COTSWOLD
District Council

Supplement for

CABINET - THURSDAY, 8 MAY 2025

Item 10. **Cotswold District Council Renewable Energy Study January 2025** 3 - 348

Purpose

The purpose of the Renewable Energy Study report is to provide Cotswold District Council with evidence-based guidance to support decision-making on renewable energy development and progress toward net zero targets, whilst also supporting the Local Plan Update.

Recommendation(s)

That Cabinet resolves to endorse the Renewable Energy Study for use as:

- part of the evidence base for the review of the Local Plan;
- part of the evidence base for future Council policies and procedures in regards to responding to the Climate and Ecological Emergencies.

Due to the size of the report Annexes B to F are published as a supplement and are available via the Cotswold District Council Website https://meetings.cotswold.gov.uk/

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Annex B:

Appendix A: Renewable energy resource and opportunity assessment

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Enhanced energy efficiency standards

Introduction

This chapter sets out the policy context and key issues associated with setting enhanced energy performance standards within the Local Plan.

National minimum standards for energy use and emissions within new developments are set by Part L1A and Part L2A of the Building Regulations, which concern the conservation of fuel and power in new dwellings and new buildings other than dwellings respectively. The current regulations came into operation in 2010 but were re-issued in 2013 and amended in 2016. The regulations apply a cap to a building's emissions through the use of a nominal Target Emissions Rate (TER) measured in $kgCO_2/m^2/year$, which must not be exceeded by the Dwelling Emissions Rate (DER) as calculated according to the Standard Assessment Procedure (SAP) methodology, or the Building Emission Rate (BER) for non-domestic buildings, as calculated using the Simplified Building Energy Model (SBEM).

In October 2019 the Government launched a consultation on the next revision of the Building Regulations and proposed a new 'Future Homes Standard' with the message that "We must ensure that new homes are future-proofed to facilitate the installation of low-carbon heat, avoiding the need to be retrofitted later, and that home builders and supply chains are in a position to build to the Future Homes Standard by 2025". A summary of consultation responses along with the Government's response was published in January 2021.

The consultation response document confirms the Government's intention for homes to be zero-carbon ready by 2025 (a commitment that has been re-stated in the Government's Heat and Building Strategy, published in October this year), with new homes being built to high efficiency standards and without fossil fuel-based heating systems. An interim 2021 uplift is to be introduced, which would require a 31% reduction in carbon from new dwellings, compared to current standards. A package of performance standards is expected to be introduced, which includes:

- a primary energy target,
- CO_2 emission target,
- fabric energy efficiency target,
- minimum standards for fabric and fixed building services.

The document states that a full technical specification for the Future Homes Standard will be consulted on in 2023, with the legislation introduced in 2024 and implemented in 2025. Despite a previous proposal to remove the discretion of local authorities to impose enhanced standards beyond those set by Building Regulations, the Government confirmed that they would not amend the Planning and Energy Act 2008 in the immediate term, but stated an intention to clarify Local Planning Authorities' role in setting energy efficiency requirements for new homes in the

future. The situation therefore remains that local authorities have powers to stipulate energy performance standards that exceed the Building Regulations.

A second, separate consultation looking at proposals for a Future Buildings Standard for non-domestic properties, as well as proposals for overheating mitigation, ventilation (Part F) and fabric efficiency of domestic buildings, ran in early 2021, but a summary of responses has not yet been published. The timeframe for policy implementation is expected to align with the Future Homes Standard and also be introduced in 2025 with an interim uplift. The Governments preferred option is for the interim uplift to deliver a 27% reduction in carbon emissions on average per building compared to the existing Part L standard.

Net Zero Emissions in new development

- Where local authorities have followed the process of carbon auditing their plans as set out in the NPPF and PPG, they have generally concluded that it would be very difficult to achieve the required carbon reduction trajectory without new developments being built to a zero-carbon standard, due to the additional emissions growth inherent in new development commitments. This will require ambitious planning policies for new development which also ensure building energy performance is future-proofed.
- A national definition of a net zero carbon building has yet to be agreed, although a framework definition was proposed in April 2019 by the UK Green Building Council (UKGBC) which is based on an “industry consensus on how a net zero carbon building can be achieved today”. At the time of writing, the UKGBC are working to strengthen this definition, for example through supporting energy performance targets and exploring potential routes for a net zero carbon buildings verification scheme. UKGBC is currently pushing for net zero carbon in both construction and operational energy, and ultimately targets ‘whole life’ carbon impacts (including embodied emissions). As part of this work the organisation published detailed guidance on renewable energy procurement and carbon offsetting in March 2021.
- For now, UKGBC is recommending that local authorities make plans for “All new homes (and buildings) to be net zero carbon emissions in operation by 2030 at the latest”, where operational energy is defined as “When the amount of carbon emissions associated with the building’s operational energy on an annual basis is zero or negative. A net zero carbon building is highly energy efficient and powered from on-site and/or off-site renewable energy sources, with any remaining carbon balance offset.” Confusingly, and depending on context, an ‘operational’ net zero carbon target can refer either to emissions from regulated energy use only, such as the Government’s 2016 zero carbon homes definition (since abandoned), or to both regulated and unregulated energy use, which is considered ‘true’ zero carbon.
- Any proposed emissions target should now be considered in the context of the Building Regulation proposals and local and national ambitions for net zero

carbon. A widely accepted approach is to implement a baseline energy efficiency or 'fabric' target which then forms part of a hierarchical approach to a net zero carbon standard for new development. This supplements the baseline target with minimum levels of onsite renewable energy generation and carbon offset requirements to achieve net zero carbon.

Local authority-set energy and carbon standards

Hierarchical approach

It is important to consider an overall energy hierarchy when progressing sustainable approaches to energy supply and demand in policy at the local level. This prioritises reducing energy demand before considering the most sustainable ways of supplying energy to meet this lower demand. The London Plan has featured an energy hierarchy since 2004, the basis of which requires developers to first reduce demand, secondly ensure energy is supplied efficiently and finally consider the use of renewable energy generation. The latest version of the London Plan (2021) sets out the hierarchy under part A of Policy SI 2 'Minimising greenhouse gas emissions' as follows:

- **be lean**: use less energy and manage demand during operation
- **be clean**: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly
- **be green**: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site
- **be seen**: monitor, verify and report on energy performance.

In the case of net zero carbon targets, financial contributions towards carbon offsetting would be a last resort for emissions that could not be mitigated within the above hierarchy.

To supplement the energy hierarchy, a similar hierarchical approach to heat supply is also useful to ensure developers consider a range of heat supply options and prioritise the most sustainable solutions where feasible in the wider context of local sustainable energy planning. For example, this should ensure that the potential for establishing or linking up to any local district energy heating/cooling networks is fully explored.

The London Plan sets out its heating hierarchy under part D of Policy SI 3 'Energy infrastructure' as follows:

"Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system:

1. the heat source for the communal heating system should be selected in accordance with the following heating hierarchy:
    a. connect to local existing or planned heat networks

    b. use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)
    c. use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)
    d. use ultra-low NOx gas boilers
2. CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that they meet the requirements in Part B of Policy SI 1 Improving air quality
3. where a heat network is planned but not yet in existence the development should be designed to allow for the cost-effective connection at a later date".

Carbon reduction standards

Local authority policies and policy proposals to encourage enhanced energy performance are often described in terms of percentage improvements over Part L of the Building Regulations. As noted above, current building regulations require a new building's operational emissions to not exceed an overall Target Emissions Rate (TER) which is assessed by comparison with a notional building of the same form but with a standard services specification. In addition, a Target Fabric Energy Efficiency rate (TFEE) also sets a maximum limit for energy demand based on the fabric energy efficiency of the building. Often, however, this target is flexible in how the reductions are achieved i.e. allowing any mix of enhanced fabric measures or onsite renewable or low carbon energy generation (unless of course a Merton Rule policy is applied in parallel – see paragraph 2.43). As this creates a risk of inappropriate trade-offs and misalignment with the energy hierarchy, it is also useful to specify an additional minimum emissions reduction target which must be achieved specifically through fabric measures.

In this way, the energy hierarchy approach is encouraged to minimise demand as far as possible before energy supply measures are considered. In terms of like-for-like emission reductions, improving building fabric energy efficiency levels beyond Part L 2013 can often be more expensive than onsite low or zero carbon generation options such as solar PV, but will result in the additional benefit of reducing energy demand and costs for the occupant. It will also help to lower peak demands on energy supply infrastructure.

An example of an onsite emissions reduction target within the context of an overall net zero emissions policy can be found in the 2021 London Plan, which sets targets under part C of Policy SI 2 as follows:

"A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target

cannot be fully achieved on-site, any shortfall should be provided, in agreement with the Borough, either:

A. through a cash in lieu contribution to the borough's carbon offset fund, or
B. off-site provided that an alternative proposal is identified and delivery is certain".

Very high levels of energy efficiency within new buildings have been achieved from proprietary ultra-low energy housing construction standards that have been deployed at small scale in the UK. These include Passivhaus, which typically achieves 75% reduction in space heating requirements compared to standard UK practice, and Energiesprong, a refurbishment and new build standard achieving net zero operational energy. Currently however these are unlikely to be economically competitive with build solutions based on the net zero carbon hierarchical approach described above.

For new non-residential development BREEAM standards such as 'Excellent' or 'Outstanding' can ensure high all-round environmental standards are achieved but they do not provide a direct measure of emissions reduction compared to building regulations.

Onsite emissions reduction targets applied within the context of energy/heat supply hierarchies therefore provide an effective approach to minimising onsite operational emissions within new development. When implemented as part of an overall net zero emissions policy, the approach can generally be considered reasonable, viable and sufficiently flexible to avoid placing undue burden on developers. Where onsite measures are considered to be unviable with respect to the targets, developers need to provide suitable evidence and agree alternative solutions, such as carbon offsetting, with the planning authority. Such hierarchical policies also usually include set requirements for monitoring and reporting on energy performance for an initial period of operation.

Including a development scale threshold as in the London example assumes that the large majority of potential emission savings are from major developments and that economy of scale makes it more difficult to viably achieve targets on small developments. Although this might simplify the planning process for small scale developments, it could be argued that net zero policies with suitable offsite emission reduction options offer a catch-all solution for all scales of development. However, for the Cotswold District the ratio of minor/major development typical for the area and any consequential benefits of including minor development within such policies should first be evaluated, bearing in mind the overall context of the hierarchical policy being considered and impacts on viability.

Energy Use Intensity targets

An alternative approach to achieving net zero total emissions for new development is described in the London Energy Transformation Initiative's (LETI) Climate Emergency Design Guide.

Total energy use targets are described in terms of 'Energy Use Intensity' (EUI), and are measured in kWh/m2/year. In this context 'total' energy use refers to operational energy use, which includes both regulated and unregulated end uses, but excludes electric vehicle charging. The targets are proposed for three building typologies (residential, office and commercial buildings, but noting that evidence in the residential sector is strongest) and were set by balancing industry capability with energy budgets based on national forecasts for renewable energy generation. The EUI targets are intended to be deployed alongside a target for space heating demand, a ban on the use of fossil fuels on-site, and a requirement for on-site renewable generation at a scale that at least matches the building's demand for energy. Where the latter is deemed not to be possible in a particular case (for example where a tall block of flats has insufficient roof area for the installation of adequate solar PV provision), then Renewable Energy Credits are proposed, where a developer can pay for the equivalent renewable generation capacity elsewhere.

Setting targets based on energy consumption rather than carbon emissions avoids the need to consider the effect of grid decarbonisation on assumed carbon factors and means that compliance can be measured post-completion relatively easily.

Table 1: LETI EUI targets for new development typologies

Rooftop Solar PV	Proposed EUI target (kWh/m2/year)	Proposed space heating target (kWh/m2/year)
Residential	35	15
Commercial offices	55	15
Schools	65	15

Cornwall Council has taken a similar approach for residential development in their recent Climate Emergency Development Plan Document (DPD), which was submitted for independent examination in November 2021. Under policy SEC1, development proposals would be required to achieve Net Zero Carbon and to submit an Energy Statement that demonstrates how the EUI targets will be achieved. These are however slightly higher than those recommended by LETI at 40kWh/m2/year total demand, 35kWh/m2/year space heating demand, and a requirement to provide on-site renewable generation to match total demand (with a preference for solar PV). Where this is shown to be either not technically feasible or economically viable, the policy would require developers to maximise renewable energy generation as far as is possible, and/or connect to a district heat network. As a last resort the residual

could be offset by a contribution to Cornwall Council's Offset Fund, as far as economic viability allows. The policy proposals suggest that major non-domestic developments (floorspace over 1,000m2) should be required to achieve a BREEAM 'Excellent' rating.

Embodied carbon

Recognition of the need to address 'whole life' carbon impacts, which incorporate both operational and embodied emissions, has grown in the last couple of years and has become an area of particular focus for organisations such as the RIBA, LETI, CIBSE and the UKGBC. In LETI's Embodied Carbon Primer the authors note that industry still has some way to go before net zero embodied emissions can be widely achieved (in terms of the knowledge and skills development needed) and that a phased approach where targets become more restrictive over time might be most appropriate. LETI suggest that a best practice approach for policymakers might be to adopt a policy hierarchy that advocates circular economy principles (i.e. where re-use and refurbishment are preferred to demolition and new construction), mandates embodied carbon reduction strategies based on a consistent and recognised methodology for embodied and whole life carbon analysis, adopts embodied carbon targets, and phases in the requirement for Environmental Product Declarations (EPDs) for at least all building parts forming the substructure, frame and upper floors. LETI neither specifically endorse or reject carbon offsetting as a means to account for embodied emissions, but note that this approach can be controversial.

Carbon offsetting

Carbon offsetting schemes are designed to allow developers to make financial contributions to offset emissions that cannot be mitigated onsite. This system has already been in use for several years in London, where the developer pays a specified amount per tonne of carbon to be offset. Similar approaches are also being taken by an increasing number of local authorities elsewhere including the West of England Combined Authorities and the Greater Manchester Combined Authorities. However, the resources to implement such schemes may make this option more difficult to adopt in smaller individual local authorities.

In the absence of developments which truly do not generate carbon emissions through their operation and occupation, carbon offset regimes can therefore provide funds to create new carbon saving projects and bring forward the rate at which carbon emission reductions are achieved. In general, however, carbon offsetting is often viewed as a controversial area of carbon management both because of the risk that it distracts from the pressing need to reduce emissions at source by seeking to compensate for carbon that has already been emitted, and because the claimed savings can be difficult to monitor and verify. It is important therefore that policies are designed in such a manner as to ensure that all viable onsite methods of reducing carbon emissions are exhausted first. They should also be seen as temporary measures until regulatory regimes, development economics and the development

industry deliver true carbon neutral or carbon positive developments on-site through use of sustainable materials, very high energy efficiency standards and integrated renewables. Care should also be taken to ensure that the emission reductions funded by carbon offset schemes are genuinely additional to what would have happened otherwise.

Where carbon offset regimes are in operation, the local authority takes on the responsibility for delivering carbon emission savings or reductions to offset for the residual carbon emissions from developments. Defined administration structures are needed to stimulate new markets and carbon saving activities to ensure that the system is keeping up with the pace of emissions it is intending to mitigate for. There is the potential to share back office processes with neighbourhood authorities to reduce costs.

Although, in the case of carbon offsetting linked to zero carbon planning policies, carbon offset payments are usually calculated on the basis of abating carbon emissions for only 30 years' worth of building occupancy, there is an assumption that during this period the decarbonisation of grid electricity and heat will be achieved through future technological and/or policy developments and therefore will account for emissions over the remaining life of the building. A carbon price to value offsets at £95 per tonne of CO_2 has been recommended for London boroughs in GLA guidance and in a report for the West of England Authorities.

Other considerations

Emission factors used by the 2013 Building Regulations (which is based on the 2012 version of SAP) are now considerably out of date and do not reflect the current level of electricity grid decarbonisation achieved in the UK. To address this issue, a draft SAP10 methodology was published in 2018, followed by a version 10.1 in October 2019 and 10.2 in August 2021. Version 10.2 is expected to replace the 2012 version as part of the next update of the Building Regulations and would reduce the carbon emissions factor from 0.519 to 0.136 gCO_2/kWh. This reduction will have a considerable impact on the contribution of renewable power generation technologies to emission reduction targets, as well as to any carbon offsetting calculations.

Future proofing measures could be encouraged in anticipation of the Future Homes Standard and the increasing need to achieve net zero carbon onsite or through connection to zero carbon local energy networks. These might include use of low temperature heat distribution systems compatible with heat pumps or making provisions for future connection to district heating networks.

In moving towards net zero emission buildings, fabric energy efficiency will continue to increase, bringing with it an increased risk of overheating. Appropriate mitigation measures should therefore be highlighted in sustainable design policy.

Solar PV/thermal (roof-mounted)

Description of technology

Both solar PV and solar water heating are well-established technologies in the UK, with uptake having been significantly boosted through the Feed-in Tariff (FiT) and the Renewable Heat Incentive (RHI) schemes. The breadth of uses for solar PV technology is vast and spans many diverse applications such as solar phone chargers, roof or ground-mounted power stations and solar streetlamps. There is also a new design for a solar PV integrated motorway noise barrier that is being considered for use by Highways England, and a trial of track-side solar panels being used to power trains by Imperial College. Solar car park canopies also offer potential, as demonstrated by the 88.5kW system installed at the Ken Martin Leisure Centre by Nottingham City Council.

Another application currently being developed in the UK is 'floatovoltaics' (floating PV arrays). These often involve situating panels on rafts of floats, anchored to the sides of a reservoir or lake. UK examples include the 6.3 MW floating solar PV array which has been developed on one of Thames Water's reservoirs, Queen Elizabeth II Reservoir, near Heathrow airport. This consists of 23,000 panels and covered around one tenth of the reservoirs surface. Other examples include Godley Reservoir near Manchester. This has a capacity of 3MW and consists of 12,000 panels. United Utilities are also developing a Lancaster reservoir. These arrays generally take up a small area of the reservoir and can have a positive environmental impact by covering portions of water bodies and therefore reducing evaporation during summer months. Another positive for those looking at opportunities for floating solar farms in the UK is that the example project (QEII) did not require planning permission, unlike for solar panels installed on land. It is worth mentioning that the examples used above are reservoirs which may reduce issues with multiple land use. In more natural spaces, however, there may be a risk that the lower light levels underneath the panels could affect the local ecosystem, in particular those organisms at the very bottom of the food chain (e.g. algae). This would need to be considered in more detail should there be any proposals for a floating array at sites such as the Cotswold Water Park which, despite being a man-made lake system, has been designated as a Site of Special Scientific Interest (SSSI).

Rooftop deployment is generally limited to roofs with minimal shading and which face south-west through to south-east with a pitch of 20-60 degrees. Systems can be roof-integrated, i.e. designed to form an integral part of the roof itself and therefore can offset some of the cost of conventional roofing materials using a range of PV materials including semi-transparent panels, tiles and shingles. Flats and non-domestic properties often have flat roofs and so orientation is not critical, although systems will then need tilted frames to house the solar array, with each frame suitably spaced in rows to avoid self-shading. For pitched roofs, solar PV generally

needs around 7.5m^2 of roof space per kW for high efficiency panels (e.g. monocrystalline silicon) and grid-connected systems are able to export power if there is insufficient load in the property at any one time. The rooftop size of solar water heating systems however is limited by the hot water demand of the property they are serving, with domestic systems typically requiring 1.5m^2 of flat panel per resident. Properties also need to have sufficient space to accommodate a hot water storage tank.

Standard installations of solar panels are considered to be 'permitted development' and therefore do not normally require planning consent. However, installations on listed buildings, or on buildings in designated areas (e.g. on the site of a scheduled monument or in a conservation area) are restricted in certain situations and may require planning consent. The Cotswolds Conservation Board, who are responsible for coordinating the conservation and enhancement of the Cotswolds Area of Outstanding Natural Beauty (AONB), are generally supportive of roof-mounted solar arrays so long as they do not detract from the character and appearance of the building or area (including in relation to non-designated heritage assets). Their position statement on renewable energy notes that in particular "there are many large farm buildings where panels could be placed with little or no negative impact on the landscape of the AONB"[1].

Existing development within Cotswold

Cotswold District saw 19MW of solar PV capacity installed between April 2010 (launch of the Feed-in Tariff) and March 2019 (when it closed), with a third of this deployed on domestic dwellings. Accredited domestic installations of solar water heating systems under the Renewable Heat Incentive (RHI) scheme from April 2014 to July 2020 totalled 30, which equates to approximately 0.09MW assuming an average system capacity of 2.9kW. Figures are not available for non-domestic installations.

Assumptions used to calculate technical potential

CSE's solar PV model estimates the potential energy output from the installation of PV panels on the buildings within a given region of the UK. There is an associated cost-benefit model which calculates the financial viability in terms of Net Present Value (NPV) and Internal Rate of Return (IRR) of all the potential PV installations. Together, the two models aim to evaluate each section of roofing of each building in the region for both the technical and financial viability of a solar PV installation.

The model uses LiDAR data for the region. This tells us the height above sea-level of each metre-by-metre square section of the region (if the resolution of the LiDAR for

[1] https://www.cotswoldsaonb.org.uk/wp-content/uploads/2017/08/renewable-energy-ps-2014-final-apr2014.pdf

that region is 1m, which most areas of the UK now have). It also uses Ordnance Survey building footprint polygons for the region to be modelled. The process/method used is as follows:

1. Model horizons: using the LiDAR data, the model builds a horizon profile for each point of LiDAR data that falls within the footprint of a building. This is the horizon height in degrees from horizontal in a ring around the building, as if an observer was standing on the roof of the building and reporting how much sky could be seen in each direction.
2. Detect roof planes: For each building, the model detects the various roof planes that make up the roof of the building using a modified version of the RANSAC algorithm. For example, it would detect one roof plane in a flat-roofed building, two in a building with gables, and our in a building with a hip roof. The higher-resolution the LiDAR is, the more accurate this process is. This tells us the size and compass orientation of each potential PV panel site.
3. Exclude unsuitable roof sections: Roof sections are excluded from the model for a range of reasons:
    - They are too North-facing;
    - They are angled too steeply;
    - They are too overshadowed to the South, South-East or South-West (using the horizon data calculated earlier);
    - The roof section is too small for a useful installation.
4. Calculate PV energy output: Using a tool called PV-GIS[2], the PV energy output of an installation with a given location, size, compass orientation, and horizon model is calculated. This includes modelling losses due to temperature, reflection, solar spectrum, and cabling/inverters.
5. Perform cost-benefit analysis: The NPV and IRR are calculated for each potential PV installation of each building (see Appendix D for detailed assessment assumptions). For example, if a building has three potential PV sites on its roof called P1, P2 and P3, in descending order of energy output per square metre, the NPV and IRR are calculated for the following installations: [P1], [P1 P2], and [P1 P2 P3]. This is so the worst site (P3) is only considered if it would be worth installing both P1 and P2.

The limitations of this model are that it cannot detect where buildings might be unsuitable for PV installation due to roof weakness, type of building, or listed status. Also, if there is no LiDAR coverage for the region, modelling will not be possible. The quality of the outputs will be reduced if there is only low-resolution (greater than 1m

[2] 'Grid-connected PV systems' model from PVGIS, via the PVcalc API. It uses the PVGIS-SARAH database, which is the recommended one for Europe, excluding Scandinavia (https://ec.europa.eu/jrc/en/PVGIS/docs/usermanual#fig:default_db)

by 1m resolution) LiDAR coverage. Within the Cotswold District the LiDAR coverage is 39.4%. This is relatively low, however most urban areas have good coverage.

The resulting outputs include a GeoPackage showing the suitable roof planes (with the ability to categorise them e.g. by tenure, residence type, NPV, IRR). This data can also be presented in a spreadsheet with one row per roof plane. Each roof plane (row) is given a peak power (MW), usable area (m^2), total yield (kWh/year), yield per roof area (kWh/m^2/year), installation cost (£), NPV and IRR.

Results

Technical potential

The potential installed capacities, energy yields and savings for solar PV across Cotswold are presented below according to the assumptions set out in Error! Reference source not found.. Potential capacity for solar thermal results have not been included as part of this analysis, however roofs with high potential in solar PV will also have high potential in solar thermal technology.

Table 2 shows the results from the solar PV analysis split by residence or building type. The average capacity is highest for non-domestic buildings (this is also shown in Figure 3 with non-domestic being higher than other tenures). However, Figure 1 shows that the total estimated technical capacity and energy yield is slightly lower than flats which is due to there being 5,750 flats and only 3,434 non-domestic buildings. These buildings are likely to have higher yields and capacity due to having a larger roof area than bungalows and terraces. Flat blocks may also receive less shading due to being higher-rise. Some of these buildings will already have solar panels and this is not accounted for.

Table 2: Assessment of roof-top solar PV by Building Type

Building type	Total Number of buildings	Total estimated technical capacity (MWp)	Average estimated capacity per roof/ building (kW)	Potential energy yield – electricity output (MWh/ year)	Potential CO_2 savings (tonnes/ year)
Terrace / end terrace	9,082	27.57	3.04	23,284.53	3,166.70
Semi-detached	12,864	40.56	3.15	34,211.37	4,652.75
Detached	14,733	66.72	4.53	56,795.02	7,724.12
Flat	5,750	98.51	17.13	86,050.64	11,702.89
Bungalow	1,761	7.90	4.49	6,702.22	911.50
Non-domestic	3,434	90.37	26.32	78,605.59	10,690.36
Total	**47,624**	**331.63**	**58.65**	**285,649.36**	**38,848.31**

Figure 1: Roof-mounted Solar PV Potential and Potential CO_2 savings across Residence Type

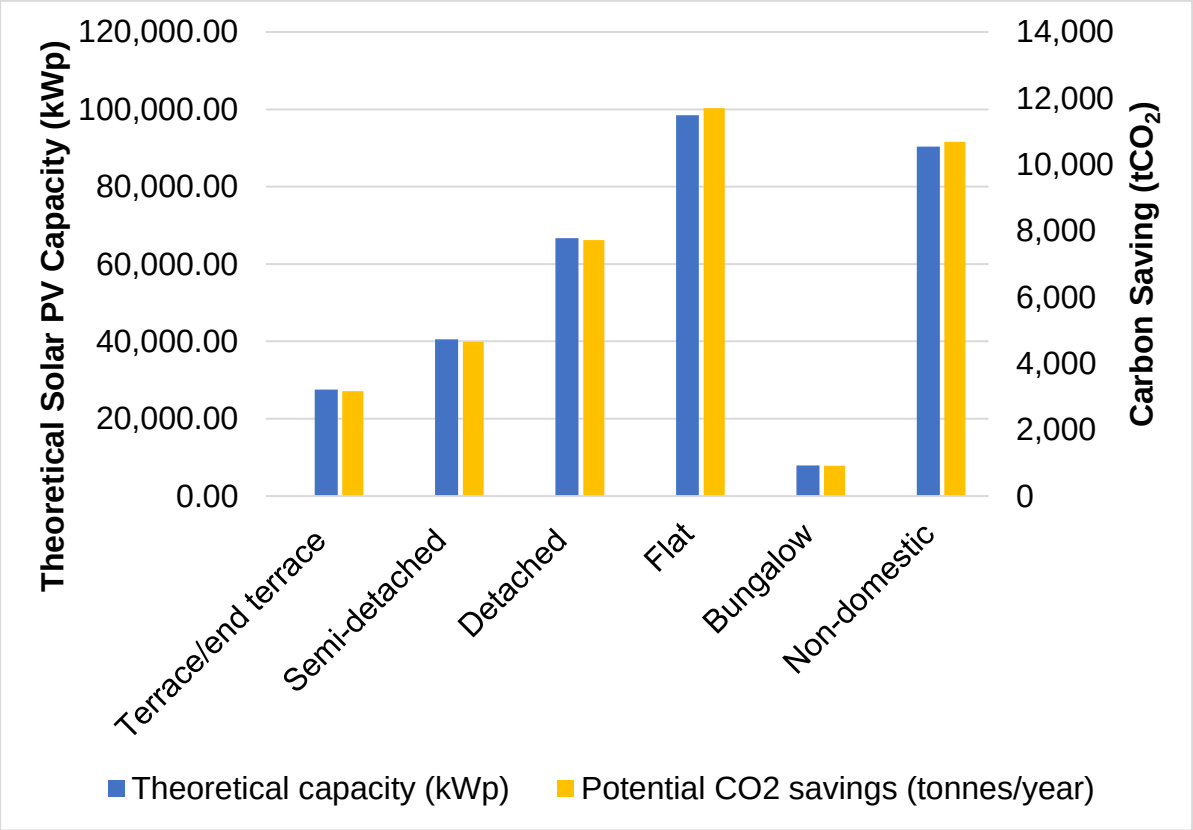
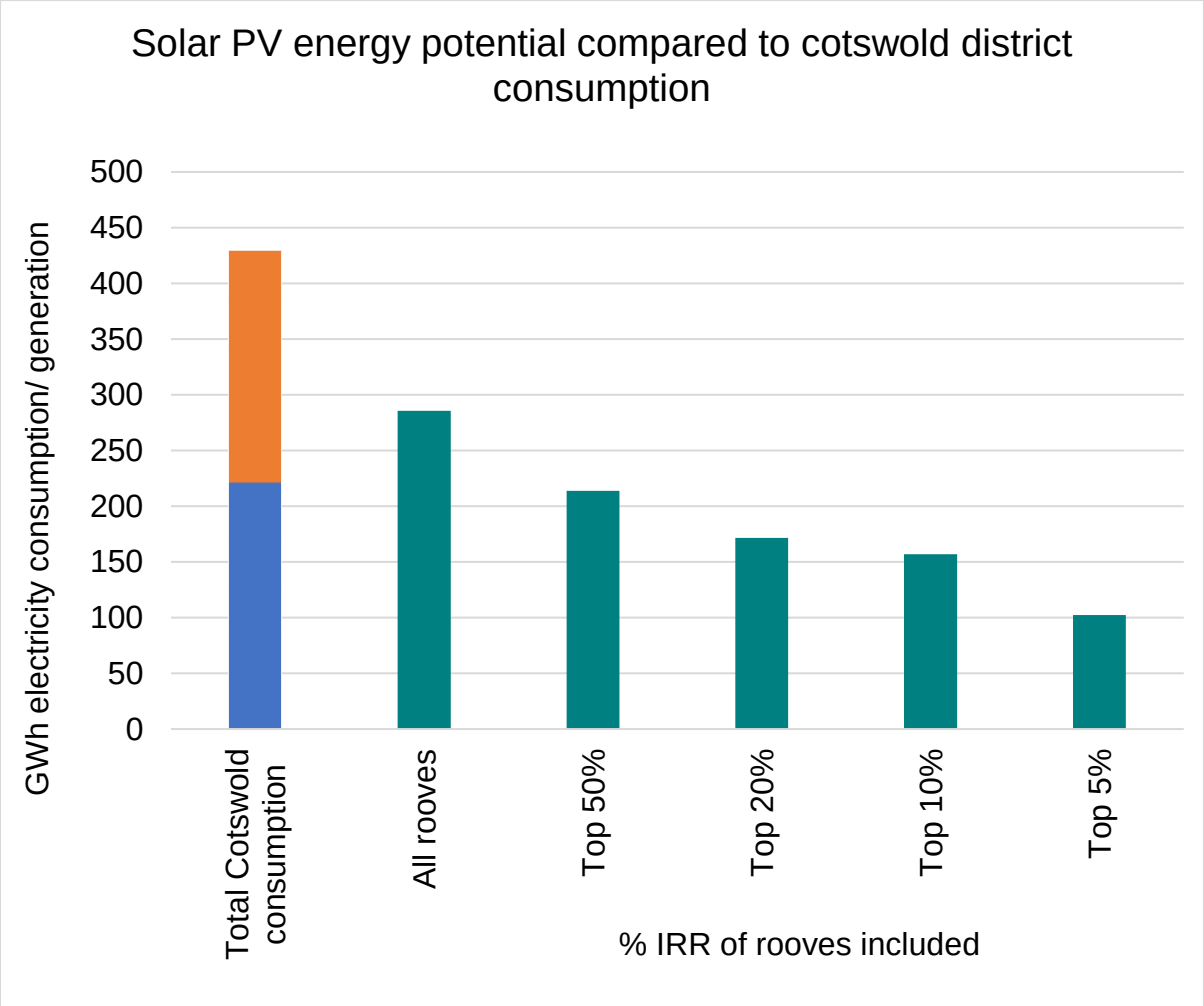


Figure 2 shows the solar PV generation potential from all roofs that were selected in the analysis to only the top 5% of IRR. It shows that even if all roofs selected in the analysis had solar PV this wouldn't cover both the domestic and non-domestic electricity demand across the district. However, it would cover either domestic or non-domestic.

Figure 2: Cotswold District electricity consumption compared to estimated solar PV generation potential

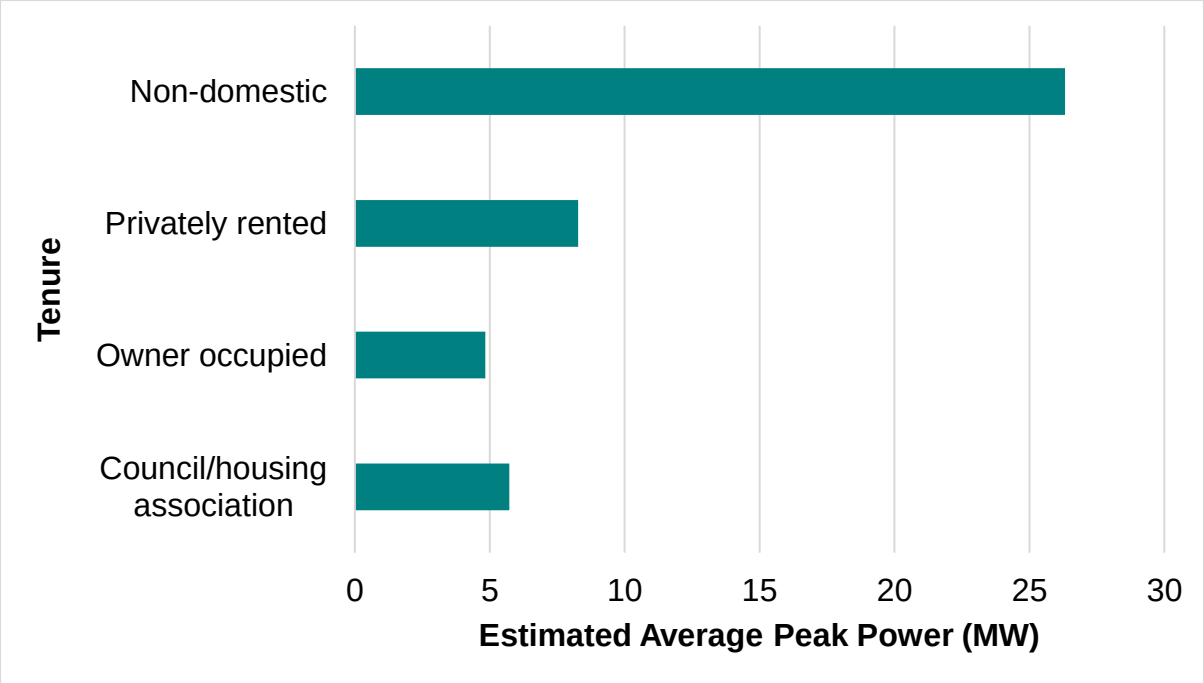


The solar PV analysis can also be split by tenure. Out of the domestic properties, the private rented homes have the highest average capacity per building (kW) (as shown in Table 3 and Figure 3). This could be due to blocks of flats more commonly being private rented. However, as there are more owner occupied homes, this has the highest potential yield of electricity.

Table 3: Assessment of roof-top solar PV by tenure

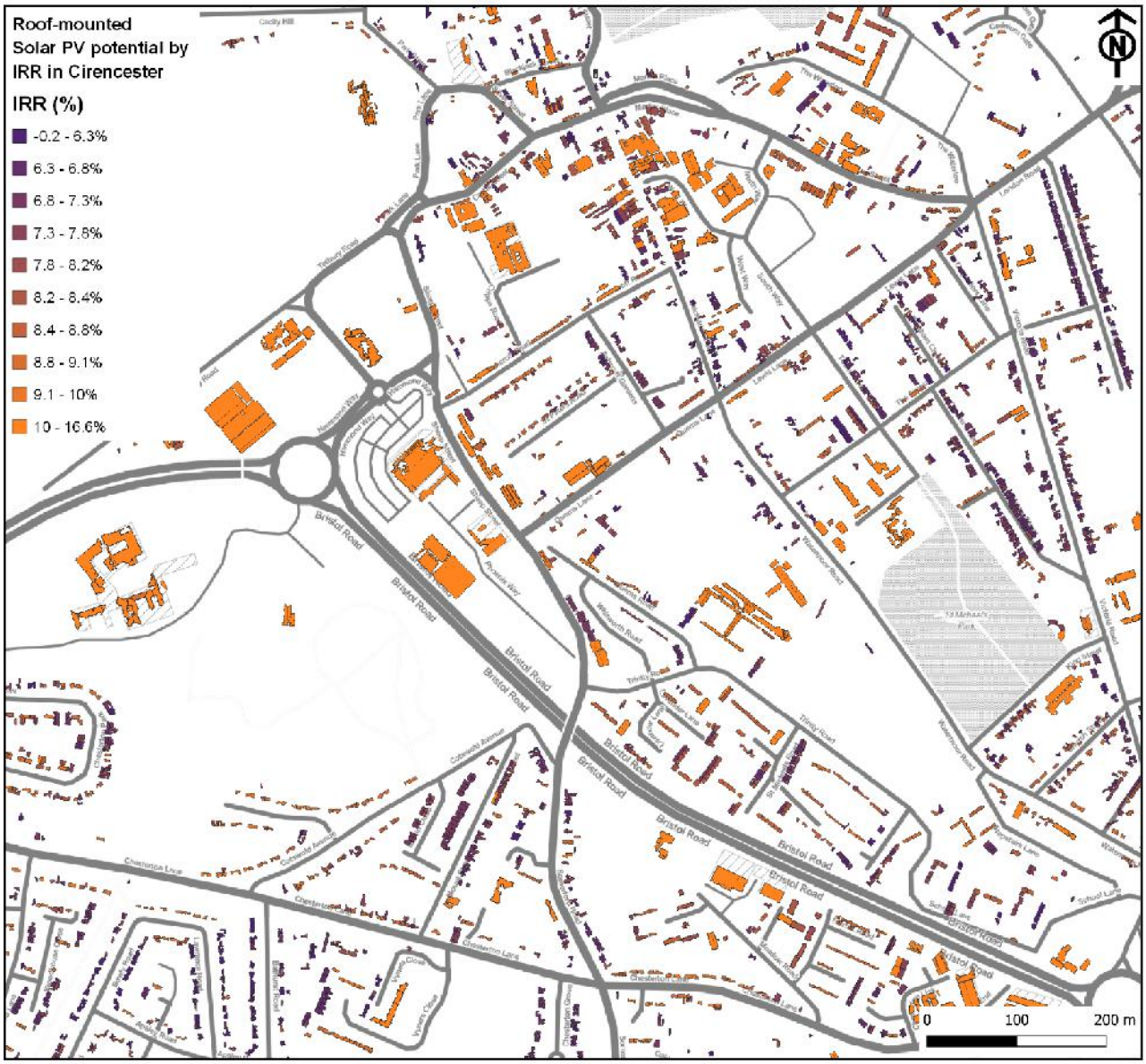
Tenure	Total Number of buildings	Total estimated technical capacity (MWp)	Average estimated capacity per roof/ building (kW)	Potential energy yield – electricity output (MWh/year)	Potential CO_2 savings (tonnes/year)
Council/ housing association	7,061	40.44	5.73	34,489.06	4,691
Owner occupied	30,950	149.70	4.84	127,956.87	17,402
Privately rented	6,179	51.12	8.27	44,597.84	6,065
Non-domestic	3,434	90.37	26.32	78,605.59	10,690
Total	**47,624**	**332**	**45**	**285,649**	**38,848**

Figure 3: Estimated average peak power (capacity) across tenure



The analysis can be viewed spatially on maps with each roof either showing financial indicators such as NPV or IRR or the electricity yield or peak of the roof. Figure 4 shows the % IRR of roofs in a select area of Cirencester. Maps of other areas can be created upon request.

Figure 4: Solar PV potential by IRR (%) in Cirencester



Issues affecting deployment

Rooftop solar PV is a mature and relatively easy-to-install renewable energy technology which can be used to help meet tightening building emissions standards by displacing higher-carbon mains electricity, and for these reasons it is often a popular option with developers. However, the steady decarbonisation of mains grid electricity means that the 'value' of these carbon savings will also continue to drop, although financial benefits will remain for those receiving free electricity from onsite PV systems.

In addition, the cost of solar PV has fallen dramatically over the last decade[3] and this trend is likely to continue with the expectation that UK grid parity (generation of power at or below the cost of mains power) will eventually be achieved for rooftop systems without the need of subsidies. Costs can also be minimised through collective buying schemes such as Solar Together. Technological advances in energy storage systems and smart power management controls, along with increasing demand from heat pumps and electric vehicles and the introduction of time-of-use tariffs to optimise benefits are also likely to act as on-going incentives for solar PV in the wake of the Feed-in Tariff scheme closure. Additionally, the Government introduced the Smart Export Guarantee scheme in January 2020, which places an obligation on licensed electricity suppliers to offer a tariff and make payment to small-scale (>5MW) low carbon generators for electricity exported to the grid. However, this only applies to exported power rather than total generation and so is generally less beneficial than incentives previously offered under the Feed-in Tariff. It also may not provide long-term financial security to owners as the suppliers can offer any rate that is not zero. In October 2019 the Government also increased VAT payable on solar PV battery systems from 5% to 20%, although the reduced rate of 5% still applies for the domestic installation of solar panels (both solar PV and solar water heating).

Solar PV will therefore continue to play a vital role in the large majority of new developments and will make a significant contribution to total installed capacity across the UK. Future uptake on existing buildings however is difficult to predict and will be more limited until subsidy-free financial viability improves.

Solar water heating is much less common, with preference generally given to solar PV during the more lucrative Feed-in Tariff period, although installations on buildings located in off-gas areas can be financially advantageous due to the increased benefits of displacing higher cost heating fuels relative to mains gas, such as electricity and oil. Installations on non-domestic buildings are more limited as viability depends on hot water demand and competition with point-of-use hot water heating. Relative to heat pumps, the technology is likely to play a much lesser role in the decarbonisation of heat, particularly if grid electricity continues to decarbonise as predicted.

[3] https://www.gov.uk/government/statistics/solar-pv-cost-data

Solar PV (ground-mounted)

Description of technology

In addition to PV modules integrated on built development, there are a large number of ground-mounted solar PV arrays or solar farms within in the UK. These consist of groups of panels (generally arranged in linear rows) mounted on a frame. Due to ground clearance and spacing between rows (and between rows and field boundary features) solar arrays do not cover a whole field and allow vegetation to continue to grow between and even underneath the panels.

Ground-mounted solar project sizes vary greatly across the UK although, as with wind, developers in a post-subsidy environment are increasingly focusing on large-scale development, with the largest currently consented scheme in England (Cleve Hill in Kent) being over 350 MW[4]. There is no one established standard for land take per MW of installed capacity, although land requirements for solar are comparatively high compared with wind. For the present assessment, an approximate requirement of 2 hectares per MW has been applied based on existing and past guidance and recent development experience.

As of 2020, the UK had 13,462 MW of installed solar PV capacity, with this providing 13,158 GWh of electricity during the year (4.2% of total energy demand)[5] (the lower energy generation relative to wind despite the similar installed capacity is due to the lower capacity factors of solar PV generation[6]). These figures include all forms of solar PV – although according to the most recent available data, ground-mounted

[4] Cleve Hill Solar Park (2020) Cleve Hill Solar Park granted development consent – 28/05/2020. Available at: www.clevehillsolar.com/.

[5] Department for Business, Energy & Industrial Strategy (June 2021) Energy Trends: UK renewables: Table 6.1 - Renewable electricity capacity and generation (ET 6.1 - quarterly). Available at: www.gov.uk/government/statistics/energy-trends-section-6-renewables.

[6] Capacity factors vary considerably between technologies – for example, solar PV may typically have a capacity factor of 0.1 whereas a large scale wind turbine may have one of 0.25. This effectively means that in terms of energy yield a 1 MW wind turbine is not directly comparable with a 1 MW solar PV farm. In this case, although both are capable of generating the same maximum instantaneous output of 1 MW in ideal conditions, the wind turbine will typically produce more energy over the course of a year as the wind tends to blow during day and night, whereas the sun only shines on the PV farm during the day. The use of energy generation yields in MWh or GWh will therefore provide a more meaningful measure of renewable energy deployment than simply using generation capacities in MW or GW. Additionally, any carbon savings resulting from displaced fossil fuel derived electricity are calculated directly from generation yields rather than generation capacities.

schemes account for 50.2% of overall capacity[7]. Falling capital costs are rendering solar PV increasingly viable in a post-subsidy context, although as outlined above, at present developers are generally focusing on large developments in order to achieve economies of scale. Grid connection costs are also critical to determine viability.

Existing development within Cotswold District

LUC/CSE's review of the data available from BEIS[8] has identified the following ground-mounted solar PV projects currently consented or installed in Cotswold District:

- Cirencester Solar Farm: 26.2MW
- Crucis Park: 12.5MW
- Duke of Gloucester Barracks: 1.4MW
- Northwick Estate (Extension): 2.2MW
- Norton Hall: 2.8MW
- Springhill Solar Park (Northwick): 5MW
- The Rainbows Solar Farm: 4MW

The overall installed capacity of these developments is 54.1MW, equating to 11.6% of the authority's current electricity demand. In addition, there is 19.9MW of solar PV submitted and awaiting planning decisions. If consented, the total installed capacity of ground-mounted solar energy generation will be 15.9%.

In addition, a notable 49.9 MW scheme is being proposed by Aura Power southwest of Kemble and northeast of Chelworth in the south of the district[9]. The planning application for this scheme is due to be submitted in 2021.

Two operational solar developments (Springhill Solar Park (Northwick) and Northwick Estate (Extension)) are located within the Cotswolds AONB along the A44 road. The remainder are located outside of the AONB, three being located close to Cirencester, and two located on the northern edge of the district.

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[7] Department for Business, Energy & Industrial Strategy (May 2021) Solar photovoltaics deployment: Using March 2021 data within Table 2, considering all FiTs (standalone), RO (ground mounted) and CfDs (ground-mounted) within the UK. Available at: www.gov.uk/government/statistics/solar-photovoltaics-deployment.

[8] BEIS (2021) Renewable Energy Planning Database (REPD): March 2021. Available at: https://www.gov.uk/government/publications/renewable-energy-planning-database-monthly-extract.

[9] Aura Power (2020) Kemble Solar Farm. Available at: https://www.aurapower.co.uk/kemble-solar-farm/.

According to the most recent BEIS Renewable Energy Planning Database, within Cotswold District one 1MW scheme has been withdrawn and one 5MW scheme was granted but its planning permission has since expired.

Technical potential (i.e. results of the assessment)

Assumptions used to calculate technical potential

The assessment of technical potential for solar developments was undertaken using GIS involving spatial mapping of key constraints and opportunities. The assessment identified areas with potential viable annual solar irradiance and a series of constraints relating to physical features and environmental/heritage protection were then removed. The remaining areas have 'technical potential' for solar energy development.

Solar development is more 'modular' than wind (developments size is dictated by the number of panels, which themselves do not differ greatly in size) and constraints (i.e. noise buffers) are not affected by project scale in the way that they are for wind. Therefore, the identification of available land for solar has not been broken down into discrete project sizes but rather any land technically suitable for development has been identified. The GIS tool assessment assumptions are set out in Appendix D.

Landscape Sensitivity Assessment

Although the landscape and visual impacts of solar PV tend not to be so contentious as wind development, it is still often a key consenting issue, particularly at larger development scales.

As the degree of acceptable landscape and visual impact is generally a matter that needs to be considered within the context of the overall planning balance, no land was excluded from the GIS technical constraints assessment on landscape or visual grounds. Instead, a separate landscape sensitivity assessment was subsequently undertaken which considered all Landscape Character Types defined within the Gloucestershire Landscape Character Assessment and, in accordance with the wishes of the Council, excluded land within the Cotswolds AONB. This can be used alongside the output of the GIS assessment, which maps and quantifies technical capacity, to determine landscape sensitivity to different scales of solar developments.

Land within the AONB was not initially included in the LSA. The findings of a subsequent landscape assessment undertaken by Cotswold Council officers on the AONB was retrospectively included in the findings of this assessment.

The landscape sensitivity assessment considered solar PV, and as sensitivity varies in accordance with development scale, different development scales were considered based on land take:

- Very large solar PV installation: (50-120ha).

- Large solar PV installation: (20 to 50ha).
- Medium solar PV installation: (5 to 20ha).
- Small solar PV installation: (1 to 5ha).
- Very small solar PV installation: (Up to 1ha).

Please refer to the separate Landscape Sensitivity Assessment in Appendix C for further details.

Results

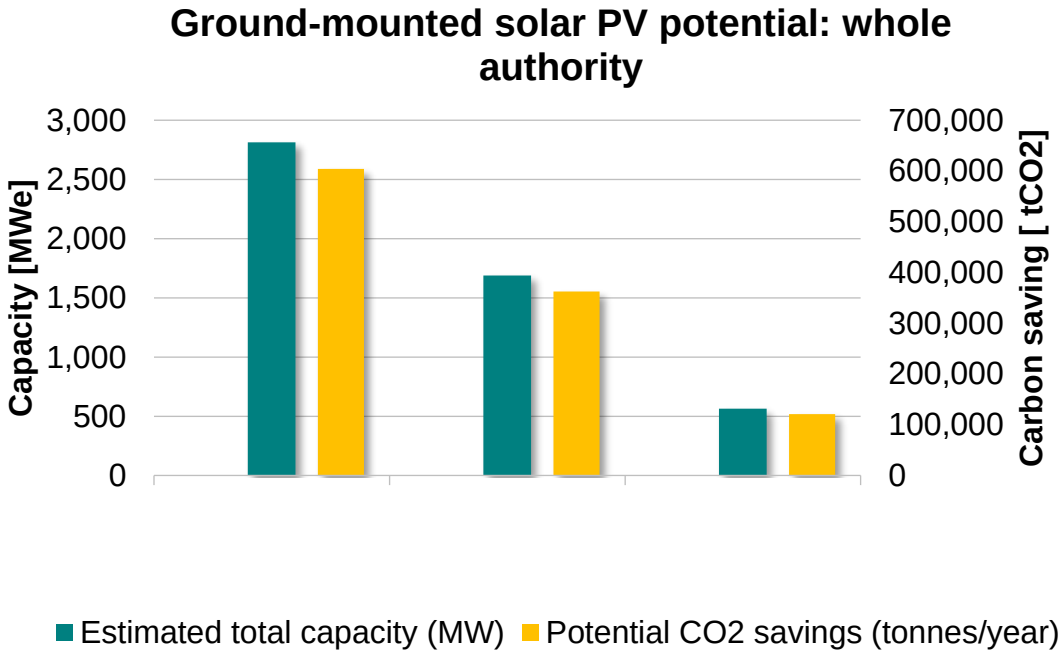
Technical potential

Figures Figure 5 to Figure 13 and

Table 4 below provide a summary estimate of the technical potential for ground-mounted solar PV within Cotswold District. As the full technical potential is very large, utilisation of 1%, 3% and 5% of the resource is also quantified. In addition, due to the potential planning constraints within the Cotswolds AONB, these values are also provided for only the land within the district located outside of the AONB, as well as within the AONB for reference. Adopting the 3% development scale would result in a total potential technical capacity from ground mounted solar PV across the district of 1,689MW, 363MW on land located outside of the AONB and 1,326MW within the AONB. This approximately equates to an area of 20.26km^2, 4.35 km^2 and 15.91km^2 respectively, and would provide 196%, 42% and 154% of the projected electricity demand in Cotswold District in 2050 respectively.

The calculation of potential energy yield requires application of a 'capacity factor' i.e. the average proportion of maximum PV capacity that would be achieved in practice over a given period. Capacity factors vary in practice in accordance with solar irradiation, which in turn is affected by location, slope and aspect. It was not possible to find suitable historic data on capacity factors taking into account these kinds of variations for the present study, and so a single capacity factor of 10.52% was used, as based on regional data[10].

Figure 5: Ground-mounted solar PV potential and carbon savings – within the whole of Cotswold District.



[10] BEIS (2020) Quarterly and annual load factors: Annual Regional PV Load Factors, averaged at 10.52% for the South West region over the last nine years. Available at: https://www.gov.uk/government/publications/quarterly-and-annual-load-factors.

Figure 6: Ground-mounted solar PV potential electricity output and current electricity demand within Cotswold District savings – within the whole of Cotswold District

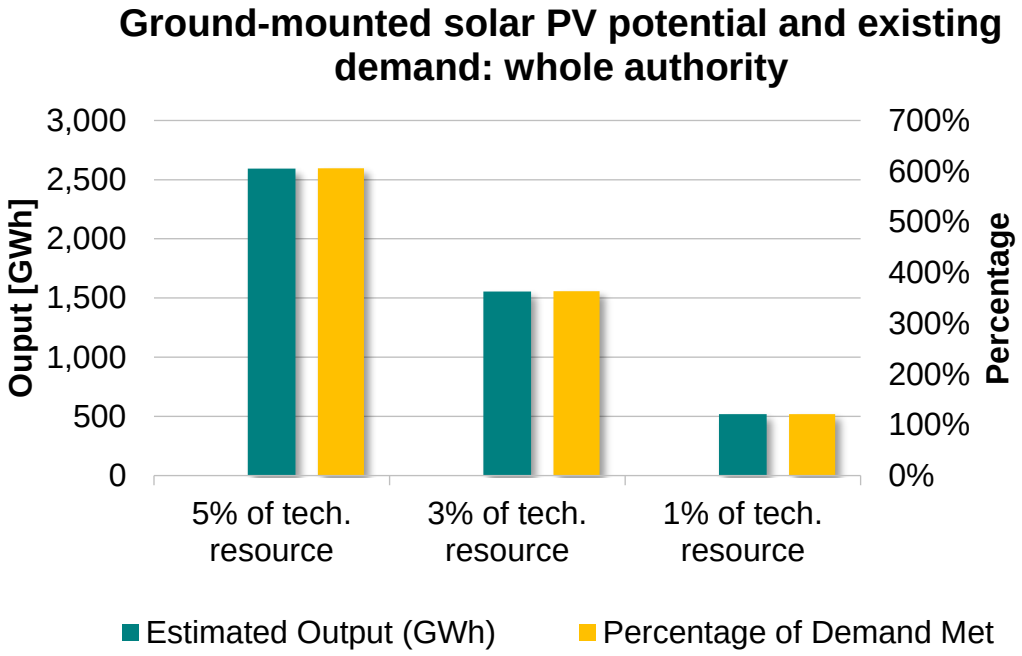


Figure 7: Ground-mounted solar PV potential electricity output and 2050 electricity demand within Cotswold District savings – within the whole of Cotswold District

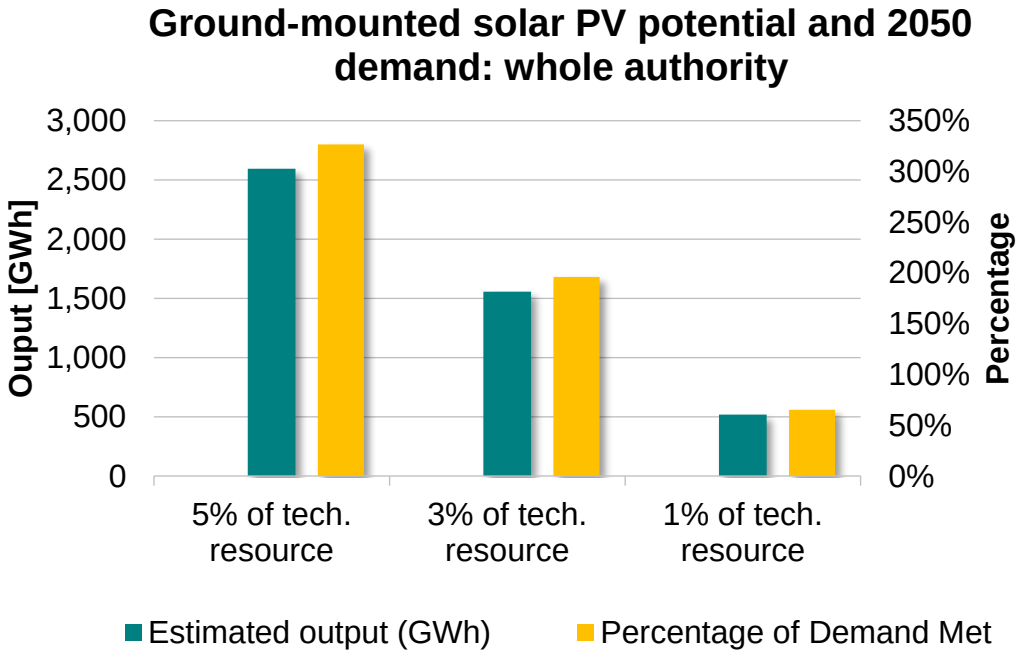


Figure 8: Ground-mounted solar PV potential and carbon savings – within land outside of the Cotswolds AONB

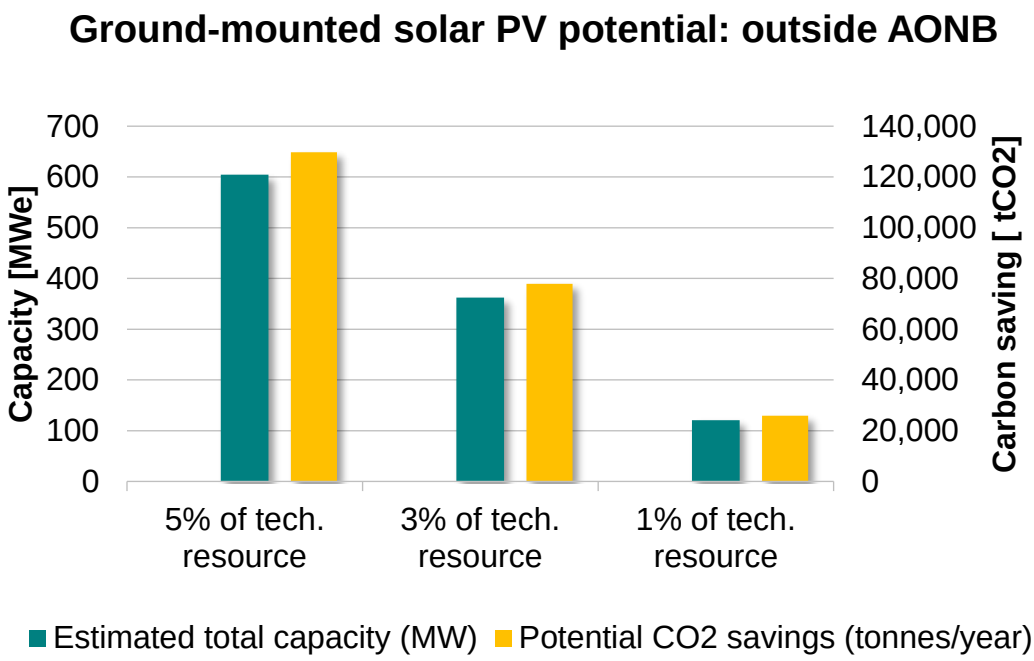


Figure 9: Ground-mounted solar PV potential electricity output and current electricity demand within Cotswold District savings – within land outside of the Cotswolds AONB

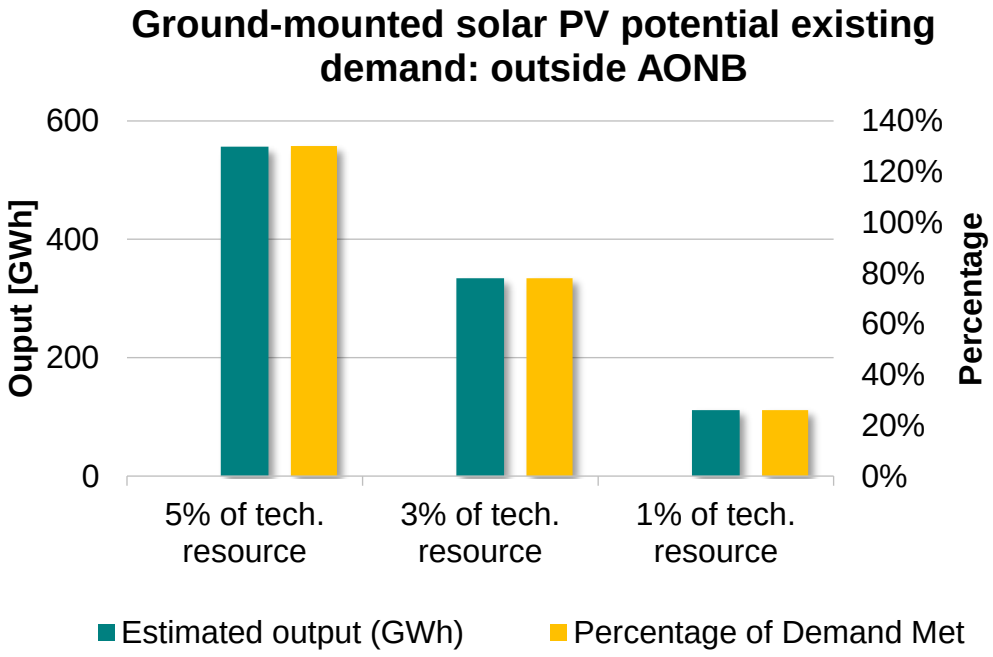


Figure 10: Ground-mounted solar PV potential electricity output and current electricity demand within Cotswold District savings – within land outside of the Cotswolds AONB

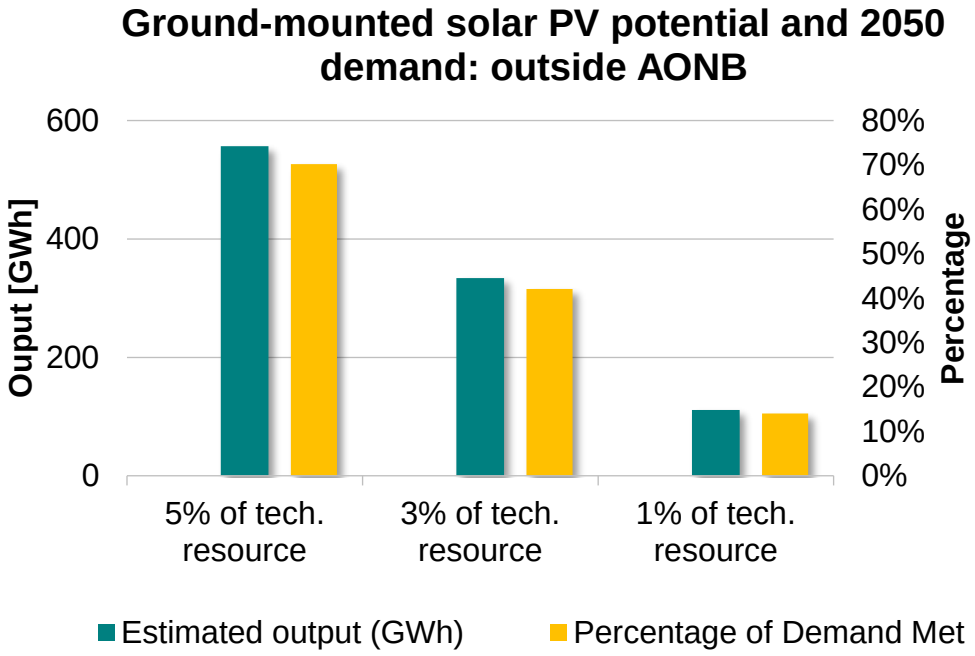


Figure 11: Ground-mounted solar PV potential and carbon savings – within land inside of the Cotswolds AONB

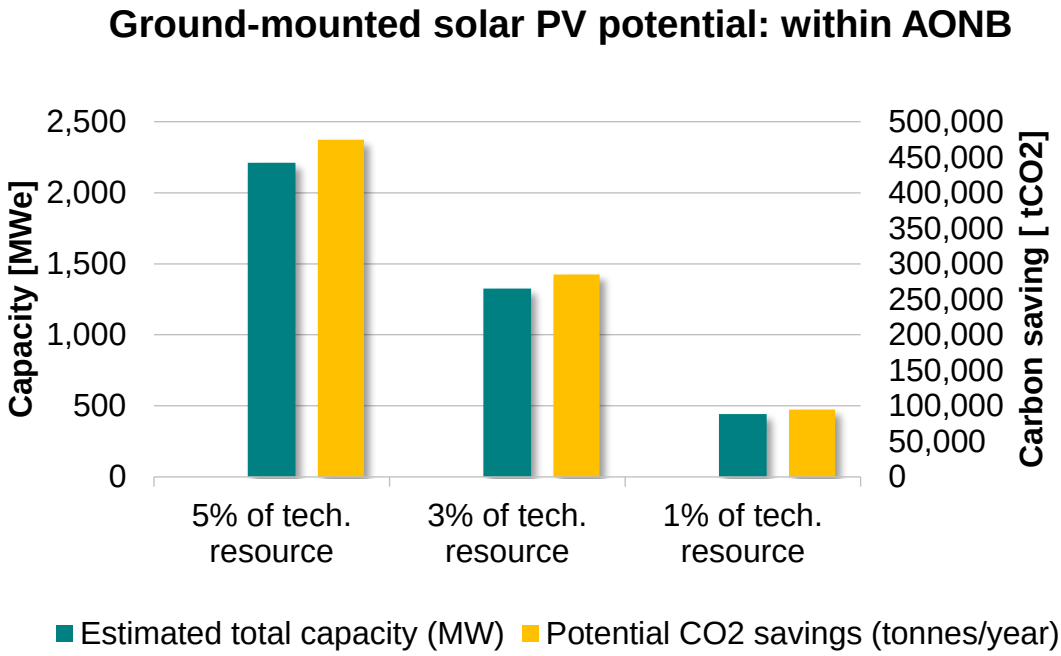


Figure 12: Ground-mounted solar PV potential electricity output and current electricity demand within Cotswold District savings – within land inside of the Cotswolds AONB

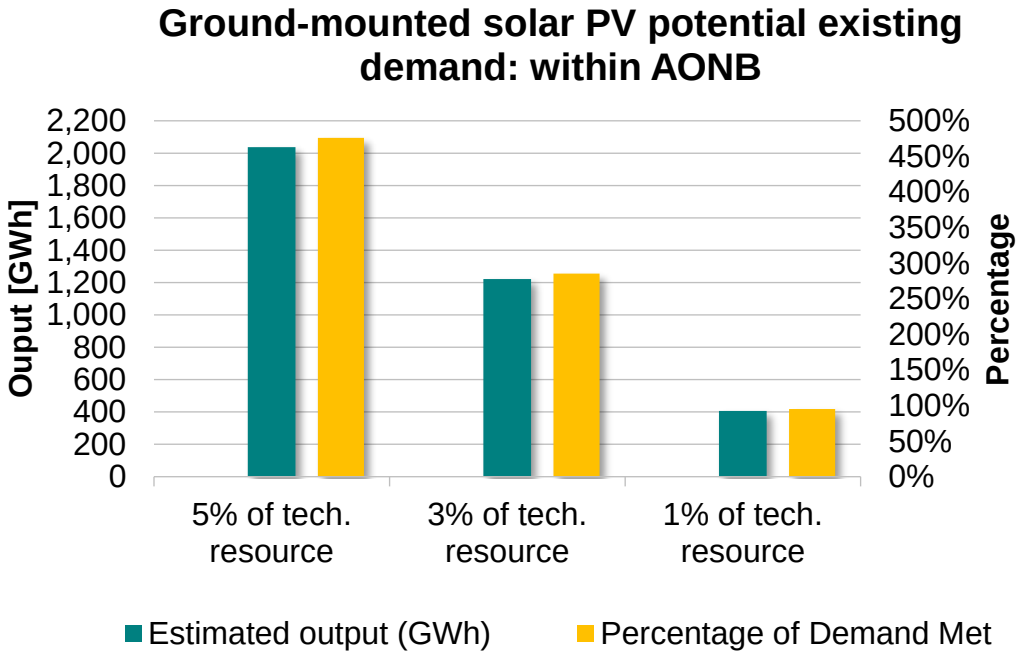


Figure 13: Ground-mounted solar PV potential electricity output and 2050 electricity demand within Cotswold District savings – within land inside of the Cotswolds AONB

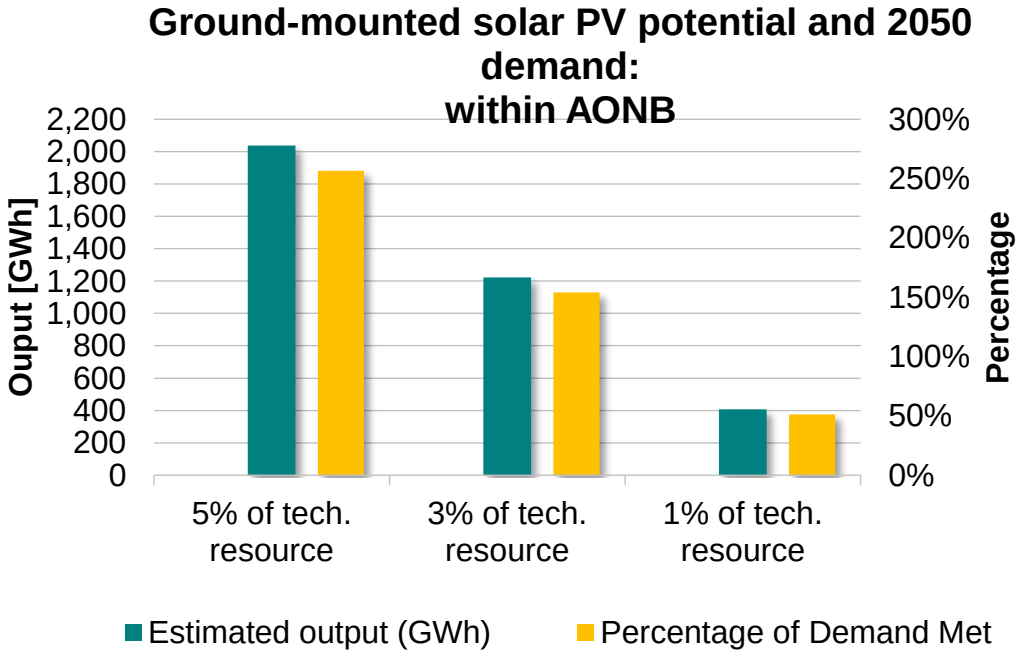


Table 4: Potential solar capacity and output

Location	Development Scale	Potential installed capacity (MW)	Electricity output (MWh/year)	Potential CO_2 savings (tonnes/year)	Percentage of existing electricity demand (428 GWh)	Percentage of 2050 electricity demand (794 GWh)
Whole Authority	100% of technical potential	56,288	51,872,131	12,086,207	12120%	6535%
	5% of technical potential	2,814	2,593,607	604,310	606%	327%
	3% technical potential	1,689	1,556,164	362,586	364%	196%
	1% of technical potential	563	518,721	120,862	121%	65%
Land outside of the Cotswolds AONB	100% of technical potential	12,084	11,135,714	2,594,621	2602%	1403%
	5% of technical potential	604	556,786	129,731	130%	70%
	3% technical potential	363	334,071	77,839	78%	42%
	1% of technical potential	121	111,357	25,946	26%	14%
Land within of the Cotswolds AONB	100% of technical potential	44,204	40,736,418	9,491,585	9518%	5132%
	5% of technical potential	2,210	2,036,821	474,579	476%	257%
	3% technical potential	1,326	1,222,093	284,748	286%	154%
	1% of technical potential	442	407,364	94,916	95%	51%

Maps showing the key constraints and resulting potentially suitable land for solar development are presented in Appendix B.

An assessment of this nature necessarily has certain limitations. Cumulative landscape and visual effects, in particular, would clearly occur if all the identified solar development potential were to be realised. Cumulative effects, however, cannot be taken into account in a high-level assessment of this nature and must be considered on a site by site basis. In addition, the current electricity networks would not support this scale of installed capacity, and as such installation would be dependent upon increasing the capacity of the network. Due to the less constrained nature of solar, relative to wind, in terms of the factors that can reasonably be considered within a high-level resource assessment, a large area of land has been identified as technically suitable for ground mounted solar; but in practice development of all or even the majority of this land would clearly not be appropriate.

Issues affecting deployment

Considerations, other than cumulative impact, that would reduce the deployable potential of solar PV in practice include landscape sensitivity, grid connection and development income. These are discussed in turn below:

Landscape sensitivity

The majority of Cotswolds District falls within the Cotswolds National Landscape, an Area of Outstanding Natural Beauty (AONB). As noted above, in agreement with the Council, this was initially excluded from the Landscape Sensitivity Assessment undertaken as part of this study. It is noted that all LCTs have a 'low' sensitivity to 'very small' solar PV developments, except for TV2, in which the sensitivity to solar VP developments of this type is 'low-moderate'. All LCTs have a 'low-moderate' sensitivity to 'small' solar PV developments except for VM1 and VM2, in which the sensitivity to solar PV developments of this scale is assessed to be 'moderate'. Sensitivity to 'medium' scale solar PV developments was mixed across the district. All accessed LCT were judges to have at least a 'moderate -high' sensitivity to 'large ' solar PV developments, whilst all LCTs had a The rest of the district has at least 'moderate-high' landscape sensitivity 'very large ' solar PV developments (see Figure 2.2-Figure 2.6 in Appendix C). Overall, the south of the district as well as VE1 tended to have a slightly lower sensitivity to solar development of all sizes when assessed at a Landscape Character Type (LCT) level.

As the sensitivity assessment notes, landscape sensitivity varies within LCTs in practice, and particular development sites may be identified within individual LCTs that have lower sensitivity than that of the LCT overall. Landscape and visual impact is also ultimately a consideration that needs to be weighed within the overall planning balance. The sensitivity assessment, however, can be used to guide development towards less sensitive areas in the first instance, and then to ensure that careful consideration is given to the choice of solar PV development locations,

numbers and scales, particularly in areas identified to be of higher sensitivity. Please refer to the separate Landscape Sensitivity Assessment in Appendix C for further details.

Grid connection

A key consideration in relation to solar PV development viability is the interaction between development income and grid connection costs. As noted above, at the present time viable solar developments are generally larger scale. It is understood, however, that even larger scale solar developments will only generally be viable at present where a grid connection is available in relatively close proximity to the development site, and does not involve significant network reinforcement costs. Although connections can in principle be made either into existing substations or into power lines (a 'tee in' connection), proximity requirements alone would limit the deployable solar PV potential in much of Cotswolds District at the present time.

The generally constrained nature of the electricity network in Cotswolds District presents a further challenge, with no substations having been identified at the present time with over 30MW available capacity. DNOs upgrade the network to create extra capacity which can be applied for in advance, even when these upgrades take years to come online. It is therefore worth periodically checking with the DNO on capacity at a specific site of interest.

Further details on network capacity within the District are provided in section **Error! Reference source not found.**.

Development income

The current lack of financial support for solar PV will particularly constrain the deployable potential of smaller schemes and schemes at greater distances from potential grid connection points. The present assessment cannot, however, rule out the potential for such schemes, bearing in mind that the financial context for solar is changing – for example solar is to be included in the next round of the Contracts for Difference (CfD) auctions. Renewable generators located in the UK that meet the eligibility requirements can apply for a CfD by submitting what is a form of 'sealed bid'. Round 4 of auctions is due to open in December 2021, and the Government has confirmed that this will include Pot 1 technologies, such as solar and onshore wind.

Over recent years solar panel costs also have reduced significantly, and as such subsidy-free solar energy schemes in the right locations are financially viable at larger scales. Solar PV module prices have dropped in price by 89% since 2010. Forecasting published by the BEIS also places solar as the cheapest source of new power generation for the coming years. Between 2025 and 2040, it is anticipated that solar parks will be more cost effective than offshore or onshore wind, gas, nuclear

and other technologies[11]. It is noted however that at present developers are mostly interested in pursuing large scale commercial ground mounted solar PV schemes to ensure viability via economies of scale.

With regards to smaller scale solar developments, the Smart Export Guarantee has been introduced since January 2020[12]. This is an obligation set by the Government for licensed electricity suppliers to offer a tariff and make payment to small-scale low-carbon generators for electricity exported to the National Grid, providing certain criteria are met. This could help to increase the financial viability of solar energy developments of up to 5MW capacity. However, the obligation does not provide financial benefits equal to the previous FiT scheme, as it only provides payments for electricity export, not generation, and it does not provide a guaranteed price for exported electricity. In its first year of operation, several new tariffs were launched, up to a peak of 11p/kWh, and the scheme is running smoothly, and enables customers to shop around for the best tariff, incentivising suppliers to increase their prices to compete[13]. However, in April 2021 the Environmental Audit Committee wrote a letter to the Business Secretary raising concern about the lack of clarity from the Government on the role of community energy in decarbonising the energy sector, and called for the introduction of a floor price above zero for the Smart Export Guarantee to help support such community energy[14]. It may therefore be that future changes to the Smart Export Guarantee or introduction of additional schemes may increase the potential developer income on solar PV developments.

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[11] Solar Trade Association – Solar Energy UK Impact Report 2020.

[12] Ofgem (2020) About the Smart Export Guarantee (SEG). Available at: www.ofgem.gov.uk/environmental-programmes/smart-export-guarantee-seg/about-smart-export-guarantee-seg.

[13] Solar Power Portal (2021) Ticking along: How the SEG has fared in its first year. Available at: https://www.solarpowerportal.co.uk/blogs/ticking_along_how_the_seg_has_faired_in_its_first_year.

[14] UK Parliament (2021) Regulatory barriers and lack of Government strategy stalling UK community energy on path to net zero. Available at: https://committees.parliament.uk/committee/62/environmental-audit-committee/news/154954/regulatory-barriers-and-lack-of-government-strategy-stalling-uk-community-energy-on-path-to-net-zero/.

Wind power

Description of technology

Onshore wind power is an established and proven technology with thousands of installations currently deployed across many countries throughout the world. The UK has the largest wind energy resource in Europe.

Turbine scales do not fall intrinsically into clear and unchanging size categories. At the largest scale, turbine dimensions and capacities are evolving quite rapidly. The deployment of turbines at particular ‘typical’ scales in the past has also been influenced by changing factors which include the availability of subsidies of different kinds. As defined scales need to be applied for the purpose of the resource assessment, the assessment has used five size categories based on consideration of current and historically ‘typical’ turbine models:

- Very large (150-200m tip height).
- Large (100-150m tip height).
- Medium (60-100m tip height).
- Small (25-60m tip height).
- Very small (<25m tip height).

An assessment of technical potential for very small wind (<25m height) was not undertaken as it is not possible to define areas of suitability for these using the same assessment criteria. Notional turbine sizes for the purposes of the present resource assessment are approximately intermediate within each class size (Table 5).

Table 5: Notional turbines used for the resource assessment.

Scale	Typical Turbine Installed Capacity	Electricity output (MWh/year)[15]	Typical Turbine Height (maximum to blade tip)	Average number of UK household's electricity demand that could be met per turbine[16]
Very large	4MW	10,021	175m	2,657
Large	2.5MW	6,263	125m	1,660
Medium	500kW	1,253	80m	332
Small	50kW	125	45m	33

Most turbines above the smallest scales have a direct connection into the electricity network. Smaller turbines may provide electricity for a single premises via a 'private wire' (e.g. a farm or occasionally a large energy use such as a factory), or be connected to the grid directly for export. Typically, turbines will be developed in larger groups (wind farms) only at the larger scales. The amount of energy that turbines generate will depend primarily on wind speed but will be limited by the maximum output of the individual turbine (expressed as 'installed capacity' in Table 5).

A review of wind turbine applications across the UK found that tip heights range from less than 20m up to around 200m, with larger turbine models particularly in demand from developers following the reduction in financial support from Government. The majority of operational and planned turbines range between 80m and 175m, with the majority at the larger end of the scale.

As of 2020, the UK had 14,282 MW of installed onshore wind capacity, providing 34,948 GWh electricity during the year[17]. Since the removal of financial support and the restrictive policy requirements in the National Planning Policy Framework (NPPF) onshore wind development activity has moved overwhelmingly away from England

[15] Assuming a single capacity factor of 28.6%, as based on regional data (see paragraph **Error! Reference source not found.**).

[16] Assuming an annual consumption of 3,772kWh. BEIS (2021) Energy consumption in the UK. Available at: https://www.gov.uk/government/statistics/energy-consumption-in-the-uk.

[17] Department for Business, Energy & Industrial Strategy (March 2021) Energy Trends: UK renewables: Table 6.1 - Renewable electricity capacity and generation (ET 6.1 - quarterly). Available at: www.gov.uk/government/statistics/energy-trends-section-6-renewables.

towards Scotland and Wales, where it is focusing particularly on sites with high wind speeds and the ability to accommodate larger numbers of tall turbines.

Existing development within Cotswold District

Cotswold District Council planning application data[18] indicates that there are four granted wind turbine schemes within the district, totalling 36kW and averaging at 12kW per scheme, equating to 0.02% of the authority's current electricity demand. In addition, one scheme was refused[19] within the district and three additional schemes withdrawn; one 10kW scheme and two 55kW schemes.

Technical potential (i.e. results of the assessment)

Assumptions used to calculate technical potential

The assessment of technical potential for very large, large, medium and small turbines was undertaken using GIS involving spatial mapping of key constraints and opportunities. The assessment identified areas with potential viable wind speeds (applying a reasonable but relatively generous assumption in this respect, bearing in mind that only the highest wind speeds are potentially viable at the present time) and the number of turbines that could be theoretically deployed within these areas. A series of constraints relating to physical features and environmental/heritage protection were then removed. The remaining areas have 'technical potential' for wind energy development. The key constraints and opportunities considered are set out in detail in in Appendix D.

Landscape Sensitivity Assessment

Landscape and visual impact has historically often been one of the defining consenting considerations for planning applications for wind developments, and has therefore been a particularly important influence on the choice of turbine scales and locations by developers. The landscape sensitivity assessment therefore also considered wind developments of differing scales.

Please refer to the Landscape Sensitivity Assessment in Appendix C for further details.

Technical potential

Table 6Table 8 provides a summary of the technical potential for wind energy within Cotswold District. The analysis examined the potential for very large, large, medium and small turbines. Where potential existed for more than one size of turbine, it was assumed that the larger turbines would take precedence i.e. it was assumed that the

[18] Note: This excludes anything below 10kW.

[19] The capacity of this application is unknown.

largest potential turbine in each case would be installed. This was in order to calculate the most realistic technical potential for wind, as to ensure viability, developers usually seek to install the largest capacity turbines.

This was in order to calculate the maximum technical potential for wind. The calculation of wind capacity involved applying an assumption concerning development density. Turbines are spaced within developments in practice based on varying multiples of the rotor diameter length (on different axes). Although separation distances vary, a 5 x 3 x rotor diameter oval spacing[20], oriented 135º, (greater in the prevailing wind direction, taken to be southwest as the 'default' assumption in the UK) was considered a reasonable general assumption at the present time in this respect. In practice, site-specific factors such as prevailing wind direction and turbulence are taken into account by developers, in discussion with manufacturers. Bearing in mind the strategic nature of the present study, the density calculation did not take into account the site shape and minimum site size, and a standardised density was used instead:

- Very large: 4 turbines per km².
- Large: 8 turbines per km².
- Medium: 22 turbines per km².
- Small: 167 turbines per km².

The calculation of potential energy yield then required application of a 'capacity factor' i.e. the average proportion of maximum turbine capacity that would be achieved in practice over a given period. Capacity factors vary in practice in accordance with wind speed, terrain and turbine scale. It was not possible to find suitable historic data on capacity factors, taking into account these kinds of variations for the present study, and so a single capacity factor of 28.6% was used for all turbine scales, as based on regional data[21]. It is noted that this averaged capacity factor will vary depending on turbine size as larger turbines can access higher windspeeds at greater elevations whilst smaller shorter turbines may suffer reduced wind speeds due to surface roughness of the ground. This variation in capacity factor between turbine scales is however beyond the scope of this strategic assessment and is not considered.

[20] To mitigate impacts on the productivity of wind turbines located close to one another caused by wind turbulence, it is standard practice for developers to maintain an oval of separation between turbines that is equal to 5 times the turbine rotor diameter (the cross sectional dimension of the circle swept by the rotating blades) on the long axis, and 3 times the rotor diameter on the short axis.

[21] BEIS (2020) Quarterly and annual load factors: Annual Regional PV Load Factors, averaged at 28.6% for the South West region over the last six years. Available at: https://www.gov.uk/government/publications/quarterly-and-annual-load-factors.

The assessment results indicate that there is a technical potential to deliver up to around 4,506MW of wind energy capacity in Cotswold District, with 862MW capacity within land outside of the AONB and 3,643MW within the AONB, with the greatest potential for small turbines (see Figure 14 to Figure 22 and Table 6). This would provide 1,422%, 272% and 1,150% of the projected electricity demand in Cotswold District in 2050 respectively).

Table 6: Onshore technical wind potential capacity, output and carbon savings within Cotswold District

Location	Development Scale	Estimated total capacity (MW)	Electricity output (MWh/year)	Potential CO_2 savings (tonnes/year)	Percentage of existing electricity demand (428 GWh)	Percentage of 2050 electricity demand (794 GWh)
Whole Authority	Small	2,084	5,221,675	1,216,650	1220%	658%
	Medium	847	2,121,332	494,270	496%	267%
	Large	556	1,392,669	324,492	325%	175%
	Very Large	1,019	2,553,185	594,892	597%	322%
	Total	**4,506**	**11,288,860**	**2,630,304**	**2,638%**	**1,422%**
Land outside of the Cotswolds AONB	Small	426	1,067,148	248,646	249%	134%
	Medium	159	398,644	92,884	93%	50%
	Large	91	227,130	52,921	53%	29%
	Very Large	187	467,869	109,014	109%	59%
	Total	**862**	**2,160,792**	**503,465**	**505%**	**272%**
Land inside of the Cotswolds AONB	Small	1,658	4,154,526	968,005	971%	523%
	Medium	688	1,722,688	401,386	402%	217%
	Large	465	1,165,539	271,571	272%	147%
	Very Large	832	2,085,315	485,878	487%	263%
	Total	**3,643**	**9,128,068**	**2,126,840**	**2,133%**	**1,150%**

Figure 14: Onshore wind potential capacity and carbon savings – within the whole of Cotswold District

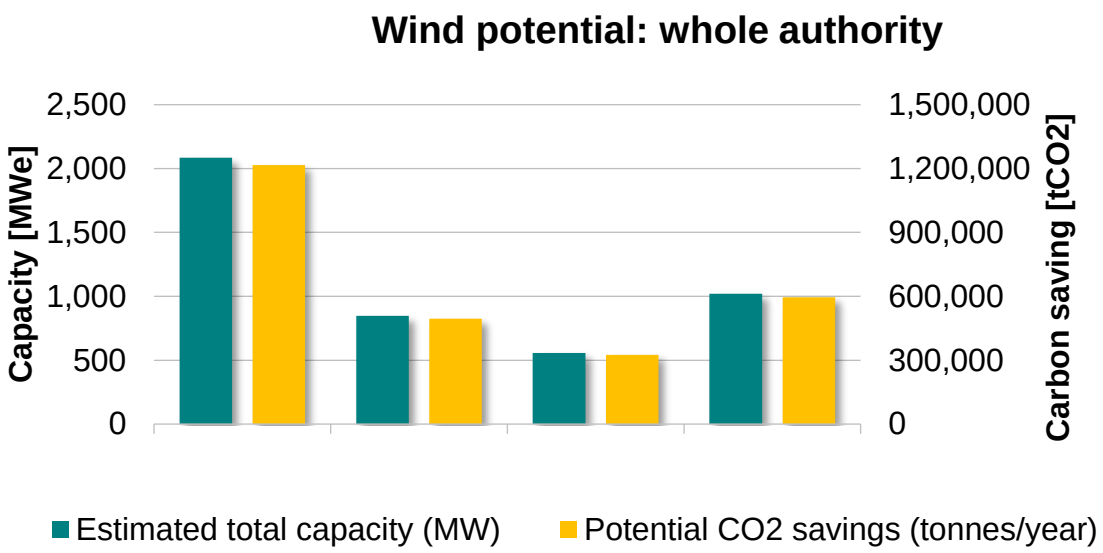


Figure 15: Onshore wind potential electricity output and current electricity demand within Cotswold District savings – within the whole of Cotswold District

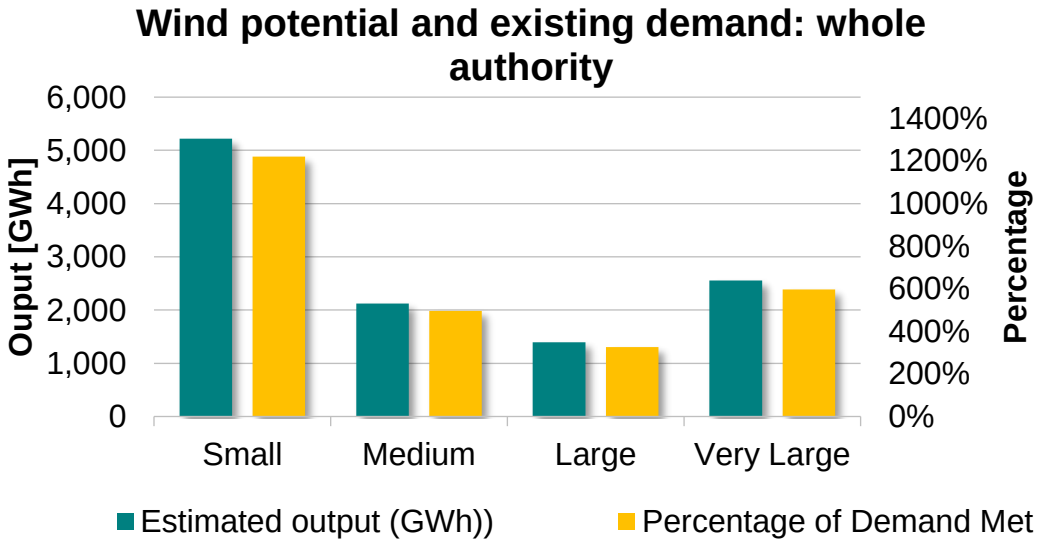


Figure 16: Onshore wind potential electricity output and 2050 electricity demand within Cotswold District savings – within the whole of Cotswold District

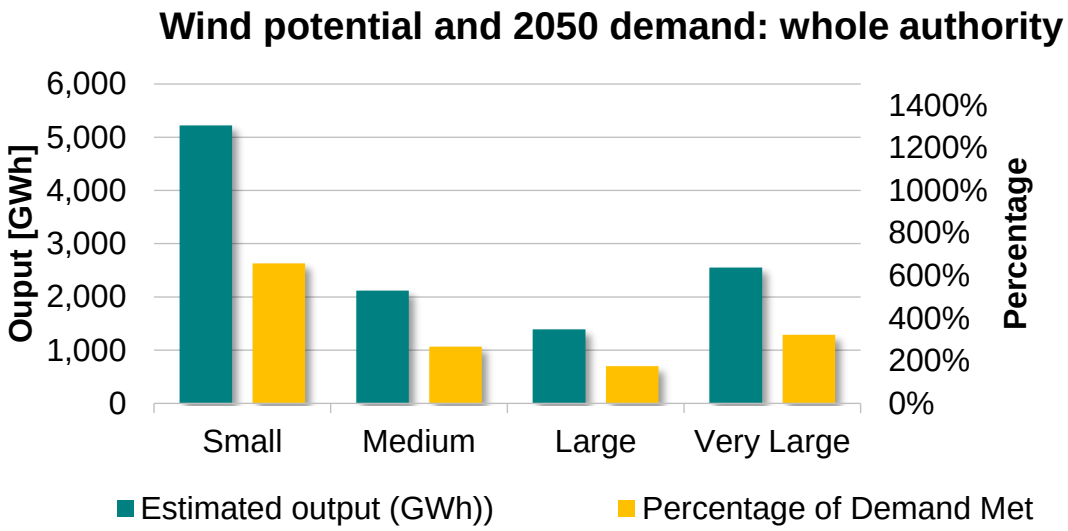


Figure 17: Onshore wind potential capacity and carbon savings – within land outside of the Cotswolds AONB

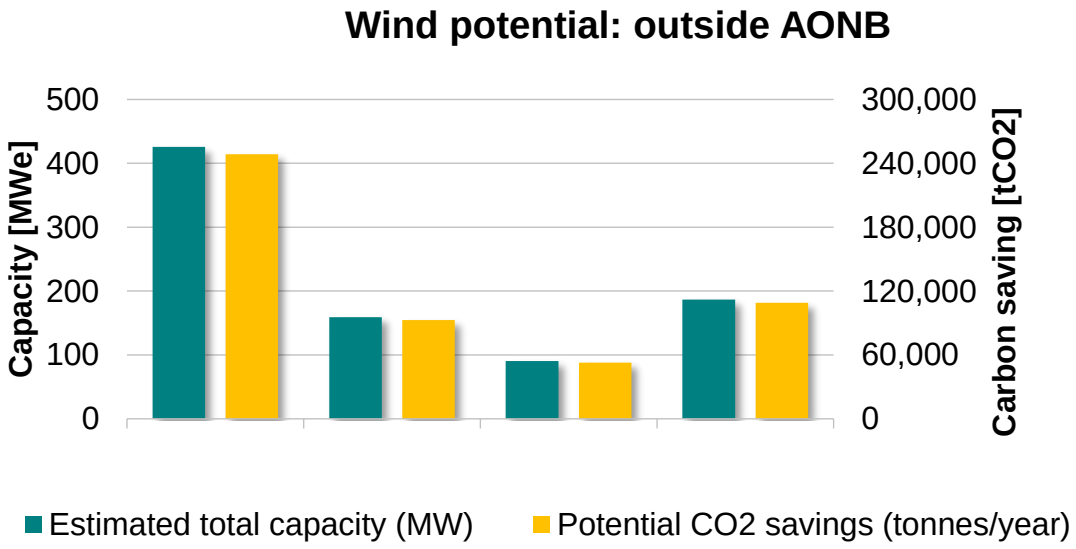


Figure 18: Onshore wind potential electricity output and current electricity demand within Cotswold District savings – within land outside of the Cotswolds AONB

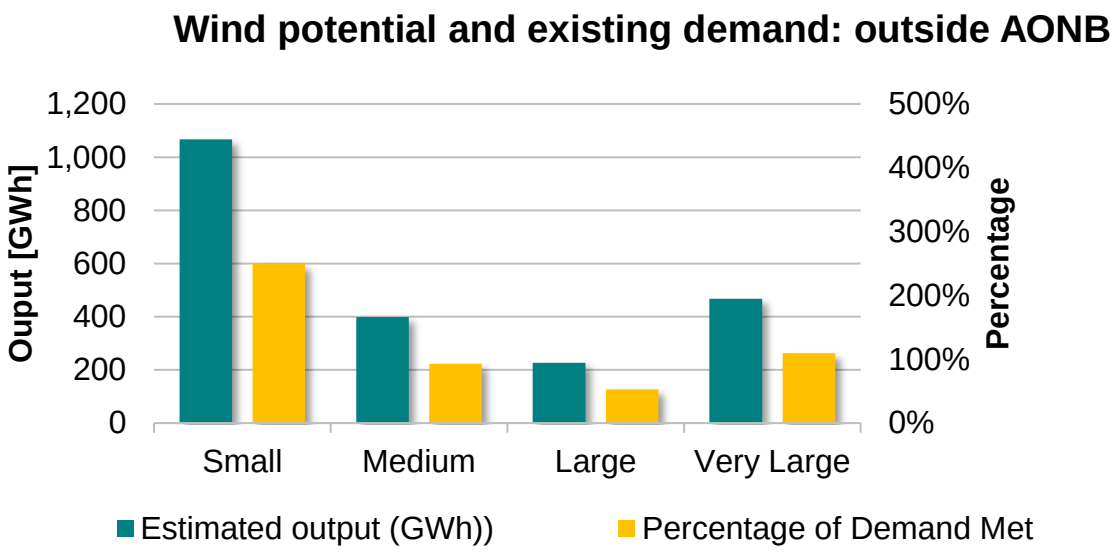


Figure 19: Onshore wind potential electricity output and 2050 electricity demand within Cotswold District savings – within land outside of the Cotswolds AONB

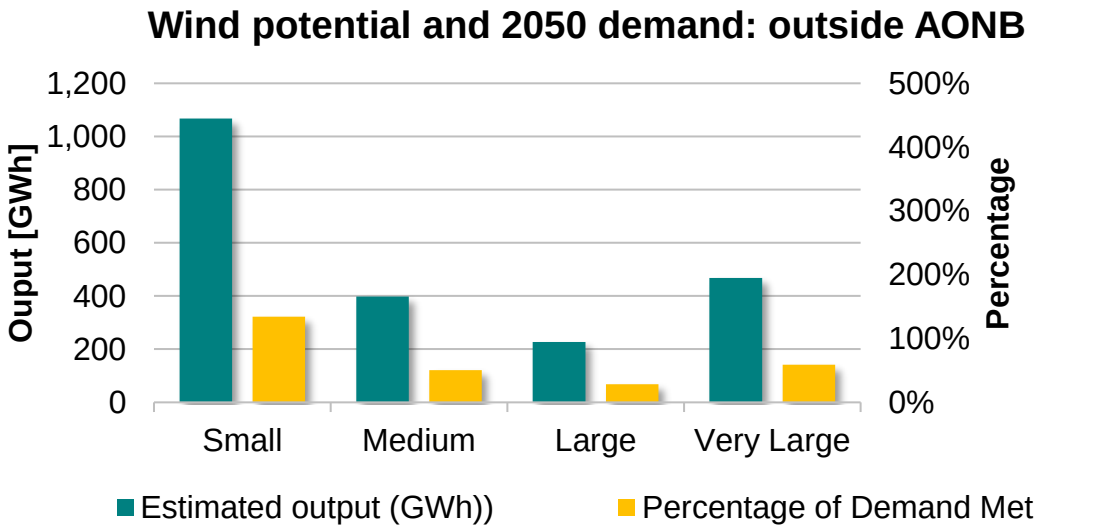


Figure 20: Onshore wind potential capacity and carbon savings – within land inside of the Cotswolds AONB

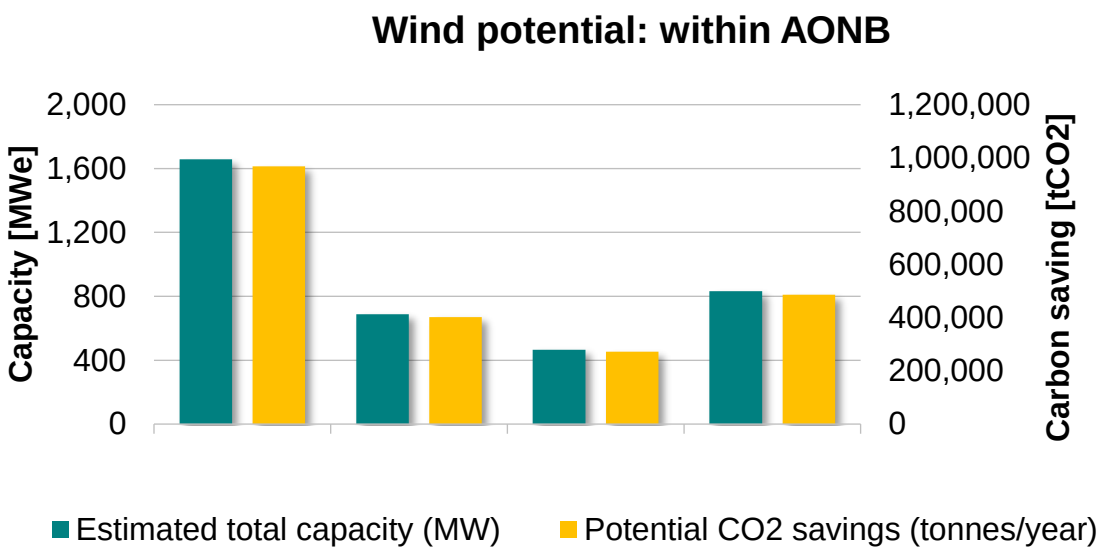


Figure 21: Onshore wind potential electricity output and current electricity demand within Cotswold District savings – within land inside of the Cotswolds AONB

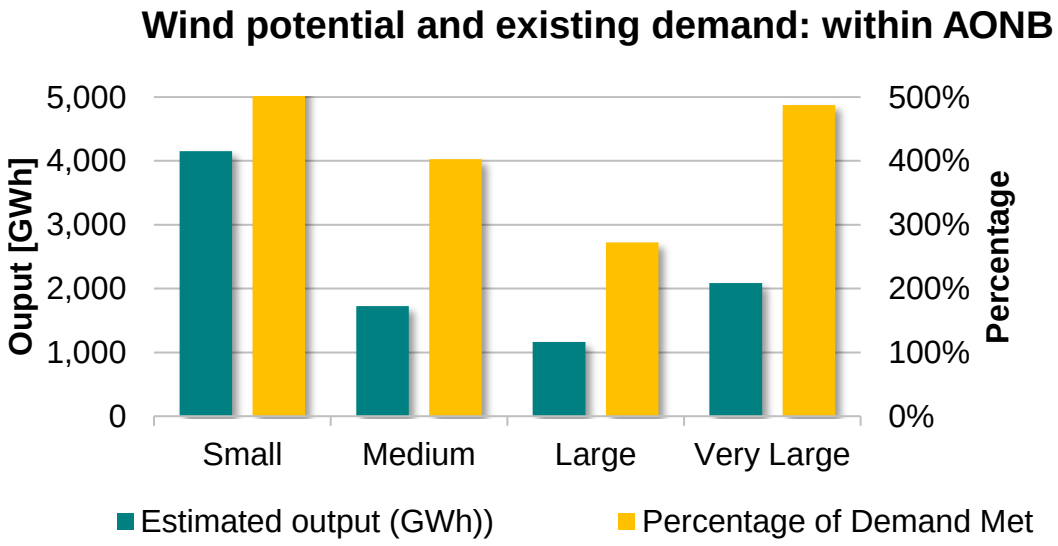
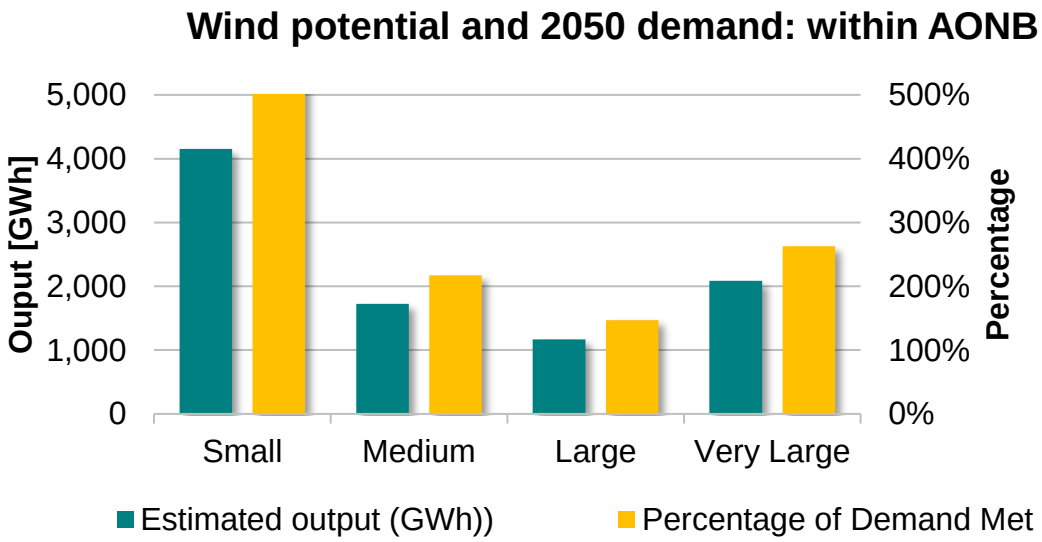


Figure 22: Onshore wind potential electricity output and 2050 electricity demand within Cotswold District savings – within land inside of the Cotswolds AONB



The maps included in Appendix B show the areas which have been identified via the GIS analysis to have technical potential for wind development at each considered turbine scale. These figures indicate that there is greatest potential for wind generation in the centre and north of the district.

In order to illustrate the GIS tool parameters, a series of opportunity and constraints maps were also produced (Appendix B):

- Figure 1.6: Wind Speed at 50m above ground level
- Figure 1.7: Wind constraints – Natural heritage
- Figure 1.8: Wind constraints – Cultural heritage
- Figure 1.9: Wind constraints – Physical constraints for small scale
- Figure 1.10: Wind constraints – Physical constraints for very large scale
- Figure 1.11: Opportunities and Constraints: small scale wind development
- Figure 1.12: Opportunities and Constraints: medium scale wind development
- Figure 1.13: Opportunities and Constraints: large scale wind development
- Figure 1.14: Opportunities and Constraints: very large scale wind development
- Figure 1.15: Opportunities for Wind Development – All scales

Figure 1.6 in Appendix B shows the wind speed within the district at 50m above ground level (agl).

This shows that the highest winds speeds are predominantly located in the northwest of the district, with the lowest wind speeds located along the river valleys and in the south of the district. Other mapped constraints that have influenced the assessment outcomes are included in Appendix B. It is noted that maps depicting the physical

constraints are only included for small and very large turbines for illustrative purposes, showing the minimum and maximum buffer distances applied to physical features depending on turbine size.

An assessment of this nature will necessarily have certain limitations, including:

Wind data – it is important to note that the macro-scale wind data which was used for this assessment can be inaccurate at the site-specific level and therefore can only be used to give a high level indication of potential capacity and output within Cotswold District. Developers will normally require wind speeds to be accurately monitored using anemometers for an extended period (typically at least one to two years) for commercial scale developments.

Cumulative effects – multiple wind turbine developments can have a variety of cumulative effects. Cumulative landscape and visual effects, in particular, would clearly occur if all the identified small wind development potential were to be realised. Cumulative effects, however, cannot be taken into account in a high-level assessment of this nature and must be considered on a development-by-development basis.

Site-specific features and characteristics – in practice, developments outside protected areas may potentially impact on amenity and sensitive 'receptors' such as protected species. These impacts can only be assessed via a site-specific survey.

Aviation – although operational airports and airfields, as well as MOD land, were considered to be constraints on wind development, aviation interests were not used to define potentially suitable land as impacts and mitigation need to be considered on a development by development basis.

Development Allocations – due to the timing of the resource assessment in relation to Cotswold District's next Local Plan programme, all site allocations from the adopted Cotswold District Local Plan were considered to be a constraint on wind development due to the presence of built development.

Issues affecting deployment

The technical wind development potential within Cotswold District, as estimated through application of reasonable constraints within a GIS tool, is not the same as the development capacity that may be expected to be deployed in practice.

Certain limitations of the resource assessment with respect to deployable wind potential have already been noted in the previous section. For example, cumulative impacts can only be considered fully when developments come forward in practice, but would generally be expected to reduce the overall deployable capacity. However, there are four particular issues that affect the deployable wind potential that merit individual consideration including: landscape sensitivity, grid connection, development income and planning issues. These are discussed in turn below:

Landscape sensitivity

The majority of Cotswolds District falls within the Cotswolds Area of Outstanding Natural Beauty (AONB). As noted above, in agreement with the Council, this was initially excluded from the Landscape Sensitivity Assessment undertaken as part of this study.

All LCTs have a 'low' landscape sensitivity to 'very small ' wind energy developments, except for VM1 an VM2 in which sensitivity was assessed to be 'low-moderate'. The northeast of the district has moderate sensitivity to at least ‘small’ scale wind development whilst all land outside of the AONB has at least moderate sensitivity to ‘medium’ scale wind developments (see Figure 2.7-Figure 2.11 in Appendix C). All land outside of the AONB has high sensitivity to ‘very large’ scale wind developments. Generally, the south of the district tended to be less sensitive to wind energy developments of all scales, with VM1 and VM2 in the north-east as well as the smaller scale TV4 LCTs tending to be more sensitive to wind energy developments of any scale.

As the sensitivity assessment notes, landscape sensitivity varies within Landscape Character Types (LCTs) in practice, and particular development sites may be identified within individual LCTs that have lower sensitivity than that of the LCT overall. Landscape and visual impact is also ultimately a consideration that needs to be weighed within the overall planning balance. The sensitivity assessment, however, can be used to guide development towards less sensitive areas in the first instance, and then to ensure that careful consideration is given to the choice of turbine locations, numbers and scales, particularly in areas identified to be of higher sensitivity. Please refer to the separate Landscape Sensitivity Assessment in Appendix C for further details.

Grid connection

Historically, it has been possible to connect a variety of wind energy development scales into the distribution network at a wide range of distances from the nearest connection point. This situation has changed dramatically over recent years due to two factors in combination:

- The distribution network, and even the transmission network, have become increasingly congested, to the point at which connections in many cases cannot take place without extremely expensive network enforcement costs (which fall to the developer) being incurred, or generation being curtailed, or both.
- The Government’s cancelling of subsidies for onshore wind in 2016 has reduced wind development incomes to the point at which previously affordable reinforcement works would now render many developments unviable, particularly those of smaller scale.

It is possible that, over the next Local Plan period, strategic changes to the network and its management may open up new connection opportunities. In particular, District Network Operators (DNOs) are making the transition to become District Service Operators (DSOs), and as DSOs, will have a greater range of tools that they will be able to use to manage the network. They may, for example, be able to facilitate an enhanced role for energy storage in balancing out the effects of increasing grid penetration of intermittent renewable generators. Further details on network capacity within the district are provided in section **Error! Reference source not found.**.

Development income

Financial support mechanisms in the form of Government subsidies (such as the Renewables Obligation (RO) and FiT) previously allowed onshore wind to be developed at a variety of scales and at a variety of wind speeds. The RO closed to all new generating capacity on 31 March 2017 and the FiT closed to new applicants from 1 April 2019.

The Contracts for Difference (CfD) scheme is now the Government's main mechanism for supporting low-carbon electricity generation[22]. The first auction included 'Pot 1' technologies; 'established' technologies, including onshore wind. The successful applicants of Round 1 auctions, as announced in February 2015, included onshore wind developments. Since then, Round 2 and Round 3 of the auctions in September 2017 and September 2019 excluded Pot 1 technologies including onshore wind developments.

Round 4 of auctions is due to open in December 2021, and the Government has confirmed that this will include Pot 1 technologies, such as onshore wind[23]. As a result of the general decline in financial support for onshore wind, developers are predominantly interested in developing wind turbines in locations with high wind speeds, such as Scotland, Wales and northern England, to enable schemes to be financially viable.

Developers have found that CfDs do not make schemes financially viable in southern England where wind speeds are typically lower, and any potentially financially viable developments require a number of very large turbines to maximise the power output. These schemes are however, unlikely to be acceptable in most locations in southern

[22] Department for Business, Energy, and Industrial Strategy (2020) Contracts for Difference. Available at: www.gov.uk/government/publications/contracts-for-difference/contract-for-difference.

[23] Department for Business, Energy, and Industrial Strategy (2020) Contracts for Difference for Low Carbon Electricity Generation: Government response to consultation on proposed amendments to the scheme. Available at: www.gov.uk/government/collections/contracts-for-difference-cfd-allocation-round-4.

England at the present time. Moreover, the resource assessment indicates that there are few opportunities of this scale in Cotswolds District, which is unsurprising considering its location and geographical characteristics. The main opportunities are instead at the small scale, and almost all planning applications for wind turbines within the district to date have been for small or very small scale developments, designed to connect 'behind the meter' to meet on-site demand rather than export to the grid. However, small scale developments are not considered by most developers to be financially viable at the present time.

Various initiatives can in theory improve wind development viability beyond the provision of subsidy. These could include, for example, establishment of local supply companies that can 'capture' the uplift from wholesale to retail energy prices. The signing of Power Purchase Agreements (PPA), such as between a developer and the Council, agreeing that the developer will sell the electricity generated to the Council, may make individual turbines viable such as on an industrial estate.

Capital costs such as turbine prices may also continue to fall[24], potentially driven in part by the loss of subsidy itself – although the migration of demand to larger turbines in a post-subsidy context is likely to limit any effect in this regard on smaller turbine sizes.

In addition, the Smart Export Guarantee has been introduced since January 2020[25]. This is an obligation set by the Government for licensed electricity suppliers to offer a tariff and make payment to small-scale low-carbon generators for electricity exported to the National Grid, providing certain criteria are met. Wind developments of up to 5MW capacity could benefit from this obligation. However, as mentioned above, the obligation does not provide equal financial benefits to the previous FiT scheme (which provided funding for smaller scale renewable energy developments), as it only provides payments for electricity export, not generation, and it does not provide a guaranteed price for exported electricity.

Overall, viability challenges, based on reduced income relative to capital costs, are a systemic challenge for wind development at all scales within southern England at the present time – to the extent that, if this challenge is not addressed by Government, the deployable wind potential within Cotswold District is likely to be and remain close to zero.

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[24] IRENA (2020) Renewable Power Generation Costs in 2019. Available at: www.irena.org/publications/2020/Jun/Renewable-Power-Costs-in-2019.

[25] Ofgem (2020) About the Smart Export Guarantee (SEG). Available at: www.ofgem.gov.uk/environmental-programmes/smart-export-guarantee-seg/about-smart-export-guarantee-seg.

Planning issues

In addition to the lack of financial support mechanisms, the NPPF requires that wind energy development may only be permitted within areas identified suitable for wind energy developments within Local Plans and where the development has the backing of the local community. The legitimate interpretation of this provision has not been definitively established via case law. However, it has had a discouraging influence on developers. Larger developers are therefore currently not interested in pursuing wind farm developments within southern England, although there may be scope for small scale, single turbine installations implemented by farmers or community energy groups. The assessment of technical potential within this study however could be used within the local plan to identify those areas which are potentially suitable for wind energy development.

Hydropower

Overview

Hydropower is a well-established and proven technology and there are few technological constraints to its use other than ensuring that water course heads (height difference) and flow rates are adequate throughout the year, the site has adequate access and can accommodate the necessary equipment, and that the electricity generated can be transmitted to its end use. For the same reasons, energy yields can be accurately predicted and economic viability established relatively easily.

Hydropower makes use of water flowing from a higher to a lower level to drive a turbine connected to an electrical generator, with the energy generated proportional to the volume of water and vertical drop or head. Although it is an established form of renewable energy, environmental constraints on large multi-MW scale plant means that most potential exists for mainly small or micro-scale schemes. Small scale hydropower plants in the UK generally refer to sites ranging up to a few hundred kilowatts where electricity is fed directly to the National Grid. Plants at the micro-scale (typically below 100kW) may include schemes providing power to a single home.

‘Low head run of river’ schemes are typically sites in lowland areas, often installed on historic mill sites using the existing channel system and weir or dam. ‘High head run of river’ schemes are typically found on steeper ground in upland areas and the diverted water is typically carried to the turbine via an enclosed penstock (pipeline).

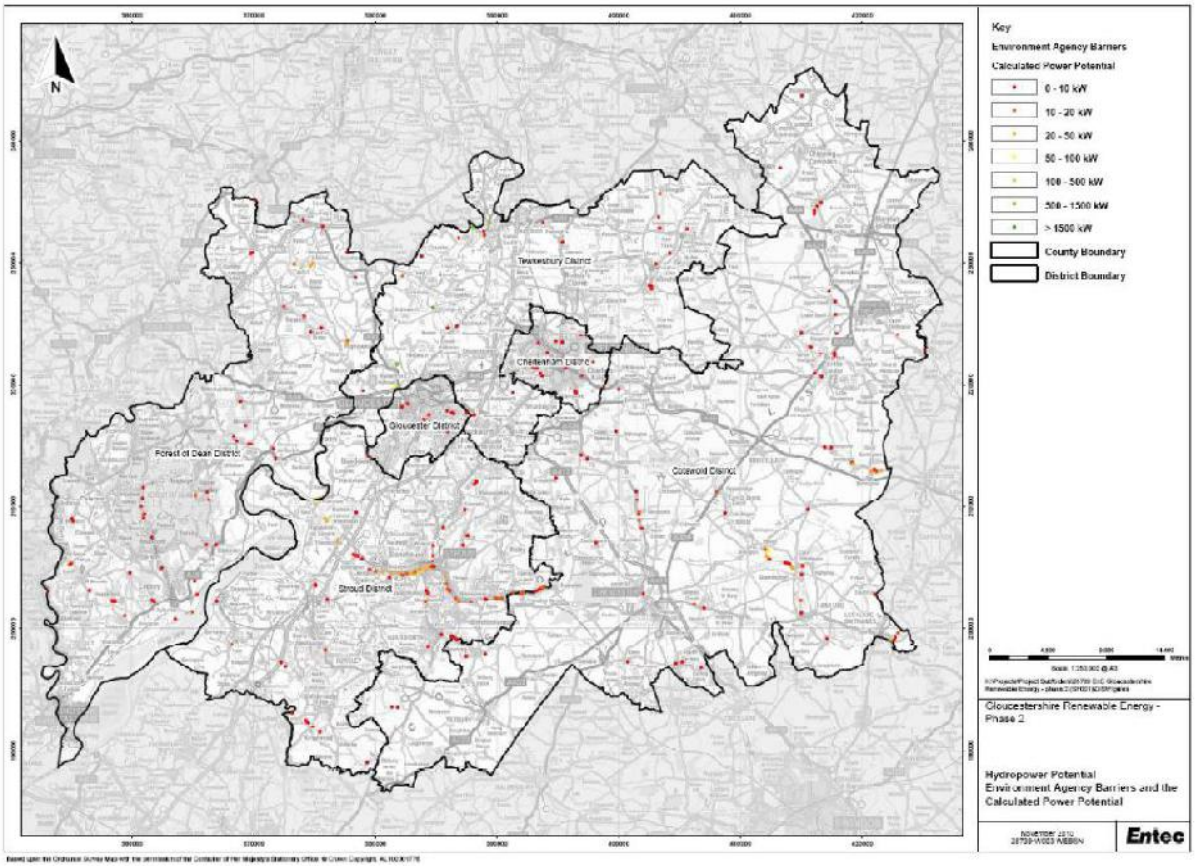
Small-scale hydro schemes will typically include dams, weirs, leats, turbine houses and power lines, which will have a visual impact on the locality, but which can usually be minimised by careful siting and design. Other important considerations include hydrology and the river ecology. Hydro plants may have an impact on upstream water flows and waterfalls, and fish populations can be vulnerable to changes in water flows and from the risk of physical harm from the plant equipment. Measures such as ‘fish passes’ are often incorporated to mitigate these impacts.

Any potential impacts of hydro installations on the status indicators of a water body as set out in the Water Framework Directive will need due consideration. Requirements will normally include abstraction licences, discharge permits and flood defence consent from Environment Agency. The cumulative impacts of hydro or other water abstraction activities along a river will need to be assessed for their impact on the protected rights of other river users. Additionally, permissions are normally issued with time limits on the abstraction period – unless these are reasonably long the developer may have concerns over the long-term viability of the plant if there is a risk of these not being renewed in the future.

In the Cotswold District as of 2019 there was a total of 7kW of Hydropower as reported in Feed-in Tariffs – sub-national statistics. This is made up of one non-domestic and one domestic installation (domestic 1.5kW and non-domestic 6.0kW).

Conducting a new assessment for Cotswold District's hydropower resource is outside of the scope of this study, and so the information presented below is taken from an assessment undertaken by Entec in 2011 covering the whole of Gloucestershire[26]. The report reviews the potential hydropower resource across the county and identifies a number of barriers (a feature which restricts the movement of groundwater across it) and associated power potential per local authority district. Within the Cotswold district 88 potential barriers were found, as shown in Figure 23 and described in Table 7, Table 8 and Table 9.

Figure 23: Gloucestershire Potential Hydropower Barriers[26]



[26] Gloucestershire County Council Renewable Energy Study: Phase 2 – Resource Assessment February 2011

Table 7: Types of barrier within Cotswold District

Type of Barrier	Cotswold District
Dam	1
Mill	9
Sluice	0
Waterfall	5
Weir	72
Unknown	1
Total	88

Table 8: Number of barriers in power categories in Cotswold District

Power Potential (kW)	Number of Barriers
0-10	68
10-20	11
20-50	7
50-100	1
100-500	1
500-1000	0
Total	88

Table 9: Power potential of barriers in power categories in Cotswold District

Power Potential categories (kW)	Power potential (kW)
0-10	199
10-20	147
20-50	240
50-100	58
100-500	227
500-1000	0
Total	868

Table 7, Table 8 and Table 9 show the large number of opportunities for hydropower systems in Cotswold District. However, the majority (68%) of sites are predicted to yield a power output of under 50kW which is small. Additionally, many of the schemes under 10kW (199; 23%) may not be a viable proposition given the very low output. Opportunities for systems over 100kW should be prioritised.

Future deployment

The identified resource indicates that the majority is made up of small (<50kW) sites, most of which are unlikely to be of sufficient scale to be economically viable and so future deployment is likely to be significantly constrained.

There have previously been proposals for a Cotswold Canals Severn – Thames Transfer (CCSTT) scheme to convey water from the west of the country to the south east, which could potentially create opportunities for hydro generation through a pumped hydro storage facility. This option appears to have been discounted by Thames Water in favour of a pipeline option as it was considered likely to perform less well in terms of the key criteria of water resources and water quality, normalised cost and ease of construction and operation.

Biomass and waste

Description of resource

Biomass can be generally defined as material of recent biological origin, derived from plant or animal matter. It is often categorised as either ‘dry’ or ‘wet’ biomass, with the former more commonly combusted either to generate heat or to produce electricity, and the latter anaerobically digested to generate ‘biogas’ or used to produce a transport ‘biofuel’.

Biomass materials such as wood are widely used in many countries as a feedstock for modern heating systems. Modern biomass heating technology is well developed and has been used to provide heat to buildings of all sizes, either through individual boilers or via district heating networks. Biomass has also often been used to fuel electricity plant or combined heat and power (CHP) plant due to the low carbon emissions associated with its use.

More recently however concerns have been raised over the impacts of biomass heating on local air quality and more scrutiny has been placed on the sustainability credentials of sourcing, processing and transporting biomass feedstocks in terms of net carbon emissions and sustainable land management. Changes in land use, for example from cultivating purpose-grown energy crops, also need careful consideration in terms of impacts on biodiversity and whether the activity is the most efficient use of the land compared to alternative sustainable energy or carbon reduction/sequestration measures.

Organic wastes can also be considered as a low carbon resource if their use in energy production has prevented them from otherwise decomposing i.e. potentially releasing methane - a potent greenhouse gas.

The most common types of biomass feedstocks for energy production include:

- Virgin woodfuel, including forestry and woodland residues, and energy crops.
- Waste residues, including municipal and commercial solid waste, recycled wood waste, agricultural residues and sewage.

Virgin woodfuel

The woodfuel resource considered here includes virgin, untreated wood residues (from forestry, arboriculture, tree surgery, etc.) and the energy crops Miscanthus and Short Rotation Coppice (SRC). There is some overlap with waste where virgin wood is present in certain waste streams, but this can be difficult to segregate from non-virgin (contaminated) wood. The distinction between virgin or contaminated wood will determine the areas of legislation that will apply to its use regarding emissions permits. Woodland residues and energy crops are generally considered to be clean or ‘untreated’ whereas other waste wood residues may contain contaminants such

as paint, preservative, etc. and would fall under stricter emission and pollution prevention controls.

Wood is generally considered to be a sustainable fuel if it can be shown to have been sustainably sourced, which usually means it is renewable through re-growth as part of local sustainable woodland management and does not carry excessive 'embodied' carbon from processing and transport. Logs and woodchip in particular are bulky fuels and should be sourced as locally as possible to their end-use. Wood from a sustainable source has therefore often been classed as a low carbon energy source as the carbon emissions released when combusted are balanced by that absorbed during its re-growth. Its use as part of a net-zero carbon future however is likely to require that any adverse impacts on land use and local air quality are avoided, the amount of woodfuel being burnt is genuinely replaced by re-growth or re-planting within an acceptable timescale, and that carbon emissions resulting from growing, processing and transport processes have been mitigated.

Various processes are used to prepare the wood feedstock prior to it becoming suitable for use as fuel in a range of forms including logs, woodchips, pellets and briquettes. These processes largely dictate the final specification of the biomass in terms of moisture content, size and form. Quality control of these parameters is vital for use in specific types of boiler and thermal conversion processes. Both woodland residues and energy crops can be used to produce either heat-only or electricity and heat (combined heat and power) via a range of energy conversion technologies including direct combustion, gasification and pyrolysis.

Existing development within Cotswold

As of July 2020 there were 34 domestic biomass systems in Cotswold accredited under the Renewable Heat Incentive (RHI) scheme. Taking an average capacity of 26kW[27] per installation gives a total installed capacity of nearly 0.9MW. No further data was identified on use of woodfuel within the District although there will be significant amounts used domestically in open fires, stoves and wood burners.

Results

Technical potential of forestry and woodland resource

Woodland and arboricultural residues are normally sourced as the residues of the sustainable management of existing woodland. The technically available resource can be assessed by calculating the total area of woodland in the study area and assuming a sustainable yield, which in this case is two odt/year (oven-dried tonnes/year) – a generally accepted figure across the industry. Annual tonnage of wood can then be obtained and its heat delivery potential estimated.

[27] https://www.gov.uk/government/collections/renewable-heat-incentive-statistics

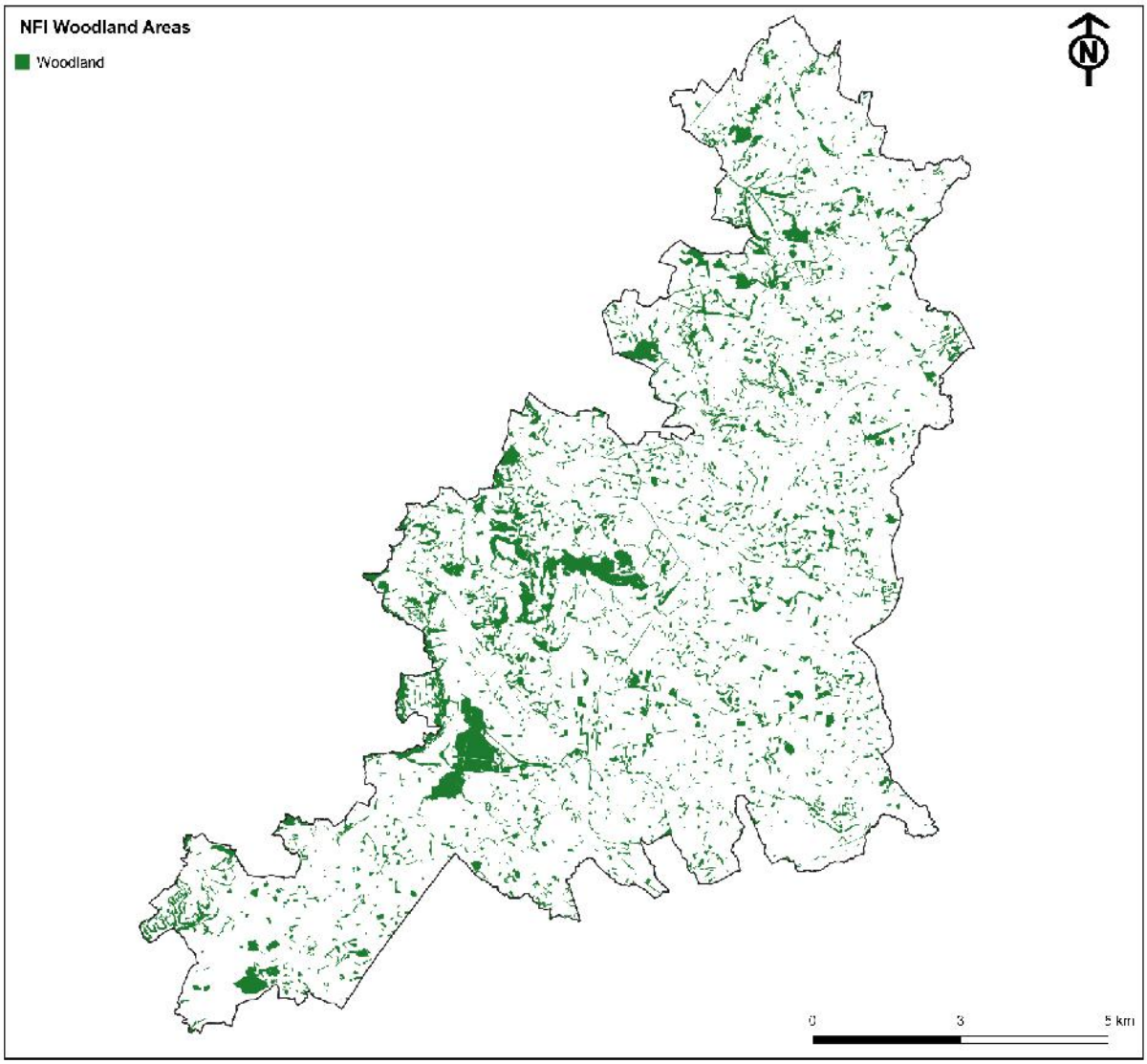
The Forestry Commission's National Forest Inventory (NFI) dataset has been used for this analysis. The NFI is produced by using satellite images to identify and classify areas of woodland, alongside ground surveys of sample areas[28]. It classifies areas of woodland into the following categories:

- Broadleaved
- Coniferous
- Mixed
- Shrub
- Young trees
- Felled
- Ground prepared for planting
- Low Density

Felled areas, ground prepared for planting, low density, shrub and young trees are excluded from the analysis because they cannot provide a sustainable source of woodfuel. They have been mentioned here because they are in the NFI, and because felled areas may be replanted in the future, while young trees will mature over time into a viable resource. Figure 24 shows areas of woodland as mapped for the study area.

[28] This means that there are occasional errors where patches in photographs have been erroneously identified.

Figure 24: Areas of woodland within Cotswold (all categories)



Using the GIS data used in the above map, the technically available resource by woodland category is shown in the table below. This estimates the annual tonnage of wood and its delivered heat potential – this has been assessed by using assumptions about the sustainable yield that can be obtained, heating plant efficiency and the energy content of wood. All assumptions are included in Appendix D.

Table 10: Woodfuel assessment of forestry and woodland resource

Woodland category	Area (Hectares)	Sustainable woodfuel yield (odt/year)	Delivered heat (MWh/year)	Proportion of estimated Cotswold building heat demand (%)	Potential CO_2 savings (tonnes/year)
Broad-leaved	10,320.53	20,641.06	92,482.25	14.45%	19,226.15
Coniferous	1,754.74	3,509.47	15,724.18	2.46%	3,268.90
Felled	152.53	305.06	1,366.83	0.21%	284.15
Mixed	1,278.14	2,556.27	11,453.37	1.79%	2,381.04
Shrub	69.30	138.60	621.02	0.10%	129.10
Young trees	942.00	1,884.00	8,441.27	1.32%	1,754.86
Ground prep	111.25	222.49	996.88	0.16%	207.24
Low density	6.20	12.39	55.53	0.01%	11.54
Total	**14,947.18**	**29,894.36**	**133,941.70**	**20.92%**	**27,845.16**
Total excl. felled, ground prep, low density, shrub and young trees	**13,783.35**	**27,566.70**	**123,512.58**	**19.29%**	**25,677.05**

The above figures relate to the resource within Cotswold only, but there is potential for surplus woodfuel to also be sourced from further afield if the cost and environmental impact of transporting the feedstock or final product is suitably assessed. The resource shown in Table 10Table 10: would increase by more than 35 times if a 40km search radius was applied from the boundary of the District. This includes the Forest of Dean area. It is likely however that a significant proportion of this resource is already being utilised for the woodfuel requirements of domestic log stoves and open fires.

A further potential source of woodfuel is from the cutting of hedgerows – however it has not been possible to assess this resource because there is no reliable yield factor for the amount of woodfuel that can be obtained from a given area or length of hedgerow.

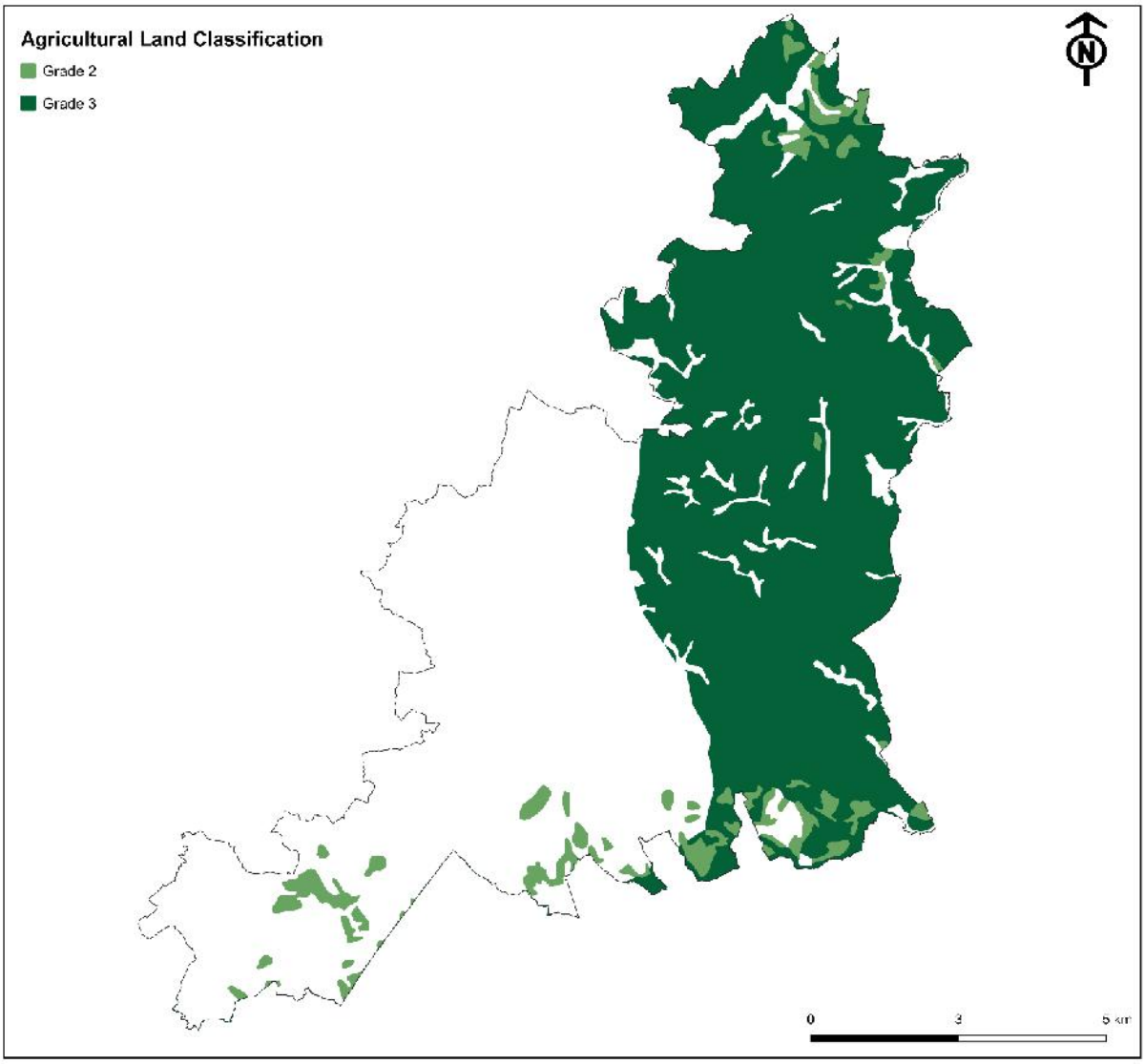
Technical potential of energy crops

The two main woodfuel energy crops are Miscanthus and Short Rotation Coppice (SRC), which are planted specifically for heat and/or electricity production. This is usually distinct from ‘biofuel’ crops such as sugar cane, maize and oilseed rape which tend to be used for transport fuels.

Miscanthus cultivation has the advantages of being able to use existing machinery, is higher yielding than SRC, undergoes annual harvesting with a relatively dry fuel product when cut, but it is more expensive to establish. SRC (commonly willow) is easier and cheaper to establish, is better for biodiversity and suitable for a wider range of boilers. However, it requires specialist machinery, is harvested every three years, and produces a wetter fuel that needs to dry before it can be used. Both crops have similar lead in times with around 4 years until they produce commercial harvests. Miscanthus will reach its peak yield in year 5 and SRC will achieve its peak yield in the second rotation which is harvested in year 7.

The technical resource for energy crops assumes that they can be grown on agricultural land of grades 2 or 3 (arable land), which for Cotswold District totals 59,552 hectares (around 51% of total land area) – see Figure 25 and Table 11Error! Reference source not found.. Grade 1 land is excluded from the analysis as it is assumed that food crops will be prioritised over energy crops in these areas. Typical constraints will preclude areas having certain types of permanent pasture and moorland, public rights of way, woodland, historic parks and gardens, and for Miscanthus, exposed areas with high average wind speeds.

Figure 25: Agricultural land classification in Cotswold



Annual yields are typically around 16-18 odt/ha for miscanthus and 8-10 odt/ha for SRC. Potential energy outputs and emissions savings are shown in Table 11. This shows two scenarios: the resource for if 1% (595 hectares) of all suitable areas was utilised and if 10% (5,955 hectares) was utilised. In the 10% scenario this could fulfil 40% of Cotswold Districts estimated building demand (if cultivating miscanthus).

Table 11: Potential yields and CO_2 savings for energy crops

Scenario Area cultivated (Hectares)		Sustainable woodfuel yield (odt/year)	Delivered heat (MWh/ year)	Proportion of estimated Cotswold building heat demand (%)	Potential CO_2 savings (tonnes/ year)
Miscanthus	595.52	10,123.82	4.07%	26,068.83	8,209.94
	5,955.19	101,238.17	40.72%	260,688.28	82,099.43
SRC	595.52	5,359.67	2.16%	13,801.14	4,346.44
	5,955.19	53,596.68	21.56%	138,011.44	43,464.40

Issues affecting deployment

Assuming there is sufficient demand, the sourcing of clean recycled wood as woodfuel will depend on suitable management of waste streams and separation processes whereas the constraints on producing woodfuel from woodlands will depend on how much woodland can be brought under active management and the incentives available for landowners to extract and process woodfuel. In both cases, competing alternative end-uses for wood such as for construction and building materials and any inherent carbon storage benefits will also be a factor. The virgin woodfuel market is currently dominated by demand from domestic log-burners or stoves with woodchip and pellet boilers still only playing a minor role. Economic viability for the latter is better in off-gas areas due to the higher cost of predominant fuels such as oil, LPG and electricity (for direct heating), and the on-going Renewable Heat Incentive scheme. Woodfuel heating systems however will increasingly need to compete with heat pumps as the electricity grid decarbonises and will also have to contend with additional constraints such as space for fuel storage, solid fuel flue regulations and maintenance requirements.

Deployment of energy crops will be influenced by economic viability, end-use/market, land ownership, existing farming activities, potential biodiversity impacts, protected landscapes, the presence of water-stressed areas and net carbon reductions achieved. In particular, conflicts over land use for alternative activities such as food production will need to be considered in relation to the relative costs and benefits of each option. There may also be land use conflict when comparing the appropriateness of different renewable technology options, for example in terms of whether more benefit could be gained from the use of a particular parcel of land for the growing of energy crops compared to the installation of a ground-mounted solar array. For the purpose of comparison, the potential heat generation from one hectare of Miscanthus could be in the region of 43MWh per year, plus 26MWh per year electricity generation (assuming CHP), whilst a solar farm covering the same hectare of land might generate around 384MWh per year of electricity.

The production of energy crops will also be dependent on landowners and farmers being offered sufficient incentive to grow and harvest the crops, with longer-term supply contracts often needing to be arranged well in advance with end-users. As with woodland residues, the logistics of fuel processing and establishing supply chains may initially act as a barrier to the widespread take-up of this resource. Other issues that may limit exploitation include the requirement for Environmental Impact Assessment (EIA) of energy crop projects, the planning and permitting of energy generating plant and the question of alternative markets for Miscanthus and SRC.

Overall there is ambition at national level for biomass to play a key role in decarbonising the UK's energy supplies. Both the Government's Clean Growth Strategy (2017) and *'Net Zero – the UK's contribution to stopping global warming'* (Committee on Climate Change, 2019)) both acknowledged the significant opportunities offered by biomass, particularly if it is used alongside carbon capture and storage (CCS) technology to both sequester carbon from the atmosphere via plant growth and capture that subsequently released in bioenergy conversion processes. The Committee on Climate Change have also reviewed the carbon and wider sustainability impacts of biomass production and use and concluded that sustainable low-carbon bioenergy is possible, but that this can only be achieved in certain circumstances, if certain practices and criteria are applied[29].

Since the 1960s, agricultural subsidy under the EU's Common Agricultural Policy (CAP) has significantly shaped farming practices in the UK, including the extent to which bioenergy initiatives have been deployed. The UK's 25-year Environment Plan and planned exit from the CAP now provide a new context for policies and strategies to scale up biomass production, not least by the Government's new Environmental Land Management (ELM) scheme which will pay farmers to deliver beneficial outcomes.

Energy from Waste

Municipal and commercial solid waste

Description of technology

Generally referred to as Energy from Waste (EfW), this technology involves extracting energy using a process undertaken on the non-recyclable residual elements of waste streams. Solid dry materials can be processed into Refuse-Derived Fuel (RDF) and are usually incinerated to produce heat and/or electricity. A proportion of this fuel could be considered as 'renewable' depending on its organic,

[29] See 'Biomass in a low carbon economy' (2018), Committee on Climate Change, p12, Box 2

non-fossil fuel content, for example as set out by Ofgem for the purposes of the Renewables Obligation.

Another form of energy from waste technology uses anaerobic digestion (AD) to process food waste. One of the by-products of the process is biogas which is then either combusted to generate electricity or processed into biomethane and injected directly into the gas grid.

Existing development within Cotswold District

Waste management in Cotswold District comes under the framework of the Gloucestershire Joint Municipal Waste Management Strategy (JMWMS), developed in 2008 in partnership with all seven District Councils[30]. Set against an overall objective of zero waste to landfill, Gloucestershire is achieving a recycling rate of around 52% for waste (2016/2017 figures), and has a target of 60% recycling by 2020 and 70% recycling and composting by 2030.[31]

All post-recycling residual household waste generated in Gloucestershire and collected by the District Councils or taken to Household Waste Recycling Centres is treated by the new Javelin Park EfW facility, located near Haresfield in Stroud District. The facility has a capacity of 190,000 tonnes of waste per year including commercial waste and is expected to generate around 14.5MW of electricity and is enabled to generate heat as a Combined Heat and Power (CHP) plant (although currently supplying electricity only). The site opened in October 2019 and in the first 12 months of operation the facility processed 177,582 tonnes of waste, which generated 118,920 MWh of electricity that was exported to the grid (equivalent to power 25,000 homes)[32]. Around 50% of the energy recovered may be called 'renewable' due to the organic composition of the waste feedstock.

However, it should be noted that the facility will remain a significant source of carbon emissions, which are associated principally with the plastic content of the waste streams. Reaching net zero carbon emissions from the District's waste by 2030 will therefore require the removal of the plastic from the residual waste stream, or cessation of incineration altogether.

Recycled wood waste

The waste wood resource is difficult to quantify and would require a detailed survey to assess material collected at Community Recycling Centres and that present within

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[30] https://www.gloucestershirerecycles.com/partnership-and-strategy/partnership-and-strategy/

[31] www.recycleforgloucestershire.com/recover/dealing-with-gloucestershires-waste/

[32] https://www.ubbgloucestershire.co.uk/news/2021/3/15/gloucestershire-energy-from-waste-facility-passes-first-anniversary

commercial, industrial and construction waste streams. This will typically consist of clean, untreated material mixed with that contaminated with paint, preservative, fixings and other foreign materials. While clean waste wood can potentially be sourced directly from saw mills, carpenters, joineries, etc., a large proportion of this resource will be mixed with contaminated material in mainstream commercial and municipal solid waste streams and so it is likely that a significant amount is currently being treated as residual waste and may therefore end up at the Javelin Park waste facility.

Due to toxic emissions and air quality concerns contaminated waste wood is generally not suitable to be used in small or medium scale thermal energy installations due to the lack of suitable exhaust gas clean-up equipment; these clean-up systems are costly and tend to be viable on large scale plant only.

Note – the wood resource from woodland and arboricultural arisings are considered in section 0.

Food waste

Much of Cotswold District's food waste is sent to an anaerobic digestion plant in Bishops Cleave, near Cheltenham. This takes delivery of around 34,000 tonnes of domestic and commercial food waste annually to produce biogas, some of which is used in a CHP engine with 1.6MW generation capacity to provide all the site's power needs, with the remaining gas processed for injection to the national gas grid. This biogas is classed as a renewable source of energy although it has not been possible to quantify the annual amounts produced.

Agricultural residues and sewage

With Cotswold being a predominantly rural district, agricultural waste represents a potential renewable energy resource, particularly from using livestock slurry as a feedstock for the anaerobic digestion process. Using estimates from Defra statistics on animal numbers for 2016 and resulting slurry and biogas yields, an estimate has been made of the potential emissions savings in Table 12. Heat delivered from cattle slurry would supply just over 1% of the Cotswold district estimated building heat demand and just under 1% of the total electricity demand. The total livestock slurry resource would meet 1.84% of estimated building heat demand and 1.65% of electricity demand in Cotswold District.

Table 12: Assessment of livestock slurry

Livestock	Numbers in Cotswold District[33]	Volume of slurry (tonnes/year)[34]	Biogas yield (m^3/tonne)	Delivered electricity (MWh/year)	Delivered heat (MWh/year)	Delivered energy (MWh/year)	Potential CO_2 savings (tonnes/year)
Cattle	25,293	101,172	20	4,067	6,779	10,846	2,573
Pigs	11,179	8,060	20	324	540	864	205
Poultry	679,163	26,492	50	2,662	4,437	7,100	1,684
Total				**7,054**	**11,756**	**18,810**	**4,463**

Biogas generation from anaerobic digestion of sewage is also classed as renewable form of energy with most large sites generating heat and/or electricity for the site's own needs. Heat recovery systems can also be used with sewage or waste water infrastructure to provide heat to local users, although this application is not yet widespread.

[33] www.gov.uk/government/statistical-data-sets/structure-of-the-agricultural-industry-in-england-and-the-uk-at-june

[34] www.organics-recycling.org.uk/uploads/category1060/10-010%20FINAL_Andersons_NNFCC_AD2010.pdf

District heating and ambient heating (heat pumps)

Introduction

The decarbonisation of heat supply is a major challenge on the route to a Net Zero future and will involve a radical departure from the fossil fuels we currently use to heat the vast majority of our buildings. The approach now being proposed by the UK Government involves the roll-out of district heating networks, where a centralised plant supplies low or zero carbon heat and/or cooling to two or more buildings via a network, and the deployment of individual heat pumps to supply low or zero carbon heat and/or cooling within buildings not served by heat networks.

To assess which areas are best suited to heat networks, the Government is currently trialling a zoning methodology by working with six major UK cities as part of a pilot programme to help local authorities develop local heat decarbonisation plans, identify heat network zones, and understand how they can use supportive policy measures to reinforce connection to networks. The Government consulted on heat network zoning in late 2021.[35]

The following sections consider the potential for district heating within Cotswold District and the accompanying role heat pumps may play in decarbonising heat supplies to buildings.

District heating

District heating is a system for distributing heat from one source (i.e. plant room or energy centre) to multiple properties. Instead of each property having its own individual heating system, a group of properties connected to a district or 'community' heating network all receive heat (in the form of hot water or steam) from a central source, via a network of insulated pipes. This can offer a number of benefits compared to individual heating systems within each property including:

- Potential for lower costs for consumers and long-term price stability through use of local low or zero carbon energy resources such as waste heat.
- Longer lifespans and higher system efficiencies than many older individual heating systems through economy of scale, better control and lower temperature heat distribution.
- Heat networks are technology-neutral and can connect to different heat sources over time with minimal disruption to consumers.
- Less space needed within properties compared to traditional individual heating systems and reduced maintenance requirements.

[35] https://www.gov.uk/government/consultations/proposals-for-heat-network-zoning

Low or zero carbon district heating is seen as playing a key role in the UK's path to achieving an affordable decarbonised heat supply and features largely in the Government's Clean Growth Strategy from 2017 and the Committee on Climate Change's Net Zero report from 2019. The latter's core Net Zero scenario suggests that around 5 million homes across the UK will need to be connected to heat networks by 2050, equivalent to around 18% of heat demand. In this context, the Clean Growth Strategy suggests that around one in five buildings will have the potential to access a largely low carbon district heat network by 2050.

The heat source of many older district heating systems is a basic fossil-fuel fired boiler, although over recent years gas-fired combined heat and power (CHP) plants have been commonly used to increase efficiency and reduce emissions. CHP produces both heat (sometimes with cooling) and electricity, so with a CHP district heating system, as well as a network of pipes distributing heat/cooling, there is also a grid connection or network of wires to distribute electricity to one or more local users. In the latter case, where the output is not grid-connected, this is referred to as a private wire network. However, the emissions savings potential of gas-fired CHP has rapidly decreased as a result of the decarbonisation of mains electricity at national scale and will continue to do so. Tightening regulations around the energy performance of buildings and their emissions now mean that supply technologies for new or refurbished heat networks will tend to be limited to low or zero carbon forms of heat generation such as heat pumps or waste heat.

Deployment of large-scale ground, water or air source heat pumps to supply heat networks is likely to become significantly more widespread as grid-supplied electricity continues to decarbonise. The use of ground source heat pumps to supply multiple properties may incorporate a ground loop array which collects the heat needed to supply a centralised large scale heat pump plant which then distributes heat via a heat network. Alternatively, a shared ground loop array may instead collect heat to serve individual heat pumps in each property. One advantage of the latter system is that all pipework which carries hot water (i.e. at temperatures ready for heating) is confined to within the properties so heat losses are minimised.

For the purposes of this study geothermal heat for building heating has not been analysed. However, there may be large potential for this across the district, as there is carboniferous limestone geology underlying it[36]. This potential should be investigated as a geothermal borehole could supply a large heat network such as the scheme in Southampton[37].

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[36] https://www.bgs.ac.uk/news/unlocking-the-deep-geothermal-energy-potential-of-the-carboniferous-limestone-supergroup/

[37] https://www.geographysouthwest.co.uk/wp-content/uploads/2020/10/Geothermal-UK-2020.pdf

Heat mapping and district heating networks

Viability of district heating

A large part of the cost of developing a district heating network is laying pipes, due to the need to excavate roads or other land, which is expensive. An energy centre, which houses the heat source, also needs to be established; this could be located within one of the buildings in the network or it could be in its own separate building. Overall costs vary widely depending on the number and type of buildings connected and the area covered. Installing a heat network in a new development is usually cheaper than installing it in an existing development because pipes can be laid at the same time as other infrastructure when roads are built. In this way, new developments often act as a trigger for a network, but with the potential to also supply existing heat demands from buildings in the vicinity which may improve economic viability.

Properties connected to a district heating network normally pay the heating network operator for units of heat delivered. Therefore the economics of a district heating system are dependent on the amount of heat provided per metre of pipe, known as the linear heat density; the higher the amount of heat delivered per metre of pipe, the better. Linear heat density is a critical factor in heat distribution economics, but this can only be calculated at the stage when a route has been defined.

As a proxy for linear heat density, spatial heat density (along with other factors) is used to find parts of the study area most likely to contain high concentrations of heat demand by means of an ‘overlay analysis’, which can then be investigated in more detail. Spatial density is the amount of heat per area (for example, per square metre).

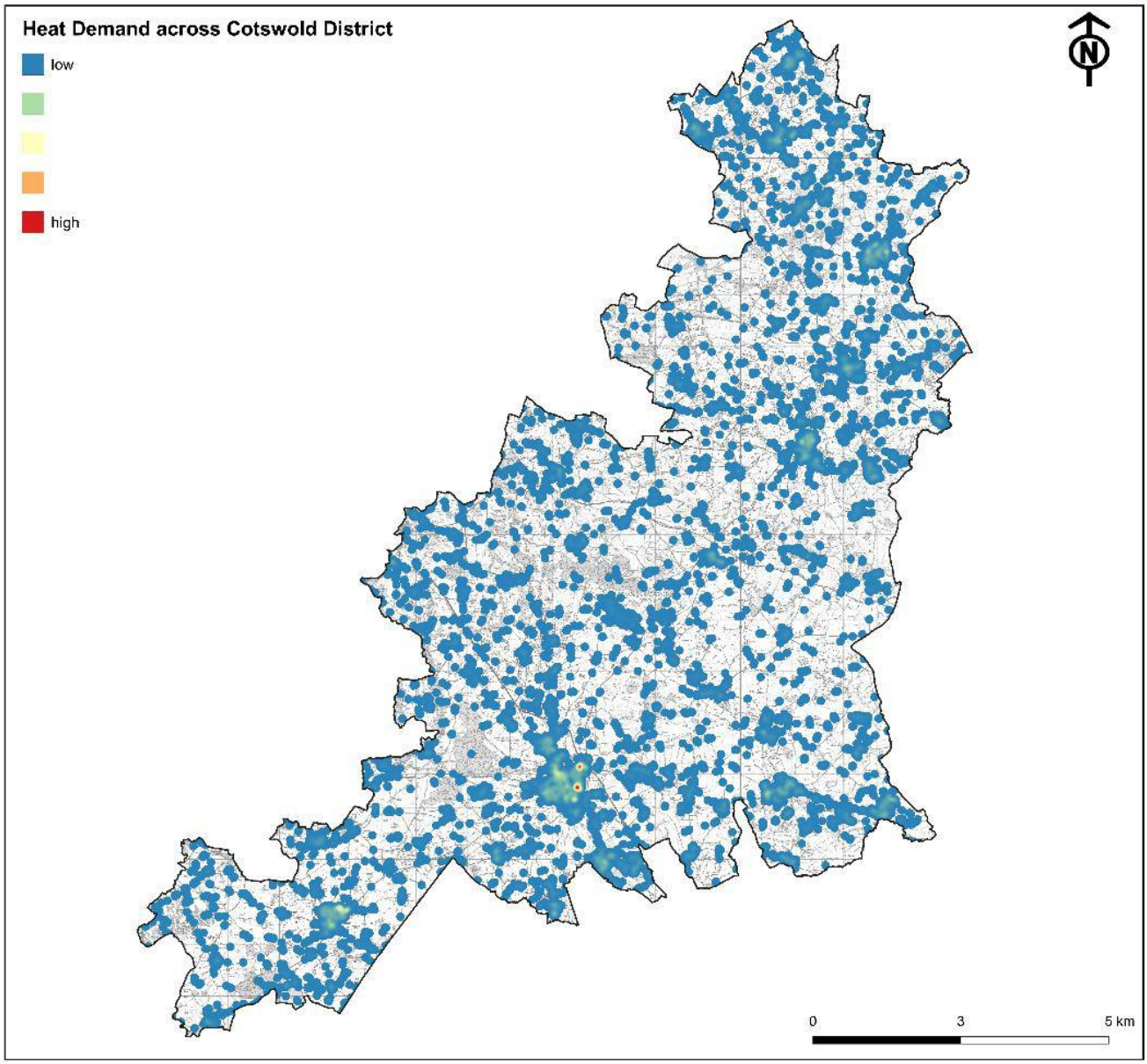
Heat mapping

Heat mapping is a process of using available datasets to make accurate estimates of heat demand from buildings within a given area, and presenting these visually on a map. The map can then be used to find areas of high heat demand which may be suitable for district heating. This analysis uses data from the heat demand model of the THERMOS project[38], which has been produced as part of an EC Horizon 2020-funded research project led by CSE. The THERMOS model incorporates a hierarchical approach to estimating demand, with the method used depending on the available input data. This starts with a basic heat demand estimation method using a 2-D representation of a building’s polygon (e.g. where only OpenStreetMap data is available) or, as in the case of Cotswold, this can be improved using a more detailed model which uses LIDAR data to estimate the 3-D shapes of buildings.

[38] www.thermos-project.eu/home/

For this analysis, address-level heat demand data across the Cotswold area was first estimated using the THERMOS tool and a Geographic Information System (GIS) was then used to analyse the spatial distribution of heat demand. All addresses in the study area, along with their associated heat demand, were mapped using their OS Grid coordinates. A heat demand density map was then produced covering the study area – see Figure 26. This is a map layer which gives the estimated heat demand per unit of land area, based on the address-level heat demand data

Figure 26: Heat density in Cotswold



Areas with high concentrations of heat demand have higher spatial density values. Heat density is shown on the map from blue to red, with blue areas being low density and red areas high density.

As would be expected, the heat map shows heat demand density to be greatest in the more urban areas of the district. The most prominent clusters are located in Cirencester.

District-wide overlay analysis

With a large area to explore, a useful way of initially identifying areas which are more likely to be suitable for district heating is to find areas which satisfy three conditions favourable to district heating, relating to: overall heat demand; presence of potential anchor loads; and groups of dwellings with high heat demand (normally blocks of flats). These conditions are:

- Areas must be within the 5% of land area with the highest heat demand density
- Areas must be within 200m of residential buildings with an annual heat demand of more than 50,000kWh per year
- Areas must be within 200m of potential anchor loads

Anchor loads are defined as those types of buildings likely to have relatively high and stable heat demands and/or be in sectors more likely to participate in heat distribution projects. For the purpose of this study, this includes all buildings with an annual demand for heat of above 50,000kWh that fall within the following categories within the THERMOS heat demand model:

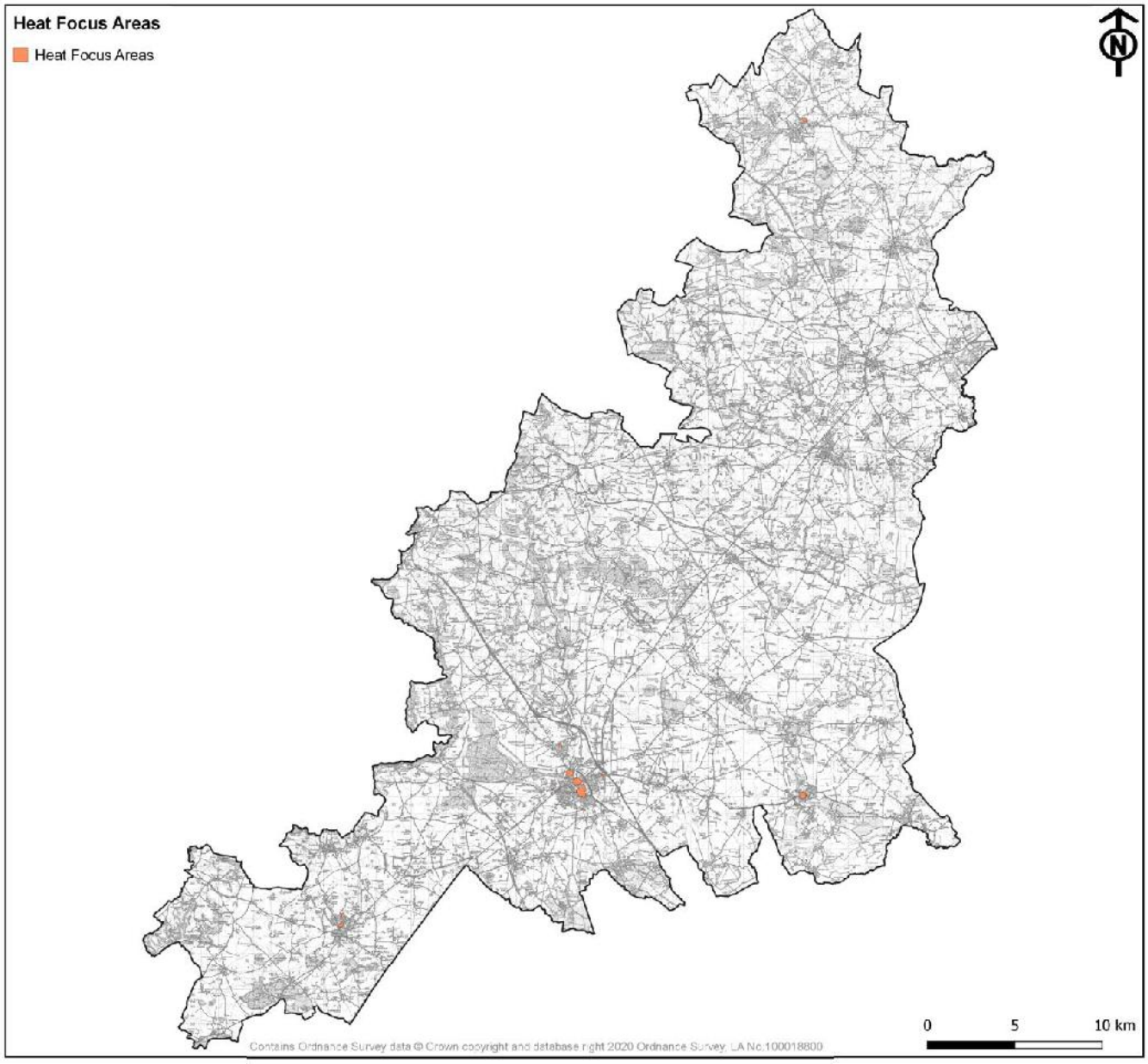
- Office
- Commercial
- Sport and Leisure
- Industrial
- Medical
- Hotel
- Prison

The THERMOS heat demand model uses data from a variety of sources which classify commercial buildings into different types. The categories are reasonably wide, so not all buildings in the above categories will actually be suitable as anchor loads (particularly in the case of industrial buildings). However, they provide a good basis for establishing the initial area of search. When these areas are established, the locations identified and the areas around them can be checked for suitability by examining Ordnance Survey maps and Google Streetview to find out more about the types of buildings and their appropriateness (for example, high heat demand can be caused by dense terraced housing, which is less suitable than larger loads due to the number of connections which would be required).

In the Cotswold district only a small number of areas met all three of the above criteria, and these were located close to or within the larger settlements of Cirencester, Tetbury, Moreton-in-Marsh and Fairford. For the purpose of this study, the areas identified through the overlay analysis can be termed as ‘Heat Focus

Areas', and may be worthy of further consideration. These areas should also be considered alongside planned large new development sites which offer particular opportunities for heat networks.

Figure 27: Heat focus areas in Cotswold District



In addition to the geographical aspects of heat demand, location of heat supply will also be a factor in planning a network. This is particularly the case when a specific building or piece of land may be under Council ownership and has the space to host an energy plant, or where waste heat from sources such as industrial processes or data centres have been identified as potentially available.

Note – no such opportunities for heat supply had been identified prior to the following analysis for the areas considered.

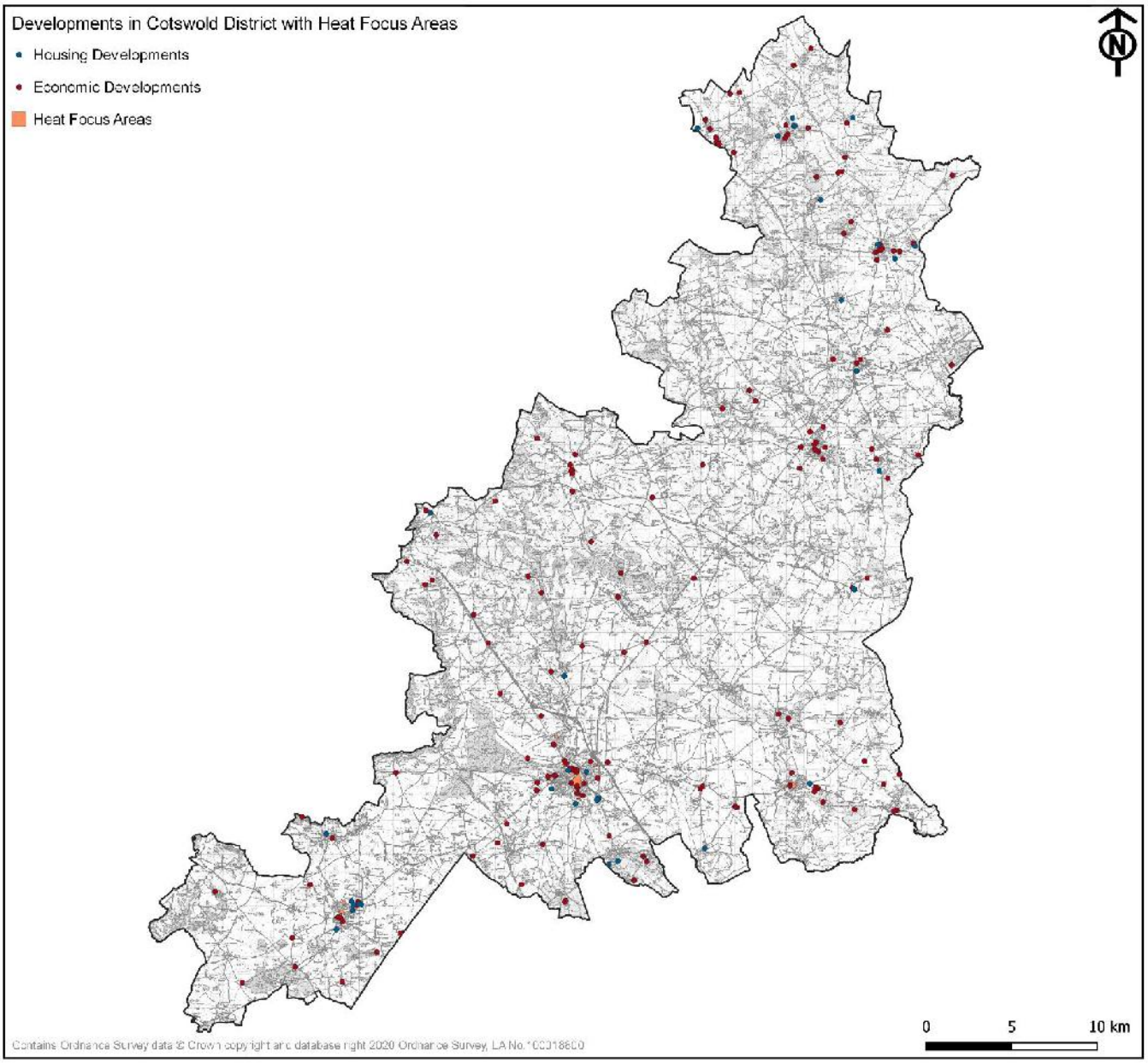
New development

When considering heat networks, new development creates an additional demand for heat and power, as well as an opportunity to find a more flexible site for an energy centre and to lay heat distribution pipework. Existing development in the close vicinity can also act as additional heat demands which may improve the economic viability of a network, particularly where anchor loads may exist along with other heat demand profiles which can smooth out the overall heat demand profile.

Sites that have already been earmarked for new development in the Cotswold area were mapped in GIS using information provided by the Council. This included Housing Allocations, Employment Allocations and the Strategic Site at Chesterton (now known as 'The Steadings') as set out within the Local Plan, as well as information on committed dwellings (including those with outline or full planning permission, reserved matters or other firm commitment) and economic developments, as provided by CDC. It should be noted that where full planning permission is not yet in place, the proposals may be subject to change.

This information was added alongside identified Heat Focus Areas in order to provide an indication of where new development might have a positive impact on the viability and layout of a heat network in the priority areas identified – see Figure 28.

Figure 28: Heat focus areas and planning applications



Focused analysis using the THERMOS tool

Following overlay analysis, the area in central Cirencester was selected for further analysis using the THERMOS tool. This is a high-level pre-feasibility analysis, assessing network route options, energy supply options and outline costs. It is based primarily on modelled data and indicative cost assumptions have been used for these examples. The model incorporates a feature where insulation can be applied (and specified by the user), or users can directly adjust heat demands of individual buildings to run before/after type scenarios. Should the Council wish to review and adjust the parameters or create new networks based on better local knowledge then

access to the online analysis can be provided[39]. The analysis is indicative and is intended to be a starting point for more in-depth analysis. More information on the tool, including training materials, can be found on the THERMOS website.

The THERMOS software finds the optimal heat network layout in a given area based on one of two objectives:

- Maximise Network NPV (net present value) - the goal is to choose which demands to connect to the network so as to maximize the NPV for the network operator. This is the sum of the revenues from demands minus the sum of costs for the network.
- Maximise Whole System NPV - The goal is to choose how to supply heat to the buildings in the problem (or abate demand) at the minimum overall cost. The internal transfer of money between buildings and network operator is not considered, so network revenues and tariffs have no effect. Alternative individual heating systems (such as air source heat pumps) and building fabric insulation can be offered where this may be considered a more financially viable option.

For the purposes of this case study, both objectives have been explored. Phase 1 refers to the smaller site selected for the start of a heat network, and Phase 2 refers to a slightly expanded option at the same location. For the purposes of this interim report new developments have not been included in the THERMOS analysis, however these could be included at a later date.

The tool allows the user to select specific buildings to be considered within the analysis, and these can be marked as ‘required’ or ‘optional’ depending on user preferences. A building must also be selected to act as a supply point (i.e. the location of an energy centre to house the required plant to supply the network with heat).

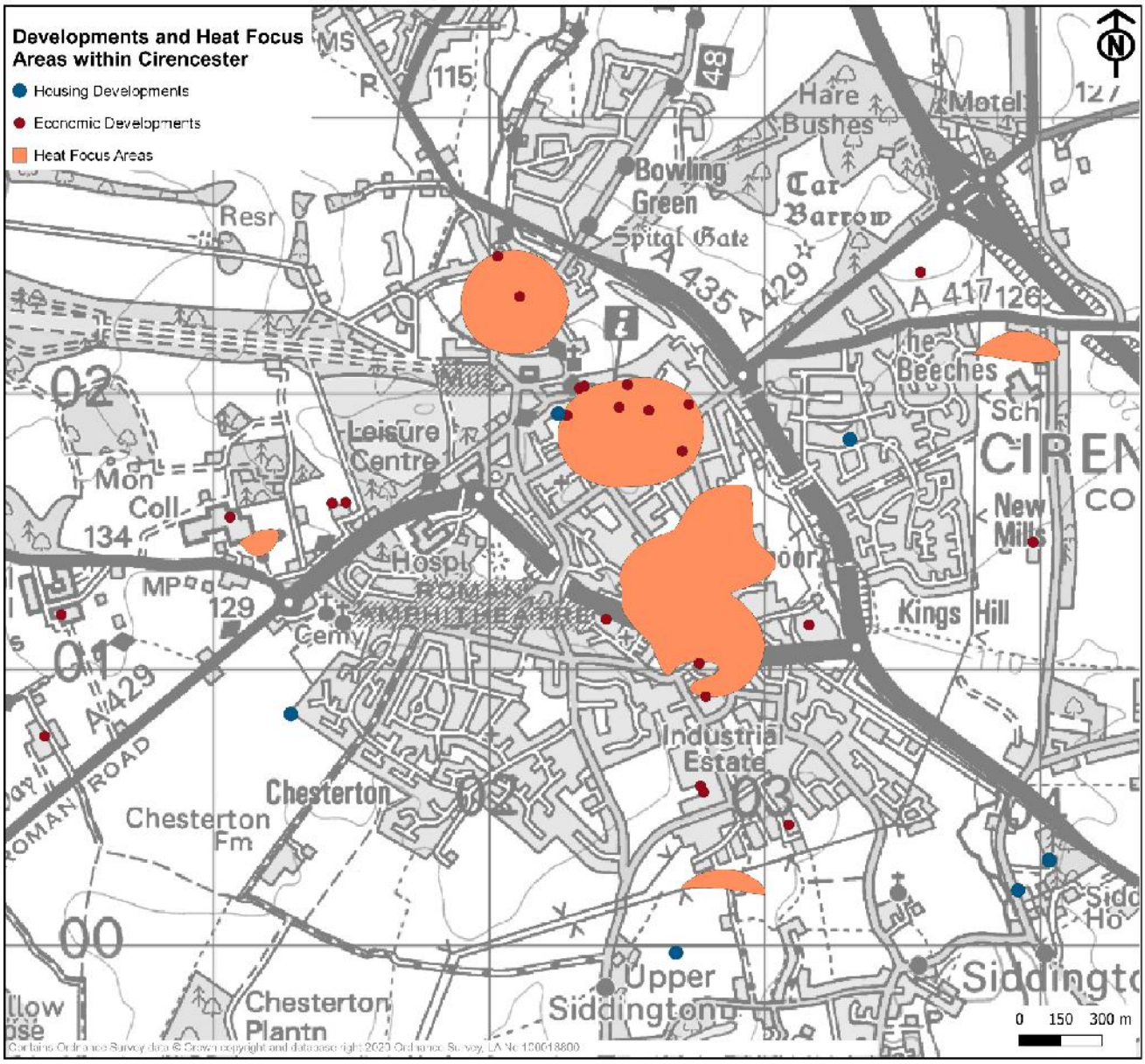
As noted above, assumptions have been applied within the THERMOS application. The supply points have been set a maximum capacity of 5 MW. The capacity cost is set to £45 per kW, which is indicative of the capital cost of a gas boiler at this scale. The supply cost is set to 2p/kWh to provide a cheaper alternative to individual gas central heating. No decision needs to be made on what theoretical heat source is supplying the network. Other defaults within the software include but are not limited to the pipe costs, standard tariff for customers on the network and costs for individual heating systems to be installed.

[39] THERMOS is a web-based tool and has been designed for use by local authorities, consultants and other stakeholders. It allows secure online collaboration through the sharing of projects via individual email addresses.

Cirencester

Cirencester is the largest urban area and a number of HFAs have been identified within its limits (shown in Figure 29).

Figure 29: Cirencester heat focus areas and planning applications



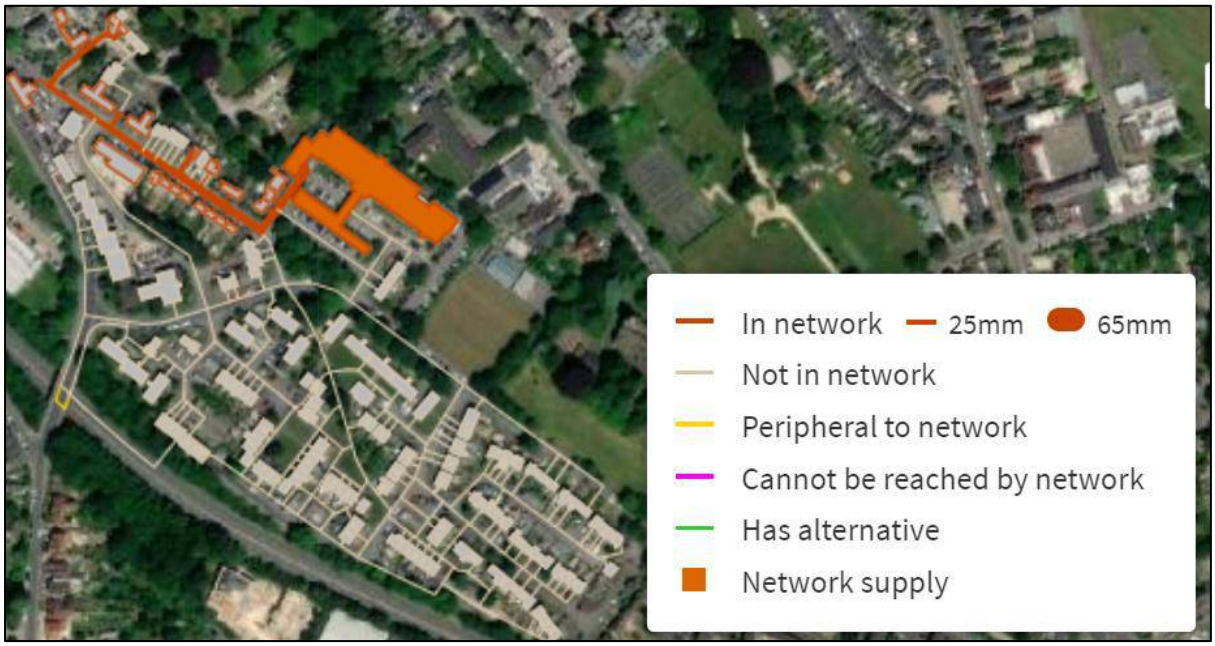
The area for heat network analysis surrounds the Cotswold District Council Trinity Road office building as a supply point. The scale of public sector land ownership in this area is likely to be of significant benefit in any attempt to coordinate a heat network development project. Potential anchor loads and buildings of particular interest include Cirencester Hospital, Cotswold Leisure Centre and Waitrose and Partners.

As discussed above, all buildings have had heat demand (MWh) and heat peak estimated by the model. However, as there is actual heat demand (gas consumption)

data for CDC offices, the heat demand has been updated to reflect the actual figures (from April 2019 to March 2020). The heat peak was increased proportionally in line with the new figures. The heat demand is 1,057 MWh and peak is 579 kWp.

Figure 30 provides an example of a possible network layout surrounding the CDC offices.

Figure 30: Cirencester example: Phase 1 network NPV



In the above example the analysis is aiming to maximise the network NPV by allowing all buildings to be 'optional'. This means that buildings will not be added if it is not optimal for the network operator. For the purpose of this exercise, it has been assumed that the plant will be housed within the building highlighted in orange (CDC office). There is the option for the network to join 176 demands (buildings) with a total of 3.25 GWh/year heat demand (heat peak 5.51 MWp). The suggested network includes the CDC office and supplies some residential properties as well as industrial buildings. Only 845kW of the supply capacity (up to 5MW for the purposes of this study) is being used. The buildings included in the network have a heat peak of 1.32 MWp.

In Figure 31 the analysis aims to include all buildings (these have been selected as 'required'). The analysis will be aiming to provide the cheapest scenario between properties connecting to the network and using individual heating systems. All buildings have been added to the network, meaning that it is financially better to be part of the network compared to having an individual heating system. The supply capacity is almost maxed out at 5.51 MWp. It is able to use more than the 5MW supply capacity due to the peak being undiversified (in reality it won't peak at 5.51 at the same time).

Figure 31: Cirencester example: Phase 1 whole system NPV

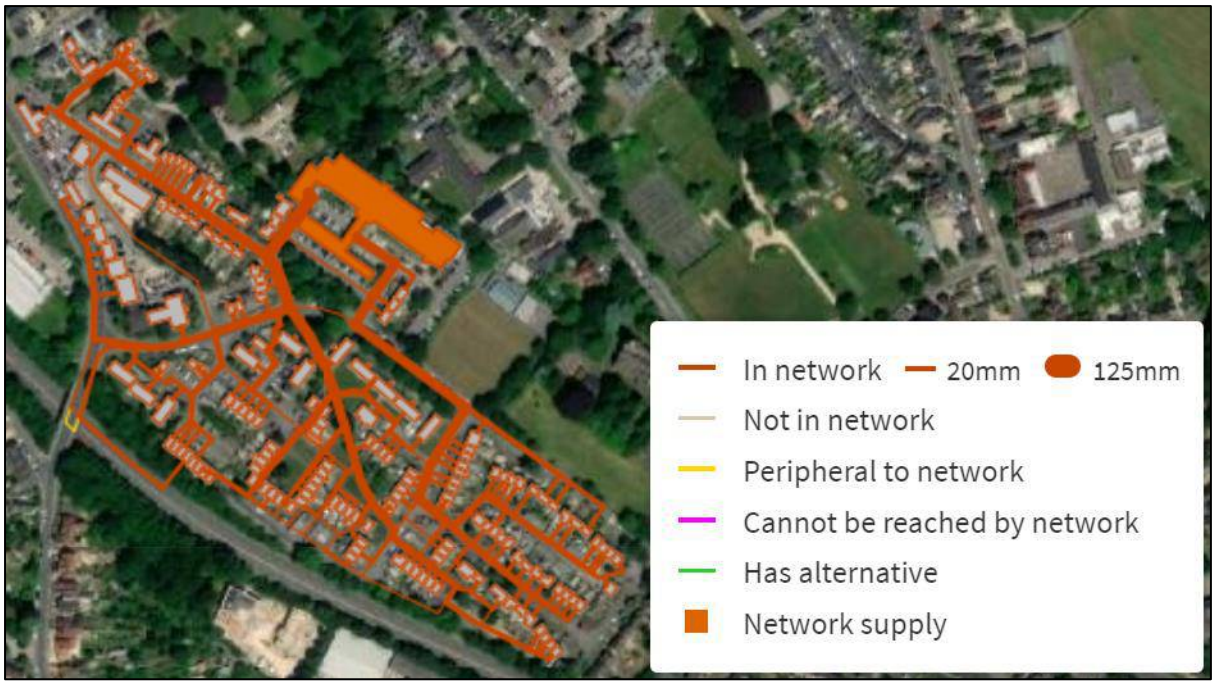


Figure 32 shows the CDC offices network extended (Phase 2) with the addition of Cirencester Hospital, Cotswold Leisure Centre and Waitrose and Partners. The model now has the option to include up to 243 demands (buildings) and the heat peak of these is 9.12 MWp. With the supply capacity at 5MW, the network would not be able to join all buildings even if it was financially viable.

The network is now using 2.28 MW of its 5MW capacity, with 52 demands connected. The hospital has a peak of 412 kWp.

Figure 32: Cirencester example: Phase 2 network NPV

Using the whole system NPV with Phase 2 results in no network.

Table 13: Andover summary of results

Andover	Phase 1 network NPV	Phase 1 whole system NPV	Phase 2 network NPV
Net Present Value			
Network NPV (£k)	£771.78	-£1.01	£1,140
Whole System NPV (£M)	-£1.14	-£5.09	-£4.75
Network Size			
Buildings	22	176	243
Paths	54	419	677
Pipework Solution			
Length (km)	0.429	4.36	11.13
Base Cost (£M)	£0.264	£2.86	£6.84
Maximum pipe diameter (mm)	65	125	125
Total Capital Cost (£M)	£0.351	£3.22	£2.18
Demand Solution			
Total Undiversified Peak Demand (MWp)	1.32	5.51	9.12
Total Demand (GWh/year)	1.58	3.25	7.58
Revenue (£k/year)	£80.3	£171.5	£247.2
Supply Solution			
Total Capacity Required (MW)	0.845	3.42	2.28
Heat Production Costs (fuel) (£M)	£1.33	£3.14	£4.32

Next Steps

The heat mapping overlay analysis presented above provides a high level indication of areas within the district where heat networks are likely to be most viable, based on the demand for heat from existing buildings. The subsequent analysis using the THERMOS tool illustrates some potential networks within Cirencester which have been selected by considering the building clusters involving high heat demands and potential anchor loads. Due to limitations of the scope of this study, the analysis is principally intended to illustrate how the tool can be easily used to model a group of

buildings with a chosen energy supply location and provide a useful basis for further study. As such, the buildings chosen and parameters used will need to be reviewed in more detail using local data and knowledge as far as possible, which will require additional work outside the scope of the current study. THERMOS is an open-source web-based tool and has been designed specifically to allow local authorities, consultants or other stakeholders to input local data to improve the accuracy of its outputs. It also allows secure online collaborative working through the sharing of maps and projects. The network scenarios modelled above for example could easily be shared with an officer at the Council, who could then view and edit the maps and parameters via the tool's user interface with minimal training.

THERMOS is mainly designed to assist the pre-feasibility phase of heat network planning, but given a robust set of input data it will also usefully contribute to, and help justify the need for a detailed techno-economic analysis. At this next stage, initial consideration should also be given to business planning around ownership, phasing, delivery and operation of the network. It is also important to explore at an early stage which stakeholders may be involved along the way and how to engage with them - particularly the heat customers. Further information on the development of heat networks is available from Government guidance[40]. Local authority funding towards the early stages of heat network development, including energy masterplanning, techno-economic feasibility and detailed project development is potentially available through the Government's Heat Networks Delivery Unit (HNDU).

Ambient heat (heat pumps)

Description of technology

Heat pumps operate by using electricity to transfer ambient heat from the ground, air or bodies of water via a standard refrigeration process to heat or cool buildings. They can range from small scale domestic sized units up to large scale systems which may be used in conjunction with district heating networks. Overall efficiency is sufficiently high in well-designed systems to make the technology a viable low carbon alternative to conventional heating or cooling systems.

Ground source heat pumps require space for either vertical bore holes or a larger area for the horizontal trenching of refrigerant pipes. By contrast air source heat pumps are physically similar to standard air conditioning units and are typically mounted on an external wall of a property. Heat pumps work best when coupled with low temperature heat distribution systems and therefore require properties to be well insulated in order for them to operate efficiently. They are often well-suited to new

[40] https://www.gov.uk/guidance/heat-networks-overview#:~:text=A%20heat%20network%20%E2%80%93%20sometimes%20called,domestic%20or%20non%2Ddomestic%20buildings

developments with high thermal insulation standards, but upgrades may need to be carried out with retrofit projects before heat pumps are considered a viable option.

Issues affecting development

The successful roll-out of heat pumps as a low or zero carbon heat supply option will be highly dependent on the on-going decarbonisation of UK grid electricity. Such widespread electrification of heat supplies will also place increased demands on local electricity supply infrastructure, in addition to increased demands from the growth of electric vehicles.

The potential for retrofitting heat pumps to existing development will also be largely dependent on capital cost reductions through mass production and the extent to which energy efficiency retrofits can be undertaken to ensure compatibility with a heat pump system. To place this in context, the Government's Clean Growth Strategy sets out an aspiration "for as many homes as possible to be EPC Band C by 2035 where practical, cost-effective and affordable" with only around 30% of UK homes currently meeting this target. Available space may also be a constraint, particularly for ground source systems in built up areas where land area is limited. For trenched systems, an area equivalent to twice the total floor area of the building to be heated may typically be needed. For borehole systems, ground conditions and the presence of groundwater can impact their feasibility and cost as they are typically installed to a depth of 70-150m.

Heat pumps on domestic premises are generally considered to be permitted development and do not normally need planning permission, although air source heat pumps need to meet specific criteria which include size and positioning. Water source heat pumps take their heat from rivers or other bodies of water and may therefore require permission from the relevant authorities to install the necessary equipment. Heat pump installations in Conservation Areas or on listed buildings will also be subject to additional criteria. For example, in Conservation Areas air source heat pumps must not be installed on a wall or roof which fronts a highway or be nearer to any highway which bounds the property than any part of the building.

The Government's Future Homes Standard and future tightening of Building Regulations may also dramatically impact the uptake of heat pumps in new development if they are perceived as a cost-effective and feasible technology to help meet the energy performance standards of the future. Heat pumps have the added benefits of working much more efficiently with the higher fabric thermal standards and the lower temperature heating distribution systems that are likely to feature within new development of the future. Ground source heat pumps also have the added advantage of having no visible external equipment and with new development can usually be factored into the footprint of larger sites to incorporate shared ground loop arrays serving multiple properties.

As discussed in section 0, due to the predominantly rural characteristics of Cotswolds District there are relatively few opportunities for district heating. This would imply that small-scale individual heat pumps are likely to play a leading role in transitioning away from fossil fuel heating across the District. Based on current fuel prices, uptake in areas off the mains gas network may be proportionally higher when competing against more expensive fuels such as electricity (for direct heating) or LPG.

Existing development within Cotswold District

According to deployment data from the Renewable Heat Incentive scheme, there were 201 air source heat pumps and 54 ground source heat pump domestic installations accredited in Cotswold District from April 2014 to July 2020. Assuming average system heat supply capacities of 9.9kW for air source and 13.6kW for ground source[41], resulting total capacities are estimated at 1.99MW and 0.73MW respectively. Figures for non-domestic installations have not been identified.

Technical potential

Theoretically, almost any building could have an air source heat pump and so the technical resource is very large and has not been specifically quantified. In terms of heat output, ground source systems are more efficient due to their heat being sourced from the ground which has more stable year-round temperatures. Air source heat pumps take their heat from ambient air which is subject to large seasonal temperature fluctuations; unfortunately heat demand is highest when the heat source temperature is at its lowest (winter), which means a significant drop in efficiency during this period.

The standard measure of operational efficiency for heat pumps is the Seasonal Performance Factor (SPF) which indicates year-round efficiency (as opposed to Coefficient of Performance, which usually indicates efficiency during optimum conditions only). Typical SPFs for air source and ground source heat pumps in the UK are 3.1 and 3.4 respectively[42].

Issues affecting deployment

The successful roll-out of heat pumps as a low or zero carbon heat supply option will be highly dependent on the on-going decarbonisation of UK grid electricity. Such widespread electrification of heat supplies will also place increased demands on local electricity supply infrastructure, in addition to increased demands from the growth of electric vehicles. Cumulative impacts of densely populated heat pumps

[41] https://www.gov.uk/government/statistics/rhi-monthly-deployment-data-july-2020

[42] As published in domestic RHI deployment data for July 2020, which includes average SPFs for all heat pumps installed under the RHI: https://www.gov.uk/government/statistics/rhi-monthly-deployment-data-july-2020

within a relatively small area may also lead to localised excess heating or cooling of the ambient heat source.

The potential for retrofitting heat pumps to existing development will also be largely dependent on capital cost reductions through mass production and the extent to which energy efficiency retrofits can be undertaken to ensure compatibility with a heat pump system. To place this in context, the Government's Clean Growth Strategy sets out an aspiration "for as many homes as possible to be EPC Band C by 2035 where practical, cost-effective and affordable" with only around 30% of UK homes currently meeting this target. Uptake in areas off the mains gas network may be proportionally higher when competing against expensive fuels such as electricity (for direct heating) or LPG.

The Government's Future Homes Standard and future tightening of Building Regulations may also dramatically impact the uptake of heat pumps in new development if they are perceived as a cost-effective and feasible technology to help meet the energy performance standards of the future. Heat pumps have the added benefits of working much more efficiently with the higher fabric thermal standards and the lower temperature heating distribution systems that are likely to feature within new development of the future. Ground source heat pumps also have the added advantage of having no visible external equipment and with new development can usually be factored into the footprint of larger sites to incorporate shared ground loop arrays serving multiple properties.

As discussed in the report, due to the predominantly rural characteristics of Cotswolds District there are relatively few opportunities for district heating. This would imply that small-scale individual heat pumps are likely to play a leading role in transitioning away from fossil fuel heating across the District.

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Annex C

Appendix B: Renewable Energy Assessment Figures

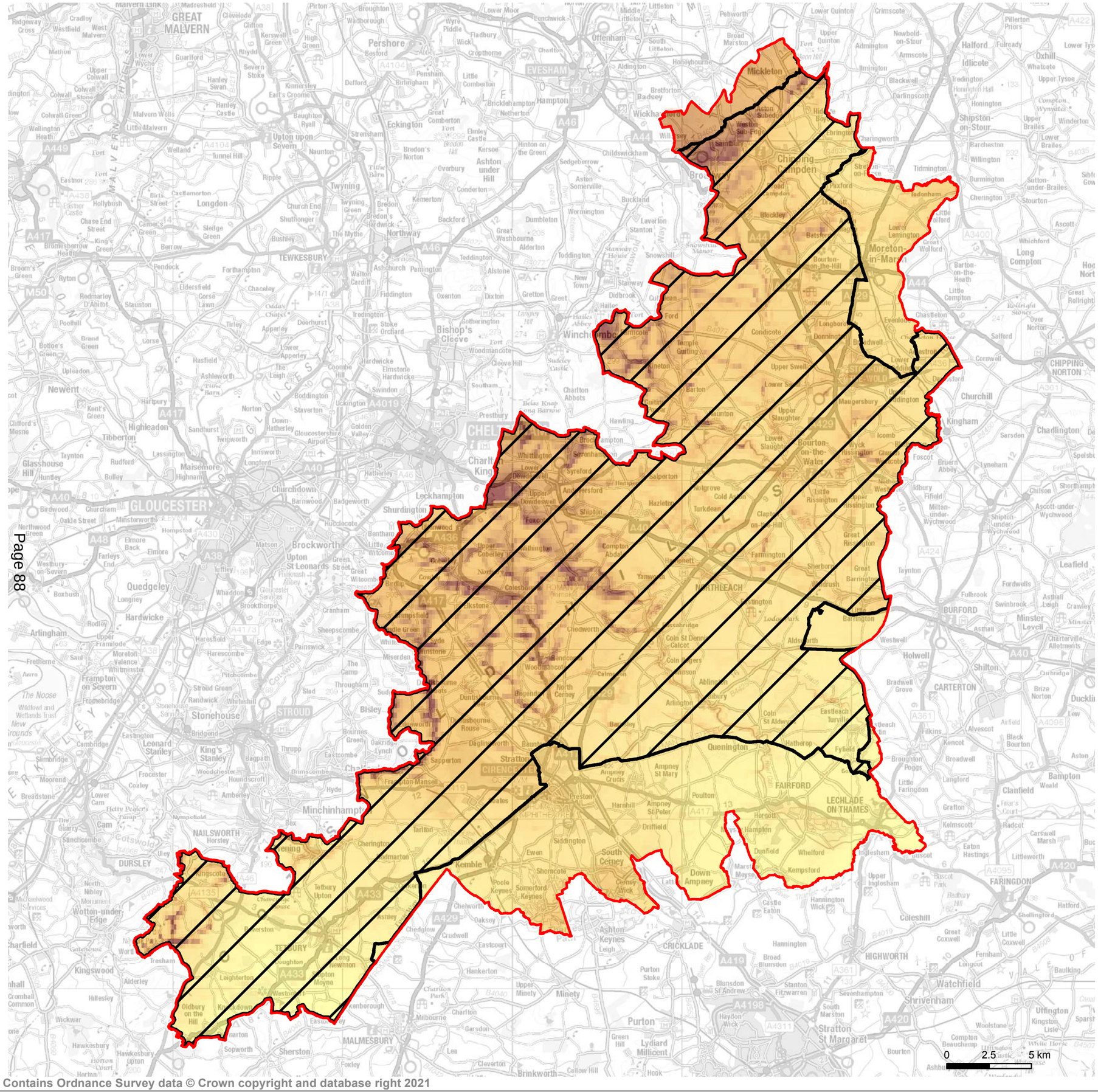

Figure 1.1: Annual solar irradiance

Cotswold District Council boundary

Cotswolds Area of Outstanding Natural Beauty

Data obtained from the Global Solar Atlas 2.0, a free, web-based application is developed and operated by the company Solargis s.r.o. on behalf of the World Bank Group, utilizing Solargis data, with funding provided by the Energy Sector Management Assistance Program (ESMAP). For additional information: https://globalsolaratlas.info.

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	Annual solar irradiance
Scale	1:220,000
Arial Bold 10	Arial Regular 10

centre for sustainable energy

LUC

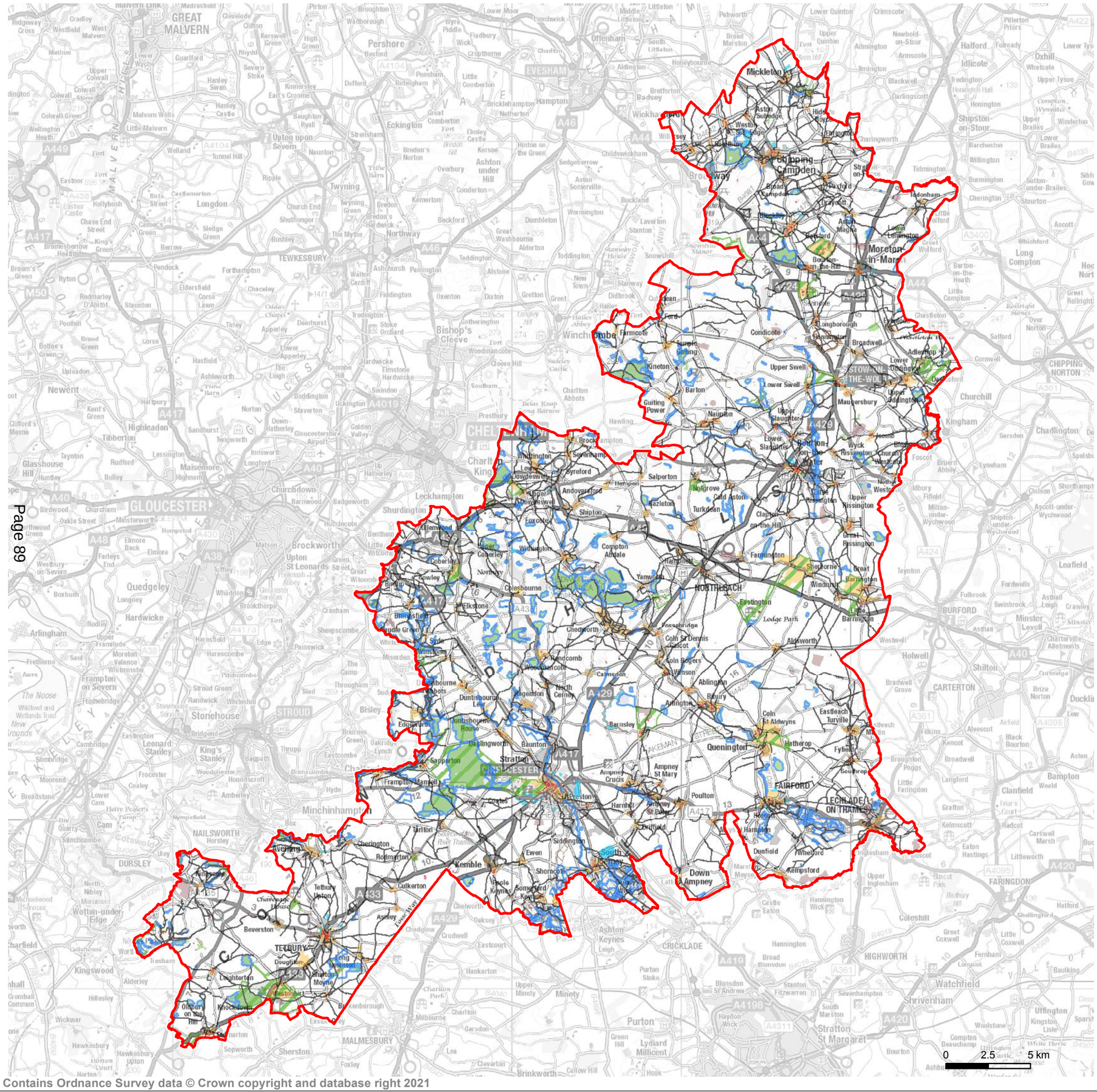

Figure 1.2: Solar constraints - Natural heritage, cultural heritage and recreation

- Cotswold District Council boundary
- Local Nature Reserve
- Local Wildlife Site
- Registered parks and gardens
- Registered battlefield
- Special Area of Conservation
- Site of Special Scientifice Interest
- Public rights of way
- Cycle routes
- Listed building
- Ancient woodland
- Conservation area
- Scheduled monument

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	Solar constraints 1
Scale	1:220,000
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centre for sustainable energy

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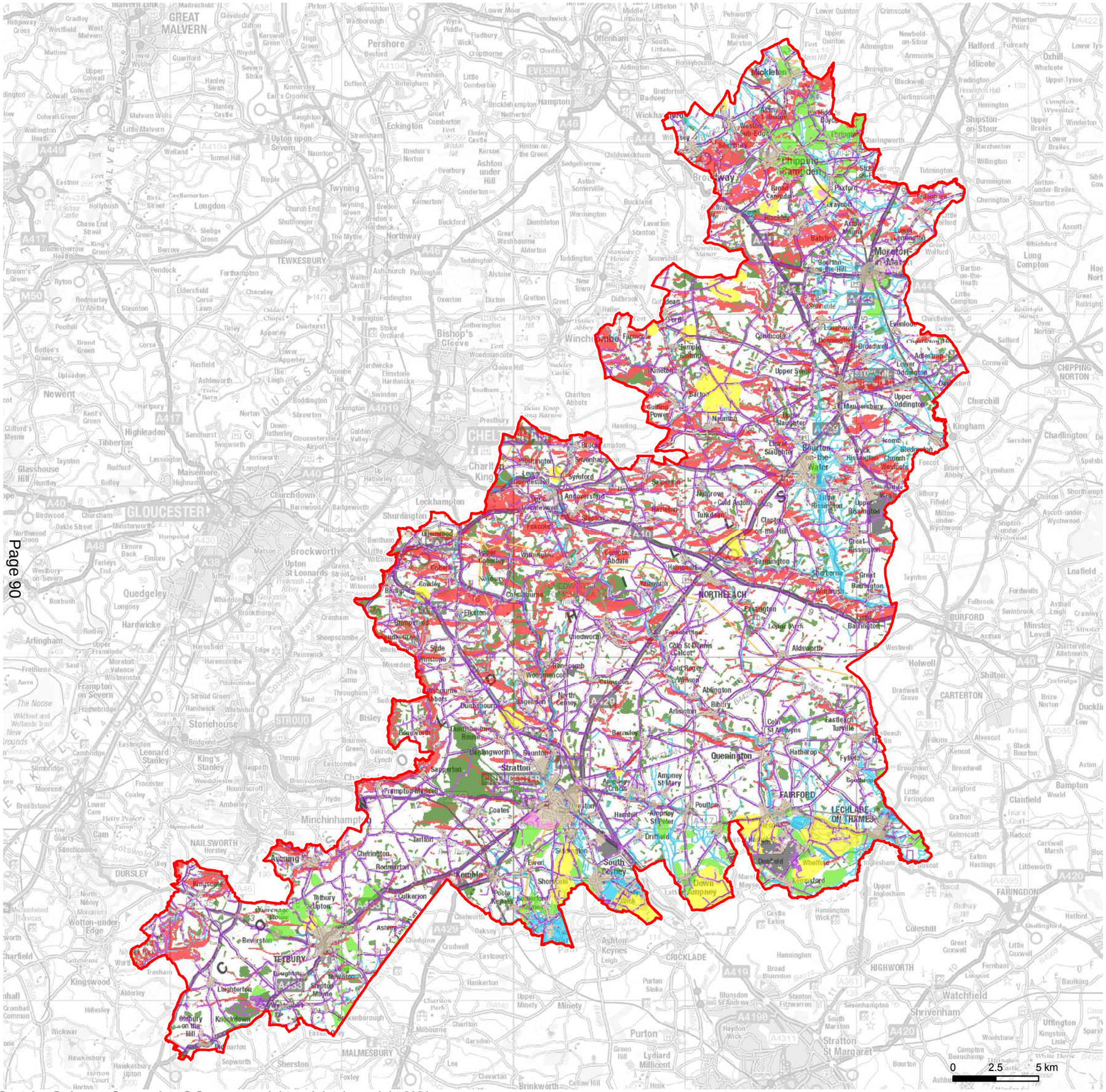

Figure 1.3: Solar constraints - Physical and land use

- Cotswold District Council boundary
- Buildings with 20m buffer
- Roads
- Railways
- Overhead lines 2m buffer
- Operational and allocated minerals sites with 250m buffer
- Airfields, airports and MOD land
- Allocated sites and employment sites
- Consented and operational renewable energy projets
- Slope greater than 10° and Aspect NW to NE with slope greater than 3°
- Agricultural land classification grade 1 and 2
- Watercourses and waterbodies
- Woodland and forestry 20m buffer

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	Solar constraints 2
Scale	1:220,000
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centre for sustainable energy

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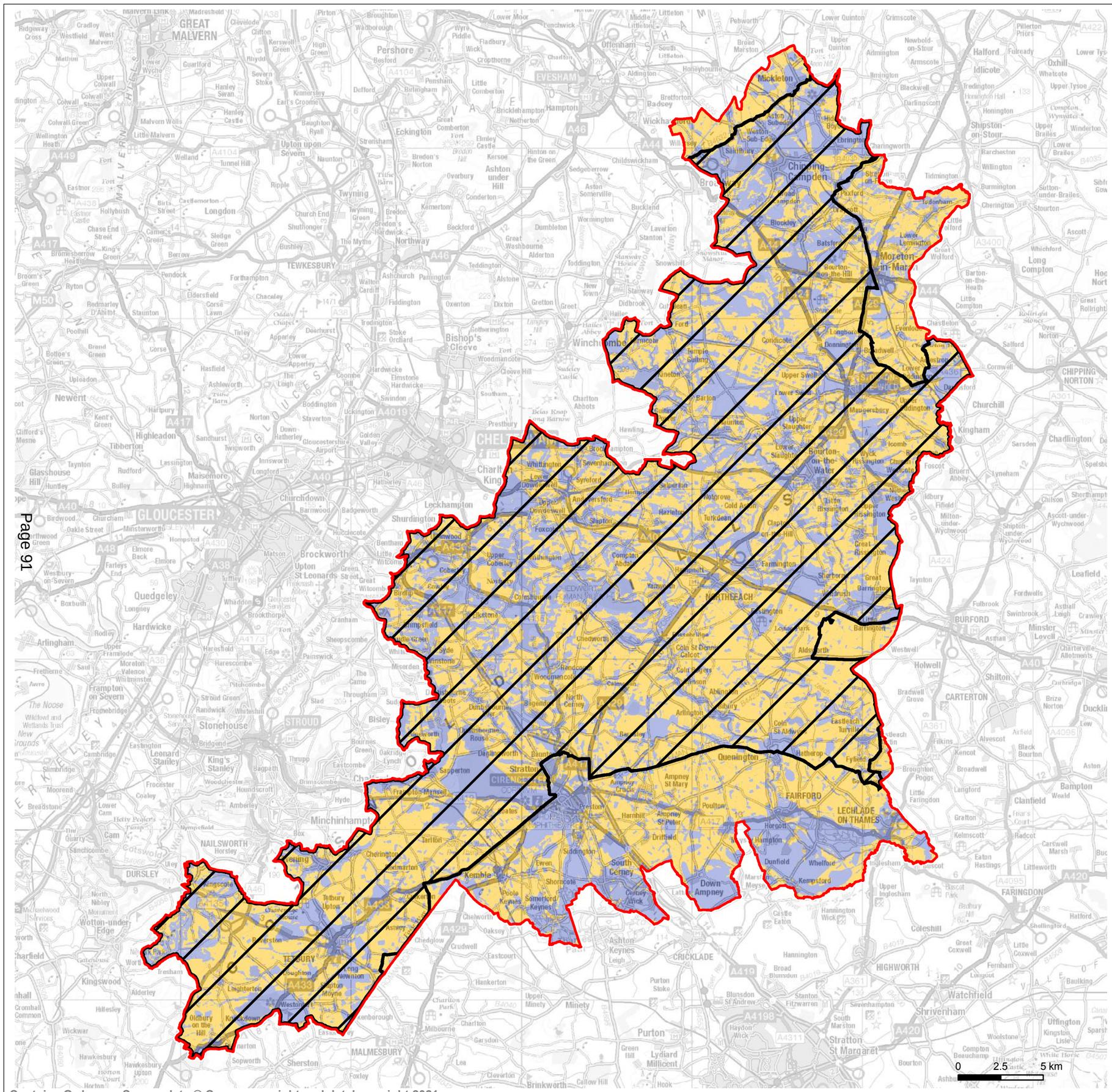

Figure 1.4: Opportunities and Constraints: solar development

- Cotswold District Council boundary
- Cotswolds Area of Outstanding Natural Beauty
- Suitable areas for solar development
- Constrained areas for solar

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	Solar opportunities and constraints
Scale	1:220,000
Arial Bold 10	Arial Regular 10

centre for sustainable energy

LUC

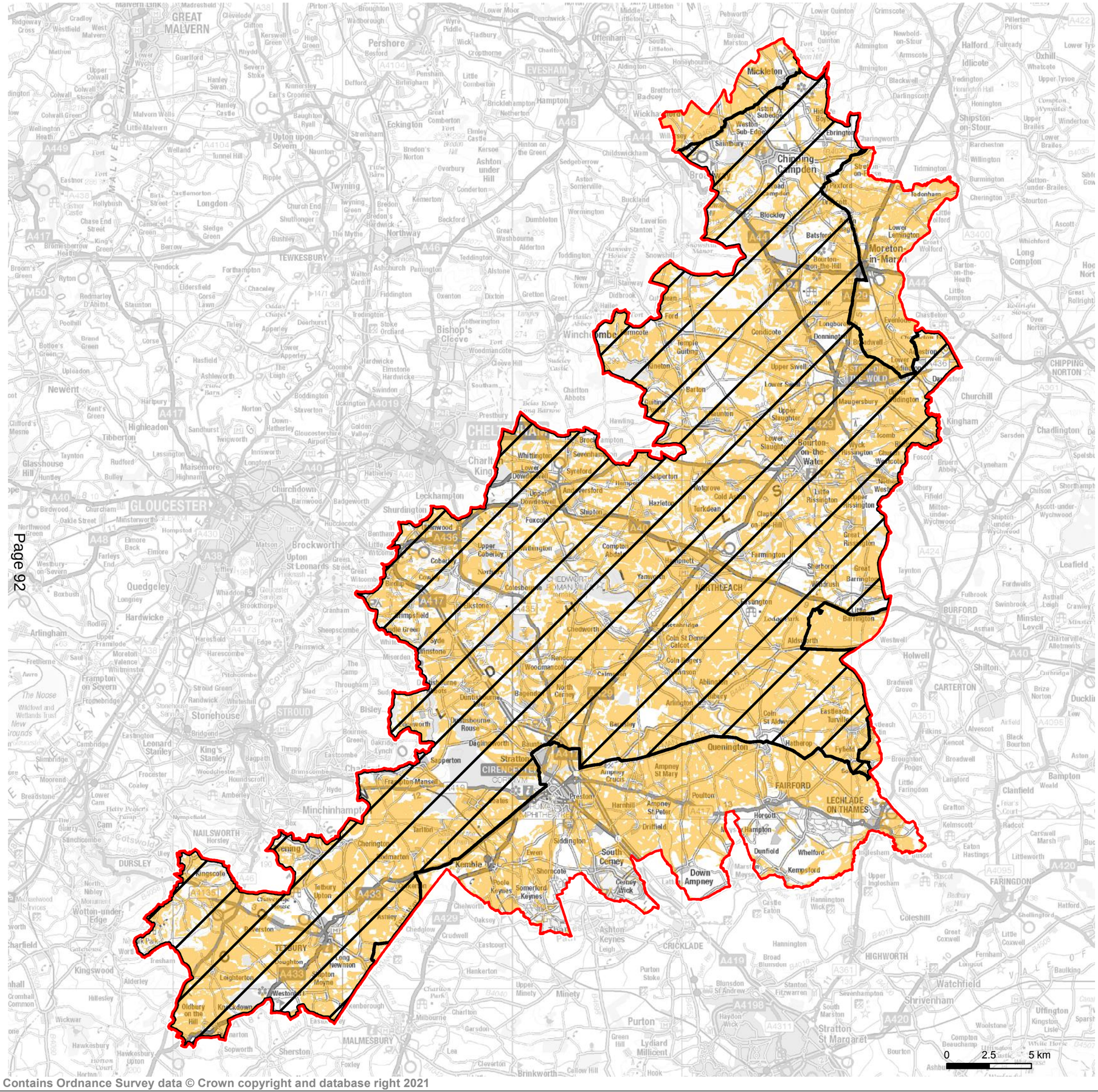

Figure 1.5: Opportunities for Solar Development

Cotswold District Council boundary

Cotswolds Area of Outstanding Natural Beauty

Areas of potential for solar development

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	Solar opportunities
Scale	1:220,000
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centre for sustainable energy

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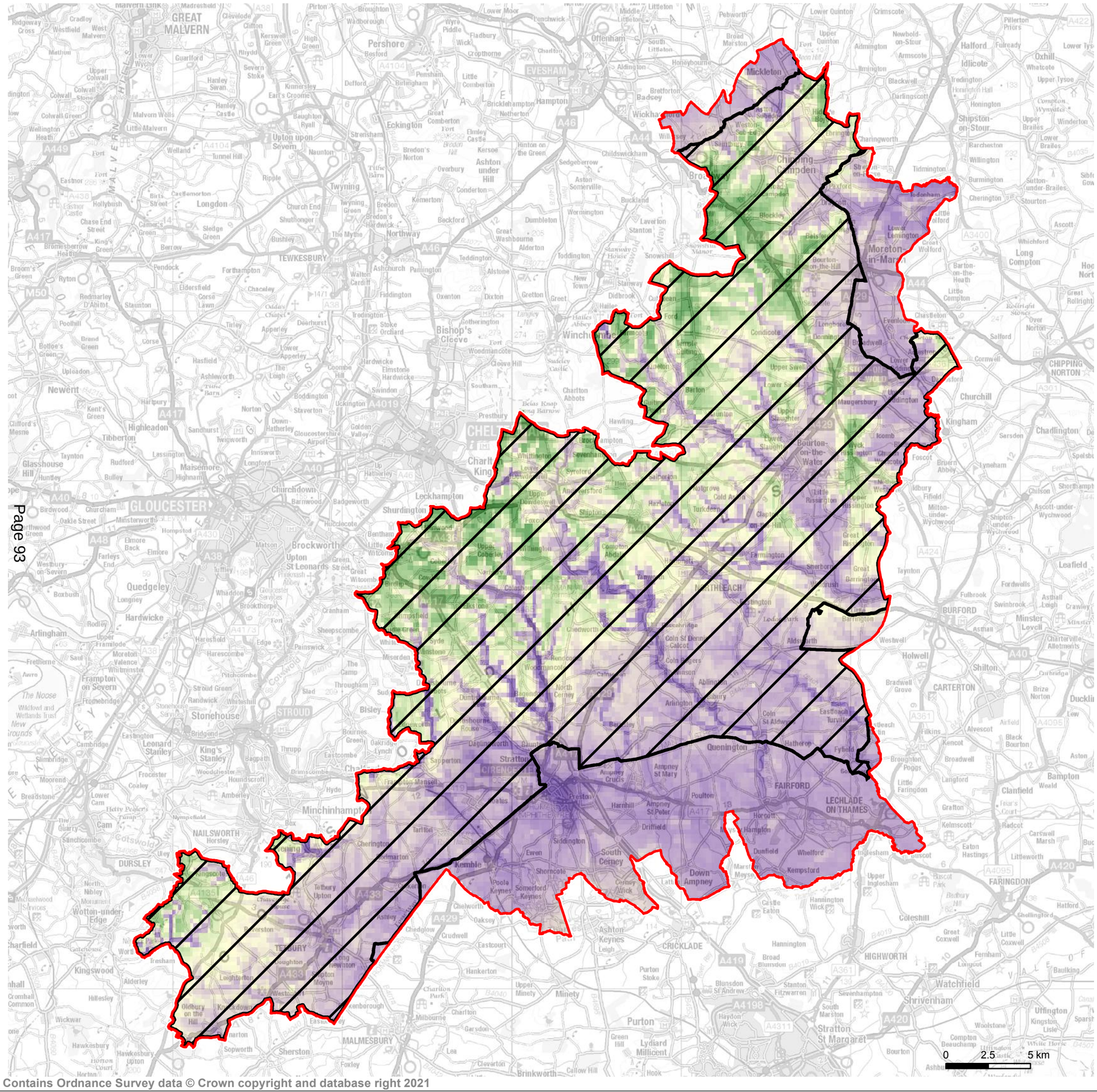

Figure 1.6: Wind Speed at 50m above ground level

Cotswold District Council boundary

Cotswolds Area of Outstanding Natural Beauty

Windspeed (m/s)

High : 9.04

Low : 5.87

Data obtained from the Global Wind Atlas 3.0, a free, web-based application developed, owned and operated by the Technical University of Denmark (DTU). The Global Wind Atlas 3.0 is released in partnership with the World Bank Group, utilizing data provided by Vortex, using funding provided by the Energy Sector Management Assistance Program (ESMAP). For additional information: https://globalwindatlas.info.

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	Wind speeds
Scale	1:220,000
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centre for sustainable energy

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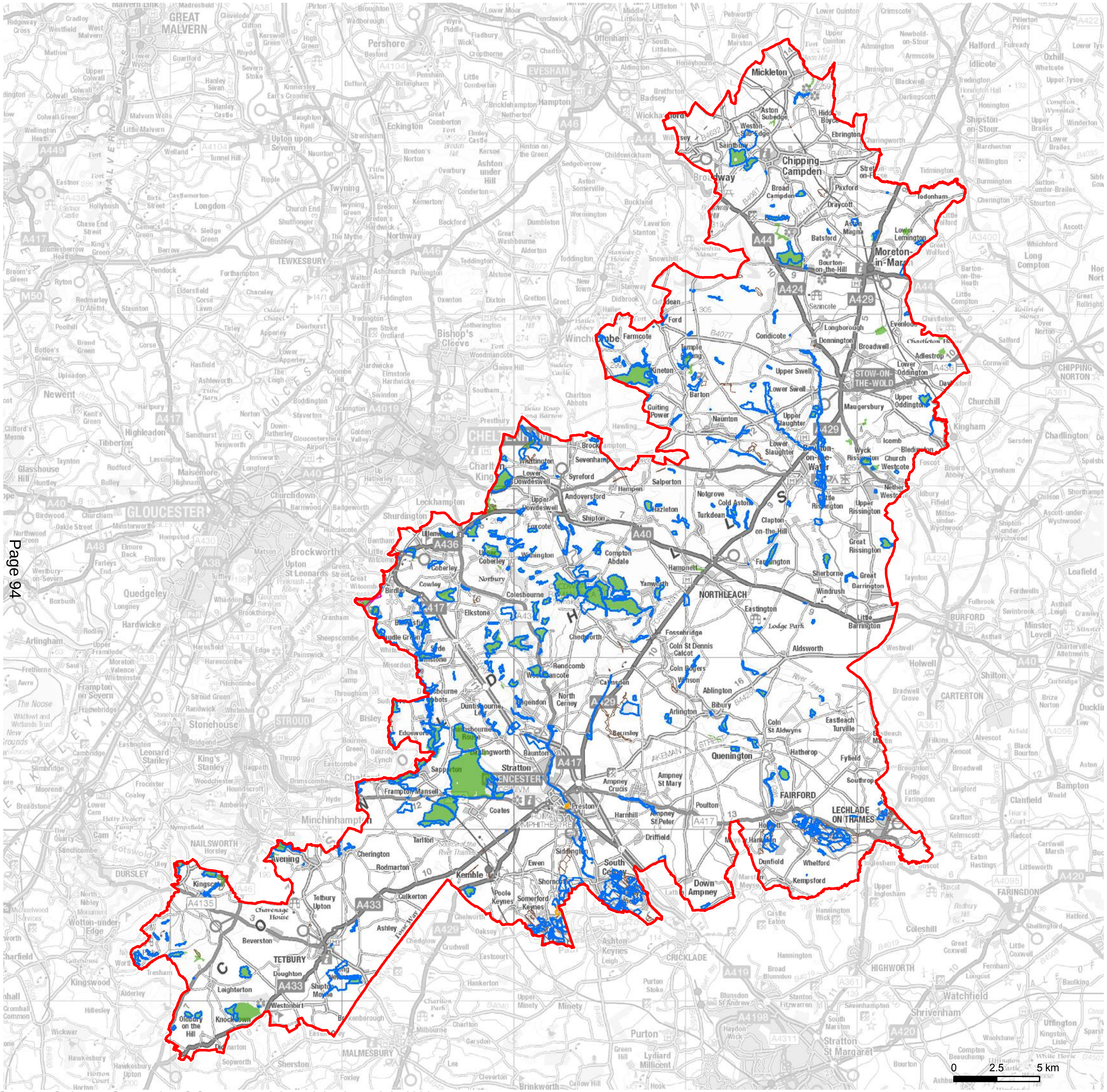

Figure 1.7: Wind constraints - Natural heritage

- Cotswold District Council boundary
- Local Nature Reserve
- Local Wildlife Site
- Ancient woodland
- Special Area of Conservation
- Site of Special Scientific Interest

In addition to the above natural heritage constraints, a blade radius buffer was applied to avoid oversail of the protected areas. This varied with wind turbine size:
Small scale: 10m
Medium scale: 27.5m
Large scale: 45m
Very large scale: 65m

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	Wind constraints 2
Scale	1:220,000
Arial Bold 10	Arial Regular 10

centre for sustainable energy

LUC

Figure 1.8: Wind constraints - Cultural heritage

- Cotswold District Council boundary
- Registered parks and gardens
- Registered battlefield
- Listed building
- Conservation area
- Scheduled monument

In addition to the above natural heritage constraints, a blade radius buffer was applied to avoid oversail of the protected areas. This varied with wind turbine size:
Small scale: 10m
Medium scale: 27.5m
Large scale: 45m
Very large scale: 65m

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	Wind constraints 2
Scale	1:220,000
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centre for sustainable energy

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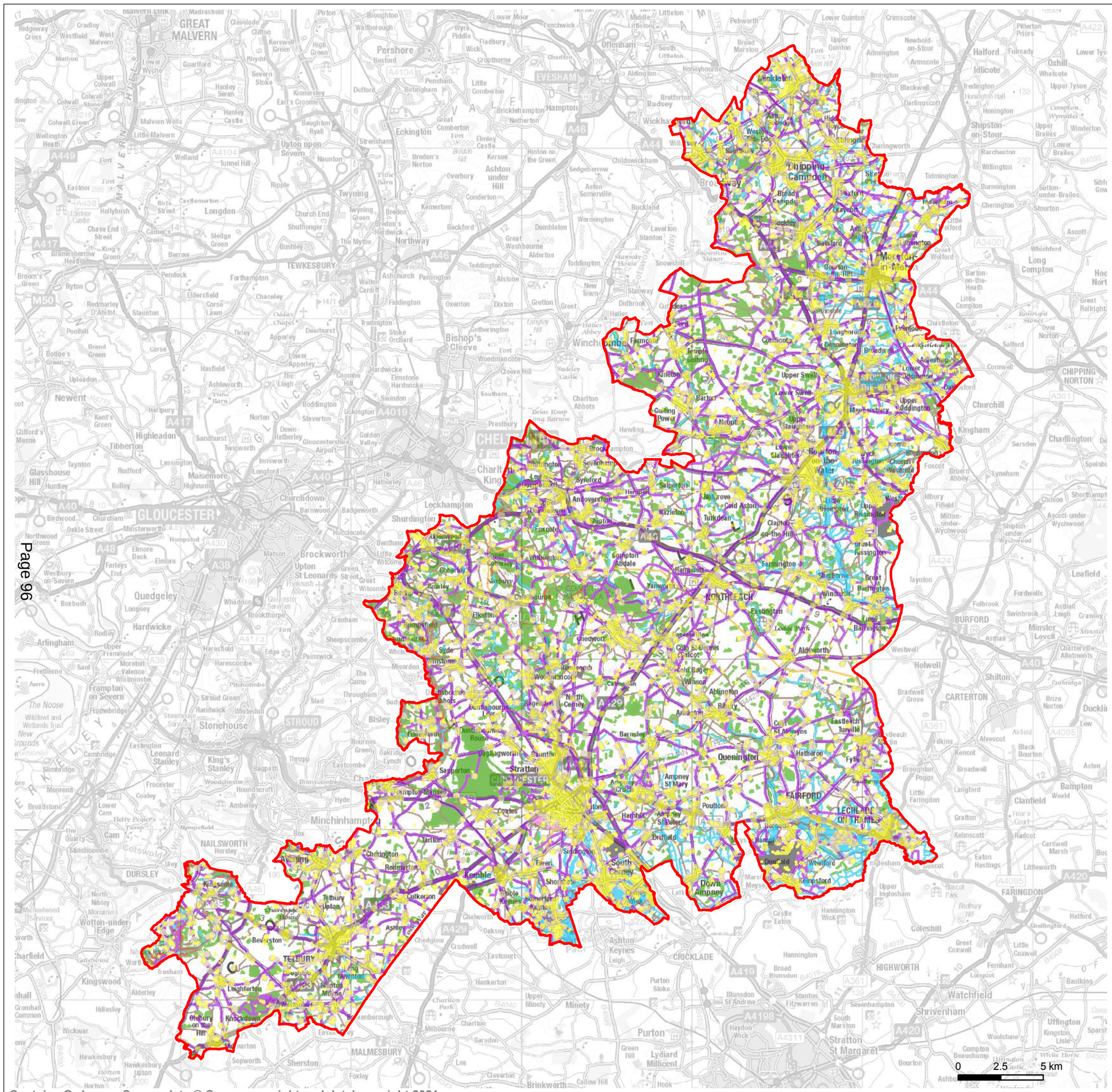

Figure 1.9: Wind constraints - Physical constraints for small scale

- Cotswold District Council boundary
- Sensitive noise receptors and buildings outside of Cotswold District 180m buffer
- Other noise receptors and 80m buffer
- Roads and railways 67.5m buffer
- Footpaths and cyclepaths 45m buffer
- Overhead line 49.5m buffer
- Airfields, airports and MOD land
- Allocated sites and employment sites
- Consented and operational renewable energy projets
- Gradient >15°
- Watercourses and waterbodies 50m buffer
- Woodland and forestry 50m buffer

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	Wind constraints 3
Scale	1:220,000
Arial Bold 10	Arial Regular 10

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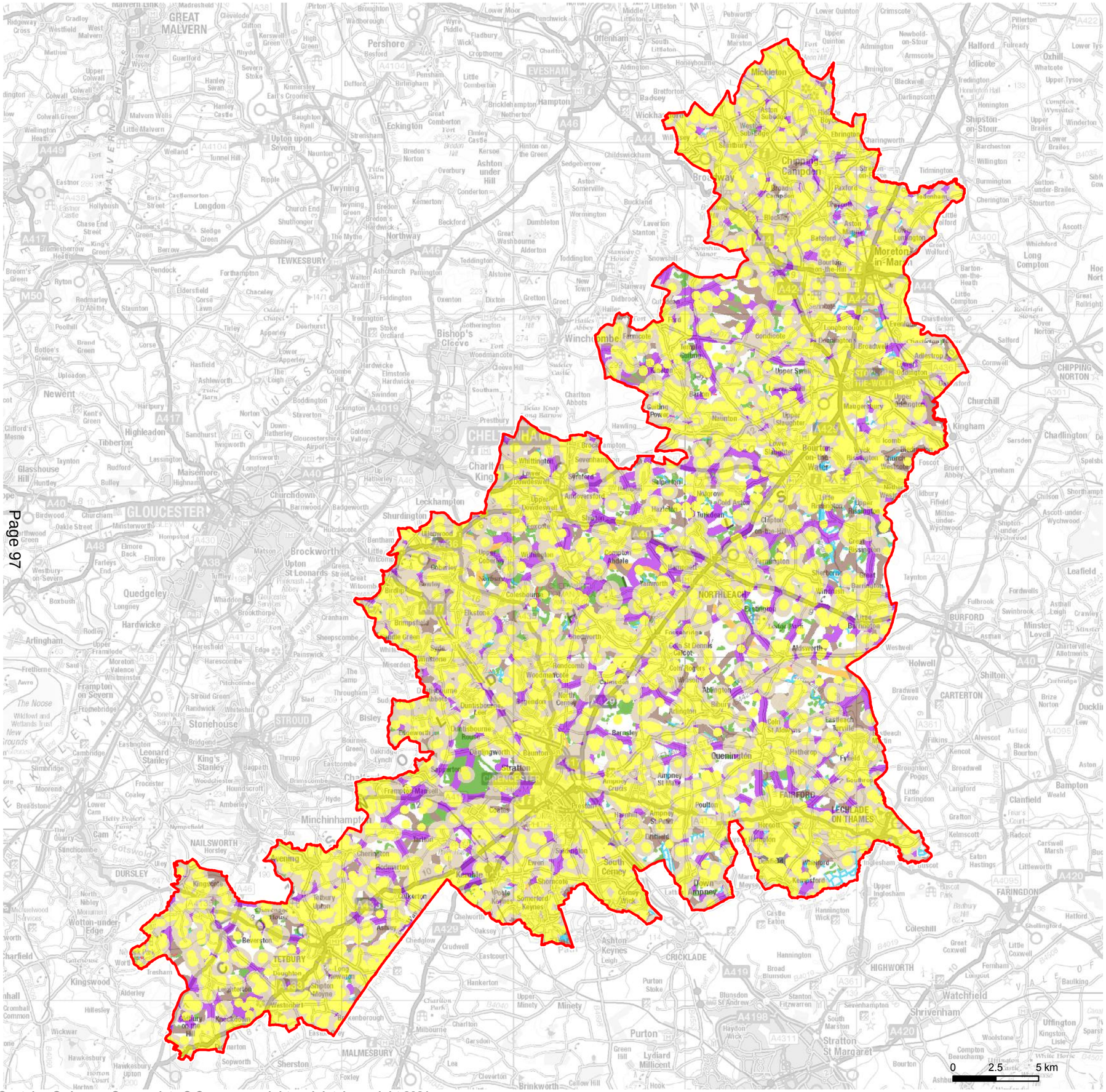

Figure 1.10: Wind constraints - Physical constraints for very large scale

- Cotswold District Council boundary
- Sensitive noise receptors and buildings outside of Cotswold District 500m buffer
- Other noise receptors and 250m buffer
- Roads and railways 225m buffer
- Footpaths and cyclepaths 175m buffer
- Overhead line 192.5m buffer
- Airfields, airports and MOD land
- Allocated sites and employment sites
- Consented and operational renewable energy projets
- Gradient >15°
- Watercourses and waterbodies 50m buffer
- Woodland and forestry 50m buffer

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	Wind constraints 4
Scale	1:220,000
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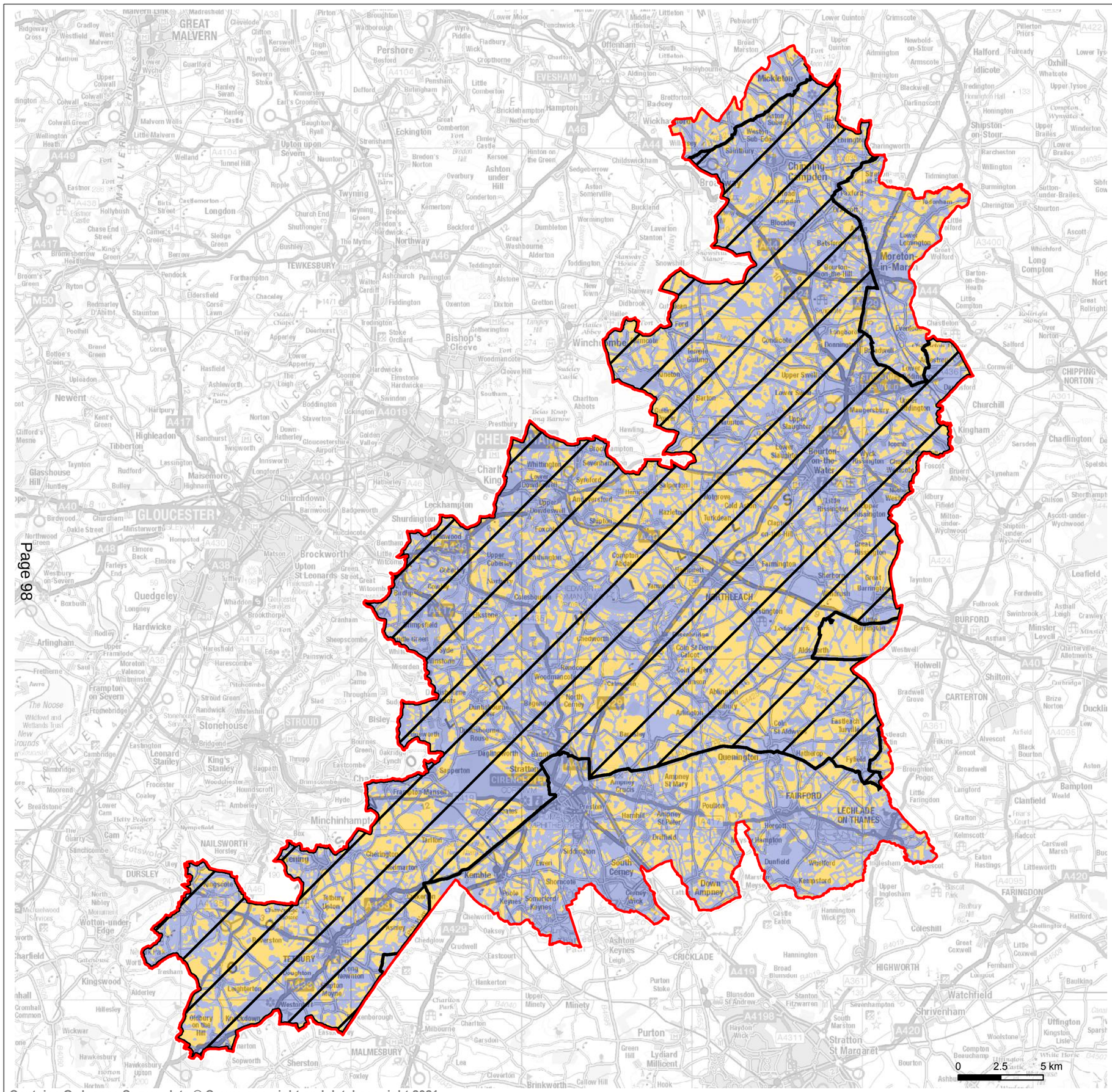

Figure 1.11: Opportunities and Constraints: small scale wind development

- Cotswold District Council boundary
- Cotswolds Area of Outstanding Natural Beauty
- Suitable areas for small scale wind
- Constrained areas for small scale wind

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	Small wind opportunities and constraints
Scale	1:220,000
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centre for sustainable energy

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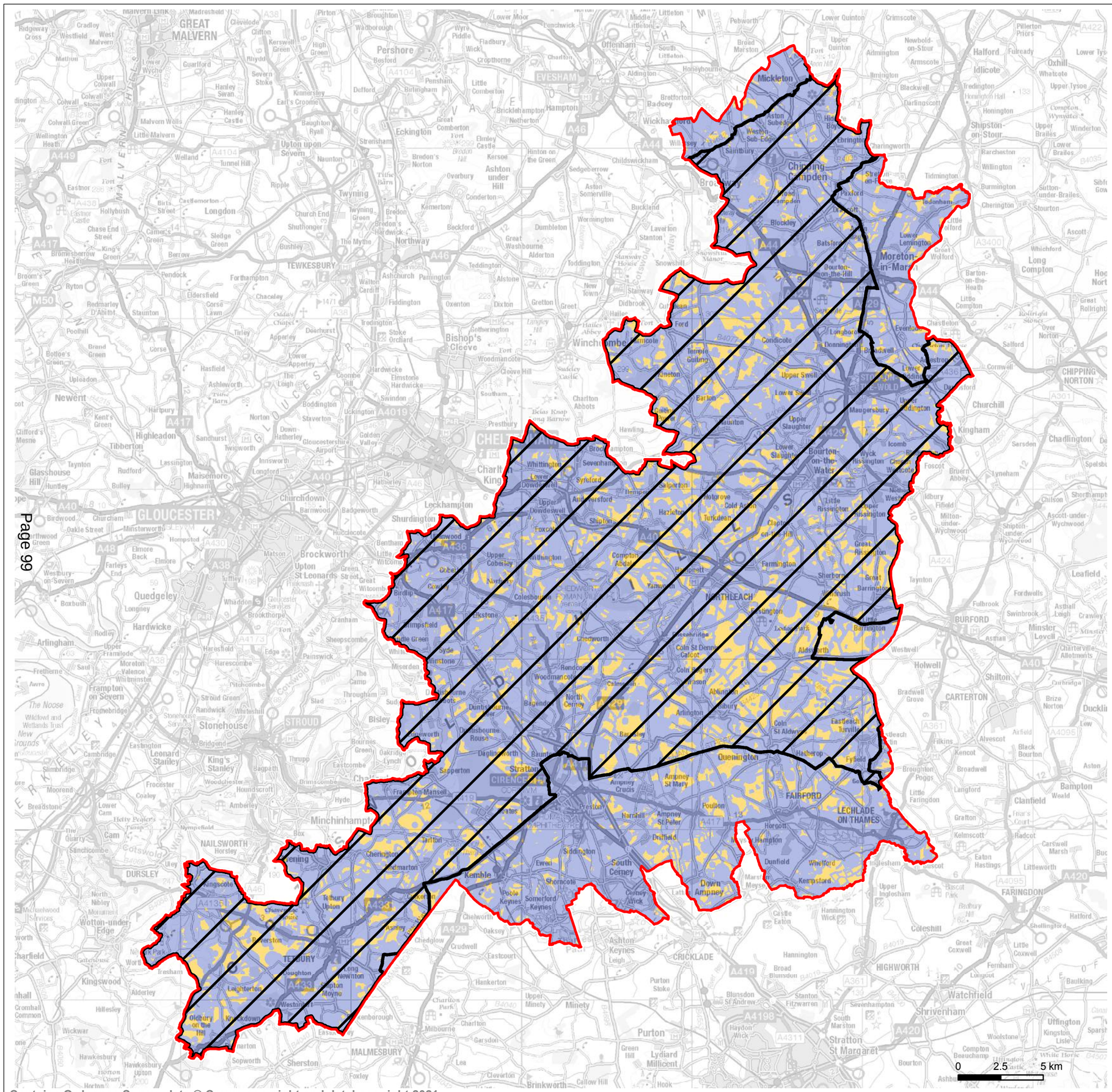

Figure 1.12: Opportunities and Constraints: medium scale wind development

- Cotswold District Council boundary
- Cotswolds Area of Outstanding Natural Beauty
- Suitable areas for medium scale wind
- Constrained areas for medium scale wind

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	Medium wind opportunities and constraints
Scale	1:220,000
Arial Bold 10	Arial Regular 10

centre for sustainable energy

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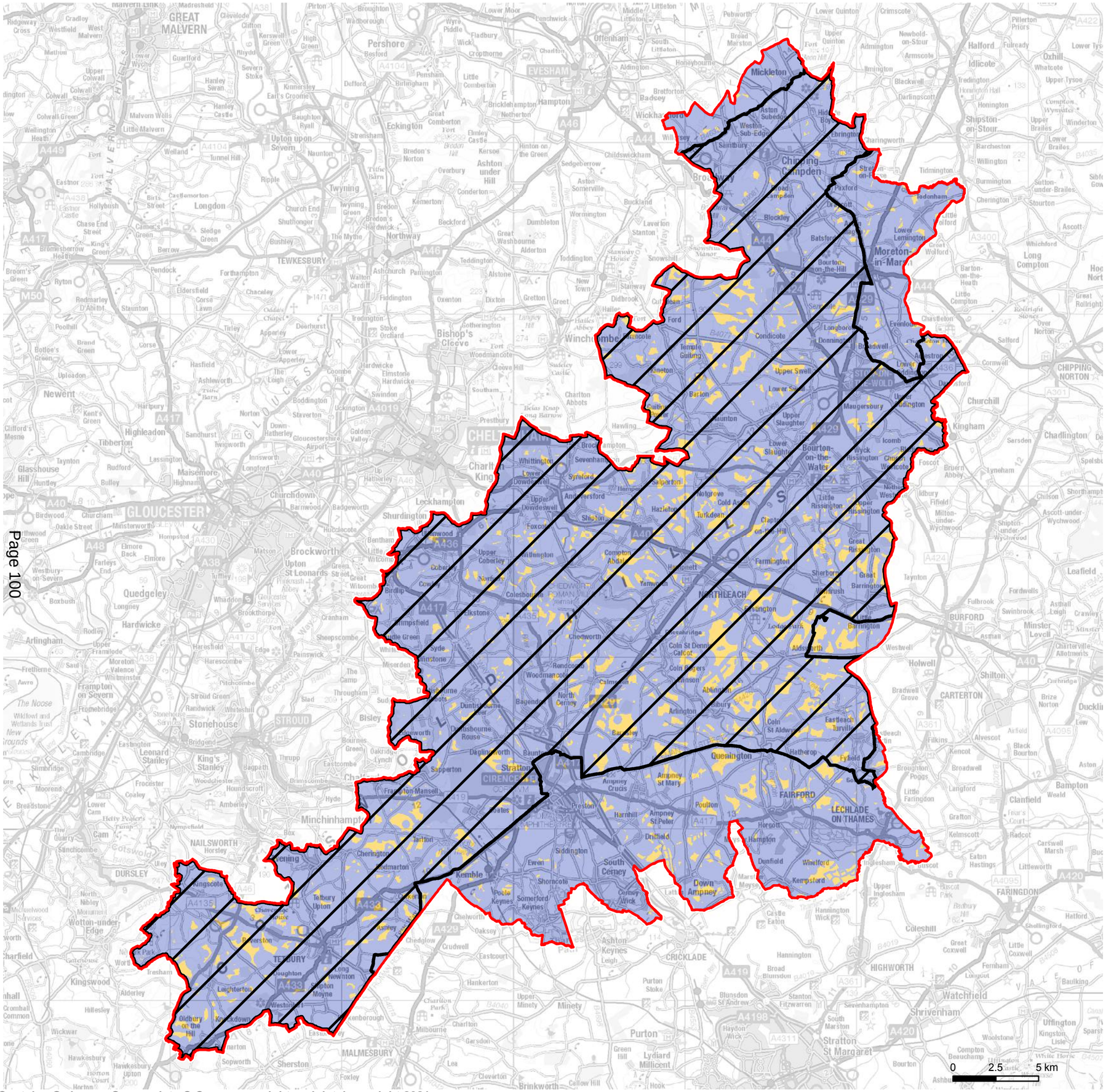

Figure 1.13: Opportunities and Constraints: large scale wind development

- Cotswold District Council boundary
- Cotswolds Area of Outstanding Natural Beauty
- Suitable areas for large scale wind
- Constrained areas for large scale wind

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	Large wind opportunities and constraints
Scale	1:220,000
Arial Bold 10	Arial Regular 10

centre for sustainable energy

LUC

Figure 1.14: Opportunities and Constraints: very large scale wind development

- Cotswold District Council boundary
- Cotswolds Area of Outstanding Natural Beauty
- Suitable areas for very large scale wind
- Constrained areas for very large scale wind

0 2.5 5 km

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	VL wind opportunities and constraints
Scale	1:220,000
Arial Bold 10	Arial Regular 10

centre for sustainable energy

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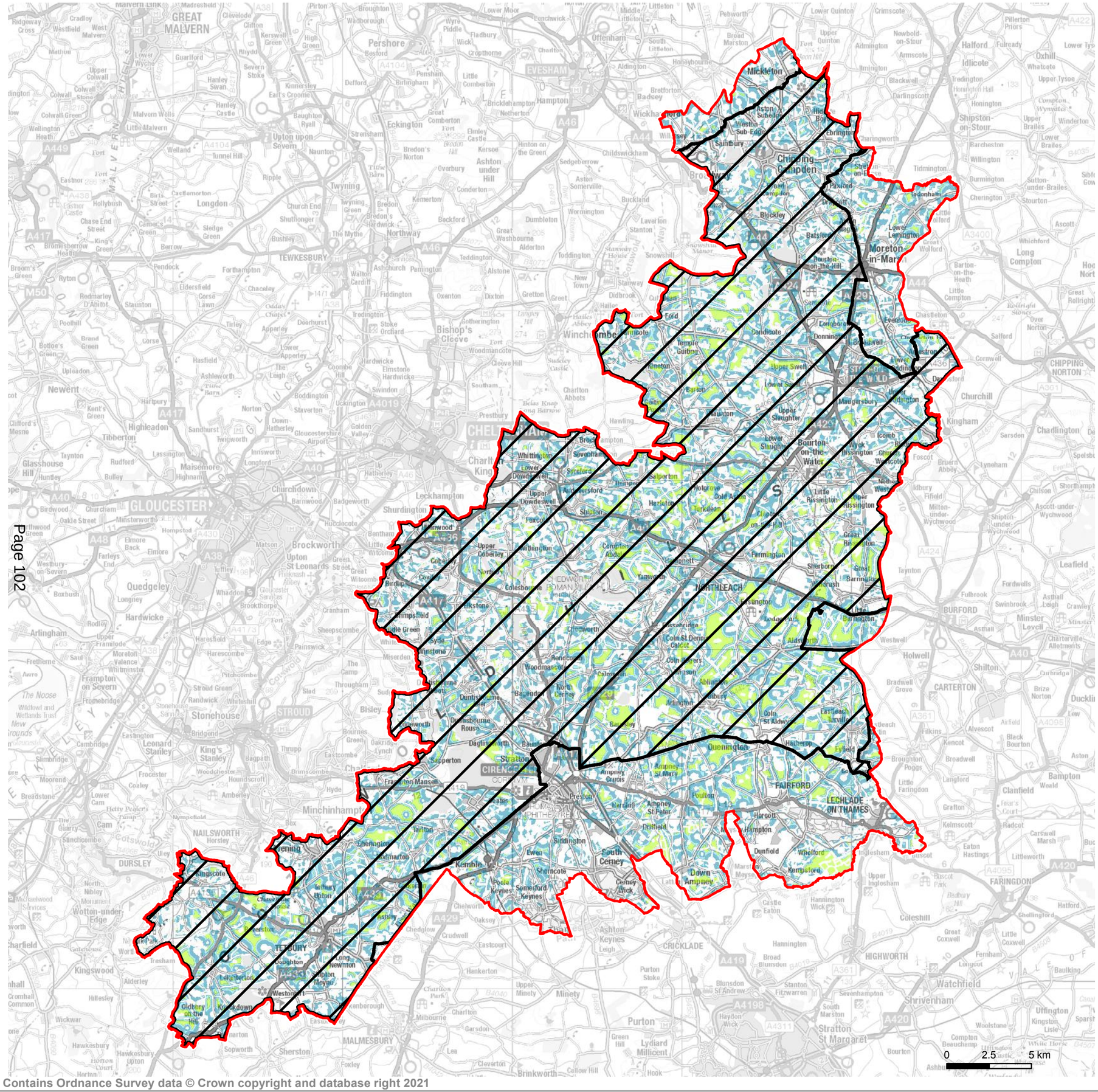


Figure 1.15: Opportunities for Wind Development - All Scales

- Cotswold District Council boundary
- Cotswolds Area of Outstanding Natural Beauty
- Small turbines only (up to 45m)
- Small to medium turbines only (up to 80m)
- Small to large turbines only (up to 125m)
- All turbine scales (up to 175m)

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	All wind opportunities
Scale	1:220,000
Arial Bold 10	Arial Regular 10

centre for sustainable energy

LUC

Annex D

Appendix C: Landscape Sensitivity Assessment

Introduction

Background and purpose of the study

In November 2019, LUC was commissioned by Cotswolds District Council, to undertake a Landscape Sensitivity Assessment (LSA) to wind turbine and solar PV development for those areas within the District that falls outside the Cotswold AONB.

This Landscape Sensitivity Assessment (LSA) was prepared alongside an assessment of the technical potential for wind and solar energy developments within the District. The results of the study aim to provide an indication of landscape sensitivity across the District, so that potential landscape opportunities and constraints can be considered in addition to the technical opportunities/constraints for these developments.

This section sets out the policy context for the landscape sensitivity assessment at a European, national and local level, followed by the methodology and a summary of the assessment findings.

Policy context

European Landscape Convention

The European Landscape Convention (ELC) came into force in the UK in March 2007. It established the need to recognise landscape in law; to develop landscape policies dedicated to the protection, management and planning of landscapes; and to establish procedures for the participation of the general public and other stakeholders in the creation and implementation of landscape policies. The ELC remains relevant despite the UK's departure from the EU.

The ELC definition of 'landscape' recognises that all landscapes matter, be they ordinary, degraded or outstanding:
"Landscape means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors."

Signing up to the ELC means that the UK is committed on the one hand to protect, manage and develop our landscapes and on the other to raise landscape awareness, involvement and enjoyment amongst local and visiting communities. Landscape character is defined by the ELC as "*a distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, rather than better or worse*".

National Planning Policy Framework (NPPF)

The Government published an updated and revised National Planning Policy Framework (NPPF) in February 2019, which sets out the environmental, social and economic planning policies for England. Central to the NPPF policies is a

presumption in favour of sustainable development, that development should be planned for positively and individual proposals should be approved wherever possible.

One of the overarching objectives that underpins the NPPF is set out in Paragraph 8: “an environmental objective – to contribute to protecting and enhancing our natural, built and historic environment.”

The NPPF also makes explicit reference to the need for defined strategic policies that make sufficient provision for climate change mitigation and adaptation and landscape and green infrastructure (paragraph 20).

The NPPF is explicit in its requirement for development plan policies to protect and where appropriate, enhance the landscape. Paragraph 180 states that “planning policies and decisions should contribute to and enhance the natural and local environment by protecting and enhancing valued landscapes” and “recognising the intrinsic character and beauty of the countryside”.

Specifically with regard to renewable and low carbon development, the NPPF states in Paragraph 160, that to help increase the use and supply of renewable and low carbon energy and heat, local plans should provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts).

National Planning Policy Guidance (NPPG)

Further guidance is provided in the NPPG on how local planning authorities can identify suitable areas for renewable and low carbon energy. It states that:

"…when considering impacts, assessments can use tools to identify where impacts are likely to be acceptable. For example, landscape character areas could form the basis for considering which technologies at which scale may be appropriate in different types of location…".

This study uses the framework of Landscape Character Types and Areas for the landscape sensitivity assessment as set out in the Gloucestershire Landscape Character Assessment (2006) .

Local Plan Policy

The Cotswolds District Local Plan 2011-2031 was adopted in 2018. This document sets out the development plan for the district as well as policies to provide clear guidance on how the Council will respond to development proposals.

The Local Plan is clear about its commitment to supporting measures which mitigate against climate change. In paragraph 11.10.7 it states:
"The Council will support low or zero-carbon energy generating proposals that

contribute positively to the aim of reducing CO2 emissions although this support does not automatically override environmental protections. Proposals will need to fully consider the impact of the development and any associated infrastructure on amenity and landscape (including local topography), any cumulative impact, and demonstrate engagement with local communities."

Policies

The District's commitment to supporting renewables is reflected in **Policy INF10**: **Renewable and low carbon energy development**

"Proposals for the generation of energy from renewable or low carbon sources will be permitted, provided it is demonstrated that:

a) any adverse impacts individually and/or cumulatively, including; visual amenity; landscape character; heritage assets; biodiversity; water quality and flood risk; highways; residential amenity, including shadow flicker, air quality and noise, are or can be satisfactorily mitigated;

b) it is of an appropriate type, scale, and design for the location and setting;

c) it is compatible with surrounding land uses, such as military activities; and

d) it avoids using the best and most versatile agricultural land unless justified by compelling evidence."

Conservation of landscape character within the District is supported in **Policy EN4: The wider natural and historic landscape** which states:

- " Development will be permitted where it does not have a significant detrimental impact on the natural and historic landscape (including the tranquillity of the countryside) of Cotswold District or neighbouring areas.
- Proposals will take account of landscape and historic landscape character, visual quality and local distinctiveness. They will be expected to enhance, restore and better manage the natural and historic landscape, and any significant landscape features and elements, including key views, the setting of settlements, settlement patterns and heritage assets."

The Cotswolds AONB (now known as the Cotswold National Landscape)

The Cotswold National Landscape adopted a Position Statement on Renewable Energy in 2023, which states that the Board has made a commitment to identify a scenario which allows us to endorse a path to Net Zero emissions (or lower) by 2050 (or sooner) and that "*Renewable energy will play an important role in mitigating the impacts of climate change and achieving Net Zero in the Cotswolds National Landscape (CNL) and its setting."*

The position statement identifies six main types of renewable energy: heat pumps, biomass, hydropower, solar energy, wind energy and battery storage. The statement

notes that the Board would be "*supportive of all of these forms of renewable energy at a small-scale, provided that relevant considerations have been adequately addressed. Large-scale forms of renewable energy are unlikely to be compatible with the statutory purpose of conserving and enhancing the natural beauty of Areas of Outstanding Natural Beauty (AONBs), such as the CNL.*"

With regard to Large-scale wind and solar energy development, it states that these are "*unlikely to be compatible with conserving and enhancing natural beauty of the CNL. However, consideration should be given to the sensitivity of the landscape to the type and scale of development being proposed, as this may vary from one part of the National Landscape to another, depending on factors such as topography.*"

It also states that "*National planning policy encourages the identification of 'suitable areas' for renewable energy in local planning authority (LPA) development plans. For wind energy, this is a requirement. We support the identification of suitable areas for wind and solar energy in LPA development plans, where this is underpinned by landscape sensitivity assessments and by relevant constraints and technical considerations.*"

Whilst the position statement does not represent development plan policy, it will be treated as a material consideration and is likely to hold weight in the planning decision process.

Methodology

This section summarises the method that was used to undertake the landscape sensitivity assessment.

Scope of assessment

This assessment focuses on the potential landscape issues associated with onshore wind energy and ground-mounted solar photovoltaic (PV) developments.

The results of the assessment (see Section 1.3 below) provide an initial indication of the relative landscape sensitivities of different areas within the Cotswolds District (outside the AONB) to wind and solar PV energy developments. These results should be interpreted alongside the detailed information provided in separate assessment profiles (**Appendix 3**).

Spatial Framework

The assessment uses the spatial framework of Landscape Character Types (LCTs) and components Landscape Character Areas (LCA) identified by the Gloucestershire Landscape Character Assessment (2006) (see **Figure 2.1**).

There are five LCTs that fall within Cotswolds District but outside the Cotswolds AONB and these landscapes are the focus of this assessment.

Landscape designations

A significant proportion of the District is included within the nationally designated Cotswolds Areas of Outstanding Natural Beauty (AONB). The landscape inside the AONB falls outside the scope of this assessment, however, the proximity of areas to this designated landscape, is relevant to the assessment. The District also contains locally designated Special Landscape Areas (SLA). The location of these protected landscapes in the context of the District is shown on **Figure 2.1**.

Potential effects of wind and solar energy development on landscape

In order to minimise effects on the landscape through siting and design, it is important to first understand the characteristics of wind and solar energy development and how they may affect the landscape. The following section describes the features of these developments and considers the potential impacts on the landscape.

In undertaking any landscape sensitivity assessment, it is necessary to acknowledge that varying attitudes to wind and solar energy development are expressed by different individuals and communities. Aesthetic perceptions can be positive or negative depending on individual attitudes to the principle and presence of renewable energy.

However, the present assessment has been based on an evaluative framework that is endorsed as good practice for studies of this nature, including via expression in national guidance and testing at Examination/Appeal. It is considered more appropriate to apply the environmental and other benefits of renewable energy, for example, as positive considerations within the overall planning balance, rather than for these benefits to modify the evaluation of landscape sensitivity per se.

Landscape effects of wind turbines

The key components of wind energy development are the wind turbines, which may be grouped together into a ‘wind farm’. The majority of wind turbines consist of horizontal axis three-bladed turbines on a steel tower (as shown in the photo below).

Wind turbines can be substantial vertical structures, and larger models will inevitably be highly visible within the landscape. The movement of the blades is a unique feature of wind energy developments, setting them apart from other tall structures in the landscape such as masts or pylons. Wind energy development may affect the landscape in the following ways:

construction of large turbines and associated infrastructure may result in direct loss of landscape features;

wind turbines are tall vertical features that may alter the perception of a landscape, potentially affecting the apparent scale of landforms;

movement of rotor blades may affect characteristics of stillness and solitude, as well as drawing the eye to turbines which may be a relatively small feature in the landscape;

the presence of turbines may increase the perceived human influence on the landscape, particularly in terms of overt modern development, and this can particularly affect landscapes which have a strong sense of naturalness or wild qualities, or which form a setting to heritage assets;

wind turbines, even at relatively small sizes, can appear large in the context of human-scale features such as domestic buildings and trees – at the largest scales, turbines can be perceived as 'overwhelming' when close to residential properties;

turbines on skylines may compete with existing landmark features for prominence where prominent skylines or landmark features are characteristic of the landscape; and

in order to be as efficient as possible, turbines are often placed in elevated locations, where they may affect views from wide areas.

Landscape effects of solar energy development

Field-scale solar PV developments comprise arrays of photovoltaic panels, mounted on linear racks up to 3m high. These are usually positioned at a fixed angle of 20-40 degrees from the horizontal, facing south, and sited in parallel rows with gaps between the rows for access and to prevent shading of adjacent rows. The actual arrangement of the arrays within the landscape varies from scheme-to-scheme (i.e. regular layouts versus more varied and irregular, depending on the site situation). Although generally, layouts of the solar arrays tend to be in regular patterns. The solar arrays are often accompanied by on-site inverter buildings, security fencing and CCTV cameras.

Solar energy developments can be substantial horizontal structures and can be highly visible and contribute to considerable change in the character of the landscape. Solar energy development may affect the landscape in the following ways:

- construction of solar panels and associated infrastructure may result in direct loss of landscape features such as hedgerows, woodland, farmland and other habitats;
- solar energy developments can cover large areas and the presence of solar panels may increase the perceived human influence on the landscape, particularly in terms of overt modern development, and this can particularly affect landscapes which have a strong sense of naturalness, or which form a setting to heritage assets; and
- at certain times of day and from certain viewing angles solar panels can reflect the sunlight, causing glint and glare which can draw the eye.

Type and scale of developments considered

The tables below set out the range of development scenarios covered in this assessment, based on bandings that reflect those that are most likely to be put forward by developers (now and in the future) in Cotswold District.

Wind turbines

The wind energy landscape sensitivity assessment applies to all forms of wind turbines, although it has been based on the most common horizontal axis three-bladed turbine. The assessment considers the suitability of different turbine heights (to blade tip).

The wind turbine heights referred to in the assessment are set out in **Table 2.1** below:

Table 2.1: Wind turbine development sizes:	
Turbine Height (to blade tip)	Turbine scale banding
Up to 25m	Very small wind installation
25m to 60m	Small wind installation
60m to 100m	Medium wind installation
100m to 150m	Large wind installation
150m to 200m	Very large wind installation

Field Scale Solar PV

The size of solar energy development can also differ greatly in terms of power output and area covered. Schemes in the UK range in area from less than 1 hectare, up to well over 100 hectares. The sizes used for this assessment are set out in **Table 2.2** below.

Table 2.2: Solar PV development sizes	
Solar PV size	Solar PV scale bandings
Up to 1 hectare	Very small solar PV installation
1 to 5 hectares	Small solar PV installation
5 to 20 hectares	Medium solar PV installation
20 to 50 hectares	Large solar PV installation
50 to 120 hectares	Very large solar PV installation

Evaluating landscape sensitivity

This landscape sensitivity assessment was undertaken in line with Natural England guidance ‘An approach to landscape sensitivity assessment '(June 2019) as well as building upon LUC’s considerable experience from previous and ongoing studies of a

similar nature. The Natural England approach includes the following definition of landscape sensitivity, which has been adopted for this assessment:

“Landscape sensitivity may be regarded as a measure of the resilience, or robustness, of a landscape to withstand specified change arising from development types or land management practices, without undue negative effects on the landscape and visual baseline and their value.”

Assessment criteria

Landscape sensitivity assessment requires judgements on both landscape susceptibility (how vulnerable the landscape is to change from the type being assessed, in this case solar PV and wind energy developments) and landscape value (consensus about importance, which can be recognised through designation as well as through descriptions within the 2014 Landscape Character Assessment).

The selection of landscape sensitivity indicators (‘criteria’) for this study is informed by the attributes of landscape that could be affected by solar and wind energy development. These consider the ‘landscape’, ‘visual’ and 'perceptual' aspects of sensitivity. Their selection is also based on current best practice and experience of LUC in undertaking similar studies elsewhere in the UK.

Table 2.4 and Table 2.5 provide guidance and examples of higher and lower sensitivity features/attributes for applying the criteria in the Cotswolds, for solar PV and wind energy, respectively. The assessments present a commentary against each criterion to inform the judgements on levels of sensitivity. It is important to note that the relative importance of each criterion varies between landscapes (due to differences in landscape character). The initial stage of the assessment involved a thorough desk-based study drawing on sources of spatial and descriptive information regarding the landscape (see Appendix xx). This was supplemented by field survey work undertaken by a team of landscape professionals to verify the findings.

Making an overall judgement on landscape sensitivity

Once the landscape sensitivity criteria were assessed individually, the results were translated into overall scores of landscape sensitivity (see **Table 2.3**) for the different bandings of solar PV and wind energy developments. This was undertaken for every LCT and the results are shown in the individual assessment profiles. If any component LCAs within the LCT were judged to be of higher/lower landscape sensitivity (due to local variations), this is accounted for in the assessments and results.

Table 2.5: The sensitivity scale	
High (H)	Key characteristics and qualities of the landscape are highly vulnerable to change from wind and solar energy development.

	Such development is likely to result in a significant change in character.
Moderate-high (M-H)	Key characteristics and qualities of the landscape are vulnerable to change from wind and solar energy development. There may be some limited opportunity to accommodate wind turbines/ solar panels without significantly changing landscape character. Great care would be needed in siting and design.
Moderate (M)	Some of the key characteristics and qualities of the landscape are vulnerable to change. Although the landscape may have some ability to absorb wind and solar energy development, it is likely to cause a degree of change in character. Care would be needed in siting and design.
Low-moderate (L-M)	Fewer of the key characteristics and qualities of the landscape are vulnerable to change. The landscape is likely to be able to accommodate wind and solar energy development with limited change in character. Care is still needed when siting and designing to avoid adversely affecting key characteristics.
Low (L)	Key characteristics and qualities of the landscape are robust in that they can withstand change from the introduction of wind turbines and solar panels. The landscape is likely to be able to accommodate wind and solar energy development without a significant change in character. Care is still needed when siting and designing these developments to ensure best fit with the landscape.

The five defined levels of landscape sensitivity form stages on a continuum, rather than clearly separated categories. Any given landscape may or may not fit neatly into one category, and an element of professional judgement is required.

As with all assessments based upon data and information which is to a greater or lesser extent subjective, some caution is required in its interpretation. This is to avoid the suggestion that certain landscape features or qualities can automatically be associated with certain sensitivities – the reality is that an assessment of landscape sensitivity is the result of a complex interplay of often unequally weighted variables (or ‘criteria’).

There may be one criterion that has a particularly strong influence on landscape sensitivity which increases the overall sensitivity score (an example might be a landscape with a prominent/highly visible skyline, or particularly high levels of tranquillity or remoteness). There may also be criteria that produce conflicting scores. For example, a settled landscape, while containing greater human influence

(indicating a lower sensitivity), will also include more human scale features that could be affected by large-scale wind turbines (indicating a higher sensitivity). Conversely, a more remote landscape will lack the human scale features but is likely to present a higher sensitivity from a perceptual point of view. In these situations, a professional judgement is made on overall sensitivity, taking all criteria into account in the context of their importance to landscape character and quality overall.

Limitations of landscape sensitivity assessment

It is important to note that Landscape Sensitivity Assessment is strategic in nature and therefore should not be interpreted as a definitive statement on the suitability of a certain location for a particular development. The LSA does not replace the requirement for more detailed assessment and all proposals will need to be assessed on their own merits through the planning process, including – where required – through proposal-specific Landscape and Visual Impact Assessments (LVIAs). It is also important to note that this assessment does not provide guidance on the wide range of other planning issues that may need to be considered as part of the preparation and determination of planning applications for renewable energy developments.

Table 2.4: Criteria and guidance for assessing landscape sensitivity to wind energy development				
Landform and scale (including sense of openness / enclosure)				
A smooth gently sloping or flat landform is likely to be less sensitive to wind energy development than a landscape with a dramatic rugged landform, distinct landform features (including prominent hills and valleys) or pronounced undulations. Larger scale landforms are likely to be less sensitive than smaller scale landforms - because turbines may appear out of scale, detract from visually important landforms or appear visually confusing (due to turbines being at varying heights) in the latter types of landscapes. Landscapes with frequent human scale features that are traditional of the landscape, such as stone farmsteads and small farm woodlands may be particularly sensitive to larger turbines. This is because large features such as wind turbines may dominate smaller scale traditional features within the landscape.				
Low	Low-Moderate	Moderate	Moderate-High	High
An extensive lowland flat landscape or elevated plateau, often a larger scale landform. A landscape that is open.	A simple gently rolling landscape, likely to be a medium-large scale landform.	An undulating landscape, perhaps also incised by valleys, likely to be a medium scale landform, with hidden areas as well as some visible slopes	A landscape with distinct landform features, and/or irregular in topographic appearance (which may be large in scale), or a smaller scale landform. The landscape may contain prominent, visible slopes.	A landscape with a rugged landform or dramatic landform features (which may be large in scale), or a small scale or intimate landform. The landform may be very steep with exposed, visible slopes e.g. narrow valleys

Landcover (including field and settlement pattern)				
Simple, regular landscapes with extensive areas of consistent land cover are likely to be less sensitive to wind energy development than landscapes with more complex or irregular land cover patterns, smaller and / or irregular field sizes,				
Low	Low-Moderate	Moderate	Moderate-High	High
An open, continuous landscape with uniform landcover and lacking in human-scale features, or an urban or 'brownfield' landscape.	A landscape of large open fields, with little variety in land cover. A landscape which contains areas of brownfield sites or urban influences.	A landscape with medium sized fields (or a mix of modern and historic enclosure), some variations in land cover. A rural landscape which may contain some brownfield sites or urban influences	A landscape with irregular or small-scale fields, variety in land cover. A rural landscape, perhaps with some areas of semi-natural land cover.	A landscape with a strong variety in land cover, complex field patterns, and / or semi-natural land cover. The field pattern may be characterised by small-scale, ancient fields.

Historic landscape character				
Landscapes which contain important archaeological or historic features are likely to have a higher level of sensitivity to wind energy development. Historical features may be in the form of historic land cover types and field systems, areas of buried archaeology, historic designed landscapes such as Registered Parks and Gardens or structures designated for their historical significance. Landscapes which make a significant contribution to the setting of a historical feature or landscapes may also have higher sensitivity to wind energy development. Landscapes that are primarily of modern influence and origin will have a lower sensitivity to wind energy development.				
Low	Low-Moderate	Moderate	Moderate-High	High
A landscape with relatively few historic features important to the character of the area, no designated heritage assets and little time depth (i.e. large intensively farmed fields).	A landscape with a small number of historic features important to the character area and some time depth.	A landscape with some visible historic features of importance to character, and a variety of time depths.	A landscape with many historic features important to the area and a strong sense of time depth.	A landscape with a high density of historic features (many designations) important to the character of the area and great time depth (i.e. piecemeal enclosure with irregular boundaries, ridge and furrow)

Visual character (including skylines / intervisibility)				
The relative visibility of a landscape may influence its sensitivity to wind development. An elevated landscape such as a hill range or plateau, which is viewed from other landscapes, may be more sensitive than a landscape with limited visibility. Landscapes which have important visual relationships with other areas, for example where one area provides a backdrop to a neighbouring area (which may be a designated landscape such as the Cotswolds AONB), are considered more sensitive than those with few visual relationships. The extent of inter-visibility may be modified by the importance of these views to appreciation of the landscape, and whether adjacent landscapes provide a setting for one another. Prominent and distinctive and/or undeveloped skylines, or skylines with important landmark features, are likely to be more sensitive to wind energy development because turbines may detract from these skylines as features in the landscape or draw attention away from existing landform or landmark features on skylines. Important landmark features on the skyline might include historic features or monuments as well as landforms. Where skylines are affected by development, e.g. through the presence of electricity pylons, the addition of turbines may lead to visual confusion. Therefore, the presence of existing development cannot always assume a lower sensitivity to development.				
Low	Low-Moderate	Moderate	Moderate-High	High
A self-contained landscape, or one with weak connections to neighbouring areas. A landscape in which skylines are not prominent, and there are no important landmark features on the skyline.	A landscape with limited connections to neighbouring areas, and/or where adjacent landscapes are not visually related. A landscape in which skylines are simple, flat or gently convex and/or there are very few landmark features on	A landscape which has some intervisibility with neighbouring areas, and/or where relationships between adjacent landscapes are of more importance. A landscape with some prominent skylines, but these are not particularly distinctive –	A landscape which is intervisible with several areas, and/or where adjacent areas are strongly interrelated. A landscape with prominent skylines that may form an important backdrop to views from settlements or important viewpoints,	A landscape which has important visual relationships with one or more neighbouring areas. It or the landscape(s) it is visible from is designated as AONB. A landscape with prominent or distinctive undeveloped skylines,

	the skyline – other skylines in adjacent LCTs may be more prominent.	there may be some landmark features on the skyline.	and/or with important landmark features.	or with particularly important landmark features on skylines.
Perceptual qualities				
Landscapes that are relatively remote or tranquil tend to be more sensitive to wind energy development, since turbines may be perceived as intrusive. Landscapes which are relatively free from overt human activity and disturbance, and which have a perceived naturalness or a strong feel of traditional rurality, will therefore be more sensitive. Qualities such as tranquillity can be found even in settled areas, where the influence of overtly modern development is reduced. Wind energy development will generally be less intrusive in landscapes which are strongly influenced by modern development, including settlement, industrial and commercial development and infrastructure.				
Low	Low-Moderate	Moderate	Moderate-High	High
A landscape with much human activity and modern development, such as industrial areas.	A rural or semi-rural landscape with much human activity and dispersed modern development, such as settlement fringes.	A rural landscape with some modern development and human activity, such as intensive farmland.	A more naturalistic landscape and/or one with little modern human influence and development.	A tranquil landscape with little or no overt sign of modern human activity and development.

Scenic and special qualities				
Landscapes that have a high scenic quality and exhibit a strong character or sense of place will be more sensitive than landscapes of low scenic quality or weak sense of place. Scenic qualities can include contrasts and combinations of landform and landcover which together contribute to attractive views. Scenic qualities may be recorded in the Landscape Character Assessment or may be referenced in tourist material. Scenic viewpoints may be marked on Ordnance Survey maps. Scenic quality is also considered in the field. Landscapes that are formally designated for their scenic quality (including those designated as SLA) are likely to be more sensitive to development than undesignated areas. The degree of sensitivity depends on the extent to which the special qualities of the designated landscape could be affected by the development type. Special qualities could include landscapes that are rare (rather than commonplace), landscapes that are in good condition, or have natural or heritage conservation interest (indicated by designation) or are valued for cultural associations or for leisure and recreation.				
Low	Low-Moderate	Moderate	Moderate-High	High
A landscape without attractive character, with no pleasing combinations of features, visual contrasts and/or dramatic elements, such as industrial areas or derelict land.	A landscape of limited attractive character, with few pleasing combinations of features, visual contrasts and/or dramatic elements.	A landscape of intermittently attractive character, with occasional pleasing combinations of features, visual contrasts and/or dramatic elements.	A landscape of attractive character, with some pleasing combinations of features, visual contrasts and/or dramatic elements, which may be recognised through designation.	A landscape of consistently attractive character, with pleasing combinations of features, visual contrasts and/or dramatic elements, which is recognised through designation.

Table 2.5: Criteria and guidance for assessing landscape sensitivity to solar PV development				
Landform and scale (including sense of openness /enclosure)				
A flat or gently undulating lowland landscape or extensive plateau is likely to be less sensitive to solar development than a landscape with prominent landforms and visible slopes. This is because arrays of solar panels will be less easily perceived in a flat landscape than on a slope, including hills and knolls, especially higher slopes. A landscape with a strong sense of enclosure (provided by land cover such as woodland, tree cover or high hedges) is likely to be less sensitive to solar PV development because these features provide screening. Landscapes of open and unenclosed character would have a higher sensitivity to field-scale solar PV development due to the lack of visual screening and less opportunities for screening mitigation without changing character.				
Low	Low-Moderate	Moderate	Moderate-High	High
An extensive lowland flat landscape or elevated plateau, often a larger scale landform. A very well enclosed landscape e.g. with fields bounded by high hedges and dense tree/woodland cover.	A simple gently rolling landscape, likely to be a medium-large scale landform. Some enclosure provided by hedges and tree/woodland cover.	An undulating landscape perhaps also incised by valleys, likely to be a medium scale landform, with hidden areas as well as some visible slopes. Some areas lacking screening by field boundaries or tree cover, whilst others might have a greater sense of enclosure	A landscape with distinct landform features, and/or irregular in topographic appearance (which may be large in scale), or a smaller scale landform. The landscape may contain prominent, visible slopes with little sense of enclosure (low, few or no	A landscape with a rugged landform or dramatic landform features (which may be large in scale), or a small scale or intimate landform. The landform may be very steep with exposed, visible slopes and no field boundaries

		owing to a denser occurrence of these features.	hedgebanks or trees /areas of woodland).	or trees to provide screening.
Land cover pattern (including field and settlement pattern)				
Since solar PV panels introduce a new land cover (of built structures), landscapes containing existing hard surfacing or built elements (e.g. urban areas, brownfield sites or large-scale horticulture) are likely to be less sensitive to field-scale solar development than highly rural or naturalistic landscapes. Landscapes with small-scale, more irregular field patterns are likely to be more sensitive to the introduction of solar development than landscapes with large, regular scale field patterns because of the risk of diluting or masking the characteristic landscape patterns. This would be particularly apparent if development takes place across a number of adjacent fields where the field pattern is small and intricate (bearing in mind that the height of panels could exceed that of a hedge).				
Low	Low-Moderate	Moderate	Moderate-High	High
A landscape with large - scale regular fields of mainly modern origin. An urban or 'brownfield' landscape.	A landscape which is mainly defined by large, modern fields or those sub-divided by non-traditional uses, e.g. horse keeping An area of large-scale horticulture or some urban or brownfield sites or urban influences.	A landscape with a mix of large-scale, modern fields and some smaller, more historic enclosures. A rural landscape with some brownfield sites or urban influences	A landscape dominated by ancient, irregular or small-scale field patterns with a few areas of modern enclosure and/or, some areas of semi-natural land cover.	A landscape with characterised by small-scale, ancient field patterns and/or a landscape dominated by semi-natural landcover.

Historic landscape character				
Landscapes which contain important archaeological or historic features are likely to have a higher level of sensitivity to solar PV development. Historical features may be in the form of historic land cover types and field systems, areas of buried archaeology, historic designed landscapes such as Registered Parks and Gardens or structures designated for their historical significance. Landscapes which make a significant contribution to the setting of a historical feature or landscapes may also have higher sensitivity to solar energy development. Landscapes that are primarily of modern influence and origin will have a lower sensitivity to solar energy development.				
Low	Low-Moderate	Moderate	Moderate-High	High
A landscape with relatively few historic features important to the character of the area, no designated heritage assets and little time depth (i.e. large intensively farmed fields).	A landscape with a small number of historic features important to the character area and some time depth.	A landscape with some visible historic features of importance to character, and a variety of time depths.	A landscape with many historic features important to the area and a strong sense of time depth.	A landscape with a high density of historic features (many designations) important to the character of the area and great time depth (i.e. piecemeal enclosure with irregular boundaries, ridge and furrow).

Visual character (including skylines)				
The relative visibility of a landscape may influence its sensitivity to solar PV development. An elevated landscape such as a hill range or plateau, which is viewed from other landscapes, may be more sensitive than an enclosed landscape, since any solar panels will be more widely seen. Landscapes which have important visual relationships with other areas, for example where one area provides a backdrop to a neighbouring area, (which may be a designated landscape such as the Cotswolds AONB), are considered more sensitive than those with few visual relationships. The extent of inter-visibility may be modified by the importance of these views to appreciation of the landscape, and whether adjacent landscapes provide a setting for one another. Prominent and distinctive and/or undeveloped skylines, or skylines with important landmark features, are likely to be more sensitive to solar PV development because panels may detract from these skylines as features in the landscape, or draw attention away from existing landform or landmark features on skylines if not sited appropriately. Important landmark features on the skyline might include historic features or monuments as well as landforms. Where skylines are affected by development, e.g. through the presence of electricity pylons, the addition of solar panels may lead to visual confusion. Therefore, the presence of existing development cannot always assume a lower sensitivity to development.				
Low	Low-Moderate	Moderate	Moderate-High	High
An enclosed, self-contained landscape, or one with weak connections to neighbouring areas. A landscape in which skylines are not prominent, and there are no important	A landscape with limited connections to neighbouring areas, and/or where adacjent landscapes are not visually related. A landscape in which skylines are simple, flat or gently convex and/or there are very few landmark features on	A landscape which has some inter-visibility with neighbouring areas. A landscape with some prominent skylines, but these are not particularly distinctive – there may be some landmark features on the skyline.	A landscape which is intervisible with several areas, and/or where adjacent areas are strongly interrelated. A landscape with prominent skylines that may form an important backdrop to views from settlements or important viewpoints,	A landscape which has important visual relationships with one or more neighbouring areas. It or the landscape(s) it is visible from is designated as AONB. A landscape with prominent or distinctive undeveloped skylines,

landmark features on the skyline.	the skyline – other skylines in adjacent LCTs may be more prominent.		and/or with important landmark features.	or with particularly important landmark features on skylines.
Perceptual qualities				
Landscapes that are relatively remote or tranquil tend to be more sensitive to solar PV development, since solar panels may be perceived as intrusive. Landscapes which are relatively free from overt human activity and disturbance, and which have a perceived naturalness or a strong feel of traditional rurality, will therefore be more sensitive. Qualities such as tranquillity can be found even in settled areas, where the influence of overtly modern development is reduced. Solar PV development will generally be less intrusive in landscapes which are strongly influenced by modern development, including settlement, industrial and commercial development and infrastructure. Landscapes that have a high scenic quality (including those areas within the SLA) will be more sensitive. Scenic qualities can include contrasts and combinations of landform and landcover. Scenic qualities are recorded in the Landscape Character Assessment, AONB Management Plans and noted from fieldwork.				
Low	Low-Moderate	Moderate	Moderate-High	High
A landscape with much human activity and modern development, such as industrial areas.	A rural or semi-rural landscape with much human activity and dispersed modern development, such as settlement fringes.	A rural landscape with some modern development and human activity, such as intensive farmland.	A more naturalistic landscape and/or one with little modern human influence and development.	A tranquil landscape with little or no overt sign of modern human activity and development.

Scenic and special qualities				
Landscapes that have a high scenic quality (including those designated as SLA) and exhibit a strong character or sense of place will be more sensitive than landscapes of low scenic quality or weak sense of place. Scenic qualities can include contrasts and combinations of landform and landcover which together contribute to attractive views. Scenic qualities may be recorded in the Landscape Character Assessment or may be referenced in tourist material. Scenic viewpoints may be marked on Ordnance Survey maps. Scenic quality is also considered in the field. Other special qualities could include landscapes that are rare (rather than commonplace), landscapes that are in good condition, or have natural or heritage conservation interest (indicated by designation) or are valued for leisure and recreation. Landscapes that are formally designated for their scenic quality (including those within the SLA). are likely to be more sensitive to development than undesignated areas. The degree of sensitivity depends on the extent to which the special qualities of the designated landscape could be affected by the development type.				
Low	Low-Moderate	Moderate	Moderate-High	High
A landscape without attractive character, with no pleasing combinations of features, visual contrasts and/or dramatic elements, such as industrial areas or derelict land.	A landscape of limited attractive character, with few pleasing combinations of features, visual contrasts and/or dramatic elements.	A landscape of intermittently attractive character, with occasional pleasing combinations of features, visual contrasts and/or dramatic elements.	A landscape of attractive character, with some pleasing combinations of features, visual contrasts and/or dramatic elements which may be recognised through designation.	A landscape of consistently attractive character, with pleasing combinations of features, visual contrasts and/or dramatic elements, which is recognised through designation.

Overview of results

Summary of landscape sensitivity in the Cotswold District

The overall results of the landscape sensitivity assessment for each landscape character type are set out in **Tables 3.1** and **3.2**. The overall results are also mapped in **Figures 2.7** to **2.11** (for wind energy) and **Figures 2.2** to **2.6** (for solar PV). The figures provide a spatial representation of the landscape sensitivity of Cotswolds District to accommodate new solar PV and wind energy development (by the different size bandings).

The LCTs in Cotswold District (outside the AONB) often contain areas of higher and lower sensitivity within them that vary from the overall sensitivity 'score'. **It is therefore very important to take note of the content of the individual landscape sensitivity assessments, including any commentary which highlights areas which deviate from the overall sensitivity.**

Presentation of results

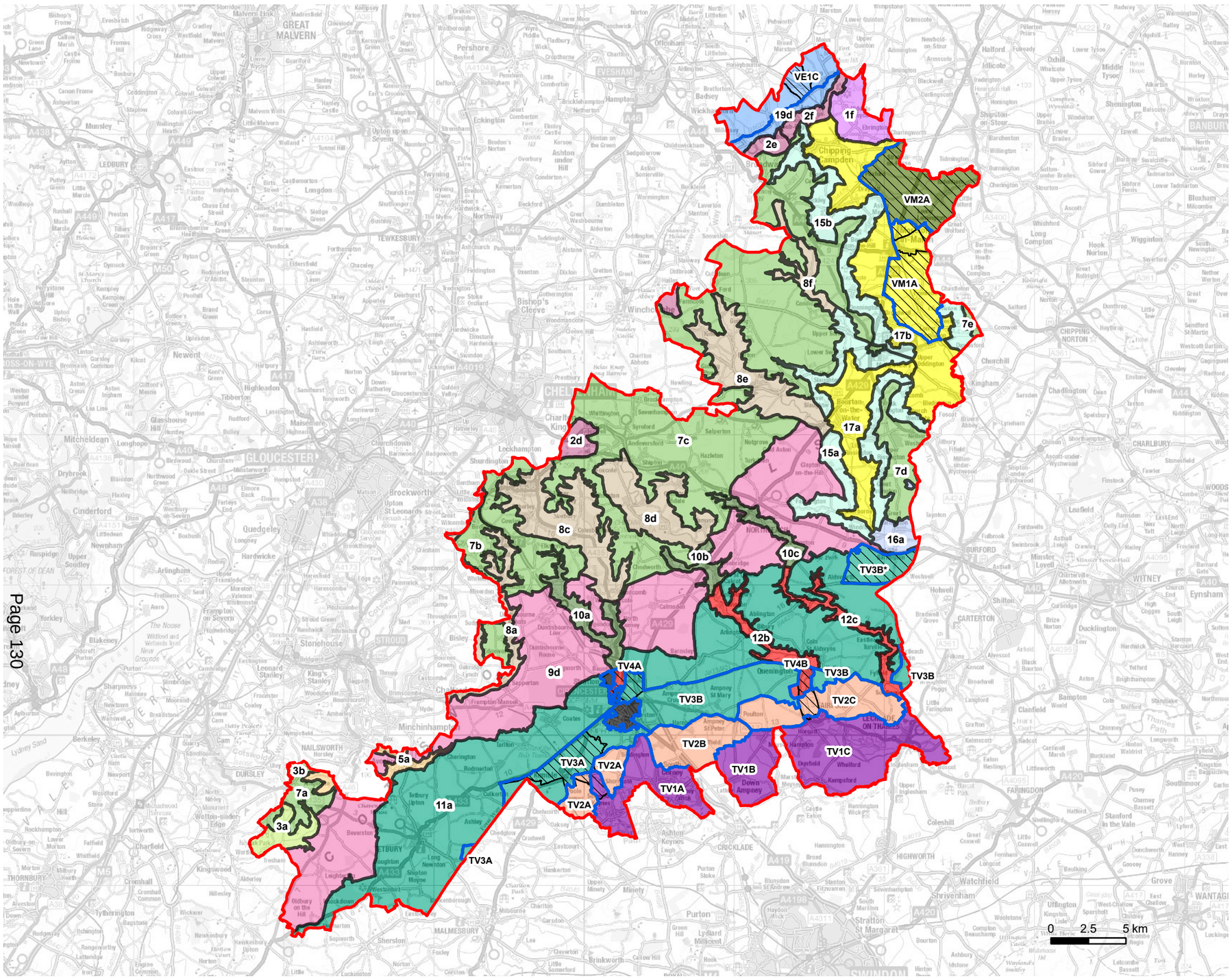
The full landscape sensitivity assessments for each of the LCTs are presented in separate assessment profiles. These are structured as follows;

- A **map of the LCT** with component Character Areas and representative photographs.
- A **summary description** of the LCT against each of the assessment criteria.
- An overall **discussion on the landscape sensitivity** of the LCT to new solar PV and wind energy developments, referencing particular features, attributes or locations which may be more or less sensitive.
- **Discussion of any variations** to the overall LCT scores at the LCA level.
- Recommendations and strategic landscape guidance for future development within the LCT.

Table 3.1: Overall landscape sensitivity scores to different wind energy development scenarios					
Landscape Character Type (LCT)	Overall sensitivity to wind development				
	Very small (Up to 25m)	Small (25m to 60m)	Medium (60m to 100m)	Large (100m to 150m)	Very large (150m to 200m)
TV1: River Basin Lowland	L	L-M	M-H	H	H
TV2: Cornbrash Lowlands	L	L-M	M-H	M-H	H
TC3: Dip Slope Lowland	L	L-M	M	M-H	H
TV4: Dip Slope Lowland Valley	L-M	M-H	H	H	H
VM1A: Pastoral Lowland Vale	L	M	M-H	H	H
VM2A: Undulating Lowland Vale	L	M	M-H	H	H
VE1C: Unwooded Vale	L	L-M	M	H	H

Table 3.2: Overall landscape sensitivity scores to different solar PV					
Landscape Character Type (LCT)	Overall sensitivity to solar PV development				
	Very small (up to 1 hectare)	Small (1 to 5 hectares)	Medium (5 to 20 hectares)	Large (20 to 50 hectares)	Very large (50 to 120 hectares)
TV1: River Basin Lowland	L	L-M	L-M	M-H	H
TV2: Cornbrash Lowlands	L	L-M	M	H	H
TC3: Dip Slope Lowland	L	L-M	M	H	H
TV4: Dip Slope Lowland Valley	L	L-M	M-H	H	H
VM1A: Pastoral Lowland Vale	L	M	M-H	H	H

Table 3.2: Overall landscape sensitivity scores to different solar PV					
Landscape Character Type (LCT)	Overall sensitivity to solar PV development				
	Very small (up to 1 hectare)	Small (1 to 5 hectares)	Medium (5 to 20 hectares)	Large (20 to 50 hectares)	Very large (50 to 120 hectares)
VM2A: Undulating Lowland Vale	L-M	M	M-H	H	H
VE1C: Unwooded Vale	L	L-M	M	M-H	H



Cotswold District Council boundary

LCA outside Cotswolds Area of Outstanding Natural Beauty

LCA within Cotswolds Area of Outstanding Natural Beauty

Special Landscape Area

Cotswolds Area of Outstanding Natural Beauty LCTs

1. Escarpment Outliers
2. Escarpment
3. Rolling Hills and Valleys
5. Settled Valley
7. High Wold
8. High Wold Valley
9. High Wold Dip-Slope
10. High Wold Dip-Slope Valley
11. Dip-Slope Lowland
12. Dip-Slope Lowland Valley
15. Farmed Slopes
16. Broad Floodplain Valley
17. Pastoral Lowland Vale
19. Unwooded Vale

Figure 2.1: Landscape Character Types (LCTs) and Areas (LCAs) and Special Landscape Areas (SLAs)

Gloucestershire LCTs and LCAs

River Basin Lowland

TV1A: Somerford Keynes

TV1B: Down Ampney

TV1C: Fairford and Lechlade

Cornbrash Lowlands

TV2A: Poole Keynes and Ewen Lowlands

TV2B: Driffield Lowlands

TV2C: Southrop Lowlands

Dip Slope Lowland

TV3A: Kemble Dipslope

TV3B*: South and Mid Cotswolds Lowlands (East)

TV3B: The Ampneys

Dip Slope Lowland Valley

TV4A: Lower Churn Valley

TV4B: Lower Coln Valley

Unwooded Vale

VE1C: Mickleton Vale Fringe

Pastoral Lowland Vale

VM1A: Upper Evenlode Vale

Undulating Lowland Vale

VM2A: Upper Stour Hills and Valleys

Urban

Contains data from Gloucestershire County Council.
Contains data from Cotswolds AONB.
The assessment of landscape sensitivity outside of the AONB was undertaken by LUC in 2021.

*The 2006 Gloucestershire Landscape Character Assessment does not include a written description of the South and Mid Cotswolds Lowlands (East) LCA. This study assumes that this LCA is part of the LCT Dip Slope Lowland.

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	Landscape character areas
Scale	1:280,000
Arial Bold 10	Arial Regular 10

centre for sustainable energy

LUC

NOTE ON MAP INTERPRETATION:

As with all assessments based upon data and information which is to a greater or lesser extent subjective, some caution is required in its interpretation. This is to avoid the suggestion that certain landscape features or qualities can automatically be associated with certain sensitivities – the reality is that an assessment of a landscape's sensitivity to development is the result of a complex interplay of often unequally weighted variables (or 'criteria'). It must be interpreted alongside the supporting information contained in the detailed Landscape Sensitivity Assessment profiles, which may indicate areas or features of higher or lower sensitivity within each Landscape Character Type.

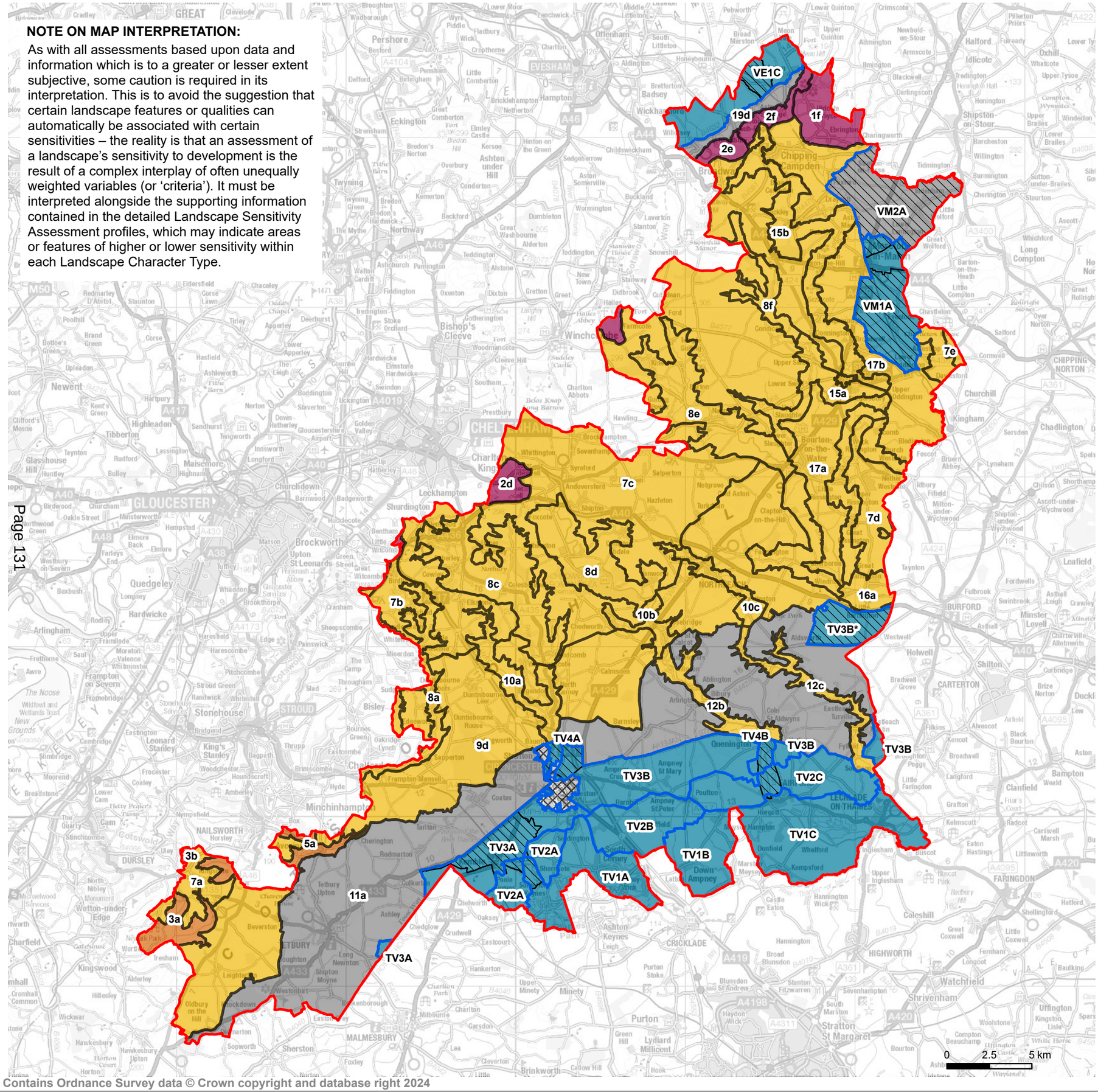


Figure 2.2: Overall landscape sensitivity to very small scale solar development

- Cotswold District Council boundary
- LCA outside Cotswolds Area of Outstanding Natural Beauty
- LCA within Cotswolds Area of Outstanding Natural Beauty
- Special Landscape Area

Landscape sensitivity rating

- Low
- Low - moderate
- Moderate
- Moderate - high
- High
- Urban

Contains data from Gloucestershire County Council.
Contains data from Cotswolds AONB.

*The 2006 Gloucestershire Landscape Character Assessment does not include a written description of the South and Mid Cotswolds Lowlands (East) LCA. This study assumes that this LCA is part of the LCT Dip Slope Lowland.

The assessment of landscape sensitivity outside of the AONB was undertaken by LUC in 2021.

The assessment of landscape sensitivity within the AONB was undertaken by Cotswold District Council in 2023.

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	LSA VS Solar
Scale	1:220,000
Arial Bold 10	Arial Regular 10

centre for sustainable energy

LUC

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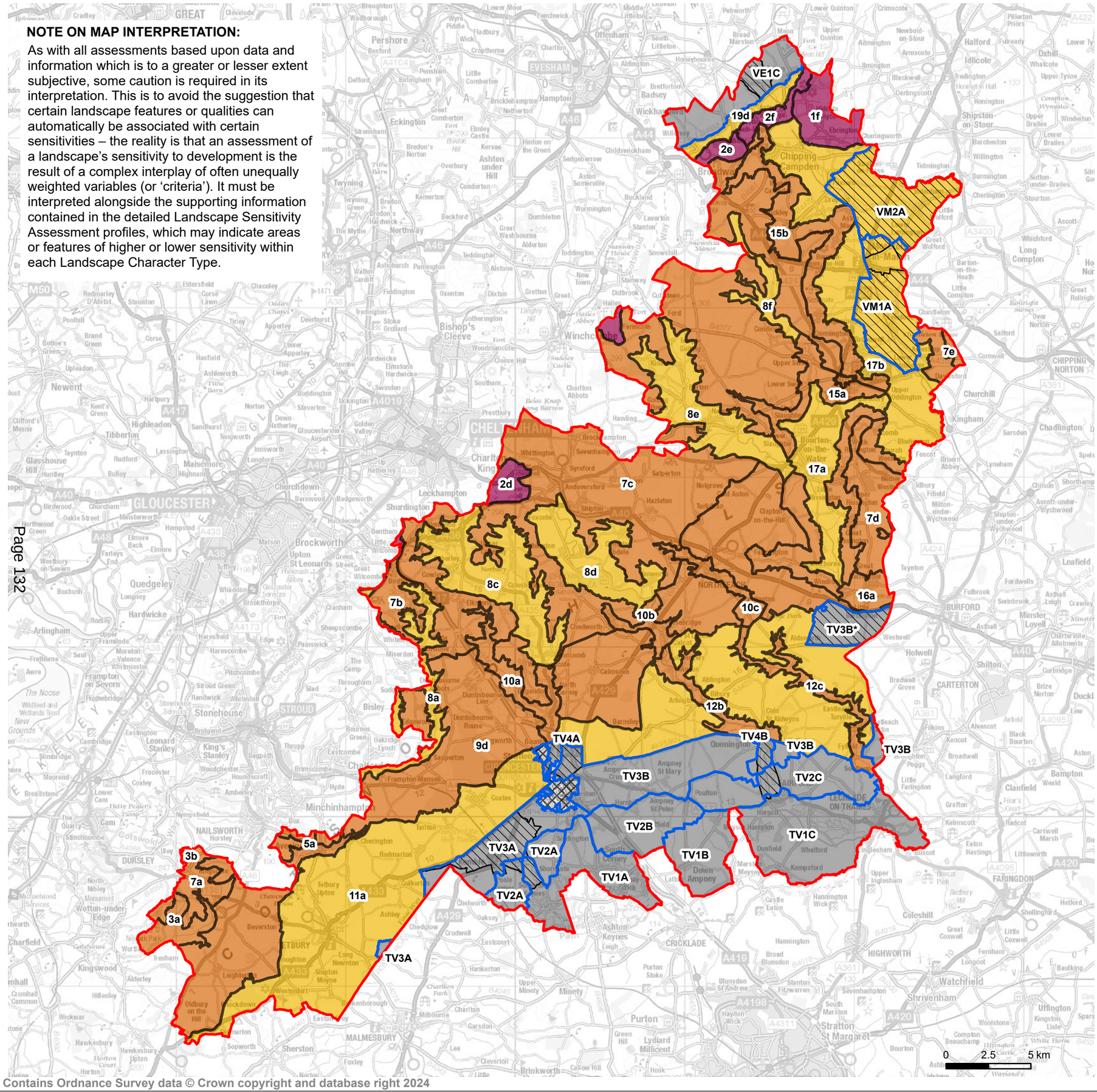

Figure 2.3: Overall landscape sensitivity to small scale solar development

- Cotswold District Council boundary
- LCA outside Cotswolds Area of Outstanding Natural Beauty
- LCA within Cotswolds Area of Outstanding Natural Beauty
- Special Landscape Area

Landscape sensitivity rating

- Low
- Low - moderate
- Moderate
- Moderate - high
- High
- Urban

Contains data from Gloucestershire County Council.
Contains data from Cotswolds AONB.

*The 2006 Gloucestershire Landscape Character Assessment does not include a written description of the South and Mid Cotswolds Lowlands (East) LCA. This study assumes that this LCA is part of the LCT Dip Slope Lowland.

The assessment of landscape sensitivity outside of the AONB was undertaken by LUC in 2021.

The assessment of landscape sensitivity within the AONB was undertaken by Cotswold District Council in 2023.

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	LSA S Solar
Scale	1:220,000
Arial Bold 10	Arial Regular 10

centre for sustainable energy

LUC

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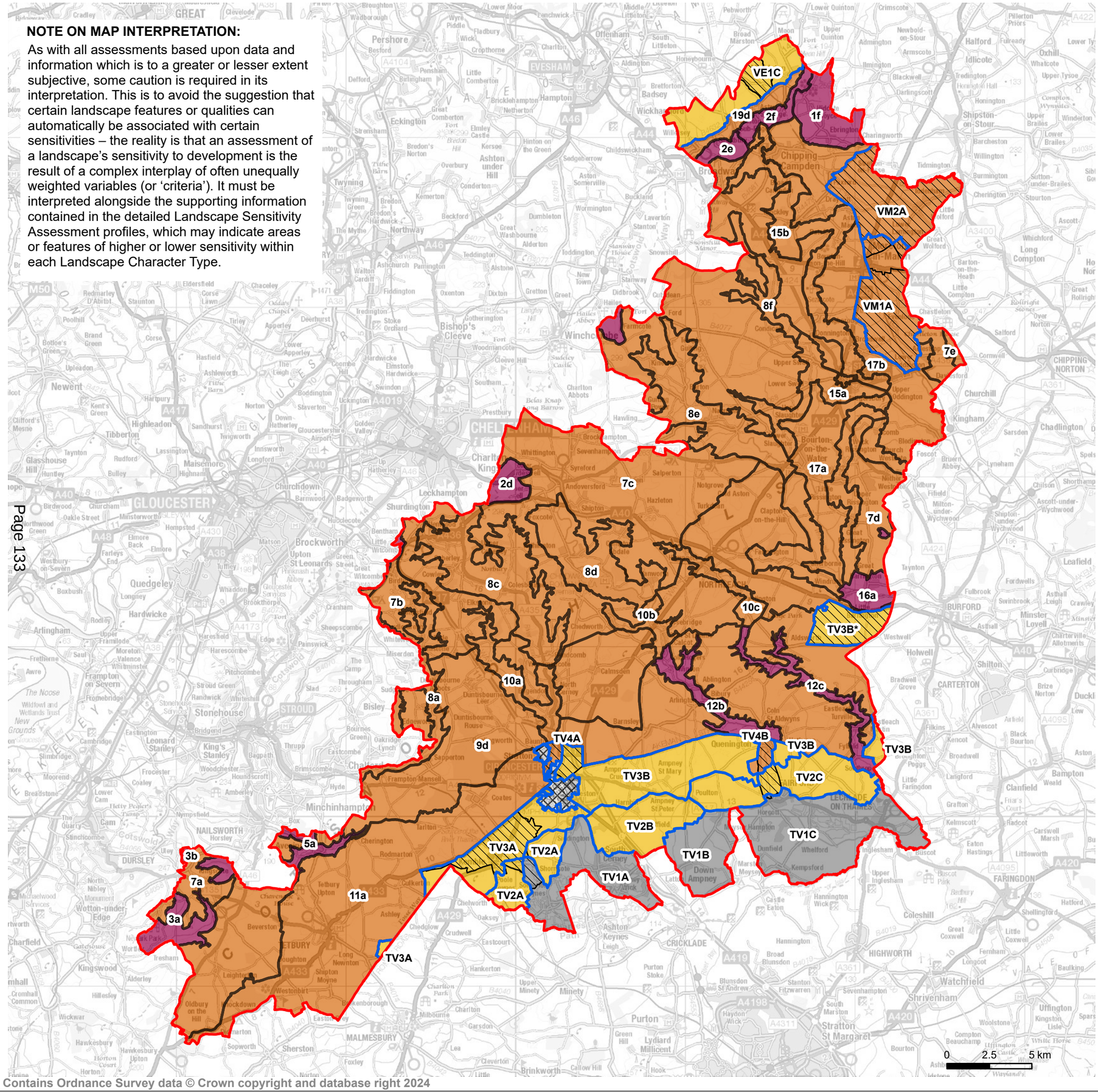

Figure 2.4: Overall landscape sensitivity to medium scale solar development

- Cotswold District Council boundary
- LCA outside Cotswolds Area of Outstanding Natural Beauty
- LCA within Cotswolds Area of Outstanding Natural Beauty
- Special Landscape Area

Landscape sensitivity rating

- Low
- Low - moderate
- Moderate
- Moderate - high
- High
- Urban

Contains data from Gloucestershire County Council.
Contains data from Cotswolds AONB.

*The 2006 Gloucestershire Landscape Character Assessment does not include a written description of the South and Mid Cotswolds Lowlands (East) LCA. This study assumes that this LCA is part of the LCT Dip Slope Lowland.

The assessment of landscape sensitivity outside of the AONB was undertaken by LUC in 2021.

The assessment of landscape sensitivity within the AONB was undertaken by Cotswold District Council in 2023.

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	LSA M Solar
Scale	1:220,000
Arial Bold 10	Arial Regular 10

centre for sustainable energy

LUC

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VE1C
19d
2f
1f
2e
VM2A
15b
8f
VM1A
7e
17b
15a
8e
17a
2d
7c
7d
8d
8c
7b
10b
10c
16a
TV3B*
10a
12c
8a
12b
9d
TV4A
TV4B
TV3B
TV3B
TV3B
TV2C
TV2B
TV1C
5a
TV3A
TV2A
TV1B
3b
7a
TV1A
11a
TV2A
3a
TV3A

0 2.5 5 km

Figure 2.5: Overall landscape sensitivity to large scale solar development

- Cotswold District Council boundary
- LCA outside Cotswolds Area of Outstanding Natural Beauty
- LCA within Cotswolds Area of Outstanding Natural Beauty
- Special Landscape Area

Landscape sensitivity rating

- Low
- Low - moderate
- Moderate
- Moderate - high
- High
- Urban

Contains data from Gloucestershire County Council.
Contains data from Cotswolds AONB.

*The 2006 Gloucestershire Landscape Character Assessment does not include a written description of the South and Mid Cotswolds Lowlands (East) LCA. This study assumes that this LCA is part of the LCT Dip Slope Lowland.

The assessment of landscape sensitivity outside of the AONB was undertaken by LUC in 2021.

The assessment of landscape sensitivity within the AONB was undertaken by Cotswold District Council in 2023.

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	LSA L Solar
Scale	1:220,000
Arial Bold 10	Arial Regular 10

centre for sustainable energy

LUC

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VE1C
19d
2f
1f
2e
VM2A
15b
8f
VM1A
7e
17b
15a
8e
17a
2d
7c
7d
8d
8c
7b
10b
10c
16a
TV3B*
10a
12c
8a
12b
9d
TV4A
TV4B
TV3B
TV3B
TV3B
TV2C
TV2B
TV1C
5a
TV3A
TV2A
TV1B
3b
7a
TV1A
11a
TV2A
3a
TV3A

0 2.5 5 km

Figure 2.6: Overall landscape sensitivity to very large scale solar development

- Cotswold District Council boundary
- LCA outside Cotswolds Area of Outstanding Natural Beauty
- LCA within Cotswolds Area of Outstanding Natural Beauty
- Special Landscape Area

Landscape sensitivity rating

- Low
- Low - moderate
- Moderate
- Moderate - high
- High
- Urban

Contains data from Gloucestershire County Council.
Contains data from Cotswolds AONB.

*The 2006 Gloucestershire Landscape Character Assessment does not include a written description of the South and Mid Cotswolds Lowlands (East) LCA. This study assumes that this LCA is part of the LCT Dip Slope Lowland.

The assessment of landscape sensitivity outside of the AONB was undertaken by LUC in 2021.

The assessment of landscape sensitivity within the AONB was undertaken by Cotswold District Council in 2023.

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	LSA VL Solar
Scale	1:220,000
Arial Bold 10	Arial Regular 10

centre for sustainable energy

LUC

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VE1C
19d
2f
1f
2e
VM2A
15b
8f
VM1A
7e
17b
15a
8e
17a
2d
7c
7d
8d
8c
16a
7b
10b
10c
TV3B*
10a
12c
8a
12b
9d
TV4A
TV4B
TV3B
TV3B
TV3B
TV2C
TV2B
TV1C
5a
TV3A
TV2A
TV1B
3b
7a
TV1A
11a
TV2A
3a
TV3A

0 2.5 5 km

Figure 2.7: Overall landscape sensitivity to very small scale wind turbine development

- Cotswold District Council boundary
- LCA outside Cotswolds Area of Outstanding Natural Beauty
- LCA within Cotswolds Area of Outstanding Natural Beauty
- Special Landscape Area

Landscape sensitivity rating

- Low
- Low - moderate
- Moderate
- Moderate - high
- High
- Urban

Contains data from Gloucestershire County Council.
Contains data from Cotswolds AONB.

*The 2006 Gloucestershire Landscape Character Assessment does not include a written description of the South and Mid Cotswolds Lowlands (East) LCA. This study assumes that this LCA is part of the LCT Dip Slope Lowland.

The assessment of landscape sensitivity outside of the AONB was undertaken by LUC in 2021.

The assessment of landscape sensitivity within the AONB was undertaken by Cotswold District Council in 2023.

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	LSA VS Wind
Scale	1:220,000
Arial Bold 10	Arial Regular 10

centre for sustainable energy

LUC

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VE1C
19d
2f
1f
2e
VM2A
15b
8f
VM1A
7e
17b
15a
8e
17a
2d
7c
7d
8d
8c
16a
7b
10b
10c
TV3B*
10a
12c
8a
12b
9d
TV4A
TV4B
TV3B
TV3B
TV3B
TV2C
TV2B
TV1C
5a
TV3A
TV2A
TV1B
3b
7a
TV1A
11a
TV2A
3a
TV3A

0 2.5 5 km

Figure 2.8: Overall landscape sensitivity to small scale wind turbine development

- Cotswold District Council boundary
- LCA outside Cotswolds Area of Outstanding Natural Beauty
- LCA within Cotswolds Area of Outstanding Natural Beauty
- Special Landscape Area

Landscape sensitivity rating

- Low
- Low - moderate
- Moderate
- Moderate - high
- High
- Urban

Contains data from Gloucestershire County Council.
Contains data from Cotswolds AONB.

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The assessment of landscape sensitivity outside of the AONB was undertaken by LUC in 2021.

The assessment of landscape sensitivity within the AONB was undertaken by Cotswold District Council in 2023.

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	LSA S Wind
Scale	1:220,000
Arial Bold 10	Arial Regular 10

centre for sustainable energy

LUC

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VE1C
19d
2f
1f
2e
VM2A
15b
8f
VM1A
7e
17b
15a
8e
17a
2d
7c
7d
8d
8c
7b
10b
10c
16a
TV3B*
10a
12c
8a
12b
9d
TV4A
TV4B
TV3B
TV3B
TV3B
TV2C
TV2B
TV1C
TV3A
TV2A
TV1B
5a
3b
7a
TV1A
11a
TV2A
3a
TV3A

0 2.5 5 km

Figure 2.9: Overall landscape sensitivity to medium scale wind turbine development

- Cotswold District Council boundary
- LCA outside Cotswolds Area of Outstanding Natural Beauty
- LCA within Cotswolds Area of Outstanding Natural Beauty
- Special Landscape Area

Landscape sensitivity rating

- Low
- Low - moderate
- Moderate
- Moderate - high
- High
- Urban

Contains data from Gloucestershire County Council.
Contains data from Cotswolds AONB.

*The 2006 Gloucestershire Landscape Character Assessment does not include a written description of the South and Mid Cotswolds Lowlands (East) LCA. This study assumes that this LCA is part of the LCT Dip Slope Lowland.

The assessment of landscape sensitivity outside of the AONB was undertaken by LUC in 2021.

The assessment of landscape sensitivity within the AONB was undertaken by Cotswold District Council in 2023.

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	LSA M Wind
Scale	1:220,000
Arial Bold 10	Arial Regular 10

centre for sustainable energy

LUC

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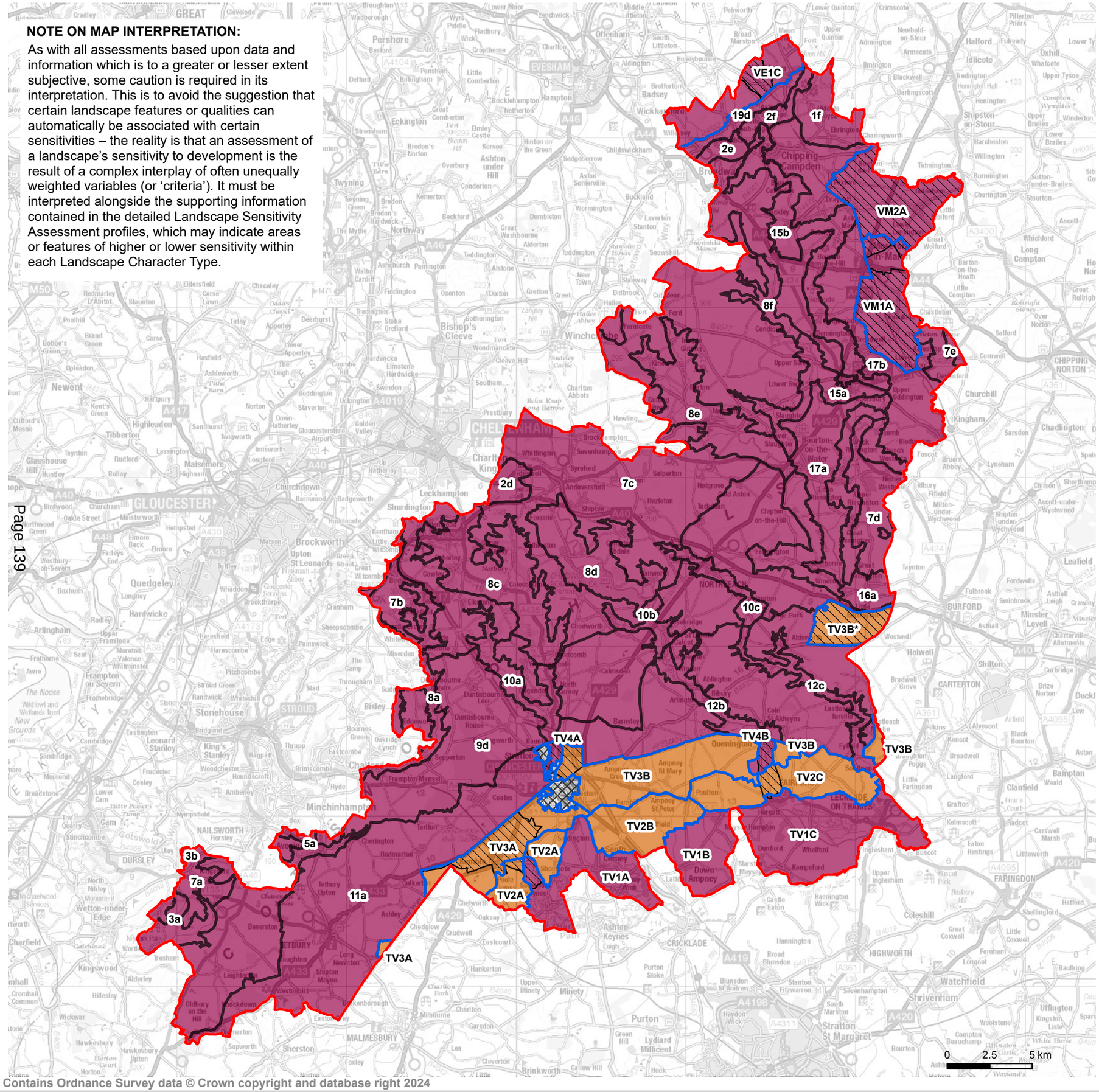

Figure 2.10: Overall landscape sensitivity to large scale wind turbine development

- Cotswold District Council boundary
- LCA outside Cotswolds Area of Outstanding Natural Beauty
- LCA within Cotswolds Area of Outstanding Natural Beauty
- Special Landscape Area

Landscape sensitivity rating

- Low
- Low - moderate
- Moderate
- Moderate - high
- High
- Urban

Contains data from Gloucestershire County Council.
Contains data from Cotswolds AONB.

*The 2006 Gloucestershire Landscape Character Assessment does not include a written description of the South and Mid Cotswolds Lowlands (East) LCA. This study assumes that this LCA is part of the LCT Dip Slope Lowland.

The assessment of landscape sensitivity outside of the AONB was undertaken by LUC in 2021.

The assessment of landscape sensitivity within the AONB was undertaken by Cotswold District Council in 2023.

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	LSA L Wind
Scale	1:220,000
Arial Bold 10	Arial Regular 10

centre for sustainable energy

LUC

NOTE ON MAP INTERPRETATION:

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VE1C
19d
2f
1f
2e
VM2A
15b
8f
VM1A
7e
17b
15a
8e
17a
2d
7c
7d
8d
8c
7b
10b
10c
16a
TV3B*
10a
12c
8a
12b
9d
TV4A
TV4B
TV3B
TV3B
TV3B
TV2C
TV2B
TV1C
5a
TV3A
TV2A
TV1B
3b
7a
TV1A
11a
TV2A
3a
TV3A

0 2.5 5 km

Figure 2.11: Overall landscape sensitivity to very large scale wind turbine development

- Cotswold District Council boundary
- LCA outside Cotswolds Area of Outstanding Natural Beauty
- LCA within Cotswolds Area of Outstanding Natural Beauty
- Special Landscape Area

Landscape sensitivity rating

- Low
- Low - moderate
- Moderate
- Moderate - high
- High
- Urban

Contains data from Gloucestershire County Council.
Contains data from Cotswolds AONB.

*The 2006 Gloucestershire Landscape Character Assessment does not include a written description of the South and Mid Cotswolds Lowlands (East) LCA. This study assumes that this LCA is part of the LCT Dip Slope Lowland.

The assessment of landscape sensitivity outside of the AONB was undertaken by LUC in 2021.

The assessment of landscape sensitivity within the AONB was undertaken by Cotswold District Council in 2023.

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	LSA VL Wind
Scale	1:220,000
Arial Bold 10	Arial Regular 10

centre for sustainable energy

LUC

NOTE ON MAP INTERPRETATION:

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Figure 2.12: Overall landscape sensitivity and technical potential to small scale solar development

- Cotswold District Council boundary
- LCA outside Cotswolds Area of Outstanding Natural Beauty
- LCA within Cotswolds Area of Outstanding Natural Beauty
- Special Landscape Area

Areas with technical potential overlaid with landscape sensitivity (rated High to Low)

- Low
- Low - moderate
- Moderate
- Moderate - high
- High
- Urban

Contains data from Gloucestershire County Council.
Contains data from Cotswolds AONB.

*The 2006 Gloucestershire Landscape Character Assessment does not include a written description of the South and Mid Cotswolds Lowlands (East) LCA. This study assumes that this LCA is part of the LCT Dip Slope Lowland.

The assessment of landscape sensitivity outside of the AONB was undertaken by LUC in 2021.

The assessment of landscape sensitivity within the AONB was undertaken by Cotswold District Council in 2023.

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	LSA and Tech S Solar
Scale	1:220,000
Arial Bold 10	Arial Regular 10

NOTE ON MAP INTERPRETATION:

As with all assessments based upon data and information which is to a greater or lesser extent subjective, some caution is required in its interpretation. This is to avoid the suggestion that certain landscape features or qualities can automatically be associated with certain sensitivities – the reality is that an assessment of a landscape's sensitivity to development is the result of a complex interplay of often unequally weighted variables (or 'criteria'). It must be interpreted alongside the supporting information contained in the detailed Landscape Sensitivity Assessment profiles, which may indicate areas or features of higher or lower sensitivity within each Landscape Character Type.

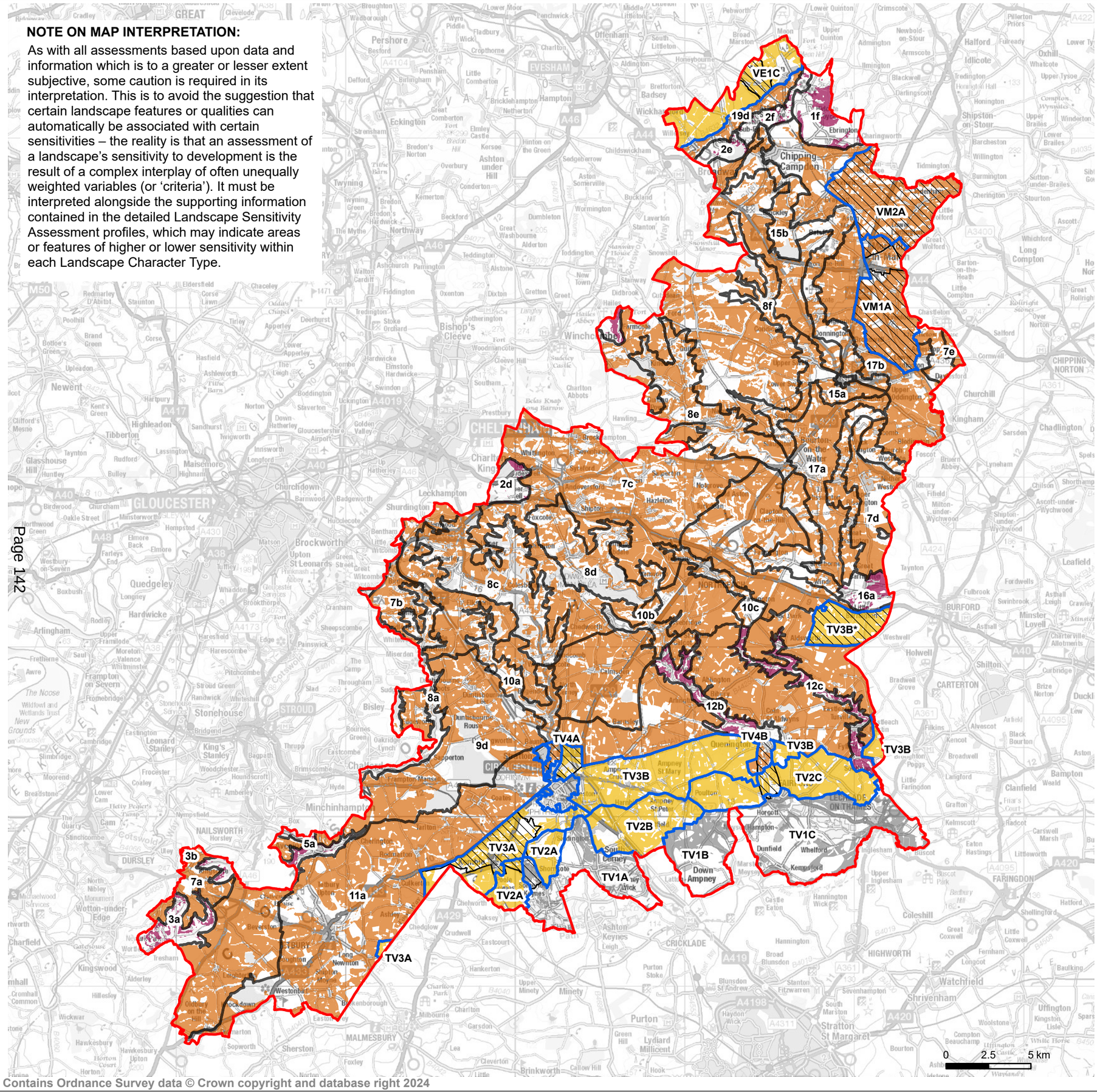

Figure 2.13: Overall landscape sensitivity and technical potential to medium scale solar development

- Cotswold District Council boundary
- LCA outside Cotswolds Area of Outstanding Natural Beauty
- LCA within Cotswolds Area of Outstanding Natural Beauty
- Special Landscape Area

Areas with technical potential overlaid with landscape sensitivity (rated High to Low)

- Low
- Low - moderate
- Moderate
- Moderate - high
- High
- Urban

Contains data from Gloucestershire County Council.
Contains data from Cotswolds AONB.

*The 2006 Gloucestershire Landscape Character Assessment does not include a written description of the South and Mid Cotswolds Lowlands (East) LCA. This study assumes that this LCA is part of the LCT Dip Slope Lowland.

The assessment of landscape sensitivity outside of the AONB was undertaken by LUC in 2021.

The assessment of landscape sensitivity within the AONB was undertaken by Cotswold District Council in 2023.

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	LSA and Tech M Solar
Scale	1:220,000
Arial Bold 10	Arial Regular 10

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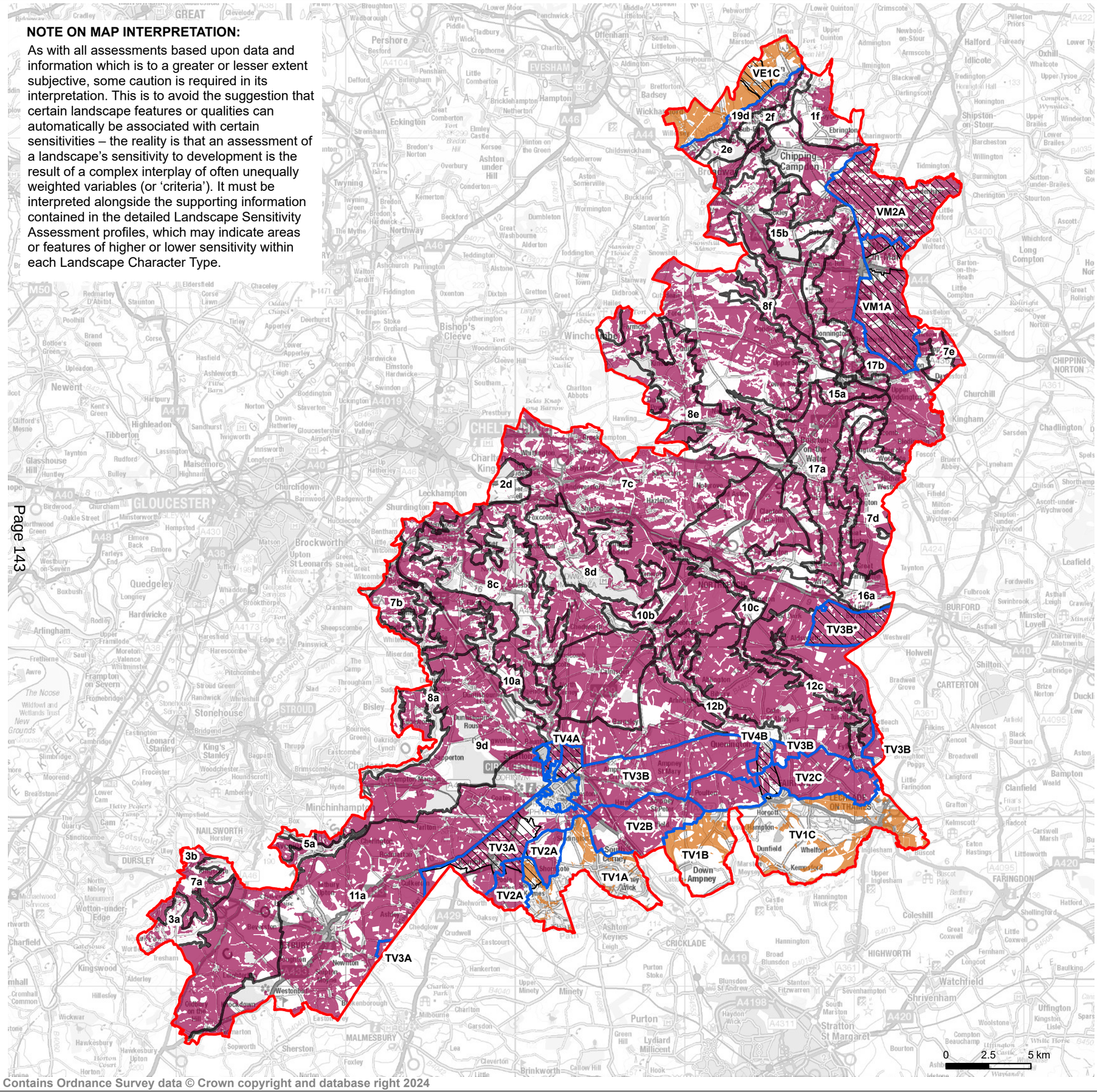

Figure 2.14: Overall landscape sensitivity and technical potential to large scale solar development

- Cotswold District Council boundary
- LCA outside Cotswolds Area of Outstanding Natural Beauty
- LCA within Cotswolds Area of Outstanding Natural Beauty
- Special Landscape Area

Areas with technical potential overlaid with landscape sensitivity (rated High to Low)

- Low
- Low - moderate
- Moderate
- Moderate - high
- High
- Urban

Contains data from Gloucestershire County Council.
Contains data from Cotswolds AONB.

*The 2006 Gloucestershire Landscape Character Assessment does not include a written description of the South and Mid Cotswolds Lowlands (East) LCA. This study assumes that this LCA is part of the LCT Dip Slope Lowland.

The assessment of landscape sensitivity outside of the AONB was undertaken by LUC in 2021.

The assessment of landscape sensitivity within the AONB was undertaken by Cotswold District Council in 2023.

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	LSA and Tech L Solar
Scale	1:220,000
Arial Bold 10	Arial Regular 10

centre for sustainable energy

LUC

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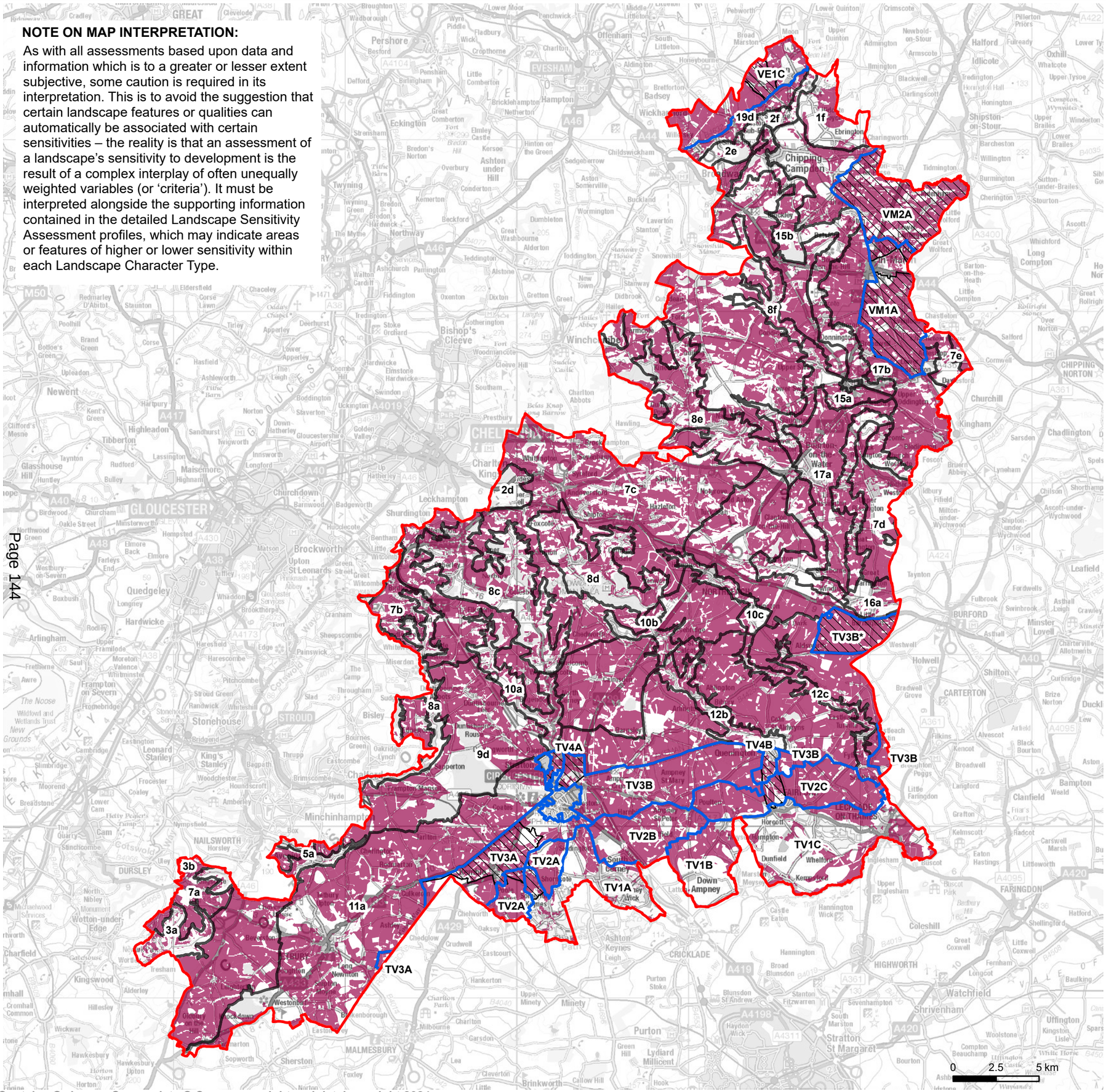

Figure 2.15: Overall landscape sensitivity and technical potential to very large scale solar development

- Cotswold District Council boundary
- LCA outside Cotswolds Area of Outstanding Natural Beauty
- LCA within Cotswolds Area of Outstanding Natural Beauty
- Special Landscape Area

Areas with technical potential overlaid with landscape sensitivity (rated High to Low)

- Low
- Low - moderate
- Moderate
- Moderate - high
- High
- Urban

Contains data from Gloucestershire County Council.
Contains data from Cotswolds AONB.

*The 2006 Gloucestershire Landscape Character Assessment does not include a written description of the South and Mid Cotswolds Lowlands (East) LCA. This study assumes that this LCA is part of the LCT Dip Slope Lowland.

The assessment of landscape sensitivity outside of the AONB was undertaken by LUC in 2021.

The assessment of landscape sensitivity within the AONB was undertaken by Cotswold District Council in 2023.

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	LSA and Tech VL Solar
Scale	1:220,000
Arial Bold 10	Arial Regular 10

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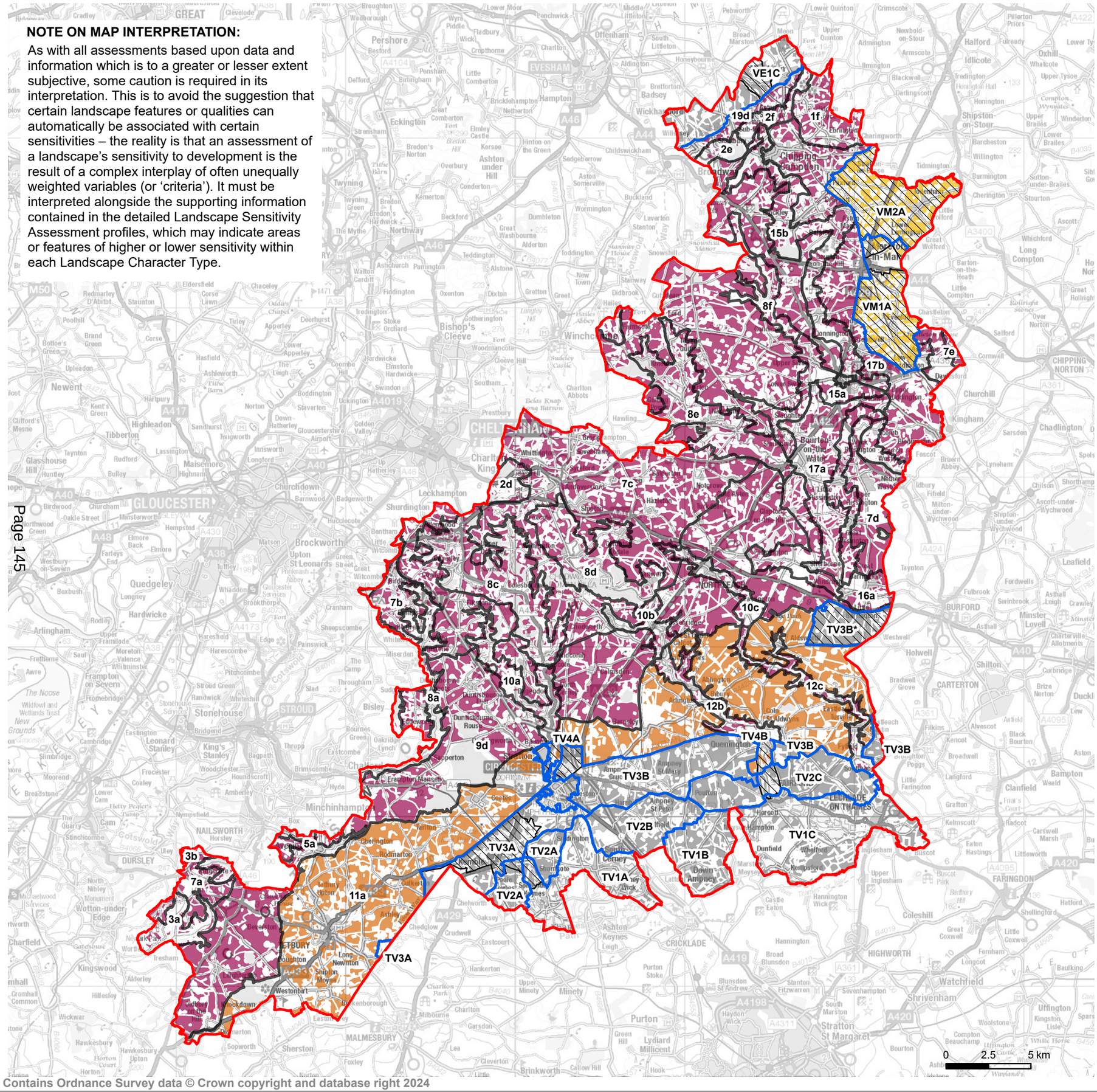

Figure 2.16: Overall landscape sensitivity and technical potential to small scale wind turbine development

- Cotswold District Council boundary
- LCA outside Cotswolds Area of Outstanding Natural Beauty
- LCA within Cotswolds Area of Outstanding Natural Beauty
- Special Landscape Area

Areas with technical potential overlaid with landscape sensitivity (rated High to Low)

- Low
- Low - moderate
- Moderate
- Moderate - high
- High
- Urban

Contains data from Gloucestershire County Council.
Contains data from Cotswolds AONB.

*The 2006 Gloucestershire Landscape Character Assessment does not include a written description of the South and Mid Cotswolds Lowlands (East) LCA. This study assumes that this LCA is part of the LCT Dip Slope Lowland.

The assessment of landscape sensitivity outside of the AONB was undertaken by LUC in 2021.

The assessment of landscape sensitivity within the AONB was undertaken by Cotswold District Council in 2023.

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	LSA and Tech S Wind
Scale	1:220,000
Arial Bold 10	Arial Regular 10

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Figure 2.17: Overall landscape sensitivity and technical potential to medium scale wind turbine development

- Cotswold District Council boundary
- LCA outside Cotswolds Area of Outstanding Natural Beauty
- LCA within Cotswolds Area of Outstanding Natural Beauty
- Special Landscape Area

Areas with technical potential overlaid with landscape sensitivity (rated High to Low)

- Low
- Low - moderate
- Moderate
- Moderate - high
- High
- Urban

Contains data from Gloucestershire County Council.
Contains data from Cotswolds AONB.

*The 2006 Gloucestershire Landscape Character Assessment does not include a written description of the South and Mid Cotswolds Lowlands (East) LCA. This study assumes that this LCA is part of the LCT Dip Slope Lowland.

The assessment of landscape sensitivity outside of the AONB was undertaken by LUC in 2021.

The assessment of landscape sensitivity within the AONB was undertaken by Cotswold District Council in 2023.

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	LSA and Tech M Wind
Scale	1:220,000
Arial Bold 10	Arial Regular 10

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LUC

NOTE ON MAP INTERPRETATION:

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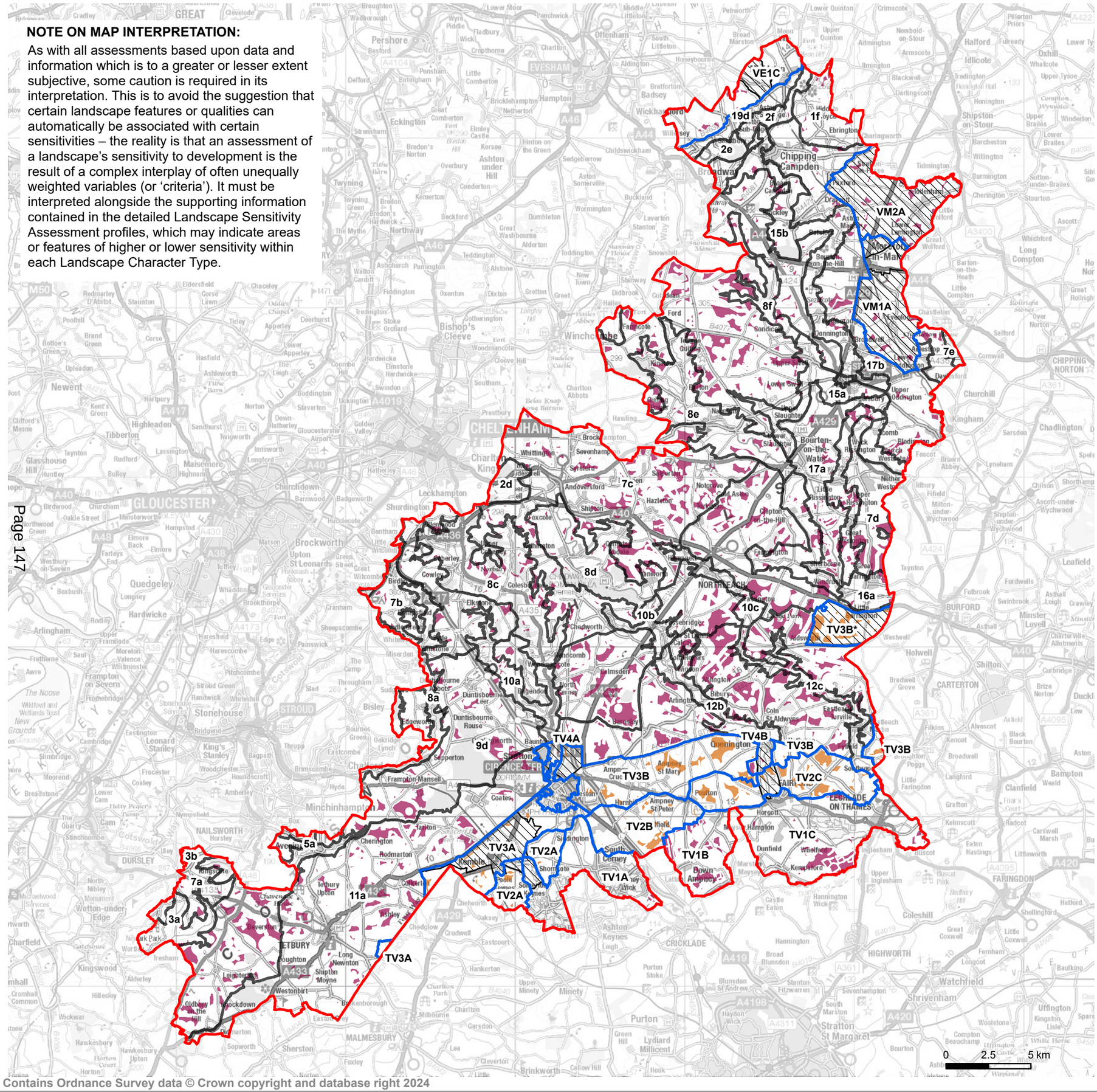

Figure 2.18: Overall landscape sensitivity and technical potential to large scale wind turbine development

- Cotswold District Council boundary
- LCA outside Cotswolds Area of Outstanding Natural Beauty
- LCA within Cotswolds Area of Outstanding Natural Beauty
- Special Landscape Area

Areas with technical potential overlaid with landscape sensitivity (rated High to Low)

- Low
- Low - moderate
- Moderate
- Moderate - high
- High
- Urban

Contains data from Gloucestershire County Council.
Contains data from Cotswolds AONB.

*The 2006 Gloucestershire Landscape Character Assessment does not include a written description of the South and Mid Cotswolds Lowlands (East) LCA. This study assumes that this LCA is part of the LCT Dip Slope Lowland.

The assessment of landscape sensitivity outside of the AONB was undertaken by LUC in 2021.

The assessment of landscape sensitivity within the AONB was undertaken by Cotswold District Council in 2023.

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	LSA and Tech L Wind
Scale	1:220,000
Arial Bold 10	Arial Regular 10

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NOTE ON MAP INTERPRETATION:

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Figure 2.19: Overall landscape sensitivity and technical potential to very large scale wind turbine development

- Cotswold District Council boundary
- LCA outside Cotswolds Area of Outstanding Natural Beauty
- LCA within Cotswolds Area of Outstanding Natural Beauty
- Special Landscape Area

Areas with technical potential overlaid with landscape sensitivity (rated High to Low)

- Low
- Low - moderate
- Moderate
- Moderate - high
- High
- Urban

Contains data from Gloucestershire County Council. Contains data from Cotswolds AONB.

*The 2006 Gloucestershire Landscape Character Assessment does not include a written description of the South and Mid Cotswolds Lowlands (East) LCA. This study assumes that this LCA is part of the LCT Dip Slope Lowland.

The assessment of landscape sensitivity outside of the AONB was undertaken by LUC in 2021.

The assessment of landscape sensitivity within the AONB was undertaken by Cotswold District Council in 2023.

Project	Cotswold Renewable Energy Study
Client	Cotswold District Council
Figure	LSA and Tech VL Wind
Scale	1:220,000
Arial Bold 10	Arial Regular 10

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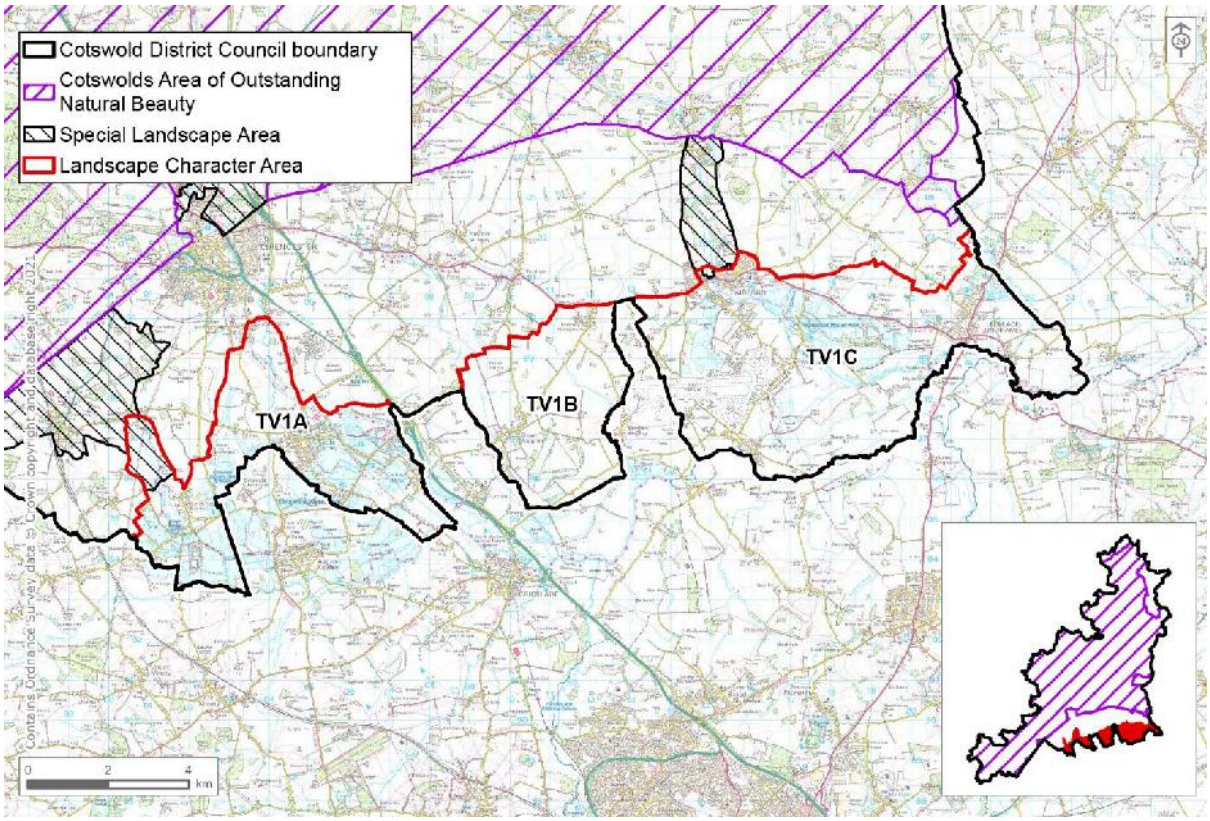
LUC

Cotswolds LCT: TV1 River Basin Lowland



View south from near Siddington across flat pasture fields along the River Churn

View south across arable fields near Whelford showing banks which mask the edge of a mineral extraction site (TV1C).

Lakes at Whelfords Pool Nature Reserve in TV1C.

Landscape sensitivity assessment			
Criteria	**Description**	**Sensitivity Score**	
		Wind	**Solar**
Landform and scale (including sense of openness/ enclosure)	• Low lying, largely flat landform with some areas of gently undulating typography and small indistinct hills. • A broad floodplain associated with the River Thames and its tributaries including the Rivers Coln and Churn. • Elevations range from 70m AOD along the Thames in the south to 100m AOD on minor hills inIndent Lcluding Horcott Hill and Furzey Hill (TV1C). • Frequent trees and small pastoral fields bounded by low hedgerows create a human-scale character and offer enclosure across much of the LCT. • Large arable fields and wide floodplain pastures are more open (TV1B).	L-M	L
Landcover (including field and settlement patterns)	• Mixed agricultural land use with small-scale pastoral fields and some large arable fields in TV1B. Floodplain pastures and wet meadows are associated with watercourses. • Restored mineral extraction sites create a mosaic of lakes in TV1A and TV1B supporting a variety of habitats, many are LNRs with some designated as SSSI. • Tree cover is associated with lakes and watercourses with scattered copses elsewhere and woodpasture in the remnant parkland at Down Ampney. • A relatively well-settled landscape with rural farmsteads and small towns. • Historic settlements are concentrated near watercourses and at bridging points typically with limestone buildings. • Both active and former military airfields at Fairford and Down Ampney influence local landscape character. • Active sand and gravel extraction sites are located across the LCT.	M	M
Historic landscape character	• Field patterns are generally regular and post-medieval to modern in origin, with areas of riverine pasture and floated meadow systems. • Scheduled Monuments are scattered throughout and include abandoned settlements from a number of periods dating back to the Iron Age. • Most settlements are protected by conservation areas, containing high concentrations of listed buildings and often centered on historic churches.	M	M

	• Church House at Lechlade is a small grade II listed Registered Parks and Gardens (RPG).		
Visual character, (including skylines/ intervisibility)	• Views are generally enclosed by mature field boundaries trees in this flat landscape but can be extensive across larger scale, open fields. • There is a very limited visual relationship with surrounding landscapes except on the boundaries of the LCT. • Skyline features are limited to mature trees and woodlands. Taller features are less frequent but include pylons in the north of TV1A.	L	L-M
Perceptual qualities	• The watercourses and restored mineral extraction sites of the Cotswolds Water Park have a naturalistic and tranquil character. • Aircraft from RAF Fairford produce intermittent disturbance. • Active extraction sites result in localised disturbance, but visual enclosure prevents industry outside the LCT detracting from rural character. • A publicly accessible landscape with two Country Parks (TV1A) and a network of public rights of way including the Thames Path and Thames and Severn Way National Trails.	L-M	L-M
Scenic and special qualities	• Small areas of TV1A and TV1C are identified as part of the Kemble & Ewen SLA and Coln Valley (north of Fairford) SLA respectively. SLAs are identified as being locally valued landscapes that have particular qualities or character[1] including riparian habitats, parklands, unspoilt villages with limestone buildings and strong visual unity with the Cotswolds AONB[2]. • Situated to the south-east of the Cotswolds AONB, the LCT shares many of its special qualities including limestone buildings, river valleys, a highly accessibility landscape and features of cultural heritage significance[3]. • The restored lakes are a distinctive and often scenic feature of this landscape, many offering peaceful recreation.	M	M

[1] Cotswolds District Local Plan 2011-2031

[2] Cotswolds District Special Landscape Areas Review: Landscape Context and Physical changes, 2017

[3] Cotswolds Area of Outstanding Natural Beauty Management Plan 2018-2023

Overall Assessment of Landscape Sensitivity: Wind Energy					
Sensitivity to new developments					
Very small (up to 25m)	L				
Small (25m to 60m)		L-M			
Medium (60m to 100m)				M-H	
Large (100m to 150m)					H
Very large (150m to 200m)					H

Summary of landscape sensitivity: The large-scale and flat landform with high levels of human influence including active mineral extraction sites and airfields could indicate a lower sensitivity to wind energy development. However, scattered human-scale features, extensive areas of semi-natural habitats, features of cultural heritage significance, the largely undeveloped skylines and the public accessibility of much of the area heighten levels of sensitivity.

Areas within the Kemble & Ewen and Coln Valley (north of Fairford) SLAs, and the north of TV1C that have a close association with the Cotswolds AONB, would have a higher sensitivity to wind energy developments.

TV1B, particularly to the north of Down Ampney would have a slightly reduced landscape sensitivity to wind energy developments due to its larger scale open arable character with fewer human scale features, the presence of RAF Fairford, and pylons on the skyline.

Overall Assessment of Landscape Sensitivity: Solar PV Developments					
Sensitivity to new developments					
Very small (up to 1 hectare)	L				
Small (1 to 5 hectares)		L-M			
Medium (5 to 20 hectares)		L-M			
Large (20 to 50 hectares)				M-H	
Very large (50 to 120 hectares)					H

Summary of landscape sensitivity: The large-scale flat landform with no distinctive slopes, visually enclosure offered by mature field boundaries and trees, and high levels of human influence including active mineral extractions sites and airfields, could indicate a lower sensitivity to solar PV developments. However, the open character of arable farmland, extensive semi-natural habitats, features of cultural heritage significance and public accessibility of much of the area would indicate a higher sensitivity to solar PV development.

Areas within the Kemble & Ewen and Coln Valley (north of Fairford) SLAs, and the north of TV1C that have a close association with the Cotswolds AONB, would have a higher sensitivity to wind energy developments.

Open fields in TV1B are likely to be more sensitive to solar PV developments as there is less visual enclosure.

Existing solar PV developments: There are no existing commercial scale solar PV developments in this LCT.

Recommendations and guidance for future development within the LCT

Wind energy developments

Overall recommendations:

- There may be opportunities to site single turbines up to 100m within the larger-scale, open rolling landscape, away from the more intimate areas of smaller scale pasture and woodland (ensuring the guidance below is followed).
- The scattering of turbines should be minimised to avoid significant cumulative impacts on landscape character from arising.
- None of the landscape is identified as suitable for large or very large turbines due to its sensitivities.

Strategic landscape guidance:

- Ensure that any new developments are similar in terms of siting, layout and relationship to key landscape characteristics, so as to present a simple image that relates clearly to landscape character[4].
- Avoid close juxtaposition of different turbine designs and heights, aiming instead for a consistent design and height in any given area.
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the relatively undeveloped skylines.
- Ensure wind energy development does not detract from historic landmarks such as the numerous Scheduled Monuments (including abandoned settlements), historic villages and listed buildings including churches with spires that are often locally important skyline features.
- Avoid siting wind turbines in the smaller scale and irregular pastoral areas of the landscape including in TV1A and TV1C which would be highly vulnerable to wind energy development
- Consider views from local settlements and popular recreational routes/areas including the National Trails and the Country Parks when considering the siting and design of wind energy development in the landscape.
- Ensure wind energy development does adversely affect the tranquil character of the floodplain of the River Thames and the Cotswolds Water Park.
- Ensure wind energy development does adversely affect the scenic qualities of the landscape or the rural setting it provides to the Cotswolds AONB to the north.

[4] For further guidance in designing multiple wind turbine developments, see Scottish Natural Heritage (2017) Siting and Designing
Wind Farms in the Landscape: Guidance. Version 3a available here.

- Ensure wind energy developments do not compromise the quality of the Kemble & Ewen and Coln Valley (north of Fairford) SLAs.

Solar PV developments

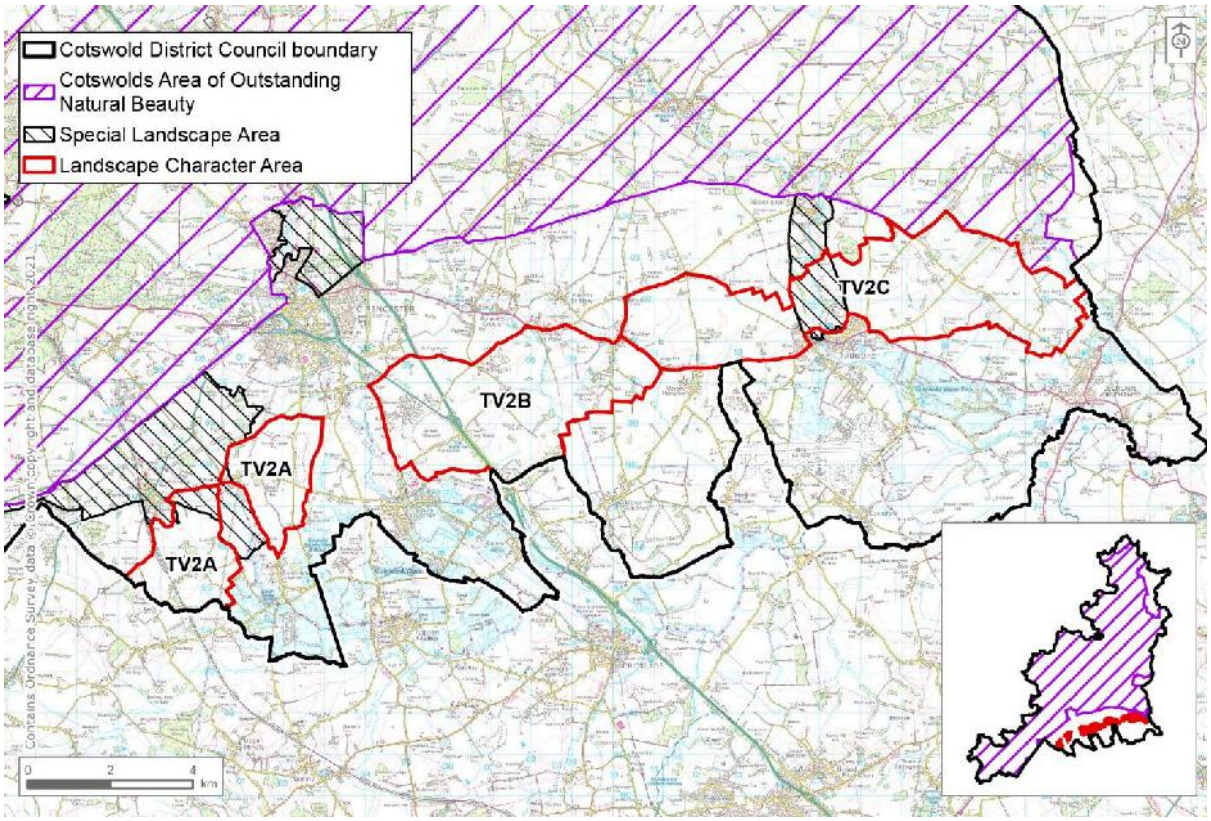
Overall recommendations:

- There are opportunities to locate solar PV developments (up to and including 20ha) within more enclosed fields where they are bound by tall hedgerows or lines of riparian vegetation, notably in TV1A and TV1C.
- PV developments should be sited within farmland, avoiding semi-natural habitat to retain naturalistic characteristics and habitat interest.
- None of the landscape is identified as suitable for 'large' or 'very large' solar PV development due to its sensitivities.

Strategic landscape guidance:

- The overall aim should be to make sure that solar PV developments do not become a key characteristic of the landscape (i.e. avoiding significant cumulative impacts on the LCT from multiple developments that would result in an overall change in landscape character).
- New Solar PV development should make use of the visual enclosure provided by woodlands, tree belts and hedges to screen development, particularly in TV1A and TV1C .
- Where additional screening is required, ensure that screening provided is in character with the landscape, using appropriate species in planting.
- Ensure that solar PV developments form part of the mixed farmland mosaic – rather than becoming a dominating land use.
- Avoid locating solar PV development where it would be directly overlooked at close quarters, particularly side-on.
- Ensure the siting of new solar PV development does not detract from the enjoyment of the landscape for users of Country Parks and public rights of way including Thames Path and Thames and Severn Way National Trails.
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the relatively undeveloped skylines.
- Ensure solar PV development does adversely affect the tranquil character of the floodplain of the River Thames and the Cotswolds Water Park.
- Ensure new solar PV development does adversely affect the scenic qualities of the landscape or the rural setting it provides to the Cotswolds AONB to the north.
- Ensure solar PV developments do not compromise the quality of the Kemble & Ewen and Coln Valley north of Fairford SLAs.

Cotswolds LCT: TV2 Cornbrash Lowlands



View south form near Pool Keynes showing rural lanes and pylons in TV2A.

View east towards the disused airfield associated with South Cerney Army Station in TV2B.

View north across expansive arable fields near Fairford, showing traditional stone walls (TV2C).

Landscape sensitivity assessment			
Criteria	**Description**	**Sensitivity Score**	
		Wind	**Solar**
Landform and scale (including sense of openness/ enclosure)	• A very gently undulating landscape often perceived as flat which slopes gently down to the south. • Minor tributaries of the River Thames cross the landscape creating occasional minor undulations. • An expansive open landscape of large-scale fields often with low hedgerow or stone boundaries and some hedgerow trees. • Scattered small woodlands, mostly geometric in form, combine with mature hedgerow trees to provide limited local enclosure (particularly in the west of TV2A and along the southern boundary of TV2B).	L	M
Landcover (including field and settlement patterns)	• Arable cultivation is the dominant land use in large-scale regular fields, field patterns become more geometric and uniform in the east. • Smaller pasture fields associated with watercourses or around settlements add to the landscape diversity. • Tree cover takes the form of scattered deciduous/coniferous woodland blocks, riparian trees and occasional hedgerow trees. • Large areas of woodpasture and parkland Priority Habitat exist around Harnhill, Poulton Priory and north of Fairford. • There are several small LNR s encompassing road verges, a deciduous woodland surrounding the Ampney Brook and Broadwater Lake. • A dispersed settlement pattern of linear villages, hamlets and farmsteads.	M	M
Historic landscape character	• The regular field patterns are a result of 18th and 19th century enclosure with evidence of modern field amalgamation due to intensive farming. • Features of heritage interest are isolated and include a Roman villa and the Rambury ring earthwork near Apney St Peter, a Saxon cemetery at Fairford (all Scheduled Monuments) and the Ermin Way, a Roman road in TV2B. • Most settlements are protected by conservation areas with high concentrations of listed buildings. • Traditional stone-built properties constructed in limestone predominate and add to the historic character of the landscape.	L-M	L-M

	• Pockets of (non-designated) historic parkland occur in TV2B and TV2C.		
Visual character, (including skylines/ intervisibility)	• Wide views are possible across the flat farmland, although long distance views are often restricted by woodland blocks and hedgerow trees. • From northern parts of TV2C there are some views to the adjacent Dip Slope Lowland LCT within the Cotswolds AONB. • Skylines are simple, marked only by woodlands and hedgerow trees, although pylons crossing TV2A are intrusive.	L-M	L-M
Perceptual qualities	• The quiet, rural landscape is locally disturbed by the A417 and A419 (TV2B) and intermittent noise disturbance from passing trains (TV2A). • Features such as the South Cerny Airfield (TV2B) and the pylon route crossing TV2A have a slightly urbanising effect on this intensively farmed rural landscape. • Public rights of way include the Thames and Severn Way.	L-M	L-M
Scenic and special qualities	• A small area of TV2A near Ewen is identified as part of the Kemble & Ewen SLA, distinguished by its gentle landform and scenic wooded streams. • Parts of TV2C are within the Coln Valley (north of Fairford) SLA, which is locally significant due its scenic combinations of vegetation, intact drystone walls and high recreational value[1]. • Much of the area is under intensive agricultural use with gappy field boundaries in places. Golf courses and army barracks have an urbanising effect, most notably in TV2B. • The LCT shares some of the special qualities of the Cotswolds AONB including drystone walls and historic villages with the distinctive Cotswold vernacular[2].	M	M

[1] Local Countryside Designation Review: Special Landscape Areas, 2001

[2] Cotswolds Area of Outstanding Natural Beauty Management Plan 2018-2023

Overall Assessment of Landscape Sensitivity: Wind Energy					
Sensitivity to new developments					
Very small (Up to 25m)	L				
Small (25m to 60m)		L-M			
Medium (60m to 100m)				M-H	
Large (100m to 150m)				M-H	
Very large (150m to 200m)					H

Summary of landscape sensitivity: The large-scale and flat lowland landform with a simple pattern of arable landcover, and high levels of human activity could indicate a lower sensitivity to wind energy development. However, the scattered human-scale features and rural character heighten levels of sensitivity.

Areas with a strong visual connection with the Cotswolds AONB, such as the north-east of TV2C as well as areas within the Kemble & Ewen and Coln Valley (north of Fairford) SLAs have a higher sensitivity to wind energy developments.

Parts of TV2C (to the east and west of Fairford) which have a large-scale and open character in which skylines are not prominent, are more intensively farmed, and with limited heritage features are likely to have a slightly lower landscape sensitivity to wind energy developments. Areas with high levels of human activity, such as along the A419 and adjacent to military bases in TV2B are also likely to also have a reduced landscape sensitivity to wind energy developments.

Overall Assessment of Landscape Sensitivity: Solar PV Developments					
Sensitivity to new developments					
Very small (up to 1 hectare)	L				
Small (1 to 5 hectares)		L-M			
Medium (5 to 20 hectares)			M		
Large (20 to 50 hectares)					H
Very large (50 to 120 hectares)					H

Summary of landscape sensitivity: The large-scale flat landform with no distinctive slopes, enclosure provided by hedgerows and woodland blocks, regular field pattern of arable fields, and high levels of human activity could indicate a lower sensitivity to solar PV developments. However, the open character of large arable fields, small historic villages, areas of parkland and rural character could indicate a higher sensitivity to solar PV development.

Areas with a strong visual connection with the Cotswolds AONB, such as the north-east of TV2C as well as the areas within the Kemble & Ewen and Coln Valley (north of Fairford) SLAs would have higher sensitivity to solar PV developments.

Areas where there is ample enclosure offered by hedgerow boundaries and woodland blocks and existing human disturbance, would be less sensitive to solar PV developments.

Existing solar PV developments: Although there are no existing solar PV develoments within this LCT there is a small solar farm, which has been consented and may be under construction at the Duke of Gloucester Barrack, South Cerney (TV2B).

Recommendations and guidance for future development within the LCT

Wind energy developments

Overall recommendations:

- There may be opportunities to site single turbines up to 60m within the more large-scale, open rolling landscape away from the more intimate areas of smaller scale pasture and woodland (ensuring the guidance below is followed).
- The scattering of turbines should be minimised to avoid significant cumulative impacts on landscape character arising.
- None of the landscape is identified as suitable for large or very large turbines due to its sensitivities.

Strategic landscape guidance:

- Ensure that any new developments are similar in terms of siting, layout and relationship to key landscape characteristics, so as to present a simple image that relates clearly to landscape character[3].
- Avoid close juxtaposition of different turbine designs and heights within the height category, aiming instead for a consistent design and height in any given area.
- Avoid locating larger turbines in the more rural and tranquil parts of the LCT where there is a distinct lack of human disturbance.
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the relatively undeveloped skylines.
- Ensure wind energy development does not detract from historic landmarks such as Scheduled Monuments, villages with conservation areas and the setting of listed buildings.
- Avoid siting wind turbines in the smaller scale and irregular pastoral areas of the landscape including those following minor streams which would be highly vulnerable to wind energy development.
- Consider views from local settlements and popular recreational routes/areas including the Thames and Severn Way National Trail when considering the siting and design of wind energy development in the landscape.
- Ensure wind energy development does adversely affect the scenic qualities of the landscape or the visual setting it provides to the Cotswolds AONB to the north.

[3] For further guidance in designing multiple wind turbine developments, see Scottish Natural Heritage (2017) Siting and Designing Wind Farms in the Landscape: Guidance. Version 3a available here.

- Ensure wind energy developments do not compromise the quality of the Kemble & Ewen and Coln Valley north of Fairford SLAs.

Solar PV developments

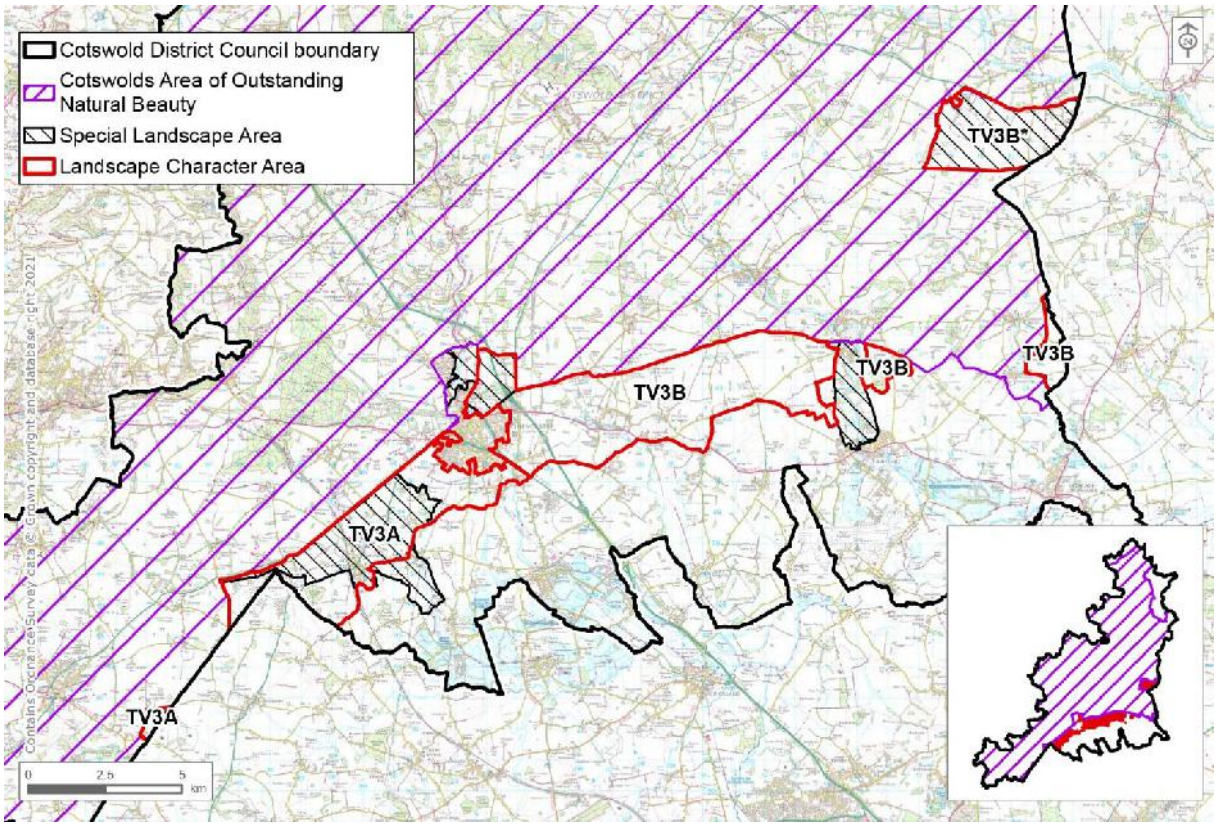
Overall recommendations:

- There are opportunities to locate solar PV developments (up to and including 20ha) on within more enclosed fields bound by hedgerows and/or woodland blocks.
- None of the landscape is identified as suitable for 'large' or 'very large' solar PV development due to its sensitivities.

Strategic landscape guidance:

- The overall aim should be to make sure that solar PV developments do not become a key characteristic of the landscape (i.e. avoiding significant cumulative impacts on the LCT from multiple developments that would result in an overall change in landscape character).
- Developments should be clearly separated so that collectively they do not have a defining influence on the overall experience of the landscape.
- New solar PV development should make use of visual enclosure provided by existing woodlands, tree belts and hedges to screen development, particularly in the west TV2A and along the southern boundary of TV2B.
- Where additional screening is required, ensure that screening provided is in character with the landscape, using appropriate species in planting.
- Ensure that solar PV developments form part of the mixed farmland mosaic – rather than becoming a dominating land use.
- Avoid locating solar PV development where it would be directly overlooked at close quarters, particularly side-on.
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the relatively undeveloped skylines.
- Ensure solar PV development does adversely affect the tranquil character of the area or detract from the enjoyment of the landscape for users of public rights of way including the Thames and Severn Way.
- Ensure new solar PV development does adversely affect the scenic qualities of the landscape or the visual setting it provides to the Cotswolds AONB to the north.
- Ensure solar PV developments do not compromise the quality of the Kemble & Ewen and Coln Valley (north of Fairford) SLAs.

Cotswolds LCT: TV3 Dip Slope Lowland



View north to Church Farm near Siddington, showing horse pasture and the grade II* listed Church of St Peter (TV3A).

View south-west across the open north-eastern section of TV3B* with views extending to pylons crossing the AONB.

View south from the edge of the Cotswolds AONB showing aircraft and hangers in the Cotswold Airport (TV3A).

Note regarding TV3B*: The 2006 Gloucestershire Landscape Character Assessment does not include a written description of the South and Mid Cotswolds Lowlands (East) LCA. This study assumes that this LCA is part of the LCT Dip Slope Lowland.

Landscape sensitivity assessment			
Criteria	**Description**	**Sensitivity Score**	
		Wind	**Solar**
Landform and scale (including sense of openness/ enclosure)	• A gently sloping lowland landform generally falling to the south-east. • Infrequent shallow tributary valleys draining into the Thames create subtle undulations which become more pronounced in the north of TV3B. • Low field boundaries and limited woodland result in a large-scale, open character. • Areas surrounding settlements often have human scale features including small fields enclosed by hedgerow trees and shelterbelts.	L-M	L-M
Landcover (including field and settlement patterns)	• A simple pattern of predominantly large scale, rectangular arable fields. • A smaller scale field pattern of improved pastures and horse grazing surrounds settlements. • Mature trees are prevalent in field boundaries or follow watercourses and line the disused canal and rail line, part of which is designated as a SSSI. • Woodland copses and shelterbelts (often geometric in shape) are scattered across the LCT, with areas of woodpasture and parkland habitats at Kemble House and Ampney Park. • The Ampney Book and some road verges are identified as LNRs. • A largely unsettled landscape of dispersed hamlets and scattered farmsteads with the nucleated settlement of Kemble in TV3A.	M	M
Historic landscape character	• Field patterns are mostly of pre-modern origin, consisting of regular planned enclosure with localised areas of irregular enclosure. • To the north of Ampney Park is an area of ancient piecemeal enclosure of strip fields, whilst modern amalgamated fields characterise the south. • Ornamental parkland characterises Kemble House and Ampney Park.	L-M	L-M

	• A landscape with a small number of historic features including the Fosse Way and Scheduled Monuments of prehistoric or Roman origin. • Industrial relicts include the disused railway line and canal. • Most settlements are protected by conservation areas and contain high concentrations of historic stone buildings.		
Visual character, (including skylines/ intervisibility)	• Open and often expansive views extend across the almost flat landscape, screened by field boundaries and shelterbelts. • Views extend to the Cotswolds AONB from the edge of the LCT. • Church towers/ spires are locally distinctive on the simple, open skylines. • Pylon lines surrounding Cirencester (TV3A and TV3B) and large aircraft and hangers at Cirencester Airport are visually intrusive.	L-M	M
Perceptual qualities	• A largely quiet landscape with a rural and remote agricultural character. • The Cotswolds Airport at Kemble, and the outskirts of Cirencester including modern development on the settlement edge, industrial estates and caravan parks, pylons and a large solar farm (East of Cirencester), have a locally urbanising influence on the LCT. • Busy roads including the A429 and A417 produce localised sound and visual disruption. • A network of public rights of way surround settlements (including the Thames Path National Trail and the D'Arcy Dalton Way) but are largely absent in the rest of the LCT.	M	M
Scenic and special qualities	• A landscape of intermittently attractive agricultural character with some pleasing combinations of features. • The Kemble & Ewen, North Cirencester and Barrington Downs SLAs (in TV3A, TV3B and TV3C respectively) are identified as being locally valued landscape that have particular qualities or character[1] including limestone walls and buildings and a strong visual unity with the Cotswolds AONB[2]. • Situated directly to the south of the Cotswolds AONB, the LCT has many views into the protected landscape and shares some of its special qualities such as tranquillity and distinctive settlements with the local Cotswold stone vernacular[3].	M-H	M-H

[1] Cotswolds District Local Plan 2011-2031

[2] Cotswolds District Special Landscape Areas Review: Landscape Context and Physical changes, 2017

[3] Cotswolds Area of Outstanding Natural Beauty Management Plan 2018-2023

Overall Assessment of Landscape Sensitivity: Wind Energy					
Sensitivity to new developments					
Very small (Up to 25m)	L				
Small (25m to 60m)		L-M			
Medium (60m to 100m)			M		
Large (100m to 150m)				M-H	
Very large (150m to 200m)					H

Summary of landscape sensitivity

The relatively large-scale, flat lowland landform and simple landcover pattern, limited time-depth and influence of modern development could indicate a lower sensitivity to wind energy development. However, areas with frequent human scale features, smaller fields surrounding settlements, semi-natural habitats and the special qualities of the landscape identified through its local designation as SLAs and its proximity to the AONB, heightens levels of sensitivity.

Areas to the north of the LCT with strong visual connections to the AONB, and areas within the Kemble & Ewen, North Cirencester and Barrington Downs SLAs would be particularly sensitive to wind energy development.

Areas with high levels of human disturbance along the route of the A419 and on the outskirts of Cirencester would be less sensitive to wind energy developments. Areas with flat, large-scale arable fields, an open character, simple skylines and distant from historic villages are likely to have a slightly lower landscape sensitivity to wind energy developments, including some eastern parts of TV3B and the west of TV3A.

Overall Assessment of Landscape Sensitivity: Solar PV Developments					
Sensitivity to new developments					
Very small (up to 1 hectare)	L				
Small (1 to 5 hectares)		L-M			
Medium (5 to 20 hectares)			M		
Large (20 to 50 hectares)					H
Very large (50 to 120 hectares)					H

Summary of landscape sensitivity

The relatively large-scale flat lowland landform with no distinctive slopes, simple landcover pattern, visually enclosed small-scale fields surrounding settlements, limited time-depth and the presence of modern development could indicate a lower sensitivity to solar PV development. However, areas with important semi-natural habitats, features of cultural heritage significance, publicly accessible areas and open arable fields (where there is little visual enclosure) and special qualities of the landscape identified through its local designation as SLAs an its proximity to the AONB, could indicate a higher sensitivity to solar PV development.

Areas that have a visual connection to the adjacent Cotswolds AONB to the north, as well as the areas within the Kemble & Ewen, North Cirencester and Barrington Downs SLAs would be particularly sensitive to Solar PV developments due to their scenic and special qualities.

Areas along the route of A14 and on the outskirts of Cirencester or areas associated with airports and military bases would have a slightly lower landscape sensitivity to solar PV developments.

Existing solar PV developments:

Crucis Park solar farm lies in the north of TV3B between the B4425 and the A417, is a large solar farm (approximately 30ha). Cirencester Solar Farm is a very large solar farm (approximately 63 ha) that has been consented and is under construction at Wilpit Lane in TV3B**.**

Recommendations and guidance for future development within the LCT

Wind energy developments

Overall recommendations:

- There may be other opportunities to site single turbines up to 100m within the larger-scale, open landscape away from more intimate areas of smaller scale pasture (ensuring the guidance below is followed).
- The scattering of turbines should be minimised to avoid significant cumulative impacts on landscape character from arising.
- None of the landscape is identified as suitable for large or very large turbines due to its sensitivities.

Strategic landscape guidance:

- Ensure that any new developments are similar in terms of siting, layout and relationship to key landscape characteristics, so as to present a simple image that relates clearly to landscape character[4].
- Avoid close juxtaposition of different turbine designs and heights within the height category, aiming instead for a consistent design and height in any given area.
- Avoid locating larger turbines in the more tranquil locations such as the villages to the north of the A417 which have distinctly small scale and rural feel, with frequent human scale features and are protected by conservation areas.
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the relatively undeveloped skylines.
- Ensure wind energy development does not detract from historic landmarks such Scheduled Monuments, villages with conservation areas and the setting of listed buildings, including church spires that are often locally important skyline features.
- Consider views from local settlements and popular recreational routes/areas including the Thames Path National Trail and the D'Arcy Dalton Way when considering the siting and design of wind energy development in the landscape.
- Ensure wind energy development does adversely affect the scenic qualities of the landscape or its visual setting to the neighbouring Cotswolds AONB to the north.
- Ensure wind energy developments do not compromise the scenic qualities and character of the Kemble & Ewen, North Cirencester and Barrington Downs SLAs.

[4] For further guidance in designing multiple wind turbine developments, see Scottish Natural Heritage (2017) Siting and Designing Wind Farms in the Landscape: Guidance. Version 3a available here.

Solar PV developments

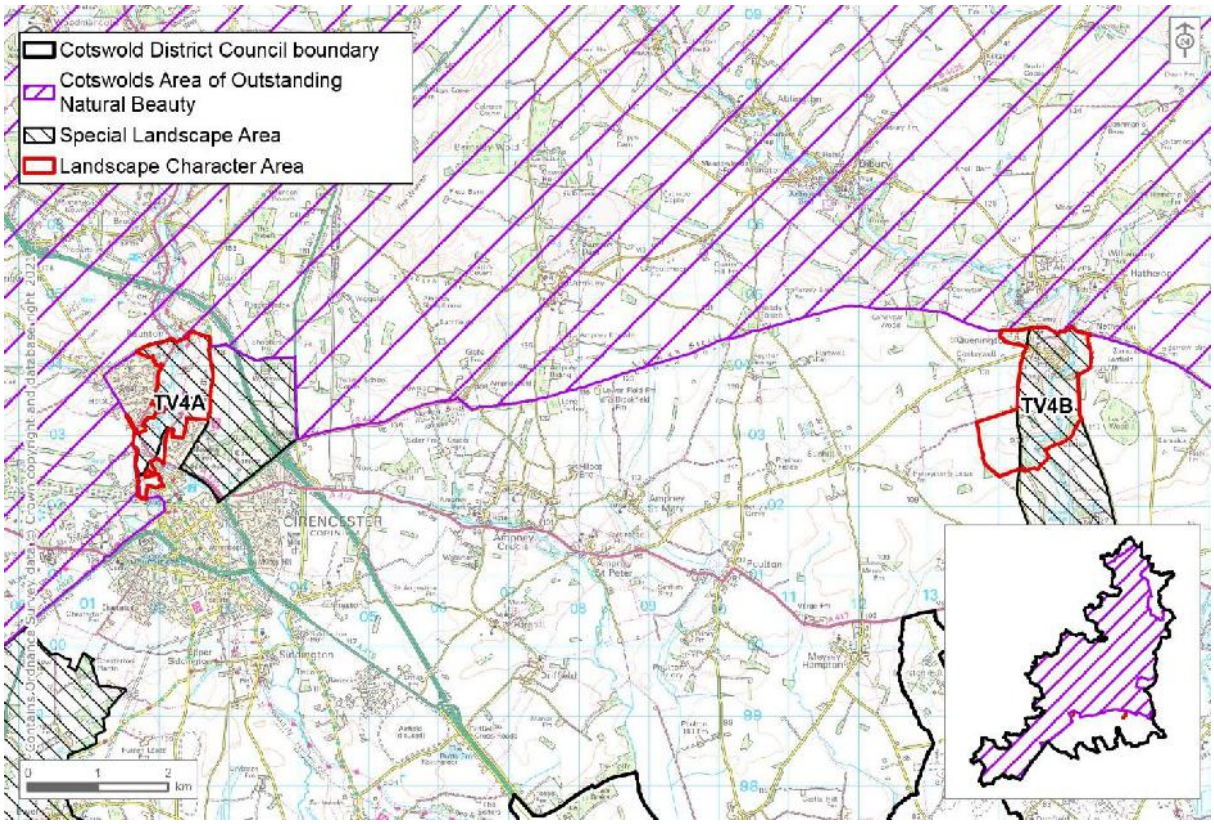
Overall recommendations:

- There are opportunities to locate solar PV developments (up to and including 20ha) on within more enclosed fields bound by tall hedgerows.
- PV developments should be sited within farmland, not semi-natural habitat, to retain the naturalistic characteristics and habitat interest.
- None of the landscape is identified as suitable for 'large' or 'very large' solar PV development due to its sensitivities.
- Consider opportunities to site new solar PV developments in association with existing built features such as on the outskirts of Cirencester or in relation to airfields or military bases.

Strategic landscape guidance:

- The overall aim should be to make sure that solar PV developments do not become a key characteristic of the landscape (i.e. avoiding significant cumulative impacts on the LCT from multiple developments that would result in an overall change in landscape character).
- Developments should be clearly separated so that collectively they do not have a defining influence on the overall experience of the landscape.
- Ensure that solar PV developments form part of the mixed farmland mosaic – rather than becoming a dominating land use.
- Avoid locating solar PV development where it would be directly overlooked at close quarters, particularly side-on.
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the relatively undeveloped skylines.
- Ensure the siting of new solar PV development does not detract from the enjoyment of the landscape for users of public rights of way including Thames Path National Trail and the D'Arcy Dalton Way.
- Ensure solar PV development does adversely affect the scenic qualities of the landscape or its visual setting to the neighbouring Cotswolds AONB to the north.
- Ensure solar PV developments do not compromise the scenic qualities and character of the Kemble & Ewen, North Cirencester and Barrington Downs SLAs.

Cotswolds LCT: TV4 Dip Slope Lowland Valley



View south over Baunton (TV4A), showing young woodland on the upper slopes.

View north-east to Quenington showing the traditional village with vernacular buildings within the valley (TV4B).

Larger arable fields on the upper slopes of TV4B, with stone walls and linear woodland enclosing the lower valley.

Landscape sensitivity assessment			
Criteria	**Description**	**Sensitivity Score**	
		Wind	**Solar**
Landform and scale (including sense of openness/ enclosure)	• The broad valley landforms of the braided rivers Churn (TV4A) and Coln (TV4B), with shallow sloping valley sides. • Low field boundaries, medium to large fields and gentle valley slopes result in areas of TV4A and upper slopes of TV4B having an open character. • Parts of the valley floors have an intimate, small-scale a character due to enclosure from surrounding wooded valley slopes and hedgerows.	M	M
Landcover (including field and settlement patterns)	• Predominantly improved pasture in TV4A, with a mix of pasture and arable land in TV4B, bounded by a mix of hedgerows, fencing and stone walls. • Important habitats include extensive areas of floodplain grazing marsh habitats along the valley floors and linear woodlands extending along the slopes of TV4B as well as young woodland in TV4A. • The River Churn and ancient woodland at The Grove are LWS. • The LCT has a rural character containing the traditional villages of Baunton and Quenington, although TV4A is overlooked by adjacent settlement.	M	M
Historic landscape character	• The HLC identifies a mixture of field patterns with most being pre-modern planned fields and some floodplain meadows typically ancient in origin. • A high density of historic features, including traditional villages with conservation areas and concentrations of listed buildings (Gloucester Street and River Walk, Cirencester Park, Baunton and Quenington). • Views to the undeveloped pastoral river valleys provide important setting to these conservation areas. • Part of the grade I listed RPG Cirencester Park extends into the southern corner of TV4A. Whilst the Grade II RPG of Hatherop Castle is situated directly north of TV4B. Both have limited visual connections to the LCT.	M-H	M-H
Visual character, (including skylines/ intervisibility)	• The landform, woodland and settlement, prevent long-distance views or visual connections to surrounding LCTs. • Views over the valleys from upper slopes are extensive and the farmed valley slopes form a backdrop to views from the valley floors. • There are some short-distance views up the valleys into the Cotswolds AONB from the northern edge of the LCT.	M	L-M

	• The tower of the grade I listed Church of St John the Baptist provides a local landmark within TV4A. • Skylines are simple, made up of buildings in surrounding settlements, mature woodlands and field boundary trees.		
Perceptual qualities	• The valleys retain a rural and tranquil agricultural character, with large areas only accessible on foot, increasing the perception of remoteness. • Public access and rights of way include Fairford Park (TV4B) and part of the Monarch's Way National Trail (TV4A). • The character of TV4A a is strongly influenced by the settlement edge of Cirencester, with views to the settlement, horsiculture and busy roads such as the A435 having a slightly urbanising influence.	M	M
Scenic and special qualities	• The LCT lies directly south of the Cotswolds AONB exhibiting many of its special qualities such as Cotswolds stone buildings, significant historical associations, ancient broadleaved woodland and high river water quality[1], contributing to a strong sense of place. • Most of the LCT falls within the North Cirencester SLA (TV4A) or Coln Valley (north of Fairford) SLA (TV4B). Both are identified as locally valued landscapes with particular qualities or character[2] including intimate small-scale landscapes, stone-built villages and a remote and rural character[3].	M-H	M-H

[1] Cotswolds Area of Outstanding Natural Beauty Management Plan 2018-2023

[2] Cotswolds District Local Plan 2011-2031

[3] Cotswolds District Special Landscape Areas Review: Landscape Context and Physical changes, 2017

Overall Assessment of Landscape Sensitivity: Wind Energy					
Sensitivity to new developments					
Very small (Up to 25m)	L-M				
Small (25m to 60m)				M-H	
Medium (60m to 100m)					H
Large (100m to 150m)					H
Very large (150m to 200m)					H

Summary of landscape sensitivity

A self-contained landscape with limited connections to neighbouring areas, few distinctive skyline features and some urban influence from surrounding settlements, which could indicate a lower sensitivity to wind energy development. However, the valley landform, visible slopes, intimate small-scale valley floors, pastoral land uses and semi-natural habitats, the concentration of features of heritage significance including historic parkland, traditional villages and stone buildings, the special qualities of the landscape identified through its local designation as SLAs and proximity and visual connections with the Cotswolds AONB, all heighten levels of sensitivity to wind energy developments.

TV4B would have a slightly higher sensitivity to any wind energy development due to its more rural and tranquil character, which is less influenced by the urban edge of Stratton and Cirencester in TV4A.

Overall Assessment of Landscape Sensitivity: Solar PV Developments					
Sensitivity to new developments					
Very small (up to 1 hectare)	L				
Small (1 to 5 hectares)		L-M			
Medium (5 to 20 hectares)				M-H	
Large (20 to 50 hectares)					H
Very large (50 to 120 hectares)					H

Summary of landscape sensitivity

A well-enclosed landscape with limited visual connections to surrounding LCTs, some urban influences from surrounding settlements, could indicate a lower sensitivity to Solar PV developments. However, visible slopes, intimate small-scale valley floors, pastoral land uses and semi-natural habitats, the concentration of features of heritage significance including historic parkland, traditional villages and stone buildings, the special qualities of the landscape identified

through its local designation as SLAs and proximity and visual connections with the Cotswolds AONB, all heighten levels of sensitivity to wind energy developments.

TV4B would have a slightly higher sensitivity to any solar PV development due to its more rural and tranquil character, which is less influenced the urban edge of Stratton and Cirencester present in TV4A.

Existing solar PV developments

There are no existing commercial scale solar PV developments in this LCT.

Recommendations and guidance for future development within the LCT

Wind energy developments

Overall recommendations:

- The scattering of turbines should be minimised to avoid significant cumulative impacts on landscape character from arising.
- None of the landscape is identified as suitable for medium to very large turbines due to its sensitivities.

Strategic landscape guidance:

- Ensure that any new developments are similar in terms of siting, layout and relationship to key landscape characteristics, so as to present a simple image that relates clearly to landscape character[4].
- Avoid close juxtaposition of different turbine designs and heights within the height category, aiming instead for a consistent design and height in any given area.
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the relatively undeveloped skylines.
- Ensure wind energy development does not detract from historic features including historic field patterns, conservation areas and adjacent RPGs.
- Avoid siting wind turbines in the smaller scale pastoral areas of the landscape which would be highly vulnerable to wind energy development
- Consider views from local settlements and popular recreational routes/areas including the Monarch's Way National Trail and Fairford Park when considering the siting and design of wind energy development in the landscape.
- Ensure wind energy development does adversely affect the scenic qualities of the landscape or the visual setting it provides to the Cotswolds AONB.
- Ensure wind energy developments do not compromise the scenic qualities and character of the North Cirencester SLA in TV4A and Coln Valley (north of Fairford) SLA in TV4B.

[4] For further guidance in designing multiple wind turbine developments, see Scottish Natural Heritage (2017) Siting and Designing Wind Farms in the Landscape: Guidance. Version 3a available here.

Solar PV developments

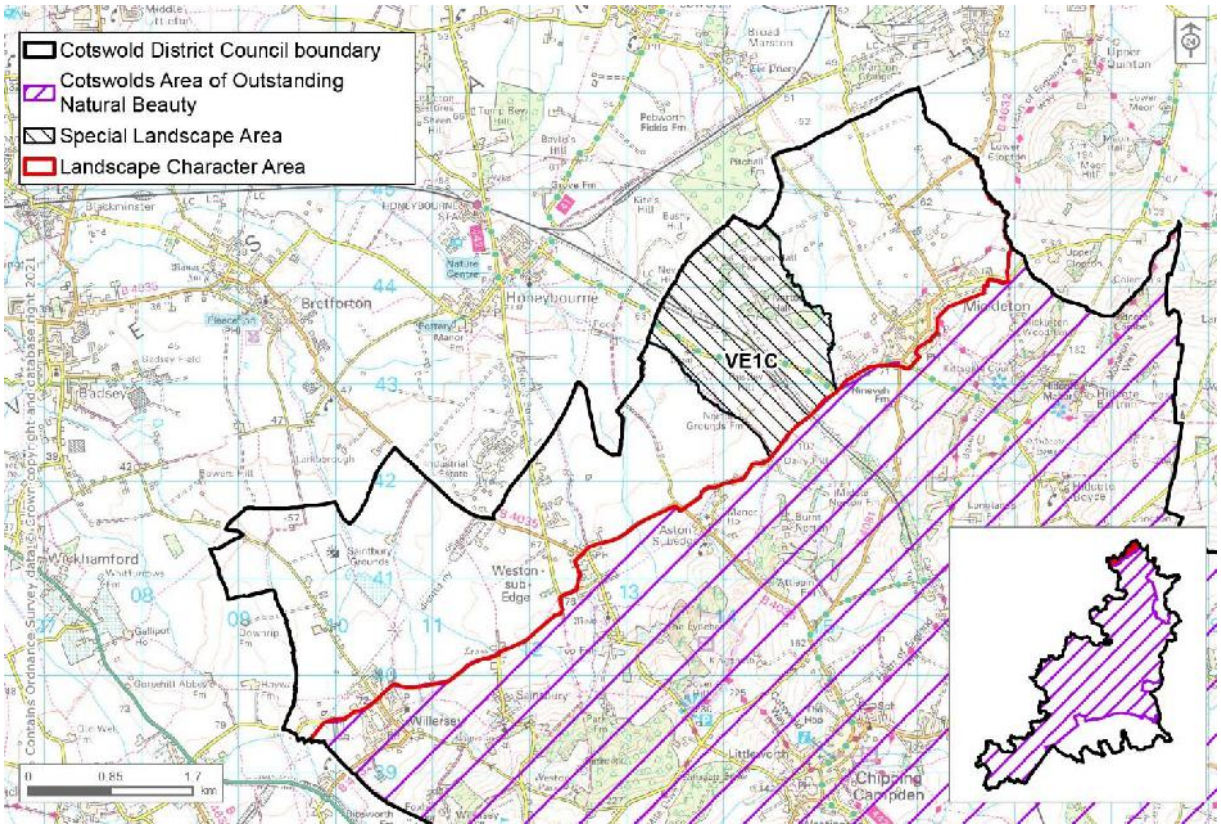
Overall recommendations:

- There are opportunities to locate solar PV developments (up to and including 5ha) within more enclosed fields on the valley floor bound by tall hedgerows or linear woodlands along the slopes, most notably in TV4B.
- PV developments should be sited within farmland, not semi-natural habitat to retain naturalistic characteristics and habitat interest.
- None of the landscape is identified as suitable for 'large' or 'very large' solar PV development due to its sensitivities.

Strategic landscape guidance:

- The overall aim should be to make sure that solar PV developments do not become a key characteristic of the landscape (i.e. avoiding significant cumulative impacts on the LCT from multiple developments that would result in an overall change in landscape character).
- Developments should be clearly separated so that collectively they do not have a defining influence on the overall experience of the landscape.
- Ensure that solar PV developments form part of the mixed farmland mosaic – rather than becoming a dominating land use.
- Where additional screening is required, ensure that it is in character with the landscape, using appropriate species in planting.
- Consider views from the elevated slopes over the valleys when considering the siting and design of solar PV development in the landscape.
- Avoid locating solar PV development where it would be directly overlooked at close quarters, particularly side-on.
- Maintain the rural character of the landscape and ensure that development does not detract from its undeveloped character or from the enjoyment of the landscape for recreational users of public rights of way including Monarch's Way National Trail and Fairford Park.
- Ensure new solar PV development does adversely affect the scenic qualities of the landscape or its visual setting to the neighbouring Cotswolds AONB to the north.
- Ensure solar PV developments do not compromise the quality of the North Cirencester SLA (TV4A) and Coln Valley north of Fairford SLA in TV4B.

Cotswolds LCT: VE1C Unwooded Vale



Views to the north-western edge of Mikleton, across arable fields to the spire of the Church of St Laurence.

View north-west from the B4632 across gently undulating large scale arable fields bound by hedgerows.

View north-east across flat arable fields to the distinctive landform of Meon Hill (outside of the district).

Landscape sensitivity assessment			
Criteria	**Description**	**Sensitivity Score**	
		Wind	**Solar**
Landform and scale (including sense of openness/ enclosure)	• A flat to gently undulating landscape except for a low ridge at Norton Hall which crosses the landscape north-west to south east. • The land rises almost imperceptibly towards the foot of the Cotswold escarpment which rises from the south eastern edge of the LCT. • Medium to large scale fields bound by hedgerows with some hedgerow trees create a mixture of enclosed and open areas. The west-facing slopes along the Norton Hall ridge are notably open.	L-M	L-M
Landcover (including field and settlement patterns)	• Regular shaped medium to large-scale arable fields predominate bound by hedgerows. • Pasture fields are more common in the west, with irregular fields situated between the B4632 and route of the disused railway line. • Woodland is limited, concentrated on the minor ridge line, with tree lines marking the route of the dismantled railway line and minor watercourses. • Small orchards scattered across the LCT and parkland add to the landscape diversity. • Relatively sparsely settled with isolated properties and farms. Mickleton is the largest settlement with modern development around its historic core. • Commercial developments are located along Honeyburn Road, with nurseries and market gardening businesses scattered across the area.	M	M
Historic landscape character	• Field patterns are pre-modern in origin, notably in the south-west, but often show signs of some alteration and amalgamation. Some remnant ridge and furrow occur. • The landscape has a small number of designated heritage features including the site of a medieval village at White's Farm (Scheduled Monument). • The historic core of Mickleton is a conservation area containing several listed buildings including the grade I listed Church of St Lawrence. • A non-designated, ornamental parkland surrounds Norton Hall with avenues and mature in-field trees.	L-M	L-M

Visual character, (including skylines/ intervisibility)	• The wooded escarpment within the Cotswolds AONB to the south and Meon Hill to the east form a backdrop to many views. • The Norton Hall ridge is locally prominent, although less so than the hills and escarpments in surrounding areas. • A pylon route crosses the north-east of the area marking the otherwise undeveloped open skylines. • The spire of the Church of St Lawrence is a locally distinctive landmark.	L-M	L-M
Perceptual qualities	• Public rights of cross the area including the Heart of England Way. • The prevalence of commercial facilities, solar PV farms, modern residential development north of Mickleton and the pylon route in the north-east have a slightly urbanising influence on the landscape. • The railway line and A-roads produce localised disturbance.	M	M
Scenic and special qualities	• A landscape dominated by large scale modern arable agriculture, with some traditional and scenic features. • The ridge of Norton Hall SLA[1] is identified as a locally valued landscape that has particular qualities or character. Its wooded skylines provide a pleasing contrast to the adjacent flat vale[2]. • The LCT lies directly north of the Cotswolds AONB and has strong intervisibility with the wooded escarpment of the Dover's Hill to Mickleton escarpment, a key characteristic of the AONB[3].	M	M

[1] Cotswolds District Local Plan 2011-2031

[2] Local Countryside Designation Review: Special Landscape Areas, 2001

[3] Cotswolds Area of Outstanding Natural Beauty Management Plan 2018-2023

Overall Assessment of Landscape Sensitivity: Wind Energy					
Sensitivity to new developments					
Very small (Up to 25m)	L				
Small (25m to 60m)		L-M			
Medium (60m to 100m)			M		
Large (100m to 150m)					H
Very large (150m to 200m)					H

Summary of landscape sensitivity

The large-scale flat to gently undulating landform and simple landcover of modern arable fields, and the urbanising influence of modern infrastructure as well as commercial and modern residential development to the north of Mickleton, could indicate a lower sensitivity to wind energy development. However, undeveloped skylines, the special landscape qualities and open slopes of the Norton Hall Ridge, and intervisibility with the adjacent escarpment within the Cotswolds AONB heighten level of landscape sensitivity to wind energy developments.

Areas within the Norton Hall SLA and those with a strong visual association with the Cotswolds AONB, would be particularly sensitive to wind energy development.

Overall Assessment of Landscape Sensitivity: Solar PV Developments					
Sensitivity to new developments					
Very small (up to 1 hectare)	L				
Small (1 to 5 hectares)		L-M			
Medium (5 to 20 hectares)			M		
Large (20 to 50 hectares)				M-H	
Very large (50 to 120 hectares)					H

Summary of landscape sensitivity

The large-scale, flat to gently undulating landform with mature treed boundaries, simple landcover, modern field patterns and urbanising influence of modern infrastructure as well as commercial and residential development to the north of Mickleton, could indicate lower levels of landscape sensitivity to solar PV development. However, the open character of the large arable fields and the visually prominent slopes and special qualities of the Norton Hall SLA and intervisibility with the adjacent escarpment within the Cotswolds AONB could indicate a higher sensitivity to solar PV development,

Areas with strong intervisibility with the Cotswolds AONB, as well as those within the Norton Hall SLA would be particularly sensitivity to solar PV developments due to their scenic and special qualities.

Areas associated with existing modern built features including roads and commercial areas as well as areas offered visual enclosure by hedgerow boundaries and/or woodland would have a reduced landscape sensitivity to solar PV developments.

Existing solar PV developments

There are two existing solar PV farms within this LCT, including a medium sized development (approxately10ha) at The Rainbows east of Badsey Lane, and a small development (approximately 7ha) at Norton Hall.

Recommendations and guidance for future development within the LCT

Wind energy developments

Overall recommendations:

- There may be opportunities to site single turbines under 100m tall within the large-scale arable fields (ensuring the guidance below is followed).
- The scattering of turbines should be minimised to avoid significant cumulative impacts on landscape character from arising.
- None of the landscape is identified as suitable for large or very large turbines due to its sensitivities.

Strategic landscape guidance:

- Ensure that any new developments are similar in terms of siting, layout and relationship to key landscape characteristics, so as to present a simple image that relates clearly to landscape character[4].
- Avoid close juxtaposition of different turbine designs and heights within the height category, aiming instead for a consistent design and height in any given area.
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the relatively undeveloped skylines.
- Ensure wind energy development does not detract from historic landmarks such as Scheduled Monuments, Mickleton Conservation Area and the setting of listed buildings, including the spire of the Church of St Lawrence which is locally distinctive on the skyline.
- Avoid siting wind turbines in the smaller scale and irregular pastoral areas of the landscape including in the south west which would be more vulnerable to wind energy development.
- Consider views from local settlements and popular recreational routes/areas including the Heart of England Way National Trail when considering the siting and design of wind energy development in the landscape.
- Ensure wind energy development does adversely affect the scenic qualities of the landscape or the visual setting it provides to the Cotswolds AONB.
- Ensure new wind energy developments do not compromise the landscape quality of the Norton Hall SLA.

Solar PV developments

Overall recommendations:

- There are opportunities to locate solar PV developments (up to and including 20ha) within more enclosed fields where they are bound by tall hedgerows or riparian vegetation more notably in TV1A and TV1C.

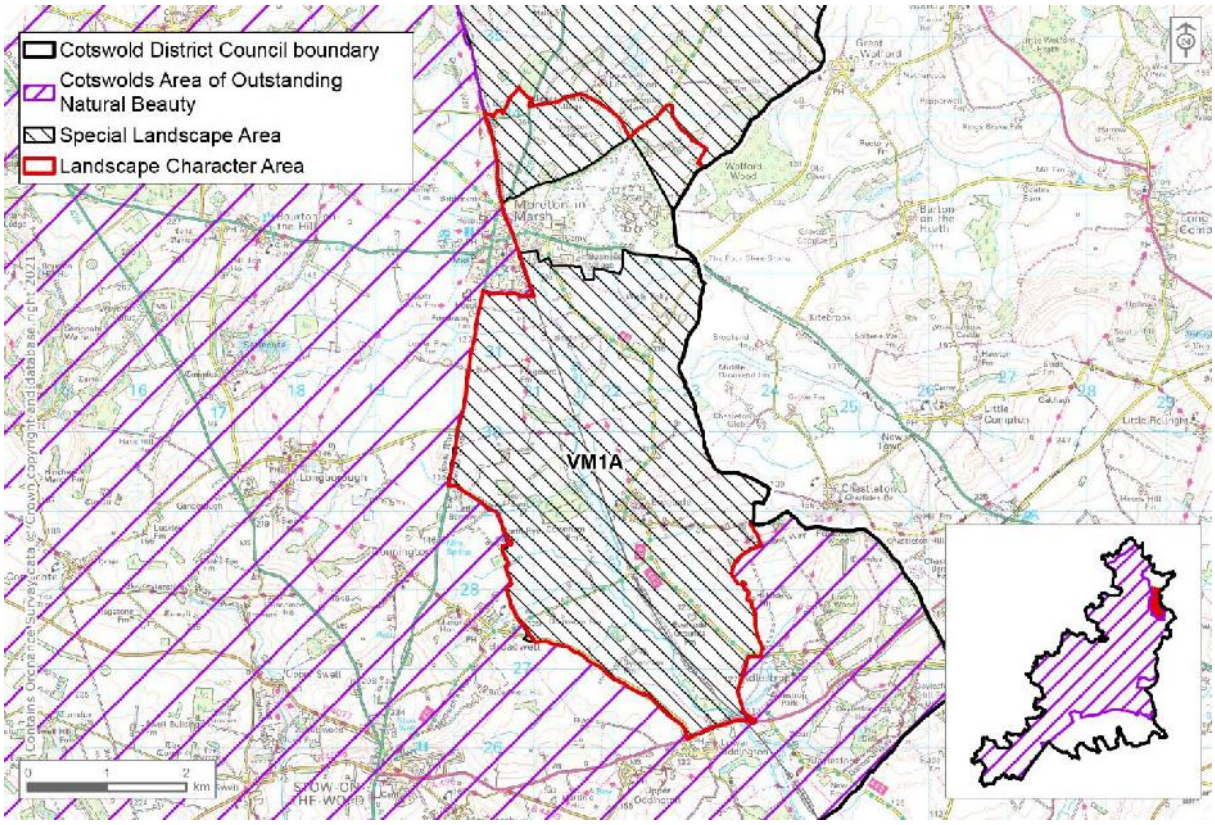
[4] For further guidance in designing multiple wind turbine developments, see Scottish Natural Heritage (2017) Siting and Designing Wind Farms in the Landscape: Guidance. Version 3a available here.

- PV developments should be sited within farmland, not semi-natural habitat to retain naturalistic characteristics and habitat interest.

Strategic landscape guidance:

- The overall aim should be to make sure that solar PV developments do not become a key characteristic of the landscape (i.e. avoiding significant cumulative impacts on the LCT from multiple developments that would result in an overall change in landscape character).
- Developments should be clearly separated so that collectively they do not have a defining influence on the overall experience of the landscape.
- Ensure that solar PV developments form part of the mixed farmland mosaic – rather than becoming a dominating land use.
- Consider views from more elevated areas, particularly the Norton Hall SLA and Cotswolds AONB escarpment when considering the siting and design of solar PV development in the landscape.
- Avoid locating solar PV development where it would be directly overlooked at close quarters, particularly side-on.
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the relatively undeveloped skylines.
- Consider views from local settlements and popular recreational routes including the Heart of England Way National Trail when considering the siting and design of solar PV developments.
- Ensure new solar PV development does adversely affect the scenic qualities of the landscape or the visual setting it provides to the Cotswolds AONB.
- Ensure new solar PV developments do not compromise the landscape quality of the Norton Hall SLA.

Cotswolds LCT: VM1A Pastoral Lowland Vale



View south towards Evenlode Grounds Farm showing ridge and furrow pasture fields in the background.

Views south-west from near Evenlode to the rising slopes within the Cotswolds AONB including a mast west of Icomb.

A minor rural lane crossing the stone Stock Bridge, with views to the elevated Cotswolds slopes to the south-west.

Landscape sensitivity assessment			
Criteria	**Description**	**Sensitivity Score**	
		Wind	**Solar**
Landform and scale (including sense of openness/ enclosure)	• A flat or gently undulating lowland landscape with the River Evenlode and tributary streams creating shallow valleys. • An intimate landscape of frequent human scale features including small-scale pastoral fields, farmsteads and woodland copses. • Hedgerow boundaries with occasional trees provide a sense of enclosure. • Locally elevated land around Evenlode has a larger scale more open character with larger fields and minimal vegetation cover.	M	L-M
Landcover (including field and settlement patterns)	• The landcover is predominantly pasture with some larger arable fields in the north, west of the A429 and in elevated areas surrounding Evenlode. • The field pattern is characterised by large and moderately sized geometric fields, with a neat patchwork of hawthorn hedges with smaller scale pastoral fields generally occurring along watercourses. • Limited woodland cover, although in places small woodland copses, hedgerow and lines of riparian trees combine to create a wooded character. • Areas semi-natural habitats add to the complexity of landscape cover, such as wet meadows and species rich grassland along watercourses. • A sparsely settled landscape characterised by scattered farms and dwellings and the small, nucleated village Evenlode. • Moreton-in Marsh, with its modern residential areas, a business park and fire service training college, has an urbanising influence locally.	M	M
Historic landscape character	• Most field patterns are 18th and 19th century enclosure. Fields along watercourses include floodplain and meadows of typically ancient origin. • Localised areas of distinctive ridge and furrow fields surround Evenlode and Evenlode Grounds Farm. • A landscape with few historic features, except for the site of a Roman town in the north (Scheduled Monument) and some isolated listed buildings. • The historic settlement of Evenlode is protected by a conservation area and contains a high concentration of listed buildings of local stone.	L-M	L-M

Visual character, (including skylines/ intervisibility)	• Open views extend across the gently undulating landscape including views to the Cotswolds AONB, particularly from elevated and open areas. • Skylines are largely undeveloped (except for settlement in the north) and marked by hedgerow trees. • The rising slopes of the Cotswolds AONB to the south and west create a distinct backdrop to this lowland landscape. • A mast to the west of Icombe is discernible on the skylines to the south-west of the LCT.	M	M
Perceptual qualities	• The south of the area retains a largely rural and tranquil agricultural character with a limited road network of minor lanes. • The north of the LCT has an urban feel due to the presence of modern residential development, the fire training college and the route of the A44. • Intermittent visual and audible disturbance from the railway line crossing the centre of the area detracts from the rural character. • Public rights of way are limited but include the Diamond Way National Trail.	M	M
Scenic and special qualities	• A landscape of intermittently attractive agricultural character with some pleasing combinations of features. • Locally designated as part of the Moreton-in-Marsh Surrounds SLA[1], the area is identified as having particular qualities including sweeping views to the Cotswolds Hills which give it a distinct sense of place[2]. • The landscape has a strong visual connection with the Cotswolds AONB, as well as possessing many of the special qualities of the protected landscape including rural tranquillity and the use of Cotswolds stone[3].	M-H	M-H

[1] Cotswolds District Local Plan 2011-2031

[2] Local Countryside Designation Review: Special Landscape Areas, 2001

[3] Cotswolds Area of Outstanding Natural Beauty Management Plan 2018-2023

Overall Assessment of Landscape Sensitivity: Wind Energy					
Sensitivity to new developments					
Very small (Up to 25m)	L				
Small (25m to 60m)			M		
Medium (60m to 100m)				M-H	
Large (100m to 150m)					H
Very large (150m to 200m)					H

Summary of landscape sensitivity

The generally flat lowland landform, areas of larger scale field patterns and modern development in the north could indicate a lower sensitivity to wind energy development. However, it's intimate scale with many human scale features, areas of semi-natural habitats (particularly along the watercourses), pockets of ancient field patterns, undeveloped skylines, the special qualities of the landscape identified through its designation as an SLA and the strong visual connection to the Cotswolds AONB, could indicate a higher sensitivity to wind energy development.

Areas with a strong visual connection to the AONB, would be particularly sensitive to wind energy development.

The north of the LCT surrounding Moreton-in-Marsh where there are larger scale field patterns and a more developed character would have a slightly lower sensitivity to wind energy.

Overall Assessment of Landscape Sensitivity: Solar PV Developments					
Sensitivity to new developments					
Very small (up to 1 hectare)	L				
Small (1 to 5 hectares)			M		
Medium (5 to 20 hectares)				M-H	
Large (20 to 50 hectares)					H
Very large (50 to 120 hectares)					H

Summary of landscape sensitivity

The generally flat lowland landform with no distinctive slopes, areas of larger scale fields and modern development in the north could indicate lower sensitivity to solar PV development. However, visually enclosure provided by hedgerows and woodland, areas of important habitats (particularly along watercourse) pockets of ancient field patterns, features of cultural heritage significance, undeveloped skylines and the special qualities of the landscape identified through its designation as a SLA, and a strong visual connection to the Cotswolds AONB could indicate a higher sensitivity to solar PV development.

Areas with a strong visual connection to the AONB, would be highly sensitive to solar PV development.

The north of the LCT surrounding Moreton-in-Marsh which has a more developed character has a slightly lower sensitivity to solar PV development.

Existing solar PV developments

There are no existing commercial scale solar PV developments in this LCT.

Recommendations and guidance for future development within the LCT

Wind energy developments

Overall recommendations:

- There may be opportunities to site single turbines up to 25m within the more large-scale, open rolling landscape away from the more intimate areas of smaller scale pasture and woodland (ensuring the guidance below is followed).
- The scattering of turbines should be minimised to avoid significant cumulative impacts on landscape character from arising.
- None of the landscape is identified as suitable for large or very large turbines due to its sensitivities.

Strategic landscape guidance:

- Ensure that any new developments are similar in terms of siting, layout and relationship to key landscape characteristics, so as to present a simple image that relates clearly to landscape character[4].
- Avoid close juxtaposition of different turbine designs and heights within the height category, aiming instead for a consistent design and height in any given area.
- Avoid locating larger turbines in the more rural and tranquil south of the LCT, where there is a distinct lack of human disturbance.
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the relatively undeveloped skylines.
- Ensure wind energy development does not detract from historic features such as historic field patterns, Scheduled Monuments, villages with conservation areas and the setting of listed buildings.
- Avoid siting wind turbines in the smaller scale and irregular pastoral areas of the landscape including along stream valleys which would be highly vulnerable to wind energy development
- Consider views from local settlements and popular recreational routes/areas including Dimond Way National Trail when considering the siting and design of wind energy development in the landscape.
- Ensure wind energy development does adversely affect the scenic qualities of the landscape recognised through its designation as a SLA, or the rural setting it provides to the Cotswolds AONB.

Solar PV developments

Overall recommendations:

- There are opportunities to locate solar PV developments (up to and including 5ha) within more sheltered fields where they are bound by tall hedgerows or riparian vegetation.

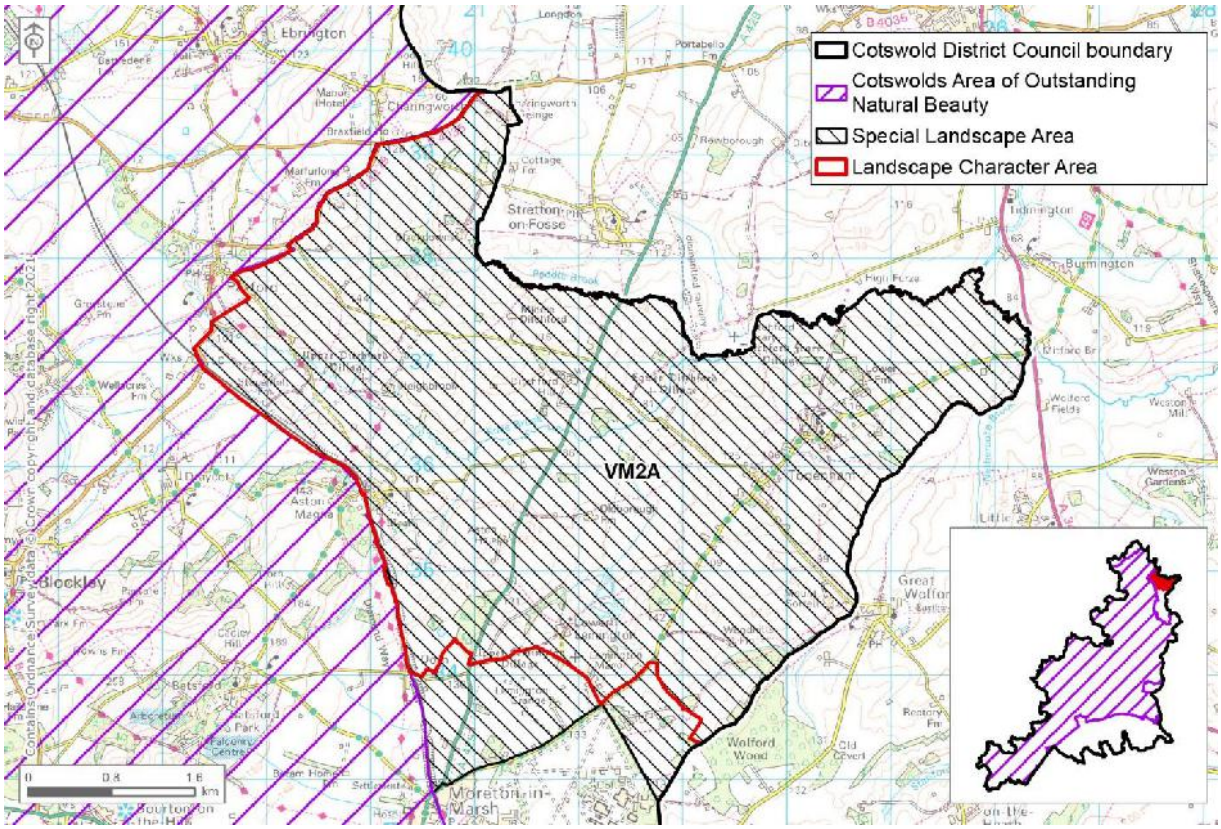
[4] For further guidance in designing multiple wind turbine developments, see Scottish Natural Heritage (2017) Siting and Designing Wind Farms in the Landscape: Guidance. Version 3a available here.

- There may be opportunities to locate new solar PV developments of up to 20ha in the north of the LCA in area strongly associated with existing development.
- None of the landscape is identified as suitable for 'large' or 'very large' solar PV development due to its sensitivities.

Strategic landscape guidance:

- The overall aim should be to make sure that solar PV developments do not become a key characteristic of the landscape (i.e. avoiding significant cumulative impacts on the LCT from multiple developments that would result in an overall change in landscape character).
- Developments should be clearly separated so that collectively they do not have a defining influence on the overall experience of the landscape.
- Ensure that solar PV developments form part of the mixed farmland mosaic – rather than becoming a dominating land use.
- PV developments should be sited within farmland, avoiding semi-natural habitat in order to retain the naturalistic characteristics and habitat interest.
- Where additional screening is required, ensure that screening provided is in character with the landscape, using appropriate species in planting.
- Where additional screening is required, ensure that screening provided is in character with the landscape, using appropriate species in planting.
- Consider views from public rights of way when considering the siting and design of solar PV development in the landscape.
- Avoid locating solar PV development where it would be directly overlooked at close quarters, particularly side-on.
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the relatively undeveloped skylines.
- Ensure solar PV development does adversely affect the scenic qualities of the landscape recognised through its designation as a SLA, or the rural setting it provides to the Cotswolds AONB.

Cotswolds LCT: VM2A Undulating Lowland Vale



The spire of the church of St Thomas of Canterbury in Todenham is a distinctive historic feature on the skyline.

View south-west across sheep pasture from near Todenham showing well-wooded slopes in the south-west of the LCT.

View south across the valley of the Knee Brook from near Dichford Hill, showing long-distance views.

Landscape sensitivity assessment			
Criteria	**Description**	**Sensitivity Score**	
		Wind	**Solar**
Landform and scale (including sense of openness/ enclosure)	• An undulating landscape of rounded hills and ridges between the shallow winding stream valleys of the Knee Brook and its tributaries. • Undulations in the landform and hedgerows with mature hedgerow trees provide a sense of local enclosure, particularly on valley bottoms. • Rolling larger-scale arable fields with limited woodland cover and exposed valley slopes have a more open character. • Human scale features include frequent hedgerow trees, farmsteads and church spires.	M-H	M-H
Landcover (including field and settlement patterns)	• A patchwork of irregular arable and pastoral fields enclosed by hedgerows containing scattered mature trees and often bordered with drainage ditches. • Field patterns are generally large-scale with some modern amalgamation of arable fields near Aston Magna and in the centre of the LCT, as well as some smaller-scale fields surrounding Todenham. • Occasional woodland blocks and traditional orchards add to the diversity of landcover. • The south of the LCT has a more wooded character, including Aston Hale and Dunsden Coppice and Lemington Coppice which are of ancient origin and identified as LNRs. • A sparse rural settlement pattern dominated by dispersed linear villages and scattered farmsteads. Buildings often use local Marlstone Rock or brick.	M	M
Historic landscape character	• The HLC indicates that field patterns are a mix of irregular fields including piecemeal enclosure of open strip fields, floodplain and meadows (typically of ancient origin). • Important historical features include the remains of the abandoned medieval settlements of Upper and Lower Dichford and the moated Aston Magna Castle (all Scheduled Monuments). • The villages of Aston Magna and Todenham are protected by conservation areas and contain high concentrations of listed buildings • The A429 roughly follows the route of the Fosse Way, a Roman road.	M	M
Visual character, (including	• Elevated slopes are visually prominent and afford long-distance sweeping views with big skies.	M	M

skylines/ intervisibility)	• The distinctive landforms of the Cotswolds AONB to the north-west and west (LCA 1f and 15b) and Brailes Hill to the north-east, are visible from the LCT. • In places, views are restricted by undulations in the landform and mature hedgerow vegetation. • The spire of the grade I listed Church of St Thomas of Canterbury in the hilltop village of Todenham and the St Michal and All Angels Church in Wolford (to the west of the LCT) are locally distinctive landmarks. • Skylines are largely open, simple and undeveloped.		
Perceptual qualities	• The landscape has a remote and tranquil agricultural character with limited human disturbance except from the A29 and railway line. • A network of public rights of way cross the landscape, including the Diamond Way National Trail.	M-H	M-H
Scenic and special qualities	• Locally designated as part of the Moreton-in-Marsh Surrounds SLA[1], the area is identified as a locally significant and valued landscape with particular qualities including sweeping views to higher land which gives it a distinct sense of place[2]. • The landscape has a strong visual connection with the Cotswolds AONB to the west as well as possessing many of the special qualities of this protected landscape including areas of rural tranquillity, 'big' skies and long-distance views[3].	M-H	M-H

[1] Cotswolds District Local Plan 2011-2031

[2] Local Countryside Designation Review: Special Landscape Areas, 2001

[3] Cotswolds Area of Outstanding Natural Beauty Management Plan 2018-2023

Overall Assessment of Landscape Sensitivity: Wind Energy					
Sensitivity to new developments					
Very small (Up to 25m)	L				
Small (25m to 60m)			M		
Medium (60m to 100m)				M-H	
Large (100m to 150m)					H
Very large (150m to 200m)					H

Summary of landscape sensitivity: The gently undulating landform and areas of larger scale field patterns could indicate a lower sensitivity to wind energy development. However, human scale features, irregular field patterns (some of which are ancient), deciduous woodlands (some of ancient origin), features of historic significance (including traditional villages), undeveloped skylines, the rural tranquil character and special qualities of the landscape identified through its designation as a SLA along with the strong visual connection to the Cotswolds AONB could indicate a higher sensitivity to wind energy development.

Areas with a strong visual connection to the AONB, would be particularly sensitive to wind energy development.

Overall Assessment of Landscape Sensitivity: Solar PV Developments					
Sensitivity to new developments					
Very small (up to 1 hectare)		L-M			
Small (1 to 5 hectares)			M		
Medium (5 to 20 hectares)				M-H	
Large (20 to 50 hectares)					H
Very large (50 to 120 hectares)					H

Summary of landscape sensitivity: Localised areas with visual enclosure due to topography and vegetation, and the gentle landform could indicate a lower sensitivity to solar PV development. However, the open character of the rolling fields and visually prominent slopes, irregular field patterns (some of which are ancient), deciduous woodlands (some of ancient origin), features of historic significance (including traditional villages), undeveloped skylines, the rural tranquil character and special qualities of the landscape identified through its designation as a SLA, along with the strong visual connection to the Cotswolds AONB could indicate a higher sensitivity to solar PV development.

Areas with a strong visual connection to the AONB, would be particularly sensitive to solar PV developments. Avoid siting Solar PV developments on the open slopes where they would have localised visual prominence.

Existing solar PV developments: There are no existing commercial scale solar PV developments in this LCT.

Recommendations and guidance for future development within the LCT

Wind energy developments

Overall recommendations:

- There may be opportunities to site occasional single turbines up to 60m within the more large-scale, open rolling landscape away from the more intimate areas of smaller scale pasture and woodland (ensuring the guidance below is followed).
- The scattering of turbines should be minimised to avoid significant cumulative impacts on landscape character from arising.
- None of the landscape is identified as suitable for large or very large turbines due to its sensitivities.

Strategic landscape guidance:

- Ensure that any new developments are similar in terms of siting, layout and relationship to key landscape characteristics, so as to present a simple image that relates clearly to landscape character[4].
- Avoid close juxtaposition of different turbine designs and heights within the height category, aiming instead for a consistent design and height in any given area.
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the relatively undeveloped skylines.
- Ensure wind energy development does not detract from historic landmarks including the numerous Scheduled Monuments, villages with conservation areas and the setting of listed buildings, including churches with spires that are often locally important skyline features.
- Avoid siting wind turbines in smaller scale and irregular pastoral areas of the landscape including areas surrounding Todenham which would be highly vulnerable to wind energy development.
- Consider views from local settlements and popular recreational routes/areas including the National Trails and the Country Parks when considering the siting and design of wind energy development in the landscape.
- Ensure wind energy development does adversely affect the scenic qualities of the landscape recognised through its designation as a SLA, or the rural setting it provides to the Cotswolds AONB.

[4] For further guidance in designing multiple wind turbine developments, see Scottish Natural Heritage (2017) Siting and Designing Wind Farms in the Landscape: Guidance. Version 3a available here.

Solar PV developments

Overall recommendations:

- There are opportunities to locate solar PV developments (up to and including 5ha) on within more sheltered fields where they are visually enclosed by folds in the landform, tall hedgerows or lines of riparian vegetation.
- None of the landscape is identified as suitable for 'large' or 'very large' solar PV development due to its sensitivities.

Strategic landscape guidance:

- The overall aim should be to make sure that solar PV developments do not become a key characteristic of the landscape (i.e. avoiding significant cumulative impacts on the LCT from multiple developments that would result in an overall change in landscape character).
- PV developments be sited within farmland, avoiding semi-natural habitat to retain the naturalistic characteristics and habitat interest.
- Developments should be clearly separated so that collectively they do not have a defining influence on the overall experience of the landscape.
- Locate solar PV development in sheltered folds in the landscape where it will be less visible and have less of an influence on landscape character.
- Ensure that solar PV developments form part of the mixed farmland mosaic – rather than becoming a dominating land use.
- Consider views from more elevated areas within the LCT which may overlook the area when considering the siting and design of solar PV development in the landscape.
- Avoid locating solar PV development where it would be directly overlooked at close quarters, particularly side-on.
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the relatively undeveloped skylines.
- Ensure solar PV development does adversely affect the scenic qualities of the landscape recognised through its designation as a SLA, or the rural setting it provides to the Cotswolds AONB.

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Annex E

Appendix D: Assessment Assumptions

Table 1 – Property statistics for Cotswold District (2019)	
No of domestic properties	
Terrace/end-terrace dwelling	9,082
Semi-detached dwelling	12,864
Detached dwelling	14,733
Dwelling in purpose-built block of flats or tenement	5,750
Bungalow	1,761
Total	47,624
No of non-domestic properties	
Commercial/industrial buildings	3,434
Total	3,434
Miscellaneous	
Overall proportion of 'off-gas' properties	36.75%
Average annual heat demand per dwelling	13,629 kWh
Average annual heat demand per non-domestic property	356,274 kWh

Notes:

- Dwelling statistics and non-domestic statistics from OS mapping datasets.
- Off-gas proportion from: https://www.gov.uk/government/statistics/lsoa-estimates-of-households-not-connected-to-the-gas-network
- Heat demand estimates derived from gas consumption statistics for Cotswold District: www.gov.uk/government/statistical-data-sets/gas-sales-and-numbers-of-customers-by-region-and-local-authority

Table 2 – Future housing development in Cotswold District	
Local Plan (to 2031)	
Committed dwelling at 1st Apr 2020	3,344
Cotswold District Local Plan 2011-31 adopted 3 August 2018 as of 1st April 2019	452
Windfall Allowance	1,272
Lapse Rate	-157
Total Housing Supply	**4,911**

Table 3 – Emission factors	
Fuel	**Emission Factor [kgCO_2e/kWh]**
Grid electricity	0.136
Mains gas	0.210
Heating oil	0.298
Wood logs	0.028

Notes:

- Factor for grid electricity assumed to be that proposed for SAP10.1 (see www.bregroup.com/sap/sap10/).
- Potential CO_2 savings (tonnes/yr) calculated by multiplying the potential electricity output / Delivered heat (MWh/year) by the above emissions factors.

Table 4 – Assumptions for roof-mounted solar resource			
Solar PV Model Parameters		**Solar Cost-Benefit Model Parameters**	
Horizon search radius in metres	1000	Period (years)	25
Horizon compass slices	16	Discount rate (potential interest per year from alternative investment)	0.035
Maximum roof slope for PV	80	Cost of electricity, £/kWh	0.16
Minimum roof area m² for PV installation	10	0-10 kWp: £ per kWp for installation	1,429
Percentage of a roof plane usable for mounting panels	0.75	10-100 kWp: £ per kWp for installation	922
Minimum degree distance from North for PV	45	kWp > 100: £ per kWp for installation	714
Angle (degrees) to mount panels on flat roofs	10	0-10 kWp: fixed cost/£	0
Nominal peak power (kWp) per m² of roof	0.12	10-100 kWp: fixed cost/£	0
PV technology	Crystalline silicon	kWp > 100: fixed cost/£	0
Maximum angle of the average horizon between ESE and WSW in degrees	35	0-10 kWp: VAT rate	0.05
		10-100 kWp: VAT rate	0.2
		kWp > 100: VAT rate	0.2
Notes: Industry accepted figures and commercial quotes			

Table 5 – Woodfuel: assumptions for forestry and woodland resource

- Data from National Inventory of Woodland and Trees
- Does not include 'felled', 'shrub' or 'young trees' categories
- Due to a predominance of broadleaf woodland, the sustainable woodfuel yield is assumed to be 2 odt/yr (oven-dried tonnes/year) source: www.biomassenergycentre.org.uk
- Energy content of wood assumed to be 5,150 kWh/tonne
- Boiler efficiency assumed to be 87% (converting woodfuel to delivered heat)
- Counterfactual heating fuels assumed to be:
    - 19.7% of resource offsetting electricity (using proportional proxy of 54% of off-gas properties)
    - 12% of resource offsetting oil (using proportional proxy of 33% of off-gas properties)
    - 5.1% of resource offsetting oil (using proportional proxy of 14% of off-gas properties)
    - 63.3% of resource offsetting gas (using proportional proxy of on-gas properties)

Table 6 – Wind resource assessment parameters			
Parameter	**Assumption**	**Data source**	**Justification and notes**
Wind turbine size	Five turbine sizes were considered: • Very large (150-200m tip height) • Large (100-150m tip height) • Medium (60-100m tip height) • Small (25-60m tip height) • Very small (<25m height) Assessment was based on notional turbine sizes, approximately intermediate within each class size i.e. • Very large: 175m tip height • Large: 125m tip height • Medium: 80m tip height • Small: 45m tip height No mapped-based assessment of 'very small' turbines was undertaken. The type of buffers applied to constraints for the assessment of other turbine size categories in many cases do not	• CSE and LUC • Research into turbine manufacturers • BEIS renewable energy planning database and other databases containing information on wind turbine applications	There are no standard categories for wind turbine sizes. The categories chosen are based on consideration of currently and historically 'typical' turbine models at various different scales. The approach is intended to be flexible in the light of uncertainty regarding future financial support for renewable energy. A review of wind turbine applications across the UK showed tip heights ranging from less than 20m up to around 200m, with larger turbine models in demand from developers following the reduction in financial support from Government. The majority of operational and planned turbines range between 80m and 175m. Due to the structure of the financial support system in the past, smaller turbines (those in the medium to small categories) have tended to be deployed as 1-2 turbine developments.

Table 6 – Wind resource assessment parameters			
Parameter	**Assumption**	**Data source**	**Justification and notes**
	reasonably apply to very small turbines. Equally, mapping a strategic district-wide 'resource' for very small turbines (which are generally developed singly in association with particular farm or other buildings) is not particularly meaningful. Instead, it is recommended that policy references the entire plan area as suitable for very small wind in principle (subject to site-specific assessment) with the exception of a defined list of constraints such as designated ecological sites.		
Wind Speed	Include: • All areas with mean annual average wind speed ≥5 m/s at 50m above ground level (agl)	• Global Wind Atlas/Vortex • Industry practice	The majority of Cotswold District meets and exceeds the minimum requirement of 5m/s. Wind speed requirements change with turbine scale and model. Some turbine manufacturers produce models which may operate at lower wind speeds and the configuration of certain turbine models can be altered to improve yield in lower wind speed environments.

Table 6 – Wind resource assessment parameters			
Parameter	**Assumption**	**Data source**	**Justification and notes**
			Future changes in government policy and turbine technology could allow developments to be deliverable at lower wind speeds than are currently viable. A 5m/s threshold was applied to take account of such changes.

Roads	Exclude:
	• Roads with a buffer of
	  ○ the height of the turbine (to blade tip height) +50m (Large and Very Large scales)
	  ○ the height of the turbine (to blade tip) x 1.5 (Medium and Small scales).
	• Anticipated road infrastructure: A417 Missing Link
		• Ordnance Survey VectorMap District.
		• Cotswold District Council
			These buffers were applied as a safety consideration. The proposed buffer distance is based on Department for Transport/Highways Agency guidance (2013)[1] as referenced in National Planning Practice Guidance (NPPG). This guidance relates explicitly to the strategic road network, but as guidance is lacking relating to other roads, the same approach was applied to all roads for the purposes of consistency. The guidance states that different buffers should be applied based on the scale of the turbine being proposed.
			Note: Only line data for roads was available and in order to create a footprint from the road centre, it was assumed that single carriageways are 10m in width, dual carriageways 20m and motorways 30m.

[1] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/237412/dft-circular-strategic-road.pdf

Table 6 – Wind resource assessment parameters			
Parameter	**Assumption**	**Data source**	**Justification and notes**

Railways	Exclude:
	• Railways, including protected former railway lines (Local Plan policy INF3 and SP6), with a buffer of
	  ○ the height of the turbine (to blade tip) +50m (Large and Very Large scales)
	  ○ the height of the turbine (to blade tip) x 1.5 (Medium and Small scales)
		• Ordnance Survey VectorMap District
		• Cotswold District Council
			This buffer was applied as a safety consideration, based on the same principles as used for roads. Note: In order to create a footprint from the railway centrelines data, it was assumed that railways are 15m in width.

Public Rights of Way Cycle Paths	Exclude: • Public Rights of Way, including the Lechlade to Fairford multi-use path (Local Plan policies S5 and S7), and cycle paths with a buffer of the height of the turbine (to blade tip height) i.e. topple distance	• Cotswold District Council • Sustrans	This buffer was applied as a safety consideration. There has never been any statutory requirement relating to separation distances between wind turbines and pedestrian, equestrian and cycle routes. Applying a general separation distance based on tip height ('topple distance') is considered a reasonable approach, and was cited as a suitable buffer in the Companion Guide to Planning Policy Statement 22. Note: In order to create a footprint from the Public Rights of Way and cycle path centrelines data, it was

Table 6 – Wind resource assessment parameters			
Parameter	**Assumption**	**Data source**	**Justification and notes**
			assumed that Public Rights of Way, Bridleways and cycle paths are 2m in width.
Transmission lines	Exclude: • Major transmission lines with a buffer of the height of the turbine (to blade tip height) +10%.	• OS Vector Mapping	This buffer was applied as a safety consideration. It is derived from guidance by the Energy Networks Association (Engineering Recommendation L44) and National Grid (Technical Advice Note 287)
Airports and Airfields	Exclude: • operational airports and airfields	• Ordnance Survey VectorMap Local Functional Site layer with the theme 'Air Transport'	OS VectorMap Local Functional Site data with the theme Air Transport was used in the assessment
MOD Land	Exclude: • MOD land in active use	• Cotswold District Council • OS Mapping	Plan of MOD landholdings provided by Cotswold District. Landholdings were digitised and cross referenced against OS 1:25000 mapping Verification of boundaries and present use was sought from CDC.

Table 6 – Wind resource assessment parameters			
Parameter	**Assumption**	**Data source**	**Justification and notes**
NATS Safeguarding Areas	Guidance includes reference to the following safeguarding areas: • 30km for aerodromes with a surveillance radar facility. • 17km for non-radar equipped aerodromes with a runway of 1,100 m or more, or 5km for those with a shorter runway. • 4km for non-radar equipped unlicensed aerodrome with a runway of more than 800m or 3km with a shorter runway. • 10km for the air-ground-air communication stations and navigation aids. • 15 nautical miles (nm) for secondary surveillance radar. These are indicative of potential constraints to wind development but cannot be used to definitively exclude land as unsuitable. They are generally presented as separate figures alongside the	• NATS	Further consultation between potential developers and NATS is required to determine if there is any impact from a proposed development. NATS safeguarding areas were therefore not excluded.

Table 6 – Wind resource assessment parameters			
Parameter	**Assumption**	**Data source**	**Justification and notes**
	main assessment of technical potential.		
Noise	Exclude: • Residential and commercial buffer zones based on turbine size: ○ Very large scale: 500m for residential/ other sensitive receptors[2], 250m for non-residential. ○ Large scale: 480m for residential/ other sensitive receptors, 230m for non-residential. ○ Medium scale: 400m for residential/ other sensitive receptors,	• Cotswold District Council Local Land and Property Gazetteer (LLPG) Residential and Commercial address points • OS OpenMap Local Buildings layer for buildings adjacent to the District Boundary	Wind turbines generate sound during their operation, and their noise impacts upon nearby properties must be limited to appropriate levels, defined in particular by the 'ETSU' Guidance – The Assessment and Rating of Noise from Wind Farms (1995) (as supplemented by the Institute of Acoustics). The relationship between turbine size and the separation distance from properties at which acceptable noise levels will be achieved is in practice quite complex and variable. However, the present assessment has applied specialist acoustic advice to define minimum distances below which it is generally unlikely that the required noise levels under ETSU-R-97 will be achievable. The approach taken necessarily involves applying various assumptions, including: - an assumed single turbine development in all cases (rather than multiple turbines)

[2] Sensitive receptors include schools, hospitals and care homes. These were identified via the LLPG data.

Table 6 – Wind resource assessment parameters			
Parameter	**Assumption**	**Data source**	**Justification and notes**
	180m for non-residential. ○ Small scale: 180m for residential/other sensitive receptors 80m for non-residential. For properties outside (but close to) the District Boundary, indicative buffers were applied to the available property/ buildings data from OS Vector Map. As this data does not distinguish commercial and residential properties, and it was not possible to verify uses by other means, residential buffers were used throughout.		- the assumption that no properties will be 'financially involved' in the wind development (financial involvement may allow higher noise levels to be accepted in individual cases). The limitations associated with such assumptions are considered preferable to avoiding the use of noise-related separation distances for the assessment, bearing in mind that noise is a key factor that influences the acceptable siting of turbines in practice. The assessment defines the *minimum* distances below which adherence to the Industry standard (ETSU-R-97) noise guidance would not be possible and it should not be inferred that the proposed distances represent acceptance of any given proposal within the areas of identified suitable potential as site based noise monitoring and assessments would still be required.
Shadow Flicker	No land excluded on this basis	• N/A	Wind turbines may in some circumstances cause 'shadow flicker' within nearby properties. However, shadow flicker effects are readily mitigated and so shadow flicker was not considered as a constraint for the purposes of this study.

Table 6 – Wind resource assessment parameters			
Parameter	**Assumption**	**Data source**	**Justification and notes**

Future developments	Exclude:
	• Site allocations from adopted Cotswold District Local Plan:
	  ○ Burial Ground Allocations
	  ○ Car Park Allocations
	  ○ Cemetery Extensions
	  ○ Employment Centres
	  ○ Housing Allocations
	  ○ Mixed Use Allocations
	  ○ Strategic Site Allocations
	  ○ Gypsy and Traveller Sites
		• Cotswold District Council	Generally unsuitable for wind turbine development, unless allocations contain relatively large undeveloped portions. Identification of suitable land for wind within specific allocation boundaries would require a separate site-specific study.

Employment Sites	Exclude: • Established employment centres from adopted Cotswold District Local Plan	• Cotswold District Council	Generally unsuitable for wind turbine development, unless sites contain relatively large undeveloped portions. Identification of suitable land for wind within specific allocation boundaries would require a separate site-specific study.
Existing Renewable Energy Developments	Exclude: • Land boundaries of consented and operational renewable energy installations	• BEIS • Cotswold District Council	The quarterly BEIS Renewable Energy Planning Database was used to determine the locations of operational and consented renewable energy installations, supplemented by planning data from

Table 6 – Wind resource assessment parameters			
Parameter	**Assumption**	**Data source**	**Justification and notes**
			Cotswold District Council. This information was cross-referenced with Inspire land boundary data obtained from the Land Registry.
Terrain	Exclude: • Slopes greater than 15 degrees.	• OS Terrain 50	This is a development/ operational constraint. Developers have indicated that this is the maximum slope they would generally consider feasible for development. Although it is theoretically possible to develop on areas exceeding 15° slopes, turbine manufacturers are considered unlikely to allow turbine component delivery to sites where this is exceeded.
Water Environment	Exclude: • Watercourses and waterbodies with 50m buffer.	• Ordnance Survey Rivers • Ordnance Survey VectorMap District	A 50m buffer was applied around all rivers and waterbodies to take account of good practice such as that relating to pollution control during construction. OS Survey VectorMap District surface water data includes waterways of approximately a minimum of 2m width. OS Rivers data is line data, and so a 1m buffer was applied to approximate a footprint of smaller waterways.
Woodland	Exclude:	• Forestry Commission	All areas of woodland were excluded with a + 50m buffer to reduce risk of impact on bats.

Table 6 – Wind resource assessment parameters			
Parameter	**Assumption**	**Data source**	**Justification and notes**
	• Woodland as shown on the National Forest Inventory and Ancient Woodland Inventory	• Natural England	A 50m clearance distance of turbines from trees and other habitat features is standard practice and endorsed by Natural England guidance set out in 'TIN051'. A 50m horizontal buffer is a reasonable proxy clearance for the purposes of a strategic study bearing in mind unknowns concerning tree height and turbine dimensions. A 50m buffer cannot be applied to all linear habitat features and individual trees due to a lack of data for a study of this scale.
Biodiversity (International designations)	Exclude international designations[3]: • Special Areas of Conservation (SAC)	• Natural England	As protected by: • Conservation of Habitats and Species Regulations 2017 (as amended). A blade radius buffer has been applied to avoid oversail of the protected areas/assets.
Biodiversity (National designations)	Exclude national designations[4]: • Sites of Special Scientific Interest	• Natural England	As protected by: • Wildlife and Countryside Act 1981.

[3] There are no Ramsar sites, Special Protection Areas, potential Special Protection Areas or potential Special Areas of Conservation located within Cotswold District Council.

[4] There are no National Nature Reserves located within Cotswold District Council.

Table 6 – Wind resource assessment parameters			
Parameter	**Assumption**	**Data source**	**Justification and notes**
			• Conservation of Habitats and Species Regulations 2017 (as amended). A blade radius buffer has been applied to avoid oversail of the protected areas/assets.

Biodiversity (Regional and local designations)	Exclude other designations[5]:
	
	• Local Nature Reserves
	• Local Sites:
	  ○ Local Wildlife Sites
	  ○ Potential Wildlife Sites
	  ○ Regionally Important Geological Sites
	  ○ Conservation road verges
		• Natural England
		• Cotswold District Council
		• Gloucestershire County Council
			Generally, would not be suitable for renewables development based on law/policy/guidance including:
			
			• National Planning Policy Framework.
			• Natural Environment and Rural Communities Act 2006.
			
			A blade radius buffer has been applied to avoid oversail of the protected areas/assets.

Cultural heritage	Exclude[6]: • Registered Parks and Gardens • Registered Battlefields • Scheduled Monuments	• Historic England • Cotswold District Council	As protected by: • National Planning Policy Framework. • The Convention Concerning the Protection of the World Cultural and Natural Heritage. • National Heritage Act 1983.

[5] There are no RSPB Reserves located within Cotswold District Council.

[6] There are no World Heritage Sites located within Cotswold District Council.

Table 6 – Wind resource assessment parameters			
Parameter	**Assumption**	**Data source**	**Justification and notes**
	• Listed Buildings • Conservation Areas		• Ancient Monuments and Archaeological Areas Act of 1979. • Planning (Listed Buildings and Conservation Areas) Act 1990. A blade radius buffer has been applied to avoid oversail of the protected areas/assets. Note: Due to potential inaccuracies in Listed Building polygon data, polygons were only used where polygon and point data align. Otherwise, point data was used. Point data was buffered 5m to estimate building footprint. The polygon data provides building footprint data and therefore did not need to be buffered.

Table 7 – Ground mounted solar resource assessment parameters			
Parameter	**Assumption**	**Data source**	**Justification and notes**
Solar Irradiance	• Preliminary estimate, as displayed in Figure x, shows an average annual generation exceeding 1000kWh/kWp for a south facing, 38° tilted	• Global Solar Atlas	All of Cotswold District Council considered theoretically suitable for solar development.

Table 7 – Ground mounted solar resource assessment parameters			
Parameter	**Assumption**	**Data source**	**Justification and notes**
	system. No shading taken into account.		
Roads	Exclude: • Roads • Anticipated road infrastructure	• Ordnance Survey VectorMap District.	Physical features preventing the development of solar PV were excluded. There is no requirement for safety buffers in relation to these with respect to solar PV. Note: Only line data for roads was available and in order to create a footprint from the road centre, it was assumed that single carriageways are 10m in width, dual carriageways 20m and motorways 30m.
Railways	Exclude • Railways, including protected former railway lines (Local Plan policy INF3 and SP6)	• Ordnance Survey VectorMap District.	Physical features preventing the development of solar PV were excluded. There is no requirement for safety buffers in relation to these with respect to solar PV. In order to create a footprint from the railway centrelines data, it was assumed that railways were 15m in width.
Public Rights of Way Cycle Paths	Exclude • Public Rights of Way, including the Lechlade to Fairford multi-use path (Local	• Cotswold District Council • SusTrans	Physical features preventing the development of solar PV were excluded. There is no requirement for safety buffers in relation to these with respect to solar PV. In order to create a footprint from the Public Rights of Way and cycle path centrelines data, it was assumed

Table 7 – Ground mounted solar resource assessment parameters			
Parameter	**Assumption**	**Data source**	**Justification and notes**
	Plan policies S5 and S7), and cycle paths		that Public Rights of Way and Bridleways are 2m in width.

Planning/land use other	Exclude:
	• Common Land
	• Local public green/open space, including:
	  ○ Playing Fields
	  ○ Formal Parks
	  ○ Cemeteries and Churchyards
	  ○ Allotments
		• Natural England (Common Land)
		• OS Green Space: 'Cemetery' and 'Religious Grounds' data categories
		• Cotswold District Council (Local Plan policy EN3)
			Due to land take requirements, these land uses/types were considered generally to constrain solar development, particularly at larger scales, although in some circumstances they may offer opportunities for smaller scale development collocated with their other facilities. They were excluded from the resource assessment but may be subject to bespoke policies with the Local Plan allowing development to take place in principle subject to defined criteria being satisfied.

Transmission lines	Exclude • Line data buffered by 1m, forming a 2m exclusion footprint	• OS Vector Mapping	Physical features preventing the development of solar PV were excluded. There is no requirement for safety buffers in relation to these with respect to solar PV. This exclusion was applied to account for shading and impacts on solar output.

Table 7 – Ground mounted solar resource assessment parameters			
Parameter	**Assumption**	**Data source**	**Justification and notes**
Buildings	Exclude: • All buildings with a 20m buffer	• OSOpenMap Local data	Buildings were buffered by 20m to account for shading and impacts on solar output.
Minerals Sites	Exclude: • All operational minerals sites • Allocated minerals sites A 250m buffer is to be applied to both of the above	• Gloucestershire County Council	Operational and allocated mineral sites were buffered to account for dust emissions which will affect the generation output. The IAQM 2016 Guidance on the Assessment of Mineral Dust Impacts for Planning indicates that adverse dust impacts from sand and gravel sites are uncommon beyond 250m and beyond 400m from hard rock quarries measured from the nearest dust generating activities.
Waste Sites	Exclude: • All operational waste sites • Allocated waste sites	• Gloucestershire County Council	Waste sites will frequently be quite highly constrained with respect to solar development (e.g. areas of active landfill) but equally may present opportunities in some circumstances, particularly when they are to be decommissioned/ restored during a plan period. Waste sites were excluded from the mapped solar resource but potentially subject to bespoke policy wording in the local plan.
Airfields and Airports	Exclude:	• Ordnance Survey	OS VectorMap Local Functional Site data with the theme Air Transport was used in the assessment

Table 7 – Ground mounted solar resource assessment parameters			
Parameter	**Assumption**	**Data source**	**Justification and notes**
	• Operational airports and airfields	VectorMap Local Functional Site layer with the theme 'Air Transport'	
MOD Land	Exclude: • MOD land	• Cotswold District Council • OS Mapping	Plan of MOD landholdings provided by Cotswold District. Landholdings were digitised and cross referenced against OS 1:25000 mapping. Verification of boundaries and present use provided by CDC.

Future developments	Exclude:
	• Site allocations from adopted Cotswold District Local Plan
	  ○ Burial Ground Allocations
	  ○ Car Park Allocations
	  ○ Cemetery Extensions
	  ○ Employment Centres
	  ○ Housing Allocations
	  ○ Mixed Use Allocations
		• Cotswold District Council	Generally these will be unsuitable for ground-mounted solar, although there may be some potential for installations on undeveloped land/open space within these areas. Identification of this potential would require a separate, site-specific study.

Table 7 – Ground mounted solar resource assessment parameters			
Parameter	**Assumption**	**Data source**	**Justification and notes**
	○ Strategic Site Allocations ○ Gypsy and Traveller Sites		
Employment Sites	Exclude: • Established employment centres from adopted Cotswold District Local Plan	• Cotswold District Council	Generally unsuitable for wind turbine development, unless sites contain relatively large undeveloped portions. Identification of suitable land for wind within specific allocation boundaries would require a separate site-specific study.
Existing Renewable Energy Developments	Exclude: • Consented and operational solar energy installations, defined by their land boundaries	• BEIS • Cotswold District Council	The BEIS quarterly renewable energy database was used to determine the locations of operational and consented renewable energy installations. This data was subject to review and addition/modification (if required) by Cotswold District Council. It was then cross-referenced with Inspire Land boundary data obtained from the Land Registry. Colocation with wind developments was considered as an opportunity.
Terrain	Exclude: • Areas with north-east to north-west aspect and inclinations greater than 3 degrees	• OS Terrain 50	Although it is possible to develop Solar PV installations on slopes facing north-east to north-west, it would generally not be economically viable to do so. However, slopes that are north-east to north-west facing and below 3° are considered potentially

Table 7 – Ground mounted solar resource assessment parameters			
Parameter	**Assumption**	**Data source**	**Justification and notes**
	• All areas with inclinations greater than 10 degrees		suitable, as generation output will not be significantly affected.
Agricultural Land Use	Exclude: • Agricultural land use classifications grades 1 and 2	• Natural England	Agricultural Land Use is a consideration, with grades 1 and 2 land having higher value for food production. Further investigation would be required of grade 3 land to determine whether it is grade 3a or b, as available data does not distinguish these. Ground Mounted Solar PV projects, over 50kWp, should ideally utilise previously developed land, brownfield land, contaminated land, industrial land or agricultural land preferably of classification 3b, 4, and 5.
Water Environment	Exclude: • Watercourses and waterbodies.	• Ordnance Survey Rivers • Ordnance Survey VectorMap District	Physical features preventing the development of solar PV were excluded. There is no requirement for safety buffers in relation to these with respect to solar PV. OS Survey VectorMap District surface water data includes waterways of approximately a minimum of 2m width. OS Rivers data is line data, and so a 1m buffer was applied to approximate a footprint of smaller waterways.
Woodland	Exclude:	• Forestry Commission	Forested areas were buffered by 20m to account for shading and impacts on solar output.

Table 7 – Ground mounted solar resource assessment parameters			
Parameter	**Assumption**	**Data source**	**Justification and notes**
	• Woodland as shown on the National Forest Inventory and Ancient Woodland Inventory	• Natural England	
Biodiversity (International designations)	Exclude international designations[7]: • Special Areas of Conservation	• Natural England	As protected by: • Conservation of Habitats and Species Regulations 2017 (as amended).
Biodiversity (National designations)	Exclude national designations[8]: • Sites of Special Scientific Interest	• Natural England	As protected by: • Wildlife and Countryside Act 1981. • Conservation of Habitats and Species Regulations 2017 (as amended).
Biodiversity (Regional and local designations)	Exclude other designations[9]:: • Local Nature Reserves • Local Sites	• Natural England • Cotswold District Council	Generally, would not be suitable for renewables development based on law/policy/guidance including: • National Planning Policy Framework.

[7] There are no Ramsar sites, Special Protection Areas, potential Special Protection Areas or potential Special Areas of Conservation located within Cotswold District Council.

[8] There are no National Nature Reserves located within Cotswold District Council.

[9] There are no RSPB Reserves located within Cotswold District Council.

Table 7 – Ground mounted solar resource assessment parameters			
Parameter	**Assumption**	**Data source**	**Justification and notes**
		• Gloucestershire County Council	• Natural Environment and Rural Communities Act 2006.
Cultural heritage	Exclude[10]: • Registered parks and gardens • Registered Battlefields • Scheduled monuments • Listed buildings • Conservation Areas	• Historic England • Cotswold District Council	As protected by: • National Planning Policy Framework. • The Convention Concerning the Protection of the World Cultural and Natural Heritage. • National Heritage Act 1983. • Ancient Monuments and Archaeological Areas Act of 1979. • Planning (Listed Buildings and Conservation Areas) Act 1990. Note: Due to potential inaccuracies in Listed Building polygon data, polygons were only used where polygon and point data align. Otherwise, point data was used. Point data was buffered 5m to estimate building footprint. The polygon data provides building footprint data and therefore did not need to be buffered.

[10] There are no World Heritage Sites located within Cotswold District.

Approach to Landscape Sensitivity Assessment

Assessment of only land outside of the AONB and structured on the Landscape Character Types within the Gloucestershire Landscape Character Assessment: https://www.gloucestershire.gov.uk/media/6800/glca_report_severn___other_vales_text_2006-51673.pdf

Wind Typology (for Resource Assessment and Landscape Sensitivity Assessment)

Table 8 – Wind Typology (for Resource Assessment and Landscape Sensitivity Assessment)

Type	Size range (tip) (m)	Candidate for assessment (tip) (m)	Candidate for assessment (RD) (m)	Candidate capacity	Notes
Very Small	<25	N/A	N/A	N/A	Not to be included in GIS tool or resource calculations.
Small	25-60	45	20	50kw	Various 50-100kw machines have been deployed at around this spec in the past including Endurance 50kw.
Medium	60-100	80	55	0.5MW	Rough specification of the old 'standard' EWT 500kw turbine.
Large	100-150	125	90	2.5MW	Standard height and RD during ROCs.
Very large	150-200	175	130	4MW	This was becoming a rough standard for post-subsidy projects as of 2018-19, although capacities, tip heights and rotor diameters are

					continually increasing.

Solar Typology (for Landscape Sensitivity Assessment)

- Very small solar PV installation: <1 hectares
- Small solar PV installation: 1-5 hectares
- Medium solar PV installation: (5-20 hectares)
- Large solar PV installation: (20-50 hectares)
- Very large solar PV installation (50-120 hectares)

Assumed solar density (for resource assessment calculations): 1.2 hectares/MW based on the Department for Energy Security and Net Zero National Policy Statement for renewable energy infrastructure (EN-3).This states that *"along with associated infrastructure, a solar farm requires between 2 to 4 acres for each MW of output"*. This equates to 0.8-1.6ha per MW, and the average of this is 1.2ha per MW.

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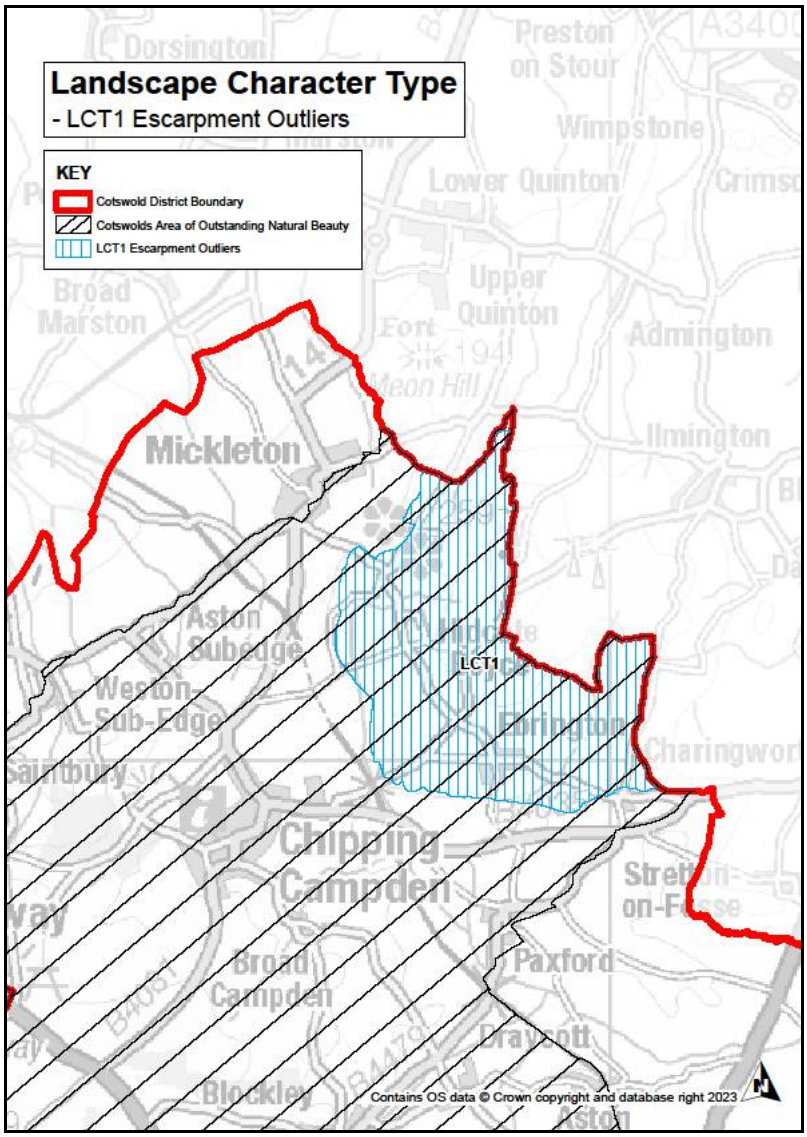
Annex F

Appendix E: Cotswold District Council Landscape Sensitivity Assessment for the Cotswold National Landscape

This appendix presents the results of a Landscape Sensitivity Assessment (LSA) of wind turbine and solar PV development for those areas within Cotswold District that fall within the Cotswold National Landscape. This was produced by Cotswold District Council in September 2023, and was based on the methodology used by LUC to undertake the LSA for those areas within the District that fall outside the Cotswold National landscape, as presented in Appendix C.

Landscape Character Type 1: Escarpment Outliers



Landscape Sensitivity Assessment

Criteria	Description	Sensitivity Score	
		Wind	Solar
Landform and Scale (including sense of openness/enclosure)	- Distinctive Hills detached from the main Cotswolds escarpment and rising above the neighbouring vale forming prominent landscape features visible from great distances. - Varied and sometimes steeply sloping topography reflecting localised differences in geology.	H	H
Landcover (including field and settlement pattern)	- Areas of rough grassland and scrub occur on some sections of the upper slopes and areas of steep landform often supporting remnants of ancient species rich grasslands and providing important habitats for many species of flora and fauna. - Woodlands and belts of trees often occupy steeper slopes of the outliers and also border the gullies of brooks draining radially into the vale. Veteran trees, scrub and ancient woodlands provide important habitats for a range of species. - Lower, gentler slopes cloaked in improved pastures and arable farmland, divided by a network of hedgerows and some dry stone walls.	H	H
Historic Landscape Character	- Sparsely settled. Small wayside villages on lower slopes give way to isolated farmsteads and dwellings linked by narrow winding lanes on upper slopes and contribute to the generally remote character. - Hilltops often the site of prehistoric hillforts or other defensive enclosures indicating a long history of settlement and a reminder of the strategic importance they held in the wider landscape.	H	H
Visual Character (including skylines/intervisibility)	- Dramatic panoramic views from upper slopes possible over the Severn Vale to the Welsh borders and Eastwards to the Cotswolds Escarpment	H	H
Perceptual Qualities	- The Outliers are a distinctive, highly visible landscape type that retains a remote character. As a result, the hills are highly sensitive to change that	H	H

	would introduce built elements to otherwise agricultural landscapes.		
Scenic and Special Qualities	- Dramatic panoramic views emphasise the remoteness and inaccessibility of many parts of the outliers. - Displays special qualities for which the AONB was designated.	H	H

Overall Assessment of Landscape Sensitivity to Development Scenarios

Please note: Landscape sensitivity often varies within an LCA, with areas exhibiting higher and lower sensitivity. It is therefore very important to take note of the explanatory text supporting the assessments in each Landscape Character Type profile, particularly the box entitled 'notes on any variations in landscape sensitivity'. Whilst the Landscape Sensitivity Assessment results provide an initial indication of landscape sensitivity, they should not be interpreted as definitive statements on the suitability of individual sites for a particular development. All proposals will need to be assessed on their own merits through the planning process, including – where required – through proposal-specific Landscape and Visual Impact Assessments (LVIAs).

Development Scenario	**Sensitivity**				
Very Small Wind Installation (up to 25m)					H
Small Wind Installation (25m to 60m)					H
Medium Wind Installation (60m to 100m)					H
Large Wind Installation (100m to 150m)					H
Very Large Wind Installation (150m to 200m)					H
Very Small Solar PV Installation (up to 1 hectare)					H
Small Solar PV Installation (1 to 5 hectares)					H
Medium Solar PV Installation (5 to 20 hectares)					H
Large Solar PV Installation (20 to 50 hectares)					H
Very Large Solar PV Installation (50 to 120 hectares)					H

Summary of Landscape Sensitivity

The Outliers are a distinctive, highly visible landscape type that often retains a remote character. As a result, the hills are highly sensitive to change that would introduce built elements to otherwise agricultural landscapes or interrupt the existing balance of rough pasture and woodland on their upper slopes.

Care should be taken to respect the character of each individual outlier and the various characteristics that are present on different faces of the same hill.

Variation to Overall LCT scores at the LCA level

- Only a small part of the LCT is present within the Cotswold District administrative area (LCA 1F Meon and Ebrington Hills).

Recommendations and Guidance for Future Developments within the LCT

Wind Energy Developments

Overall Recommendations:

- All turbine development is likely to be highly sensitive given the presence of the Cotswold AONB and its inherent sensitivities;
- The Cotswolds escarpment is identified as one of the AONBs special qualities. The LCT is therefore likely to be highly sensitive to this form of development; and
- Neighbouring LCTs would be visually sensitive to this form of development.

Strategic Landscape Guidance:

- Conserve the open, remote character by objecting to the development of vertical elements on the skyline or where these would adversely affect views across to and from the outliers;
- Ensure the development of vertical elements in neighbouring areas beyond the AONB or in adjacent LCTs do not adversely affect views to and from the Escarpment Outliers;
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the undeveloped skyline;
- Ensure the development of vertical elements in neighbouring LCTs and areas beyond the AONB do not adversely affect views to and from the Escarpment Outliers;
- Bury cables underground and seek opportunities to bury existing power lines;
- Avoid use of visually prominent urban security fencing and CCTV masts;
- Ensure a comprehensive LVIA is undertaken (including potential cumulative effects); and
- Ensure full assessment of heritage setting impacts and appropriate measures undertaken.

Solar PV Developments

Overall Recommendations:

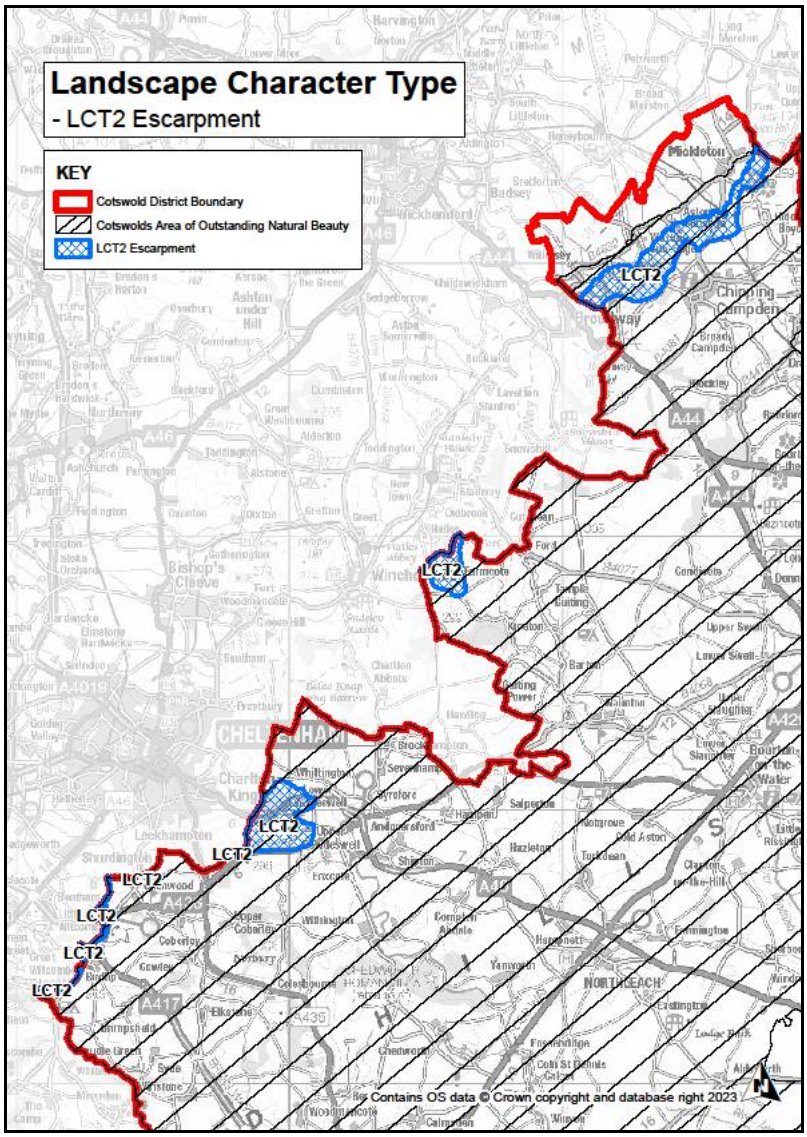
- All solar PV development is likely to be highly sensitive given the presence of the Cotswold AONB and its inherent sensitivities;
- The Cotswolds escarpment is identified as one of the AONBs special qualities. The LCT is therefore likely to be highly sensitive to this form of development; and
- Neighbouring LCTs would be visually sensitive to this form of development.

Strategic Landscape Guidance:

- Prevent proposals for solar farms that will impact negatively on landscape character and/or intrude into views to and/or from the outliers;
- Avoid proposals that will result in the loss or harm to landscape features such as Strip Lynchets, Ridge and Furrow, hedgerows and walls;
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the undeveloped skyline;
- Ensure a comprehensive LVIA is undertaken (including potential cumulative effects);
- Ensure a glint/glare assessment is undertaken to determine the heliographic impact on receptors;
- Reduce landscape impact with appropriate screening;
- Bury cables underground and seek opportunities to bury existing power lines;
- Keep supporting infrastructure to a minimum and ensure it is in keeping with landscape character;
- Ensure removal and restoration on temporary construction access;
- Avoid the inclusion of any security lighting proposals; and

- Seek appropriate landscape enhancement to field boundaries and margins within solar farm development proposals.

Landscape Character Type 2: Escarpment



Landscape Sensitivity Assessment

Criteria	Description	Sensitivity Score	
		Wind	Solar
Landform and Scale (including sense of openness/enclosure)	- Steep exposed and elevated west facing escarpment slope, partly cloaked in semi-natural broadleaved woodland. - Gentler landform on lower slopes below the spring line dissected by numerous streams and characterised by hummocky areas of former landslip, ridge and furrow and areas of arable farming blurring the transition with the surrounding vale.	H	H
Landcover (including field and settlement pattern)	- Generally poor soils and steep sloping relief of the escarpment not suited to arable farming. Primarily used for pasture or woodland. - Limited areas of Registered Common Land on upper scarp slopes merging into the more extensive areas on the High Wold represent an important landscape resource often of nationally important nature conservation and cultural heritage value. - Woodlands, hedgerows, scrub and isolated trees give the impression of a well wooded landscape.	H	H
Historic Landscape Character	- Rock outcrops often mark the site of former quarries. - Settlement generally confined to lower, shallower slopes, in sheltered locations and adjacent to spring lines. - Numerous prehistoric sited and follies are located on promontories and elevated sections of the escarpment indicating their symbolic and strategic importance.	H	H
Visual Character (including skylines/intervisibility)	- Strong sense of elevation with dramatic panoramic views over the Severn Vale and beyond. - The escarpment forms a dramatic relief feature visible from the Forest of Dean and Malverns. The escarpment is seen as a backdrop to the neighbouring lowlands. - Summit of the escarpment slopes often marked by dramatic linear beech hangers. These are often viewed as a silhouette against the skyline from the vale below.	H	H

Perceptual Qualities	- The open areas on the upper escarpment contrast with the more intimate landscapes at lower elevations. - The escarpment is a distinctive and dramatic landscape. The combination of its elevation, and the steep slopes rising from the lowlands, make it a highly visible feature and is therefore very sensitive to change.	H	H
Scenic and Special Qualities	- Continuity of escarpment face interrupted by a series of major valleys and embayments creating dramatic relief features and local interest. - A number of large towns and cities located at, or in the vicinity of the foot of the escarpment. The scarp forms a rural backdrop to urban development and limits eastward expansion.	H	H

Overall Assessment of Landscape Sensitivity to Development Scenarios

Please note: Landscape sensitivity often varies within an LCA, with areas exhibiting higher and lower sensitivity. It is therefore very important to take note of the explanatory text supporting the assessments in each Landscape Character Type profile, particularly the box entitled 'notes on any variations in landscape sensitivity'. Whilst the Landscape Sensitivity Assessment results provide an initial indication of landscape sensitivity, they should not be interpreted as definitive statements on the suitability of individual sites for a particular development. All proposals will need to be assessed on their own merits through the planning process, including – where required – through proposal-specific Landscape and Visual Impact Assessments (LVIAs).

Development Scenario	**Sensitivity**				
Very Small Wind Installation (up to 25m)					H
Small Wind Installation (25m to 60m)					H
Medium Wind Installation (60m to 100m)					H
Large Wind Installation (100m to 150m)					H
Very Large Wind Installation (150m to 200m)					H
Very Small Solar PV Installation (up to 1 hectare)					H
Small Solar PV Installation (1 to 5 hectares)					H
Medium Solar PV Installation (5 to 20 hectares)					H
Large Solar PV Installation (20 to 50 hectares)					H
Very Large Solar PV Installation (50 to 120 hectares)					H
Summary of Landscape Sensitivity					
The escarpment is a distinctive and dramatic landscape. The combination of its elevation, and the steep slopes rising from the lowlands, make it a highly visible feature and is therefore very sensitive to change, particularly where this would introduce built elements within the otherwise agricultural landscapes, or interrupt the balance of rough grassland, species rich calcareous grassland and broadleaved woodland on the upper escarpment slopes.					

The undulating lower escarpment slopes, at the junction of the vale, are visually less prominent than the upper escarpment slopes and generally more widely settled.

Variation to Overall LCT Scores at the LCA Level

- Only a small part of the LCT is present within the Cotswold District administrative area (LCA 2D Cooper's Hill to Winchcombe, 2E Winchcombe to Dover's Hill and 2F Dover's Hill to Mickleton).

Recommendations and Guidance for Future Developments within the LCT

Wind Energy Developments

Overall Recommendations:

- All turbine development is likely to be highly sensitive given the presence of the Cotswold AONB and its inherent sensitivities;
- The Cotswolds escarpment is identified as one of the AONBs special qualities. The LCT is therefore likely to be highly sensitive to this form of development; and
- Neighbouring LCTs would be visually sensitive to this form of development.

Strategic Landscape Guidance:

- Conserve the open, remote character by objecting to the development of vertical elements on the skyline or where these would adversely affect views along the escarpment or from the neighbouring vales and Cotswolds LCTs;
- Ensure the development of vertical elements in neighbouring areas beyond the AONB or in adjacent LCTs do not adversely affect views to, from and along the escarpment and across the adjacent LCTs;
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the undeveloped skyline;
- Ensure the development of vertical elements in neighbouring LCTs and areas beyond the AONB do not adversely affect views to and from the Escarpment Outliers;
- Bury cables underground and seek opportunities to bury existing power lines;
- Avoid use of visually prominent urban security fencing and CCTV masts;
- Ensure a comprehensive LVIA is undertaken (including potential cumulative effects); and
- Ensure full assessment of heritage setting impacts and appropriate measures undertaken.

Solar PV Developments

Overall Recommendations:

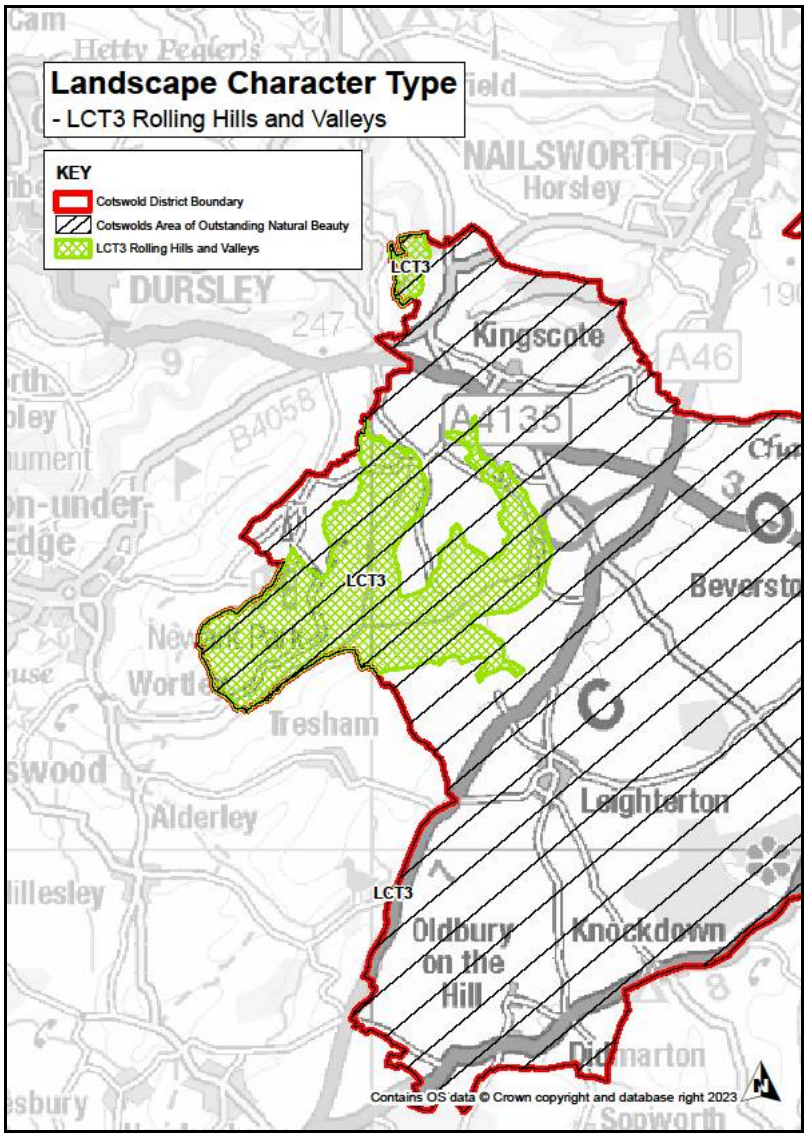
- All solar PV development is likely to be highly sensitive given the presence of the Cotswold AONB and its inherent sensitivities;
- The Cotswolds escarpment is identified as one of the AONBs special qualities. The LCT is therefore likely to be highly sensitive to this form of development; and
- Neighbouring LCTs would be visually sensitive to this form of development.

Strategic Landscape Guidance:

- Prevent proposals for solar farms that will impact negatively on landscape character and/or intrude into views to and/or from the escarpment;

- Avoid proposals that will result in the loss or harm to landscape features such as Strip Lynchets, Ridge and Furrow, hedgerows and walls;
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the undeveloped skyline;
- Ensure a comprehensive LVIA is undertaken (including potential cumulative effects);
- Ensure a glint/glare assessment is undertaken to determine the heliographic impact on receptors;
- Reduce landscape impact with appropriate screening;
- Bury cables underground and seek opportunities to bury existing power lines;
- Keep supporting infrastructure to a minimum and ensure it is in keeping with landscape character;
- Ensure removal and restoration on temporary construction access;
- Avoid the inclusion of any security lighting proposals; and
- Seek appropriate landscape enhancement to field boundaries and margins within solar farm development proposals.

Landscape Character Type 3: Rolling Hills and Valleys



Landscape Sensitivity Assessment

Criteria	Description	Sensitivity Score	
		Wind	Solar
Landform and Scale (including sense of openness/enclosure)	- Relatively enclosed and secluded 'secret' character in upper sections of the valleys and narrow valley bottoms, contrasts to more open landscapes on the neighbouring High Wold and High Wold Dip-Slope and in the Unwooded Vale below. - Broader and more open valley form and developed character where valleys meet the vale. - Steep sided concave valleys with steeper upper slopes often dominated by woodland, contribute to the area's rural and secretive character.	H	M-H
Landcover (including field and settlement pattern)	- Area principally under pastoral use, together with some scattered areas under arable cultivation, mainly within the valley slopes and bottom. Areas of scrubby pasture often evident on upper slopes. - Fields generally small-scale, mainly enclosed with hedgerows, with hedgerow trees being frequent on valley slopes creating a patchwork effect. - Post and wire fences frequent throughout the landscape break up the patterns created by hedgerows.	M-H	M-H
Historic Landscape Character	- Contrasting settlement patterns with larger settlements with more pronounced urban influences at valley mouths, and smaller and deeply rural settlements along valley bottoms upper valley slopes. - Grade 2 listed Park and Garden at Newark Park. - Grade 1 listed Newark Park plus other listings around the Newark Park estate. - Grade 2* listed Ozleworth Park and Church of St Nicholas plus other listings around the Ozleworth estate.	H	H
Visual Character (including skylines/intervisibility)	- The highly visible landscapes on the upper slopes of the valleys and spurs of land separating the valleys are highly sensitive to change.	H	H
Perceptual Qualities	- The upper valley sections represent quiet rural landscapes with strong	H	H

	associations of peace, tranquillity and a sense of remoteness.		
Scenic and Special Qualities	- Landscape character is strong, and these sections of the valleys are highly sensitive to developments that may compromise these characteristics (quiet, rural, peaceful, tranquil and remoteness).	H	H

Overall Assessment of Landscape Sensitivity to Development Scenarios

Please note: Landscape sensitivity often varies within an LCA, with areas exhibiting higher and lower sensitivity. It is therefore very important to take note of the explanatory text supporting the assessments in each Landscape Character Type profile, particularly the box entitled 'notes on any variations in landscape sensitivity'. Whilst the Landscape Sensitivity Assessment results provide an initial indication of landscape sensitivity, they should not be interpreted as definitive statements on the suitability of individual sites for a particular development. All proposals will need to be assessed on their own merits through the planning process, including – where required – through proposal-specific Landscape and Visual Impact Assessments (LVIAs).

Development Scenario	**Sensitivity**				
Very Small Wind Installation (up to 25m)					H
Small Wind Installation (25m to 60m)					H
Medium Wind Installation (60m to 100m)					H
Large Wind Installation (100m to 150m)					H
Very Large Wind Installation (150m to 200m)					H
Very Small Solar PV Installation (up to 1 hectare)				M-H	
Small Solar PV Installation (1 to 5 hectares)				M-H	
Medium Solar PV Installation (5 to 20 hectares)					H
Large Solar PV Installation (20 to 50 hectares)					H
Very Large Solar PV Installation (50 to 120 hectares)					H

Summary of Landscape Sensitivity

The upper valley sections represent quiet rural landscapes with strong associations of peace, tranquillity and a sense of remoteness. Landscape character is strong, and these sections of the valleys are highly sensitive to developments that may compromise these characteristics. Of similar sensitivity are the highly visible landscapes on the upper slopes of the valleys and spurs of land separating the valleys.

The more expansive and heavily settled mouths of the valleys are generally less sensitive although change should reflect the form, massing and layout of the existing valley settlements. New development should be avoided on highly visible valley sides.

Variation to Overall LCT Scores at the LCA Level

- Only a small part of the LCT is present within the Cotswold District administrative area.
- Areas which are strongly overlooked from the surrounding elevated LCAs have higher levels of sensitivity to all the renewable energy development scenarios considered as part of this LSA.

- Steep slopes which lack woodland coverage and screening, including those on the valley sides, have higher levels of sensitivity due to visual prominence in these areas.

Recommendations and Guidance for Future Developments within the LCT

Wind Energy Developments

Overall Recommendations:

- All turbine development is likely to be highly sensitive given the presence of the Cotswold AONB and its inherent sensitivities;
- The upper valley sections represent quiet rural landscapes with strong associations of peace, tranquillity and a sense of remoteness;
- The setting of a number of highly listed country houses and parks is an important consideration; and
- Neighbouring LCTs would be visually sensitive to this form of development.

Strategic Landscape Guidance:

- Conserve the secluded character and open spurs by objecting to the development of vertical elements on the skyline and valley rims or where they would adversely affect views within, to and from the Rolling Hills and Valleys;
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the undeveloped skyline;
- Ensure the development of vertical elements in neighbouring LCTs and areas beyond the AONB do not adversely affect views to and from the valleys;
- Bury cables underground and seek opportunities to bury existing overhead cables;
- Avoid use of visually prominent urban security fencing and CCTV masts;
- Consider other renewable energy technologies; and
- Ensure full assessment of heritage setting impacts and appropriate measures undertaken.

Solar PV Developments

Overall Recommendations:

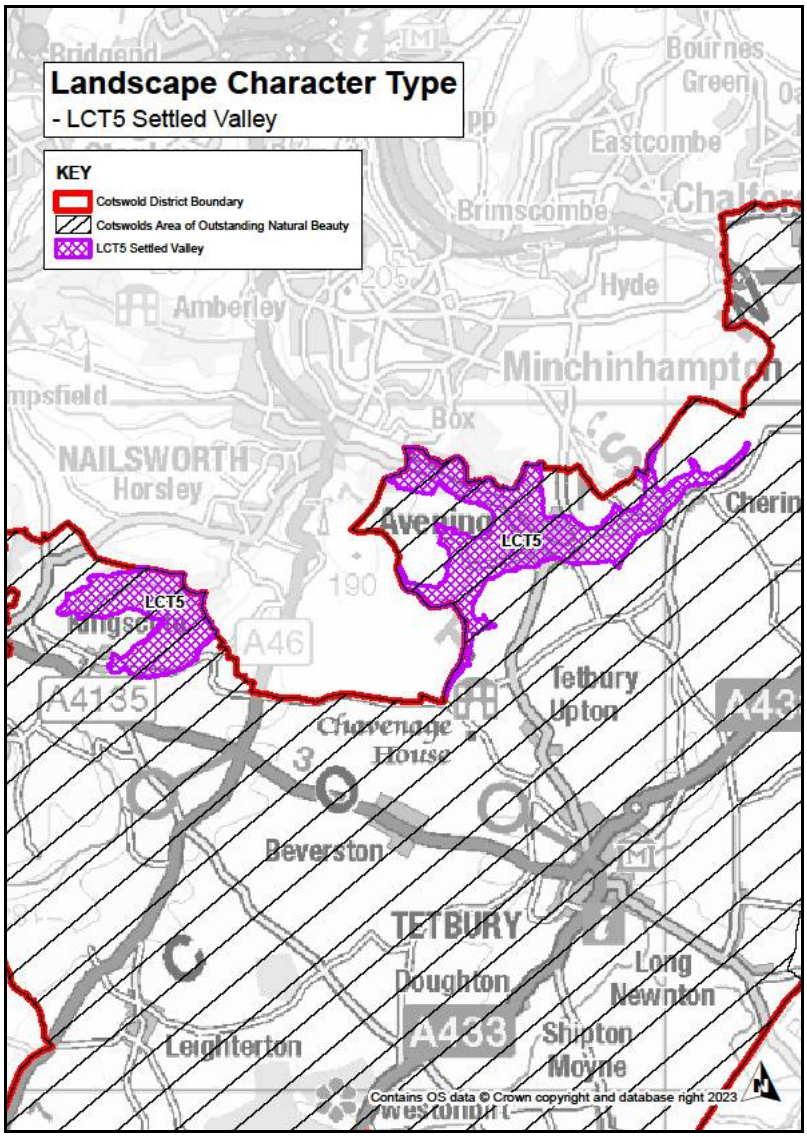
- There may be opportunities to locate solar PV developments (up to and including 5ha) within more sheltered fields where they are bound by tall hedgerows or riparian vegetation;
- Anything larger than this is considered to be highly sensitive given the presence of the Cotswold AONB and its inherent sensitivities;
- The setting of a number of highly listed country houses and parks is an important consideration; and
- PV developments should be sited within farmland, not semi-natural habitat to retain naturalistic characteristics and habitat interest.

Strategic Landscape Guidance:

- Prevent proposals for solar farms that will impact negatively on landscape character and/or intrude into views or result in loss or harm to landscape features such as hedgerows, trees and Ridge and Furrow;
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the relatively undeveloped skyline;
- Reduce landscape and visual impact with appropriate screening;

- Ensure a comprehensive LVIA is undertaken (including potential cumulative effects);
- Ensure a glint/glare assessment is undertaken to determine the heliographic impact on receptors;
- Bury cables underground and seek opportunities to bury existing power lines;
- Keep supporting infrastructure to a minimum and ensure it is in keeping with landscape character;
- Ensure removal and restoration on temporary construction access;
- Avoid the inclusion of any security lighting proposals; and
- Seek appropriate landscape enhancement to field boundaries and margins within solar farm development proposals.

Landscape Character Type 5: Settled Valley



Landscape Sensitivity Assessment

Criteria	Description	Sensitivity Score	
		Wind	Solar
Landform and Scale (including sense of openness/enclosure)	- Steep sided, concave, narrow valleys with upper sections forming an abrupt break of slope with the High Wold and High Wold Dip-Slope. - Strong sense of enclosure provided by the steep-sided valley profile and presence of woodland.	H	M-H
Landcover (including field and settlement pattern)	- Predominantly pastoral land use with scattered areas of arable land enclosed by a network of hedgerow boundaries providing a rural backdrop to urban forms. - Relatively well wooded with deciduous species predominating, with a large proportion of ancient woodland. - Stone walls are common features within the valley bottoms particularly surrounding settlements and create distinctive field patterns.	M-H	M-H
Historic Landscape Character	- Sequence of settlements along the valley bottoms and sides resulting in a settled character. - Strong evidence of industrial past from communications infrastructure and mills and stone built civic buildings confined primarily to valley floors. - Historic associations with industrial period apparent, with terraces of houses following contours close to the sites of mills. - Grade 2 listed Gatcombe Park and Garden present.	H	H
Visual Character (including skylines/intervisibility)	- The settled valleys are under particular pressure from the outward expansion of existing urban areas onto the steep, highly visible valley sides.	H	H
Perceptual Qualities	- A strong sense of enclosure is provided by the valley sides and tall hedges, many of which contain mature trees. - In most places there are high levels of tranquillity, although urban development can detract from this. - The valleys are sensitive to the coalescence of settlements along the valley floor, resulting in the loss of their distinctive identity.	H	H

Scenic and Special Qualities	- Extensive road network within the majority of valleys connecting settlements and areas within the valleys to the High Wold. - Land exhibits special qualities of the AONB. - The steep valley sides have limited development and the landscape has retained much of its traditional rural character. - Isolated and deeply rural character survives in remoter tributary valleys.	H	H

Overall Assessment of Landscape Sensitivity to Development Scenarios

Please note: Landscape sensitivity often varies within an LCA, with areas exhibiting higher and lower sensitivity. It is therefore very important to take note of the explanatory text supporting the assessments in each Landscape Character Type profile, particularly the box entitled 'notes on any variations in landscape sensitivity'. Whilst the Landscape Sensitivity Assessment results provide an initial indication of landscape sensitivity, they should not be interpreted as definitive statements on the suitability of individual sites for a particular development. All proposals will need to be assessed on their own merits through the planning process, including – where required – through proposal-specific Landscape and Visual Impact Assessments (LVIAs).

Development Scenario	**Sensitivity**				
Very Small Wind Installation (up to 25m)					H
Small Wind Installation (25m to 60m)					H
Medium Wind Installation (60m to 100m)					H
Large Wind Installation (100m to 150m)					H
Very Large Wind Installation (150m to 200m)					H
Very Small Solar PV Installation (up to 1 hectare)				M-H	
Small Solar PV Installation (1 to 5 hectares)				M-H	
Medium Solar PV Installation (5 to 20 hectares)					H
Large Solar PV Installation (20 to 50 hectares)					H
Very Large Solar PV Installation (50 to 120 hectares)					H
Summary of Landscape Sensitivity					
The settled valleys are under particular pressure from the outward expansion of existing urban areas onto the steep, highly visible valley sides. Such development would detract from the characteristic wooded, rural backdrop of valley towns and their typical linear form. The valleys are also sensitive to the coalescence of settlements along the valley floor, resulting in the loss of their distinctive identity. Despite the close proximity of large urban areas, some valleys retain an isolated rural character. The remoter sections of these valleys are highly sensitive to change that would promise their intrinsic character.					
Variation to Overall LCT Scores at the LCA Level					

- Only a small part of the LCT is present within the Cotswold District administrative area.
- Areas which are strongly overlooked from the surrounding elevated LCAs have higher levels of sensitivity to all the renewable energy development scenarios considered as part of this LSA.
- Steep slopes which lack woodland coverage and screening, including those on the valley sides, have higher levels of sensitivity due to visual prominence in these areas.

Recommendations and Guidance for Future Development Within the LCT

Wind Energy Developments

Overall Recommendations:

- All turbine development is likely to be highly sensitive given the presence of the Cotswold AONB and its inherent sensitivities;
- The areas of Settled Valley LCT present within the Cotswold District have limited settlement present. This enhances the rural and tranquil character of the LCT;
- The setting of Gatcombe Park is an important consideration; and
- Likely to affect views from neighbouring LCTs.

Strategic Landscape Guidance:

- Conserve the often open character of the valleys by objecting to the development of vertical elements on the skyline or where these would adversely affect views to and from the valley slopes along the valleys;
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the undeveloped skyline;
- Ensure the development of vertical elements in neighbouring LCTs and areas beyond the AONB do not adversely affect views to and from the valleys;
- Bury cables underground and seek opportunities to bury existing overhead cables;
- Avoid use of visually prominent urban security fencing and CCTV masts;
- Consider other renewable energy technologies; and
- Ensure full assessment of heritage setting impacts and appropriate measures undertaken.

Solar PV Developments

Overall Recommendations:

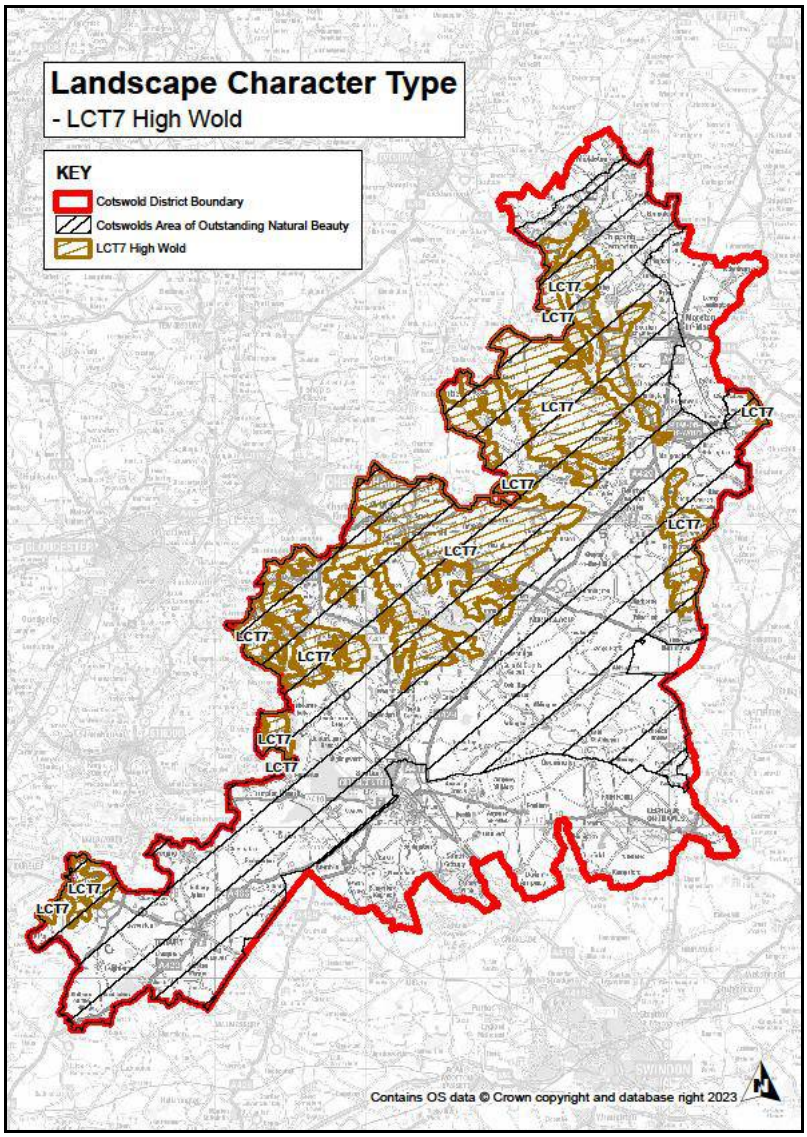
- There may be opportunities to locate solar PV developments (up to and including 5ha) within more sheltered fields where they are bound by tall hedgerows or riparian vegetation;
- Anything larger than this is considered to be highly sensitive given the presence of the Cotswold AONB and its inherent sensitivities;
- The setting of Gatcombe Park is an important consideration; and
- PV developments should be sited within farmland, not semi-natural habitat to retain naturalistic characteristics and habitat interest.

Strategic Landscape Guidance:

- Prevent proposals for solar farms that will impact negatively on landscape character and/or intrude into views across or along the valleys;
- Avoid proposals that will result in the loss or harm to landscape features such as hedgerows and walls;

- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the relatively undeveloped skyline;
- Reduce landscape and visual impact with appropriate screening;
- Ensure a comprehensive LVIA is undertaken (including potential cumulative effects);
- Ensure a glint/glare assessment is undertaken to determine the heliographic impact on receptors;
- Bury cables underground and seek opportunities to bury existing power lines;
- Keep supporting infrastructure to a minimum and ensure it is in keeping with landscape character;
- Ensure removal and restoration on temporary construction access;
- Avoid the inclusion of any security lighting proposals; and
- Seek appropriate landscape enhancement to field boundaries and margins within solar farm development proposals.

Landscape Character Type 7: High Wold



Landscape Sensitivity Assessment

Criteria	Description	Sensitivity Score	
		Wind	Solar
Landform and Scale (including sense of openness/enclosure)	- Broad, elevated, gently undulating plateau dissected by a network of dry valleys with distinctive convex profile valley sides. - large areas of open landscape with big skies.	H	M-H
Landcover (including field and settlement pattern)	- Predominantly arable land use with some improved pasture/grass leys, and very limited permanent pasture mainly confined to valley bottoms. - Large scale, regular fields mainly enclosed by dry stone walls, together with hedgerows with very occasional hedgerow trees, and post and wire fencing create a patchwork effect across wide areas of the landscape. - Small to moderate size geometric farm woodlands, many comprising small coniferous and broadleaved plantations and shelterbelts, and plantations bordering roads provide shelter across areas of otherwise open landscape.	M-H	M
Historic Landscape Character	- Evidence of a long period of occupation of the landscape, with many Neolithic and Bronze Age barrows and Iron Age hillforts. - Settlement limited to small villages and hamlets, generally within valleys, and isolated farmsteads and individual dwellings.	M-H	M-H
Visual Character (including skylines/intervisibility)	- Expansive long distance views across the open plateau and to distant hills beyond the Severn Vale. - Prominent telecommunication masts and power lines gain visual prominence as vertical elements in otherwise vast sweeping landscapes.	H	H
Perceptual Qualities	- Low density of settlement resulting in a sense of tranquillity and areas of dark skies.	H	H
Scenic and Special Qualities	- An expansive, large-scale landscape with long views and an impression of cohesion that belies its fragmentation. - Displays special qualities for which the AONB was designated.	H	H

Overall Assessment of Landscape Sensitivity to Development Scenarios

Please note: Landscape sensitivity often varies within an LCA, with areas exhibiting higher and lower sensitivity. It is therefore very important to take note of the explanatory text supporting the assessments in each Landscape Character Type profile, particularly the box entitled 'notes on any variations in landscape sensitivity'. Whilst the Landscape Sensitivity Assessment results provide an initial indication of landscape sensitivity, they should not be interpreted as definitive statements on the suitability of individual sites for a particular development. All proposals will need to be assessed on their own merits through the planning process, including – where required – through proposal-specific Landscape and Visual Impact Assessments (LVIAs).

Development Scenario	Sensitivity				
Very Small Wind Installation (up to 25m)					H
Small Wind Installation (25m to 60m)					H
Medium Wind Installation (60m to 100m)					H
Large Wind Installation (100m to 150m)					H
Very Large Wind Installation (150m to 200m)					H
Very Small Solar PV Installation (up to 1 hectare)			M		
Small Solar PV Installation (1 to 5 hectares)				M-H	
Medium Solar PV Installation (5 to 20 hectares)				M-H	
Large Solar PV Installation (20 to 50 hectares)					H
Very Large Solar PV Installation (50 to 120 hectares)					H

Summary of Landscape Sensitivity

Despite its predominantly agricultural character, the wide, elevated, gently undulating plateau landscape retains a strong sense of remoteness and tranquillity contributing to its high sensitivity. Wide panoramic views, a high degree of inter-visibility, and limited woodland cover also add to the sensitivity of the High Wold landscape to development, particularly tall vertical elements, such as wind turbines.

The High Wold contains a large number of Prehistoric monuments including funerary monuments dating to the Neolithic and Bronze Age and defensive enclosures dating to the Iron Age. These are an important component of the landscape and highly sensitive to development that may affect their landscape setting and material remains.

Variation to Overall LCT Scores at the LCA Level

- None

Recommendations and Guidance for Future Development Within the LCT

Wind Energy Developments

Overall Recommendations:

- All turbine development is likely to be highly sensitive given the presence of the Cotswold AONB and its inherent sensitivities; and
- Neighbouring LCTs would be visually sensitive to this form of development.

Strategic Landscape Guidance:

- Conserve the open, remote character by objecting to the development of vertical elements on the skyline or where these would adversely affect views across and to the High Wold;
- Ensure the development of vertical elements in neighbouring LCTs and areas beyond the AONB do not adversely affect views to, from and across the High Wold;
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the undeveloped skyline;
- Bury cables underground and seek opportunities to bury existing power lines;
- Avoid use of visually prominent urban security fencing and CCTV masts;
- Ensure a comprehensive LVIA is undertaken (including potential cumulative effects); and
- Ensure full assessment of heritage setting impacts and appropriate measures undertaken.

Solar PV Developments

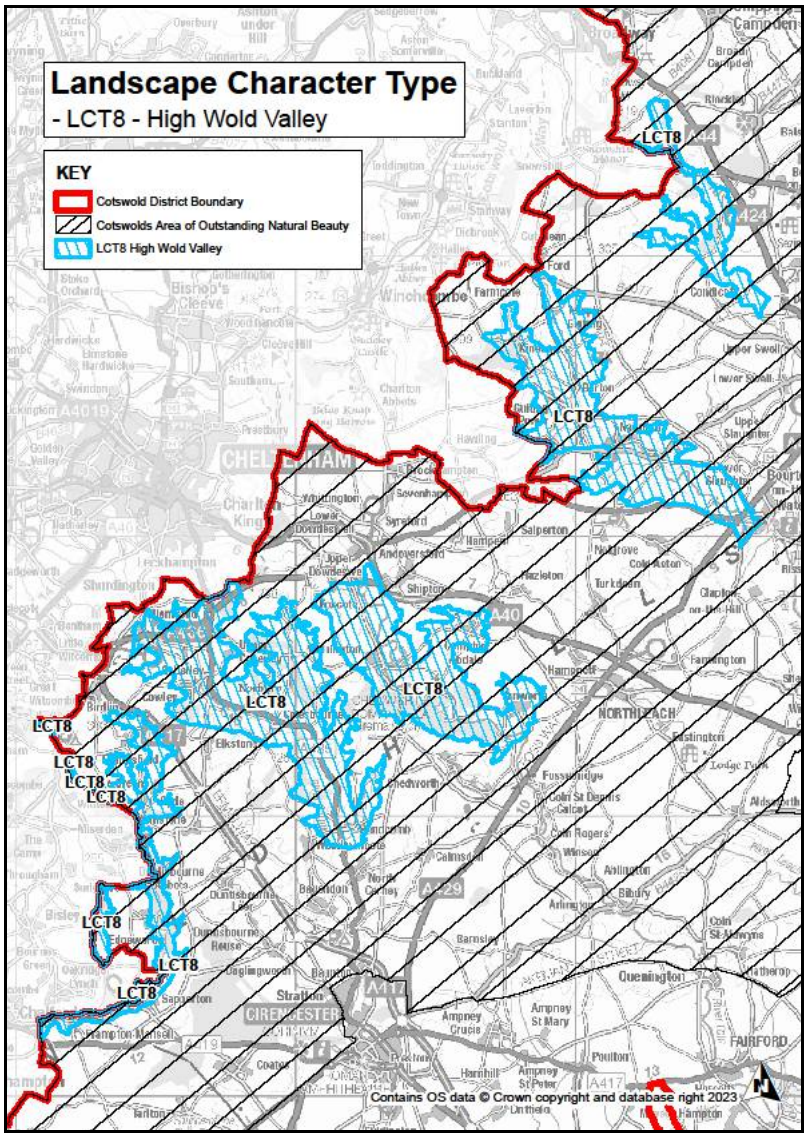
Overall Recommendations:

- There may be opportunities to locate solar PV developments (up to and including 20ha) within more sheltered fields where they are bound by characteristic hedgerows;
- Anything larger than this is considered to be highly sensitive given the presence of the Cotswold AONB and its inherent sensitivities;
- The setting of heritage assets is an important consideration; and
- PV developments should be sited within farmland, not semi-natural habitat to retain naturalistic characteristics and habitat interest.

Strategic Landscape Guidance:

- Prevent proposals for solar farms that will impact negatively on landscape character and/or intrude into views;
- Avoid proposals that will result in the loss or harm to landscape features such as Strip Lynchets, hedgerows and walls;
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the undeveloped skyline;
- Reduce landscape and visual impact with appropriate screening;
- Ensure a comprehensive LVIA is undertaken (including potential cumulative effects);
- Ensure a glint/glare assessment is undertaken to determine the heliographic impact on receptors;
- Bury cables underground and seek opportunities to bury existing power lines;
- Keep supporting infrastructure to a minimum and ensure it is in keeping with landscape character;
- Ensure removal and restoration on temporary construction access;
- Avoid the inclusion of any security lighting proposals; and
- Seek appropriate landscape enhancement to field boundaries and margins within solar farm development proposals.

Landscape Character Type 8: High Wold Valley



Landscape Sensitivity Assessment

Criteria	Description	Sensitivity Score	
		Wind	Solar
Landform and Scale (including sense of openness/enclosure)	- Predominantly dry or ephemeral flow headwater valleys with generally broad valley form and shallow slope profiles. - Incised valley form below heads of valleys with often steep, convoluted valley sides dissected by minor watercourses and distinctive convex profile at transition with the High Wold and forming dramatic landscape features and contrast to the open landscapes characteristic of the neighbouring High Wold.	H	M-H
Landcover (including field and settlement pattern)	- Areas of open pastoral farmland extend between the wooded slopes, and along valley bottoms, together with pockets of arable land, particularly on the shallower slopes indicative of a well-settled and long farmed landscape.	M-H	M
Historic Landscape Character	- Occasional private parklands and gardens associated with country houses add to the wooded and historic character of the valleys. - Intermittent stone villages occupying secluded locations in valley bottoms, often in association with a bridging point, indicate a long history of settlement in the valleys.	M-H	M-H
Visual Character (including skylines/intervisibility)	- Extensive areas of predominantly broadleaved woodland cloaking sections of the valley sides, particularly across the steeper sections, create visual containment and add to the secluded, secretive character of many stretches of the valleys.	H	M-H
Perceptual Qualities	- A strong sense of enclosure is provided by the valley sides and tall hedges, many of which contain mature trees. - The sheltered landscapes of the valleys provide a relative sense of enclosure and seclusion in comparison to the surrounding more open and exposed High Wold.	H	M-H
Scenic and Special Qualities	- The steep valley sides have limited development and the landscape has retained much of its traditional rural character.	H	H

	- The geology of the area is reflected in building materials, with many traditional houses, farm buildings and walls constructed in Cotswold limestone, as well as the presence of dry stone walls.		

Overall Assessment of Landscape Sensitivity to Development Scenarios

Please note: Landscape sensitivity often varies within an LCA, with areas exhibiting higher and lower sensitivity. It is therefore very important to take note of the explanatory text supporting the assessments in each Landscape Character Type profile, particularly the box entitled 'notes on any variations in landscape sensitivity'. Whilst the Landscape Sensitivity Assessment results provide an initial indication of landscape sensitivity, they should not be interpreted as definitive statements on the suitability of individual sites for a particular development. All proposals will need to be assessed on their own merits through the planning process, including – where required – through proposal-specific Landscape and Visual Impact Assessments (LVIAs).

Development Scenario	**Sensitivity**				
Very Small Wind Installation (up to 25m)					H
Small Wind Installation (25m to 60m)					H
Medium Wind Installation (60m to 100m)					H
Large Wind Installation (100m to 150m)					H
Very Large Wind Installation (150m to 200m)					H
Very Small Solar PV Installation (up to 1 hectare)			M		
Small Solar PV Installation (1 to 5 hectares)			M		
Medium Solar PV Installation (5 to 20 hectares)				M-H	
Large Solar PV Installation (20 to 50 hectares)					H
Very Large Solar PV Installation (50 to 120 hectares)					H

Summary of Landscape Sensitivity

The High Wold Valleys are sensitive to developments that might interrupt the sense of seclusion within them and their rural, pastoral character. In addition, the confined landform and steep slopes within the valleys, together with many areas of nature conservation interest together form a further constraint to development. Such areas include riparian and riverine habitats along watercourses at the base of the valleys, areas of ancient broadleaved woodland, and calcareous grassland on steep landform beyond the limits of grazing stock. The valleys are therefore particularly sensitive to direct change bought about by development.

Variation to Overall LCT Scores at the LCA Level

- None

Recommendations and Guidance for Future Development Within the LCT

Wind Energy Developments

Overall Recommendations:

- All turbine development is likely to be highly sensitive given the presence of the Cotswold AONB and its inherent sensitivities; and
- Neighbouring LCTs would be visually sensitive to this form of development.

Strategic Landscape Guidance:

- Conserve the character by opposing the development of wind turbines where these would adversely affect views along the valleys and from the valley sides and on valley rims;
- Ensure the development of vertical elements in neighbouring LCTs and areas beyond the AONB do not adversely affect views to, from and across or along the valleys;
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the undeveloped skyline;
- Bury cables underground and seek opportunities to bury existing power lines;
- Avoid use of visually prominent urban security fencing and CCTV masts;
- Ensure a comprehensive LVIA is undertaken (including potential cumulative effects); and
- Ensure full assessment of heritage setting impacts and appropriate measures undertaken.

Solar PV Developments

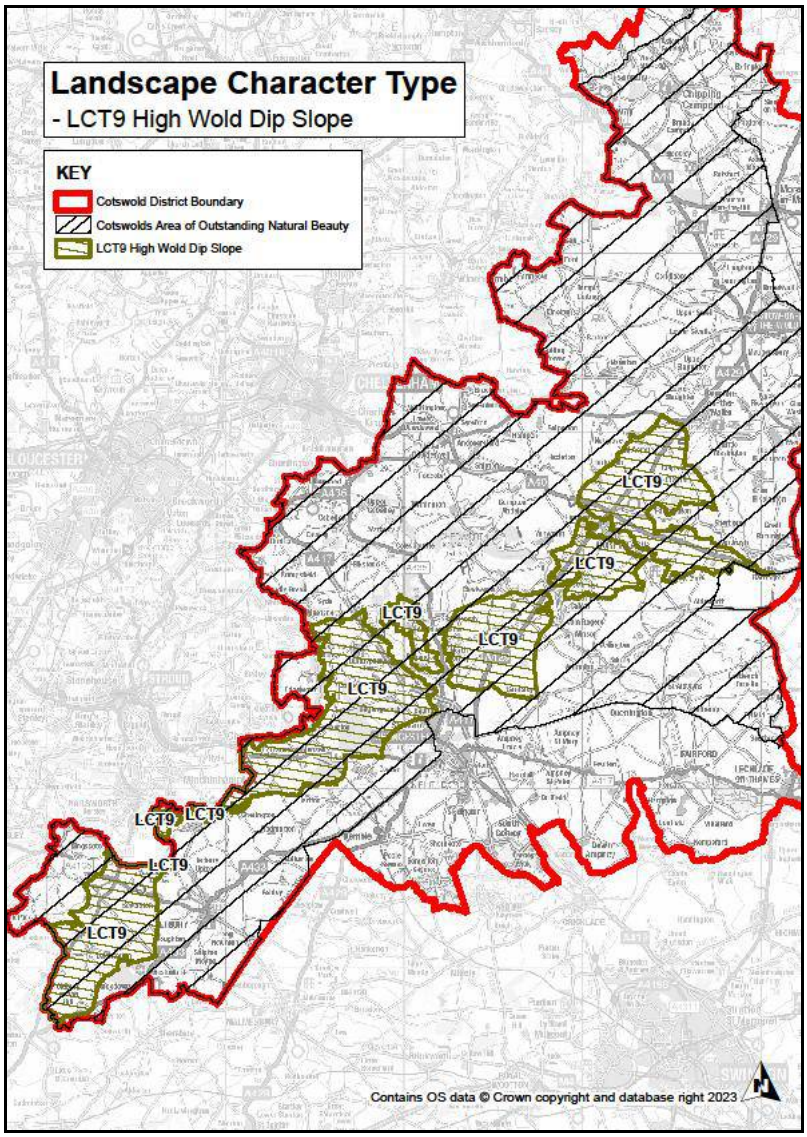
Overall Recommendations:

- There may be opportunities to locate solar PV developments (up to and including 20ha) within more sheltered fields where they are bound by characteristic hedgerows;
- Anything larger than this is considered to be highly sensitive given the presence of the Cotswold AONB and its inherent sensitivities;
- The setting of heritage assets is an important consideration; and
- PV developments should be sited within farmland, not semi-natural habitat to retain naturalistic characteristics and habitat interest.

Strategic Landscape Guidance:

- Prevent proposals for solar farms that will impact negatively on landscape character and/or intrude into views;
- Avoid proposals that will result in the loss or harm to landscape features such as hedgerows and walls;
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the undeveloped skyline;
- Reduce landscape and visual impact with appropriate screening;
- Ensure a comprehensive LVIA is undertaken (including potential cumulative effects);
- Ensure a glint/glare assessment is undertaken to determine the heliographic impact on receptors;
- Bury cables underground and seek opportunities to bury existing power lines;
- Keep supporting infrastructure to a minimum and ensure it is in keeping with landscape character;
- Ensure removal and restoration on temporary construction access;
- Avoid the inclusion of any security lighting proposals; and
- Seek appropriate landscape enhancement to field boundaries and margins within solar farm development proposals.

Landscape Character Type 9: High Wold Dip Slope



Landscape Sensitivity Assessment

Criteria	Description	Sensitivity Score	
		Wind	Solar
Landform and Scale (including sense of openness/enclosure)	- Soft, gently undulating landscape with a south-easterly fall dissected by a series of predominantly south-east flowing rivers.	H	M-H
Landcover (including field and settlement pattern)	- Widespread arable farming lends it a well maintained, productive character, with a strong framework of hedges and woodland defining a complex mosaic of small scale arable and pasture land. - Network of dry valley systems provide intimate pastoral landscapes within the wider arable landscape.	M-H	M
Historic Landscape Character	- Airfields on shallow sloping elevated landscapes are evidence of their former strategic role in the defence of Britain in World War II. - Designed parklands and gardens exert a subtle influence over the landscape.	M-H	M-H
Visual Character (including skylines/intervisibility)	- Intermittent long distance views towards the High Wold and across neighbouring lowlands in which the subtle but distinctive slope profiles of the landscape can be discerned.	H	M-H
Perceptual Qualities	- A strong sense of openness. - Where arable farming predominates and fields are large, there is a sense of a prairie type landscape which can contribute to a sense of remoteness.	H	H
Scenic and Special Qualities	- Landscape displays many of the characteristics of the neighbouring High Wold and Dip-Slope Lowland landscape between the two. - Stone walls less prevalent than on the High Wold although still make a significant contribution to landscape character.	H	H

Overall Assessment of Landscape Sensitivity to Development Scenarios

Please note: Landscape sensitivity often varies within an LCA, with areas exhibiting higher and lower sensitivity. It is therefore very important to take note of the explanatory text supporting the assessments in each Landscape Character Type profile, particularly the box entitled 'notes on any variations in landscape sensitivity'. Whilst the Landscape Sensitivity Assessment results provide an initial indication of landscape sensitivity, they should not be interpreted as definitive statements on the suitability of individual sites for a particular development. All proposals will need to be assessed

on their own merits through the planning process, including – where required – through proposal-specific Landscape and Visual Impact Assessments (LVIAs).

Development Scenario	Sensitivity				
Very Small Wind Installation (up to 25m)					H
Small Wind Installation (25m to 60m)					H
Medium Wind Installation (60m to 100m)					H
Large Wind Installation (100m to 150m)					H
Very Large Wind Installation (150m to 200m)					H
Very Small Solar PV Installation (up to 1 hectare)			M		
Small Solar PV Installation (1 to 5 hectares)				M-H	
Medium Solar PV Installation (5 to 20 hectares)				M-H	
Large Solar PV Installation (20 to 50 hectares)					H
Very Large Solar PV Installation (50 to 120 hectares)					H

Summary of Landscape Sensitivity

The wide, elevated, gently undulating Dip-Slope landscape is sensitive to landscape change. Characteristic features such as wide panoramic views, a high degree of intervisibility and limited woodland cover increase the sensitivity of the landscape. It is particularly sensitive to large scale developments or elements that may introduce tall vertical elements.

In view of the brownfield status of decommissioned airfields, they are particularly susceptible to proposals for new large-scale development that has the potential to have a widespread impact on landscape character and visual amenity over large areas of the surrounding landscape. Such sites may offer some capacity for development, however, due to the established use of existing development, but nevertheless require careful site planning and mitigation.

Variation to Overall LCT Scores at the LCA Level

- None

Recommendations and Guidance for Future Development Within the LCT

Wind Energy Developments

Overall Recommendations:

- All turbine development is likely to be highly sensitive given the presence of the Cotswold AONB and its inherent sensitivities; and
- Neighbouring LCTs would be visually sensitive to this form of development.

Strategic Landscape Guidance:

- Conserve the open and often remote character by objecting to the development of turbines where these would adversely affect the skyline and views along and to the High Wold Dip-slope;
- Ensure the development of vertical elements in neighbouring LCTs and areas beyond the AONB do not adversely affect views to and from the southern scarp area and from the panoramic south and south east views;
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the undeveloped skyline;
- Bury cables underground and seek opportunities to bury existing power lines;
- Avoid use of visually prominent urban security fencing and CCTV masts; and

- Ensure a comprehensive LVIA is undertaken (including potential cumulative effects).

Solar PV Developments

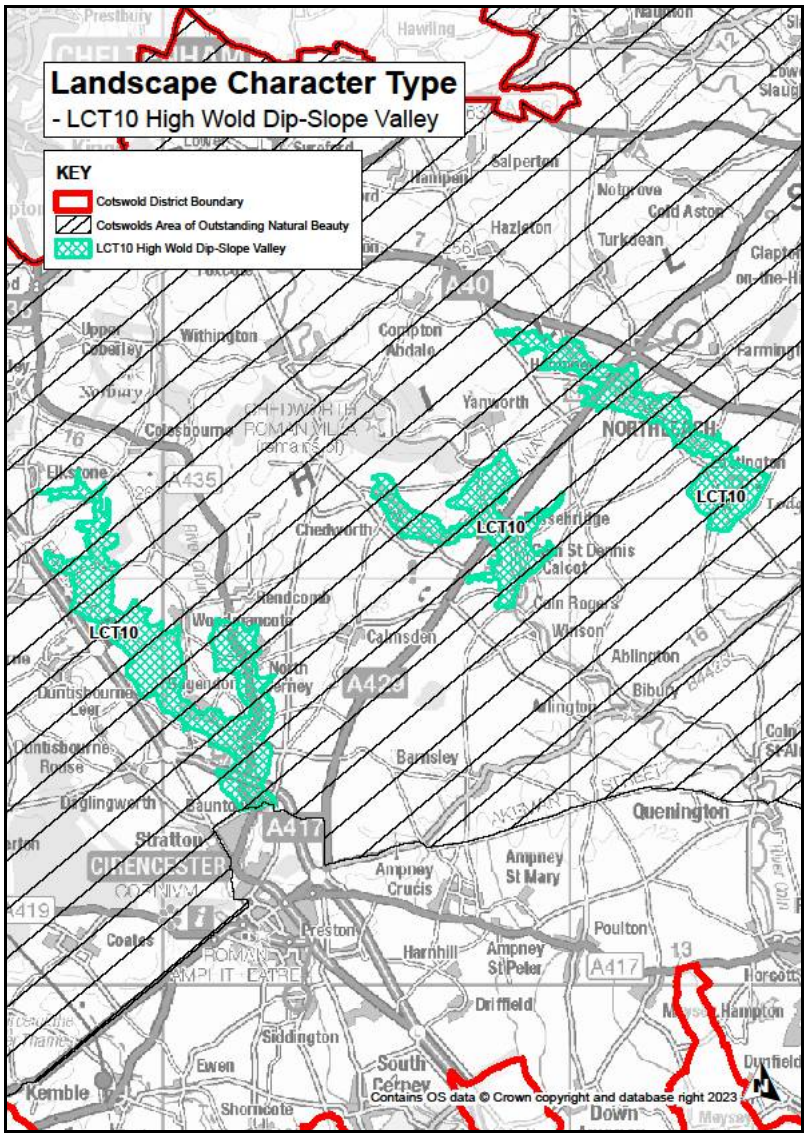
Overall Recommendations:

- There may be opportunities to locate solar PV developments (up to and including 20ha) within more sheltered fields where they are bound by characteristic hedgerows;
- Anything larger than this is considered to be highly sensitive given the presence of the Cotswold AONB and its inherent sensitivities; and
- PV developments should be sited within farmland, not semi-natural habitat to retain naturalistic characteristics and habitat interest.

Strategic Landscape Guidance:

- Prevent proposals for solar farms that will impact negatively on landscape character and/or intrude into views;
- Avoid proposals that will result in the loss or harm to landscape features such as Strip Lynchets, hedgerows and walls;
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the undeveloped skyline;
- Reduce landscape and visual impact with appropriate screening;
- Ensure a comprehensive LVIA is undertaken (including potential cumulative effects);
- Ensure a glint/glare assessment is undertaken to determine the heliographic impact on receptors;
- Bury cables underground and seek opportunities to bury existing power lines;
- Keep supporting infrastructure to a minimum and ensure it is in keeping with landscape character;
- Ensure removal and restoration on temporary construction access;
- Avoid the inclusion of any security lighting proposals; and
- Seek appropriate landscape enhancement to field boundaries and margins within solar farm development proposals.

Landscape Character Type 10: High Wold Dip Slope Valley



Landscape Sensitivity Assessment

Criteria	Description	Sensitivity Score	
		Wind	Solar
Landform and Scale (including sense of openness/enclosure)	- Well-defined, gentle concave valley forms with intermittently very steep and indented sides dissected by minor watercourses represent the mid sections of valleys that rise on the High Wold and drain south-eastwards through the Dip-Slope Lowlands to the Thames. - Parts of the valley floor have an intimate, small-scale character due to enclosure from surrounding wooded valley slopes and hedgerows.	H	M-H
Landcover (including field and settlement pattern)	- Predominance of pastoral farmland of improved grassland extend between small woodlands on slopes, and along valley bottoms, together with pockets of arable land, particularly on the shallower slopes which together define a productive farmland character where landform permits. - Intermittent areas of predominantly broadleaved and mixed woodland extend across sections of the valley sides, particularly across the steeper sections form a backdrop to valley settlements and add texture to the otherwise smooth verdant pastures.	M-H	M-H
Historic Landscape Character	- Intermittent stone built villages occupy sheltered locations in valley bottoms, often in association with a bridging point indicate a long history of settlement in the valleys. - Numerous conservations areas, listed structures and registered parks and gardens present within the LCT - Private parklands within or adjacent to the valley influence the local character of the landscape in the form of estate architecture and formal planned planting.	H	H
Visual Character (including skylines/intervisibility)	- Sheltered, visually contained and intimate valley systems provide a contrast to the more open landscapes on the neighbouring High Wold Dip-Slope. - Views over the valleys from upper slopes are extensive and the farmed	M-H	M

	valley slopes form a backdrop to views from the valley floors.		
Perceptual Qualities	- The valleys retain a rural and tranquil agricultural character, with large areas only accessible on foot, increasing the perception of remoteness. - The A435 and A417 has an urbanising effect on LCA 10a.	H	M-H
Scenic and Special Qualities	- These valleys, like the High Wold Dip Slope through which they cut, form a transitional zone between the High Wold Valleys and the Dip-Slope Lowland Valleys.	H	H

Overall Assessment of Landscape Sensitivity to Development Scenarios

Please note: Landscape sensitivity often varies within an LCA, with areas exhibiting higher and lower sensitivity. It is therefore very important to take note of the explanatory text supporting the assessments in each Landscape Character Type profile, particularly the box entitled 'notes on any variations in landscape sensitivity'. Whilst the Landscape Sensitivity Assessment results provide an initial indication of landscape sensitivity, they should not be interpreted as definitive statements on the suitability of individual sites for a particular development. All proposals will need to be assessed on their own merits through the planning process, including – where required – through proposal-specific Landscape and Visual Impact Assessments (LVIAs).

Development Scenario	**Sensitivity**				
Very Small Wind Installation (up to 25m)					H
Small Wind Installation (25m to 60m)					H
Medium Wind Installation (60m to 100m)					H
Large Wind Installation (100m to 150m)					H
Very Large Wind Installation (150m to 200m)					H
Very Small Solar PV Installation (up to 1 hectare)			M		
Small Solar PV Installation (1 to 5 hectares)				M-H	
Medium Solar PV Installation (5 to 20 hectares)				M-H	
Large Solar PV Installation (20 to 50 hectares)					H
Very Large Solar PV Installation (50 to 120 hectares)					H

Summary of Landscape Sensitivity

The soft pastoral landscape of the High Wold Dip-Slope Valleys are sensitive to development that would compromise their rural character. Whilst the agricultural landscape appears profitable and well managed, areas of nature conservation interest exist in the form of riparian and riverine habitats along watercourses at the base of the valleys and areas of ancient broadleaved woodland and calcareous grassland on steep landform beyond the limits of grazing stock. These are particularly sensitive to direct change brought about by development.

Variation to Overall LCT Scores at the LCA Level

- The A435 and A417 has an urbanising effect on LCA 10a.
- LCA 10b and 10c heavily influenced by conservation areas and other historic designations.

Recommendations and Guidance for Future Development Within the LCT

Wind Energy Developments

Overall Recommendations:

- All turbine development is likely to be highly sensitive given the presence of the Cotswold AONB and its inherent sensitivities.

Strategic Landscape Guidance:

- Conserve the open and often remote character by objecting to the development of turbines where these would adversely affect views from valley sides and on valley rims;
- Conserve the secluded character of the High Wold Dip-Slope Valleys by objecting to the development of turbines where these would adversely affect views to and from valley sides and rims;
- Ensure the development of vertical elements in neighbouring LCTs do not adversely affect views across or along the valleys;
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the undeveloped skyline;
- Bury cables underground and seek opportunities to bury existing power lines;
- Avoid use of visually prominent urban security fencing and CCTV masts;
- Ensure a comprehensive LVIA is undertaken (including potential cumulative effects); and
- Ensure full assessment of heritage setting impacts and appropriate measures undertaken.

Solar PV Developments

Overall Recommendations:

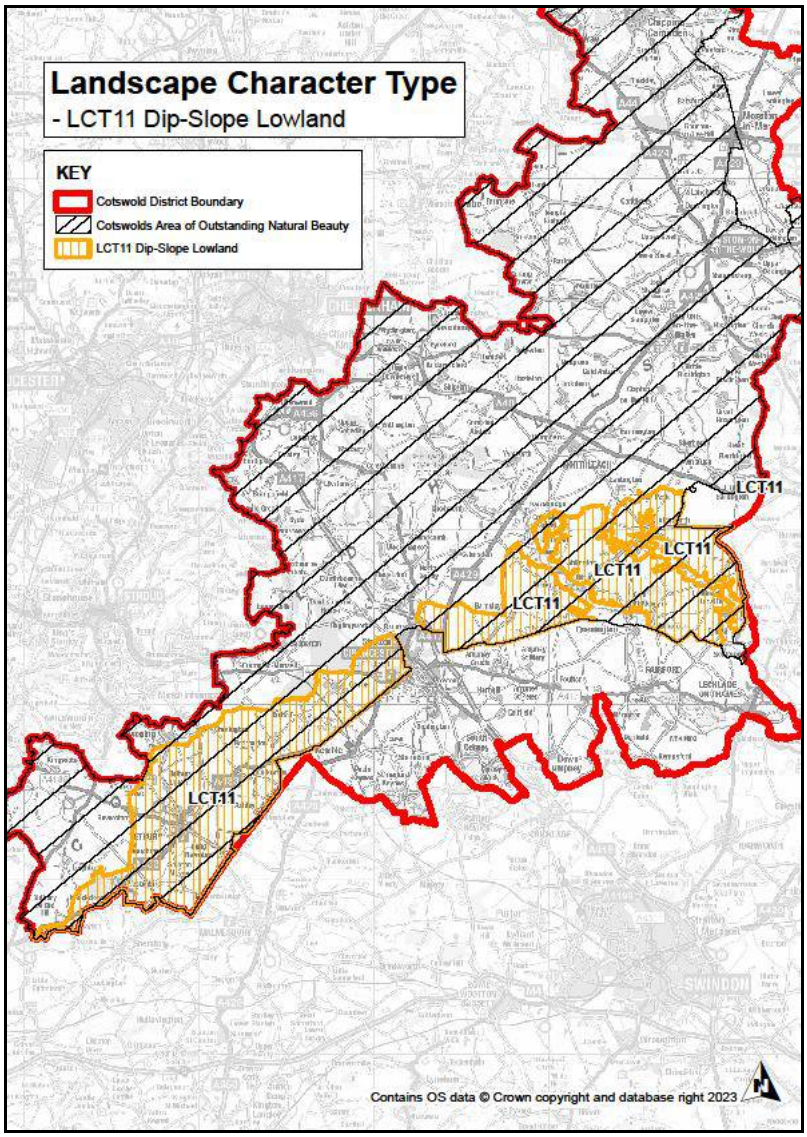
- There may be opportunities to locate solar PV developments (up to and including 20ha) within more sheltered fields where they are bound by characteristic hedgerows;
- Anything larger than this is considered to be highly sensitive given the presence of the Cotswold AONB and its inherent sensitivities; and
- PV developments should be sited within farmland, not semi-natural habitat to retain naturalistic characteristics and habitat interest.

Strategic Landscape Guidance:

- Prevent proposals for solar farms that will impact negatively on landscape character and/or intrude into views;
- Avoid proposals that will result in the loss or harm to landscape features such as Strip Lynchets, hedgerows and walls;
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the undeveloped skyline;
- Reduce landscape and visual impact with appropriate screening;
- Ensure a comprehensive LVIA is undertaken (including potential cumulative effects);
- Ensure a glint/glare assessment is undertaken to determine the heliographic impact on receptors;
- Bury cables underground and seek opportunities to bury existing power lines;
- Keep supporting infrastructure to a minimum and ensure it is in keeping with landscape character;
- Ensure removal and restoration on temporary construction access;
- Avoid the inclusion of any security lighting proposals; and

- Seek appropriate landscape enhancement to field boundaries and margins within solar farm development proposals.

Landscape Character Type 11: Dip Slope Lowland



Landscape Sensitivity Assessment

Criteria	Description	Sensitivity Score	
		Wind	Solar
Landform and Scale (including sense of openness/enclosure)	- Broad area of gently sloping, undulating lowland with a predominantly south-easterly fall represents a transition between the landscape of the High Wold Dip-Slope to the north and west and the low lying landscapes in the Thames basin to the south east. - Lowland landform gently dissected by infrequent small watercourses flowing into the main rivers that cross the area, reinforcing the general grain of the topography. - Open character but smaller in scale than the High Wold and High Wold Dip Slope.	M-H	M
Landcover (including field and settlement pattern)	- Well-managed, productive agricultural landscape of mixed arable and improved pasture, together with more limited areas of permanent pasture, mainly within the valley bottoms. - Medium to large scale regular fields predominate, mainly enclosed by hedgerows, with hedgerow trees, together with some stone walls or post and wire fencing indicating strong similarities with the High Wold and High Wold Dip Slope landscape to the north and west. - Woodland cover limited to intermittent copses and shelterbelts within agricultural landscapes. - Settlement pattern of intermittent small nucleated villages, hamlets and isolated farmsteads, together with occasional larger settlements, contribute to the strong rural character.	M-H	M
Historic Landscape Character	- Distinctive pattern of large estates and associated planned parkland landscape and woodland occurring throughout the area. - Evidence of long period of occupation.	M-H	M
Visual Character (including skylines/intervisibility)	- Open and often expansive views extend across the almost flat landscape, screened by flat boundaries and shelterbelts.	M-H	M

	- Dip Slope Lowland makes an important contribution to the wider character of the landscape due to the influences of designed parkland and planned woodland planting which often form a backdrop to long distance views across the otherwise open landscape.		
Perceptual Qualities	- A largely quiet landscape with a rural and remote agricultural character. - Busy roads including the B4425 and A433 produce localised sound and visual disruption. - The settlement of Tetbury is a prominent feature within the south of the LCT.	M-H	M
Scenic and Special Qualities	- Attractive agricultural landscape punctuated with linear road corridors and settlement. - Demonstrates a number of the special qualities for which the AONB was designated. This includes high levels of tranquillity, distinctive settlements and areas of dark skies.	H	H

Overall Assessment of Landscape Sensitivity to Development Scenarios

Please note: Landscape sensitivity often varies within an LCA, with areas exhibiting higher and lower sensitivity. It is therefore very important to take note of the explanatory text supporting the assessments in each Landscape Character Type profile, particularly the box entitled 'notes on any variations in landscape sensitivity'. Whilst the Landscape Sensitivity Assessment results provide an initial indication of landscape sensitivity, they should not be interpreted as definitive statements on the suitability of individual sites for a particular development. All proposals will need to be assessed on their own merits through the planning process, including – where required – through proposal-specific Landscape and Visual Impact Assessments (LVIAs).

Development Scenario	**Sensitivity**				
Very Small Wind Installation (up to 25m)				M-H	
Small Wind Installation (25m to 60m)				M-H	
Medium Wind Installation (60m to 100m)					H
Large Wind Installation (100m to 150m)					H
Very Large Wind Installation (150m to 200m)					H
Very Small Solar PV Installation (up to 1 hectare)		L-M			
Small Solar PV Installation (1 to 5 hectares)			M		
Medium Solar PV Installation (5 to 20 hectares)				M-H	
Large Solar PV Installation (20 to 50 hectares)					H
Very Large Solar PV Installation (50 to 120 hectares)					H
Summary of Landscape Sensitivity					

The strongly structured cultivated Dip Slope Lowland landscape is sensitive to large scale development that might interrupt wide views across the landscape and in particular to development that would introduce tall vertical elements such as turbines.

However, the presence of more intensively managed landscapes makes Dip Slope Lowlands generally less sensitive than remoter and more elevated landscape on the High Wold and High Wold Dip-Slope. Areas where a strong woodland framework exists are particularly suited to accommodate development. Development proposals should avoid extensive woodland planting, as this would compromise the open character of the landscape and long views across the Dip-Slope Lowlands.

Parkland landscapes are particularly sensitive to developments that might compromise their historic character and the contribution they make to the wider landscape of the Dip Slope Lowlands. Care should be taken to ensure that developments do not compromise elements that constitute the wider setting of designed parklands such as estate villages and tree plantations.

Variation to Overall LCT Scores at the LCA Level

- The settlement of Tetbury within LCA 11a is a prominent feature.

Recommendations and Guidance for Future Development Within the LCT

Wind Energy Developments

Overall Recommendations:

- There may be opportunities for the siting of wind turbines up to 60m within the larger-scale, open landscape away from more intimate areas of smaller scale pasture (ensuring the guidance below is followed); and
- The scattering of turbines should be minimised to avoid significant cumulative impacts on landscape character from arising.

Strategic Landscape Guidance:

- Conserve the open and often remote character of the Dip-Slope Lowland by objecting to the development of turbines where these would adversely affect panoramas and views along and to the Dip-Slope Lowland;
- Ensure that any new developments are similar in terms of siting, layout and relationship to key landscape characteristics, so as to present a simple image that relates clearly to landscape character;
- Avoid close juxtaposition of different turbine designs and heights within the height category, aiming instead for a consistent design and height in any given area;
- Ensure the development of vertical elements in neighbouring LCTs do not adversely affect views across or along the valleys;
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the relatively undeveloped skyline;
- Ensure wind energy development does not detract from historic landmarks such as scheduled monuments, villages with conservation areas and the setting of listed buildings, including church spires that are often locally important skyline features;
- Consider views from local settlements and popular recreational routes/areas;
- Bury cables underground and seek opportunities to bury existing power lines;
- Avoid use of visually prominent urban security fencing and CCTV masts;
- Ensure a comprehensive LVIA is undertaken (including potential cumulative effects); and
- Ensure full assessment of heritage setting impacts and appropriate measures undertaken.

Solar PV Developments

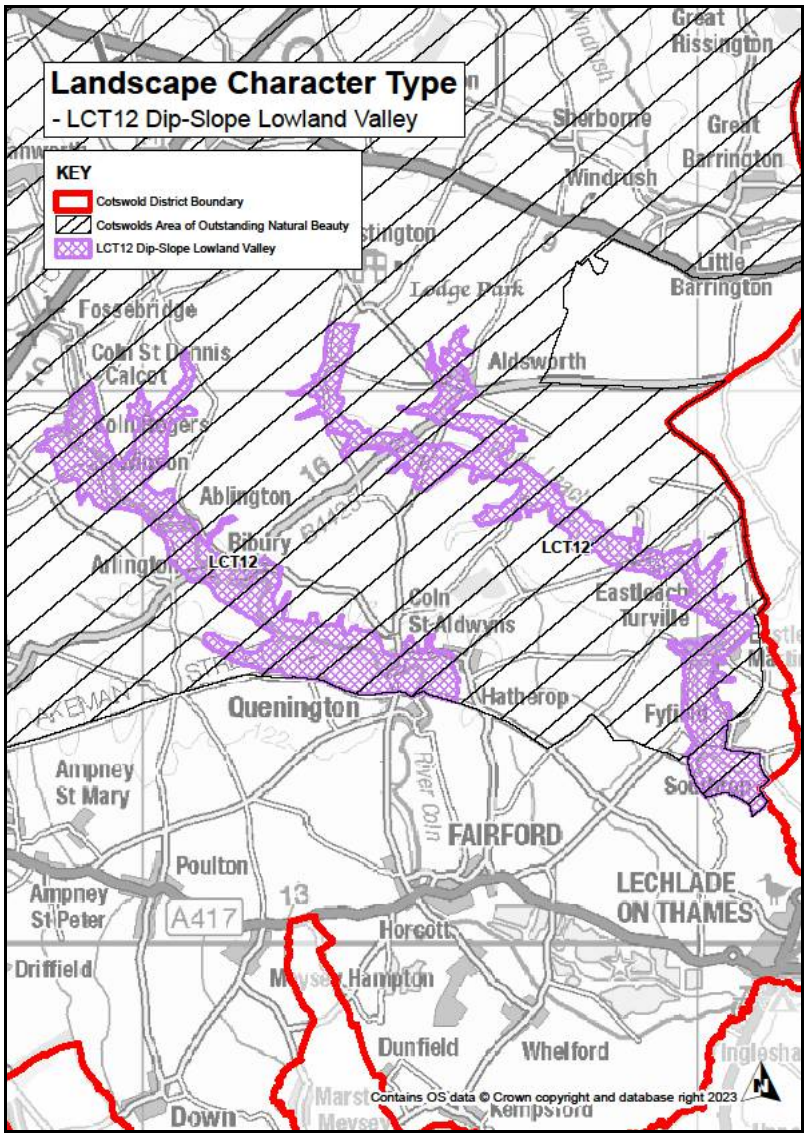
Overall Recommendations:

- There may be opportunities to locate solar PV developments (up to and including 20ha) within more sheltered fields where they are bound by characteristic hedgerows;
- Anything larger than this is considered to be highly sensitive given the presence of the Cotswold AONB and its inherent sensitivities; and
- PV developments should be sited within farmland, not semi-natural habitat to retain naturalistic characteristics and habitat interest.

Strategic Landscape Guidance:

- Prevent proposals for solar farms that will impact negatively on landscape character and/or intrude into views;
- Avoid proposals that will result in the loss or harm to landscape features such as Strip Lynchets, hedgerows and walls;
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the undeveloped skyline;
- Reduce landscape and visual impact with appropriate screening;
- Ensure a comprehensive LVIA is undertaken (including potential cumulative effects);
- Ensure a glint/glare assessment is undertaken to determine the heliographic impact on receptors;
- Bury cables underground and seek opportunities to bury existing power lines;
- Keep supporting infrastructure to a minimum and ensure it is in keeping with landscape character;
- Ensure removal and restoration on temporary construction access;
- Avoid the inclusion of any security lighting proposals; and
- Seek appropriate landscape enhancement to field boundaries and margins within solar farm development proposals.

Landscape Character Type 12: Dip Slope Lowland Valley



Landscape Sensitivity Assessment

Criteria	Description	Sensitivity Score	
		Wind	Solar
Landform and Scale (including sense of openness/enclosure)	- Well-defined valley form with convex slope profile at transition onto the adjacent Dip Slope Lowland landscape. - Progressively shallower and more open valley form within the lower reaches of the Thames tributaries extending into the very gently undulating landscape of the Thames Basin.	H	M-H
Landcover (including field and settlement pattern)	- Predominance of open pastoral farmland of improved grassland between intermittent wooded slopes and along valley bottoms, together with pockets of arable land, particularly on the shallower slopes extending onto the neighbouring Dip Slope Lowlands providing seasonal variations in texture and colour. - Linear belts of mixed and broadleaved woodland follow steeper landform and often extend up to the river edge. These often combine with hedgerow and hedgerow trees to create the impression of a well-wooded landscape and represent important green ways linking the river to the wider landscape.	M-H	M-H
Historic Landscape Character	- Sequence of stone built villages occupying secluded locations in valley bottoms, often in association with a bridging point and on valley sides. - High density of historic features, including traditional villages with conservation areas and concentrations of listed buildings.	H	H
Visual Character (including skylines/intervisibility)	- Intimate, small scale, settled landscape character with landform and woodlands restricting long views out of the valleys. - Views over the valleys from upper slopes are extensive and the farmed valley slopes form a backdrop to views from the valley floors.	H	M-H
Perceptual Qualities	- The valleys retain a rural and tranquil agricultural character, with large areas only accessible on foot, increasing the perception of remoteness.	H	H
Scenic and Special Qualities	- Some areas of the valleys, including tributary valleys are only accessible on	H	H

	foot and retain a remote rural character.		

Overall Assessment of Landscape Sensitivity to Development Scenarios

Please note: Landscape sensitivity often varies within an LCA, with areas exhibiting higher and lower sensitivity. It is therefore very important to take note of the explanatory text supporting the assessments in each Landscape Character Type profile, particularly the box entitled 'notes on any variations in landscape sensitivity'. Whilst the Landscape Sensitivity Assessment results provide an initial indication of landscape sensitivity, they should not be interpreted as definitive statements on the suitability of individual sites for a particular development. All proposals will need to be assessed on their own merits through the planning process, including – where required – through proposal-specific Landscape and Visual Impact Assessments (LVIAs).

Development Scenario	Sensitivity				
Very Small Wind Installation (up to 25m)					H
Small Wind Installation (25m to 60m)					H
Medium Wind Installation (60m to 100m)					H
Large Wind Installation (100m to 150m)					H
Very Large Wind Installation (150m to 200m)					H
Very Small Solar PV Installation (up to 1 hectare)			M		
Small Solar PV Installation (1 to 5 hectares)				M-H	
Medium Solar PV Installation (5 to 20 hectares)					H
Large Solar PV Installation (20 to 50 hectares)					H
Very Large Solar PV Installation (50 to 120 hectares)					H

Summary of Landscape Sensitivity

The Dip Slope Lowland Valleys are deeply rural and are therefore sensitive to developments that might compromise this characteristic. A number of deeply incised stretches of the valleys and some tributaries are inaccessible other than on foot and are therefore highly sensitive to development that might erode their remote character. These stretches also often contain significant areas of semi-natural broadleaved ancient woodland and species rich grassland, which in view of their national importance are highly sensitive to all forms of development that might result in their loss or damage.

In the more developed sections of their valleys, and where a strong woodland framework exists, the landscape is less sensitive due to tree cover offering opportunities to successfully integrate small scale developments into their surroundings. However, development should avoid the sensitive and more visually prominent upper valley slopes and areas of floodplain bordering the river channel.

Existing valley settlements also have a reduced sensitivity to change. However, consideration should be given to the contribution that sections of the valleys sides make to landscape and townscape character, particularly where these sensitive landscapes form a rural backdrop to the setting of valley villages.

Variation to Overall LCT Scores at the LCA Level

- None

Recommendations and Guidance for Future Development Within the LCT

Wind Energy Developments

Overall Recommendations:

- All turbine development is likely to be highly sensitive given the presence of the Cotswold AONB and its inherent sensitivities.

Strategic Landscape Guidance:

- Conserve the intimate character of the Dip-Slope Lowland Valley by objecting to the development of vertical elements where these would adversely affect views along the valleys;
- Ensure the development of vertical elements in neighbouring LCTs do not adversely affect views across or along the valleys;
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the undeveloped skyline;
- Bury cables underground and seek opportunities to bury existing power lines;
- Avoid use of visually prominent urban security fencing and CCTV masts;
- Ensure a comprehensive LVIA is undertaken (including potential cumulative effects); and
- Ensure full assessment of heritage setting impacts and appropriate measures undertaken.

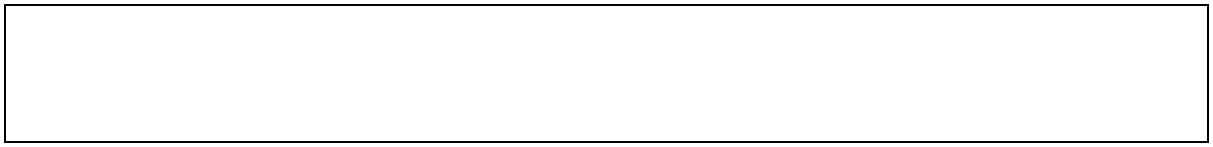
Solar PV Developments

Overall Recommendations:

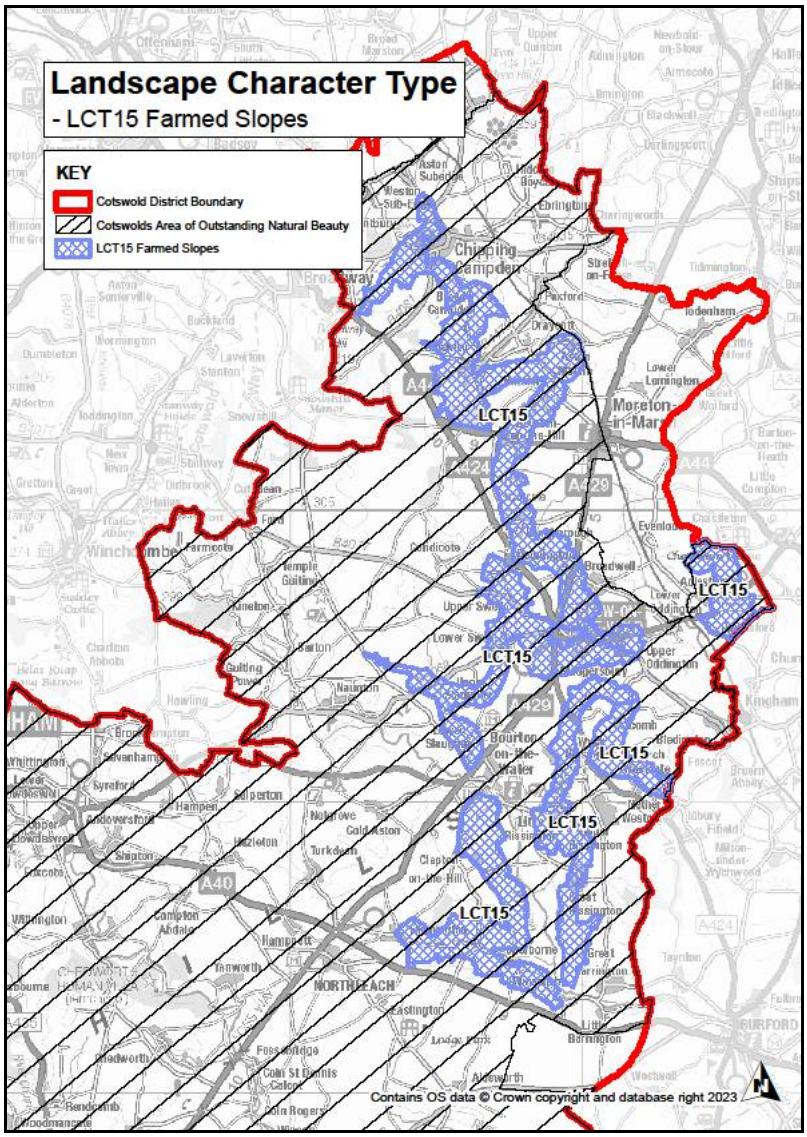
- There may be opportunities to locate solar PV developments (up to and including 5ha) within more sheltered fields where they are bound by characteristic hedgerows;
- Anything larger than this is considered to be highly sensitive given the presence of the Cotswold AONB and its inherent sensitivities; and
- PV developments should be sited within farmland, not semi-natural habitat to retain naturalistic characteristics and habitat interest.

Strategic Landscape Guidance:

- Prevent proposals for solar farms that will impact negatively on landscape character and/or intrude into views;
- Avoid proposals that will result in the loss or harm to landscape features such as Strip Lynchets, hedgerows and walls;
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the undeveloped skyline;
- Reduce landscape and visual impact with appropriate screening;
- Ensure a comprehensive LVIA is undertaken (including potential cumulative effects);
- Ensure a glint/glare assessment is undertaken to determine the heliographic impact on receptors;
- Bury cables underground and seek opportunities to bury existing power lines;
- Keep supporting infrastructure to a minimum and ensure it is in keeping with landscape character;
- Ensure removal and restoration on temporary construction access;
- Avoid the inclusion of any security lighting proposals; and
- Seek appropriate landscape enhancement to field boundaries and margins within solar farm development proposals.



Landscape Character Type 15: Farmed Slopes



Landscape Sensitivity Assessment

Criteria	Description	Sensitivity Score	
		Wind	Solar
Landform and Scale (including sense of openness/enclosure)	- Transitional landscape between the large fields and exposed nature of the High Wold and High Wold Dip Slope and the more sheltered and verdant, intimate landscapes of the Pastoral Lowland Vales. - Smooth gentle landform on lower slopes and sense of exposure on some upper slopes - Landform has a consistent north-south orientation following the course of the Evenlode and Windrush giving the landscape a well-defined grain and prodiving a general sense of orientation when in the vales.	H	M-H
Landcover (including field and settlement pattern)	- Productive arable and pasture farmland merging with areas of arable farming on the High Wold and High Wold Dip Slope and pasture farming in the lowland vale. - Strong pattern of hedgerows divide the farmed slopes into a patchwork of fields of sometime contrasting colours and textures.	M-H	M
Historic Landscape Character	- Areas of ridge and furrow on lower slopes indicate a long history of farming on the drier slopes above the less well-drained landscapes in the Vale. - Significant number of historic parks, sited to take advantage of the dramatic landform and extensive views, and often bordered by deciduous woodland.	M-H	M-H
Visual Character (including skylines/intervisibility)	- Some views across wide areas of the Pastoral Lowland Vales from upper slopes. - Small stone villages and hamlets climbing the slopes above the level of the wetter lowland vale are clearly visible from within the neighbouring lowlands and often afford wide views over the pastoral vales from their outer limits.	H	M-H
Perceptual Qualities	- The landscape has a rural and tranquil agricultural character.	H	H

	- A network of public rights of way cross the landscape, including a number of long distance promoted routes.		
Scenic and Special Qualities	- The landscape demonstrates a number of the special qualities for which the AONB was designated. Including 'big' skies, long distance views, dark skies, tranquillity and is an accessible landscape for quiet recreation.	H	H

Overall Assessment of Landscape Sensitivity to Development Scenarios

Please note: Landscape sensitivity often varies within an LCA, with areas exhibiting higher and lower sensitivity. It is therefore very important to take note of the explanatory text supporting the assessments in each Landscape Character Type profile, particularly the box entitled 'notes on any variations in landscape sensitivity'. Whilst the Landscape Sensitivity Assessment results provide an initial indication of landscape sensitivity, they should not be interpreted as definitive statements on the suitability of individual sites for a particular development. All proposals will need to be assessed on their own merits through the planning process, including – where required – through proposal-specific Landscape and Visual Impact Assessments (LVIAs).

Development Scenario	**Sensitivity**				
Very Small Wind Installation (up to 25m)					H
Small Wind Installation (25m to 60m)					H
Medium Wind Installation (60m to 100m)					H
Large Wind Installation (100m to 150m)					H
Very Large Wind Installation (150m to 200m)					H
Very Small Solar PV Installation (up to 1 hectare)			M		
Small Solar PV Installation (1 to 5 hectares)				M-H	
Medium Solar PV Installation (5 to 20 hectares)				M-H	
Large Solar PV Installation (20 to 50 hectares)					H
Very Large Solar PV Installation (50 to 120 hectares)					H

Summary of Landscape Sensitivity

Although gentler and shallower than the escarpment, the Farmed Slopes are in many respects similar, particularly with regard to their sensitivity to development.

Rising from the lowlands, the elevated and sloping landform of the Farmed Slopes makes them a highly visible feature and therefore very sensitive to change, particularly where this would introduce built elements to the otherwise agricultural landscape, or interrupt the strong patchwork patterns created by hedged pasture and arable fields.

The gentler lower slopes, at the junction of the Pastoral Vales, are visually less prominent than the upper slopes and generally more widely settled, decreasing their sensitivity to change and development.

Variation to Overall LCT Scores at the LCA Level

- None

Recommendations and Guidance for Future Development Within the LCT

Wind Energy Developments

Overall Recommendations:

- All turbine development is likely to be highly sensitive given the presence of the Cotswold AONB and its inherent sensitivities; and
- Neighbouring LCTs would be visually sensitive to this form of development.

Strategic Landscape Guidance:

- Conserve the open, remote character by objecting to the development of vertical elements particularly on the upper slopes and crest or where they would adversely affect views to and from the Farmed Slopes;
- Ensure the development of vertical elements in neighbouring LCTs and areas beyond the AONB do not adversely affect views to, from and across the Farmed Slopes;
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the undeveloped skyline;
- Bury cables underground and seek opportunities to bury existing power lines;
- Avoid use of visually prominent urban security fencing and CCTV masts;
- Ensure a comprehensive LVIA is undertaken (including potential cumulative effects); and
- Ensure full assessment of heritage setting impacts and appropriate measures undertaken.

Solar PV Developments

Overall Recommendations:

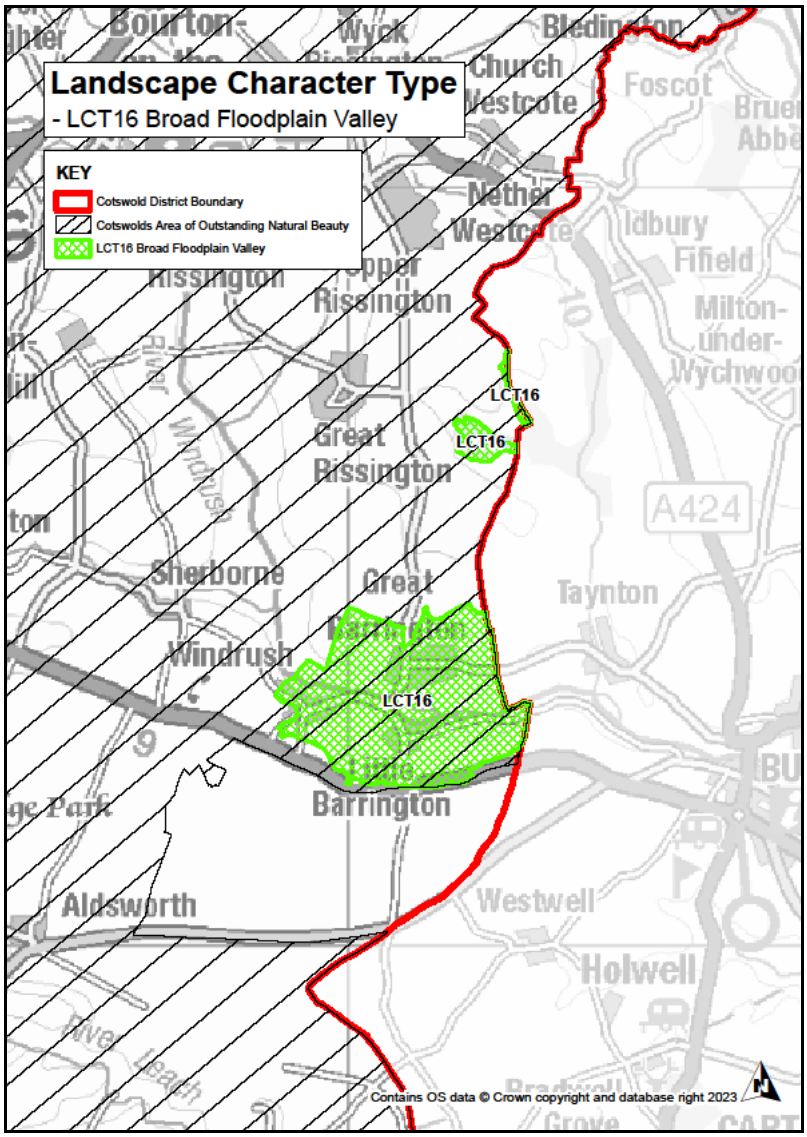
- There may be opportunities to locate solar PV developments (up to and including 20ha) within more sheltered fields where they are bound by characteristic hedgerows;
- Anything larger than this is considered to be highly sensitive given the presence of the Cotswold AONB and its inherent sensitivities;
- The setting of heritage assets is an important consideration; and
- PV developments should be sited within farmland, not semi-natural habitat to retain naturalistic characteristics and habitat interest.

Strategic Landscape Guidance:

- Avoid proposals for solar farms that will impact negatively on landscape character and/or intrude into views or result in loss or harm to landscape features such as hedgerows, trees and ridge and furrow;
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the undeveloped skyline;
- Reduce landscape and visual impact with appropriate screening;
- Ensure a comprehensive LVIA is undertaken (including potential cumulative effects);
- Ensure a glint/glare assessment is undertaken to determine the heliographic impact on receptors;
- Bury cables underground and seek opportunities to bury existing power lines;
- Keep supporting infrastructure to a minimum and ensure it is in keeping with landscape character;
- Ensure removal and restoration on temporary construction access;
- Avoid the inclusion of any security lighting proposals; and

- Seek appropriate landscape enhancement to field boundaries and margins within solar farm development proposals.

Landscape Character Type 16: Broad Floodplain Valley



Landscape Sensitivity Assessment

Criteria	Description	Sensitivity Score	
		Wind	Solar
Landform and Scale (including sense of openness/enclosure)	- Intimate, small scale settled and relatively busy landscape, contrasts with the more remote neighbouring areas of High Wold.	M-H	M-H
Landcover (including field and settlement pattern)	- Land use within valley floor and floodplain dominated by pasture although some extensive areas of arable land also occur on areas less prone to flooding offering contrasting land use elements and seasonal variations in colour and texture. - Valley sides cloaked in improved pasture and arable land forming a backdrop to the valley floor landscape and settlements. - Fields defined by hedgerows and some stone walls although the robust framework is eroded by hedgerow loss and the use of post and wire fencing. - River floodplain features such as meanders, water meadows, ponds, old river channel and islands provide visual interest and variety to the floodplain landscape.	M-H	M
Historic Landscape Character	- This LCT has a limited presence within the Cotswold District. The LCT within the district has a high concentration of conservation areas, registered parks and gardens (Barrington Park Grade 2*) and listed buildings. - Among the numerous listed buildings are Grade 1 listed Barrington Park and the Church of St Peter. - Linear settlements often located at ancient bridging and fording points established in the Saxon and Medieval period. - Historic character of villages evident in their distinctive layout, building styles and use of Oolitic limestone. - Prolific archaeological remains likely to be hidden by fluvial and human activity.	H	H
Visual Character (including skylines/intervisibility)	- Small in scale and relatively 'busy', the valleys have a well-defined profile that limits distant views and creates and impression of intimacy.	H	M-H

Perceptual Qualities	- Network of public rights of way present through the limited LCT area within the Cotswold District. These allow for quiet recreation within the area. - River corridor marked by main transport routes through the valley introduce movement and noise to an otherwise quiet, rural landscapes.	H	M-H
Scenic and Special Qualities	- Attractive agricultural landscape surrounds characteristic settlement and designed parkland. - Many of the special qualities of the AONB are present within the limited area present within the district.	H	H

Overall Assessment of Landscape Sensitivity to Development Scenarios

Please note: Landscape sensitivity often varies within an LCA, with areas exhibiting higher and lower sensitivity. It is therefore very important to take note of the explanatory text supporting the assessments in each Landscape Character Type profile, particularly the box entitled 'notes on any variations in landscape sensitivity'. Whilst the Landscape Sensitivity Assessment results provide an initial indication of landscape sensitivity, they should not be interpreted as definitive statements on the suitability of individual sites for a particular development. All proposals will need to be assessed on their own merits through the planning process, including – where required – through proposal-specific Landscape and Visual Impact Assessments (LVIAs).

Development Scenario	**Sensitivity**				
Very Small Wind Installation (up to 25m)					H
Small Wind Installation (25m to 60m)					H
Medium Wind Installation (60m to 100m)					H
Large Wind Installation (100m to 150m)					H
Very Large Wind Installation (150m to 200m)					H
Very Small Solar PV Installation (up to 1 hectare)			M		
Small Solar PV Installation (1 to 5 hectares)				M-H	
Medium Solar PV Installation (5 to 20 hectares)					H
Large Solar PV Installation (20 to 50 hectares)					H
Very Large Solar PV Installation (50 to 120 hectares)					H
Summary of Landscape Sensitivity					
The broad valleys retain a quiet, rural character. The landscape along the valley floor has an intimate, enclosed character with views limited by vegetation and landform. Wide views from the upper valley slopes and over long stretched of the valley are possible, thus increasing the sensitivity of the valleys to large scale built development that might interrupt views or impact on their rural character. Limited woodland cover in the valleys further reduces the capacity of the valleys to accommodate development as there is little to integrate new structures to their surroundings. The gently sloping valley sides also have limited development capacity as they often form an agricultural backdrop to views from the valley floor.					

The floodplain and valley floor are highly sensitive to development. The natural river profile is also an important feature of the landscape that should be protected and enhanced wherever possible.

Existing settlements along the valley floor and on the valley sides may have some capacity for built development although new buildings should respect local building styles and materials, ensuring that key views along the valleys to and from prominent features such as churches are retained and that settlement forms are perpetuated in the layout and location of new development.

Variation to Overall LCT Scores at the LCA Level

- Very limited part of the LCT is present within the Cotswold District.

Recommendations and Guidance for Future Development within the LCT

Wind Energy Developments

Overall Recommendations:

- All turbine development is likely to be highly sensitive given the presence of the Cotswold AONB and its inherent sensitivities; and
- Neighbouring LCTs would be visually sensitive to this form of development.

Strategic Landscape Guidance:

- Conserve the intimate, pastoral character and open valley floors of the Broad Floodplain Valley by objecting to the development of wind turbines where these would adversely affect views;
- Ensure the development of vertical elements in neighbouring LCTs and areas beyond the AONB do not adversely affect views to, from and across the Farmed Slopes;
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the undeveloped skyline;
- Bury cables underground and seek opportunities to bury existing power lines;
- Avoid use of visually prominent urban security fencing and CCTV masts;
- Ensure a comprehensive LVIA is undertaken (including potential cumulative effects); and
- Ensure full assessment of heritage setting impacts and appropriate measures undertaken.

Solar PV Developments

Overall Recommendations:

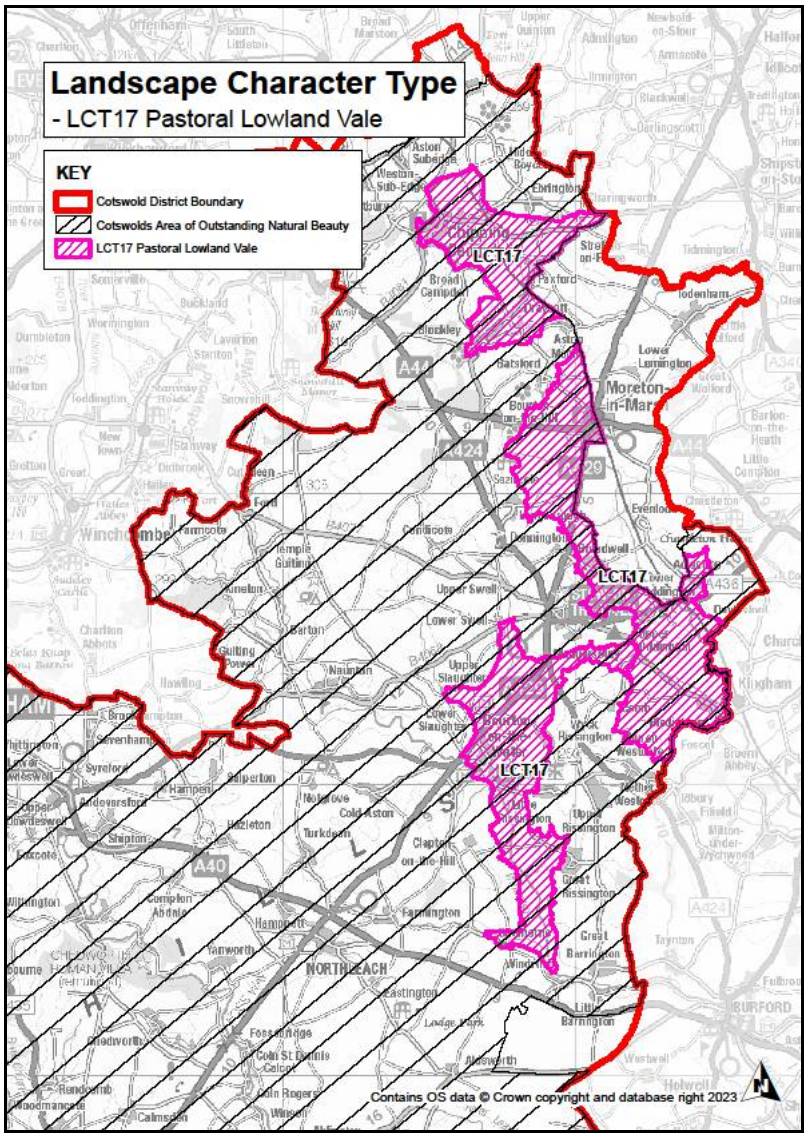
- There may be opportunities to locate solar PV developments (up to and including 5ha) within more sheltered fields where they are bound by characteristic hedgerows;
- Anything larger than this is considered to be highly sensitive given the presence of the Cotswold AONB, heritage assets and their inherent sensitivities;
- The setting of heritage assets is an important consideration; and
- PV developments should be sited within farmland, not semi-natural habitat to retain naturalistic characteristics and habitat interest.

Strategic Landscape Guidance:

- Avoid proposals for solar farms that will impact negatively on landscape character and/or intrude into views including from the adjacent High Wold and Dip-Slope landscape types;

- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the undeveloped skyline;
- Reduce landscape and visual impact with appropriate screening;
- Ensure a comprehensive LVIA is undertaken (including potential cumulative effects);
- Ensure a glint/glare assessment is undertaken to determine the heliographic impact on receptors;
- Bury cables underground and seek opportunities to bury existing power lines;
- Keep supporting infrastructure to a minimum and ensure it is in keeping with landscape character;
- Ensure removal and restoration on temporary construction access;
- Avoid the inclusion of any security lighting proposals; and
- Seek appropriate landscape enhancement to field boundaries and margins within solar farm development proposals.

Landscape Character Type 17: Pastoral Lowland Vale



Landscape Sensitivity Assessment

Criteria	Description	Sensitivity Score	
		Wind	Solar
Landform and Scale (including sense of openness/enclosure)	- Extensive pastoral vale defined by the neighbouring Farmed Slopes LCT with flat or gently undulating landform fringed by distinctive shallow slopes. - Generally human scale intimate landscape, but with intermittent open expansive character and expansive views in some areas.	M-H	M
Landcover (including field and settlement pattern)	- Productive and verdant landscape of lush improved and semi-improved pastures. - Network of hedgerows of varying height and quality with intermittent hedgerow trees and occasional stone walls create a neat patchwork of fields. - Sparse settlement pattern emphasises the landscapes rural, agricultural character.	M-H	M-H
Historic Landscape Character	- Limited woodland cover including ancient woodland indicative of a long history of clearance and intensive agriculture within the vale. - Extensive drift deposits mask underlying solid geology, reflected in the relative absence of stone as a building material. - Chipping Campden present in the north of the LCT. Numerous listed structures and a scheduled ancient monument present.	H	M-H
Visual Character (including skylines/intervisibility)	- Views often limited by intervening vegetation and undulating landform. - Views possible across flat landscapes bordering river channels where vegetation cover is minimal from areas of raised landform. - Grade 1 listed Church of St James in Chipping Campden a prominent feature in views within the north of the LCT.	H	M-H
Perceptual Qualities	- Limited woodland cover, a strong rural character, sparse settlement pattern and the proximity to elevated viewing opportunities on the neighbouring Farmed Slopes increases the sensitivity of the Pastoral Lowland Vale landscape to large scale built development.	H	M-H

Scenic and Special Qualities	- Sparse settlement pattern. - Rural agricultural character. - Displays special qualities for which the AONB was designated.	H	H

Overall Assessment of Landscape Sensitivity to Development Scenarios

Please note: Landscape sensitivity often varies within an LCA, with areas exhibiting higher and lower sensitivity. It is therefore very important to take note of the explanatory text supporting the assessments in each Landscape Character Type profile, particularly the box entitled 'notes on any variations in landscape sensitivity'. Whilst the Landscape Sensitivity Assessment results provide an initial indication of landscape sensitivity, they should not be interpreted as definitive statements on the suitability of individual sites for a particular development. All proposals will need to be assessed on their own merits through the planning process, including – where required – through proposal-specific Landscape and Visual Impact Assessments (LVIAs).

Development Scenario	**Sensitivity**				
Very Small Wind Installation (up to 25m)					H
Small Wind Installation (25m to 60m)					H
Medium Wind Installation (60m to 100m)					H
Large Wind Installation (100m to 150m)					H
Very Large Wind Installation (150m to 200m)					H
Very Small Solar PV Installation (up to 1 hectare)			M		
Small Solar PV Installation (1 to 5 hectares)			M		
Medium Solar PV Installation (5 to 20 hectares)				M-H	
Large Solar PV Installation (20 to 50 hectares)					H
Very Large Solar PV Installation (50 to 120 hectares)					H

Summary of Landscape Sensitivity

Limited Woodland cover, a strong rural character, sparse settlement pattern and the proximity to elevated viewing opportunities on the neighbouring Farmed Slopes increases the sensitivity of the Pastoral Lowland Vale landscape to large scale built development.

Existing vale settlements may have the capacity to accommodate some development where this does not interfere with or detract from their landscape setting.

Variations to Overall LCT Scores at the LCA Level

- None

Recommendations and Guidance for Future Development within the LCT

Wind Energy Developments

Overall Recommendations:

- All turbine development is likely to be highly sensitive given the presence of the Cotswold AONB and its inherent sensitivities.
- Likely to affect views from neighbouring LCTs.

Strategic Landscape Guidance:

- Conserve the open, agricultural character of the Pastoral Lowland Vale by objecting to the development of vertical elements where these would adversely affect views;
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the relatively undeveloped skylines;
- Ensure the development of vertical elements in neighbouring LCTs and areas beyond the AONB do not adversely affect views to and from the Pastoral Lowland Vale;
- Bury cables underground and seek opportunities to bury existing overhead cables;
- Avoid use of visually prominent urban security fencing and CCTV masts;
- Consider other renewable energy technologies; and
- Ensure full assessment of heritage setting impacts and appropriate measures undertaken.

Solar PV Developments

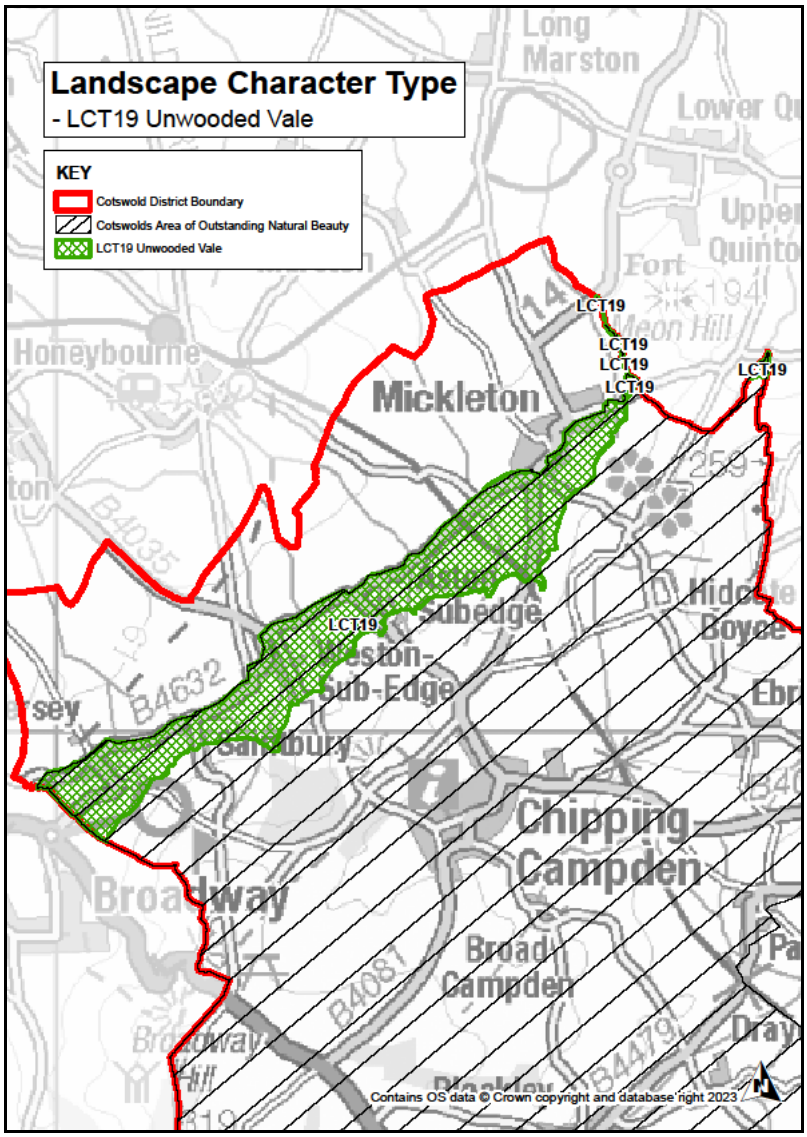
Overall Recommendations:

- There may be opportunities to locate solar PV developments (up to and including 20ha) within more sheltered fields where they are bound by tall hedgerows or riparian vegetation;
- Anything larger than this is considered to be highly sensitive given the presence of the Cotswold AONB and its inherent sensitivities; and
- PV developments should be sited within farmland, not semi-natural habitat to retain naturalistic characteristics and habitat interest.

Strategic Landscape Guidance:

- Prevent proposals for solar farms that will impact negatively on landscape character and/or intrude into views including from the adjacent Farmed Slopes and High Wold;
- Developments should be clearly separated so that collectively they do not have a defining influence on the overall experience of the landscape;
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the relatively undeveloped skylines;
- Ensure a comprehensive LVIA is undertaken (including potential cumulative effects);
- Avoid proposals that will result in the loss or harm to landscape features such as ridge and furrow, hedgerows and walls;
- Ensure a glint/glare assessment is undertaken to determine the heliographic impact on receptors;
- Reduce landscape impact with appropriate screening;
- Bury cables underground and seek opportunities to bury existing overhead cables;
- Keep supporting infrastructure to a minimum and ensure it is in keeping with landscape character;
- Ensure removal and restoration on temporary construction access;
- Avoid inclusion of any security lighting proposals;
- Seek appropriate landscape enhancements to field boundaries and margins within solar farm development proposals;
- Consider views from public rights of way when considering the siting and design of solar PV development in the landscape; and
- Promote the use of roof space for photovoltaic panels particularly on modern farm buildings.

Landscape Character Type 19: Unwooded Vale



Landscape Sensitivity Assessment

Criteria	Description	Sensitivity Score	
		Wind	Solar
Landform and Scale (including sense of openness/enclosure)	- A flat to gently undulating landscape except for a low ridge at Norton Hall which crosses the landscape north-west to south east. - The land rises gently towards the foot of the Cotswold escarpment.	M-H	M
Landcover (including field and settlement pattern)	- Wide, open, settled agrarian landscape cloaked in pasture and arable fields appear well maintained and productive. - Well maintained hedgerows, some of great antiquity, form an extensive network throughout the vale defining field patterns indicative of different episodes of enclosure. When viewed from the neighbouring uplands, hedgerows give the expansive vale a strong sense of visual unity. - Numerous mature field and hedgerow oaks, riverside trees and small farm woodlands give the sense of a well treed landscape when viewed from ground level. - Woodland is limited.	M-H	M-H
Historic Landscape Character	- Remnants of ancient open fields and moated sites in the wider vale landscape indicate the long history of farming in the vale. - Some remnant ridge and furrow. - Settlement present within the LCT. Willersey, Weston Subedge, Aston Subedge and parts of Mickleton. - The historic core of Mickleton is a conservation area containing several listed buildings including the grade 1 listed Church of St Lawrence.	M-H	M
Visual Character (including skylines/intervisibility)	- The Cotswolds escarpment, as well as the escarpment outliers, provide a dramatic backdrop to many easterly views across the vale and provides a valuable orientation point from within the vale landscape. - Adjacent steep escarpment landform and associated woodlands generally limit views and create an intimate landscape although long views to	H	M-H

	distant hills are possible from more elevated areas of the vale. - The spire of the Church of St Lawrence is a locally distinctive landmark.		
Perceptual Qualities	- Public rights of way cross the area including the Heart of England Way.	M-H	M-H
Scenic and Special Qualities	- Quiet winding lanes link numerous isolated farms and hamlets, and emphasise the rural character of the landscape. - Modern agriculture enterprise a common feature. - The LCT has strong intervisibility with the wooded escarpment of the Dover's Hill to Mickleton escarpment, a key characteristic of the AONB.	M-H	M-H

Overall Assessment of Landscape Sensitivity to Development Scenarios

Please note: Landscape sensitivity often varies within an LCA, with areas exhibiting higher and lower sensitivity. It is therefore very important to take note of the explanatory text supporting the assessments in each Landscape Character Type profile, particularly the box entitled 'notes on any variations in landscape sensitivity'. Whilst the Landscape Sensitivity Assessment results provide an initial indication of landscape sensitivity, they should not be interpreted as definitive statements on the suitability of individual sites for a particular development. All proposals will need to be assessed on their own merits through the planning process, including – where required – through proposal-specific Landscape and Visual Impact Assessments (LVIAs).

Development Scenario	**Sensitivity**				
Very Small Wind Installation (up to 25m)					H
Small Wind Installation (25m to 60m)					H
Medium Wind Installation (60m to 100m)					H
Large Wind Installation (100m to 150m)					H
Very Large Wind Installation (150m to 200m)					H
Very Small Solar PV Installation (up to 1 hectare)		L-M			
Small Solar PV Installation (1 to 5 hectares)			M		
Medium Solar PV Installation (5 to 20 hectares)				M-H	
Large Solar PV Installation (20 to 50 hectares)					H
Very Large Solar PV Installation (50 to 120 hectares)					H
Summary of Landscape Sensitivity					
The sparsely settled and deeply rural Unwooded Vale landscape type is highly sensitive to change, particularly in agricultural areas not currently associated with development. Despite this, even in rural areas the screening effects of landform, farm woodlands, hedgerows and shelterbelts provide a framework in which some opportunities for small-scale development exist. Vale landscapes bordering upland areas with wide vantage points such as the Escarpment and Escarpment Outliers landscape types are particularly sensitive to the effects of large scale built development such as agricultural sheds and light industrial units as these are difficult to screen					

from elevated vantage points. These landscapes are also highly sensitive to development that may disturb the strong field patterns created by hedgerows as these are best perceived from higher ground.

Variations to Overall LCT Scores at the LCA Level

- None

Recommendations and Guidance for Future Development within the LCT

Wind Energy Developments

Overall Recommendations:

- All turbine development is likely to be highly sensitive given the presence of the Cotswold AONB and its inherent sensitivities;
- The Cotswolds escarpment forms an elevated backdrop to the LCT. Turbines are likely to appear as clutter within the view;
- The setting of the Grade 1 listed St Lawrence's Church is an important consideration; and
- Likely to affect views from neighbouring LCTs.

Strategic Landscape Guidance:

- Conserve the open, agricultural character of the Unwooded Vale by objecting to the development of vertical elements where these would adversely affect views;
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the relatively undeveloped skylines;
- Ensure the development of vertical elements in neighbouring LCTs and areas beyond the AONB do not adversely affect views to and from the Unwooded Vale;
- Bury cables underground and seek opportunities to bury existing overhead cables;
- Avoid use of visually prominent urban security fencing and CCTV masts;
- Consider other renewable energy technologies; and
- Ensure full assessment of heritage setting impacts and appropriate measures undertaken.

Solar PV Developments

Overall Recommendations:

- There may be opportunities to locate solar PV developments (up to and including 20ha) within more sheltered fields where they are bound by tall hedgerows or riparian vegetation;
- Anything larger than this is considered to be highly sensitive given the presence of the Cotswold AONB and its inherent sensitivities; and
- PV developments should be sited within farmland, not semi-natural habitat to retain naturalistic characteristics and habitat interest.

Strategic Landscape Guidance:

- Prevent proposals for solar farms that will impact negatively on landscape character and/or intrude into views including from the adjacent scarp landscapes;
- Consider views from more elevated areas, particularly the Norton Hall SLA and Cotswolds AONB escarpment when considering the siting and design of solar PV development in the landscape;

- Developments should be clearly separated so that collectively they do not have a defining influence on the overall experience of the landscape;
- Maintain the rural character of the landscape and ensure that cumulative development does not impact on the relatively undeveloped skylines;
- Ensure a comprehensive LVIA is undertaken (including potential cumulative effects);
- Avoid proposals that will result in the loss or harm to landscape features such as ridge and furrow, hedgerows and walls;
- Ensure a glint/glare assessment is undertaken to determine the heliographic impact on receptors;
- Reduce landscape impact with appropriate screening;
- Bury cables underground and seek opportunities to bury existing overhead cables;
- Keep supporting infrastructure to a minimum and ensure it is in keeping with landscape character;
- Ensure removal and restoration on temporary construction access;
- Avoid inclusion of any security lighting proposals;
- Seek appropriate landscape enhancements to field boundaries and margins within solar farm development proposals;
- Consider views from public rights of way which include the Heart of England Way National Trail, when considering the siting and design of solar PV development in the landscape; and
- Promote the use of roof space for photovoltaic panels particularly on modern farm buildings.