the following information in our noise review:

Information References:

a) Email correspondence from BMSDC Senior Environmental Health Protection Officer dated 2nd January 2024.
b) NVC Noise Impact Assessment report for the Proposed Development (ref. R23/0708/DRK dated 31st August 2023.
c) Doug Sharps email to NVC on December 18th 2023 regarding queries on noise impact assessment report.
d) Objection comments from Stop Grove Solar Farm (DC-23-05656).
e) NANR45 `Proposed criteria for the assessment of low frequency noise disturbance' Rev1 December 2011 (University of Salford, Manchester) DEFRA.

1. Environmental Health comment:
"'6.2.2 The methodology takes into account source position and distance to the NSRs. The noise modelling assumes that all inverters, transformers and switchgear plant are in operation and therefore the noise predictions provide an indication of the highest likely noise level." Whilst this consideration is given to the assumed noise levels during both daytime and the sunrise times of 0500-0700. I would also expect that any noise assessment considers Low Frequency Noise (LFN) cumulatively from the equipment when operating at full theoretic capacity. The Low Frequency noise assessment shall have regard to the noise guidance reference levels presented in NANR45:2005. For any exceedances predicted, a scheme of mitigation shall be proposed for approval by the LPA."

NVC response:

As explained in section 3.2.18 a) of the NVC report:

"In terms of tonality, given the separation distance, predicted noise levels, residual sound levels and proposed mitigation measures any tonal noise from transformers are unlikely to be perceptible at the NSR and we would therefore not apply a correction."

Whilst we have acknowledged the fact that plant such as transformers, by its nature, generate some LFN. The `humming' sound created in proximity to transformers, is caused by magnetostriction of the transformer core laminations with the peak fundamental frequency occurring at twice the mains forcing frequency of 50Hz and is therefore likely to produce a peak at 100Hz. Good core designs will assist in reducing this effect or other controls such as the use of acoustic screens, enclosures or use of damping materials, which can be considered where practicable.

Due to the predicted very low absolute noise levels at NSRs, we had not provided any further analysis relative to NANR45:2005 as no exceedance of this guidance was expected.

We are aware that whilst there is no specific statutory guidance or standards on LFN, BS4142:2014+A1:2019 refers to NANR 45 in section 1.3.

The NANR45 `Proposed criteria for the assessment of low frequency noise disturbance' as produced for DEFRA via Salford University refers to low frequency noise limits when measured **within** a sensitive room rather than externally. This can be difficult to undertake in practice, where properties are occupied and therefore this may need to be proven by external measurement and calculation. The criterion curve is provided in NANR45 Table 2 and in Figure 1 of the document (Table 9 is provided below for ease of reference).

If the noise occurs only during the day then 5dB relaxation may be applied to all third-octave bands.

Hz	**10**	**12.5**	**16**	**20**	**25**	**31.5**	**40**	**50**	**63**	**80**	**100**	**125**	**160**
dB, Leq	92	87	83	74	64	56	49	43	42	40	38	36	34

An assessment of the predicted one-third octave band frequency analysis is provided within Appendix 1 to show compliance with the NANR45 criteria.

The noise levels for the associated plant are not based on any specific plant, but on typical noise levels provided within the industry from Technology Providers and empirical data measured at existing sites in the UK.

String Inverters

The assumed level of 62dB LAeq @ 1m for the string inverter operation is considered to err on the conservative side, based on measured data from sites operating in the UK. The inverters are normally mounted directly behind the solar panels and therefore the panels provide a natural acoustic screen and levels at 1m under load normally range between 46dB to 55dB LAeq @ 1m. The attached data sheets from Huawei show test levels varying between 34dB to 55dB LAeq @ 1m. Additionally, the data sheet from the SE60KTL inverter indicates <62dB which we assume is a sound power level as it does not define a distance. The spectral shape used in the NANR 45 calculation for this plant is based on measured data and increased to match the 62dB level assumed in the noise prediction. The client would choose the plant most suitable for the design and commercially available at the time of detailed design and procurement and limit noise levels to ensure the development complies with imposed planning conditions on any subsequent planning permission. The string inverters do not typically generate any significant LFN with peak levels tending to occur at high frequencies and are very quiet when standing at a few metres distance.

Solar Transformers

Noise levels from solar transformer units produce some LFN at 50Hz to 200Hz and the general overall levels provided by Technology Providers are typically around 70dB LAeq @ 1m. These can be either un-enclosed, on open sided skids or enclosed. The peak of LFN is less pronounced than the sub-station transformers, which are physically larger. The frequency spectrum is based on empirical data measured at other solar sites under load and the client would choose the plant most suitable for the design and commercially available at the time of detailed design and procurement and limit noise levels to ensure the development complies with imposed planning conditions on any subsequent planning permission. The assessment of LFN for this plant is considered to be err on the conservative side and where the plant was within 150m of receptors we have included an acoustic screen around the unit to provide further attenuation. The assumed sound power level for the solar transformers in the NANR45 calculations is 81dB(A).

Sub-station Grid Transformers

Noise levels from the larger grid transformers on site have been included based on measured levels at other sites in the UK where levels have been recorded under load at 55dB LAeq @ 10m. Commercially available units typically range from 70dB to 75dB @ 2m. For the NANR45 calculations we have assumed the highest likely LFN spectrum to give the upper range level of 75dB LAeq @ 2m. The client would choose the plant most suitable for the design and commercially available at the time of detailed design and procurement and limit noise levels to ensure the development complies with imposed planning conditions on any subsequent planning permission. The spectrum at 100Hz assumes a sound power level of 96dB and an overall sound power level of 91dB(A). Where appropriate, the transformer could be acoustically screened to reduce radiated noise.

Arrester, Circuit Breakers & Disconnector

The arrester, circuit breakers and disconnector equipment would not normally generate any significant noise within the sub-station compound, however we have assumed that a noise level of 65dB LAeq at 1m is likely to represent the highest likely scenario. No noise character is predicted due to the separation distance to NSRs.

Conclusions in respect of NANR45 guidance

The results of the analysis show that the NANR internal guidance levels would be achieved at all receptor locations. This assumes that the bedroom window is ajar or `trickle vents' open and an allowance of 5dB attenuation is included (for the low frequency end of the spectrum). No allowance is made for the natural acoustic screening effect from the solar panels, which would naturally reduce the radiated noise.

Other comments based on planning submission response

i) Details on the 100Hz transformer sound energy and comment on the LFN concern is detailed in this Technical Note.

ii) There are no battery storage energy system facilities proposed at this development.

iii) The string inverters are normally located behind the solar panels at the end of specific rows. There are not always inverters needed on each row of solar panels as often the smaller lines of panels are electrically linked together. The layout assumes a total of 114 inverters as detailed in the calculations.

iv) It is normal practice to monitor baseline levels at the nearest receptors to a proposed development, as these are likely to receive the highest likely noise and impact relative to the site. The four locations chosen for the assessment therefore present this case. The Maltings House receptor is much further from the development than other properties and also this receptor is closer to the A137 road. The proxy position chosen to use as an indication of background sound levels seemed to be reasonable and the one closest to this receptor and on the eastern side of the site. The predicted noise levels at the Maltings House location were the lowest predicted and as such absolute noise levels are shown to be below sleep disturbance criteria according to BS8233:2014, WHO guidance and NANR45 criteria within the property, this fact also applies to all other receptors.

Note: It is not uncommon for absolute level limits that fall below the sleep disturbance criteria to be acceptable in planning terms (e.g. good practice guidance for wind turbines allows lower limits of 35dB LA90 and minerals guidance at 42dB LAeq,1hr at night-time).

v) Measurements of background sound levels were recorded at 4 positions around the Site over a 4 day and 3-night period covering a weekend period measuring levels over 15-minute contiguous periods. The weather conditions were appropriate for monitoring in accordance with BS4142, which are detailed in section 4.1.19. The wind conditions were either light or calm over the weekend and therefore unlikely to generate any abnormal ambient noise from road traffic or wind generated noise. This covers a monitoring period when ambient levels are likely to be at the lowest and is therefore representative and in our expert opinion provides a robust assessment of residual and background sound levels.

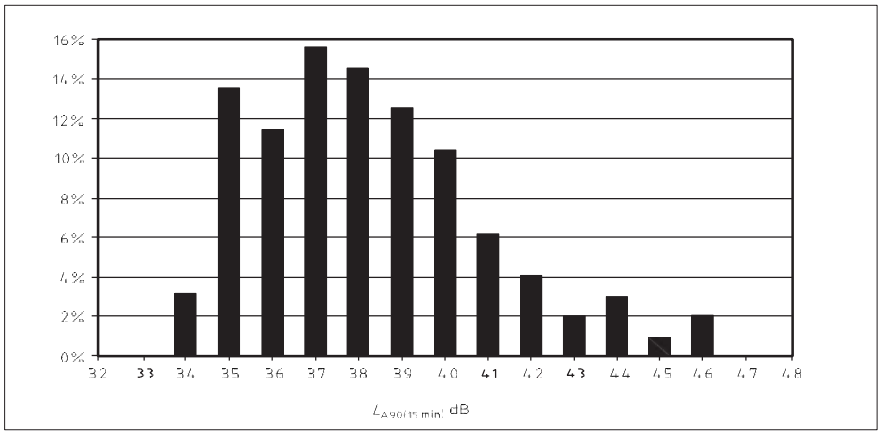
vi) Reference is made to Church Farm analysis suggesting that the assessor has used a background sound level of 33dB(A) for the assessment for the `sunrise' period. This is incorrect as Table 6.1 shows a level of 31dB has been used as the `representative' background level. BS4142(2019) requires that a representative level is determined i.e.

8.1.3 *"Ensure that the measurement time interval is sufficient to obtain a representative value of the background sound level for the period of interest. This should comprise continuous measurements of normally not less than 15 min intervals, which can be contiguous or disaggregated.*

8.1.4 *The monitoring duration should reflect the range of background sound levels for the period being assessed. In practice, there is no "single" background sound level as this is a fluctuating parameter. However, the background sound level used for the assessment should be representative of the period being assessed."*

BS4142(2019) provides an example of statistical analysis (Figure 4) which uses a method of establishing the `most commonplace' level.

Figure 4 — *Example of a statistical analysis to determine the background sound level*



Our approach is to determine the most commonplace, the average and the median and advise on what is considered to be representative. The analysis at MP1 shows for the sunrise period that the most commonplace to occur at 24dB, 31dB and 34dB LA90. The median level was shown to be 31dB and the average 33dB LA90. Our expert view was that 31dB was representative as it is reflected in the analysis as being reasonable and the standard does not advise that the lowest level should be used, as this is clearly not representative.

vii) It has been suggested that NVC have used the incorrect noise level for the inverters. As explained previously, the Sungrow data sheet referenced was never part of the analysis or indicated in the report, as the level of 62dB(A) was simply indicative of the highest likely. The evidence shows that there are string inverters which do produce noise at this level, but there are others which are much quieter. It should also be noted that during the sunrise period the plant would not be operating under full load and therefore noise levels are likely to be lower than under full load.

viii) The choice of plant and mitigation will be defined commercially at the point at which the detailed design and procurement is reached, and any noise limits set out in any subsequent planning conditions would be applied and the design and mitigation measures adopted accordingly in order to comply. Technology is constantly changing and as tech providers advance new plant models through R&D, the noise levels are reducing over time.

ix) There would be no adverse impacts from the development as suggested and the conclusion of the NANR45 analysis would indicate that the LFN guidance would not be exceeded.

x) When dealing with the sunrise periods which falls within what is classified as sleep periods, the predicted highest noise levels would fall well below sleep disturbance criteria which is what we are wanting to protect and the assessment of peak load analysis provides a conservative view of impacts based on what would occur in practice due to the solar energy loading at this time.

There is no reason for refusing the development on grounds of noise as the equipment latest designs, selection and noise control measures can provide sufficient mitigation to comply with appropriate and relevant guidance and standards for noise. This can be enforced by the LPA through appropriate and reasonable planning consent conditions.

The writer and author of the report and technical note is also an eminent noise expert who has been involved in the subject matter for over 40 years and has significant experience in dealing with significant number of renewable energy projects including many solar farms and is a Member of the Institute of Acoustics, Association of Noise Consultants and Academy of Experts.

We hope the above provides sufficient information and clarity in respect of the proposed noise comments and conditions to inform the decision-making process.

Yours sincerely,

D R Kettlewell MSc MIOA MAE I.Eng
Managing Director
Principal Acoustic Consultant

APPENDIX 1

NANR 45 CALCULATIONS

Receptor R1: Church Farm															
Predicted Noise Level from Solar Transformers															
Substation Transformer 1		RECEPTOR R1													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R1 Church Farm (north)	Leq (dB)	SWL	92.4	91.6	93.2	91.9	91.0	91.6	91.8	88.6	89.9	89.2	95.7	87.2	86.8
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			22.0	28.0	36.8	41.5	46.2	52.1	57.3	58.3	63.7	66.8	76.6	71.0	73.6
Distance (m)	940		67.4	67.4	67.4	67.4	67.4	67.4	67.4	67.4	67.4	67.4	67.4	67.4	67.4
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			20.0	19.2	20.8	19.5	18.6	19.2	19.4	16.2	17.5	16.8	23.3	14.8	14.4
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-72.0	-67.8	-62.2	-54.5	-45.4	-36.8	-29.6	-26.8	-24.5	-23.2	-14.7	-21.2	-19.6
Substation Transformer 2		RECEPTOR R1													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R1 Church Farm (north	Leq (dB)	SWL	92.4	91.6	93.2	91.9	91.0	91.6	91.8	88.6	89.9	89.2	95.7	87.2	86.8
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			22.0	28.0	36.8	41.5	46.2	52.1	57.3	58.3	63.7	66.8	76.6	71.0	73.6
Distance (m)	880		66.9	66.9	66.9	66.9	66.9	66.9	66.9	66.9	66.9	66.9	66.9	66.9	66.9
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			20.5	19.7	21.3	20.0	19.1	19.7	19.9	16.7	18.0	17.3	23.8	15.3	14.9
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-71.5	-67.3	-61.7	-54.0	-44.9	-36.3	-29.1	-26.3	-24.0	-22.7	-14.2	-20.7	-19.1
Nearest Solar Transformers		RECEPTOR R1													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R1 Church Farm (north	Leq (dB)	SWL	83.1	81.8	87.5	88.7	87.7	84.8	83.3	89.9	88.6	78.8	82.8	70.9	73.9
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			12.7	18.2	31.1	38.3	42.9	45.3	48.8	59.6	62.4	56.4	63.7	54.7	60.7
No. of Solar Transformers	4		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Distance (m)	800		66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			18.1	16.8	22.5	23.7	22.7	19.8	18.3	24.9	23.6	13.8	17.8	5.9	8.9
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-73.9	-70.2	-60.5	-50.3	-41.3	-36.2	-30.7	-18.1	-18.4	-26.2	-20.2	-30.1	-25.1
Nearest Solar Transformers (centre of Site)		RECEPTOR R1													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R1 Church Farm (north	Leq (dB)	SWL	83.1	81.8	87.5	88.7	87.7	84.8	83.3	89.9	88.6	78.8	82.8	70.9	73.9
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			12.7	18.2	31.1	38.3	42.9	45.3	48.8	59.6	62.4	56.4	63.7	54.7	60.7
No. of Solar Transformers	4		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Distance (m)	380		59.6	59.6	59.6	59.6	59.6	59.6	59.6	59.6	59.6	59.6	59.6	59.6	59.6
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			24.5	23.2	28.9	30.1	29.1	26.2	24.7	31.3	30.0	20.2	24.2	12.3	15.3
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-67.5	-63.8	-54.1	-43.9	-34.9	-29.8	-24.3	-11.7	-12.0	-19.8	-13.8	-23.7	-18.7
Nearest Solar Transformers (LHS of Site)		RECEPTOR R1													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R1 Church Farm (north	Leq (dB)	SWL	83.1	81.8	87.5	88.7	87.7	84.8	83.3	89.9	88.6	78.8	82.8	70.9	73.9
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			12.7	18.2	31.1	38.3	42.9	45.3	48.8	59.6	62.4	56.4	63.7	54.7	60.7
No. of Solar Transformers	4		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Distance (m)	240		55.6	55.6	55.6	55.6	55.6	55.6	55.6	55.6	55.6	55.6	55.6	55.6	55.6
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			28.5	27.2	32.9	34.1	33.1	30.2	28.7	35.3	34.0	24.2	28.2	16.3	19.3
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-63.5	-59.8	-50.1	-39.9	-30.9	-25.8	-20.3	-7.7	-8.0	-15.8	-9.8	-19.7	-14.7

Nearest String Inverters area 1		RECEPTOR R1													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R1 Church Farm (north	Leq (dB)	SWL	68.9	75.7	78.2	74.8	76.3	74.3	74.3	78.5	72.5	64.5	60.7	57	53.4
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			-1.5	12.1	21.8	24.4	31.5	34.8	39.8	48.2	46.3	42.1	41.6	40.8	40.2
No. of Inverters	24		13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8
Average Distance (m)	730		65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			12.5	19.3	21.8	18.4	19.9	17.9	17.9	22.1	16.1	8.1	4.3	0.6	-3.0
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-79.5	-67.7	-61.2	-55.6	-44.1	-38.1	-31.1	-20.9	-25.9	-31.9	-33.7	-35.4	-37.0

Nearest String Inverters area 2		RECEPTOR R1													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R1 Church Farm (north	Leq (dB)	SWL	68.9	75.7	78.2	74.8	76.3	74.3	74.3	78.5	72.5	64.5	60.7	57	53.4
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			-1.5	12.1	21.8	24.4	31.5	34.8	39.8	48.2	46.3	42.1	41.6	40.8	40.2
No. of Inverters	57		17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6
Average Distance (m)	340		58.6	58.6	58.6	58.6	58.6	58.6	58.6	58.6	58.6	58.6	58.6	58.6	58.6
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			22.8	29.6	32.1	28.7	30.2	28.2	28.2	32.4	26.4	18.4	14.6	10.9	7.3
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-69.2	-57.4	-50.9	-45.3	-33.8	-27.8	-20.8	-10.6	-15.6	-21.6	-23.4	-25.1	-26.7

Nearest String Inverters area 3		RECEPTOR R1													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R1 Church Farm (north	Leq (dB)	SWL	68.9	75.7	78.2	74.8	76.3	74.3	74.3	78.5	72.5	64.5	60.7	57	53.4
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			-1.5	12.1	21.8	24.4	31.5	34.8	39.8	48.2	46.3	42.1	41.6	40.8	40.2
No. of Inverters	23		13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8
Average Distance (m)	240		64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			13.5	20.3	22.8	19.4	20.9	18.9	18.9	23.1	17.1	9.1	5.3	1.6	-2.0
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-78.5	-66.7	-60.2	-54.6	-43.1	-37.1	-30.1	-19.9	-24.9	-30.9	-32.7	-34.4	-36.0

Nearest String Inverters area 4		RECEPTOR R1													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R1 Church Farm (north	Leq (dB)	SWL	68.9	75.7	78.2	74.8	76.3	74.3	74.3	78.5	72.5	64.5	60.7	57	53.4
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			-1.5	12.1	21.8	24.4	31.5	34.8	39.8	48.2	46.3	42.1	41.6	40.8	40.2
No. of Inverters	14		13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8
Average Distance (m)	400		60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			17.7	24.5	27.0	23.6	25.1	23.1	23.1	27.3	21.3	13.3	9.5	5.8	2.2
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-74.3	-62.5	-56.0	-50.4	-38.9	-32.9	-25.9	-15.7	-20.7	-26.7	-28.5	-30.2	-31.8

Cumulative Noise Levels															
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
Internal bedroom level			31.9	33.7	37.5	37.1	36.8	34.4	33.6	38.9	36.5	27.7	31.7	21.6	22.8
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-60.1	-53.3	-45.5	-36.9	-27.2	-21.6	-15.4	-4.1	-5.5	-12.3	-6.3	-14.4	-11.2

Note: No allowance for screening from the solar panels and string inverter noise higher than emprical data indicates.

Receptor R2: Uplands East															
Predicted Noise Level from Solar Transformers															
Substation Transformer 1		RECEPTOR R2													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R2 Uplands East	Leq (dB)	SWL	92.4	91.6	93.2	91.9	91.0	91.6	91.8	88.6	89.9	89.2	95.7	87.2	86.8
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			22.0	28.0	36.8	41.5	46.2	52.1	57.3	58.3	63.7	66.8	76.6	71.0	73.6
Distance (m)	370		59.3	59.3	59.3	59.3	59.3	59.3	59.3	59.3	59.3	59.3	59.3	59.3	59.3
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			28.1	27.3	28.9	27.6	26.7	27.3	27.5	24.3	25.6	24.9	31.4	22.9	22.5
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-63.9	-59.7	-54.1	-46.4	-37.3	-28.7	-21.5	-18.7	-16.4	-15.1	-6.6	-13.1	-11.5
Substation Transformer 2		RECEPTOR R2													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
Receptor R2: Uplands East	Leq (dB)	SWL	92.4	91.6	93.2	91.9	91.0	91.6	91.8	88.6	89.9	89.2	95.7	87.2	86.8
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			22.0	28.0	36.8	41.5	46.2	52.1	57.3	58.3	63.7	66.8	76.6	71.0	73.6
Distance (m)	380		59.6	59.6	59.6	59.6	59.6	59.6	59.6	59.6	59.6	59.6	59.6	59.6	59.6
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			27.8	27.0	28.6	27.3	26.4	27.0	27.2	24.0	25.3	24.6	31.1	22.6	22.2
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-64.2	-60.0	-54.4	-46.7	-37.6	-29.0	-21.8	-19.0	-16.7	-15.4	-6.9	-13.4	-11.8
Nearest Solar Transformers		RECEPTOR R2													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
Receptor R2: Uplands East	Leq (dB)	SWL	83.1	81.8	87.5	88.7	87.7	84.8	83.3	89.9	88.6	78.8	82.8	70.9	73.9
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			12.7	18.2	31.1	38.3	42.9	45.3	48.8	59.6	62.4	56.4	63.7	54.7	60.7
No. of Solar Transformers	4		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Distance (m)	300		66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			18.1	16.8	22.5	23.7	22.7	19.8	18.3	24.9	23.6	13.8	17.8	5.9	8.9
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-73.9	-70.2	-60.5	-50.3	-41.3	-36.2	-30.7	-18.1	-18.4	-26.2	-20.2	-30.1	-25.1
Nearest Solar Transformers (centre of Site)		RECEPTOR R2													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
Receptor R2: Uplands East	Leq (dB)	SWL	83.1	81.8	87.5	88.7	87.7	84.8	83.3	89.9	88.6	78.8	82.8	70.9	73.9
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			12.7	18.2	31.1	38.3	42.9	45.3	48.8	59.6	62.4	56.4	63.7	54.7	60.7
No. of Solar Transformers	4		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Distance (m)	280		56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			27.2	25.9	31.6	32.8	31.8	28.9	27.4	34.0	32.7	22.9	26.9	15.0	18.0
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-64.8	-61.1	-51.4	-41.2	-32.2	-27.1	-21.6	-9.0	-9.3	-17.1	-11.1	-21.0	-16.0
Nearest Solar Transformers (LHS of Site)		RECEPTOR R2													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
Receptor R2: Uplands East	Leq (dB)	SWL	83.1	81.8	87.5	88.7	87.7	84.8	83.3	89.9	88.6	78.8	82.8	70.9	73.9
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			12.7	18.2	31.1	38.3	42.9	45.3	48.8	59.6	62.4	56.4	63.7	54.7	60.7
No. of Solar Transformers	4		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Distance (m)	420		60.4	60.4	60.4	60.4	60.4	60.4	60.4	60.4	60.4	60.4	60.4	60.4	60.4
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			23.7	22.4	28.1	29.3	28.3	25.4	23.9	30.5	29.2	19.4	23.4	11.5	14.5
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-68.3	-64.6	-54.9	-44.7	-35.7	-30.6	-25.1	-12.5	-12.8	-20.6	-14.6	-24.5	-19.5

Nearest String Inverters area 1		RECEPTOR R2													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
Receptor R2: Uplands East	Leq (dB)	SWL	68.9	75.7	78.2	74.8	76.3	74.3	74.3	78.5	72.5	64.5	60.7	57	53.4
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			-1.5	12.1	21.8	24.4	31.5	34.8	39.8	48.2	46.3	42.1	41.6	40.8	40.2
No. of Inverters	24		13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8
Average Distance (m)	250		55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			21.8	28.6	31.1	27.7	29.2	27.2	27.2	31.4	25.4	17.4	13.6	9.9	6.3
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-70.2	-58.4	-51.9	-46.3	-34.8	-28.8	-21.8	-11.6	-16.6	-22.6	-24.4	-26.1	-27.7

Nearest String Inverters area 2		RECEPTOR R2													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
Receptor R2: Uplands East	Leq (dB)	SWL	68.9	75.7	78.2	74.8	76.3	74.3	74.3	78.5	72.5	64.5	60.7	57	53.4
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			-1.5	12.1	21.8	24.4	31.5	34.8	39.8	48.2	46.3	42.1	41.6	40.8	40.2
No. of Inverters	57		17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6
Average Distance (m)	250		55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			25.5	32.3	34.8	31.4	32.9	30.9	30.9	35.1	29.1	21.1	17.3	13.6	10.0
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-66.5	-54.7	-48.2	-42.6	-31.1	-25.1	-18.1	-7.9	-12.9	-18.9	-20.7	-22.4	-24.0

Nearest String Inverters area 3		RECEPTOR R2													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
Receptor R2: Uplands East	Leq (dB)	SWL	68.9	75.7	78.2	74.8	76.3	74.3	74.3	78.5	72.5	64.5	60.7	57	53.4
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			-1.5	12.1	21.8	24.4	31.5	34.8	39.8	48.2	46.3	42.1	41.6	40.8	40.2
No. of Inverters	23		13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8
Average Distance (m)	420		60.4	60.4	60.4	60.4	60.4	60.4	60.4	60.4	60.4	60.4	60.4	60.4	60.4
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			17.3	24.1	26.6	23.2	24.7	22.7	22.7	26.9	20.9	12.9	9.1	5.4	1.8
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-74.7	-62.9	-56.4	-50.8	-39.3	-33.3	-26.3	-16.1	-21.1	-27.1	-28.9	-30.6	-32.2

Nearest String Inverters area 4		RECEPTOR R2													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
Receptor R2: Uplands East	Leq (dB)	SWL	68.9	75.7	78.2	74.8	76.3	74.3	74.3	78.5	72.5	64.5	60.7	57	53.4
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			-1.5	12.1	21.8	24.4	31.5	34.8	39.8	48.2	46.3	42.1	41.6	40.8	40.2
No. of Inverters	14		13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8
Average Distance (m)	510		62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			15.6	22.4	24.9	21.5	23.0	21.0	21.0	25.2	19.2	11.2	7.4	3.7	0.1
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-76.4	-64.6	-58.1	-52.5	-41.0	-35.0	-28.0	-17.8	-22.8	-28.8	-30.6	-32.3	-33.9

Cumulative Noise Levels															
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
Internal bedroom level			34.2	36.5	39.4	38.0	38.1	36.3	36.0	39.9	36.9	30.4	35.4	26.6	26.6
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-57.8	-50.5	-43.6	-36.0	-25.9	-19.7	-13.0	-3.1	-5.1	-9.6	-2.6	-9.4	-7.4

Note: No allowance for screening from the solar panels and string inverter noise higher than emprical data indicates.

Receptor R3: Falstaff Manor & Church Road															
Predicted Noise Level from Solar Transformers															
Substation Transformer 1		RECEPTOR R3													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R3 Falstaff Manor/Church Rd	Leq (dB)	SWL	92.4	91.6	93.2	91.9	91.0	91.6	91.8	88.6	89.9	89.2	95.7	87.2	86.8
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			22.0	28.0	36.8	41.5	46.2	52.1	57.3	58.3	63.7	66.8	76.6	71.0	73.6
Distance (m)	620		63.8	63.8	63.8	63.8	63.8	63.8	63.8	63.8	63.8	63.8	63.8	63.8	63.8
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			23.6	22.8	24.4	23.1	22.2	22.8	23.0	19.8	21.1	20.4	26.9	18.4	18.0
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-68.4	-64.2	-58.6	-50.9	-41.8	-33.2	-26.0	-23.2	-20.9	-19.6	-11.1	-17.6	-16.0
Substation Transformer 2		RECEPTOR R3													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R3 Falstaff Manor/Church Rd	Leq (dB)	SWL	92.4	91.6	93.2	91.9	91.0	91.6	91.8	88.6	89.9	89.2	95.7	87.2	86.8
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			22.0	28.0	36.8	41.5	46.2	52.1	57.3	58.3	63.7	66.8	76.6	71.0	73.6
Distance (m)	280		56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			30.5	29.7	31.3	30.0	29.1	29.7	29.9	26.7	28.0	27.3	33.8	25.3	24.9
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-61.5	-57.3	-51.7	-44.0	-34.9	-26.3	-19.1	-16.3	-14.0	-12.7	-4.2	-10.7	-9.1
Nearest Solar Transformers		RECEPTOR R3													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R3 Falstaff Manor/Church Rd	Leq (dB)	SWL	83.1	81.8	87.5	88.7	87.7	84.8	83.3	89.9	88.6	78.8	82.8	70.9	73.9
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			12.7	18.2	31.1	38.3	42.9	45.3	48.8	59.6	62.4	56.4	63.7	54.7	60.7
No. of Solar Transformers	4		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Distance (m)	280		56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			27.2	25.9	31.6	32.8	31.8	28.9	27.4	34.0	32.7	22.9	26.9	15.0	18.0
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-64.8	-61.1	-51.4	-41.2	-32.2	-27.1	-21.6	-9.0	-9.3	-17.1	-11.1	-21.0	-16.0
Nearest Solar Transformers (centre of Site)		RECEPTOR R3													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R3 Falstaff Manor/Church Rd	Leq (dB)	SWL	83.1	81.8	87.5	88.7	87.7	84.8	83.3	89.9	88.6	78.8	82.8	70.9	73.9
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			12.7	18.2	31.1	38.3	42.9	45.3	48.8	59.6	62.4	56.4	63.7	54.7	60.7
No. of Solar Transformers	4		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Screening			5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Distance (m)	180		53.1	53.1	53.1	53.1	53.1	53.1	53.1	53.1	53.1	53.1	53.1	53.1	53.1
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			26.0	24.7	30.4	31.6	30.6	27.7	26.2	32.8	31.5	21.7	25.7	13.8	16.8
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-66.0	-62.3	-52.6	-42.4	-33.4	-28.3	-22.8	-10.2	-10.5	-18.3	-12.3	-22.2	-17.2
Nearest Solar Transformers (LHS of Site)		RECEPTOR R3													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R3 Falstaff Manor/Church Rd	Leq (dB)	SWL	83.1	81.8	87.5	88.7	87.7	84.8	83.3	89.9	88.6	78.8	82.8	70.9	73.9
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			12.7	18.2	31.1	38.3	42.9	45.3	48.8	59.6	62.4	56.4	63.7	54.7	60.7
No. of Solar Transformers	4		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Distance (m)	420		60.4	60.4	60.4	60.4	60.4	60.4	60.4	60.4	60.4	60.4	60.4	60.4	60.4
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			23.7	22.4	28.1	29.3	28.3	25.4	23.9	30.5	29.2	19.4	23.4	11.5	14.5
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-68.3	-64.6	-54.9	-44.7	-35.7	-30.6	-25.1	-12.5	-12.8	-20.6	-14.6	-24.5	-19.5

Nearest String Inverters area 1		RECEPTOR R3													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R3 Falstaff Manor/Church Rd	Leq (dB)	SWL	68.9	75.7	78.2	74.8	76.3	74.3	74.3	78.5	72.5	64.5	60.7	57	53.4
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			-1.5	12.1	21.8	24.4	31.5	34.8	39.8	48.2	46.3	42.1	41.6	40.8	40.2
No. of Inverters	24		13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8
Average Distance (m)	320		58.1	58.1	58.1	58.1	58.1	58.1	58.1	58.1	58.1	58.1	58.1	58.1	58.1
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			19.6	26.4	28.9	25.5	27.0	25.0	25.0	29.2	23.2	15.2	11.4	7.7	4.1
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-72.4	-60.6	-54.1	-48.5	-37.0	-31.0	-24.0	-13.8	-18.8	-24.8	-26.6	-28.3	-29.9

Nearest String Inverters area 2		RECEPTOR R3													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R3 Falstaff Manor/Church Rd	Leq (dB)	SWL	68.9	75.7	78.2	74.8	76.3	74.3	74.3	78.5	72.5	64.5	60.7	57	53.4
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			-1.5	12.1	21.8	24.4	31.5	34.8	39.8	48.2	46.3	42.1	41.6	40.8	40.2
No. of Inverters	57		17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6
Average Distance (m)	200		54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			27.5	34.3	36.8	33.4	34.9	32.9	32.9	37.1	31.1	23.1	19.3	15.6	12.0
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-64.5	-52.7	-46.2	-40.6	-29.1	-23.1	-16.1	-5.9	-10.9	-16.9	-18.7	-20.4	-22.0

Nearest String Inverters area 3		RECEPTOR R3													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R3 Falstaff Manor/Church Rd	Leq (dB)	SWL	68.9	75.7	78.2	74.8	76.3	74.3	74.3	78.5	72.5	64.5	60.7	57	53.4
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			-1.5	12.1	21.8	24.4	31.5	34.8	39.8	48.2	46.3	42.1	41.6	40.8	40.2
No. of Inverters	23		13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8
Average Distance (m)	450		61.0	61.0	61.0	61.0	61.0	61.0	61.0	61.0	61.0	61.0	61.0	61.0	61.0
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			16.7	23.5	26.0	22.6	24.1	22.1	22.1	26.3	20.3	12.3	8.5	4.8	1.2
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-75.3	-63.5	-57.0	-51.4	-39.9	-33.9	-26.9	-16.7	-21.7	-27.7	-29.5	-31.2	-32.8

Nearest String Inverters area 4		RECEPTOR R3													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R3 Falstaff Manor/Church Rd	Leq (dB)	SWL	68.9	75.7	78.2	74.8	76.3	74.3	74.3	78.5	72.5	64.5	60.7	57	53.4
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			-1.5	12.1	21.8	24.4	31.5	34.8	39.8	48.2	46.3	42.1	41.6	40.8	40.2
No. of Inverters	14		13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8
Average Distance (m)	410		60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			17.5	24.3	26.8	23.4	24.9	22.9	22.9	27.1	21.1	13.1	9.3	5.6	2.0
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-74.5	-62.7	-56.2	-50.6	-39.1	-33.1	-26.1	-15.9	-20.9	-26.9	-28.7	-30.4	-32.0

Cumulative Noise Levels															
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
Internal bedroom level			35.1	37.4	40.4	39.2	39.2	37.3	36.9	41.1	38.1	31.2	36.0	27.1	27.2
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-56.9	-49.6	-42.6	-34.8	-24.8	-18.7	-12.1	-1.9	-3.9	-8.8	-2.0	-8.9	-6.8

Note: No allowance for screening from the solar panels and string inverter noise higher than emprical data indicates.

Receptor R4: Potash Lane															
Predicted Noise Level from Solar Transformers															
Substation Transformer 1		RECEPTOR R4													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R4 Potash Lane	Leq (dB)	SWL	92.4	91.6	93.2	91.9	91.0	91.6	91.8	88.6	89.9	89.2	95.7	87.2	86.8
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			22.0	28.0	36.8	41.5	46.2	52.1	57.3	58.3	63.7	66.8	76.6	71.0	73.6
Distance (m)	840		66.5	66.5	66.5	66.5	66.5	66.5	66.5	66.5	66.5	66.5	66.5	66.5	66.5
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			20.9	20.1	21.7	20.4	19.5	20.1	20.3	17.1	18.4	17.7	24.2	15.7	15.3
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-71.1	-66.9	-61.3	-53.6	-44.5	-35.9	-28.7	-25.9	-23.6	-22.3	-13.8	-20.3	-18.7
Substation Transformer 2		RECEPTOR R4													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R4 Potash Lane	Leq (dB)	SWL	92.4	91.6	93.2	91.9	91	91.6	91.8	88.6	89.9	89.2	95.7	87.2	86.8
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			22.0	28.0	36.8	41.5	46.2	52.1	57.3	58.3	63.7	66.8	76.6	71.0	73.6
Distance (m)	520		62.3	62.3	62.3	62.3	62.3	62.3	62.3	62.3	62.3	62.3	62.3	62.3	62.3
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			25.1	24.3	25.9	24.6	23.7	24.3	24.5	21.3	22.6	21.9	28.4	19.9	19.5
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-66.9	-62.7	-57.1	-49.4	-40.3	-31.7	-24.5	-21.7	-19.4	-18.1	-9.6	-16.1	-14.5
Nearest Solar Transformers		RECEPTOR R4													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R4 Potash Lane	Leq (dB)	SWL	83.1	81.8	87.5	88.7	87.7	84.8	83.3	89.9	88.6	78.8	82.8	70.9	73.9
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			12.7	18.2	31.1	38.3	42.9	45.3	48.8	59.6	62.4	56.4	63.7	54.7	60.7
No. of Solar Transformers	4		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Distance (m)	520		62.3	62.3	62.3	62.3	62.3	62.3	62.3	62.3	62.3	62.3	62.3	62.3	62.3
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			21.8	20.5	26.2	27.4	26.4	23.5	22.0	28.6	27.3	17.5	21.5	9.6	12.6
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-70.2	-66.5	-56.8	-46.6	-37.6	-32.5	-27.0	-14.4	-14.7	-22.5	-16.5	-26.4	-21.4
Nearest Solar Transformers (centre of Site)		RECEPTOR R4													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R4 Potash Lane	Leq (dB)	SWL	83.1	81.8	87.5	88.7	87.7	84.8	83.3	89.9	88.6	78.8	82.8	70.9	73.9
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			12.7	18.2	31.1	38.3	42.9	45.3	48.8	59.6	62.4	56.4	63.7	54.7	60.7
Screening			5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
No. of Solar Transformers	4		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Distance (m)	120		49.6	49.6	49.6	49.6	49.6	49.6	49.6	49.6	49.6	49.6	49.6	49.6	49.6
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			28.5	27.2	32.9	34.1	33.1	30.2	28.7	35.3	34.0	24.2	34.3	22.4	25.4
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-63.5	-59.8	-50.1	-39.9	-30.9	-25.8	-20.3	-7.7	-8.0	-15.8	-3.7	-13.6	-8.6
Nearest Solar Transformers (LHS of Site)		RECEPTOR R4													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R4 Potash Lane	Leq (dB)	SWL	83.1	81.8	87.5	88.7	87.7	84.8	83.3	89.9	88.6	78.8	82.8	70.9	73.9
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			12.7	18.2	31.1	38.3	42.9	45.3	48.8	59.6	62.4	56.4	63.7	54.7	60.7
No. of Solar Transformers	4		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Distance (m)	240		55.6	55.6	55.6	55.6	55.6	55.6	55.6	55.6	55.6	55.6	55.6	55.6	55.6
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			28.5	27.2	32.9	34.1	33.1	30.2	28.7	35.3	34.0	24.2	28.2	16.3	19.3
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-63.5	-59.8	-50.1	-39.9	-30.9	-25.8	-20.3	-7.7	-8.0	-15.8	-9.8	-19.7	-14.7

Nearest String Inverters area 1		RECEPTOR R4													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R4 Potash Lane	Leq (dB)	SWL	68.9	75.7	78.2	74.8	76.3	74.3	74.3	78.5	72.5	64.5	60.7	57	53.4
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			-1.5	12.1	21.8	24.4	31.5	34.8	39.8	48.2	46.3	42.1	41.6	40.8	40.2
No. of Inverters	24		13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8
Average Distance (m)	520		62.3	62.3	62.3	62.3	62.3	62.3	62.3	62.3	62.3	62.3	62.3	62.3	62.3
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			15.4	22.2	24.7	21.3	22.8	20.8	20.8	25.0	19.0	11.0	7.2	3.5	-0.1
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-76.6	-64.8	-58.3	-52.7	-41.2	-35.2	-28.2	-18.0	-23.0	-29.0	-30.8	-32.5	-34.1

Nearest String Inverters area 2		RECEPTOR R4													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R4 Potash Lane	Leq (dB)	SWL	68.9	75.7	78.2	74.8	76.3	74.3	74.3	78.5	72.5	64.5	60.7	57	53.4
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			-1.5	12.1	21.8	24.4	31.5	34.8	39.8	48.2	46.3	42.1	41.6	40.8	40.2
No. of Inverters	57		17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6
Average Distance (m)	120		54.4	54.4	54.4	54.4	54.4	54.4	54.4	54.4	54.4	54.4	54.4	54.4	54.4
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			27.0	33.8	36.3	32.9	34.4	32.4	32.4	36.6	30.6	22.6	18.8	15.1	11.5
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-65.0	-53.2	-46.7	-41.1	-29.6	-23.6	-16.6	-6.4	-11.4	-17.4	-19.2	-20.9	-22.5

Nearest String Inverters area 3		RECEPTOR R4													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R4 Potash Lane	Leq (dB)	SWL	68.9	75.7	78.2	74.8	76.3	74.3	74.3	78.5	72.5	64.5	60.7	57	53.4
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			-1.5	12.1	21.8	24.4	31.5	34.8	39.8	48.2	46.3	42.1	41.6	40.8	40.2
No. of Inverters	23		13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8
Average Distance (m)	320		58.1	58.1	58.1	58.1	58.1	58.1	58.1	58.1	58.1	58.1	58.1	58.1	58.1
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			19.6	26.4	28.9	25.5	27.0	25.0	25.0	29.2	23.2	15.2	11.4	7.7	4.1
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-72.4	-60.6	-54.1	-48.5	-37.0	-31.0	-24.0	-13.8	-18.8	-24.8	-26.6	-28.3	-29.9

Nearest String Inverters area 4		RECEPTOR R4													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R4 Potash Lane	Leq (dB)	SWL	68.9	75.7	78.2	74.8	76.3	74.3	74.3	78.5	72.5	64.5	60.7	57	53.4
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			-1.5	12.1	21.8	24.4	31.5	34.8	39.8	48.2	46.3	42.1	41.6	40.8	40.2
No. of Inverters	14		13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8
Average Distance (m)	230		55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			22.5	29.3	31.8	28.4	29.9	27.9	27.9	32.1	26.1	18.1	14.3	10.6	7.0
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-69.5	-57.7	-51.2	-45.6	-34.1	-28.1	-21.1	-10.9	-15.9	-21.9	-23.7	-25.4	-27.0

Cumulative Noise Levels															
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
Internal bedroom level			34.5	37.3	40.7	39.6	39.6	37.4	36.8	41.7	38.8	30.3	36.5	26.1	27.7
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-57.5	-49.7	-42.3	-34.4	-24.4	-18.6	-12.2	-1.3	-3.2	-9.7	-1.5	-9.9	-6.3

Note: No allowance for screening from the solar panels and string inverter noise higher than emprical data indicates.

Receptor R5: Malting Farm/Garden House
Predicted Noise Level from Solar Transformers

Substation Transformer 1		RECEPTOR R5													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R5 Malting Farm	Leq (dB)	SWL	92.4	91.6	93.2	91.9	91.0	91.6	91.8	88.6	89.9	89.2	95.7	87.2	86.8
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			22.0	28.0	36.8	41.5	46.2	52.1	57.3	58.3	63.7	66.8	76.6	71.0	73.6
Distance	300		57.5	57.5	57.5	57.5	57.5	57.5	57.5	57.5	57.5	57.5	57.5	57.5	57.5
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			29.9	29.1	30.7	29.4	28.5	29.1	29.3	26.1	27.4	26.7	33.2	24.7	24.3
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-62.1	-57.9	-52.3	-44.6	-35.5	-26.9	-19.7	-16.9	-14.6	-13.3	-4.8	-11.3	-9.7

Substation Transformer 2		RECEPTOR R5													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R5 Malting Farm	Leq (dB)	SWL	92.4	91.6	93.2	91.9	91.0	91.6	91.8	88.6	89.9	89.2	95.7	87.2	86.8
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			22.0	28.0	36.8	41.5	46.2	52.1	57.3	58.3	63.7	66.8	76.6	71.0	73.6
Distance	650		64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2	64.2
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			23.2	22.4	24.0	22.7	21.8	22.4	22.6	19.4	20.7	20.0	26.5	18.0	17.6
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-68.8	-64.6	-59.0	-51.3	-42.2	-33.6	-26.4	-23.6	-21.3	-20.0	-11.5	-18.0	-16.4

Nearest Solar Transformers		RECEPTOR R5													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R5 Malting Farm	Leq (dB)	SWL	83.1	81.8	87.5	88.7	87.7	84.8	83.3	89.9	88.6	78.8	82.8	70.9	73.9
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			12.7	18.2	31.1	38.3	42.9	45.3	48.8	59.6	62.4	56.4	63.7	54.7	60.7
No. of Solar Transformers	4		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Distance	600		63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			20.6	19.3	25.0	26.2	25.2	22.3	20.8	27.4	26.1	16.3	20.3	8.4	11.4
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-71.4	-67.7	-58.0	-47.8	-38.8	-33.7	-28.2	-15.6	-15.9	-23.7	-17.7	-27.6	-22.6

Nearest Solar Transformers (centre of Site)		RECEPTOR R5													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R5 Malting Farm	Leq (dB)	SWL	83.1	81.8	87.5	88.7	87.7	84.8	83.3	89.9	88.6	78.8	82.8	70.9	73.9
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			12.7	18.2	31.1	38.3	42.9	45.3	48.8	59.6	62.4	56.4	63.7	54.7	60.7
No. of Solar Transformers	4		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Distance 1000m	1000		68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			16.1	14.8	20.5	21.7	20.7	17.8	16.3	22.9	21.6	11.8	15.8	3.9	6.9
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-75.9	-72.2	-62.5	-52.3	-43.3	-38.2	-32.7	-20.1	-20.4	-28.2	-22.2	-32.1	-27.1

Nearest Solar Transformers (LHS of Site)		RECEPTOR R5													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R5 Malting Farm	Leq (dB)	SWL	83.1	81.8	87.5	88.7	87.7	84.8	83.3	89.9	88.6	78.8	82.8	70.9	73.9
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			12.7	18.2	31.1	38.3	42.9	45.3	48.8	59.6	62.4	56.4	63.7	54.7	60.7
No. of Solar Transformers	4		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Distance	1200		69.6	69.6	69.6	69.6	69.6	69.6	69.6	69.6	69.6	69.6	69.6	69.6	69.6
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			14.6	13.3	19.0	20.2	19.2	16.3	14.8	21.4	20.1	10.3	14.3	2.4	5.4
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-77.4	-73.7	-64.0	-53.8	-44.8	-39.7	-34.2	-21.6	-21.9	-29.7	-23.7	-33.6	-28.6

Nearest String Inverters area 1		RECEPTOR R5													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R5 Malting Farm	Leq (dB)	SWL	68.9	75.7	78.2	74.8	76.3	74.3	74.3	78.5	72.5	64.5	60.7	57	53.4
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			-1.5	12.1	21.8	24.4	31.5	34.8	39.8	48.2	46.3	42.1	41.6	40.8	40.2
No. of Inverters	24		13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8
Average Distance	600		63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			14.2	21.0	23.5	20.1	21.6	19.6	19.6	23.8	17.8	9.8	6.0	2.3	-1.3
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-77.8	-66.0	-59.5	-53.9	-42.4	-36.4	-29.4	-19.2	-24.2	-30.2	-32.0	-33.7	-35.3

Nearest String Inverters area 2		RECEPTOR R5													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R5 Malting Farm	Leq (dB)	SWL	68.9	75.7	78.2	74.8	76.3	74.3	74.3	78.5	72.5	64.5	60.7	57	53.4
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			-1.5	12.1	21.8	24.4	31.5	34.8	39.8	48.2	46.3	42.1	41.6	40.8	40.2
No. of Inverters	57		17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6
Average Distance	800		66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			15.4	22.2	24.7	21.3	22.8	20.8	20.8	25.0	19.0	11.0	7.2	3.5	-0.1
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-76.6	-64.8	-58.3	-52.7	-41.2	-35.2	-28.2	-18.0	-23.0	-29.0	-30.8	-32.5	-34.1

Nearest String Inverters area 3		RECEPTOR R5													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R5 Malting Farm	Leq (dB)	SWL	68.9	75.7	78.2	74.8	76.3	74.3	74.3	78.5	72.5	64.5	60.7	57	53.4
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			-1.5	12.1	21.8	24.4	31.5	34.8	39.8	48.2	46.3	42.1	41.6	40.8	40.2
No. of Inverters	23		13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8
Average Distance	1150		69.2	69.2	69.2	69.2	69.2	69.2	69.2	69.2	69.2	69.2	69.2	69.2	69.2
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			8.5	15.3	17.8	14.4	15.9	13.9	13.9	18.1	12.1	4.1	0.3	-3.4	-7.0
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-83.5	-71.7	-65.2	-59.6	-48.1	-42.1	-35.1	-24.9	-29.9	-35.9	-37.7	-39.4	-41.0

Nearest String Inverters area 4		RECEPTOR R5													
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
R5 Malting Farm	Leq (dB)	SWL	68.9	75.7	78.2	74.8	76.3	74.3	74.3	78.5	72.5	64.5	60.7	57	53.4
A-weighting			70.4	63.6	56.4	50.4	44.8	39.5	34.5	30.3	26.2	22.4	19.1	16.2	13.2
Weighted Level			-1.5	12.1	21.8	24.4	31.5	34.8	39.8	48.2	46.3	42.1	41.6	40.8	40.2
No. of Inverters	14		13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8
Average Distance	1200		69.6	69.6	69.6	69.6	69.6	69.6	69.6	69.6	69.6	69.6	69.6	69.6	69.6
Open Window Attenuation	5		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Internal bedroom level			8.1	14.9	17.4	14.0	15.5	13.5	13.5	17.7	11.7	3.7	-0.1	-3.8	-7.4
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-83.9	-72.1	-65.6	-60.0	-48.5	-42.5	-35.5	-25.3	-30.3	-36.3	-38.1	-39.8	-41.4

Cumulative Noise Levels															
	Freq (Hz)		10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
Internal bedroom level			31.5	31.6	34.0	33.0	32.5	31.7	31.6	33.1	31.7	28.1	34.3	25.7	25.4
NANR 45 Limits			92.0	87.0	83.0	74	64	56	49	43	42	40	38	36	34
Level Difference (dB)			-60.5	-55.4	-49.0	-41.0	-31.5	-24.3	-17.4	-9.9	-10.3	-11.9	-3.7	-10.3	-8.6

Note: No allowance for screening from the solar panels and string inverter noise higher than emprical data indicates.

Appendix 2 – Example Test Data Sheets

Example String Inverter Data Sheets

PV Inverter

THREE PHASE & QUAD MPPT

SE 50/60KTL

Application: Large-scale Industrial and Commercial Sites

SUPERIOR EFFICIENCY

- Maximum efficiency 99.0%
- String current 13A, compatible with high power modules
- 150% PV configuration, 110% output overload

HIGH RELIABILITY

- Integrated type II DC/AC SPD
- APP for local settings & display
- High quality components use

INTELLIGENT MAINTENANCE

- String level I/V detect (Optional)
- Remote configuration and upgrade
- Supports export control

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Model	SE 50KTL	SE 60KTL
Efficiency		
Max. Efficiency	99.0%	
European Efficiency	98.5%	
Input(PV)		
Max. Input Voltage	1100V	
Max. PV configuration (STC)	150%	
Rated Input Voltage	620V	
Max. Input Current	130A (39A/39A/26A/26A)	156A (39A/39A/39A/39A)
Max.Short Circuit Current	150A (45A/45A/30A/30A)	180A (45A/45A/45A/45A)
Start Input Voltage	250V	
MPPT Operating Voltage Range	200V-1000V	
Max. Number of PV Strings	10 (3/3/2/2)	12 (3/3/3/3)
No. of MPPTs	4	
Output(Grid)		
Rated AC Active Power	50,000W	60,000W
Max. AC Apparent Power	55,000VA	66,000VA
Max. AC Active Power (PF=1)	55,000W	66,000W
Max. AC Output Current	3*76A	3*92A
Rated AC Voltage	380V/400V, 3W+N+PE	
AC Voltage Range①	277V-520V (Adjustable)	
Rated Grid Frequency	50Hz / 60Hz	
Grid Frequency Range②	45Hz-55Hz / 55Hz-65Hz (Adjustable)	
THDI	<3% (Rated Power)	
DC Current Injection	<0.5%In	
Power Factor	>0.99 Rated power (Adjustable 0.8 LD - 0.8 LG)	
Protection		
DC switch	Support	
Anti-islanding protection	Support	
AC overcurrent protection	Support	
AC short circuit protection	Support	
DC reverse connection	Support	
Surge Arrester	DC Type II / AC Type II	
Insulation detection	Support	
Leakage current protection	Support	
General		
Topology	Transformerless	
IP Rating	IP65	
Night Self Consumption	<1W	
Cooling	Fan cooling	
Operating Temperature Range	-25°C-60°C	
Relative Humidity Range	0-100%	
Max. Operating Altitude	4000m	
Noise	<62dB	
Dimensions (W*H*D)	855mm*555mm*275mm	
Weight	73Kg	74Kg
HMI & COM		
Display	Wireless & APP+LED, LCD (Optional)	
Communication	RS485, Optional: WiFi / GPRS / 4G / LAN	
Certification		
Safety	IEC62109-1, IEC62109-2	
Grid Code	VDE-AR-N 4105, EN 50549-1, CEI 0-21, UNE 206006/206007-1, UNE 217001, IEC 61727/62116	
Warranty	5 Years	

Remarks:
- ①②The range of output voltage and frequency may vary depending upon different grid codes.
- Specifications are subject to change without advance notice.

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Example String Inverter

Acoustic Test Report

Product Name: Solar Inverter

Product Model: SUN2000-90KTL-H0
SUN2000-90KTL-H1
SUN2000-95KTL-INH0
SUN2000-100KTL-H0
SUN2000-100KTL-H1

Applicant:	Huawei Technologies Co., Ltd.
Address:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C
Product Name:	Solar Inverter
Product Model:	SUN2000-90KTL-H0 SUN2000-90KTL-H1 SUN2000-95KTL-INH0 SUN2000-100KTL-H0 SUN2000-100KTL-H1
Date of Receipt Sample:	2017-12-16
Start Date of Test:	2017-12-18
End Date of Test:	2018-01-13

1 General Information

1.1 Standard Compliance

Test Methods:

1.2 Test Location

Test Location:	GCTC Laboratory of Shanghai Huawei Technologies Co., Ltd.
Address:	NO.2222, Xinjinqiao Road, Pudong District, Shanghai, 201206, P.R.C

1.3 Testing Environment Condition

Ambient Temperature:	+20℃ to +25℃
Relative Humidity:	45% to 55%
Atmospheric Pressure:	101kPa

SUN2000 Acoustic Test Report

2 Test Results

2.1 Test Items and Results

Table 1 Test items and results

SN	Test Item	Standard Compliance	Test Parameter	Result
19	Acoustic test	NB/T 32004	+25℃, cubical measurement surface, sound pressure L_W dB(A) ≤ 55 dB(A)	Pass

2.2 Test Instruments

Table 2 List of test instruments

Test Instrument	Model	Manufacturer	Asset Number	Calibration Date	Calibration Interval (month)
Acoustical measurement instrument	MF02PN	BBM	3606111719	2017-07-31	12

2.3 Auxiliary Equipment

Table 3 List of test auxiliary instruments

Name	Model	Manufacturer	(Asset) number	Calibration Date	Calibration Interval (month)
PV source	N8957APV	Keysight	DE16431819	2017-10-30	12
PV source	N8957APV	Keysight	DE16391780	2017-08-14	12
PV source	N8957APV	Keysight	DE16391779	2017-08-14	12
PV source	N8957APV	Keysight	DE16391778	2017-10-30	12
PV source	N8957APV	Keysight	DE16391777	2017-08-14	12

3 Product Specification

3.1 Main Product Specification

Table 4 Main product specification

Rated Input Voltage	1080V DC
Rated Power	100 KW
Dimensions of the Sample	1075 mm (W) × 310 mm (D) ×605 mm (H)
Weight of the Sample	76kg
Sample Assembly Level	Module
Quantity of the Packaged Sample	1 set

3.2 Product Configuration and Test Setup

3.2.1 Product Configuration

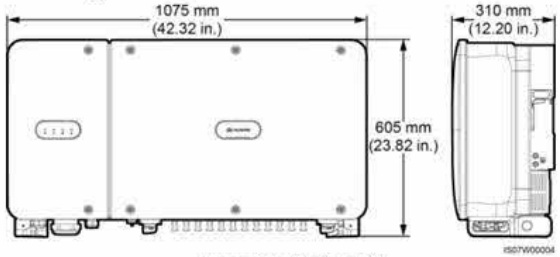


Figure 1. Test Configuration

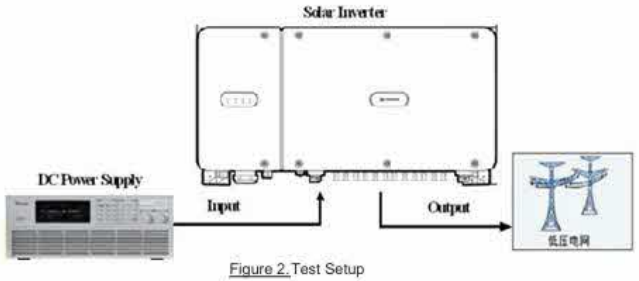


Figure 2. Test Setup

4 Detailed Test Data

4.1 Acoustic Test

4.1.1 Test Procedure

1) Put the sample in the center of the hemi-anechoic room.
2) The locations of microphones are lay as the following figure.
3) Measure the background noise.
4) Power on the EUT, then adjust fan speed.
5) Record the data of the measurement points, and then calculate the sound power level.d=1m

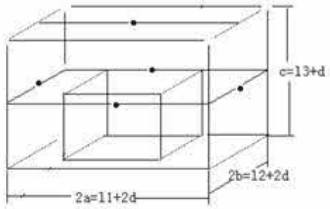


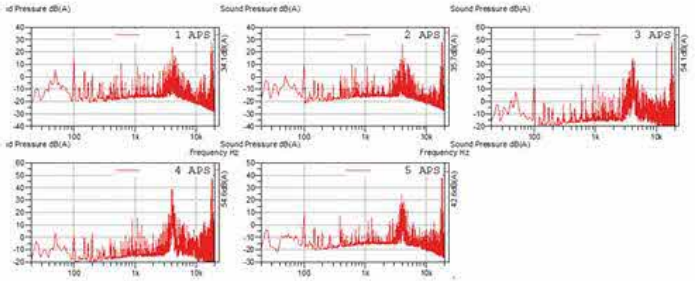
Figure 3. The locations of microphones

4.1.2 Detailed Test Data

1) Sound pressure level produced by equipment while the rotational speed of air moving devices within the equipment under test be set to the speed that the devices would run at when the equipment is operating in an ambient temperature equal to +23℃.

Table 5 Detailed test data of acoustic test

Test Item	Measurement Point	Sound Pressure Level (dB(A))
5 chanls	1	34.1
	2	35.7
	3	54.1
	4	54.6
	5	42.6
Qualification criterion	≤55dBA	
Test result	Pass	



5 Test Photos