Melton Climate Change Study

Document F: Renewable Energy Assessment

Melton Borough Council

Final report
Prepared by LUC
December 2024

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Land Use Consultants Limited

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Melton Climate Change Study

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Introduction

1.1 LUC was commissioned by Melton Borough Council in May 2024 to prepare a renewable and low carbon study, as part of a wider Climate Change Study, to assist with the preparation of the Local Plan Review. This renewable and low carbon study identifies the different types of renewable and low carbon energy technologies that may be potentially suitable within the Borough.

1.2 This report provides a robust evidence base to underpin planning policies that both support renewable and low carbon energy generation and storage and low carbon development but also protect the valued environment and landscape of Melton borough. It identifies the potential for different renewable and low carbon energy technologies at all scales within the Borough.

Renewable energy refers to sources of energy that are not depleted when used, for example, wind and solar.

Low-carbon energy sources are technologies that produce power with substantially lower amounts of carbon dioxide emissions than are emitted from conventional fossil fuel power generation. An example of this is a heat pump. Whilst the heat from the ground is free and renewable, it still requires an electric pump to operate the system.

Decentralised energy generally refers to energy that is generated closer to where it will be used, rather than the more conventional very large scale ‘centralised’ energy plant that typically serve much wider areas.

1.3 Melton Borough Council formally declared a climate emergency in 2019. MBC also adopted a Climate Change Strategy that sets out the priorities to achieve the commitment of net zero carbon by no later than 2050.

1.4 The Melton Local Plan was adopted in October 2018, so prepared prior to the amendments to the Climate Change Act (2008) that introduced the national 2050 Net Zero Target. The 5 year review of the Local Plan found a need to review and update the Local Plan's overall approach to climate change as a consequence of this and wider policy and regulatory changes, but also to ensure that it reflected local community expectations, as set out in the climate change strategy for the Borough, to ensure that the Council uses its local planning powers effectively to address both the causes and impacts of Climate Change. The adopted Melton Local Plan was also written under different expectations for renewable energy development, worded with a strong emphasis on wind turbine development, the dominant type of renewable energy proposal at the time. In practice however, technological, regulatory and financial cost changes have meant that development proposals assessed under the Local Plan's renewable energy policy (EN10) have been dominated by solar farm developments on agricultural land. The Council wish to ensure as part of the Partial Local Plan Update that the plan's renewable energy policy is robust to assess all types of renewable development. The objective of this assessment is to ensure that sufficient evidence is available to inform this.

1.5 The evidence base and the recommended policies meet the requirements of the existing National Planning Policy Framework (NPPF) and Planning Policy Guidance (PPG) and take into account the guidance and considerations set out in relevant national policy statements. It is acknowledged that the Government are currently consulting on proposed changes to the NPPF which will have a material impact (if implemented) on the policy framework for renewable energy projects.

1.6 The evidence base and recommended policies will also help contribute towards achieving the net zero carbon vision and targets set out in MBC's Climate Change Strategy.

1.7 In summary, the key objectives of the study were to:

- Analyse the 'technical' potential for renewable and low carbon energy technologies of all scales within the Borough and the factors that may affect the extent to which the technologies can be deployed – including grid connection, planning, and economic constraints; and
- Provide recommendations or appropriate policy options to include in the Local Plan Review regarding renewable and low carbon energy.

Report structure

1.8 The remainder of this report is structured as follows:

- Chapter 2 provides a review of the policy context in relation to renewable and low carbon energy.
- Chapter 3 outlines the existing renewable and low carbon energy generation in Melton borough.
- Chapter 4 summarises the findings of the assessment of 'technical' potential for renewable and low carbon energy.
- Chapter 5 outlines the potential planning policy options for the Local Plan Review.
- Chapter 6 summarises the study conclusions.

Chapter 2

Renewable and Low Carbon Policy Context

2.1 The following chapter provides a summary of the national and local legislative and policy context for the development of renewables and low carbon energy within Melton borough.

National climate change and renewable energy legislation and policy

2.2 The current profile of climate change on the world's stage has never been higher. The risks of failing to limit a global average temperature increase to 1.5°C are clearly set out in the IPCC Special Report 'Global Warming of 1.5°C' **[See reference 1]** and have recently been reiterated in COP26. In response to this and the 2016 Paris Agreement, the UK's Committee on Climate Change (CCC) in its Sixth Carbon Budget recommended in December 2020 a new emissions target for the UK: reduction by 78% by 2035 relative to 1990 and net zero greenhouse gases by 2050 **[See reference 2]**. It also advised that current carbon reduction targets submitted under the Paris Agreement are predicted to lead to global average temperatures rising around 3 degrees Celsius by 2100 compared to pre-industrial levels.

Climate Change Act 2008

2.3 The UK's legally binding emission reduction targets were first set by the Climate Change Act 2008 and included a reduction of at least 80% by 2050 against the 1990 baseline **[See reference 3]**. However, on 1st May 2019, Parliament declared a formal climate and environment emergency, and on 12th

June 2019 the Government amended the Climate Change Act to target full net carbon neutrality (a 100% reduction of greenhouse gas emissions) in the UK by 2050 **[See reference 4]**.

2.4 In response to its obligations to prepare policies to meet climate targets, the UK Government has also produced various sector-specific policies and strategies. These include Powering Up Britain (2023), British Energy Security Strategy (2022), Net Zero Strategy (2021), Ten Point Plan for a Green Industrial Revolution (2020), UK National Energy & Climate Plan (2019), the Clean Growth Strategy (2017) and the Industrial Strategy White Paper (2017) (further details below). In addition, in December 2020, the former Department for Business Energy and Industrial Strategy (BEIS) published the Energy White Paper which sets out how the UK will clean up its energy system and reach net zero emissions by 2050. BEIS was subsequently split into three departments, with the Department for Energy Security and Net Zero (DESNZ) now responsible for energy and climate change.

UK Energy Act 2023

2.5 Energy policy in the UK is underpinned by the 2023 Energy Act and aligns with the Climate Change Act 2008. It is a legislative framework for providing secure, affordable, and low carbon energy. The Act will deliver a more efficient energy system in the long-term, helping to keep energy costs low. It will do this by increasing competition in Great Britain's onshore electricity networks, through a new tender process – reducing costs for network operation and development. This new model is expected to save consumers up to £1 billion off their energy bills by 2050. It is set to accelerate development of offshore wind and help deliver the UK's net zero commitments.

2.6 The National Energy System Operator (NESO) has been established through powers under the Energy Act 2023. This sets out the responsibilities of the new public body to maintain the UK's energy supplies, protect energy consumers and plan for an efficient clean energy system that is fit for the future. NESO will help connect new generation projects with the electricity grid, working alongside Great British Energy to deploy renewable energy **[See reference** 5**]**.

British Energy Security Strategy

2.7 In response to the rising costs of oil and gas on the global energy market, the UK government has set out its plan to reduce the UK's dependence on imported oil and gas. A key part of this strategy (2022) is accelerating the UK's transition towards renewable sources. The strategy sets out an ambition for 95% of UK electricity to come from low carbon sources by 2030, ahead of a complete decarbonisation target in 2035. In regard to renewables, the strategy proposes to:

- Aim to cut the development and deployment time of offshore wind projects by half through a streamlined planning process, including reducing consent time from up to four years down to one year and establishing a fast-track consenting route for priority cases where quality standards are met;
- Consult on developing local partnerships for communities who wish to host new onshore wind infrastructure; and
- Consult on amending planning rules to favour development of solar projects on non-protected land and support projects that are co-located with other functions.

Powering Up Britain

2.8 This policy paper **[See reference 6]** sets out how the government will enhance the UK's energy security, seize the economic opportunities of the transition, and deliver on the net zero commitments. One of the main aims is to accelerate the deployment of renewables with the goal of developing up to 50GW of offshore wind by 2030 and to quintuple solar power by 2035.

The Ten Point Plan for a Green Industrial Revolution

2.9 This plan (published in 2020) puts forward the ten main areas where the UK wishes to scale up decarbonisation, mobilising £12 billion of government investment. The outlined areas in the plan will be continually built upon by further legislation and policy, such as the Net Zero Strategy (2021) and Energy White Paper (2020).

Energy White Paper – Powering Our Net Zero Future

2.10 This white paper (2020) is based on the Ten Point Plan and sets out the specific energy-related measures that will be implemented in line with the UK's 2050 net zero target. The paper emphasises the UK government's commitment to ensuring that the cost of the transition is fair and affordable for consumers. Key commitments in the paper include:

- Targeting 40GW of offshore wind generation by 2030, including 1GW of floating wind generation. This is alongside the expansion of other renewable technologies;
- Supporting the development of carbon capture and storage in four industrial clusters;
- Consulting on whether to stop gas grid connections to new homes being built from 2025;
- Increasing the installation of electric heat pumps from 30,000 per year to 600,000 per year by 2028; and
- Aim to develop 5GW of low-carbon hydrogen production capacity by 2030.

Net Zero Strategy

2.11 The Net Zero Strategy (Oct 2021) sets out the UK's policies and proposals to meet its allocated carbon budgets and Nationally Determined Contributions (NDC's) alongside the long-term vision of decarbonising the economy by 2050. The strategy sets out a delivery pathway showing indicative emissions reductions across sectors to meet the UK's targets up to the sixth carbon budget (2033-2037). This builds on the proposals set out in the Ten Point Plan for a Green Industrial Revolution. Key policies in the strategy include:

- By 2035 the UK will be powered entirely by clean electricity, subject to security of supply; and
- 40GW of offshore wind by 2030 and further development of onshore wind and solar projects. Ensuring that new renewable projects incorporate generation and demand in the most efficient way – taking into account the needs of local communities.

2.12 The strategy also outlines key commitments in Local Climate Action, including:

- Setting clearer expectations on how central and local government interact in the delivery of net zero;
- Establishing a Local Net Zero Forum, chaired by BEIS, to bring together national and local government officials to discuss policy and delivery on net zero; and
- Continuing the Local Net Zero Programme to support local areas with their capability and capacity to meet net zero.

2.13 However the strategy has been subject to legal challenge and found to be unlawful, highlighting the need for stronger future action to reduce emissions.

UK Integrated National Energy and Climate Plan

2.14 The UK National Energy and Climate Plan (2020) sets out the UK's approach to meeting the five objectives of the EU's Energy Union **[See reference 7]**: energy security; energy efficiency; decarbonisation; the internal energy market; and research, innovation and competitiveness.

2.15 The Plan describes the current state of the energy sector in the UK, outlining the government's current approach to climate change mitigation through policy, and how this is expected to affect the five objectives of the Energy Union in future. This is supported by a summary table containing all the relevant UK policies that contribute to achieving the UK's climate goals, taken from the UK's National Communication with the United Nations Framework Convention on Climate Change (UNFCCC).

2.16 The report also includes scenario testing on the UK's projected emissions to 2035, with business as usual, all current measures and all current and planned measure scenarios. It demonstrates that the government's current measures have the potential to reduce baseline emissions by approximately 20% over the current baseline, with a further 10% reduction through implementation of planned measures.

Clean Growth Strategy

2.17 In the context of the UK's legal requirements under the Climate Change Act, the UK's approach to reducing emissions, as set out in the Clean Growth Strategy (2017, updated 2018), has two guiding objectives:

1. To meet domestic commitments at the lowest possible net cost to UK taxpayers, consumers and businesses; and

2. To maximise the social and economic benefits for the UK from this transition.

2.18 The Clean Growth Strategy sets out three possible pathways to decarbonise the UK's economy by 2050:

1. Electric: Including full deployment of electric vehicles (EVs), electric space heating, and industry moves to 'clean fuels'.
2. Hydrogen: Including heating homes and buildings, fuelling many vehicles and the power industry.
3. Emissions removal: Including construction of sustainable biomass power stations with carbon capture and storage technology.

2.19 The Strategy also encourages local authorities to actively pursue a low carbon economy:

> "Local areas are best placed to drive emission reductions through their unique position of managing policy on land, buildings, water, waste and transport. They can embed low carbon measures in strategic plans across areas such as health and social care, transport, and housing." [p118]

2.20 The strategy also announced up to £557 million in further 'Pot 2' (less established renewables) funding for Contracts for Difference (CfD) – a 15-year contract that offers low-carbon electricity generators payments for the electricity they produce. This opened in May 2019.The most recent allocation round (sixth) opened in 2024.

Green Finance Taskforce and the Green Finance Strategy

2.21 One of the key proposals within the Clean Growth Strategy is to develop world leading Green Finance capabilities by setting up a Green Finance

Taskforce, the aim of which is to “provide recommendations for delivery of the public and private investment we need to meet our carbon budgets and maximise the UK’s share of the global green finance market”.

2.22 Building on the important work of the Green Finance Taskforce, the first Green Finance Strategy was produced in July 2019 and recently updated in 2023. This seeks to reinforce and expand the UK's position as a world leader on green finance and investment, delivering five key objectives:

- UK financial services growth and competitiveness;
- Investment in the green economy;
- Financial stability;
- Incorporation of nature and adaptation; and
- Alignment of global financial flows with climate and nature objectives.

2.23 The Strategy notes the importance of local key players in directing potential investors towards opportunities that meet local priorities and so are more likely to secure local community support.

Industrial Strategy White Paper

2.24 Achieving ‘Clean Growth’ is one of the future challenges the Government outlines as part of its Industrial Strategy. In order to maximise the advantages of the global shift to clean growth for the UK, the strategy proposes to:

- Develop smart systems for cheap and clean energy across power, heating and transport;
- Transform construction techniques to dramatically improve efficiency;
- Make our energy intensive industries competitive in the clean economy;
- Put the UK at the forefront of the global move to high efficiency agriculture;

- Make the UK the global standard setter for finance that supports clean growth; and
- Support key areas of innovation, investing £725m over 4 years.

UK Ban of New Petrol and Diesel Cars by 2030

2.25 The government has committed to phasing out new cars that rely solely on internal combustion engines by 2030 and that from 2035 all new cars and vans sold in the UK will be zero emission **[See reference 8]**. This means that the uptake of Battery Electric vehicles (BEV) will significantly increase in Melton borough, from the current estimated baseline of 900 to a future 12,000 by 2030 **[See reference 9]**. This will increase the demand for electricity in the area. If Melton Borough is to meet its targets set in the Local Plan, this increase in electricity demand will need to be met by renewable resources **[See reference 10]**.

Heat and Buildings Strategy

2.26 The Heat and Buildings Strategy (2021) **[See reference 11]** sets out a ten-point plan to address UK building stock energy efficiency and heating systems:

1. Phasing out domestic natural gas boilers by 2035.
2. Reducing the cost of heat pump installation by 25 – 50% by 2025 and ensuring cost parity with gas boilers by 2030.
3. Investing in heat pump research and innovation.
4. Providing financial support through the Clean Heat Grant for domestic homeowners of £5,000 per installation.

5. Re-balancing energy prices to ensure heat pumps are no more expensive to run than gas boilers.

6. Targeting 600,000 heat pump installations per year by 2028 by supporting the domestic supply chain.

7. Implementing a Future Homes Standard, including heat pumps in a third of new homes.

8. Phasing out of fossil fuel heating in off-gas-grid locations from 2026.

9. Targeting a 30-fold increase in UK manufactured heat pumps by 2030.

10. Working with Ofgem to ensure that electricity systems can accommodate increased electricity demand.

UK Heating System Target

2.27 The UK has a target for all new heating systems installed in UK homes from 2035 to be using low-carbon technologies, such as electric heat pumps. This will also increase the electricity demand in Melton borough, increasing the need for renewable electricity generation **[See reference 12]**.

Minimum Energy Efficiency Standards

2.28 The Minimum Energy Efficiency Standards (MEES) came into force in England and Wales in 2018, applying to private rented residential and non-domestic property. The standards are aimed at landlords and property owners to improve the energy efficiency of their properties. These properties must have a MEES Performance Certificate rating of E or above, rising to a D-rating by 2025 and C-rating by 2030. The government are currently consulting on bringing these dates forward.

UK Power System Decarbonisation

2.29 The UK has committed to decarbonise the electricity system by 2035. This brings forward the 2050 commitment set out in the Energy White Paper by 15 years. This will be achieved by focusing on offshore wind, onshore wind, solar, nuclear and hydrogen **[See reference 13]**.

Current government position

2.30 The UK government remains committed to achieving net zero greenhouse gas emissions by 2050, as enshrined in the 2008 Climate Change Act. This long-term target includes interim goals, such as reducing emissions by 68% by 2030 compared to 1990 levels, in line with the UK’s Nationally Determined Contribution under the Paris Agreement. It also aims to meet a 78% reduction by 2035, aligning with the Sixth Carbon Budget.

2.31 The current UK Government has set out aims to decarbonise the UK power system (thus have a zero carbon electricity system) by 2030. Recent measures under the Labour administration, particularly outlined in the 2024 Autumn Budget, aim to position the UK as a global leader in clean energy and green technologies. This includes significant investment in renewable energy, such as offshore wind, green hydrogen, and carbon capture and storage, alongside efforts to accelerate the transition to electric vehicles through a Zero Emission Vehicle mandate and expanded charging infrastructure.

2.32 The government is also focusing on green job creation, targeting industrial revitalisation in regions like the North East and Midlands, and promoting the export of low-carbon technologies. To support private investment in the green transition, initiatives like the Green Finance Strategy have been introduced, along with investment roadmaps for key technologies.

Great British Energy

2.33 The new Labour Government is setting up Great British Energy, a publicly owned company headquartered in Scotland to invest in clean, home-grown energy and has introduced the Great British Energy Bill to Parliament. Great British Energy's mission will be to drive clean energy deployment to create jobs, boost energy independence and ensure UK taxpayers, billpayers and communities reap the benefits of clean, secure, home-grown energy. This mission will be delivered through the following five functions:

- Project investment and ownership;
- Project development;
- Local Power Plan;
- Supply chain; and
- Great British Nuclear **[See reference 14]**.

2.34 Great British Energy's strategy includes the Local Power Plan, which aims to develop small and medium-scale renewable energy projects with local community involvement. This approach could help to further decentralise energy generation and potentially bring economic benefits to rural areas such as Melton borough, although detailed plans and their implementation will be crucial to realising potential benefits locally.

Onshore Wind Energy Task Force

2.35 The Government is diligently examining how to achieve its ambition of securing an additional 600 MW – 1 GW of onshore wind capacity in England over the next nine years. As such, the Onshore Wind Energy Task Force was established in July 2024 to accelerate the development of onshore wind in England. The taskforce is chaired by Ed Miliband, the UK Secretary of State for Energy Security and Net Zero and Matthieu Hue, the CEO of EDF Renewables UK. The taskforce includes industry experts, regulatory bodies and RenewableUK, the UK's renewable energy trade association. The taskforce will meet regularly throughout 2024 and issue a policy statement at the end of the year. The statement will outline a roadmap to 2030 and beyond, including the challenges and opportunities of increasing onshore wind capacity in England and the actions needed to achieve this. The taskforce will then become an overarching body to monitor the progress of the agreed actions.

National Planning Legislation

Planning and Compulsory Purchase Act

2.36 The Planning and Compulsory Purchase Act (2004) sets out the structure of the local planning framework for England, including the duty on plan-making authorities to mitigate and adapt to climate change. In other words, local planning authorities must make positive and proactive policies and decisions which contribute to the mitigation of, and adaptation to, climate change – polices and decisions that make measurable, ongoing reductions in carbon emissions reported in Council's annual monitoring reports. This legislation is supported by national planning policy and guidance set out below.

2.37 Section 19(1A) of the Planning and Compulsory Purchase Act 2004 requires that climate change is addressed through development plan documents and that obligations regarding annual monitoring of any targets or indicators are fulfilled:

> "Development plan documents must (taken as a whole) include policies designed to secure that the development and use of land in the local planning authority's area contribute to the mitigation of, and adaptation to, climate change." [Section 19(1A)]

> "Every local planning authority must prepare reports containing such information as is prescribed as to…the extent to which the policies set out in the local development documents are being achieved." [Section 35(2)]

2.38 This means that local plans **must** consider how policies can deliver on these requirements, including having regard to the objectives and trajectories for reducing emissions set out within the Climate Change Act (2008).

Planning Act and National Policy Statements

2.39 The Planning Act (2008) introduced a new planning regime for nationally significant infrastructure projects (NSIPs), including energy generation plants of capacity greater than 50 megawatts (50MW). In 2011, six National Policy Statements (NPSs) for Energy were published and subsequently updated in 2024. The energy NPSs are designed to ensure that major energy planning decisions are transparent and are considered against a clear policy framework. They set out national policy against which proposals for major energy projects will be determined by the National Infrastructure Directorate (NID) (formerly the Infrastructure Planning Commission or IPC).

2.40 The Overarching National Policy Statement for Energy (EN-1) sets out national policy for energy infrastructure and describes the need for new nationally significant energy infrastructure projects. EN-3 (NPS for Renewable Energy Infrastructure) provides the primary basis for decisions by the NID on applications it receives for nationally significant renewable energy infrastructure. It provides guidance on various technologies and their potential for significant effects. In 2016, onshore wind installations above 50MW were removed from the NSIP regime; as such, these applications are now dealt with by local planning authorities, based on the NPPF. The NPSs were consulted on in 2021 and officially updated in 2024 to:

- Reflect the current regulatory framework and contain new transitional provisions applicable during and following a review;

- Update the Government's greenhouse gas emission reductions target from "at least 80%" by 2050 to net zero by 2050, and 78% by 2035 compared to 1990 levels;
- Add flexibility for the applicability of the NPS to new and developing types of energy infrastructure, such as carbon capture and storage and hydrogen infrastructure;
- Confirm future energy generation would come from a range of sources including renewables, nuclear, low carbon hydrogen, with "residual use of unabated natural gas and crude oil fuels" for heat, electricity, transport, and industrial applications; and
- Remove reference to the need for new coal and large-scale oil-fired electricity generation and update references to the need for other infrastructure.

2.41 Furthermore, renewable energy infrastructure is now classified as a Critical National Priority.

2.42 Since the 2021 update, the British Energy Security Strategy (2022) was published and as such set out some commitments relating to planning reform. Therefore, various changes were made to the draft energy NPS and were consulted on until the end of May 2023. The amended NPSs are likely to strengthen the process for delivering major new energy infrastructure in England and Wales, reinforcing the country's national priority of delivering on net zero. The updates are also expected to speed up the planning process so that low-carbon generation can be developed at the right time and place whilst protecting and enhancing the national and historic environments and landscape.

2.43 The consultation document titled 'Proposed reforms to the National Planning Policy Framework and other changes to the planning system' proposes changes to the NSIP thresholds and bringing large onshore wind projects back into the Nationally Significant Infrastructure Projects (NSIP) regime. This could result in:

- A threshold at which onshore wind projects are considered National Significant at 100MW and an increase to the threshold for solar projects to 150MW.

- Streamlined approval processes for large-scale wind farms.
- Greater certainty for developers of major projects.
- Potential for faster delivery of significant renewable energy capacity.

Planning and Energy Act

2.44 The Planning and Energy Act (2008) enables local planning authorities to set requirements for energy use and energy efficiency in local plans, including a proportion of energy used in development to be generated from renewable and low carbon sources in the locality of the development. Such requirements can relate to specific types and scales of development but also broad areas within a local planning authority’s area of influence, such as areas with optimal conditions for decentralised heat networks.

2.45 The Act also enables local authorities to require standards for energy efficiency in new buildings beyond those in the Building Regulations. In 2015 the energy efficiency requirements were proposed to be repealed, to effectively make the Building Regulations the sole authority regarding energy efficiency standards for residential development and removing the ability for local planning authorities to set their own energy efficiency standards. However, in January 2021, the Government launched a consultation on Part L of the Building Regulations which confirmed that the Planning and Energy Act 2008 will not be amended, which means that local authorities will retain powers to set local energy efficiency standards for new homes.

2.46 National standards for energy use and emissions in new developments are set by Part L of the Building Regulations, which cap a building’s emissions through the Target Emissions Rate (TER) and Dwelling Emissions Rate (DER), calculated using the Standard Assessment Procedure (SAP). Updated regulations in 2022 require a 31% reduction in carbon emissions for new homes and 27% for new commercial buildings compared to 2013 standards.

2.47 The Future Homes and Buildings Standard, set for implementation in 2025, aims to reduce emissions by 75-80% and eliminate reliance on fossil fuels by encouraging low-carbon heating systems, such as heat pumps and heat networks. The government has also introduced interim measures, including enhanced energy efficiency and ventilation standards, to prepare the construction industry for these changes.

2.48 Consultations in 2023-2024 explored further improvements to energy performance metrics, standards for building services, and clean heat networks, all aligned with the UK’s 2050 net zero target. Local authorities retain powers to set higher energy efficiency standards under the Planning and Energy Act 2008, ensuring flexibility in achieving these goals.

National planning policy

National Planning Policy Framework (NPPF)

2.49 The NPPF was first published on 27th March 2012 and updated various times until most recently on 19th December 2023. This sets out the government’s planning policies for England and how these are expected to be applied.

2.50 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; including… mitigating and adapting to climate change, including moving to a low carbon economy”.

2.51 The revised NPPF supports the contents of the Neighbourhood Planning Act (2017) by making explicit reference to the need for local planning authorities to work with duty to cooperate partners on strategic priorities (paragraph 24) and defined strategic policies that make sufficient provision for climate change mitigation and adaptation (paragraph 20). These amendments provide a clear policy framework for local planning authorities to work collaboratively with partners and neighbours to tackle climate change mitigation and adaptation at a strategic scale and over the longer term.

2.52 Paragraph 158 of the NPPF states:

> "Plans should take a proactive approach to mitigating and adapting to climate change taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures."

2.53 Paragraph 160 states that:

> "To help increase the use and supply of renewable and low carbon energy and heat, plans should:
>
> a. 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);
>
> b. consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and
>
> c. identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers."

2.54 Paragraph 161 states that:

> "Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning."

2.55 The NPPF goes on to state at paragraph 163 that:

> "When determining planning applications for renewable and low carbon development, local planning authorities should:
>
> a. not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions;
>
> b. approve the application if its impacts are (or can be made) acceptable. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas" and
>
> c. in the case of applications for the repowering and life-extension of existing renewable sites, give significant weight to the benefits of utilising an established site, and approve the proposal if its impacts are or can be made acceptable.

2.56 The December 2023 version of the NPPF contained the following footnotes to paragraph 163:

> Footnote 57: "Wind energy development involving one or more turbines can also be permitted through Local Development Orders, Neighbourhood Development Orders and Community Right to Build Orders. In the case of Local Development Orders, it should be demonstrated that the planning

impacts identified by the affected local community have been appropriately addressed and the proposal has community support."

Footnote 58: "Except for applications for the repowering and life-extension of existing wind turbines, a planning application for wind energy development involving one or more turbines should not be considered acceptable unless it is in an area identified as suitable for wind energy development in the development plan or a supplementary planning document; and, following consultation, it can be demonstrated that the planning impacts identified by the affected local community have been appropriately addressed and the proposal has community support."

2.57 These footnotes have been characterised (and earlier, similar versions) have been characterised as creating a de-facto ban on the development of onshore wind and very few wind energy applications have been submitted for planning approval in England since the policy regime was originally introduced in 2015 **[See reference** 15**]**.

2.58 However, the new Labour Government issued a Written Ministerial policy statement on 8th July 2024 deleting the tests set out in Footnotes 57 and 58 with immediate effect. These changes are reflected in the proposed reforms to the NPPF that the Government is consulting on from 30th July 2024 to 24th September 2024 **[See reference** 16**]**. These proposed reforms to the NPPF also include wider changes to support locally consented renewable energy development, including:

- Amendments to existing paragraph 163 to direct decision makers to give significant weight to the benefits associated with renewable and low carbon energy generation, and proposals' contribution to meeting a net zero future.
- Further amendments to paragraph 160 to set a stronger expectation that authorities proactively identify sites for renewable and low carbon development when producing plans, where it is likely that in allocating a site, it would help secure development.

- Development of renewables may be proposed in sensitive areas which may include valuable habitats.

2.59 The consultation also proposes bringing large onshore wind proposals back into the Nationally Significant Infrastructure Project regime, to support quick determination, followed by a revised National Policy Statement.

2.60 The Government has also signalled an intention to empower local communities to participate in decisions on local infrastructure and to benefit from hosting local renewable energy infrastructure and will shortly publish an update to the Community Benefits Protocol for Onshore Wind in England **[See reference 17]**.

National Planning Practice Guidance (PPG)

2.61 The online National Planning Practice Guidance (PPG) resource, published by the Department for Levelling Up, Housing and Communities (DLUHC) and Ministry of Housing, Communities and Local Government (MHCLG) provides further interpretation of national planning policy for the benefit of local planning authorities and planning practitioners. Although the section on climate change has not been updated following the changes to the Climate Change Act and the UK Climate Emergency Declaration, it strongly asserts the importance of climate change within the planning system and the need for adequate policies if Local Plans are to be found sound **[See reference 18]**:

> "Addressing climate change is one of the core land use planning principles which the National Planning Policy Framework expects to underpin both plan-making and decision-taking. To be found sound, local plans will need to reflect this principle and enable the delivery of sustainable development in accordance with the policies in the National Planning Policy Framework. These include the requirements for local authorities to adopt proactive strategies to mitigate and adapt to climate change in line with the provisions

and objectives of the Climate Change Act 2008, and co-operate to deliver strategic priorities which include climate change." [Paragraph 1]

2.62 In respect of the approach to identifying climate mitigation measures for new development, the PPG also states:

"Every area will have different challenges and opportunities for reducing carbon emissions from new development such as homes, businesses, energy, transport and agricultural related development. Robust evaluation of future emissions will require consideration of different emission sources, likely trends taking into account requirements set in national legislation, and a range of development scenarios." [Paragraph 7]

2.63 The PPG also makes it clear with regards to renewable energy that **[See reference 19]**:

"When drawing up a Local Plan local planning authorities should first consider what the local potential is for renewable and low carbon energy generation. In considering that potential, the matters local planning authorities should think about include:

- The range of technologies that could be accommodated and the policies needed to encourage their development in the right places;
- The costs of many renewable energy technologies are falling, potentially increasing their attractiveness and the number of proposals; and
- Different technologies have different impacts and the impacts can vary by place.
- The UK has legal commitments to cut greenhouse gases and meet increased energy demand from renewable sources. Whilst local authorities should design their policies to maximise renewable and low carbon energy

> development, there is no quota which the Local Plan has to deliver.” [Paragraph 3]

2.64 The role community-led renewable energy initiatives have is outlined and states that they:

> “are likely to play an increasingly important role and should be encouraged as a way of providing positive local benefit from renewable energy development…Local planning authorities may wish to establish policies which give positive weight to renewable and low carbon energy initiatives which have clear evidence of local community involvement and leadership.” [Paragraph 4]

2.65 In terms of identifying suitable locations for renewable energy development, such as wind power, the PPG section on ‘Renewable and Low Carbon Energy’ states:

> “There are no hard and fast rules about how suitable areas for renewable energy should be identified, but in considering locations, local planning authorities will need to ensure they take into account the requirements of the technology and, critically, the potential impacts on the local environment, including from cumulative impacts. The views of local communities likely to be affected should be listened to.
>
> When identifying suitable areas it is also important to set out the factors that will be taken into account when considering individual proposals in these areas. These factors may be dependent on the investigatory work underpinning the identified area.

> There is a methodology available from the Department for Energy and Net Zero's website on assessing the capacity for renewable energy development which can be used and there may be existing local assessments. However, the impact of some types of technologies may have changed since assessments were drawn up (for example, the size of wind turbines has been increasing). In 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." [Paragraph 5]

2.66 It also goes on to state that:

> "Local planning authorities should not rule out otherwise acceptable renewable energy developments through inflexible rules on buffer zones or separation distances. Other than when dealing with setback distances for safety, distance of itself does not necessarily determine whether the impact of a proposal is unacceptable." [Paragraph 8]

2.67 The Government are not currently consulting on changes to PPG but these may follow once NPPF is formally updated.

Neighbourhood Development Plans

2.68 Neighbourhood planning offers local communities an opportunity to produce positive and ambitious sustainable energy plans for their local area. The PPG on Renewable and Low Carbon Energy states that:

> "Local and neighbourhood plans are the key to delivering development that has the backing of local communities." [Paragraph 3]

2.69 Across the country, the large majority of the numerous plans adopted so far, show little evidence of having considered the issue of climate change and energy to the level that is required to have meaningful impact **[See reference 20]**.

2.70 However, given the right support, Neighbourhood Development Plan (NDP) groups can serve to convene and inform local communities and stimulate bottom-up renewable energy policies and development.

Building Regulations – Part L

2.71 National 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.

2.72 In January 2021 the Government launched a consultation on the second stage of the 2-part consultation on proposed changes to Part L (Conservation of fuel and power) and Part F (ventilation) of Building Regulations. It confirmed that the Planning and Energy Act 2008 will not be amended, which means that local authorities will retain powers to set local energy efficiency standards for new homes. It also built on the Future Homes Standard consultation by setting out energy and ventilation standards for non-domestic buildings, existing homes and included proposals to mitigate against overheating in residential buildings.

2.73 This consultation considered two options to uplift energy efficiency and ventilation standards for new non-domestic buildings including: introduction of overheating standards for new residential buildings in 2021 and a 2021 uplift of energy and ventilation standards (Part L and Part F) for homes. The Government responded in December 2021 to the consultation **[See reference 21]**, the responses are summarised below:

- Starting from 2025, the Future Building Standard will produce highly efficient new non-domestic buildings;

- Employment of the performance metrics set out in the consultation will be undertaken: a new primary energy target, a CO_2 emissions target and minimum standards for fabric and fixed building services; and
- The interim uplift will also make sure that construction professionals and supply chains are working to higher specifications in readiness for the introduction of the Future Buildings Standard from 2025.

2.74 Alongside, the publication of the Government's response, the 2021 uplift has been implemented, therefore as of 15th June 2022, all new build homes and commercial buildings must reduce their carbon emissions by 31% and 27% respectively, according to the updated Building Regulations. A further, more detailed, consultation began in December 2023 and went until March 2024. The Heat and Buildings Strategy outlines the need to eliminate virtually all emissions arising from heating, cooling and energy use in our buildings. As such, the 2025 Future Homes and Buildings Standards aim to build on the 2021 Part L uplift and set more ambitious requirements for energy efficiency and heating for new homes and non-domestic buildings. These standards are set to be in line with meeting the 2050 net zero target. The main proposals being consulted on include: performance requirements for new building, retaining existing metrics, improvements to standards for fixed building services and on-site electricity generation, improved standards for dwellings created through material change of use, expanding cleaner heat networks, changes to the regulations permitting local authorities to relax or dispense the energy efficiency requirements, gathering evidence on two proposed measures to improve building performance in new homes against expected energy use and reviewing approach to setting standards and transitional arrangements.

Local Policy and Guidance

The Melton Local Plan

2.75 The Melton Local Plan (2011-2036), adopted in 2018, prioritises renewable energy as a key objective, aiming to "*minimise the use of energy and promote forms of renewable energy generation in appropriate locations*" (page 19).

2.76 The Local Plan aims to ensure that land use and development contribute to climate change mitigation, with new developments designed to be energy-efficient and consider opportunities for renewable and low carbon energy production. The Local Plan highlights the Planning for Climate Change Study (2008), which found that Melton borough has strong potential to develop solar, wind, and biomass energy from crops and waste, noting that while these technologies are viable, they can impact the landscape.

2.77 The strategic climate change policy of the Local Plan EN8 (Climate Change) sets out the need for all new development proposals to demonstrate how the need to mitigate and adapt to climate change has been considered, (subject to considerations of viability) in terms of several factors including the provision of renewable and/or low carbon energy production, including decentralised energy and/or heat networks in accordance with the plans renewable energy policy, Policy EN10 (Energy Generation from Renewable and Low Carbon Sources.

2.78 Policy EN10: Energy Generation from Renewable and Low Carbon Sources states that renewable and low carbon energy proposals appropriate for Melton borough, including biomass power generation, combined heat and power (CHP), hydro, wind, solar and micro generation systems, will be supported and considered in the context of sustainable development and climate change. Additionally, the policy states that wind turbine development will only be granted if the development site is identified as suitable in a Neighbourhood Plan or falls within an area that has been identified as being of low or low-moderate sensitivity in the Melton and Rushcliffe Landscape Sensitivity Study 2014. The Melton and

Rushcliffe Landscape Sensitivity Study 2014 **[See reference 22]** examined the sensitivity of the landscape to wind turbine development at a range of scales. It found that no turbines over 76m would be acceptable as all landscape character units (LCU) were found to be of moderate-high or high sensitivity to turbines above this height and only one LCU within the 51-75m height category had a low-moderate sensitivity rating.

2.79 Policy EN9: Ensuring Energy Efficient and Low Carbon Development also states that major developments will be required to demonstrate *“How developments (dwellings and non-dwellings) have considered on-site renewable, low carbon or de-centralised energy provision, including connection to existing networks, where feasible, in accordance with Policy EN10”.*

Melton Borough Climate Change Strategy

2.80 Melton Borough Council (MBC) developed the Climate Change Strategy (2024-2036) to set out how as a community the area can work together to tackle climate change across Melton borough. The Strategy sets out a framework for reducing greenhouse gas emissions and for making the Borough more resilient to the impacts of climate change. It draws upon addressing climate change within its rural agricultural context and reflects local community feedback on tackling climate change.

2.81 The strategy sets out that a key consideration is balancing the competing demands of land in the Borough, the need to maintain local food production whilst also balancing the competing need for land for nature recovery, new homes, to store carbon and for renewable energy generation.

2.82 In relation to renewables, the strategy and associated community consultations have showed very strong local community support for rooftop solar energy. Some concerns do remain however about the potential impacts of land based renewable energy schemes, particularly in relation to the impact on local landscapes. Rural communities have set out that they are deeply attached to their local landscapes and that the local countryside is a central part to their lives and an important element of their work, identity and wellbeing. They are particularly concerned about schemes that might impact agricultural land and food production. The Strategy also highlights the economic benefits that renewables might offer to the rural area and the need to expand green low carbon energy and retrofit jobs locally if the area is to meet net zero ambitions and benefit from the shift to a greener economy.

2.83 The strategy also sets out a need, and strong community support for, both Melton Borough Council and Leicestershire County Council to use their local planning powers effectively to tackle climate change, including the policies of the Melton Local Plan.

2.84 One of the key actions stated within the Strategy is to seek funding to undertake a comprehensive local area energy assessment, to investigate the potential for all types of renewable energy and help MBC to better understand future energy demands.

Chapter 3

Existing renewable and low carbon energy generation

Introduction

3.1 This chapter sets out information on existing renewable and low carbon energy generation within Melton borough.

3.2 It is not possible to identify an exact figure for the amount of existing renewable energy generation across the Borough, and there are numerous datasets available providing information on renewable energy deployment across the UK. As such, the values for existing renewable developments within Melton borough quoted within this report are not exhaustive. This is particularly notable with regards to existing wind development within the Borough because wind energy data is not covered well by the MCS Data Dashboard.

3.3 Further sources of information could be referred to as part of further study, but caution should be taken so as not to double-count installations that are included within multiple data sources.

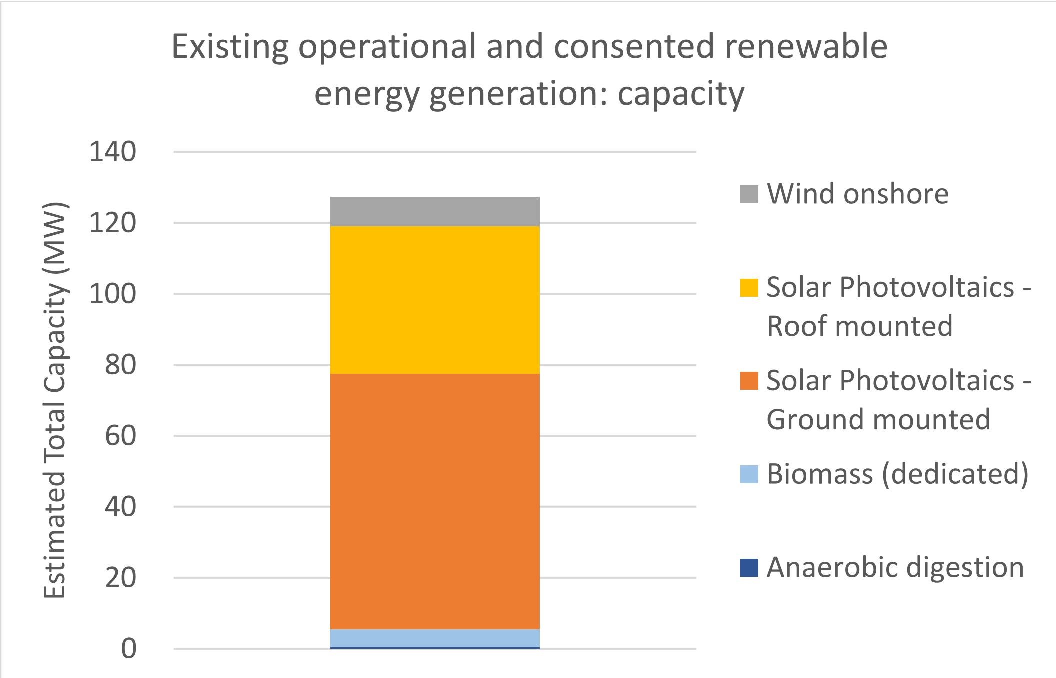
3.4 Estimates for installed electricity generation capacity and output are set out in Table 3.1. This draws on:

- Data from the MCS Data Dashboard **[See reference** 23**]**.
  - This dashboard includes the details of every MCS certified, small-scale renewable energy installation in the UK since 2008. However, as noted above, wind energy is not covered very well by MCS, so there are inevitable gaps in this data.

  - This data was used to estimate the number of existing domestic and non-domestic small scale renewable electricity developments within Melton borough. It was assumed that any "unspecified" installations were non-domestic. It was also assumed that any solar development was roof-top solar.
  - Note however, that MCS certification is not a mandatory requirement, so the MCS data does not capture all small-scale renewable energy installations. However, the MCS advise that they are confident that their data represents a significant proportion of deployment in the UK.
- Sub-regional data from the Government's Feed-in Tariff (FiT) scheme **[See reference 24]**.
  - This data was used to estimate the average size of existing domestic and non-domestic small scale renewable electricity developments within Melton borough, as the MCS database does not include this information.
  - This data was used to estimate the current deployment of small-scale hydropower and anaerobic digestion development within Melton borough, technologies that are not currently included in the MCS database. This data was also used to estimate the current deployment of small-scale wind, as very few installations are included on the MCS database (see paragraph 4.18).
  - Note however that this scheme closed in 2019, and the latest data available for use was published in 2020.
- Department for Energy Security & Net Zero's (DESNZ) April 2024 Renewable Energy Planning Database (REPD) **[See reference 25]**.
  - This data lists all renewable electricity projects over 150kW and was accessed at the start of the study and used to estimate the current deployment of larger-scale renewable developments within Melton borough.
  - Note however that the minimum threshold for installed capacity was 1MW until 2021, at which point it was lowered to 150kW. This means that projects below 1MW that were going through the planning system before 2021 may not be included.

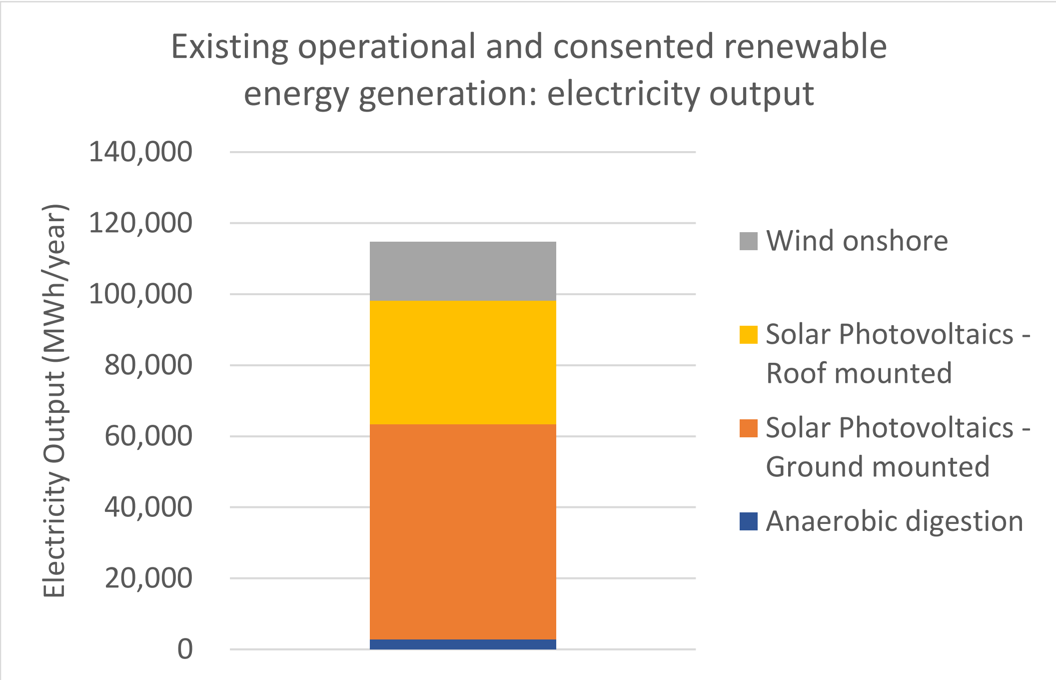
3.5 Figure 3.1 to Figure 3.3 only include projects that were registered as operational and consented at the time of preparing this report using the sources listed above. To note, operational and consented developments have been included in the tables and figures below because consented development will be operational in the future, so it provides the most up to date information on emerging renewable energy developments within the local planning authority.

Figure 3.1: Existing operational and consented renewable energy generation: capacity



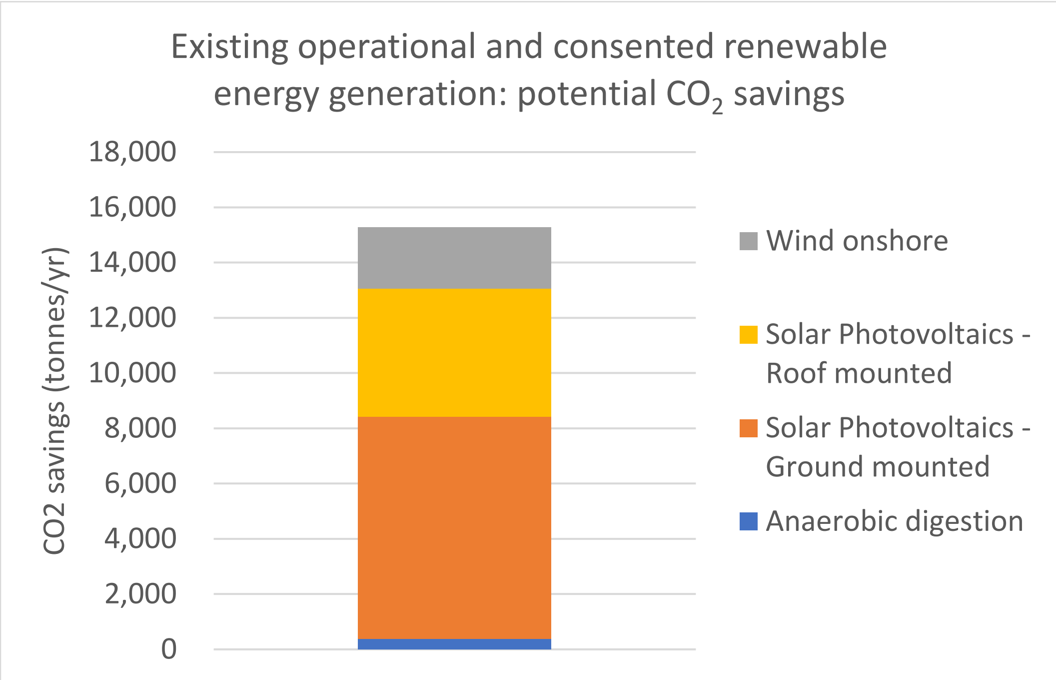
Note: Anaerobic digestion contributions are too small to show clearly on this graph.

Figure 3.2: Existing operational and consented renewable energy generation: electricity output



Note: Anaerobic digestion contributions are too small to show clearly on this graph. Data is not available to calculate the potential electricity output from the existing biomass developments.

Figure 3.3: Existing operational and consented energy generation: potential CO_2 savings



Note: Anaerobic digestion contributions are too small to show clearly on this graph. Data is not available to calculate the potential electricity output from the existing biomass developments.

3.6 The locations for existing and consented installations across Melton Borough, as currently listed in the April 2024 Renewable Energy Planning Database are shown in Figure 3.4. (Note the limitations of this dataset as listed in paragraph 3.24).

3.7 Figure 3.4 shows that the renewable energy installations are focused across the centre of Melton borough. Most of these are ground mounted solar photovoltaics.

3.8 As outlined in Table 3.1, there is currently 204 MW of operational and consented renewable electricity generation capacity across Melton Borough, providing annual emission savings of 24,893 tCO_2.

3.9 Table 3.1 shows that solar photovoltaics and onshore wind are the main sources of renewable energy generation in Melton borough. Note that this includes 50MW of solar photovoltaics that are consented but not yet operational.

Table 3.1: Existing and consented renewable and low carbon energy installations in Melton borough

Status	Technology	Estimated Total Capacity (MW)	Electricity Output (MWh/year)	Potential CO_2 Savings (tonnes/yr)
Operational	Anaerobic Digestion	0.50	2,841	378
Operational	Biomass	5	N/A	N/A
Operational	Solar Photovoltaics - Ground mounted	22	18,640	2,479
Operational	Solar Photovoltaics - Roof mounted	41	34,333	4,566
Operational	Onshore Wind	8	16,586	2,206
Consented	Solar Photovoltaics - Ground mounted	50	41,898	5,572
Consented	Solar Photovoltaics - Roof mounted	1	470	63
Consented and Operational	**Total**	**204**	**187,168**	**24,893**

Note: Data is not available to calculate the potential electricity output from the existing biomass developments.

Renewable Heat

3.10 The amount of existing renewable heat generation in Melton borough from biomass, solar water heating and heat pumps has been estimated using the following datasets:

- Data from the MCS Data Dashboard **[See reference** 26**]**.
  - This dashboard includes the details of every MCS certified, small-scale renewable energy installation in the UK since 2008.
  - This data was used to estimate the number of existing domestic and non-domestic small scale renewable heat developments within Melton borough. It was assumed that any “unspecified” installations were non-domestic.
  - Note however, that MCS certification is not a mandatory requirement, so the MCS data does not capture all small-scale renewable energy installations. However, the MCS advise they are confident that their data represents a significant proportion of deployment in the UK.
- Sub-national data within the Renewable Heat Incentive (RHI) statistics **[See reference** 27**]**.
  - This data was used to estimate the average size of existing domestic and non-domestic small scale renewable heat developments within Melton borough, as the MCS database does not include this information.
  - Note that this scheme closed in 2022, however the latest data available for use was published in March 2024.

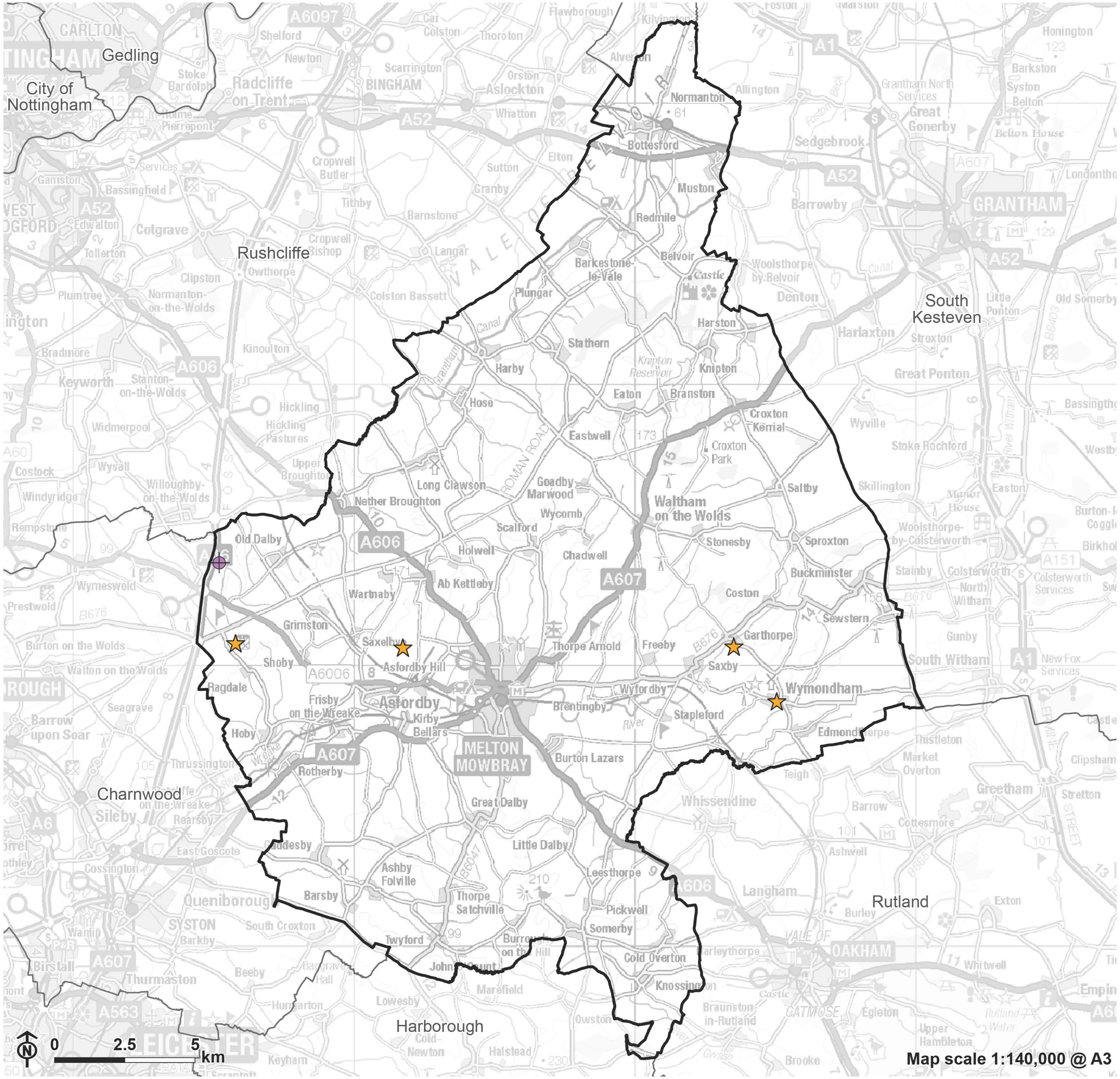
3.11 These statistics indicate that there are 287 (approx. 3.13 MW) domestic and 99 non-domestic (9.48 MW) MCS certified biomass, solar water heating and heat pump installations within Melton borough. Technology breakdowns for installations are given in Table 3.2. This is in addition to any renewable heat generated via anaerobic digestion and biomass, as covered in Table 3.1.

Table 3.2: Existing renewable heat installations

Type	Technology	Number of Certified Domestic Installations	Approx. Installed Capacity (MW)	Approx. Delivered Heat (MWh/year)	Approx. CO_2 Savings (tonnes/yr)
Domestic	Air source heat pumps	248	3	4,077	704
Domestic	Ground source heat pumps	25	0.4	598	105
Domestic	Biomass systems – assuming heat only	8	0.2	811	170
Domestic	Solar water heating	6	0.0	7	1
Non-domestic	Air source heat pumps	30	1	2,250	388
Non-domestic	Ground source heat pumps	26	3	4,529	795
Non-domestic	Biomass systems – assuming heat only	18	5	18,245	3,823
Non-domestic	Solar water heating	25	0.5	186	39
Domestic and non-domestic	**Total**	**386**	**13**	**30,701**	**6,025**

Climate Change Study
Melton Borough Council

Figure 3.4: Existing and consented renewable energy installations within Melton



Melton Borough
Neighbouring local authority

Technology

Wind onshore
Solar photovoltaic

Contains Department for Energy Security and Net Zero data.

12909_Additional_Figures 28/08/2024 EB:Collins_N

Chapter 4

Renewable and Low Carbon Energy Opportunities

4.1 This chapter provides the results of the assessment of the ‘technical’ potential for renewables within Melton borough. The ‘technical potential’ is the total amount of renewable energy that could be delivered in the area based on a number of assumptions regarding the amount of resource and space.

4.2 The assumptions used to calculate ‘technical potential’ for each renewable technology are provided within Appendix A. The assessment of technical potential has been applied at a strategic scale across Melton borough and more detailed site assessments (such as those required for a planning application) would be required to determine if specific sites are suitable in planning terms.

4.3 This chapter also includes a discussion of the issues that will affect what could be realistically delivered within Melton borough – or the ‘deployable potential’. This includes the consideration of factors such as planning, economic viability and grid connection. For new grid infrastructure, decision makers also need to balance a range of competing objectives including contributing to net zero, quality of scheme design, landscape/visual impacts, heritage and local amenity.

4.4 Geothermal energy technologies extract heat from geothermal boreholes that can extend multiple kilometres downwards beneath the ground. Water or steam that has been heated by geothermal activity can be used directly to extract heat or used to generate electricity in locations where there are higher temperatures. At present, geothermal energy is used in limited locations around the UK; predominantly within Cornwall and the Lake District/Weardale where the highest heat flows within the UK are present. The “Dig Deep” report **[See reference** 28**]** reviewed all the UK through geothermal temperature data and Melton borough was identified as having potential for deep geothermal energy. Existing mines and boreholes could help to facilitate the exploitation of this resource. However, geothermal energy has not been included within the scope of this study as to investigate localised potential for geothermal energy generation, specialist surveys would need to be undertaken. If the Council is interested in supporting geothermal energy development, it could consider a similar approach to Cornwall Council which incorporated geothermal energy in Policy RE1: Renewable and Low Carbon Energy of the Climate Emergency DPD.

Assessment of technical potential for renewables

4.5 The following section summarises the assessment of technical potential for each form of renewable and low carbon technology. For each resource, where relevant, it includes:

- Description of the technology;
- Summary of existing deployment within Melton borough (based on the sourced listed paragraph 3.2 and paragraph 3.10);
- Assumptions used to calculate technical potential (refer to Appendix A for further details);
- Results of assessment of technical potential; and
- Summary of issues affecting deployment.

4.6 The assessment approach is based on the former Department of Energy and Climate Change (DECC) Renewable and Low-Carbon Energy Capacity Methodology: Methodology for the English Regions (2010) **[See reference 29]** but this has been updated and refined to take account of local circumstances within Melton borough where appropriate.

4.7 The potential carbon savings as a result of generation via the identified potential from each renewable technology was calculated by considering the “emissions factor” of energy sources. An emissions factor provides the annual average carbon intensity of energy used. It is used to calculate the potential carbon savings of replacing national grid-sourced electricity, mains gas and heating oil, with that from renewables, which have negligible carbon emissions.

4.8 The emissions factors for mains gas and heating oil used in this assessment were 0.210 kgCO_2e/kWh and 0.298 kgCO_2e/kWh respectively and were sourced from SAP10.2 **[See reference** 30**]**. These sources of energy remain consistent and as such their emissions factors do not change over time **[See reference** 31**]**.

4.9 However, the sources of electricity feeding the national grid can change and its carbon intensity is decreasing over time as more of the UK's grid electricity is sourced from renewables. As such, the carbon savings from deploying renewable electricity generating infrastructure is also decreasing over time. The national grid electricity emission factor used within this assessment was 0.133 kgCO_2e/kWh. This is sourced from the National Grid (2024) Future Energy Scenarios: FES 2024 Data workbook **[See reference** 32**]** and provides the annual average carbon intensity of electricity based on a five-year forecast from 2023. This was used as this is the most up to date forecast available, and so the most accurate value to use to calculate the potential carbon savings of using renewable energy in the future.

Wind

Description of technology

4.10 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.

4.11 Turbine scales do not fall intrinsically into clear and unchanging size categories. At the largest scale, turbine dimensions and capacities are evolving quite rapidly with the largest onshore turbines in Scotland now reaching approximately 250m to blade tip **[See reference** 33**]**. The deployment of turbines at particular 'typical' scales in the past has also been influenced by changing factors which include the availability of various subsidies. As defined scales need to be applied for the purpose of the resource assessment, the assessment used five size categories based on consideration of current and historically 'typical' turbine models:

- Very large (150-220m tip height);
- Large (100-150 tip height);
- Medium (60-100 tip height);
- Small (25-60 tip height); and
- Very small (<25m tip height).

4.12 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. Very small turbines can be micro-sited in and around constraints and would require site specific study, beyond the scope of this strategic study, to identify suitable locations with technical potential.

4.13 Notional turbine sizes falling within the middle of each class size are used for the technical resource assessment as set out in Table 4.1.

Table 4.1: Notional turbines used for the resource assessment

Scale	Typical Turbine Installed Capacity	Typical Turbine Height (maximum to blade tip)
Very large	4MW	185m
Large	2.5MW	125m
Medium	0.5MW	80m
Small	0.05MW	45m

4.14 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' (for example, 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 4.1).

4.15 A review of wind turbine applications across the UK found that tip heights range from less than 20m up to around 250m, with larger turbine models particularly in demand from commercial developers following the reduction in financial support from Government and driven by the manufacturers and trends from other European markets where turbines of this scale have been developed for some time. The majority of operational and planned turbines range between 80m and 250m, with the majority of new applications in Scotland and Wales currently being at the larger end of the scale. However, within England, the majority of onshore wind applications that have been granted and/or become operational since 2015 have been for less than 10 turbines and all are under 150m other than two **[See reference 34]**. Specifically, within Melton borough, there have been no onshore wind applications since the de facto ban in 2015. As such, Local Plan Policy EN10 has not been tested for wind since the Local Plan was adopted in 2018. Prior to the adoption of the Local Plan in 2018, most onshore wind applications were very small to small installations, and they were mostly for single turbines with a tip height around 46m and associated with agricultural holdings.

4.16 For January to March 2024, the UK had 15,460MW of installed onshore wind capacity, providing 11,040GWh electricity during those months **[See reference 35]**. Since the removal of financial support and restrictive policy requirements in the 2015 Written Ministerial Statement and subsequently incorporated in the NPPF, onshore wind development activity moved overwhelmingly away from England towards Scotland and Wales, where it is focusing particularly on sites with high wind speeds and the ability to accommodate large numbers of tall turbines. Very few onshore wind energy projects have been approved and built within England since 2015. However, this is likely to change following the new Labour Government's removal of Footnotes 57 and 58 from the NPPF, as announced in the ministerial statement titled 'Building the Homes We Need' in July 2024.

Existing development within Melton borough

4.17 According to the April 2024 DESNZ Renewable Energy Planning Database there is one currently operational large capacity **[See reference** 36**]** wind development within Melton borough; Dalby Wind Farm. The development has an installed capacity of 7.2MW from a total of nine turbines (0.8MW per turbine). Each turbine has a height to tip of 77 metres **[See reference 37].** Dalby Wind Farm was approved in December 2010 and was constructed in January 2015. In addition, Melton borough saw 1,072 kW of small-scale wind capacity installed between April 2010 (launch of the FiT) and March 2019 (when it closed), as recorded on the Feed In Tariff scheme **[See reference 38].**

4.18 The MCS databased additionally includes records for 9 small wind installations within Melton borough and these were installed between 2010 and 2013 **[See reference** 39**]**. When cross-referred to the FiT data on average system sizes **[See reference 40]**, this equates to approximately 675kW. However, as so few small wind schemes are included within the MCS dashboard data, the Feed in Tariff scheme data was instead used to represent the existing number of small-scale wind installations within Melton borough. Since 2021, the Renewable Energy Planning Database began to include not only developments above 1MW, but also those above 150kW. Therefore, in the future the Renewable Energy Planning Database should better represent the existing wind capacity within Melton borough.

Assumptions used to identify land with technical potential

4.19 The assessment of technical potential for very large, large, medium and small turbines was undertaken using GIS (Geographical information Systems) involving spatial mapping of key constraints and opportunities. The assessment identified areas with suitable 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). This identified the entire Borough as potentially having suitable wind speeds, and the number of turbines that could theoretically be deployed within these areas. A series of constraints relating to physical features, such as environmental/heritage protection were then removed. The remaining areas have 'technical potential' for wind energy development. To note, areas with 'technical potential' does not equate to the area being suitable for wind energy development, further site-specific studies will have to be conducted.

4.20 The key constraints considered are set out in detail in Appendix A.

4.21 Unconstrained areas of land were excluded if they were below a minimum developable size of 40m width and an area that varied per turbine size:

- Very large: 0.8ha
- Large: 0.6ha
- Medium: 0.4ha
- Small: 0.2ha.

4.22 Following this, the total area of land with 'technical potential' for wind energy development for each turbine size category was then calculated.

4.23 The calculation of potential wind capacity involved applying an assumption concerning development density. In practice, turbines are spaced within developments based on varying multiples of the rotor diameter length. Turbine separation distances vary however the following assumptions were applied: a 5 by 3 rotor diameter oval spacing **[See reference 41]**, with the major axis of the oval oriented towards the prevailing wind direction, (south-west is the 'default' assumption in the UK). In practice, site-specific factors such as prevailing wind direction and turbulence are taken into account by developers, in discussion with turbine manufacturers. Reflecting the strategic nature of the present study, the density calculation did not take into account the site shape. A standardised density was used instead, as set out below:

- Very large: 4 turbines per km^2
- Large: 8 turbines per km^2

- Medium: 22 turbines per km^2
- Small: 167 turbines per km^2

4.24 The calculation of potential energy yield requires the application of a 'capacity factor', meaning 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 local historic data on capacity factors, considering these kinds of variations in Melton borough for the present study. Instead a single capacity factor of 22.9% was used for all turbine scales, based on regional data **[See reference 42]**.

4.25 Additionally, the potential carbon savings as a result of generation via the identified wind potential was calculated. This assumed that the electricity generated from the identified wind potential would result in negligible carbon emissions and would replace that currently provided by the national grid, which has an emission factor of 0.133kgCO_2e/kWh **[See reference 43]**.This could either be via use of the electricity on-site, on-site following battery storage, or off-site via export.

Results

Technical potential

4.26 Figure 4.1 and Table 4.2 below provide a summary estimate of the technical potential for wind energy within Melton borough. The analysis examined the potential for very large, large, medium and small turbines. Where potential exists for more than one size of turbine, it was assumed that the larger turbines would take precedence as, to ensure viability, developers usually seek to install the largest capacity turbines possible.

4.27 The assessment results indicate that there is a technical potential to deliver up to around 2,768MW of wind energy capacity in Melton borough, equating to powering approximately 2 million homes a year **[See reference 44]**. The associated potential annual CO_2 savings of 738,123 tonnes are equivalent to planting approximately 28.4 million trees a year **[See reference 45]**. The greatest potential is for very large turbines (see Figure 4.1 and Table 4.2). The second greatest potential is for small turbines. Prior to the 2015 de facto on shore wind ban, the borough had a number of non-commercial small scale single turbine development.

Figure 4.1: Onshore wind potential capacity and carbon savings within Melton Borough

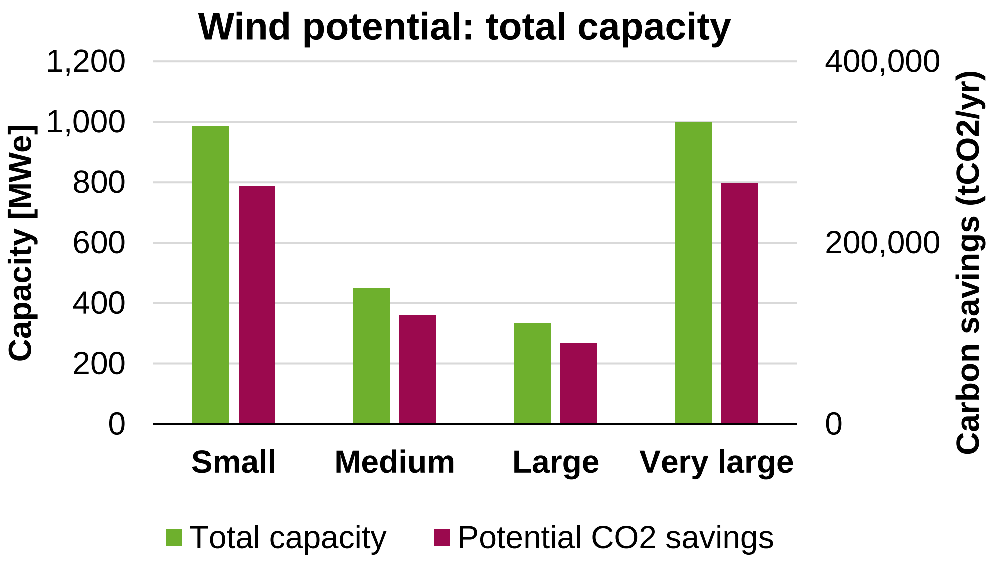


Table 4.2: Potential wind capacity and output

Development Scale	Estimated Total Capacity (MW)	Electricity Output (GWh/year)	Potential CO_2 Savings (tonnes/year)
Small	985	1,975	262,716
Medium	451	905	120,351

Development Scale	Estimated Total Capacity (MW)	Electricity Output (GWh/year)	Potential CO_2 Savings (tonnes/year)
Large	334	669	89,024
Very large	998	2,000	266,033
Total	**2,768**	**5,550**	**738,123**

4.28 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 the largest areas of potential for wind generation, particularly large scale generation, are located primarily in the east of the borough. However, there are pockets of potential throughout the borough other than across the centre of the borough.

4.29 In order to illustrate the GIS tool parameters, a series of opportunity and constraints maps were produced. Figure B.1 in Appendix B shows the wind speed within Melton borough at 50m above ground level (agl). This shows that the highest wind speeds are located predominantly in the south of the borough and to the west. However, Figure B.1 shows that all land within the borough has a mean annual average wind speed of <5m/s at 50m agl. 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.

4.30 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 Melton borough. 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 areas of 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 site-by-site basis.
- Site-specific features and characteristics – In practice, developments outside protected areas may potentially an impact on amenity and sensitive ‘receptors’ such as protected species. These impacts can only be assessed via site-specific surveys.
- Aviation – Although operational airports and airfields, as well as MOD land in active use were considered to be constraints to wind development, airport safeguarding zones were only mapped for information. Aviation interests were not used to restrict potentially suitable areas as these impacts require site by site consideration and mitigation may be available to address any issues.
- Friends of the Earth (FOE) wind energy potential mapping – FOE drew on LUC’s methodology to identify potential strategic constraints to large-scale renewable energy projects. The report building on advice that we provided to Stroud Council, working alongside the Centre for Sustainable Energy. FOE’s report identifies huge potential for onshore wind and solar farms, however they have used more conservative assumptions, so it identifies less technical potential for Melton borough than this study does.

Issues affecting deployment

4.31 The technical wind development potential within Melton borough, 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.

4.32 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 key factors that affect the deployable wind potential that merit individual consideration: landscape sensitivity, grid connection, development income and planning issues. These are discussed in turn below.

Landscape sensitivity

4.33 In the past Landscape and Visual Impact (LVI) was often a defining consenting consideration within the context of planning applications for wind developments. It has therefore been a particularly important influence on the choice of turbine scales and locations by developers.

4.34 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. The Melton and Rushcliffe Landscape Sensitivity Study: Wind Energy Development (2014) shows that almost all of the borough has a ‘high’ sensitivity to large-scale turbines (111-150m high to tip). There is a lack of evidence of what commercial schemes are likely to come forwards in England due to the de facto ban on onshore wind in England from 2015 to July 2024 created by national planning policy. Now that supportive national planning policy exists, it will be necessary to wait and see what proposals commercial developers bring forward, given the relatively low wind speeds in much of England, including Melton borough. However, experience elsewhere in the UK suggests that commercial developers are principally interested in large / very large turbines. While the landscape and visual impact of commercial scale wind energy development is likely to be significant across most of the borough, it would nevertheless be beneficial to direct such development to those parts of the borough that are relatively less sensitive. Although now 10 years old, the Melton and Rushcliffe Landscape Sensitivity Study (2014) should continue to give a reasonable indication of the sensitivity of different landscape character areas within the Borough to wind energy development for the partial update of the Local Plan. The study shows that almost all of the Borough has a ‘high’ sensitivity to large-scale turbines (111-150m high to tip). However, it is recommended when the Local Plan is being fully reviewed, the 2014 landscape sensitivity study could be updated to take into account recent developments and current turbine sizes. Site specific assessments (including landscape and visual impact and residential amenity assessments) would also be needed to verify the suitability of specific wind energy development proposals in landscape terms.

4.35 In addition to commercial led schemes, there is potential for non-commercial small scale single turbines to be developed across the borough as they may be more attractive to farmers and rural businesses and be a part of community energy projects. While most wind turbines require planning permission, some stand-alone wind turbines can fall under permitted development if they comply with the MCS Planning Standards, are not more than 11.1 meters high and do not have a rotor diameter of 2m. However, very little commercially available equipment meets these requirements. As such, similar to commercial led schemes, site specific assessments (including landscape and visual impact and residential amenity assessments) would be needed for small scale turbine development as well.

Grid connection

4.36 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 **[See reference 46]**, have become increasingly congested, to the point at which connections in many cases cannot take place without expensive network reinforcement 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.

4.37 Within Melton borough, National Grid (formerly Western Power Distribution) is the distribution network operator. Western Power Distribution prepared their Business Plan 2023-2028, which is still being used by National Grid, and this actively supports community renewable energy schemes **[See reference 47]**.

4.38 The National Grid Electricity System Operator (ESO) has recently announced a significant restructuring, and the government has decided to acquire ESO, transitioning it into public ownership. National Energy System Operator (NESO) has assumed the role of overall electricity system operator for the UK, under the Energy Act 2023. A set of offshore and onshore network recommendations have been made within the Beyond 2030 plan **[See reference** 48**]**. For Leicestershire, the plan notes that upgrades are necessary to existing infrastructure in the region. For example, NESO has proposed increasing the voltage of the circuit, replacing the line conductors with higher capacity ones, or adding devices to better control how electricity flows along the line. These upgrades reduce the amount of new infrastructure needed but cannot wholly eliminate the need for new infrastructure.

4.39 Although investment is being proposed it is likely that grid capacity will remain constrained for the immediate future. Grid could therefore be a significant constraint in the short-medium term in relation to the deployment of wind and all large-scale grid connected renewable energy developments. As the local plan period extends past 2028, policy will have to be flexible to allow for future scenarios, changes in national policy and the grid being upgraded, or better balanced.

Development income

4.40 Financial support mechanisms in the form of Government subsidies such as the Renewables Obligation (RO) and Feed In Tariff (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.

4.41 The Contracts for Difference (CfD) scheme is now the Government's main mechanism for supporting low-carbon electricity generation **[See reference 49]**. 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. 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.

4.42 Round 4 of CfD auctions opened in December 2021 and Round 5 opened in March 2023, and Round 6 opened in March 2024, all of which now include Pot 1 technologies, such as onshore wind **[See reference 50]**. Following the budget uplift announced by the new Labour government in July 2024 **[See reference** 51**]**, Round 6 includes a budget increase compared to previous Rounds, although the majority of the budget is allocated to offshore wind. It remains unclear whether this will make schemes more financially viable for developers in England as much of the country, including Melton borough, has relatively low wind speeds, and any potentially financially viable developments require a number of very large turbines to maximise the power output and make the scheme economical.

4.43 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, could make individual turbines viable, for example on an industrial estate or rural businesses.

4.44 Between 2010 and 2022, solar and wind power experienced a large cost deflation. For onshore wind projects specifically, the global weighted-average cost of electricity fell by 69% **[See reference 52]**. Over the last decade the decline in turbine prices globally has occurred despite the increase in rotor diameters, hub-heights and nameplate capacities.

4.45 In addition, the Smart Export Guarantee has been introduced since January 2020 **[See reference 53]**. 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 **[See reference 54]**. Wind developments of up to 5 MW 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.

4.46 Overall, viability challenges, based on reduced income relative to capital costs, are a challenge for wind development at all scales unless sites have high wind speeds. Within England, the highest wind speeds are found within the north of England so it is likely that wind energy developers will look to develop sites here before pursuing less viable sites elsewhere.

Planning issues

4.47 In addition to the lack of financial support mechanisms, until July 2024, the NPPF required that wind energy development may only be permitted within areas identified suitable for wind energy developments within the development plan or supplementary planning document and where the development has the support of the local community (footnote 58 in the NPPF). As such, the uptake of wind energy in England was very minimal as it discouraged developers. However, with the removal of the footnote by the new Labour Government, there may be an increase in onshore wind in England in the coming years. The Government’s Onshore Wind Task Force is currently looking at how it going to achieve its ambition of securing 600MW-1GW of additional onshore wind in England over the next 9 years and the policy interventions that are needed to achieve this.

4.48 Securing consent for onshore wind turbines, particularly very large-scale wind turbines which are the most economically viable, is likely to remain a challenge although setting out positive planning policies within the Local Plan can help with this. However, if the proposed changes to the NSIP thresholds is taken forward any onshore wind projects at 100MW will be considered National Significant and dealt with by the NSIP regime.

Onshore wind - conclusion

Onshore wind has the second largest technical potential energy output in Melton borough of all the renewable and low carbon energy technologies considered in this study, after ground-mounted solar PV. It is estimated to have the potential to contribute 20% (5,549,798 MWh/year) of Melton borough's total technical potential energy output (based on the illustrative technical potential **[See reference** 55**]**). In light of the recent proposed changes to the NPPF and the Government's ambition to deliver onshore wind, there is renewed optimism within the onshore wind energy industry. The economic viability of commercial led onshore wind in England does, however, remain a challenge to deployment; despite a more favourable national planning policy. Commercial renewable energy developers may prioritise schemes in the North of England, where wind speeds are higher. Smaller scale onshore wind schemes may have more success within the borough as they can be more attractive to rural businesses and community groups, but the Local Plan should identify suitable areas for renewable energy to help secure development. Grid capacity could also be a significant constraint in the short-medium term.

Solar PV (ground-mounted)

4.49 In addition to PV modules integrated on built development, there are a large number of ground-mounted solar PV arrays within the UK. Larger sites, whose purpose is to export energy to the gird, are sometimes referred to as solar farms. Ground mounted solar PV 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 within solar farms do not cover a whole field and allow vegetation to continue to grow between and even underneath the panels. Ground mounted solar panels can offer several benefits over rooftop solar panels such as they can produce more energy, can be adjusted and tilted to optimise performance, they are easier to access and maintain and can be easily expanded to accommodate a larger solar array. They can also work well for domestic and business energy needs which have a large amount of land and/or a roof that is not suitable for rooftop solar panels. However, ground mounted solar panels can be more expensive to install than rooftop systems and require more space.

4.50 Ground-mounted solar project sizes vary greatly across the UK although commercially led developments in a post-subsidy environment are increasingly focusing on large-scale development, with the largest currently consented scheme in England (Longfield Solar Farm in Essex) being up to 500MW **[See reference 56]**. Mallard Pass in Melton borough's neighbouring local authority Rutland is expected to generate in the region of 350MW when completed. To note, only smaller scale solar PV projects are determined by Local Planning Authorities. Solar farms with a generating capacity above 50MW need development consent from the Secretary of State for Energy Security and Net Zero, because they are considered nationally significant infrastructure projects' (NSIPs). However, the new Labour government has recently proposed to increase the NSIP threshold for solar to 150MW **[See reference** 57**]**, in part to reflect technological advances in the increased efficiency of panels and therefore reduce the land required per MW.

4.51 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 1.2 hectares per MW has been applied based on past and recent development experience. The government estimates that a typical 50MW solar farm will include around 100,000 to 150,000 panels and cover between 125 and 200 acres **[See reference** 58**]**.

4.52 In the period January to March 2024, the UK had 16,695MW of installed solar PV capacity, with this providing 1,914GWh of electricity during those months **[See reference** 59**]**. These figures include all forms of solar PV – although according to the most recent available data, ground-mounted schemes account for 48.6% of overall solar capacity **[See reference** 60**]**. Falling capital costs mean solar PV is increasingly viable in a post-subsidy context, although as outlined above, at present commercial developers are generally focusing on large developments in order to achieve economies of scale. Grid connection costs can also critically affect viability. Many solar farms are proposed at 49.9MW, just under the threshold for the more costly and time consuming NSIP decision making process. If the threshold were raised, then it is reasonable to expect economies of scale to drive further increases in the size of scheme.

4.53 Small scale ground mounted solar PV installations can be installed through permitted development rights so long as the solar PV array is no more than 4m high, installed more than 5m from the property boundary and it does not exceed 9 square metres in size (approximately 4-5 large solar panels; usually 3x3m2). There are limitations however, these rights do not apply within the boundary of a listed building or a scheduled monument and if the solar equipment is to be installed on Article 2(3) land (designated land which includes Conservation Areas, National Landscapes, National Parks and World Heritage Sties) there are additional restrictions based on the location and views of the panels that may require some proposals to seek either prior approval or planning permission from the Local Planning Authority. There are also separate criteria that provide similar permitted development rights for solar parking canopies. In rural areas like the borough of Melton, many homes and businesses are not land constrained and so there may be greater potential for ground mounted solar PV. However, the size limitations of the permitted development rights are small and those who want to install a ground-mounted solar panel systems large enough to power all of their energy needs will normally require planning permission.

Existing development within Melton borough

4.54 The April 2024 Renewable Energy Planning Database data available from DESNZ identifies that there are two currently operational solar photovoltaic developments in Melton borough. These have a combined installed capacity of 22.2MW, with the Six Hills Solar Farm providing the majority of this (18.7MW). However, a third solar farm (Jericho Covert Solar Farm), with an installed capacity of 49.9MW, was granted planning permission in 2022 and it is awaiting construction **[See reference 61]**.

Assumptions used to identify land with technical potential

4.55 A GIS assessment of technically suitable land for solar development was undertaken using a similar approach to that undertaken for wind development. The assessment identified areas with financially viable solar irradiance levels (amount of sunlight) for PV. A series of primary constraints relating to physical features and environmental/heritage protection were then removed. The remaining areas have ‘technical potential’ for ground-mounted solar energy development.

4.56 Solar development is more ‘modular’ than wind (development size is dictated by the number of panels, which themselves do not differ greatly in size) and constraints are not affected by project scale in the way that they are for wind. Therefore, the identification of available land for ground-mounted solar has not been broken down into discrete project sizes but rather any land technically suitable for development has been identified.

4.57 The use of agricultural land for solar development is as an issue for Melton borough, given that agriculture and food production is a key part of the economy of this rural borough. Agricultural land of grades 1, 2 and 3a land is classed as “the best and more versatile (BMV)” land, having higher value for food production. The NPPF requires planning policies and decisions to contribute to and enhance the natural and local environment by recognising the economic and other benefits of BMV; however, there is no requirement to use it solely for food production. Schedule 4 of the Development Management Procedure Order 2015 requires local planning authorities to consult Natural England, on planning applications that will result in the loss of over 20 hectares of BMV agricultural land (if the development of that land is not in accordance with their local plan). Natural England's guide to assessing development proposals on agricultural land sets out the considerations that local planning authorities must take into account when they assess applications for development for agricultural land **[See reference** 62**]**.

4.58 The updated National Policy Statement (NPS) EN-3 recognises that it is “likely” that some agricultural land will need to be used for solar farms, it recommends that developers should try using poorer-quality agricultural land “where possible” but it does not prohibit the siting of solar farms on BMV agricultural land. Lower grade agricultural land can often be in more remote locations which are less suitable for solar farms and there are limited opportunities to build solar farms on brownfield land at the scale required.

4.59 The key constraints considered in the assessment of technical potential are set out in Appendix A and agricultural land grades 1 and 2 were treated as a constraint and excluded from the areas identified as having technical potential for ground-mounted solar PV development. Further, site-specific study would be required to identify grade 3a agricultural land in order to treat this as a constraint, as full-coverage national dataset is not available.

4.60 As calculated by Solar Energy UK **[See reference 63]**, solar farms currently occupy less than 0.1% of the UK’s land. To meet the government’s net zero target, the Climate Change Committee estimates that 90GW of solar is needed by 2050 (70GW by 2035) which would mean solar farms would account for roughly 0.6% of UK land, at most. This is less than the amount currently occupied by golf courses. Several organisations have attempted to estimate how much land is required to meet the government’s target for solar power (70GW by 2035). Back in 2022, BEIS proposed that future solar power will need between two and four acres of land to produce 1MW of power. Assuming an average of three acres per MW, it the government is to meet its target of increasing solar capacity fivefold, it is estimated that around 700 square kilometres of land (below 0.3% of the UK’s total land area) would host solar farms in 2035. It is estimated that if these 700 square kilometres were used to grow wheat, they would only account for 4% of the UK’s annual wheat yield, suggesting the likely impact of solar farms on overall food production would be small. **[See reference 64]** The UK Government Food Security Report (December 2021) implies that while there will be the loss of arable production on some higher quality land due to solar farms, this will not impact on the UK’s food security. **[See reference 65]**

4.61 It should be noted that the construction and operation of a solar farm will not lead to the long-term degradation or loss of soils or necessarily end agricultural use of the land. This is because it is technically a temporary development, the land can return to agricultural use in the future and the solar farm could give intensively farmed land the opportunity to recover. The debate around using farmland for solar farms also often assumes that the two are incompatible. However, the concept of “agrivoltaics” outlines various ways in which land use can be optimised to address the dual needs of energy and food production. Agrivoltaics can come in many forms, including providing ecosystem services, grazing by livestock and crop production. The NFU has expressed support for multi-purpose land uses to address competing land pressures and a wide variety of crops have been demonstrated to grow underneath and alongside panels. Japan is a world leader in agrivoltaics, where more than 120 different crops are grown beneath solar PV panels. **[See reference** 66**]**

4.62 Typically, solar farms are subject to a Landscape and Environmental Management Plan (LEMP) which requires the ground beneath and around the panels to be seeded and managed to promote biodiversity through mowing or grazing, as well as typically avoiding the use of pesticides, herbicides, and fertilizers whilst the solar farm is operational. It can serve as valuable pollinator habitat and provide ecosystem services that can benefit both nature and farming. Grazing by small livestock is often used to keep the grass low and continue an agricultural use during the project lifetime. Solar farms also provide diversification for landowners, by adding a consistent income stream to their business that is not dependent on agriculture. This provides longer-term security against volatility in wholesale food commodity markets and yields, offering support to their wider farming business / operations.

4.63 The total area of land with ‘technical potential’ for ground-mounted solar energy development was calculated. The calculation of potential solar capacity involved applying an assumption concerning development density. An assumption of 1MW per 1.2 hectares was applied, in line with guidance within the Draft National Policy Statement for Renewable Energy Infrastructure (EN-3).

4.64 The calculation of potential energy yield requires the application of a ‘capacity factor’, meaning 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 factors within Melton borough for the present study, and so a single capacity factor of 9.59% was used, based on regional data for the East Midlands **[See reference** 67**]**.

4.65 The potential carbon savings as a result of generation via the identified ground-mounted solar potential was also calculated. This assumed that the electricity generated from the identified ground-mounted solar potential would result in negligible carbon emissions and would replace that currently provided by the national grid, which has an emission factor of 0.133kgCO_2e/kWh **[See reference 68]**.This could either be via use of the electricity on-site, on-site following battery storage, or off-site via export.

Results

Technical potential

4.66 Figure 4.2, Figure 4.3 and Table 4.3 below provide a summary estimate of the technical potential for ground-mounted solar PV within Melton borough. As the full technical potential is very large, utilisation of 1%, 3% and 5% of the resource is also quantified. Adopting the 3% development scale would result in a total potential technical capacity from ground-mounted solar PV across Melton borough of 727MW – this approximately equates to an area of 8.73km^2, powering 226,000 homes a year **[See reference** 69**]**, with potential CO_2 savings equating to planting approximately 3 million trees a year **[See reference** 70**]**.

Figure 4.2: Ground-mounted solar PV potential

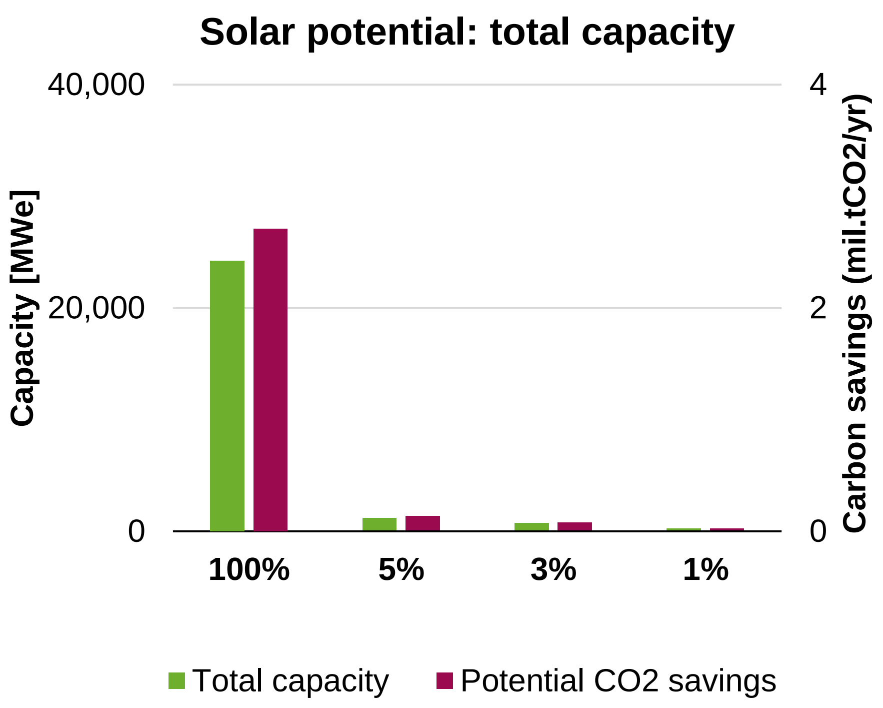


Figure 4.3: Ground-mounted solar PV potential: 1%, 3% and 5% only

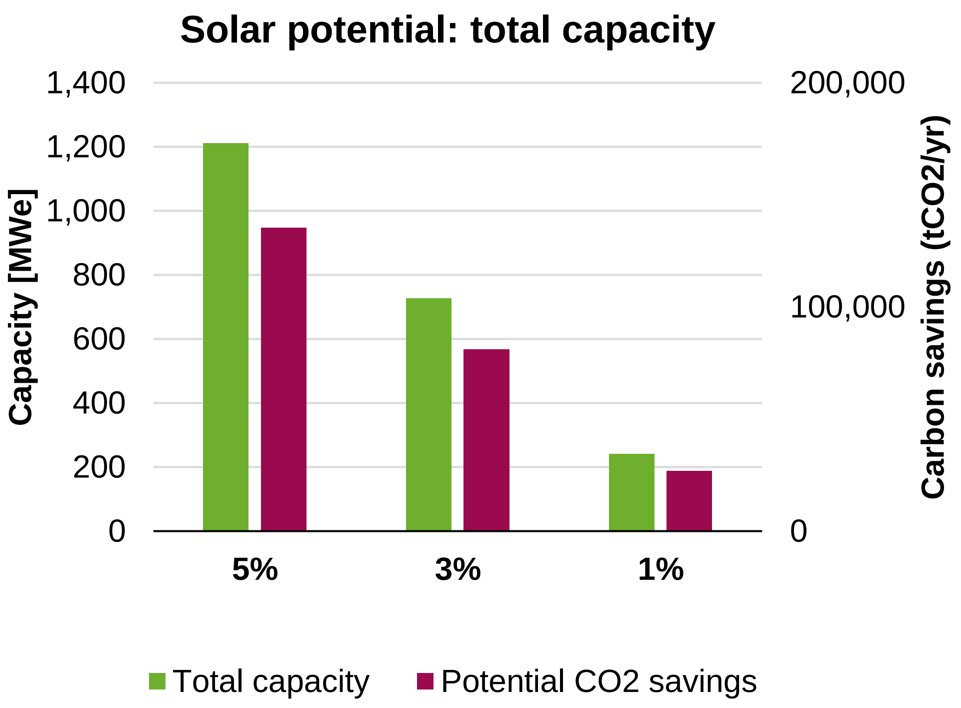


Table 4.3: Potential solar capacity and output

Development Scale	Potential Installed Capacity (MW)	Electricity Output (MWh/year)	Potential CO_2 Savings (tonnes/yr)
100% of tech. resource	24,240	20,352,995	2,706,948
5% of tech. resource	1,212	1,017,650	135,347
3% of tech resource	727	610,590	81,208
1% of tech resource	242	203,530	27,069

4.67 The key constraints and resulting potentially suitable land for solar development are presented in maps in Appendix C.

4.68 As with the wind resource assessment, the solar assessment has some key limitations. In particular, cumulative impacts are again a key consideration that the tool cannot take into account but which would affect the suitability of planning applications in practice. 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. In practice development of all or even the majority of this land would clearly not be appropriate.

Issues affecting deployment

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

Landscape sensitivity

4.70 Although the landscape and visual impacts of solar PV tends not to be as contentious as wind development, it is still often a key consenting issue, particularly for 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 an overall planning balance, no land was excluded from the GIS technical constraints assessment on landscape or visual grounds. Instead, similar to wind, a landscape sensitivity study could be commissioned to identify which areas within the borough are less sensitive to different scales of ground mounted solar.

Grid connection

4.71 As with wind, 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 Melton borough at the present time.

Development income

4.72 Until recently, the lack of financial support for solar PV has constrained the deployable potential, particularly for 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 has been included in the latest 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 6 of auctions opened in March 2024 and includes Pot 1 technologies, such as solar PV >5MW and onshore wind >5MW. **[See reference 71]**.

4.73 Over recent years solar panel costs also have decreased 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. A Government report confirmed that solar farms offer the most cost-effective power generation method, with levelized costs projected to decrease significantly by 2040 **[See reference 72]**. It is noted however that at present, commercial ground mounted solar PV schemes are predominantly pursued at large scales to ensure viability via economies of scale.

4.74 With regards to smaller scale solar developments, the Smart Export Guarantee has been introduced since January 2020 **[See reference 73]**. 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 5 MW 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 **[See reference 74]**. 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 **[See reference 75]**. It may therefore be that future changes to the Smart Export Guarantee or introduction of additional schemes may increase the potential developer income on future solar PV developments.

Ground-mounted solar PV - conclusion

Ground-mounted solar PV has the largest technical potential energy output in Melton borough of all the renewable and low carbon energy sources considered by this study. It is estimated, assuming 100% of land identified to have technical potential for solar was delivered, to have the potential to contribute 72% (20,352,995 MWh) of Melton borough's total technical potential energy output (based on the illustrative technical potential **[See reference 76]**). The economic viability of ground-mounted solar PV in England is good as the costs have decreased significantly in recent years. Although Melton borough has good technical potential for ground-mounted solar, there is uncertainty surrounding the capacity of the grid and the costs of connecting to it. Rural community concerns regarding solar farms impacts on agriculture are noted, however appropriate and well-designed solar farms and farming can be complementary to food production, supporting each other financially, environmentally and through shared use of land.

Solar – rooftop

Description of technology

4.75 Rooftop solar photovoltaic (PV) panels capture the sun's energy and convert it into electricity to use locally, with the potential to sell excess electricity generated back to the grid or store it in a battery for later use. Solar water heating (aka solar thermal) systems use energy from the sun to warm water for storage in a hot water cylinder or thermal store. Both rooftop 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. Installations are largely confined to southwest to southeast facing roofs, pitched between 20-60º, and which have minimal shading. These may be installed upon existing roofs or can be roof-integrated. Roof-integrated systems, such as PV tiles, shingles and semi-transparent PV panels, form part of the roof itself and can offset some of the cost of conventional roofing materials.

4.76 On flat roofs, commonly found on flats and on-domestic properties, the orientation of the roof is less critical to the viability of solar technologies. However, on these roofs, the panels will instead need to be pitched on tilted frames and spaced appropriately to limit self-shading.

4.77 On pitched roofs, approximately 7.5m^2 of roof space per kW of high efficiency (such as monocrystalline silicon) solar PV panel is required. This takes into consideration of an internal roof buffer. These PV systems can also be connected to export power to the grid at times when there is insufficient energy use or storage capabilities within the property. In comparison, the rooftop size requirements for the installation of solar water heating systems is limited to the usage of hot water within the property itself. On residential properties, solar water heating systems therefore typically occupy 1.5m^2 of flat panel per resident, and properties require sufficient space to accommodate a hot water storage tank.

4.78 Most standard installations of solar panels on existing buildings are considered to be ‘permitted development’ **[See reference 77]** and therefore do not normally require planning consent. However, installations on listed buildings (including any building within the listed building’s grounds) and those on a site of a scheduled monument will normally require planning permission. Some installations in designated areas, including Conservation Areas and World Heritage Sites will also require planning permission, for example where the installation is prominent and faces the road. Non-domestic solar PV rooftop installation above 50kw must seek Prior Approval from the Local Planning Authority, applications of this type must comply with the relevant criteria of Schedule 2 Part 14 Class J of The Town and Country Planning (General Permitted Development) (England) Order 2015. Prior approval considerations are limited however to assessing the design and external appearance of the development, such as the potential impact of glare on occupiers of neighbouring land.

4.79 Building regulations will normally apply to the installation of rooftop solar PV, these require consideration of the ability of the existing roof to carry the load (weight) of the panels (sometimes strengthening work may be needed) and ensure safe electrical installation. As for new development, please refer to Document B as it explores sustainable building design options which includes rooftop solar.

Other emerging solar PV technologies considered but not assessed

4.80 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 2.7MW system installed by FlexiSolar at a large manufacturing site in England **[See reference 78]**.

4.81 Emerging solar PV technologies include 'floatovoltaics', whereby PV systems float on waterbodies such as reservoirs and lakes, often floating on rafts and anchored to the side of the water body. For example, a 6.3 MW 23,046 panel scheme has been developed on Queen Elizabeth II Reservoir, near Heathrow airport **[See reference 79]**, and a 3 MW 12,000 panel scheme has been installed on Godley Reservoir near Manchester **[See reference 80]**. These schemes generally occupy only a small area of the water bodies and are beneficial in reducing evaporation over the summer. As such, there may be potential to utilise the various lakes within Melton borough for 'floatovoltaics'.

4.82 However, if such 'floatavoltaic' systems were installed on more natural water bodies as opposed to reservoirs, their installation could risk impacting the ecosystems of water bodies by creating too much shading beneath the panels. This would require more investigation if proposals for such 'floatavoltaic' systems are proposed on sensitive or protected water bodies.

4.83 Furthermore, it should be noted that the efficiency of solar panels and other system components continues to improve. For example, tracking systems enable solar panels to follow the sun from east to west during the day, while bifacial (double side) panels increase the output of the panels themselves. Solar power is a very effective way to reduce spending on energy as well as it is now the cheapest source of electricity in history**[See reference** 81**]**. Improved efficiency and decreased costs will likely result in long term demand, viability, and the potential need for smaller panel areas with the same output or scope to increase output from rooftop PV. This may also increase attractiveness of rooftop solar PV to more businesses and householders.

Existing Development within Melton borough

4.84 The MCS databased includes records for 1,915 solar PV installations within Melton borough **[See reference** 82**]**. When cross-referred to the FiT data on average system sizes **[See reference 83]**, this equates to approximately 41MW. In addition, data from the April 2024 Renewable Energy Planning Database identifies a combined 0.76 MW of roof-mounted solar PV currently either awaiting construction or awaiting decision **[See reference** 84**]**.

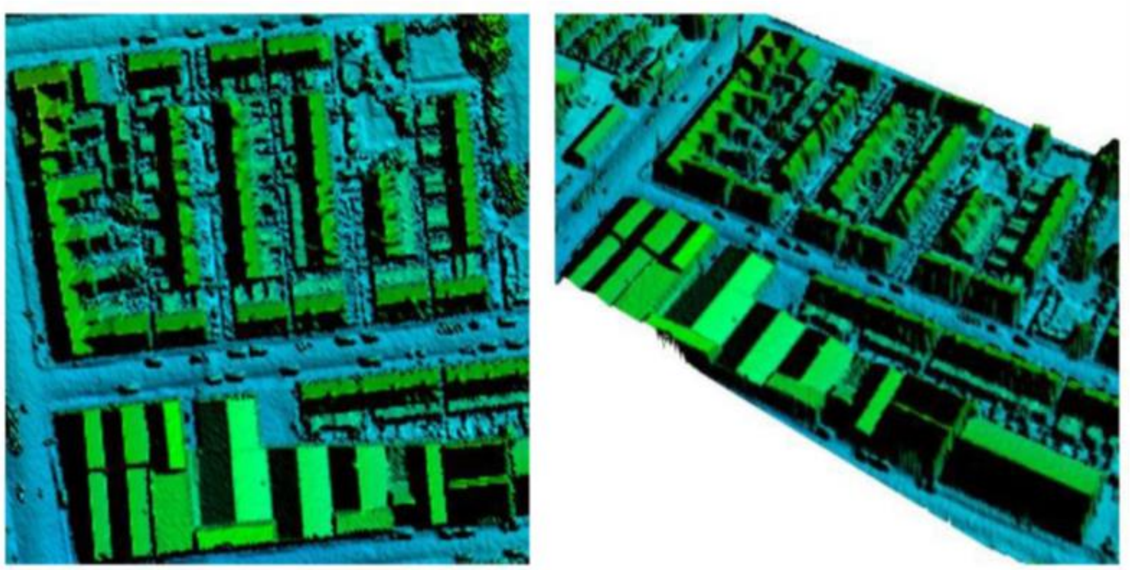
4.85 The MCS databased includes records for 31 solar water heating installations within Melton borough **[See reference** 85**]**. When cross-referred to the RHI data on average system sizes **[See reference 86]**, this equates to approximately 488kW.

Assumptions used to calculate technical potential – solar PV

4.86 Geospatial Insight undertook the assessment of roof-mounted solar resource potential.

4.87 To establish individual property level solar suitability and potential, Geospatial Insight utilised a Digital Surface Model (DSM) alongside a building footprint dataset collated and conflated by Geospatial Insight from multiple Open Data sources. The DSM is a high-resolution surface model produced using airborne LiDAR or photogrammetric stereo aerial photography. The DSM provides a digital model or 3D representation of a terrain's surface and all above ground features, including buildings and trees (see Figure 4.4).

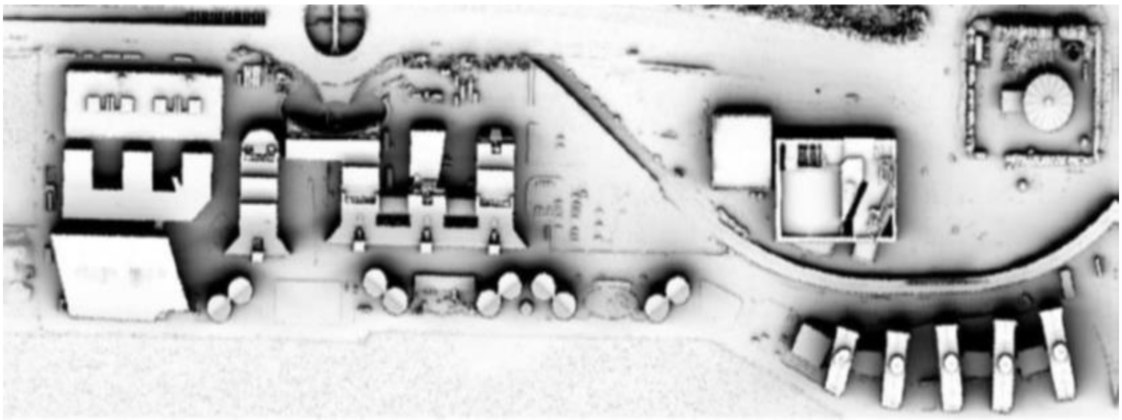
Figure 4.4: Example of DSM



4.88 Automated interrogation of the DSM data within each building footprint (representative of the roof area) was undertaken to determine which roofs are potentially suitable for solar by identifying the roof pitch, aspect, and useable area. Geospatial Insight used 'standard' values, where flat roofs and roofs with a pitch of between 5° and 50°, and within a 90° to 270° aspect (through south) were deemed suitable. Roofs outside of these values were deemed unsuitable, but the building footprints are still retained in the output database.

4.89 The DSM data was additionally modelled in PV.GIS, a solar irradiance calculation tool that uses the pitch, aspect, and location of a surface to estimate average annual irradiance exposure based on real world historic values (see Figure 4.5, where 'white' areas have the highest irradiance).

Figure 4.5: Example of irradiance



4.90 Using roof pitch, aspect, area, and irradiance details Geospatial Insight further established the potential array size, install costs, onsite energy savings, export revenue, and CO_2 savings for each building over both a 1-year period and a 20 year 'lifetime'.

4.91 The results are drawn from national analysis completed by Geospatial Insight, which uses a different CO_2 factor than the wind and ground-mounted solar assessments. The processing parameters are detailed below:

4.92 Export Rate Inflation (RPI): 3.1% Per Annum

- Energy Price Inflation: 3% Per Annum
- Drop in System Performance: 0.8% Per Annum
- System Size: 450W
- System Cost:
  - Residential £1,600
  - Commercial: £1,500 - £ 950 (Depending on kW)
- Imported Electricity Cost: 24.5 Pence Per kWh (estimated for 2022) **[See reference** 87**]**
- Percentage of Self Consumption: 40%

- Percentage of Export: 60%
- System Efficiency: 21%
- Life Span: 20 Years
- Exported Electricity Rate: 3.5 Pence Per kWh **[See reference** 88**]**
- CO_2 Factor: 0. 207074kg CO_2e Per kWh for UK electricity (June 2023) **[See reference** 89**]**

4.93 Using Historic England and Melton Borough Council's data, Conservation Areas, scheduled monuments and listed buildings **[See reference** 90**]** were considered as secondary constraints to solar rooftop development. This is because installations on listed buildings, or on buildings in designated areas (such as on the site of a scheduled monument or in a Conservation Area) are restricted in certain situations and may require planning consent. As such, developments in such locations may be more difficult to deploy.

4.94 It is noted that further study would be required to consider other constraints to rooftop solar development, such as:

- Roof surface material/construction;
- Roof structure and loading capacity;
- Protected species – bat roosts;
- Protected species – bird nests; and
- Grid connection (for larger developments).

4.95 The analysis within this report included the following rooftop solar deployment scenarios:

- All buildings;
- All residential properties only (as defined in Ordnance Survey AddressBase data); and
- All large industrial buildings only (with a minimum system size threshold of 50kWp).

4.96 Within the scenarios, the following sub-divisions of results were also included: 100% deployment; 10% deployment; and unconstrained deployment, which excludes properties affected by secondary heritage constraints (listed buildings 5m buffer footprints and buildings within Conservation Areas or scheduled monuments).

4.97 This report also includes recommendations on additional analysis and potential application of the rooftop solar results that Melton Borough Council could apply.

Limitations

4.98 As noted in paragraph 4.77, the suitable rooftop area to potential solar capacity ratio takes into consideration an internal roof buffer. However, as 1m LiDAR data is used by Geospatial Insight to produce their rooftop solar potential database, and obstruction vertically less than 150mm and horizontally less than 1m cannot be considered. For example, a tall chimney or wide dormer would be considered, but a stench pipe or skylight would not.

4.99 As noted in paragraph 4.91, Geospatial Insight's rooftop solar potential database considers modules with a 250W power output as standard. As technology improves, it is planned that future developments of their database will consider modules with a power output of 400W as standard. This will impact the suitable rooftop area to potential solar capacity ratio. Additional work could therefore be commissioned in the future to assess rooftop solar potential within Melton borough considering modules with higher power outputs as technology improves.

Assumptions used to calculate technical potential – solar water heating

4.100 The total potential capacity of roof mounted solar water heating was estimated based on typical system sizes and the estimated percentage of suitable roofs within the study area. A high-level assessment was undertaken, considering the number of buildings and types of building within Melton borough. Assumptions on the suitability of the roofs of these buildings were applied – see Appendix A.

4.101 Roofs that have potential to deliver solar water heating also have the potential to deliver solar PV generation. However, the technical potential for these technologies were assessed separately within this study.

4.102 The total potential capacity of solar water heating was calculated along with the generation potential. The calculation of potential energy yield requires the application of a 'capacity factor', meaning the average proportion of maximum solar water heating that would be achieved in practice over a given period. A capacity factor of 4.5% was used for solar water heating, based on national scale BEIS data **[See reference 91]**.

4.103 The potential carbon savings as a result of generation via the identified roof-mounted solar potential was also calculated. This assumed that the heat generated from the identified solar water heating potential would result in negligible carbon emissions and would replace that currently provided by the mains gas (emission factor of 0.210kgCO_2e/kWh **[See reference 92]**), or either heating oil (emission factor of 0.298kgCO_2e/kWh **[See reference 93]**) or national grid electricity (emission factor of 0.133kgCO_2e/kWh **[See reference 94]**) for properties located 'off-gas' – see Appendix A.

Results

Technical potential

4.104 Figure 4.6 and Table 4.4 below provide a summary estimate of the technical potential for roof-mounted solar PV within Melton borough. The analysis within this report included the following rooftop solar deployment scenarios:

- A – All buildings (24,901 buildings assessed, 85% identified to be suitable for solar PV);
- B – All residential properties only (18,571 buildings assessed, 89% identified to be suitable for solar PV); and
- C – All large industrial buildings only (547 buildings assessed to have potential for 50kWhp and above).

4.105 Within the scenarios, these following sub-divisions of results were also included: 100% deployment; 10% deployment; and unconstrained deployment, which excludes properties affected by secondary heritage constraints (listed buildings and buildings within Conservation Areas or scheduled monuments).

4.106 Figure 4.9 and Table 4.5 below provide a summary estimate of the technical potential for roof-mounted solar water heating within Melton borough.

4.107 Figure 4.9 and Table 4.5 below provide a summary estimate of the technical potential for roof-mounted solar water heating within Melton borough.

Figure 4.6: Total capacity of rooftop solar PV potential and carbon savings

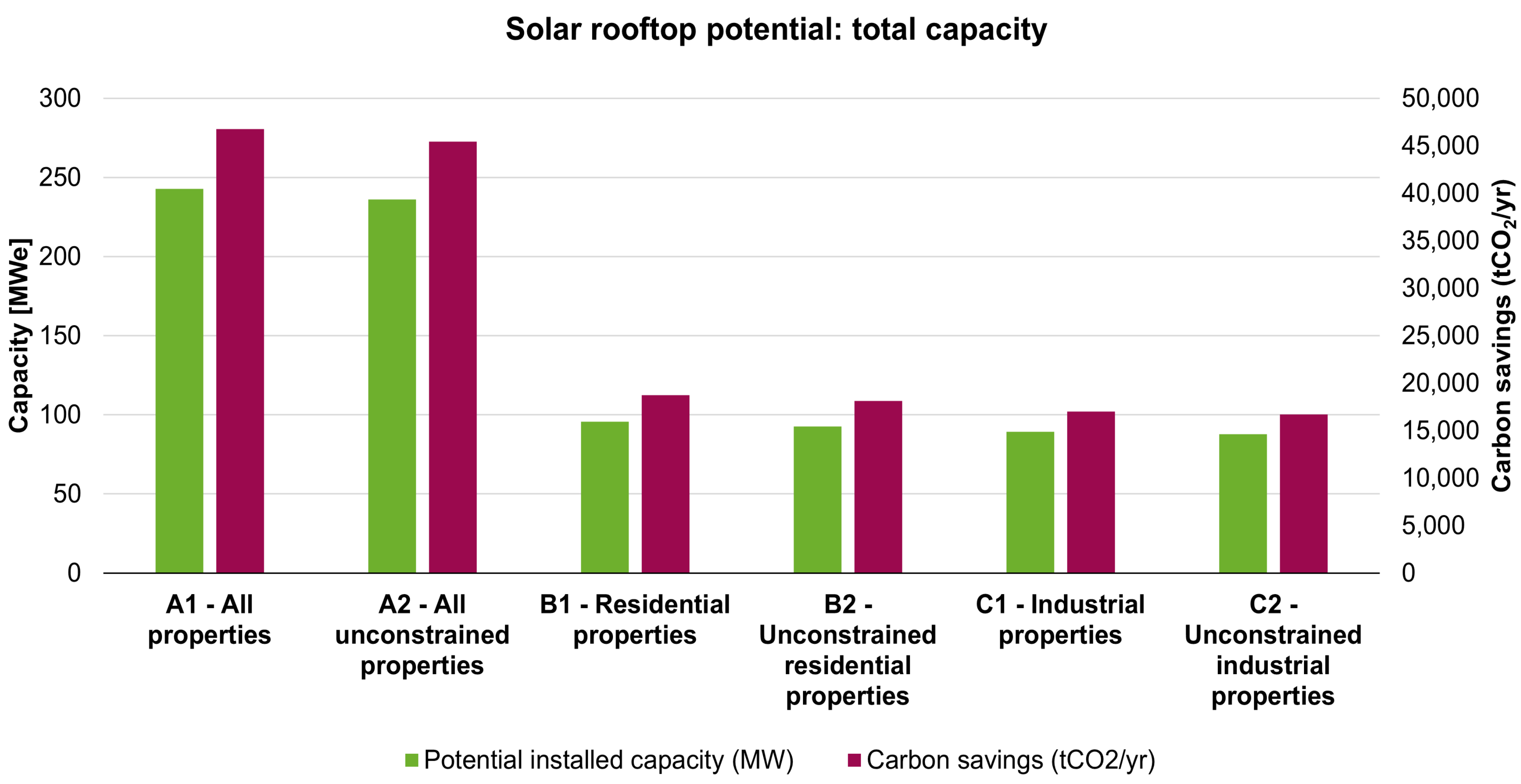


Table 4.4: Assessment of rooftop solar PV

Development scale	Scale	Number of buildings	Potential installed capacity (MW)	Electricity output (GWh/year)	Potential CO_2 savings (tonnes/year)
A1 - All properties	100% of tech. resource	24,901	242.8	225.7	46,735
A1 - All properties	10% of tech. resource	4,674	24.3	22.6	4,674
A1 - All properties	0 - 3,000 kWh	8,330	18.4	18.3	3,794
A1 - All properties	3,001 - 10,000 kWh	12,676	68.9	64.7	13,404
A1 - All properties	10,001 - 20,000 kWh	2,410	36.2	32.9	6,821
A1 - All properties	20,001 - 100,000 kWh	1,299	55.9	51.3	10,631
A1 - All properties	>100,001 kWh	186	63.4	58.4	12,086
A2 - All unconstrained properties	100% of tech. resource	24,290	235.9	219.4	45,438
A2 - All unconstrained properties	10% of tech. resource	4,544	23.6	21.9	4,544
A2 - All unconstrained properties	0 - 3,000 kWh	8,217	18.1	18.1	3,744
A2 - All unconstrained properties	3,001 - 10,000 kWh	12,358	66.9	62.9	13,023

Development scale	Scale	Number of buildings	Potential installed capacity (MW)	Electricity output (GWh/year)	Potential CO_2 savings (tonnes/year)
A2 - All unconstrained properties	10,001 - 20,000 kWh	2,282	34.2	31.2	6,456
A2 - All unconstrained properties	20,001 - 100,000 kWh	1,251	54.0	49.6	10,271
A2 - All unconstrained properties	>100,001 kWh	182	62.7	57.7	11,944
B1 - Residential properties	100% of tech. resource	18,571	95.8	90.5	18,746
B1 - Residential properties	10% of tech. resource	1,875	9.6	9.1	1,875
B1 - Residential properties	0 - 3,000 kWh	7,138	15.6	15.7	3,250
B1 - Residential properties	3,001 - 10,000 kWh	9,841	51.8	49.0	10,154
B1 - Residential properties	10,001 - 20,000 kWh	1,373	20.1	18.3	3,784
B1 - Residential properties	20,001 - 100,000 kWh	214	7.5	6.8	1,403
B1 - Residential properties	>100,001 kWh	5	0.8	0.7	154
B2 - Unconstrained residential properties	100% of tech. resource	18,177	92.7	87.6	18,148
B2 - Unconstrained residential properties	10% of tech. resource	1,815	9.3	8.8	1,815
B2 - Unconstrained residential properties	0 - 3,000 kWh	7,051	15.4	15.5	3,212

Development scale	Scale	Number of buildings	Potential installed capacity (MW)	Electricity output (GWh/year)	Potential CO_2 savings (tonnes/year)
B2 - Unconstrained residential properties	3,001 - 10,000 kWh	9,610	50.4	47.7	9,888
B2 - Unconstrained residential properties	10,001 - 20,000 kWh	1,317	19.3	17.5	3,626
B2 - Unconstrained residential properties	20,001 - 100,000 kWh	193	6.6	6.0	1,242
B2 - Unconstrained residential properties	>100,001 kWh	6	1.0	0.9	181
C1 - Industrial properties	100% of tech. resource	547	89.3	82.2	17,015
C1 - Industrial properties	10% of tech. resource	1,701	8.9	8.2	1,701
C1 - Industrial properties	< 100,000 kWh	361	25.9	23.8	4,929
C1 - Industrial properties	100,000 - 300,000 kWh	134	23.6	21.7	4,500
C1 - Industrial properties	300,000 - 600,000 kWh	30	13.8	12.7	2,628
C1 - Industrial properties	600,000 - 1,200,000 kWh	17	16.8	15.4	3,189
C1 - Industrial properties	1,200,000 - 2,800,000 kWh	5	9.2	8.5	1,769
C2 - Unconstrained industrial properties	100% of tech. resource	530	87.7	80.7	16,716
C2 - Unconstrained industrial properties	10% of tech. resource	1,672	8.8	8.1	1,672

Development scale	Scale	Number of buildings	Potential installed capacity (MW)	Electricity output (GWh/year)	Potential CO_2 savings (tonnes/year)
C2 - Unconstrained industrial properties	< 100,000 kWh	348	25.0	23.0	4,771
C2 - Unconstrained industrial properties	100,000 - 300,000 kWh	130	22.8	21.0	4,358
C2 - Unconstrained industrial properties	300,000 - 600,000 kWh	30	13.8	12.7	2,628
C2 - Unconstrained industrial properties	600,000 - 1,200,000 kWh	17	16.8	15.4	3,189
C2 - Unconstrained industrial properties	1,200,000 - 2,800,000 kWh	5	9.2	8.5	1,769

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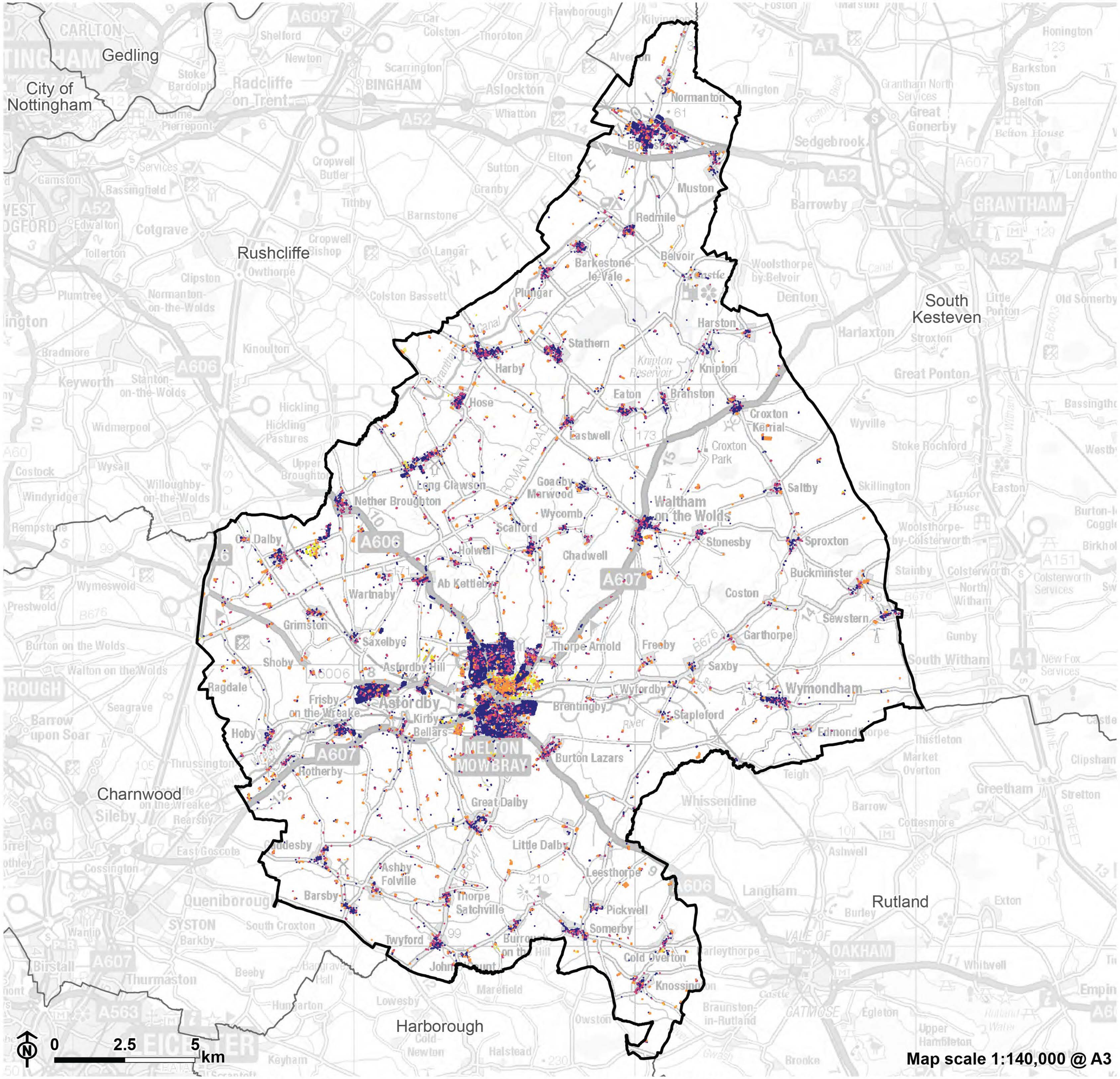
Figure 4.7: Technical potential for rooftop solar



Melton Borough

Neighbouring local authority

Potential annual yield (kWh)

- 0 - 3,000
- 3,001 - 10,000
- 10,001 - 20,000
- 20,001 - 100,000
- >100,000

Notes:

Geospatial Insight make no representations or warranties of any kind, express or implied, about the completeness, reliability, accuracy, suitability with respect to information, products, services, graphics or images contained in their data service for any purpose. The information contained in the survey is for information purposes only. Any reliance you place on such information is therefore strictly at your own risk. In no event will Geospatial Insight be liable for any loss or damage including, without limitation, indirect or consequential loss or damage, or any loss or damage whatsoever arising from loss of profits arising out of, or in connection with, the use of any service provided.

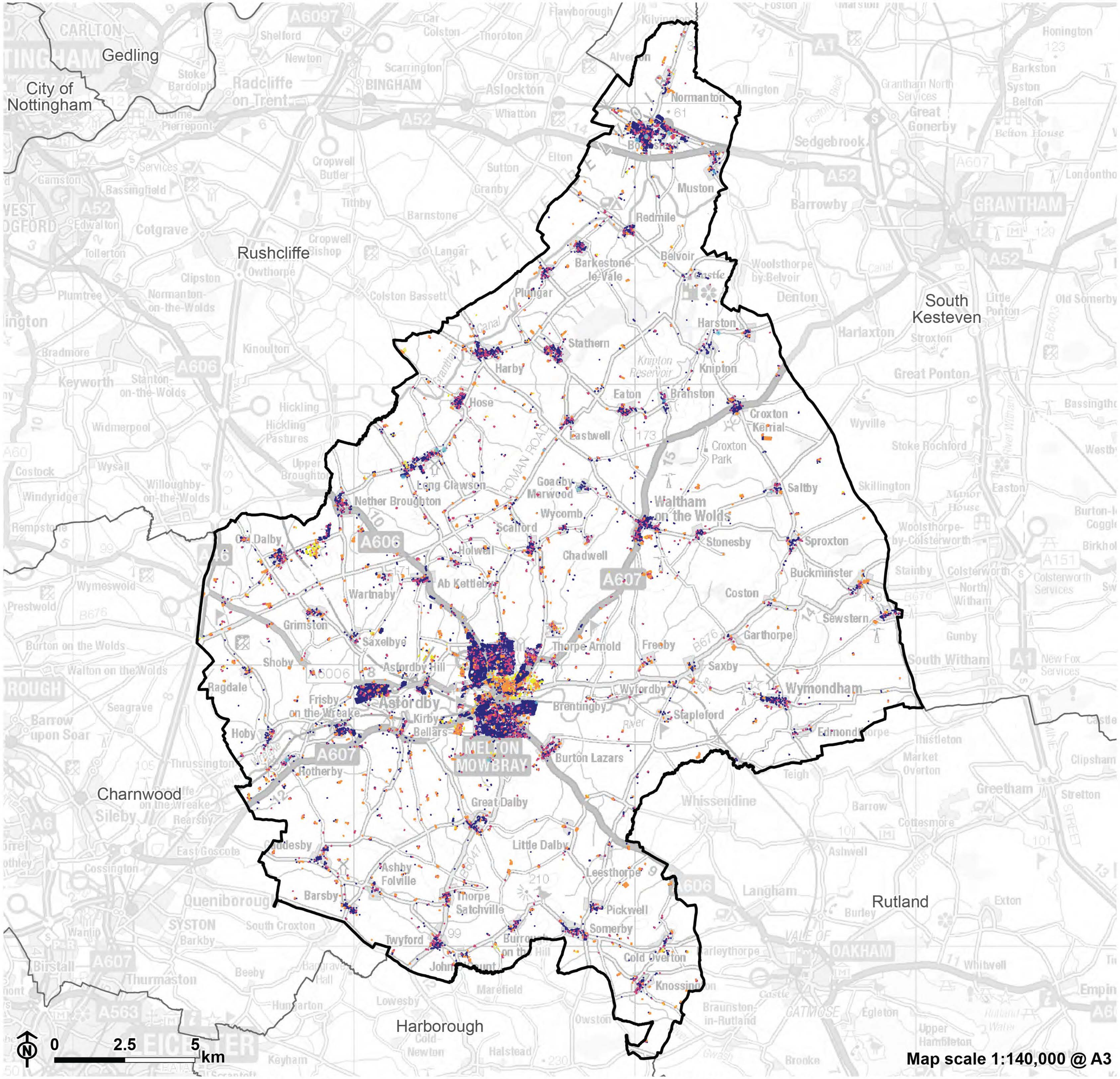
Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

12909_Solar_Figures 27/08/2024 EB:sparks_m

Climate Change Study
Melton Borough Council

LUC

Figure 4.8: Technical potential for rooftop solar - excluding secondary heritage constraints



Melton Borough

Neighbouring local authority

Potential annual yield (kWh)

- 0 - 3,000
- 3,001 - 10,000
- 10,001 - 20,000
- 20,001 - 100,000
- >100,000

Notes:

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Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

12909_Solar_Figures 27/08/2024 EB:sparks_m

4.108 Figure 4.9 and Table 4.5 below provide a summary estimate of the technical potential for roof-mounted solar water heating within Melton borough.

Figure 4.9: Rooftop solar water heating potential capacity and savings

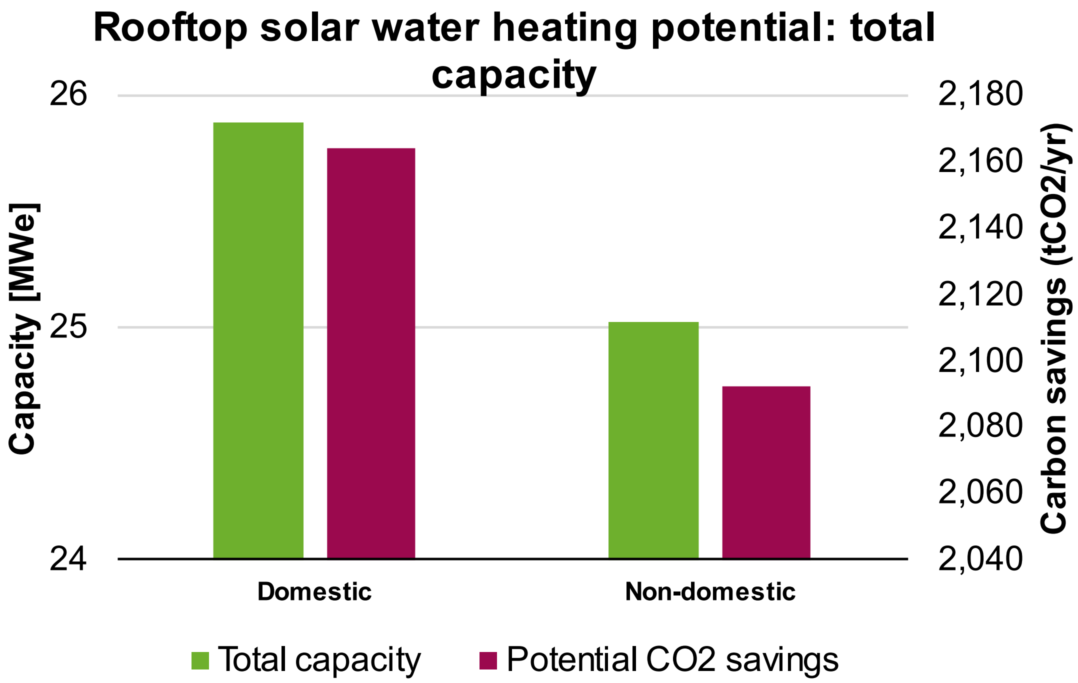

Table 4.5: Assessment of rooftop solar water heating

Building category	Number of buildings	Estimated Capacity (MWth)	Delivered Heat (MWh/yr)	Potential CO_2 Savings (tonnes/yr)
Domestic	23,110	26	10,203	2,164
Non-domestic	1,772	25	9,865	2,092
Total	26,398	**51**	**20,069**	**4,256**

Issues affecting deployment

Grid decarbonisation

4.109 Rooftop solar PV is proving to be attractive to developers as an easily deployed renewable energy generation technology that offsets high-carbon mains electricity usage, thereby helping to meet tightening buildings emission standards. However, the 'value' of this offsetting will continue to drop as the mains grid electricity gradually decarbonises.

4.110 Nonetheless, for those already receiving a proportion of free electricity from onsite solar PV, the financial benefits of reduced bills from mains electricity usage will continue. Over the past decade, the cost of solar PV has reduced significantly. The solar panel payback period depends on energy usage, grid energy costs and system design, but the Energy Savings Trust broadly estimate that with export payments a household can currently expect savings on energy costs to cover instalment costs in around 11-13 years with systems typically able to work for around 25 years (based on energy prices as of October 2024).

4.111 In addition, recent advances in smart power management controls and energy storage systems have benefited solar PV. The dual deployment of these technologies with rooftop solar PV, for example through time-of-use electricity tariffs, could automate and optimise the generation and storage of power, determining whether power is used directly on site, stored for later use, or exported immediately directly to the grid. Furthermore, the integration of solar PV into 'whole house' systems, which could also incorporate electric vehicle charging, could further incentivise uptake of rooftop solar PV technologies. However, the grid is unlikely to be able to accommodate energy exported from all of the buildings highlighted as having technical potential in this study. As such, the grid requires significant upgrades or battery storage uptake.

Lack of financial incentives

4.112 The FiT scheme, which enabled properties to gain payments for energy generation and export from small-scale renewable installations, closed to new applicants in March 2019. Following this, the Government introduced the Smart Export Guarantee scheme in January 2020. This scheme requires that licenced electricity suppliers offer a tariff to pay small-scale (>5MW) low carbon electricity generators to export electricity to the grid. However, this scheme is generally less beneficial than the FiT as the payments are only related to the exported electricity, rather than the total amount of electricity generated. However, as part of the Spring Statement 2022, the Chancellor made the announcement that from 1 April 2022 until 31 March 2027 VAT on installing energy-saving materials (ESMs), which includes solar thermal and PV systems, in residential properties will be 0% in Great Britain. The measure is intended to incentivise the take-up of ESMs in line with the government's net zero objectives and making schemes potentially more financially viable for most users **[See reference 95]**.

4.113 Compared to solar PV, solar water heating installations are less common, as preference was previously given to PV installations during the more profitable FiT period. Local evidence shows that initial take up of the technology stalled in 2015 when green home grants that allowed more flexible choice of installations ended. This is with the exception of solar water heating installations on properties that are located off the gas grid. For off-gas properties, the installation of roof-mounted solar water heating panels are often more financially beneficial, due to the higher cost of heating fuels like electricity and oil in comparison to mains gas.

4.114 With regards to non-domestic properties, the installation of roof-mounted solar water heating technologies is more limited than on domestic properties, as the viability of these installations is dependent on hot water demand, as well as competition with point-of-use hot water heating. This technology is less likely to play a significant role in the decarbonisation of heat in comparison to heat pumps, particularly as grid electricity continues to decarbonise in pursuit of the Government's goal of a fully decarbonised electricity system by 2035 **[See reference** 96**]**.

4.115 It is noted, that in most circumstances, rooftop solar PV and solar water heating installations can be considered to be permitted development **[See reference 97]** and therefore may not need planning permission, potentially encouraging uptake.

Roof-mounted solar PV - conclusion

Roof-mounted solar PV has a relatively small technical potential energy output in Melton borough (approximately 1%, 225,693 MWh/year, based on the illustrative technical potential **[See reference** 98**]**) of all the renewable and low carbon energy sources considered by this study. Rooftop solar PV is currently attractive as the cost of solar PV has reduced significantly in the last decade and depending on the size and location of the installation it could be delivered through permitted development rights. It is an easily deployed renewable energy generation technology that offsets high-carbon mains electricity usage.

Solar water heating – conclusion

This technology is less likely to play a significant role in the decarbonisation of heat in comparison to heat pumps. It may be an attractive technology for some high hot water consumers, such as within leisure uses (for example, swimming pools and hotels) and where significant amounts of hot water is required in industrial processes. It may also be attractive in the short to medium term for some rural off gas grid homes with high hot water use that rely on more expensive electric emersion or oil powered water heating systems, where heat pumps are not currently considered practical for space heating. However, as noted in Appendix A, it was assumed that all roofspace was used for solar PV as this is a more popular technology than solar water heating, as such it was not included in the illustrative technical potential.

Hydropower

Description of technology

4.116 The generation of energy via hydropower involves using water flowing from a higher to a lower level to power a turbine that is connected to an electrical generator. The resultant energy generation is therefore directly proportional to the height difference (the head) of the water flowing and the volume of water flowing.

4.117 Hydropower is a proven well-established technology. There are few technological constraints to its use, with the exception of ensuring:

- The water course has sufficient flow rates and heads (height difference) throughout the year;
- The electricity generates can be transmitted to the end user; and
- The site is accessible and can accommodate the required equipment.

4.118 Based on these few constraints, the energy yields of potential installations can be accurately estimated and the economic viability of installations determined relatively easily.

4.119 However, due to the environmental constraints on large-scale multi-MW installations, the most potential for hydropower exists mainly from small or micro-scale schemes. In the UK, micro scale (typically under 100 kW) hydropower installations can include schemes that provide power to individual homes, whilst small-scale schemes can reach up to a few hundred kW in size and export electricity directly to the grid. These small schemes commonly incorporate dams, weirs, leats, turbine houses and power lines, which have the potential to visually impact the landscape. However, suitable siting and design of these installations can commonly mitigate these impacts. For 'low head run of river' developments, typically for schemes located in lowland areas, these can often be located on the site of old mills and utilise existing channel systems and weirs or dams. In comparison, in 'high head run of river' schemes, that are typically found in upland steeper areas, the water flow is often diverted via enclosed penstocks (pipelines) to the turbines.

4.120 In addition to potential landscape and visual impacts, impacts on hydrology and river ecology require consideration in determining the suitability of sites for hydropower developments. For example, aquatic plants may impact the performance of a hydropower scheme by impacting the water flows and waterfalls. Moreover, river fish populations may be sensitive to changes in water flows, as well as risk physical harm from the hydropower equipment installed. However, mitigation measures including the incorporation of ‘fish passes’ are often included within schemes to limit such impacts.

4.121 Potential impacts of hydropower developments upon the status indicators of a water body, as set out in the Water Framework Directive, may require abstraction licences, discharge permits and flood defence consent from the Environment Agency. As well as the assessment of potential impacts from individual hydropower installations upon waterways, the cumulative impacts of hydropower and any other water abstraction activities along a waterway on the protected rights of other river users will require assessment. Moreover, as permissions on use of waterways for hydropower are commonly issued with a time limit on the permitted abstraction period, this must also be considered. Unless such time periods are sufficiently long, the long-term viability of hydropower developments may be at risk if these permissions are not renewed in the future.

Existing development within Melton borough

4.122 Data from the Department for Energy Security and Net Zero indicates that there are currently no known hydropower installations located within Melton borough **[See reference 99]**. There are also no recorded recent planning applications for hydropower in within the Borough.

Results

Technical potential

4.123 In 2010 the Environment Agency published the findings of a study identifying hydropower opportunities within England and Wales **[See reference 100].** This study has not been updated since, but it was produced to provide an overview at national and regional scales of the potential hydropower opportunities available, as well as the relative environmental sensitivity of identified potential sites to development. However, the Environment Agency's data did not identify any opportunities for hydropower within Melton borough and as such it has not been possible within the scope of this study to undertake an assessment of the technical potential for hydropower within Melton borough.

Hydropower – conclusion

The lack of existing hydropower installations together with the failure of a historic, national study to identify any such potential suggest that hydropower is unlikely to represent a meaningful renewable and low carbon energy resource for Melton borough. This is combined with the location of Melton borough within an area of serious water stress **[See reference** 101**]**.

Heat Pumps

Description of technology

4.124 Heat pumps are highly efficient electric appliances that transfer and intensify heat from the outside air or ground into a building. They can produce around three units of heat for every unit of electricity they use. They significantly reduce a property's energy demand when replacing technologies such as gas boilers **[See reference** 102**]**. There are several types of heat pumps including air source heat pumps, ground source heat pumps and water source heat pumps. A description of each is set out below.

Air Source Heat Pumps

4.125 An air source heat pump transfers heat from the air outside a building to water that is used to heat rooms inside the building via radiators or underfloor heating. It can also heat water stored in a hot water cylinder to help supply hot taps, showers, and baths. Heat is transferred via a process known as a refrigeration cycle, similar to that used by a fridge to move heat from its interior to its exterior.

Ground source heat pumps

4.126 Ground source heat pumps work along the same principles as the air source heat pumps described above but they transfer heat from the ground rather than from the surrounding air to heat a building and its hot water supply. Ground source heat pumps require more space than air source, requiring pipes to be buried vertically in a deeper system or horizontally in a shallow wider system. While ground source heat pumps tend to be more efficient than air source, they are also more expensive to install, particularly if a borehole rather than a trench is used to bury the ground loop **[See reference** 103**].**

4.127 Ground source heat pumps fall into two main categories – open loop or closed loop. This refers to the design of the loop that is buried in and extracts heat from the ground. A closed loop system is the most common, using a sealed ground loop containing a water and antifreeze mixture. An open loop system uses water from the ground surrounding the ground loop but this needs to meet certain requirements such as being low in chlorine **[See reference** 104**].** The British Geological Survey has produced a map identifying the potential viability of open-loop ground source heat pumps across England and Wales, considering hydrogeological and economic factors **[See reference** 105**]**. This indicates that there is mix of land within Melton borough that is favourable or less favourable for open-loop ground source heat pumps. However, the British Geological Survey states that this is an initial screening assessment only. Detailed environmental assessments of proposed sites would be required, considering local variations in environmental conditions and factors such as the availability of water (that is, the amount of water that is available for licensing by the Environment Agency) and discharge of water from a scheme **[See reference** 106**]**.

Water source heat pumps

4.128 Water source heat pumps work in the same way but extract heat from a nearby lake or other large water body rather than the ground. The DECC 2014 water source heat map identified, at a high level, opportunities for water source heat pump technologies **[See reference 107]**. Less is known about the potential for water source heat pumps. In the right locations, they have been shown to have the potential to provide efficient low carbon heating or cooling at scale as long as the buildings to be served are in close vicinity, as demonstrated by the Kingston Heights installation by the River Thames **[See reference 108]**. This incorporates a 2.3MW water source heat pump for space and water heating of a mixed development. In addition, the Grade I listed house Kelmarsh Hall installed a water source heat pump to obtain heat from the estate’s lake and reduce the site’s carbon footprint by 50% **[See reference 109]**.

4.129 For most properties, installing a heat pump is considered permitted development, meaning that planning permission is typically not required. However, specific rules apply depending on the type of heat pump and location of the property. Under Schedule 2 Part 14 of The Town and Country Planning (General Permitted Development) (England) Order 2015 Part 14 there are additional requirements and limitations like those for solar panels including removal of permitted development rights for installations within the property boundary of listed buildings and scheduled monuments. There are also limitations for ASHP units in conservation areas where they face a highway. The permitted development rights specify that ASHPs must be removed if no longer needed and sited, so far as is practicable, to minimise its effect on the external appearance of the building and its effect on the amenity of the area. Ground source and water source heat pumps can also fall under permitted development rights.

Existing development within Melton borough

4.130 The MCS databased includes records for 278 air source heat pump and 51 ground or water sourced heat pump installations within Melton borough **[See reference** 110**]**. When cross-referred to the RHI data on average system sizes **[See reference 111]**, this equates to approximately 3.9 MW of air source heat pump and 3.2 MW of ground or water sourced heat pump installations.

Assumptions used to calculate technical potential

4.131 A high-level assessment of air source heat pumps was undertaken, considering the number of buildings and types of building within Melton borough. The total number of domestic and non-domestic properties within Melton borough were considered within this assessment and were calculated based on OS Address data. The total potential capacity of air source heat pumps was estimated based on typical system sizes obtained from RHI deployment data **[See reference 112]**:

- Domestic: 10.2kW
- Non-domestic: 46.5kW

4.132 As stated above, ground source heat pumps require significant space requiring pipes to be buried vertically in a deeper system or horizontally in a shallow wide system. Due to these significant space constraints, this study did not estimate the potential capacity of ground source heat pumps across the study area for the following reasons:

- It was not possible to estimate how many properties have access to the required, significant space to bury a ground loop.

- The limitations of the British Geological Survey data re. ground suitability for open loop systems.

4.133 Average system sizes of domestic pumps were derived however from DESNZ data, which indicated that typical domestic ground source heat pumps in the UK are 15kW **[See reference** 113**]**.

4.134 Furthermore, the sensitivity analysis included in the 2014 DECC water source heat map **[See reference 114]** notes that there are no rivers within Melton borough with a sufficient heat capacity. Therefore, it has not been possible within the scope of this study to assess the potential for water source heat pumps.

4.135 Almost any building theoretically has the potential for an air source heat pump to be installed. Therefore, the assessment considered the potential for air source heat pumps to be delivered in all dwellings and non-domestic properties within Melton borough. Justification for these assumptions is set out in Appendix A.

4.136 The calculation of potential energy yield requires the application of a 'capacity factor', meaning the average proportion of air source heat pump capacity that would be achieved in practice over a given period. Capacity factors vary in practice in accordance with location and climate. It was not possible to find suitable historic data on capacity factors taking into account these kinds of factors within Melton borough for the present study, and so a single capacity factor of 18.4% was used, based on national scale DESNZ data **[See reference** 115**]**.

4.137 In addition, as the performance of air source heat pumps vary with air temperature, their performance varies with season. As such the calculation of potential energy yield also requires the application of a 'seasonal performance factor' (SPF), meaning the ratio of the total heat supplied to a building to the electricity used by the heat pump to run it. A value of 3.6 was used, as based on national scale DESNZ data **[See reference** 116**]**.

4.138 The potential carbon savings as a result of generation via the identified air source heat pump potential was also calculated. This assumed that the heat generated from the identified solar water heating potential would result in negligible carbon emissions and would replace that currently provided by the mains gas (emission factor of 0.210kgCO_2e/kWh **[See reference** 117**]**), or either heating oil (emission factor of 0.298kgCO_2e/kWh **[See reference** 118**]**) or national grid electricity (emission factor of 0.133kgCO_2e/kWh **[See reference** 119**]**) for properties located 'off-gas' – see Appendix A.

Results

4.139 Figure 4.10 and Table 4.6 below provide a summary estimate of the technical potential for air source heat pumps within Melton borough.

Figure 4.10: Air source heat pump potential capacity and savings for domestic and non-domestic

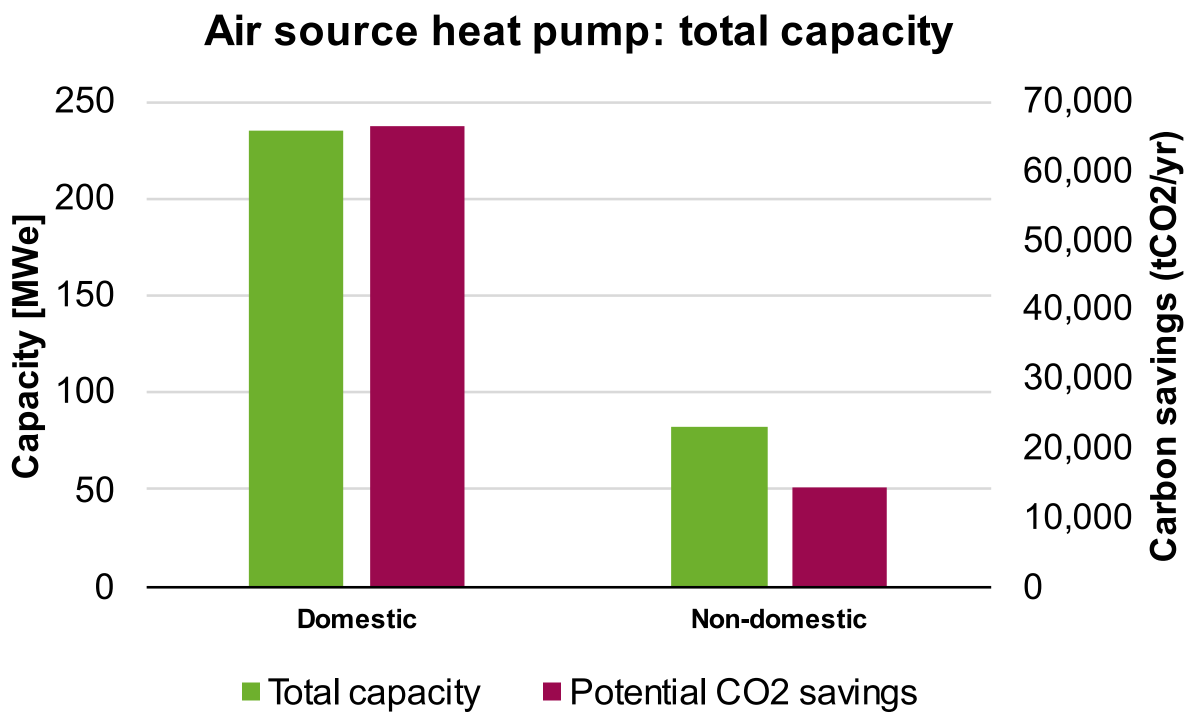

Table 4.6: Assessment of air source heat pumps

Building category	Number of buildings	Estimated capacity (MW)	Delivered Heat (MWh/yr)	Potential CO_2 Savings (tonnes/yr) (including SPF [See reference **120**])
Domestic	23,110	235	378,854	66,357
Non-domestic	1,772	82	132,874	14,221
Total	26,398	**317**	511,727	80,578

4.140 In October 2023, the Government's Boiler Upgrade Scheme **[See reference** 121**]** increased grants for the installation of air source and ground source heat pumps to £7,500. The scheme also offers £5,000 off the cost of a biomass boiler. Up to the end of January, the scheme has now received 33,424 applications in total which is up 39% since January 2023.

Heat Pumps – conclusion

Overall, it was not possible within the scope of this study to undertake an assessment of the technical potential for ground source or water source heat pumps within Melton borough. Air source heat pumps have a relatively small technical potential energy output (approximately 2%, 511,727 MWh/year, based on the illustrative technical potential **[See reference** 122**]**) of all the renewable and low carbon energy technologies considered in this study. They do, however, benefit from the fact that almost any building theoretically has the potential for an air source heat pump to be installed.

It is likely that air source heat pumps will continue to dominate growth in the sector. They are expected to be standard for all new buildings after the next uplift in building regulation standards, anticipated to be confirmed through FHS from 2025. Retrofitting is likely to be driven by the national policy approach including measures to incentivise homeowners to replace boilers with heat pumps.

Biomass and waste

Description of resource

4.141 Biomass is defined generally as material of recent biological origin that is derived from plant or animal matter. 'Dry' biomass is commonly combusted to produce electricity or generate heat. 'Wet' biomass is commonly used to produce biogas via anaerobic digestion. This can be used as 'green' gas on the grid or used to produce 'biofuel' for transport.

4.142 In many countries, dry biomass materials such as wood are commonly used as a fuel for modern heating systems. These modern technologies can be used to heat a variety of building sizes and can be utilised within individual boilers or district heating systems.

4.143 In addition, organic wastes can be considered a source of low-carbon energy production if their use in generation prevents them from otherwise decomposing and potentially releasing methane, contributing to greenhouse gas levels in the atmosphere.

4.144 Biomass can also be used to generate electricity, fuelling electricity plants or combined heat and power (CHP) plants. This is becoming increasingly common due to the low carbon emissions of its use. However, to ensure the technology is low-carbon, consideration must be given to ensuring the biomass feedstocks are sustainably sourced with minimal carbon emissions associated with any required processing and transportation. Except for landfill gas, energy supply from most bioenergy sources has grown since 2010 with the largest upturn from plant biomass (imported and domestic).

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

- Virgin woodfuel: Including that sourced via forestry and woodland residues, and energy crops (crops planted specifically to be used in the production of heat and electricity, as further described below).
- Waste residues: Including municipal and commercial solid waste, recycled wood waste, agricultural residues and sewage.

Virgin woodfuel

Description of technology

4.146 The virgin woodfuel considered within this study includes:

- Untreated wood residues (such as from forestry, woodlands, arboriculture and tree surgery); and
- The energy crops Miscanthus and Short Rotation Coppice (SRC).

4.147 It is noted that there is some overlap in which virgin wood enters certain waste streams, however this is difficult to extract from contaminated non-virgin wood. As such, virgin woodfuel within waste streams is not considered within this part of the assessment.

4.148 It is necessary to separately consider virgin and non-virgin woodfuel resources as different legislation will apply to its usage for energy generation regarding emission permits. Virgin woodfuel is considered to be clean and safer than non-virgin woodfuel, which may be contaminated for example by paint or preservatives. As such the use of non-virgin woodfuel for energy generation would fall under stricter emission and pollution controls.

4.149 Provided virgin woodfuel is sustainably sourced, such as via sustainable woodland management through re-growth and low emissions from processing and transportation, it can be considered a sustainable fuel. The carbon emissions released from the combustion of the wood are theoretically balanced by the regrowth of replacement woodland and energy crops, provided the carbon emissions released in growing and transporting the woodfuel are mitigated. For example, logs and woodchip are considered to be less sustainable due to their 'bulky' nature, and as such should be sourced locally to limit greater transport emissions.

4.150 Woodfuel biomass is commonly produced as logs, woodchips, pellets and briquettes, and there are several processes that are required to prepare the woodfuel to reach these usable states. Processing influences the moisture content, size and form of the biomass fuels and the quality control of these factors is necessary to ensure the biomass is usable within specific boilers and thermal conversion processes.

4.151 Virgin woodfuel biomass can be utilised for both heat-only generation as well as CHP, and a variety of energy conversion technologies can be used, such as direct combustion, gasification and pyrolysis.

4.152 Miscanthus and Short Rotation Coppice (SRC) are the two main virgin woodfuel energy crops used within biomass and considered within this study. Such crops are commonly planted specifically to be used in the production of heat and electricity, whilst other 'biofuel' crops, including sugar cane, maize and oilseed rape, are more commonly planted to be used as transport fuels.

4.153 The benefits of Miscanthus cultivation relative to SRC are:

- It utilises existing machinery (SRC requires specialist equipment to be cultivated);
- It is higher yielding;
- It is annually harvested (SRC is harvested only once every three years); and

- It is a relatively dry fuel product when cut (SRC requires drying once cut, prior to use).

4.154 The benefits of SRC cultivation relative to Miscanthus are:

- It is easier and cheaper to establish;
- It is better for biodiversity; and
- It is suitable for a wider range of boilers.

4.155 Although both crops have similar lead-in times of approximately four years until they are able to produce commercial harvests, Miscanthus will reach its peak yield in the fifth year and SRC in the seventh year, after its second rotation.

Existing development within Melton borough

4.156 The MCS databased includes records for 26 biomass installations within Melton borough **[See reference** 123**]**. When cross-referred to the RHI data on average system sizes **[See reference 124]**, this equates to approximately 4.98MW.

4.157 In addition, the April 2024 Renewable Energy Planning Database data available from DESNZ indicates there are no large-scale anaerobic digestion facilities within Melton borough currently, but there are two smaller installations, totalling 0.5MW, as recorded on the Feed In Tariff scheme **[See reference** 125**]**.

4.158 No further data was identified on use of woodfuel within the area, although there will be significant amounts used domestically in open fires, stoves and wood burners. There are several firewood suppliers within Melton borough, for example J&H Logs and Brittens Logs.

Forestry and woodland resource

Assumptions Used to Calculate Technical Potential

4.159 To determine the potential for biomass generation from farming existing forestry and woodland for fuel, suitable woodland within the study areas was identified using the Forestry Commission's National Forest Inventory (NFI). Only woodland categories that were considered to be mature **[See reference** 126**]** and able to provide a sustainable yield of woodfuel (meaning the annual harvest of woodfuel that can be maintained indefinitely) of two odt/ha/yr (oven-dried tonnes/ha/year) **[See reference** 127**]**, and that were not protected ancient woodland or a designated biodiversity or heritage site, were considered (see Appendix A). It should be noted that while important local woodland sites were included within this assessment, they are essential to the character of Melton borough and are protected locally, and would require consideration but further site-specific study.

4.160 Figure 4.11 shows the existing woodland opportunities and constraints to woodland exploitation for biomass considered within this assessment.

4.161 The total area of suitable woodland was then calculated. To calculate the total potential energy generation from this area of woodland, this area of suitable woodland was multiplied by the energy generation of woodland per hectare per year as based on Forestry Research **[See reference** 128**]**: 10.3 MWh/ha/year.

4.162 Both the potential for heating and for combined heat and power were calculated. Therefore, the calculation of potential energy yield required the consideration of the efficiency of boilers (77%) **[See reference** 129**]** and CHP units (50% heating and 30% electricity) **[See reference** 130**]** (meaning the ratio of total energy output to the total energy input to the boiler/CHP unit).

4.163 The potential carbon savings as a result of generation via the identified biomass potential was also calculated. This assumed that the electricity generated from the identified biomass CHP potential would result in negligible carbon emissions and would replace that currently provided by the national grid, which has an emission factor of 0.133kgCO_2e/kWh **[See reference** 131**]**. This could either be via use of the electricity on-site, on-site following battery storage, or off-site via export. Similarly, this assumed that the heat generated from the identified biomass boiler and CHP potential would result in negligible carbon emissions and would replace that currently provided by the mains gas (emission factor of 0.210kgCO_2e/kWh **[See reference** 132**]**), or either heating oil (emission factor of 0.298kgCO_2e/kWh **[See reference** 133**]**) or national grid electricity (emission factor of 0.133kgCO_2e/kWh **[See reference** 134**]**) for properties located ‘off-gas’ – see Appendix A.

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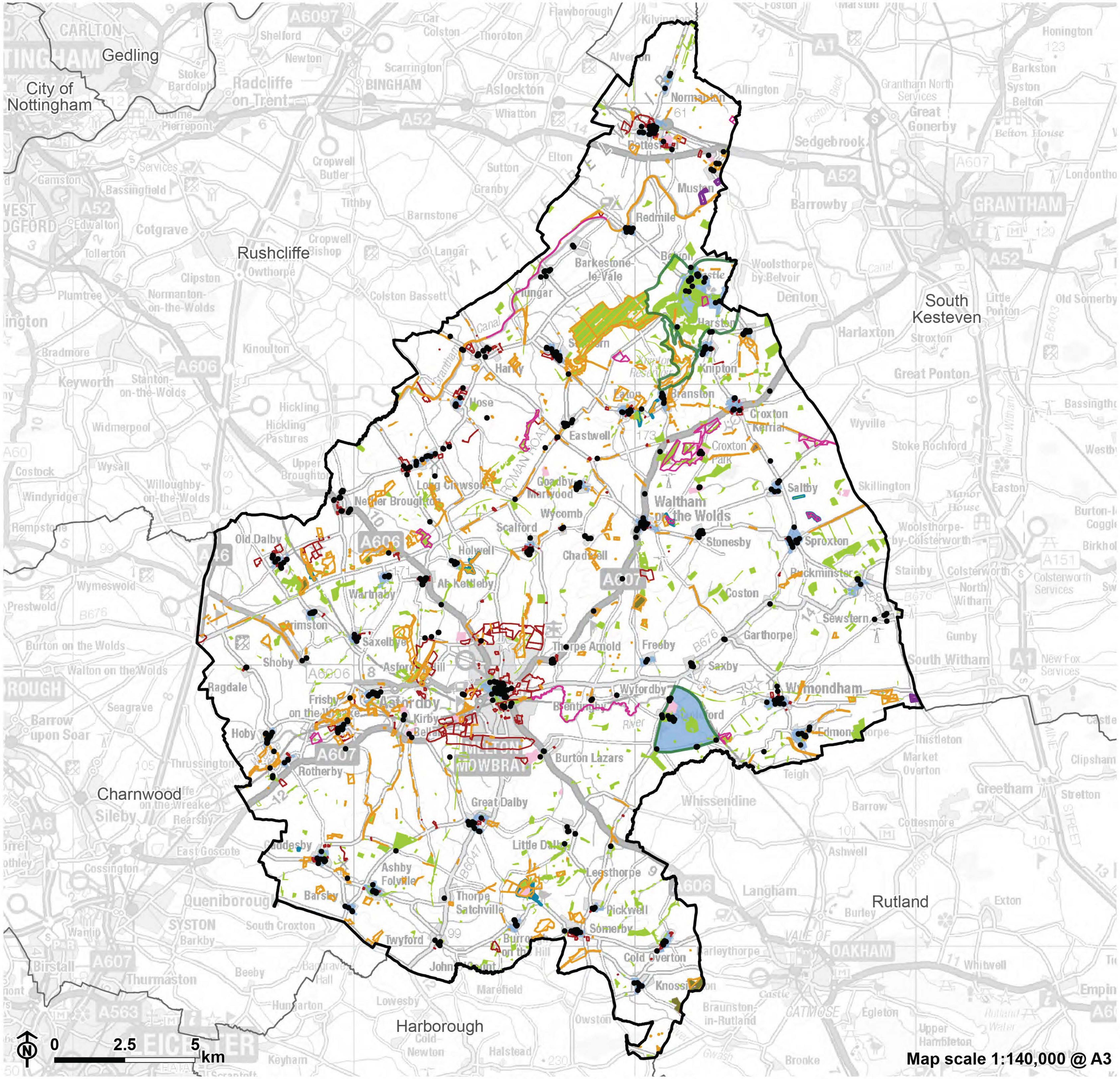
Figure 4.11: Opportunities and constraints - biomass - virgin woodfuel - forestry and woodland



- Melton Borough
- Neighbouring local authority

Opportunities

- National forest inventory

Constraints

- Listed building
- Registered Parks and Gardens
- National Nature Reserve
- Site of Special Scientific Interest
- Ancient woodland
- Regionally Important Geological site
- Conservation area
- Local Wildlife Site
- Scheduled monument
- Future developments, safeguarded land and employment sites

Notes:

Ministry of Defence land was also treated as a constraint in the assessment. However, due to the sensitive nature of this data this is not presented on this map.

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

Results

4.164 The calculated woodland and forestry biomass resource was calculated in line with the assumptions outlined in Appendix A. The technical potential findings are presented in Table 4.7, considering the biomass resource is used for heating only, and in Table 4.8 considering the biomass resource is used for heat and electricity generation via CHP. This only assumed the use of woodfuel from woodland within Melton borough and that all woodland within the study area has a sustainable yield of two odt/yr (oven-dried tonnes/ha/year) – see Appendix A.

Table 4.7: Woodfuel: Assessment of forestry and woodland resource - use for heating only

Woodland Type	Area (ha)	Estimated Capacity (MW)	Delivered Heat (MWh/year)	Potential CO_2 Savings (tonnes/year)
Assumed woodland	61	0.1	480	102
Broadleaved	905	1.9	7,177	1,522
Conifer	112	0.2	888	188
Coppice	0	0.0	0.0	0.0
Mixed mainly broadleaved	81	0.2	643	136
Mixed mainly conifer	82	0.2	651	138
Total	**1240**	**2.6**	**9,838**	**2,087**

Table 4.8: Woodfuel: Assessment of forestry and woodland resource - use for CHP

Woodland Type	Area (ha)	Estimated Capacity (MW)	Delivered Electricity (MWh/year)	Delivered Heat (MWh/year)	Potential CO_2 Savings (tonnes/year)
Assumed woodland	61	0.1	187	312	91
Broadleaved	905	1.9	2,793	4660	1,360
Conifer	112	0.2	346	577	168
Coppice	0	0.0	0.0	0.0	0.0
Mixed mainly broadleaved	81	0.2	251	418	122
Mixed mainly conifer	82	0.2	254	423	123
Total	1240	**2.6**	**3,833**	**6,389**	**1,865**

4.165 In addition to the calculated potential woodland and forestry biomass resource within Melton borough, surplus woodfuel could potentially also be sourced from neighbouring authorities, provided the cost and transportation sustainability were viable. Furthermore, the cutting back of hedgerows could additionally provide a source of woodfuel, however due to the lack of data regarding hedgerow yields, it has not been possible to factor this into the assessment.

Technical Potential of Energy Crops

Assumptions Used to Calculate Technical Potential

4.166 A GIS assessment of technically suitable land for energy crop planting was undertaken using a similar approach to that undertaken for wind and solar development.

4.167 In order to protect the best and most versatile agricultural land for food crops, it was assumed that neither energy crop should be planted on Grade 1 or 2 agricultural land within Melton borough. It was assumed that both crops have the ability to successfully grow on Grade 3 and 4 agricultural land. It was also assumed the SRC has the potential to grow on Grade 5 agricultural land. However, there is no Grade 5 agricultural land in Melton borough. On land where both Miscanthus and SRC can be grown, it is assumed that 80% of this land will be used for Miscanthus and 20% by SRC, as based on Defra data on energy crop ratios (see Appendix A).

4.168 Cultural heritage, natural heritage and physical constraints were also considered to prevent the growing of the crops. The constraints to energy crop planting are presented in Figure 4.12 to Figure 4.15 in Appendix A.

4.169 The remaining areas have 'technical potential' for energy crop planting. The total area of land with 'technical potential' for energy crop planting development was calculated.

4.170 To calculate the total potential energy generation from this area for crop planting, this area was multiplied by the energy generation of the crops per hectare per year as based on Forestry Research data **[See reference** 135**]**:

- Miscanthus: 46 MWh/ha/year
- SRC: 63 MWh/ha/year

4.171 Both the potential for heating and for combined heat and power were calculated. Therefore, the calculation of potential energy yield required the consideration of the efficiency of boilers (77%) **[See reference** 136**]** and CHP units (50% heating and 30% electricity) **[See reference** 137**]** (meaning the ratio of total energy output to the total energy input to sun the boiler/CHP unit).

4.172 The potential carbon savings as a result of generation via the identified biomass potential was also calculated. This assumed that the electricity generated from the identified biomass CHP potential would result in negligible carbon emissions and would replace that currently provided by the national grid, which has an emission factor of 0.133kgCO_2e/kWh **[See reference** 138**]**. This could either be via use of the electricity on-site, on-site following battery storage, or off-site via export. Similarly, this assumed that the heat generated from the identified biomass boiler and CHP potential would result in negligible carbon emissions and would replace that currently provided by the mains gas (emission factor of 0.210kgCO_2e/kWh **[See reference** 139**]**), or either heating oil (emission factor of 0.298kgCO_2e/kWh **[See reference** 140**]**) or national grid electricity (emission factor of 0.133kgCO_2e/kWh **[See reference** 141**]**) for properties located ‘off-gas’ – see Appendix A.

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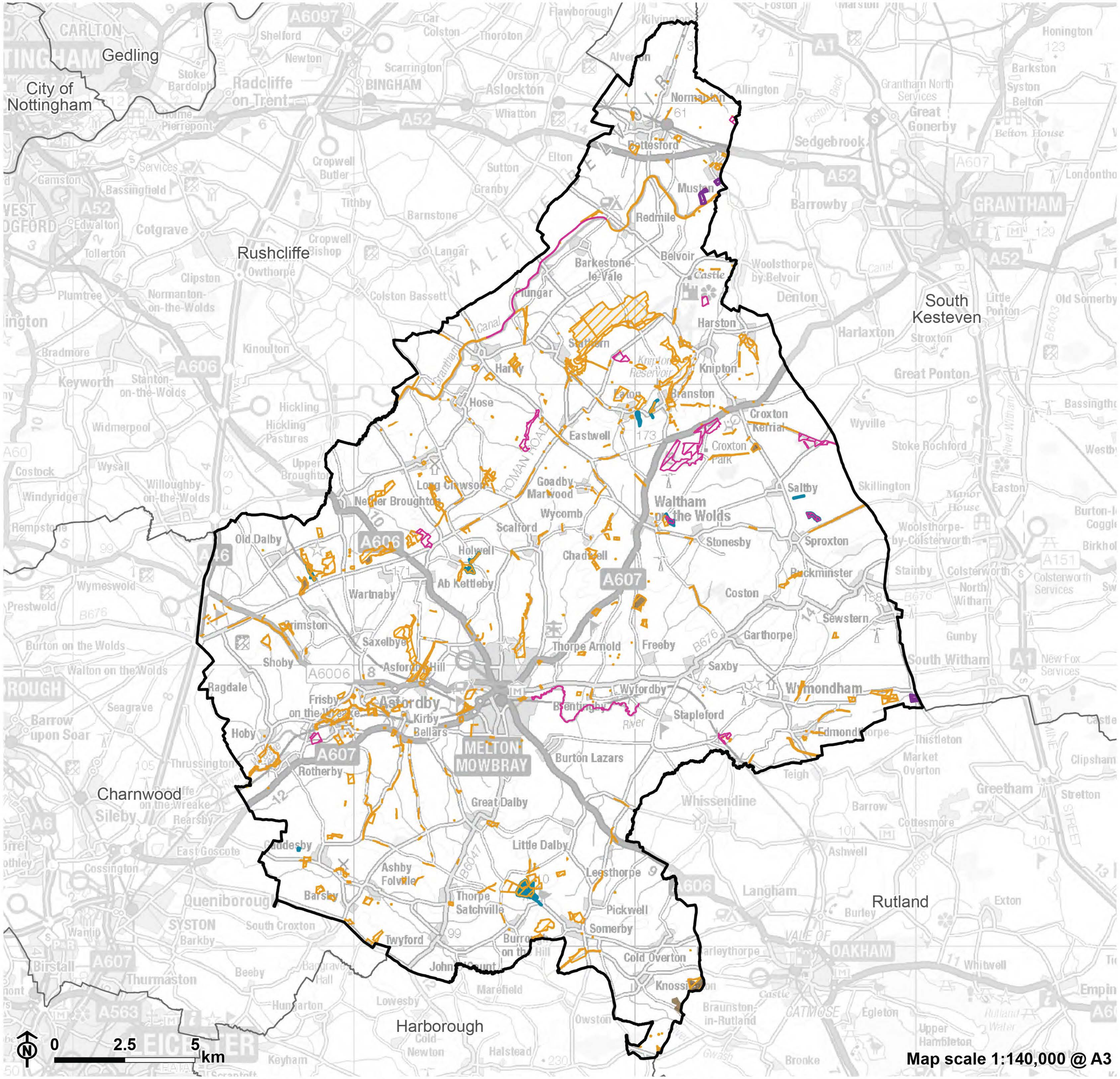
Figure 4.12: Constraints - biomass - virgin woodfuel - energy crops - natural heritage



Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

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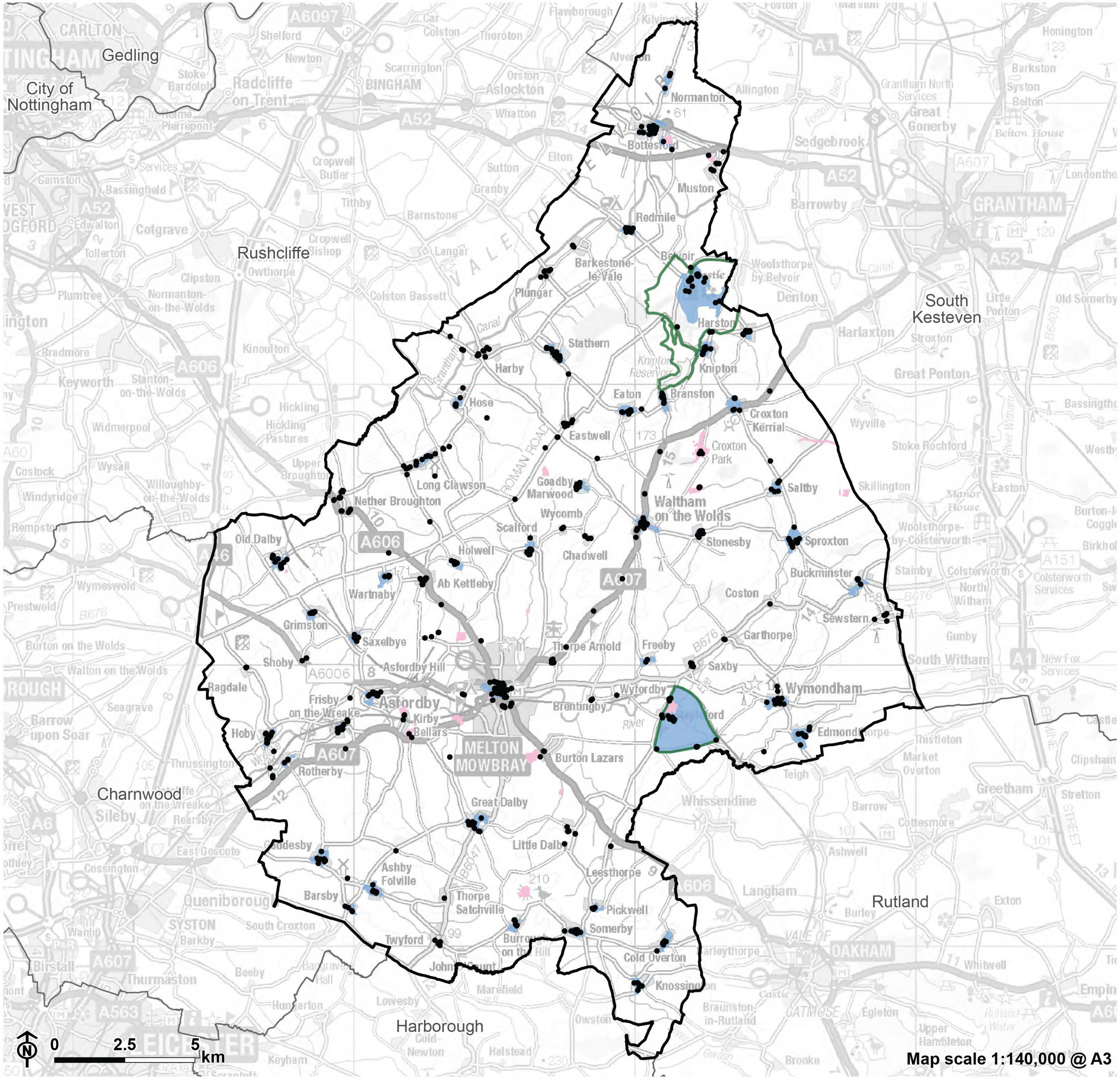
Figure 4.13: Constraints - biomass - virgin woodfuel - energy crops - cultural heritage



- Melton Borough
- Neighbouring local authority
- Listed building
- Registered Parks and Gardens
- Scheduled monument
- Conservation area

Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

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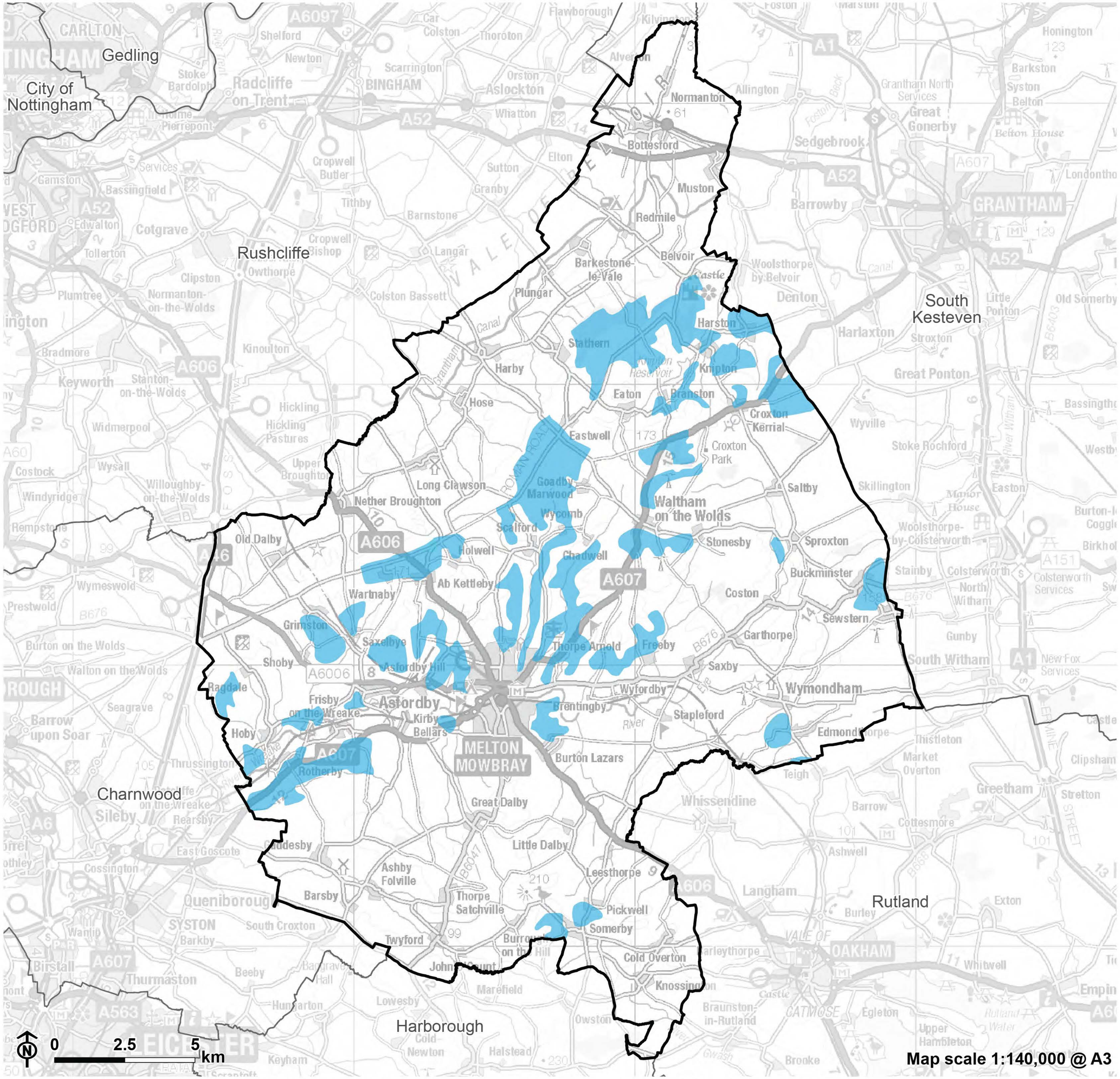
Figure 4.14: Constraints - biomass - virgin woodfuel - energy crops - agricultural



Melton Borough

Neighbouring local authority

Grade 1 and 2 agricultural land and non-agricultural land

Notes:

No land was classified as Grade 5.

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

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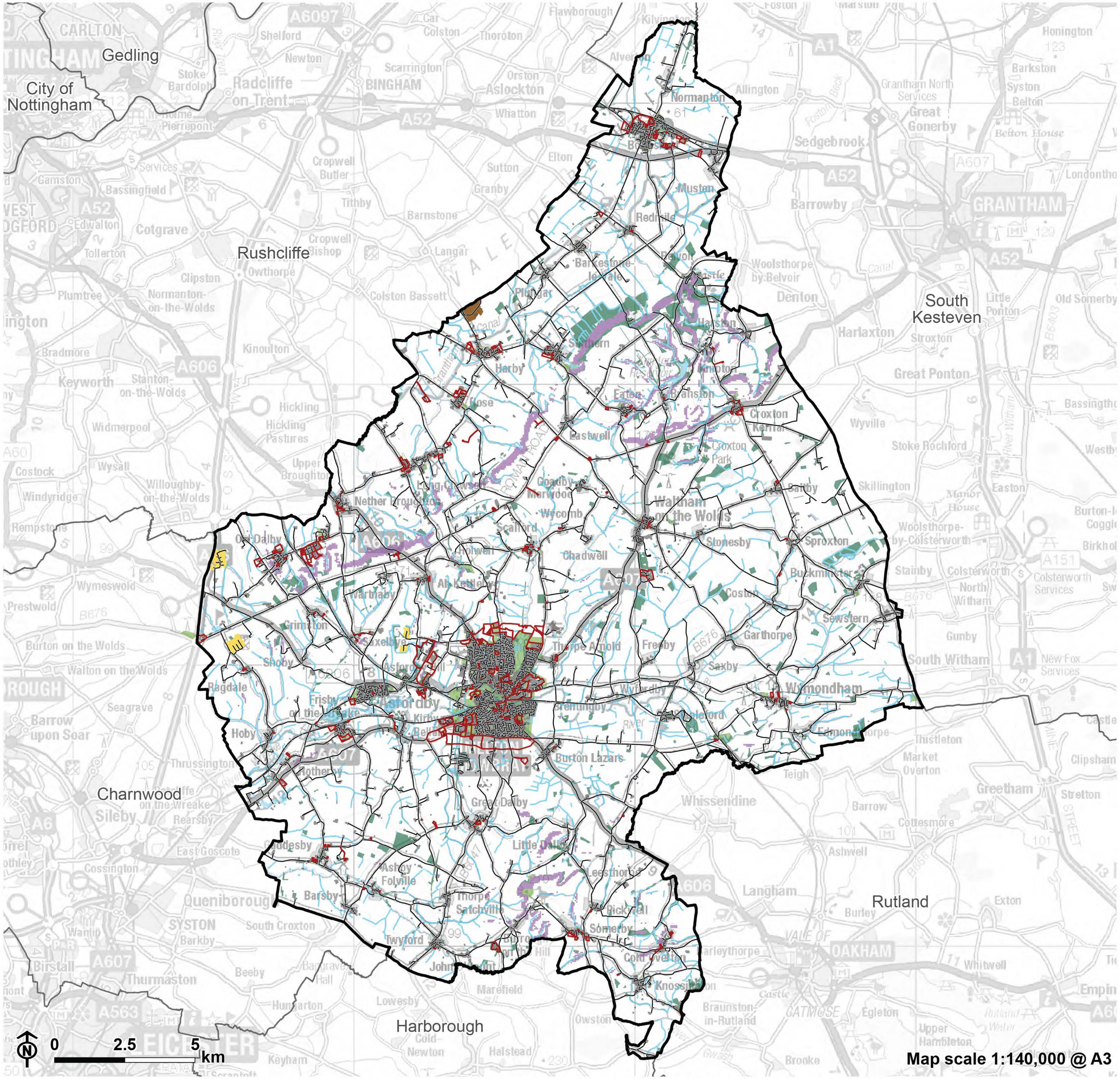
Figure 4.15: Constraints - biomass - virgin woodfuel - energy crops - physical



- Melton Borough
- Neighbouring local authority
- Roads and railways
- Building
- Airports and airfields
- Slope above 15° or slope above 7° and north-east to north-west aspect
- Existing renewable development
- Woodland
- Open space, common land and other green space
- Watercourses and water bodies
- Future developments, safeguarded land and employment sites

Notes:

Ministry of Defence land was also treated as a constraint in the assessment. However, due to the sensitive nature of this data this is not presented on this map.

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

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Results

4.173 Table 4.9 presents the findings of the technical assessment, assuming that the energy crops would be used for heating only, and Table 4.10 presents the findings assuming that the energy crops were used to produce electricity and heat via CHP. A total area of 36,457 hectares was identified to have technical potential for energy crop growth.

Table 4.9: Woodfuel: Assessment of energy crops - use for heating only

Energy Crop Type	Area (ha)	Estimated Capacity (MW)	Delivered Heat (MWh/year)	Potential CO_2 Savings (tonnes/year)
Miscanthus	29,165	370	1,414,818	300,077
SRC	7,291	68	258,260	54,776
Total	**36,457**	**437**	**1,673,078**	**354,853**

Table 4.10: Woodfuel: Assessment of energy crops - use for CHP

Energy Crop Type	Area (ha)	Estimated Capacity (MW)	Delivered electricity (MWh/year)	Delivered Heat (MWh/year)	Potential CO_2 Savings (tonnes/year)
Miscanthus	29,165	370	551,228	918,713	268,169
SRC	7,291	68	100,621	167,702	48,951
Total	**36,457**	**437**	**651,849**	**1,086,415**	**317,120**

Issues affecting deployment

4.174 The quantity of production of virgin woodfuel for biomass from forestry and woodland will depend on the quantity of woodland that can be actively managed and the incentives available for landowners to extract and process the woodfuel. At present, the demand for domestic log-burners dominates the virgin woodfuel market. The demand for woodchip stoves and pellet boilers is less than that for log-burners, however the economic viability of these installations is greater for off-gas properties, due to the higher costs of heating fuels such as oil and electricity. However, heat pump deployment is anticipated to significantly increase in the UK as the electricity grid decarbonises and the electrification of heat increases. The viability of biomass installations will need to compete with the costs of heat pumps, as well as additional constraints such as space for fuel storage, solid fuel flue regulations and maintenance requirements.

4.175 The deployment of energy crops, and to a lesser degree the management of woodland for woodfuel, will be influenced by:

- Economic viability including in comparison to other potential uses of the land;
- The presence of local processing facilities and markets;
- Land ownership;
- Existing farming activities;
- Potential biodiversity impacts from the alternative management techniques required for wood fuel crops and the creation of alternative land cover;
- The impact of energy crops on the local landscape character; and
- The suitability of the land for energy crop production, including water availability (the entire Melton borough is water stressed).

4.176 Notably, the conflict between land use for food production or for energy crops will require consideration with regards to the potential scale of energy crop potential within Melton borough.

4.177 The availability of incentives for landowners and farmers to grow and harvest crops will impact energy crop production. Often, longer-term supply contracts with end users will need to be arranged in advance. In addition, the establishment of supply-chains and logistics of fuel processing may initially limit the widespread uptake of energy crop resource. Other issues that may limit the exploitation of Melton borough's energy crop resource include the requirement for an Environmental Impact Assessment (EIA) of energy crop projects, the planning and permitting of energy generating plants and the question of alternative markets for Miscanthus and SRC other than energy use.

4.178 There is ambition at national level for biomass to play an important role in decarbonising the UK's energy generation. The Government's Clean Growth Strategy (2017) and the Committee on Climate Change's 'Net Zero – the UK's contribution to stopping global warming' report (2019) both acknowledge the significant opportunities offered by biomass, notably if it is used in conjunction with carbon capture and storage 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 has also reviewed the carbon and wider sustainability impacts of biomass production and use and concluded that sustainable, low-carbon bioenergy is possible but only if:

- Rules governing the supply of sustainable sources of biomass for energy are improved; and
- The use of harvested biomass is carefully managed to maximise the removal and minimise the release of carbon into the atmosphere **[See reference** 142**]**.

4.179 Subsequently, the Government has restated its firm commitment to biomass sustainability via its Biomass Strategy. **[See reference** 143**]**

4.180 Since the 1960s, agricultural subsidies under the EU's Common Agricultural Policy (CAP) have 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 phased exit from CAP-based subsidies now provide a new context for policies and strategies to scale up biomass production. The Government's new Environmental Land Management (ELM) scheme, which will pay farmers to deliver beneficial outcomes. For example, the Sustainable Farming Incentive (SFI – part of the ELM scheme) pays farmers and land managers to take up or maintain sustainable farming and land management practices (known as 'SFI actions') that protect and benefit the environment, support food production or improve productivity. Land use types eligible for support of SFI actions include Miscanthus and SRC energy crops. **[See reference 144]**

Energy from waste

Description of technology

4.181 Generally referred to as 'Energy from Waste', this technology involves extracting energy using a process undertaken on the non-recyclable residual elements of waste stream. 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 (usually up to 50% of the residual waste prior to being processed) could be considered as 'renewable' depending on its organic, non-fossil fuel content, for example as set out by Ofgem for the purposes of the Renewables Obligation **[See reference 145]**. However, the RDF itself remains a significant source of carbon emissions, particularly from the plastic content of the waste stream, so there is some debate whether it should be classed as a renewable or even a partially renewable fuel. Residual waste arisings should therefore be minimised at source as far as possible in order to reduce their impact on emissions.

4.182 Another form of energy from waste technology uses anaerobic digestion 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. Due to lack of data available on local waste streams and the energy content of such waste streams, the technical potential of such biogas energy is not included within this assessment. Further detailed study would be required to make consideration of this.

4.183 It should be noted that waste planning is dealt with at the County Council level, so the policies within the Leicestershire Minerals and Waste Local Plan (adopted 2019) should be referred to.

Existing development within Melton borough

4.184 Waste disposal is dealt with at County level and there is only one energy recovery treatment plant serving the County, Newhurst ERF, which is located outside of the borough, near Shepshed. It has treatment capacity for up to 455,000 tonnes of residual waste per year, generating up to 42 megawatts of energy. It began full operations in June 2023.

Results

Technical potential

4.185 Melton borough's technical resource for municipal and commercial waste, as a sustainable energy generating technology, is directly related to the amount of residual waste that is generated and collected within the borough, and whether all this can be treated using energy recovery processes. This is complicated by the fact that, as noted above, waste disposal is dealt with at County level and there is no energy recovery treatment plant within the borough.

4.186 The Leicestershire Minerals and Waste Local Plan (LMWLP) was adopted on the 25th of September 2019, replacing the Leicestershire Minerals Development Framework and Leicestershire Waste Development Framework. The Local Plan addresses the need to provide protection to the environment and the amenity of local residents, while ensuring the provision of waste management facilities in accordance with Government policy and society's needs. It aims to maximise the use of alternative materials in order to reduce the reliance on primary-won minerals, and to significantly increase levels of reuse and recovery of waste and move away from landfill as a means of disposal, having regard to sustainability objectives.

4.187 Leicestershire County Council's approach to waste management is to tackle the growth in waste through the use of the waste hierarchy which seeks to prioritise the prevention of waste at source, followed by reuse, recycling, recovery including energy recovery and as a last option, safe disposal.

4.188 Department for Environment, Food and Rural Affairs (DEFRA) figures show 20,616 tonnes of waste were collected by Melton Borough Council in the year to March 2023. Of this, 8,788 tonnes were sent for reuse, recycling or composting – meaning the borough had a recycling rate of 42.6% **[See reference 146]**. At the time of writing detailed data on commercial waste arisings in Melton borough had not been identified.

Issues affecting deployment

4.189 As discussed above, 'deployment' of this technology is related to levels of residual waste arisings within the Borough and County. These levels are likely to decrease in the future as waste minimisation and recycling initiatives increase to comply with tightening regulations. Additionally, biomaterials (including wood products such as pulp, paper and fibre) are a key input to several sectors of the economy – and are likely to increase in importance. Given that competition for renewable materials is likely to increase in the coming decades, it will become increasingly essential to prioritise the recycling and reuse of biomaterials – and not for energy recovery.

Waste residues – agricultural residues

Description of technology

4.190 Agricultural waste also represents a potential renewable energy resource, particularly from using livestock slurry as a feedstock for the anaerobic digestion (AD) process. This describes the process by which organic matter is broken down by microbes in the absence of oxygen to produce methane-based biogas for heat and/or power generation, and a liquid or solid digestate residue, which can often safely be used as a fertiliser. This potential resource is considered below.

4.191 Biogas generation from the anaerobic digestion of sewage is also classed as a renewable form of energy, with most large plant generating heat and/or electricity for the site's own needs and exporting excess power to the local grid. Biogas can also be upgraded to biomethane and injected directly into the gas grid. Heat recovery systems can also be used with sewage or wastewater infrastructure to provide heat to local users, although this application is not yet widespread. Due to lack of data available on local waste streams and the energy content of such waste streams, the technical potential of such biogas energy is not included within this assessment. Further detailed study would be required to make consideration of this.

Existing development within Melton borough

4.192 Agricultural waste is mostly animal matter and plant waste which is dealt with on site. The April 2024 Renewable Energy Planning Database data available from DESNZ indicates there are no large-scale anaerobic digestion facilities within Melton borough currently, but there are two smaller installations, totalling 0.5MW, as recorded on the Feed In Tariff scheme **[See reference 147]**.

Assumptions used to calculate technical potential

4.193 As Melton borough is predominantly rural, agricultural waste is 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 2024 **[See reference 148]** the total number of livestock that can produce waste for biogas (cattle, pigs and poultry) within Melton borough was calculated.

4.194 The total potential slurry produced by livestock and subsequent potential biogas yield via anaerobic digestion were then calculated based on these total livestock numbers by considering:

- The number of animals required to produce 1 tonne of slurry per day.
- The biogas yield from 1 tonne of slurry from each animal type.
- The energy content of biogas.

4.195 Details of these calculations are included in Appendix A.

4.196 The potential for combined heat and power using the biogas produced via the anaerobic digestion of livestock slurry was calculated. The calculation of potential energy yield required the application of a 'capacity factor' meaning the average proportion of maximum anaerobic digestion capacity that would be achieved in practice over a given period. A capacity factor of 64.9% was used, based on national scale DESNZ data **[See reference 149]**. The calculation of potential energy yield also required the consideration of the efficiently of CHP units (50% heating and 30% electricity) **[See reference 150]** (meaning the ratio of total energy output to the total energy input to sun the boiler/CHP unit).

4.197 The potential carbon savings as a result of generation via the identified biogas was also calculated. This assumed that the electricity generated from the identified biogas CHP potential would result in negligible carbon emissions and would replace that currently provided by the national grid, which has an emission factor of 0.133kgCO_2e/kWh **[See reference 151]**. This could either be via use of the electricity on-site, on-site following battery storage, or off-site via export. Similarly, this assumed that the heat generated from the identified biogas CHP potential would result in negligible carbon emissions and would replace that currently provided by the mains gas (emission factor of 0.210kgCO_2e/kWh **[See reference** 152**]**), or either heating oil (emission factor of 0.298kgCO_2e/kWh **[See reference** 153**]**) or national grid electricity (emission factor of 0.133kgCO_2e/kWh **[See reference** 154**]**) for properties located 'off-gas' – see Appendix A.

Results

Technical potential

4.198 The technical potential findings are presented in Table 4.11.

Table 4.11: Biomass: Assessment of slurry - use for CHP

Livestock	Number of animals	Estimated Capacity (MW)	Delivered electricity (MWh/year)	Delivered Heat (MWh/year)	Potential CO_2 Savings (tonnes/year)
Cattle	23,063	6.6	11,280	18,800	5,487
Pigs	14,307	0.4	763	1,272	372
Poultry	1,141,082	3.0	5,182	8,637	2,521
Total	**1,178,452**	**10.1**	**17,226**	**28,710**	**8,380**

Issues affecting deployment

4.199 Larger AD (or biomass) plants can cause landscape impacts, with the presence of features such as storage tanks, lighting and ground disturbances having the potential to impact the landscape of the site itself and the landscape character of the surrounding area. The presence of the storage tanks and industrial buildings within AD plants could also impact views from key viewpoints and settlements, and multiple AD plants could have cumulative impacts on landscape character. AD plants can also cause local nuisance issues due to release of bioaerosols and odour.

Biomass and waste – conclusion

This section of the study estimated the technical potential in Melton borough for energy from virgin woodfuel (untreated wood residues from forestry/ woodland and from energy crops) and from agricultural slurry. It was not possible within the scope of the study to estimate potential from other waste residues such as food waste or sewage waste. While much smaller than the technical potential from ground-mounted solar PV or from onshore wind, the combined technical potential (for electricity and heating) of virgin woodfuel and agricultural slurry is nevertheless potentially significant in Melton borough, representing approximately 6.3% (1,794,421 MWh/year) of the total technical potential energy output of all the renewable and low carbon energy technologies considered in this study (based on the illustrative technical potential **[See reference 155]**). Deployment of virgin woodfuel as an energy source will be influenced by a wide variety of factors affecting the quantity of land that is managed as woodland or for energy crops, incentives available for landowners to extract and process the woodfuel, as well as economic viability.

Potential impacts and considerations

4.200 In addition to the issues affecting deployment outlined above, there are other planning issues relevant to each form of technology that should be considered. This section does not cover microgeneration technologies such as, rooftop solar and heat pumps, as they often do not require planning permission and are captured under permitted development rights. A summary is set out for each topic area below:

- Landscape and visual - this includes both direct and indirect impacts on the landscape. For example, the loss of landscape features or change in the character of the area resulting from construction or the change in character of landscapes and sense of place. There is also potential for direct impacts on views or vistas from construction. Cumulative impacts should also be considered in combination with other existing or proposed energy developments. This topic area is relevant to onshore wind, ground mounted solar, hydropower and biomass energy developments. Residential amenity should also be considered for ground mounted solar developments.
- Ecology and Ornithology – this includes direct and indirect impacts of construction and associated infrastructure on the loss/displacement of ecological receptors (such as habitat loss and/or loss of notable or protected plant or animal species, disturbance, or fragmentation of habitat). There is also potential for direct and indirect impacts of operation on ecological receptors. However, there are opportunities for habitat management and enhancement, including biodiversity net gain. This topic area should be considered for onshore wind, ground mounted solar, hydropower and biomass energy developments.
- Historic Environment – this includes physical impacts to above ground and buried heritage assets as well as harm to the significance of assets arising from change in their setting. There is also potential for harm to historic landscape character. This topic area should be considered for onshore wind, ground mounted solar, hydropower and biomass energy developments.
- Hydrology – there is a potential risk to local watercourses / water bodies / groundwater and private and public water supplies through runoff generation and erosion. Water may also be required for cooling systems for biomass plants which could affect water availability. There is also potential for flood risk posed by developments closer than 50m from any watercourses and an increase in surface water runoff as a result of development footprint. This topic area should be considered for onshore wind, ground mounted solar, hydropower and biomass energy developments.
- Noise and Vibration – there is potential for an increase in noise levels at nearby sensitive receptors during construction and decommissioning (such as construction of access tracks and piling). Also, there is potential for an increase in noise levels at sensitive receptors during operation (such as from

aerodynamic noise of wind turbines, biomass plant operation). This topic should be considered for onshore wind, hydropower and biomass energy developments.

- Air quality – there is potential for dust emissions during construction as well as emissions from construction and operation vehicles, travelling to, from and around the site, particularly for larger scale developments. Odour from some biomass fuels (agricultural residues and waste) should also be considered. This topic should be considered for onshore wind and biomass energy developments.
- Traffic and transport – there is potential for increased vehicle movements on local roads during construction. This topic area should be considered for onshore wind, ground mounted solar, hydropower and biomass energy developments.
- Aviation and Telecommunications – there is potential for disruption to civilian and military airspace and radar systems as well as interference with television, radio and mobile phone reception due to presence of turbines. This is most relevant for onshore wind (see glint and glare below for photovoltaics).
- Socio-economic – there is potential for impacts to landuse activities (such as loss of grazing / arable land) or tourism and disruption to and/or loss of public footpaths. There is also potential for community costs and benefits of renewable energy development including economic growth opportunities within rural areas and green jobs. This topic area should be considered for onshore wind, ground mounted solar, hydropower and biomass energy developments.
- Shadow flicker – there is potential for houses within close proximity to wind turbines to experience shadow flicker. This is only likely to occur in a building located within a distance of ten times the rotor diameter of a wind turbine and within 130 degrees either side north. This is only relevant for onshore wind developments.
- Glint and glare – there is potential for the glint and glare of solar PV panels to cause issues for any light-sensitive receptors such as aviation, roads, rail infrastructure and residential properties. However, glint and glare would be unlikely as solar panels are designed to absorb light. Modern Solar PV

panels have high-tech anti-reflective coatings and ultra-transparent glass to improve panel efficiency. This topic is only relevant to ground mounted solar.

Chapter 5

Policy Options

5.1 An effective local development plan is key to the delivery of appropriate renewable energy development within Melton borough. This section provides an overview of some of the key policy issues MBC may wish to consider as part of the preparation of the Local Plan review and other local planning guidance or documents. The benefits and limitations of each policy approach is provided below each option.

5.2 The main policy options proposed for consideration at this stage include:

- Criteria based policies in relation to renewable and low carbon energy projects that ensure that the adverse impact of renewable and low carbon energy development are addressed satisfactorily, including cumulative impacts;
- Development of 'energy opportunity maps' to identify suitable areas for renewable and low carbon energy sources, and supporting infrastructure;
- Allocation of sites for standalone renewable and low carbon energy developments;
- Encouraging community renewables by supporting community-led initiatives for renewable and low carbon energy, including developments being taken forward through neighbourhood planning; and
- Decommissioning.

5.3 Additional policy options for on-site renewable energy can be found below the main policy options.

5.4 A review has been undertaken of the existing policies EN8, EN9 and EN10 within the Local Plan (2018). This provides a useful starting point for the analysis of options to strengthen future policies. A summary of the existing relevant policy and the benefits and limitations for both are set out below:

- Policy EN8 sets out the need for all new development proposals to demonstrate how the need to mitigate and adapt to climate change has been considered, (subject to considerations of viability) in terms of several factors including the provision of renewable and/or low carbon energy production, including decentralised energy and/or heat networks in accordance with the plans renewable energy policy, Policy EN10 (Energy Generation from Renewable and Low Carbon Sources).
- Policy EN10 outlines the support and criteria for evaluating renewable and low carbon energy projects in Melton borough, such as biomass, CHP, hydro, wind, solar and micro-generation systems. The policy emphasises support for renewable proposals where they support sustainable development and climate change mitigation. It sets out 18 key assessment factors which will be assessed both individually and cumulatively which include (but are not limited to) siting, the surrounding environment, residential and visual amenity, noise and nature conservation. The policy specifically references the Melton and Rushcliffe Landscape Sensitivity Study 2014, which identifies areas with low or low-moderate sensitivity to wind turbine development. Wind energy proposals must be in these designated areas to receive planning permission, ensuring that the landscape's character and sensitivity are respected.
- Policy EN9 (Ensuring Energy Efficient and Low Carbon Development) states that major developments will be required to demonstrate *"How developments (dwellings and non-dwellings) have considered on-site renewable, low carbon or de-centralised energy provision, including connection to existing networks, where feasible, in accordance with Policy EN10."*

5.5 The benefits and limitations of the existing relevant policies are summarised below:

Benefits:

- The Melton and Rushcliffe Landscape Sensitivity Study 2014 helps developers to identify areas of low or low-moderate sensitivity for wind energy as is referenced in Policy EN10. It provides a degree of clarity for local communities and developers as to what is and is not acceptable and where.

- Policy EN10 provides detailed criteria for evaluating renewable energy projects, helping to streamline the planning process. By referencing factors such as siting, environmental impact and community considerations, the policy offers a structured approach to ensure that projects are feasible and sensitive to their surroundings.

Limitations:

- The policy restricts the development of wind turbines over 76m which means that no large-scale commercial wind turbines could be delivered within the borough. This is a highly restrictive policy.
- The policies could consider the use of net zero targets and further detail to give developers a better steer.
- There is no mention of how unregulated emissions or embodied carbon should be addressed.
- There is a disconnect between the policies which can be confusing to developers.

Criteria based policies

5.6 The NPPF states that local authorities should design their policies to maximise renewable and low carbon energy development while ensuring that adverse impacts are addressed satisfactorily. The PPG provides helpful guidance for local authorities on how to develop robust criteria-based policies in relation to renewable and low carbon energy projects. Key points include:

- The criteria should be expressed positively (meaning that proposals will be accepted where the impact is or can be made acceptable);
- Projects should consider the criteria in the National Policy Statements as these set out the impacts particular technologies can give rise to and how these should be addressed;
- Cumulative impacts require particular attention, especially the increasing impact that wind turbines and large-scale solar farms can have on landscape

and local amenity as the number of turbines and solar arrays in an area increase;

- Local topography is an important factor in assessing whether wind turbines and large-scale solar farms could have a damaging effect on landscape. Recognise that the impact can be as great in predominantly flat landscapes as in hilly areas;
- Care should be taken to ensure heritage assets are conserved in a manner appropriate to their significance, including the impact of proposals on views important to their setting; and
- Protecting local and residential amenity is an important consideration which should be given proper weight in planning decisions.

5.7 As noted above, MBC's existing policy, EN10, is a criteria-based policy, but it is too restrictive especially for wind energy development. It should also provide further guidance for developers for ground mounted solar especially in relation to BMV agricultural land. Drawing on the guidance outlined in the PPG, after expressing positive support in principle for renewable and low carbon energy development, Local Plans should list the issues that will be taken into account in considering specific applications. This should not be a long negative list of constraints but it should set out the range of safeguards that seek to protect the environment – including landscape and townscape.

5.8 As explored in Document E and summarised below the list of factors (1-14) in the existing policy EN10 relating to proposals for all types of renewable energy development is considered broadly appropriate. However, MBC may also want to consider the following:

- Not all of the factors are relevant to all types of renewables technology. The policy could make this clear when introducing the list. Although not essential, the policy could also be restructured and expanded to highlight factors likely to be of particular importance for the technologies with the greatest technical potential, i.e. ground-mounted solar PV and wind (see for example the Central Lincolnshire Local Plan **[See reference** 156**]**).
- In addition, MBC could consider adding text that directs developers to identify opportunities to deliver additional environmental benefits beyond climate

change mitigation by designing and managing renewable energy development sites to deliver multiple forms of ecosystems services (for related guidance **[See reference** 157**]**.

- Factor 2: Consider deleting the word ‘surrounding’ to make clear that the effects of development on landscape, townscape and heritage assets within site boundaries must also be considered.
- Factor 6: It is unclear why ancient woodland and veteran trees have been singled out; consider referring instead to ‘irreplaceable habitats’ for consistency with the terminology in footnote 7 and paragraph 186(c) of the NPPF.
- Factor 10: Consider referring to the ‘best and most versatile agricultural land’ rather than ‘high quality agricultural land’ for consistency with the terminology in the NPPF.
- Factor 13: These factors are likely to be covered by health and safety regulations; consider confirming this and deleting from the policy.

5.9 It is considered that factors 15, 16 and 18 relating to wind energy development should be amended or replaced as follows:

- Factor 15: It is recommended that the policy’s decommissioning requirements are not limited to wind energy developments since other types of renewable infrastructure, notably ground-mounted solar PV are also relatively temporary in nature and can take up a large land area. The policy could, for example, state that decommissioning arrangements will be secured by condition where appropriate to the nature of the proposed scheme. Further advice and links to policy examples are provided in chapter 5 of Document F.
- Factors 16 and 18: Factors 16 and 18 are out of date as they reflect restrictions that were removed from the NPPF in July 2024 (see above). They should be reframed to reflect the need for community engagement and involvement in the scheme design.
- Factor 17 and the accompanying landscape sensitivity table restrict wind energy development to scales of development and to locations where sensitivity to this development is low or low-moderate. It is considered that this is unduly restrictive in light of national policy objectives on achieving net

zero and doubling onshore wind development by 2030 and the local climate change mitigation objectives outlined above. Although relevant at the current time, it is recommended that the Landscape Sensitivity study (2014) should be updated to support the next review of the local plan. The text in Factor 17 should be amended to refer to the current landscape sensitivity study, so that reference to the 2014 study is not outdated.

5.10 The Lancaster Regulation 19 Partial Review Local Plan Part 2 **[See reference** 158**]** Policy DM53: Renewable and Low Carbon Energy Generation is a criteria-based policy that goes further than most policies as it sets out criteria for onshore wind, hydro, solar, other renewable and low carbon technologies, heating and cooling networks and energy storage. Cornwall Climate Emergency DPD Policy RE1: Renewable and Low Carbon Energy builds on this by including criteria for various renewable energy types and states that significant weight will be given to community led energy schemes. MBC should also include text within the policy regarding wider opportunities, such as "The Council will seek to try to maximise wider benefits of the renewable energy development, such as for biodiversity on solar sites".

5.11 It is important that policy does not preclude the development of specific technologies other than in the most exceptional circumstances and does not merely repeat national policy but is relevant to the process of decision-making at the local level, focusing on locally distinctive criteria related to local assets, characteristics, and sensitivities.

5.12 We recommend that any criteria-based policy designed to manage the development of renewable and low carbon technologies should be supported by guidance on the most suitable locations (see appropriate sections relating to energy opportunity mapping and allocations below), either within the Local Plan or an accompanying Supplementary Planning Document (SPD) **[See reference** 159**]** on renewables. Guidance could also take the form of the findings of a renewable energy study. For example, Stroud Local Plan Review Pre-Submission Draft Plan (May 2021) Delivery Policy ES2 Renewable or low carbon energy generation is a criteria-based policy that states that ground mounted solar and wind energy developments are more likely to be supported in areas identified as suitable in principle as indicated on the Policies Map. The Policies Map utilises technical potential maps that LUC and CSE produced as part of the Renewable Energy Resources Assessment (2019) to identify areas of suitability for wind and solar energy. Melton Borough Council could take a similar approach.

5.13 The benefits and limitations of adopting criteria-based policies are summarised below:

Benefits:

- Creates greater policy certainty for developers and local communities.
- Allows MBC to clearly set out the circumstances in which renewable energy proposals will and will not be permitted.
- Not dependent on additional assessments or studies, so achievable within the confines and timeframe of the Melton Local Plan Partial Update.

Limitations:

- May be perceived to be overly restrictive by certain stakeholders.

Development of 'Energy O ortunitie Maps'

5.14 The NPPF and PPG encourage local planning authorities to "consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure". MBC should therefore identify suitable areas for all of those types of renewable and low carbon energy sources that can be spatially defined, where this would help secure the development of such sources. The consultation version of the NPPF removes the word 'consider' and instructs local authorities to identity suitable areas. However, it is noted that the Local Plan Partial Update is not being prepared under the new NPPF.

5.15 Clearly identifying and mapping an area's renewable and low carbon sources of energy represents a positive and proactive way to spatially plan for renewable and low carbon energy generation. With a spatial map illustrating energy opportunities it is easier for local authorities to work with local communities and developers to identify the areas that would be most appropriate for development in strategic terms, accelerating the planning and development processes and avoiding conflict.

5.16 Energy opportunities maps can provide a spatial summary of the key opportunity areas (in terms of their technical potential) for various forms of renewable energy. These can be used to inform development decisions and discussions and guide development towards the most suitable areas. MBC could build on the Melton and Rushcliffe Landscape Sensitivity Assessment: Wind Energy Development (2014) but rather than ruling out areas of higher sensitivity, identify where within the borough, larger scale turbines could potentially be accommodated – subject to site specific assessments. The same could also be undertaken for ground mounted solar development.

5.17 At the scale of neighbourhood planning, energy opportunities maps can provide a useful tool for communities and other stakeholders to identify the key opportunities for renewables within their area. It is important to note, however, that it is not possible to identify locations for all types of renewable energy, as many technologies such as building integrated solar, heat pumps, farm-scale anaerobic digestion, and small-scale biomass can be located in nearly all areas.

5.18 The benefits and limitations of adopting 'Energy Opportunities Maps' are summarised below:

Benefits:

- Enables planners to have informed discussions with developers and communities about potential opportunities for renewable and low carbon energy technologies – meaning proactive rather than reactive planning.

- Meets NPPF, PPG requirements that LPAs should identify suitable areas for renewable and low carbon energy sources and supporting infrastructure.
- Can act as a useful tool for neighbourhood planning.

Limitations:

- Not possible to identify locations for all types of renewable energy technologies.
- It does not provide a definitive statement on the suitability of a certain location for a particular development – each application must be assessed on its own merits. It is not a replacement for detailed site studies.
- Given the 2014 landscape sensitivity study findings, that areas within the Borough had significant potential landscape impacts from renewable energy development, the energy opportunity maps alone may be of limited benefit for directing development across the Borough. A separate assessment to update the landscape sensitivity study would be required to address this gap.
- May identify potential areas for renewable energy development that are unpopular.
- Additional assessment to refine the opportunity maps may be considered required for this approach to be useful (such as updating the Landscape sensitivity study and better understanding the location of 3a and 3b agricultural land).

Allocating sites for standalone renewable and low carbon energy schemes

5.19 The Local Plan could allocate sites specifically for standalone renewable developments. This could provide more strategic direction to the siting of renewables for developers, investors, the local authority, statutory stakeholders and communities.

5.20 If sites exist that have potential for standalone renewable or low carbon energy use but are constrained in a way that would make them less attractive to commercial developers, then allocating the site is a way of promoting that site for renewable/low carbon development to a wider audience such as landowners or co-operatives. Alternatively or in addition, MBC could undertake a ‘call for sites’ exercise for renewable and low carbon development and consider the merits of promoted sites in isolation or in combination with other planned types of development. It should however be noted that such call for sites exercises tend to generate a relatively poor level response.

5.21 Again, it would be important that site allocations only highlight appropriate schemes/areas. Site developers and communities would still be required to undertake detailed site-based assessment work to support individual development planning applications and if required Environmental Impact Assessments. Furthermore, site allocations should be framed such that they do not preclude projects in other locations.

5.22 The benefits and limitations of allocating sites for standalone renewable and low carbon energy schemes are summarised below:

Benefits:

- Provide direction to the siting of renewables.
- May promote sites to a wider audience such as co-operatives.
- Can set specific criteria to enhance the quality of development and address, mitigate, and overcome constraints impacting a site.

Limitations:

- Very resource intensive to gather necessary evidence to justify allocation and arguably not the best use of Council resources.

- Would be desirable to secure agreement of landowner which may be resource intensive.
- May identify potential sites for renewable energy development which when subject to detailed site surveys are not appropriate for development.
- Not considered possible to undertake this process within the confines and timeframe of the current Partial Update process.

Encouraging community renewables

5.23 There is no definition of community energy within planning law, and planning authorities are unable to assess renewable energy proposals from community energy groups any differently to commercial projects, nor give weight to the substantial co-benefits delivered by these projects **[See reference** 160**]**. However, the NPPF states that local authorities should support community-led initiatives for renewable and low carbon energy, including developments being taken forward through neighbourhood planning. Community-led renewable energy projects are increasingly being seen as an attractive option for local communities wishing to contribute to local/national climate change targets and as a way to generate local revenue to directly benefit the community. For example, the Westmill Wind Farm Co-operative **[See reference** 161**]** in Swindon was the first 100% community owned wind farm to be built in the south of England.

5.24 Community groups can face considerable challenges in the pre-planning stage and there are several opportunities for local authorities to provide advice and guidance throughout this stage, including the provision of early advice on planning requirements and lending support to consultation activities within the community. Engaging communities in the earliest stages of plan-making and providing clear information on local issues and the decision-making process can aid the development of community renewable energy projects.

5.25 Examples of plans that include policies to support community renewable energy schemes include the adopted Bath and North East Somerset Local Plan **[See reference** 162**]** and the adopted Cornwall Climate Emergency Development

Plan Document **[See reference** 163**]**. MBC's emerging Local Plan could broaden its support for community renewable schemes by stating that MBC would actively support community renewable energy schemes which are led by or meet the needs of local communities. Such developments would normally be conceived by and/or promoted within the community within which the renewable development will be undertaken, delivering economic, social and/or environmental benefits to the community. Neighbourhood plans provide a particular opportunity to define detailed local site allocation policies for renewable and low carbon technologies. To aid neighbourhood planning committees, the Council could develop an interactive map to support the development of renewable and community energy schemes through neighbourhood plan policies (for example informed by outputs from this study).

5.26 Currently, there is no policy within the Local Plan that relates to community energy schemes. As such, a policy should be incorporated within the Local Plan Partial Update specifically relating to community-led renewable schemes. It should explicitly state that the Council would actively support community energy schemes which are led by or meet the needs of local communities.

5.27 Specific wording proposed:

Support will be given to renewable and low carbon energy generation developments that are led by, or meet the needs of local communities.

The positive benefits of community energy schemes will be a material consideration in assessing renewable energy development proposals. The preference is for schemes that are led by and directly meet the needs of local communities, in line with the hierarchy and project attributes below:

Community Led Energy:

- Project part or fully owned by a local community group or social enterprise;

- Local community members have a governance stake in the project or organisation e.g. with voting rights.

Justification

5.28 As stated above, community groups can face considerable challenges in the pre-planning stage and there are a number of opportunities for local authorities to provide advice and guidance at this stage. The policy wording above is based on Policy SCR4 which was successfully adopted in the Bath and North Somerset Local Plan.

5.29 The benefits and limitations of encouraging community renewable schemes are summarised below:

Benefits:

- Provides support to local communities to develop renewables and low carbon energy.
- Generates local revenue to directly benefit the local community.
- Can secure a broad base of local support for renewable energy schemes.

Limitations:

- Care may need to be taken not to prescribe the process of community ownership (such as shared ownership) as it is not the role of the planning system to do this.

Decommissioning

5.30 Renewable energy infrastructure, such as solar panels and wind turbines are temporary in nature. They typically have a lifespan in the range of 20 to 40 years and there is a need for renewable energy project stakeholders to plan for project end-of-life obligations.

5.31 Decommissioning ensures that infrastructure is removed responsibly, minimising its environmental impact whilst allowing for the repurposing of potentially large-scale areas of land for other uses. Repurposing may also include updating more viable and feasible renewable energy technologies for further renewable energy projects. This is often more economically viable than maintaining outdated infrastructure that may no longer be cost-effective. The recycling and / or repurposing of materials may also establish economic opportunities whilst promoting sustainable outcomes.

5.32 Examples of plans that include policies to support the decommissioning of renewable energy infrastructure include the adopted Cheshire East Local Plan **[See reference** 164**]**, Salford Local Plan **[See reference** 165**]** and the Central Lincolnshire Local Plan **[See reference** 166**]**. Requirements for the decommissioning of renewable energy infrastructure are typically captured within the wider scope of a broader renewable and low carbon energy policy rather than an independent policy specifically for decommissioning.

5.33 However, a policy could be included in the Local Plan to provide guidance and regulations for the decommissioning of renewable energy installations to ensure the safe, efficient, and environmentally responsible decommissioning of infrastructure. Like the policy examples provided, this policy could sit within the wider remit of an all-encompassing renewable energy policy.

5.34 The policy could also state that decommissioning activities must minimise adverse environmental impacts, including habitat disruption, pollution, and landscape degradation, must prioritise public safety and mitigate any potential hazards associated with the removal of renewable energy infrastructure, maximise the reuse, recycling, and repurposing of materials to minimise waste generation, consider stakeholder consultation and community engagement and consider opportunities for job creation and sustainable redevelopment of decommissioned sites.

5.35 MBC should consider using planning conditions to ensure that redundant renewable infrastructure is removed when no longer in use and land is restored to an appropriate use.

5.36 The benefits and limitations of decommissioning-based policies are summarised below:

Benefits:

- Provides clarity for renewable energy developers surrounding the expectations and requirements for infrastructure at the end of its operational life.
- Safeguards the environment and biodiversity by incorporating measures to ensure proper restoration of sites post-decommissioning.
- Front-loaded decommissioning policy can help ensure that developers provide financial guarantees to cover decommissioning costs at an early stage.

Limitations:

- Difficult to set out detailed decommissioning plans considering the projects may be in place for 30+ years.
- Decommissioning requirements may deter developers from investing, particularly if they perceive the associated costs and obligations as prohibitive.
- Advancements in renewable energy technology may outpace provisions outlined in decommissioning policy, rendering it obsolete.

Monitoring

5.37 Careful monitoring of the success of the policies should also be established to measure the Borough's progress towards its ultimate goal of becoming net zero by 2050. The following monitoring indicators could be incorporated within the Local Plan Partial Update:

- Number of renewable energy applications that have come forward and whether they have been granted planning permission.
- Capacity of renewable energy schemes, how much has been generated from renewables and furthermore how much that contributes to the net zero target.
- If suitable areas for wind and ground mounted solar are identified within the Local Plan partial update, the number of developments that come forward in these areas could be monitored.
- Identifying the key issues arising in determination of applications for different forms of renewables and if there are any significant blockages.
- Number of community led renewable schemes that come forward.

Additional policy options for on-site renewable energy

5.38 Although the policy options set out above focus more on large-scale renewable energy generation, MBC could also provide policy support for the generation of on-site renewable energy, which contribute to the same goals of reducing emissions and demand on the local grid whilst also supporting residents and businesses to reduce their energy bills.

5.39 Below sets out some additional policy options for on-site renewable energy the Council may wish to consider in its Local Plan Partial Update as well as through wider policymaking and Council-led initiatives.

- Loosen or remove planning restrictions to make it easier to install building-mounted renewables. Learning from the London Borough of Camden's guidance on retrofitting within Conservation Areas **[See reference** 167**]**, the Council could set out clear guidance on retrofitting existing buildings especially regarding solar PV and how it will be applied within Conservation Areas and Listed Buildings. This could include specific guidance for each Conservation Area, either by updating Conservation Area Management Plans to specifically include the Borough's approach to solar PV or through the creation of overarching guidance based on area types throughout the Borough. As for new development, Document B explores sustainable building design options.
- Local Development Orders (LDOs) have come to be used for a range of uses, including most recently the provision of low carbon solutions. For example, Swindon Borough Council has prepared low carbon-related LDOs covering non-domestic air source heat pumps and district heating installations, hydrogen and electric car fuelling installations and pre-identified sites for solar arrays and solar farms **[See reference** 168**]**. Melton could employ a similar approach.

Policy examples

5.40 In addition to some of the specific examples referred to above, Section 3 of the TCPA/RTPI Climate Change Planning Guidance (2023) **[See reference 169]** provides various model approaches for renewable energy and low carbon policy options that can be referred to as examples for local authority plan making.

Chapter 6

Summary and Conclusions

Summary

6.1 This study has sought to provide MBC with evidence of the technical potential for renewable and low carbon energy technologies within the borough and how renewable and local issues could be embedded within MBC's emerging Local Plan.

6.2 There is currently 77MW of operational renewable electricity generation capacity across Melton borough, enough to power approximately 26,800 homes a year **[See reference** 170**]**. This delivers annual emission savings of over 9,629 tCO_2, equivalent to planting approximately 371,000 trees a year **[See reference** 171**]**.

6.3 The findings of this study show that there is significant technical potential for additional renewable and low carbon energy development within the borough. If all of this electricity and heat generation potential could be realised, it would have a total illustrative capacity of 28,019MW, outputting 28,434,636 MWh of energy per year, equating to powering approximately 9.9 million homes with electricity and 142,100 homes with heat a year **[See reference** 172**]**. This would save 3,899,753 tCO_2 emissions annually, equating to planting approximately 150 million trees a year **[See reference** 173**]**. However, the deployable potential will be much lower, one reason being that technologies would require the same areas of land to be developed **[See reference** 174**]** and due to the many issues affecting deployment described in this study.

6.4 The greatest technical potential lies in the opportunity to use the power of the sun in the form of ground-mounted solar PV. Onshore wind also has significant technical potential, particularly if economic viability improves, although developers may in the short to medium term, prioritise opportunities in the north of England where windspeeds tend to be higher.

Table 6.1: Summary of illustrative technical potential by renewable energy technology

Technology	Estimated total capacity (MW)	Energy output – electricity (MWh/yr)	Energy output – heat (MWh/yr)	Energy output – total (MWh/yr)	Potential CO_2 savings (tonnes/yr)
Wind	2,768	5,549,798	None	5,549,798	738,123
Ground-mounted solar (100%)	24,240	20,352,995	None	20,352,995	2,706,948
Rooftop solar PV	243	225,693	None	225,693	46,735
Hydro	None	None	None	None	None
ASHP	317	None	511,727	511,727	80,578
Biomass – livestock slurry (CHP)	10	17,226	28,710	45,936	8,380
Biomass – woodfuel (CHP)	3	3,833	6,389	10,222	1,865
Biomass – energy crops – miscanthus only (CHP)	370	551,228	918,713	1,469,941	268,169
Biomass – energy crops – SRC only (CHP)	68	100,621	167,702	268,323	48,951

Technology	Estimated total capacity (MW)	Energy output – electricity (MWh/yr)	Energy output – heat (MWh/yr)	Energy output – total (MWh/yr)	Potential CO_2 savings (tonnes/yr)
Total illustrative technical potential	**28,019**	**26,801,396**	**1,633,240**	**28,434,636**	**3,899,753**

6.5 One of the difficulties for setting borough-wide carbon targets is the co-dependency on national policy measures, such as those which will contribute to decarbonising both the electricity grid and heat supplies. Such measures are likely to be achieved through a mix of technologies, including some which most local authorities have little or no influence over such as offshore wind power and the development of hydrogen infrastructure. The rate at which grid decarbonisation occurs will be dependent on national policies and local authorities will in turn be largely dependent on a decarbonised grid to fulfil their own policy commitments.

6.6 New developments do, however, have the potential to make a significant contribution towards low and zero carbon energy generation capacity within the borough. This will be supported if a rapid trajectory towards operational net zero carbon is adopted for new buildings – aided by the Future Homes Standard when this is implemented, but this is very uncertain at this stage. It is difficult to quantify their impact as the mix of technologies used will depend on costs, onsite emission targets and applied emission factors, but it is likely that developers will focus on heat technologies such as heat pumps and rooftop solar. However, the additional capacity will not decrease overall emissions; it will instead limit the additional emissions resulting from the new development. Please refer to Document B for information on sustainable building design options.

Conclusions

6.7 Achieving net zero is hugely challenging considering the radical changes that are needed to enact the necessary innovative transformative action across all sectors. However, in their ‘Net Zero’ report, the Committee on Climate Change view the UK-wide target as being "achievable with known technologies, alongside improvements in people's lives… However, this is only possible if clear, stable and well-designed policies to reduce emissions further are introduced across the economy without delay" **[See reference** 175**]**.

6.8 As such, this document focussed on the potential interventions through local planning for renewable energy development. With Melton Borough Council in the process of preparing a limited partial update to its Local Plan, there is an opportunity to ensure that the new Local Plan sets out a step change in the support given to the development of renewable and local carbon energy projects.

6.9 To support the deployment of renewable energy in the borough, it is recommended that stronger polices should be put in place supporting:

- Onsite renewable and low carbon energy generation via supportive and positively worded criteria-based policies;
- Stand-alone renewable and low carbon energy generation schemes, including specific policies on solar PV and wind energy identifying areas of suitability for these technologies and recognising that some landscape change will be required; and
- Community-led renewable and low carbon energy schemes.

6.10 Furthermore, it is noted that this study relates to the Melton Local Plan Partial Update, so it is recommended that an updated landscape sensitivity study is prepared to inform the next full review of the Local Plan.

6.11 Careful monitoring of the success of the policies should also be established to measure the borough's progress towards its ultimate goal of becoming net zero by 2050. Additionally, monitoring can also help address unintended consequences on future occupants such as badly installed heat pumps or higher costs to run the technology.

6.12 The delivery of renewable and low carbon projects will also require changes not just to planning policy but also to the implementation of policy. It will be imperative that due weight and consideration is given to the importance of addressing climate change in development management decisions. This should include providing appropriate training and checklists for development management officers and planning committees to ensure that the policies are implemented as intended and that due weight is given to Climate Change issues in all planning decisions.

Appendix A

Key Assumptions to be Applied in the Assessment of Renewable and Low Carbon Energy Resource

Introduction

A.1 This note sets out the key assumptions that were used within the assessments of technical potential for the different types of renewable energy technology including:

- Wind;
- Ground-mounted solar;
- Rooftop solar;
- Hydropower;
- Heat pumps; and
- Biomass (including forestry and woodland residues, energy crops, recycled wood waste, agricultural residues [including anaerobic digestion] and sewage)

A.2 Please note, the assumptions outlined below are written in the past tense and will subsequently be updated and incorporated into an appendix within the main report.

Existing Property Statistics for Melton

A.3 The existing stock of domestic dwellings and non-domestic properties within Melton was derived from LLPG Address data.

A.4 The overall proportion of 'off-gas' properties (those not connected to the gas network) was derived from the 2024 Department for Energy Security & Net Zero (DESNZ) LSOA estimates **[See reference** 176**]**.

Table A.1: Properties in Melton

Property type	Number of properties within Melton
Detached dwelling	9,378
Semi-detached dwelling	8,155
Terraced dwelling	5,577
Flat **[See reference** 177**]**	1,516
Other dwelling **[See reference** 178**]**	187
Total dwellings considered in the rooftop solar and air source heat pump assessments	23,110
Properties other than dwellings **[See reference** 179**]**	1,772
Total properties considered in the rooftop solar and air source heat pump assessments	26,398

Source: Melton LLPG Address data

Emission Factors

A.5 To determine the potential CO2 savings from the identified potential renewable resources, the identified potential electricity/heating output was multiplied by the emissions factors at present of the fuels the renewable energy generation would replace:

- Grid electricity: 0.133 kgCO2e/kWh **[See reference** 180**]**
- Mains gas: 0.210 kgCO2e/kWh **[See reference** 181**]**
- Heating oil: 0.298 kgCO2e/kWh **[See reference** 182**]**
- Wood fuel: 0.011 kgCO2e/kWh **[See reference** 183**]**

UK Capacity Factors

A.6 Regional capacity factors, where available, were used when calculating technical potential within Melton. Where unavailable, national DESNZ and RHI data on annual load factors were used when calculating technical potential

Table A.2: UK Renewable Capacity Factors

Technology	UK-level Capacity Factor
Anaerobic Digestion **[See reference** 184**]**	64.9%
Hydro **[See reference** 185**]**	38.2%
Micro CHP **[See reference** 186**]**	12.6%
Solar PV **[See reference** 187**]**	9.6%
Wind **[See reference** 188**]**	24.5%
Solar Water Heating **[See reference** 189**]**	4.5%
Air Source Heat Pumps **[See reference** 190**]**	18.4%
Ground Source Heat Pumps **[See reference** 191**]**	18.2%

Technology	UK-level Capacity Factor
Biomass (plant-based) **[See reference** 192**]**	56.7%
Sewage Sludge Digestion **[See reference** 193**]**	43.8%

Wind Resource Assessment Parameters

A.7 The potential wind development resource within Melton was assessed using a Geographical Information Systems (GIS) approach. This involved mapping a variety of technical and environmental parameters (see below) to identify parts of the Borough which are constrained with respect to wind development at various scales. The remaining land was then identified as having 'technical potential' **[See reference** 194**]** (subject to further site-specific assessment at application stage). The parameters of the GIS tool are set out in below.

A.8 The maximum theoretical wind generation capacity of the areas of technical potential was estimated using:

A.9 Standardised turbine densities and assumed turbine maximum generation capacities (the latter expressed in Megawatts (MW));

- One or more assumed capacity factors based on historic data broken down at least to regional level (using data from the Department for Business, Energy and Industrial Strategy (BEIS, now DESNZ) relating to Feed in Tariff (FiT) installations) **[See reference** 195**]**; and
- The assumption that, where land has technical potential for multiple turbine scales, the largest scale will be developed in preference to smaller scales.

Proposed assumptions to be used for assessment of technical potential for onshore wind – Constraints

Parameter: Wind Turbine Size

Assumption

- Five turbine sizes were considered:
  - Very large (150-220m tip height)
  - Large (100-150m tip height)
  - Medium (60-100m tip height)
  - Small (25-60m tip height)
  - Very small (<25m tip height)
- Assessment was based on notional turbine sizes, approximately intermediate within each class size:
  - Very large: 185m tip height, 4MW capacity
  - Large: 125m tip height, 2.5MW capacity
  - Medium: 80m tip height, 0.5MW capacity
  - Small: 45m tip height, 0.05MW capacity

Data source

- LUC
- Research into turbine manufacturers
- BEIS (now DESNZ) renewable energy planning database and other databases containing information on wind turbine applications.

Justification and notes

- 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 25m up to around 220m, with larger turbine models in demand from developers following the reduction in financial support from Government and driven by the manufacturers and trends from other European markets where turbines of this scale have been developed for some time **[See reference** 196**]**.
- 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.
- As this is a strategic scale study, notional turbine sizes, approximately intermediate within each class size, were used to represent each scale of turbine within this assessment.
- 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 reasonably apply to very small turbines. Equally, mapping a strategic Borough-wide 'resource' for very small turbines (which are generally developed individually in association with particular farm or other buildings) is not particularly meaningful. Instead, it is recommended that policy references the entire plan area as being potentially suitable for very small wind in principle (subject to site-specific assessment).

Parameter: Wind Speed

Assumption

- Exclude:

- All areas with mean annual average wind speed <5m/s at 50m above ground level (agl).

Data source

- Global Wind Atlas/Vortex
- Industry practice

Justification and notes

- 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.
- Future changes in government policy, such as the reintroduction of greater financial support for wind projects, 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.
- It is noted that none of the land within Melton borough is below this wind speed threshold and as such no land was excluded from consideration for wind potential based on wind speed.

Parameter: Roads

Assumption

- Exclude:
  - Roads (excl. restricted access tracks) with a buffer of the height of the turbine (to blade tip height) +10%.

Data source

- Ordnance Survey OpenRoads

Justification and notes

- These buffers were applied as a safety consideration. The proposed buffer distance is based on standard safety distances used by wind turbine developers and the DECC Renewable and Low-carbon Energy Capacity Methodology **[See reference** 197**]**.
- Restricted access tracks were excluded from consideration as these predominantly comprise of forestry and other tracks which could be more easily diverted than standards roads.

Parameter: Railways

Assumption

- Exclude:
  - Railways with a buffer of the height of the turbine (to blade tip height) +10%.

Data source

- Ordnance Survey OpenMap Local

Justification and notes

- This buffer was applied as a safety consideration, based on the same principles as used for roads.

Parameter: Electricity Lines

Assumption

- Exclude:
  - Major transmission lines (132kV minimum) with a buffer of the height of the turbine (to blade tip height) +10%.

Data source

- Ordnance Survey OpenMap Local
- National Grid

Justification and notes

- 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).
- It is noted that this guidance also states that a buffer of 3x the rotor diameter should be applied to account for turbine wake downwind of a turbine impacting the weathering of electricity lines. However, this also states that this impact is variable depending on factors including turbine positioning. This would require site-level study and consultation with the relevant DNO. As such, this buffer distance was not applied as a constraint.
- Further study would be required to make consideration of transmission lines operated by the local DNO National Grid (Formerly Western Power Distribution).

Parameter: Airports and Airfields

Assumption

- Exclude:
  - Operational airports and airfields.

Data source

- Ordnance Survey OpenMap Local Functional Site layer with the theme 'Air Transport'

Justification and notes

- OS OpenMap Local Functional Site data with the theme Air Transport was used in the assessment.
- It is noted that land within consultation zones surrounding airports and airfields may also be unsuitable for wind turbine development, and further consultation between potential developers and airport and airfields is required to determine if there is any impact from a proposed development.

Parameter: MOD Land

Assumption

- Exclude:
  - MOD land

Data source

- OpenStreetMap

Justification and notes

- MOD land was considered unsuitable for wind turbine development, as this land is already in use for MOD activities. Further consultation with the MOD would be required to determine if there is any potential for wind turbine development to be delivered on this land.
- Due to the sensitive nature of this data, these sites were included as constraints to development within the assessment, but were not individually mapped.

Parameter: Noise

Assumption

- Exclude:
  - Sensitive **[See reference** 198**]** and non-sensitive receptor **[See reference** 199**]** buffer zones based on turbine size:
    - Very large scale: 500m for residential/other sensitive receptors, 250m for non-residential.
    - Large scale: 480m for residential/other sensitive receptors, 230m for non-residential.
    - Medium scale: 400m for residential/other sensitive receptors, 180m for non-residential.
    - Small scale: 180m for residential/other sensitive receptors, 80m for non-residential.
- For properties outside (but close to) the authority boundary, indicative buffers were applied to the available property/buildings data from OS OpenMap. As this data does not distinguish commercial and residential properties, and it was not possible to verify uses by other means, non-residential buffers were used throughout.

Data source

- OS Addressbase
- OS OpenMap

Justification and notes

- 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 buffer for a noise level of 35dB LA90 for small-medium turbines and 38dB LA90 for large-very large turbines was used as the minimum limit applied to sensitive receptors in a typical rural location.
- The approach taken necessarily involves applying various assumptions, including:
  - An assumed single turbine development in all cases (rather than multiple turbines); and
  - The assumption that no properties will be 'financially involved' in the wind development or are located in an existing nosier area (financial involvement and existing elevated baseline noise levels 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.

- Note: Within the Authority, address points were buffered 5m to estimate building footprint. Moreover, due to lack of sufficient data, buildings outside of the Authority were assumed to be of non-sensitive use. This was to ensure that land was not unnecessarily ruled as being constrained to wind development, as a result of non-sensitive buildings being mistakenly assessed as being sensitive. It is noted further site-specific study would be required to determine the necessary buffer distance between specific buildings and proposed turbines.

Parameter: Buildings

Assumption

- Exclude:
  - Buildings with a buffer of the height of the turbine (to blade tip height) +10%.

Data source

- SOS OpenMap

Justification and notes

- National Planning Practice Guidance notes that the topple distance + 10% is a safe separation distance between turbines and buildings.

Parameter: Future Developments, Safeguarded Land and Employment Sites

Assumption

- Exclude:
  - Key employment sites (EC3 11 2016)
  - 5YHLS 2023
  - Local plan employment allocations

Data source

- Melton Borough Council

Justification and notes

- 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. It is assumed that opportunities for renewables within such sites will potentially be considered as part of their design.
- It is noted that developers would need to make consideration of other allocations, such as those within neighbourhood plans, as part of further site feasibility study.

Parameter: Existing Renewable Energy Developments

Assumption

- Exclude:

- Land boundaries of consented and operational renewable energy installations.

Data source

- Melton Borough Council
- BEIS (now DESNZ)
- Aerial imagery
- LUC windfarm database

Justification and notes

- The quarterly BEIS (DESNZ) Renewable Energy Planning Database, Melton Borough Council data and the LUC internal windfarm database was used to determine the locations of operational and consented renewable energy installations. To approximate the site boundary, land was excluded based on Melton Borough Council boundary data in combination with assessment of surrounding recent aerial imagery. For existing wind developments, it was assumed these were of notional medium scale tip height and occupied a 5 x 3 rotor diameter oval spacing **[See reference** 200**]**, with the major axis of the oval oriented towards the prevailing wind direction, taken to be south-west (see turbine spacing below).
- Existing roof-mounded solar PV developments are building-integrated and therefore were excluded via the consideration of existing built development as a constraint.
- Additionally, existing landfill gas developments were not considered a constraint to wind developments, as there is potential that turbines could be incorporated onto such existing sites.
- Existing battery developments were not included as, due to their small scale, their exact location within a site was difficult to identify. Moreover, there is potential for battery and turbine developments to also be co-located.

Parameter: Terrain

Assumption

- Exclude:
  - Slopes greater than 15%.

Data source

- OS Terrain 50

Justification and notes

- 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.

Parameter: Water Environment

Assumption

- Exclude:
  - Watercourses and waterbodies with a 50m buffer

Data source

- OS OpenMap Local

Justification and notes

- 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 OpenMap Local surface water area data includes waterways of approximately a minimum of 2m width. OpenMap Local surface water line data is line data, and so a 1m buffer was applied to approximate a footprint of smaller waterways contained within this dataset.

Parameter: Woodland

Assumption

- Exclude:
  - Ancient Woodland Inventory with a 50m buffer; and
  - Woodland as shown on the National Forest Inventory with a 50m buffer including:
    - Assumed woodland
    - Broadleaved
    - Conifer
    - Coppice
    - Coppice with standards
    - Low density
    - Mixed mainly broadleaved
    - Mixed mainly conifer
    - Young trees

Data source

- Forestry Commission
- Natural England

Justification and notes

- All areas of woodland were excluded with a +50m buffer to reduce risk of impact on bats.
- A 50m clearance distance of turbine blades from tree canopies and other habitat features is standard practice and endorsed by Natural England guidance set out in 'TIN051'. A 50m horizontal buffer from turbine masts is a reasonable proxy clearance for the purposes of a strategic study bearing in mind unknowns concerning tree height and turbine dimensions. In addition, 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. Further site specific study would therefore be required to accurately define buffer distances between turbines and adjacent woodland.
- The following National Forestry Inventory categories of woodland were considered non-permanent or non-woodland and therefore not excluded as wind turbine development may be suitable in these locations:
  - Cloud/shadow
  - Failed
  - Felled
  - Group prep
  - Shrub
  - Uncertain
  - Windblown

Parameter: Geological Designations

Assumption

- Exclude:
  - Regionally Important Geological Sites

Data source

- Melton Borough Council

Justification and notes

- As protected by:
  - Town and Country Planning Act 1990
  - Melton Local Plan
  - Locally Important Geological Site data not available for Melton

Parameter: Biodiversity (National Designations)

Assumption

- Exclude national designations:
  - Sites of Special Scientific Interest (SSSI)
  - National Nature Reserves (NNR)

Data source

- Natural England

- Melton Borough Council / Wildlife Trust

Justification and notes

- As protected by:
  - Wildlife and Countryside Act 1981
  - Conservation of Habitats and Species Regulations 2017 (as amended)

Parameter: Biodiversity (Regional and Local Designations)

Assumption

- Exclude other designations:
  - Local Wildlife Sites (LWS)

Data source

- Natural England
- Melton Borough Council

Justification and notes

- Generally, would not be suitable for renewables development based on law/policy/guidance including:
  - NPPF
  - Natural Environment and Rural Communities Act 2006
  - Melton Local Plan

- It is noted that further site-specific study would be required to consider non-designated features.
- Local Nature Reserves would also be considered constrains to solar development, however there are none located within the authority.

Parameter: Cultural Heritage

Assumption

- Exclude:
  - Registered Parks and Gardens
  - Scheduled Monuments
  - Listed Buildings
  - Conservation Areas

Data source

- Historic England
- Melton Borough Council

Justification and notes

- As protected by:
  - NPPF
  - National Heritage Act 1983
  - Ancient Monuments and Archaeological Areas Act of 1979
  - Planning (Listed Buildings and Conservation Areas) Act 1990
  - Melton Local Plan

- Registered Battlefields and World Heritage Sites (core sites) would also be considered constraints to wind development, however there are none located within the authority.
- It is noted that further site-specific study would be required to determine if any unexpected archaeological remains or non-designated but nationally or locally significant features, such as those identified within neighbourhood plans, are present that would require consideration, as well as the setting of historic features.
- Note: Listed building point data was buffered 5m to estimate building footprints where they did not intersect or have the same name as Melton Borough's listed building polygon data.

Parameter: Minimum Development Size

Assumption

- Unconstrained areas of land were excluded if they were below a minimum developable size of 40m width and an area that varied per turbine size:
  - Very large: 0.8ha
  - Large: 0.6ha
  - Medium: 0.4ha
  - Small: 0.2ha

Data source

- Not applicable

Justification and notes

- The minimum development size was based on developer knowledge of recent wind turbine developments, and accounts for the estimated land take requirements for a single turbine base, the adjacent laydown area and other immediate infrastructure requirements adjacent to the turbine itself.

- However, further site-specific study would be required in order to determine the land take requirements of individual turbines depending on factors such as their model and location.

Parameter: Turbine Spacing

Assumption

- The following standardised turbine densities were considered when determining the overall potential for turbine development across Melton:
- Very large: 4 per km2 (assuming a rotor diameter of 130m)
  - Large: 8 per km2 (assuming a rotor diameter of 90m)
  - Medium: 22 per km2 (assuming a rotor diameter of 55m)
  - Small: 167 per km2 (assuming a rotor diameter of 20m)

Data source

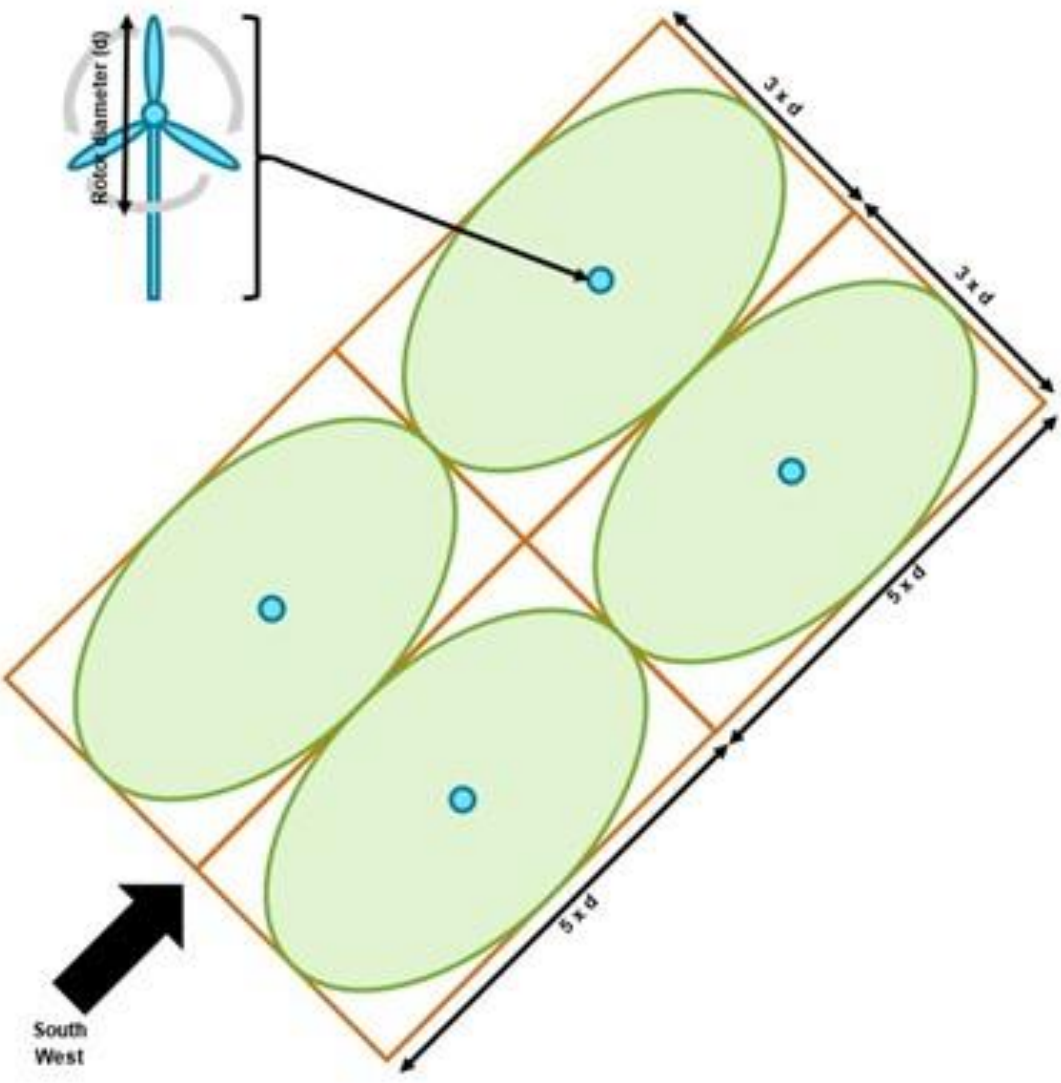
- Not applicable

Justification and notes

- The calculation of potential wind capacity involved applying an assumption concerning development density. In practice, turbines are spaced within developments based on varying multiples of the rotor diameter length. Although turbine separation distances vary, a 5 x 3 rotor diameter oval spacing , with the major axis of the oval oriented towards the prevailing wind direction, taken to be south-west as the ‘default’ assumption in the UK, was considered a reasonable general assumption at the present time in this respect. This is based on industry knowledge of recent developer applications. In practice, site-specific factors such as prevailing wind direction, turbine model and varying rotor diameters, and turbulence are taken into account by developers, in discussion with turbine manufacturers.

- Bearing in mind the strategic nature of the present study, the density calculation did not take into account the site shape, and a standardised rectangular grid density based on a 5 x 3 rotor diameter was used instead (see image below).

Figure A.1: Wind turbine spacing



Proposed assumptions to be used for assessment of technical potential for onshore wind – Constraints considered but not used

6.13 The parameters below have not been used to exclude land for the purposes of this study. This does not mean that these constraints are not present or do not require consideration on a specific site.

Parameter: Biodiversity

Assumption

- No land excluded on this basis.

Data source

- Natural England
- Wildlife Trust

Justification and notes

- The following designations would also be considered constraints however none are present within the study area:
  - Special Protection Area (SPA)
  - Special Areas of Conservation (SAC)
  - Ramsar sites
  - Potential SAC
  - Potential SPA

  - Proposed Ramsar sites
  - Local Nature Reserves
- Wildlife Trust reserve data was not available to use for this project. Further site-specific study would be required to consider these sites.

Parameter: Electricity Grid

Assumption

- No land excluded on this basis.

Data source

- National Grid (Formerly Western Power Distribution)

Justification and notes

- General commentary was provided on the current state of grid capacity within Melton to inform the assessment of deployment potential.
- However, as grid capacity is so variable with little certainty in advance of where there could be capacity for additional electricity generation to be connected, no land was excluded on this basis for the technical assessment. Further consultation would be required with National Grid (Formerly Western Power Distribution) to determine the feasibility to connect specific sites to the electricity grid. MBC is currently developing a Local Area Energy Plan which may be able to provide additional detail and should be considered by developers once finalised.
- Moreover, for larger wind turbine schemes, developers commonly deliver substations and additional grid infrastructure as required to support the additional generation capacity requirements of the development, limiting concerns regarding connecting to constrained parts of the existing grid.

Parameter: National Air Traffic Service (NATS) Safeguarding Areas

Assumption

- 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 1,100m 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 definitely exclude land as unsuitable. They are generally presented as separate figures alongside the main assessment of technical potential.

Data source

- National Air Traffic Service (NATS)

Justification and notes

- 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.

Parameter: Shadow Flicker

Assumption

- No land excluded on this basis.

Data source

- Not applicable

Justification and notes

- Wind turbines may in some circumstances cause 'shadow flicker' within nearby properties. However, shadow flicker effects can be readily mitigated and so shadow flicker was not considered as a constraint for the purposes of this study.

Parameter: Residential Amenity

Assumption

- No land excluded on this basis.

Data source

- Not applicable

Justification and notes

- It is noted that it may be inappropriate to develop wind turbines in proximity to residential properties, due to impacts upon residential amenity. However, due to the potential for micro siting, property aspect and potential for mitigation, it would require further site-specific study to determine whether wind turbines would be suitable in proximity to residential properties.

- Therefore, this factor would require consideration within a site specific residential and visual amenity assessment (RVAA).

Parameter: Public Rights of Way and Cycle Path

Assumption

- No land excluded on this basis.

Data source

- Melton Borough Council
- Sustrans

Justification and notes

- Public Rights of Way and cycle paths can be diverted if necessary to ensure they are safely distanced from wind turbines.
- Public Rights of Way and cycle paths were therefore not excluded.

Parameter: Blade oversail of biodiversity and cultural heritage designations

Assumption

- No land excluded on this basis.

Data source

- Not applicable

Justification and notes

- Depending on individual designated site characteristics, it may not be suitable for the blades of adjacent wind turbines to oversail the site. However, this is site dependent and would require further studies.
- As such, a blade oversail buffer was not excluded.

Ground-Mounted Solar Resource Assessment Parameters

A.10 Melton's technical potential for ground mounted solar PV development was assessed in a similar way to the potential for wind **[See reference** 201**]**. The key GIS tool parameters are set out below.

A.11 The maximum solar PV capacity of the area of technical potential was estimated using an assumed development density expressed as Megawatts (MW) per hectare; and regional capacity factor **[See reference** 202**]** (again, derived from historic data broken down to at least regional level).

A.12 As solar PV is essentially modular, the land with technical potential was not differentiated by project scale.

Proposed assumptions to be used for assessment of technical potential for commercial/ large scale ground-mounted solar – Constraints

Parameter: Development Size Categories

Assumption

- None

Data source

- Not applicable

Justification and notes

- Solar development is more 'modular' than wind (development size is dictated by the number of panels, which themselves do not differ greatly in size) and constraints are not affected by project scale in the way that they are for wind. Therefore, the identification of available land for ground-mounted solar has not been broken down into discrete project sizes but rather any land technically suitable for development has been identified.

Parameter: Roads

Assumption

- Exclude:
  - Roads

Data source

- Ordnance Survey OpenRoads

Justification and notes

- Physical features preventing the development of ground-mounted solar PV were excluded. There is no requirement for safety buffers in relation to these with respect to ground-mounted solar PV.
- Restricted access tracks were excluded from consideration as these predominantly comprise of forestry and other tracks which could be more easily diverted than standards roads.
- 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. This based it on professional judgment of what is the typical width of these roads.

Parameter: Railways

Assumption

- Exclude:
  - Railways

Data source

- Ordnance Survey OpenMap Local

Justification and notes

- Physical features preventing the development of ground-mounted solar PV were excluded. There is no requirement for safety buffers in relation to these with respect to ground-mounted solar PV.
- Note: In order to create a footprint from the railway centrelines data, it was assumed that railways were 15m in width. This based it on professional judgment of what is the typical width of railways.

Parameter: Planning/Land Use Other

Assumption

- Exclude:
  - Registered Common Land
  - Open Access Land
  - Country Parks
  - Local public green/open space, including:
    - Local draft open space
    - Local Green Spaces from Neighbourhood plans

Data source

- Natural England
- Melton Borough Council

Justification and notes

- Due to land take requirements, these land uses/types were considered generally to constrain ground-mounted 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.

- It is noted that further site-specific study would be required to determine if any additional open spaces, such as those identified within additional or emerging neighbourhood plans, are present that would require consideration.

Parameter: MOD Land

Assumption

- Exclude:
  - MOD land

Data source

- OpenStreetMap

Justification and notes

- MOD land was considered unsuitable for solar development, as this land is already in use for MOD activities. Further consultation with the MOD would be required to determine if there is any potential for solar development to be delivered on this land.
- Due to the sensitive nature of this data, these sites were included as constraints to development within the assessment, but were not individually mapped.

Parameter: Buildings

Assumption

- Exclude:
  - All buildings with a 10m buffer

Data source

- OS OpenMap Local data

Justification and notes

- Buildings were buffered by 10m to account for shading and impacts on solar output. It is noted that further site-specific study considering building heights and orientation in relation to the site would be required to determine the exact buffers required to account for shading.

Parameter: Future Developments, Safeguarded Land and Employment Sites

Assumption

- Exclude:
  - Housing Allocations
  - Key Employment Sites
  - Employment Allocations

Data source

- Melton Borough Council

Justification and notes

- 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. In addition, it is assumed that opportunities for renewables within such sites may potentially be considered as part of the master planning activities for the allocations.
- It is noted that developers would need to make consideration of other allocations, such as those within neighbourhood plans, as part of further site feasibility study.

Parameter: Existing Renewable Energy Developments

Assumption

- Exclude:
  - Land boundaries of consented and operational renewable energy installations.

Data source

- Melton Borough Council
- BEIS (now DESNZ)
- Aerial imagery
- LUC windfarm database

Justification and notes

- The quarterly BEIS (DESNZ) Renewable Energy Planning Database, Melton Borough Council data and the LUC internal windfarm database was used to determine the locations of operational and consented renewable energy installations. To approximate the site boundary, land was excluded based on Melton Borough Council boundary data in combination with assessment of surrounding recent aerial imagery. For existing wind developments, it was assumed these were of notional medium scale tip height and occupied a 5 x 3 rotor diameter oval spacing **[See reference** 203**]**, with the major axis of the oval oriented towards the prevailing wind direction, taken to be south-west (see turbine spacing below).
- Existing roof-mounded solar PV developments are building-integrated and therefore were excluded via the consideration of existing built development as a constraint.
- Additionally, existing landfill gas developments were not considered a constraint to wind developments, as there is potential that turbines could be incorporated onto such existing sites.
- Existing battery developments were not included as, due to their small scale, their exact location within a site was difficult to identify. Moreover, there is potential for battery and turbine developments to also be co-located.

Parameter: Terrain

Assumption

- Exclude:
  - Areas with north-east to north-west aspect and inclinations greater than 7 degrees; and
  - All areas with inclinations greater than 15 degrees.

Data source

- OS Terrain 50

Justification and notes

- Although it is possible to develop Ground-mounted 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 7°, as well as all other land with inclinations less than 15°, are considered potentially suitable **[See reference** 204**]**, as generation output will not be significantly affected.

Parameter: Agriculture Land Use

Assumption

- Exclude:
  - Agricultural land use classifications grades 1 and 2.

Data source

- Natural England
- Melton Borough Council

Justification and notes

- Agricultural Land Use is a consideration, with grades 1, 2 and 3a land being classed as “the best and more versatile (BMV)” land and 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.

- However, solar developments can be built on BMV land, if they have been deemed to pass the sequential test, whereby sites on lower grade a non-agricultural land are prioritised over BNM land.
- Within Melton, the majority of land is grades 3 agricultural land.
- As such, grade 1 (excellent quality) and grade 2 (very good quality) agricultural land were treated as a constraint to solar development, and further site-specific study would be required to determine if sites on lower grade BMV would be suitable based on the sequential text. Grade 3 land was also mapped for information to indicate where developers would need to make further consideration of this land and determine whether this is Grade 3a or Grade 3b.

Parameter: Water Environment

Assumption

- Exclude:
  - Watercourses and waterbodies with a 50m buffer

Data source

- OS OpenMap Local

Justification and notes

- 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 OpenMap Local surface water area data includes waterways of approximately a minimum of 2m width. OpenMap Local surface water line

data is line data, and so a 1m buffer was applied to approximate a footprint of smaller waterways contained within this dataset.

Parameter: Woodland

Assumption

- Exclude:
  - Ancient Woodland Inventory with a 20m buffer
  - Woodland as shown on the National Forest Inventory with a 20m buffer including:
    - Assumed woodland
    - Broadleaved
    - Conifer
    - Coppice
    - Coppice with standards
    - Failed
    - Felled
    - Group prep
    - Low density
    - Mixed mainly broadleaved
    - Mixed mainly conifer
    - Shrub
    - Young trees

Data source

- Forestry Commission
- Natural England

Justification and notes

- Forested areas were buffered by 20m to account for shading and impacts on solar output. It is noted that further site-specific study considering woodland heights and orientation in relation to the site would be required to determine the exact buffers required to account for shading.
- The following National Forestry Inventory categories of woodland were considered non-permanent or non-woodland and therefore not excluded as wind turbine development may be suitable in these locations:
  - Cloud/shadow
  - Uncertain
  - Windblown

Parameter: Geological Designations

Assumption

- Exclude:
  - Regionally Important Geological Sites

Data source

- Melton Borough Council

Justification and notes

- As protected by:
  - Town and Country Planning Act 1990
  - Melton Local Plan

Parameter: Biodiversity (National Designations)

Assumption

- Exclude national designations:
  - Sites of Special Scientific Interest (SSSI)
  - National Nature Reserves (NNR)

Data source

- Natural England

Justification and notes

- As protected by:
  - Wildlife and Countryside Act 1981
  - Conservation of Habitats and Species Regulations 2017 (as amended)

Parameter: Biodiversity (Regional and Local Designations)

Assumption

- Exclude other designations:
  - Local Wildlife Sites (LWS)

Data source

- Natural England
- Melton Borough Council
- Wildlife Trust

Justification and notes

- Generally, would not be suitable for renewables development based on law/policy/guidance including:
  - NPPF
  - Natural Environment and Rural Communities Act 2006
  - Melton Local Plan
- It is noted that further site-specific study would be required to consider non-designated features.
- Local Nature Reserves would also be considered constrains to solar development, however there are none located within the authority.

Parameter: Cultural Heritage

Assumption

- Exclude:
  - Registered Parks and Gardens
  - Scheduled Monuments
  - Listed Buildings
  - Conservation Areas

Data source

- Historic England
- Melton Borough Council

Justification and notes

- As protected by:
  - NPPF
  - National Heritage Act 1983
  - Ancient Monuments and Archaeological Areas Act of 1979
  - Planning (Listed Buildings and Conservation Areas) Act 1990
  - Melton Local Plan
- Registered Battlefields and World Heritage Sites (core sites) would also be considered constraints to wind development, however there are none located within the authority.
- It is noted that further site-specific study would be required to determine if any unexpected archaeological remains or non-designated but nationally or locally significant features, such as those identified within neighbourhood

plans, are present that would require consideration, as well as the setting of historic features.

- Note: Listed building point data was buffered 5m to estimate building footprints where they did not intersect or have the same name as Melton Borough's listed building polygon data.

Parameter: Minimum Development Size

Assumption

- Unconstrained areas of land were excluded if they were below a minimum developable size of 0.6ha.

Data source

- Not applicable

Justification and notes

- A minimum development size of 0.6ha (0.5MW) was set in agreement with Melton Borough Council.

Parameter: Development Density

Assumption

- 1.2 hectares per MW

Data source

- Not applicable

Justification and notes

- The Draft National Policy Statement for Renewable Energy Infrastructure (EN-3) states that, along with associated infrastructure, generally a solar farm requires between 2 to 4 acres for each MW of output. This equates to 0.8-1.6ha per MW. For this study, the average of 1.2ha per MW was used.
- It its noted that on sites where solar farms are co-located with wind turbines, the value of MW per ha may increase as infrastructure may be able to be shared between the technologies.

Proposed assumptions to be used for assessment of technical potential for commercial/large scale ground-mounted solar – Constraints considered but not used

A.13 The parameters below have not been used for the purposes of this study. This does not mean that these constraints are not present or do not require consideration on a specific site.

Parameter: Biodiversity

Assumption

- No land excluded on this basis

Data source

- Natural England
- Wildlife Trust

Justification and notes

- The following designations would also be considered constraints however none are present within the study area:
  - Special Protection Area (SPA)
  - Special Areas of Conservation (SAC)
  - Ramsar sites
  - Potential SAC
  - Potential SPA
  - Proposed Ramsar sites
  - Local Nature Reserves
- Wildlife Trust reserve data was not available to use for this project. Further site-specific study would be required to consider these sites.

Parameter: Operational and allocated minerals and waste sites

Assumption

- No land excluded on this basis

Data source

- Leicestershire County Council

Justification and notes

- 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 will frequently be quite highly constrained with respect to ground-mounted solar development (such as areas of active landfill) but landfill sites equally may present opportunities in some circumstances, particularly when they are to be decommissioned/restored during a plan period. Waste sites would therefore be excluded from the identified ground-mounted solar resource but potentially subject to bespoke policy wording in the local plan.
- As such, all operational and allocated minerals sites with a 250m buffer, and all operation and allocated waste sites would be considered constraints. However, data for these sites was not available for this project. Further site specific study would be required to consider these sites.

Parameter: Solar Irradiance

Assumption

- No land excluded on this basis.

Data source

- Global Solar Atlas

Justification and notes

- Using modern solar panel technology, the vast majority of land within England is deemed suitable for solar panel development in terms of solar irradiance. Any land unsuitable due to slope and aspect which limit the total hours of direct daily sunlight within a location, were excluded from consideration as based on the above constraints table.
- Therefore, no land was excluded from this assessment based on this, and solar irradiance levels they were mapped for information only to indicate where the more productive sites may be located.

Parameter: Electricity Grid

Assumption

- No land excluded on this basis.

Data source

- National Grid (Formerly Western Power Distribution)

Justification and notes

- Grid connection is a key consideration for solar developments, as additional grid connections costs, such as long cable distances and additional substation requirements, can significantly hinder the economic viability of this technology.
- General commentary was provided on the current state of grid capacity within Melton to inform the assessment of deployment potential.
- However, as grid capacity is so variable with little certainty in advance of where there could be capacity for additional electricity generation to be connected, no land was excluded on this basis for the technical assessment. Further consultation would be required with National Grid (Formerly Western Power Distribution) to determine the feasibility to connect specific sites to the electricity grid. In addition, MBC is currently developing a Local Area Energy Plan which may be able to provide additional detail and should be considered by developers once finalised.

Parameter: Gas Pipelines

Assumption

- No land excluded on this basis

Data source

- National Grid

Justification and notes

- Although the presence of buried pipelines could impact the suitability of overlaying above-ground solar panels, mitigation and panel layout design can be applied to limit impacts.
- There are no national grid gas pipelines within the study area.
- It is noted that only National Grid open data was available for use within this study. Further site-specific study would be required to consider any other buried pipelines not contained within this dataset.

Parameter: Electricity Lines

Assumption

- No land excluded on this basis

Data source

- Ordnance Survey OpenMap
- National Grid
- National Grid (Formerly Western Power Distribution)

Justification and notes

- Although overhead lines have the potential to cause some limited shading of solar panels, and thereby impact on potential PV generation potential, panel layout design can limit impacts. Further site-specific study would be required to consider this parameter.

- As such, no land was excluded on this basis.

Parameter: Residential Amenity

Assumption

- No land excluded on this basis

Data source

- Not applicable

Justification and notes

- It is noted that it may be inappropriate to develop solar farms in proximity to residential properties, due to impacts upon residential amenity. However, due to the potential for micro siting, property aspect and potential for mitigation, it would require further site-specific study to determine whether solar developments would be suitable in proximity to residential properties.
- Therefore, no land was excluded on this basis from the technical assessment.

Parameter: Public Rights of Way/ Cycle Paths

Assumption

- No land excluded on this basis

Data source

- Melton Borough Council

- DEFRA
- Sustrans

Justification and notes

- Public Rights of Way and cycle paths can be diverted if necessary, around or safely through ground mounted solar developments, and these impacts are considered as part of the assumed development density.
- Public Rights of Way and cycle paths were therefore not excluded.

Parameter: Airports and Airfields

Assumption

- No land excluded on this basis

Data source

- Ordnance Survey OpenMap Local Functional Site layer with the theme 'Air Transport'
- Aerial imagery

Justification and notes

- Glint and glare caused by solar panels is a consideration for aviation safety. However, this is site dependent and scheme design can enable solar developments to be situated within airports and airfields themselves. As such, only the airport and airfield buildings and hardstanding should be treated as constraints to solar development.
- Although airport buildings were treated as constraints to solar development, considered under "Buildings", no spatial data was available to map runways

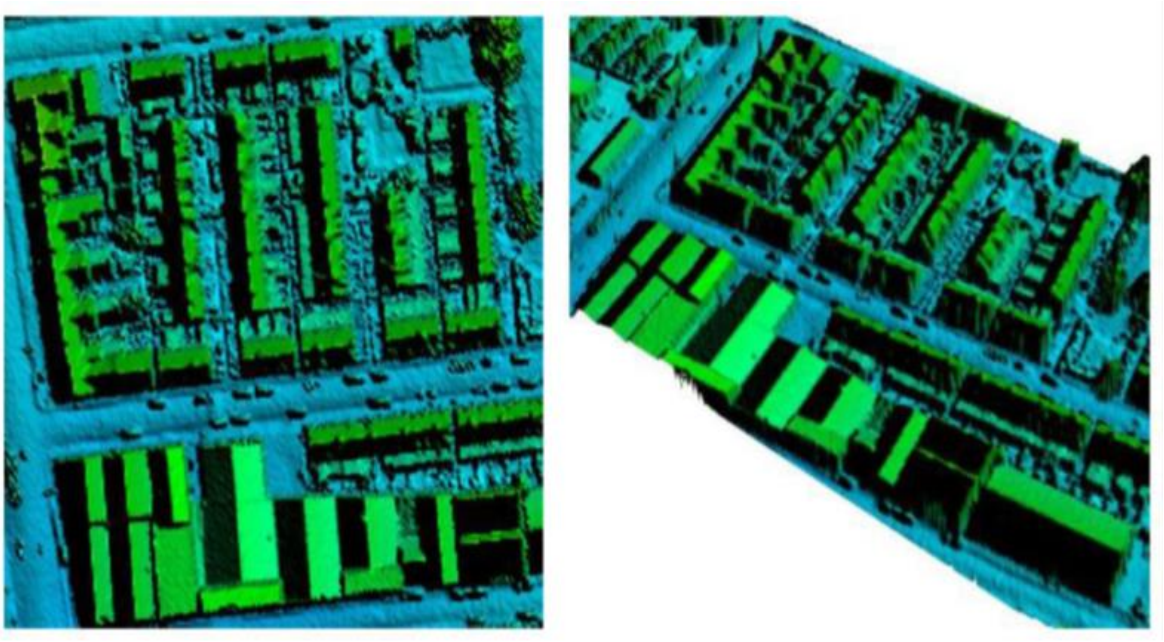
and in-use airport hardstanding. Therefore, further site-specific study would be required to consider these.

Rooftop Solar Resource Assessment: Solar PV

A.14 Geospatial Insight undertook the assessment of roof-mounted solar resource potential.

A.15 To establish individual property level solar suitability and potential, Geospatial Insight utilised a Digital Surface Model (DSM) alongside a building footprint dataset collated and conflated by Geospatial Insight from multiple Open Data sources. The DSM is a high-resolution surface model produced using airborne LiDAR or photogrammetric stereo aerial photography. The DSM provides a digital model or 3D representation of a terrain's surface and all above ground features, including buildings and trees (see Figure A.2).

Figure A.2: Example of DSM



A.16 Automated interrogation of the DSM data within each building footprint (representative of the roof area) was undertaken to determine which roofs are potentially suitable for solar by identifying the roof pitch, aspect, and useable area. Geospatial Insight used 'standard' values, where flat roofs and roofs with a pitch of between 5° and 50°, and within a 90° to 270° aspect (through south) were deemed suitable. Roofs outside of these values were deemed unsuitable, but the building footprints are still retained in the output database.

A.17 The DSM data was additionally modelled in PV.GIS, a solar irradiance calculation tool that uses the pitch, aspect, and location of a surface to estimate average annual irradiance exposure based on real world historic values (see Figure A.3, where 'white' areas have the highest irradiance).

Figure A.3: Example of irradiance

A.18 Using roof pitch, aspect, area, and irradiance details Geospatial Insight further established the potential array size, install costs, onsite energy savings, export revenue, and CO_2 savings for each building over both a 1-year period and a 20 year 'lifetime'.

A.19 The results are drawn from national analysis completed by Geospatial Insight, which uses a different CO2 factor than the wind and ground-mounted solar assessments. The processing parameters are detailed below:

- Export Rate Inflation (RPI): 3.1% Per Annum
- Energy Price Inflation: 3% Per Annum
- Drop in System Performance: 0.8% Per Annum
- System Size: 450W
- System Cost:
  - Residential £1,600
  - Commercial: £1,500 - £ 950 (Depending on kW)
- Imported Electricity Cost: 24.5 Pence Per kWh (estimated for 2022) **[See reference** 205**]**
- Percentage of Self Consumption: 40%
- Percentage of Export: 60%
- System Efficiency: 21%
- Life Span: 20 Years
- Exported Electricity Rate: 3.5 Pence Per kWh **[See reference** 206**]**
- CO2 Factor: 0. 207074kg CO2e Per kWh for UK electricity (June 2023) **[See reference** 207**]**

A.20 Using Historic England and Melton Borough Council's data, conservation areas, scheduled monuments and listed buildings **[See reference** 208**]** were considered as secondary constraints to solar rooftop development. This is because installations on listed buildings, or on buildings in designated areas (such as on the site of a scheduled monument or in a conservation area) are restricted in certain situations and may require planning consent. As such, developments in such locations may be more difficult to deploy.

A.21 It is noted that further study would be required to consider other constraints to rooftop solar development, such as:

- Roof surface material/construction;
- Roof structure and loading capacity;
- Protected species – bat roosts;
- Protected species – bird nests; and
- Grid connection (for larger developments).

Rooftop Solar Resource Assessment: Solar Water Heating

A.22 The total potential capacity of roof mounted solar water heating was estimated based on typical system sizes and the estimated percentage of suitable roof space within the study area. It is noted that roofs that have potential to deliver solar PV also have the potential to deliver solar water heating generation. However, this was treated as being mutually exclusive with solar PV potential, meaning the same roof space can only be utilised for one of the technologies. Generation potential was therefore calculated for each technology for separate comparison.

Solar water heating resource assessment assumptions

Parameter: System Size

Assumption

- Average size of system based on property type:

- Domestic: 2.8kW
- Non-domestic: 18.83kW

Data source

- BEIS (now DESNZ)

Justification and notes

- Average sizes for solar water heating systems obtained from RHI deployment data **[See reference** 209**]**. Due to lack of appropriate data on typical system sizes and suitability of roofs, dwellings classed as 'flats', 'in part of a converted or shared house (including bedsits)' and those classed as 'other dwellings' were not included within the assessment.

Parameter: Suitable Roofs

Assumption

- See above – the same as for roof-mounted solar PV

Data source

- See above – the same as for roof-mounted solar PV

Justification and notes

- See above – the same as for roof-mounted solar PV

Parameter: Heating Fuel Offset

Assumption

- Heating fuel assumed to be offset:
  - Electricity: 45% of off-gas properties **[See reference** 210**]**
  - Oil: 55% of off-gas properties **[See reference** 211**]**
  - Gas: All on-gas properties

Data source

- BEIS (now DESNZ)

Justification and notes

- None

Hydropower

A.23 It has not been possible within the scope of this study to undertake a new assessment of the potential hydropower resource within Melton.

A.24 However, in 2010 the Environment Agency published the findings of a study identifying hydropower opportunities within England and Wales. This was produced to provide an overview at national and regional scales of the potential hydropower opportunities available, as well as the relative environmental sensitivity of identified potential sites to development. These findings will be reviewed as part of this study. It is noted that this data is indicative and that further site specific study would be required in order to determine the technical potential and suitability of sites for hydropower developments.

A.25 The study included identifying 'heavily modified water bodies' that are identified as being at significant risk of failing to achieve good ecological status because of modifications to their hydromorphological characteristics resulting from past engineering works, including impounding works. Due to these characteristics, such waterbodies were identified as having the potential to create hydropower barriers that would also be beneficial to the passage of fish upstream. These were overlayed with identified locations where suitable yearly flow characteristics are present and could feasibly support hydropower sites. The resultant identified sites were classified as 'win-win' opportunities where hydropower developments could potentially be installed whilst also improving the ecological status of waterways.

Heat Pumps

Air Source Heat Pump resource assessment assumptions

A.26 Almost any building theoretically has the potential for an air source heat pump to be installed. Therefore, the assessment considered the potential for air source heat pumps to be delivered in all buildings.

Parameter: System Size

Assumption

- Average size of system based on property type:
  - Domestic: 10.20kW
  - Non-domestic: 46.52kW

Data source

- BEIS (now DESNZ)
- OS Addressbase
- OS OpenMap

Justification and notes

- Average sizes for air source heat pump systems obtained from RHI deployment data **[See reference** 212**]**.
- Due to lack of appropriate data on typical system sizes and suitability of individual properties, dwellings classed as ‘flats’ and those classed as ‘other dwellings’ were not included within the assessment.

Parameter: Heating Fuel Offset

Assumption

- SPF: 3.6 (efficiency of 72%)
- Heating fuel assumed to be offset:
  - Electricity: 45% of off-gas properties **[See reference** 213**]**
  - Oil: 55% of off-gas properties **[See reference** 214**]**
  - Gas: All on-gas properties

Data source

- BEIS (now DESNZ)

Justification and notes

- SPF derived from BEIS Renewable Heat Incentive data: 3.6 **[See reference** 215**]**. For every 3.6kW of heat generated, offsetting CO2 from the existing heating fuel (gas/oil/electricity), 1kW of energy is consumed, contributing to CO2 generated by consuming electricity.

Ground Source Heat Pumps

A.27 Ground source heat pumps require more space than air source, requiring pipes to be buried vertically in a deeper system or horizontally in a shallow wider system. Due to these significant space constraints, this study did not estimate the potential capacity of ground source heat pumps across the study area, as it was not possible to estimate how many properties have access to the required space.

A.28 It is noted however that the average system size of domestic pumps is 15kW in the UK **[See reference** 216**]**.

Open Loop Ground Source Heat Pumps

A.29 The British Geological Survey has produced a map identifying the potential viability of open-loop ground source heat pumps across England and Wales, considering hydrogeological and economic factors **[See reference** 217**]**. This was reviewed as part of this study.

A.30 However, the British Geological Survey states that this is an initial screening assessment only and that identified areas favourable for open-loop systems are not automatically suitable for this technology to be installed. Instead, detailed environmental assessment of proposed sites would be required, considering local variations in environmental conditions and factors such as the availability of water (meaning the amount of water that is available for licensing by the Environment Agency) and discharge of water from a scheme **[See reference** 218**]**. Therefore, with the data available, it is not possible to determine the potential annual energy generation and carbon savings that could be produced by open loop ground source heat pumps within Melton.

Water-Source Heat Pump

A.31 The DECC 2014 water source heat map identified, at a high level, opportunities for water source heat pump technologies **[See reference** 219**]**. This was reviewed as part of this study.

Biomass Resource Assessment

Virgin Woodfuel Thermal Conversion: Forestry and Woodland – proposed assumptions

A.32 To determine the potential for biomass generation from forestry and woodland, it was assumed that all woodland within the study area has a sustainable yield of two odt/yr (oven-dried tonnes/ha/year) **[See reference** 220**]** and assumptions were applied. Both the potential for heating and for combined heat and power were calculated.

A.33 To identify existing suitable woodland within the study area, the Forestry Commission's National Forest Inventory (NFI) was used. The NFI records the location and extent of all forests and woodland above 0.5ha across the UK and it is noted that although a sample of forests and woodland are ground surveyed every 5 years, the inventory is updated annually using aerial photography, interpretation of satellite imagery and administrative records of newly planted areas covered by government grant schemes **[See reference** 221**]**. Therefore, there can be occasional errors due to misidentification of sites not ground-surveyed.

A.34 To calculate the total capacity of the resource in MW from the annual generation potential in MWh, a national capacity factor was applied, as based on national data for plant-sourced biomass **[See reference 222]**.

A.35 The proposed assumptions to be used for assessment of technical potential for virgin woodfuel thermal conversion for forestry and woodland are detailed below.

Parameter: Woodland Resource

Assumption

- The following National Forestry Inventory (NFI) woodland categories within the study area were included:
  - Broadleaved
  - Conifer
  - Coppice
  - Coppice with standards
  - Assumed woodland
  - Mixed mainly conifer
  - Mixed mainly broadleaved
- Energy generation per hectare per year: 10.3 MWh/ha/year

Data source

- Forestry Commission

Justification and notes

- These woodland categories were included as they were assumed to be mature and able to provide a sustainable yield of woodfuel.
- The following woodland categories were not included as they were assumed to currently be unable to provide a sustainable yield of woodfuel:
  - Cloud\shadow
  - Failed
  - Felled
  - Ground prep
  - Low density
  - Shrub
  - Uncertain
  - Windblow
  - Young trees
- The non-woodland categories within the NFI were also not assessed as they do not provide woodfuel.
- The assumed energy generation per hectare per year is derived from Forestry Commission data **[See reference** 223**]**.

Parameter: Constraints

Assumption

- The following constrained areas of woodland were excluded from the assessment:
  - Ancient woodland
  - Sites of Special Scientific Interest

  - National Nature Reserves
  - Local Wildlife Sites (LWS)
  - Registered Parks and Gardens
  - Scheduled Monuments
  - Listed Buildings
  - Conservation Areas
  - Future developments, safeguarded land and employment sites
  - MOD Land

Data source

- Natural England
- Historic England
- Melton Borough Council
- OpenStreetMap

Justification and notes

- As protected by:
  - Conservation of Habitats and Species Regulations 2017 (as amended)
  - Wildlife and Countryside Act 1981
  - Conservation of Habitats and Species Regulations 2017 (as amended)
  - NPPF
  - Natural Environment and Rural Communities Act 2006
- The following designations would also be considered constraints however none are present within the study area:
  - Special Protection Areas (SPA)

- Special Areas of Conservation (SAC)
- Ramsar sites
- Potential SAC
- Potential SPA
- Proposed Ramsar sites
- Local Nature Reserves
- Registered Battlefields
- World Heritage Sites (core sites)

- It is noted that further site-specific study would be required to make consideration of non-designated biodiversity and cultural heritage features.

Parameter: Heating Fuel Offset: Heating Only

Assumption

- Boiler efficiency assumed to be 77% **[See reference** 224**]**
- Heating fuel assumed to be offset:
  - Electricity: 45% of off-gas properties **[See reference** 225**]**
  - Oil: 55% of off-gas properties **[See reference** 226**]**
  - Gas: All on-gas properties

Data source

- BEIS (now DESNZ)

Justification and notes

- Biomass boiler efficiency derived from research by BEIS (DESNZ) **[See reference** 227**]**.

Parameter: Combined Heat and Power (CHP)

Assumption

- CHP efficiency:
  - Electricity: 30%
  - Heating: 50%
- Heating fuel assumed to be offset:
  - Electricity: 45% of off-gas properties **[See reference** 228**]**
  - Oil: 55% of off-gas properties **[See reference** 229**]**
  - Gas: All on-gas properties

Data source

- Centre for Sustainable Energy

Justification and notes

- Average CHP efficiencies estimated from prior research undertaken by CSE **[See reference** 230**]**.

Virgin Woodfuel Thermal Conversion: Energy Crops – proposed assumptions

A.36 To determine the potential for biomass generation via thermal conversion (burning within a boiler) from the two main woodfuel energy crops Miscanthus and Short Rotation Coppice (SRC), the below assumptions were applied. Both the potential for heating and for combined heat and power were calculated.

A.37 To calculate the total capacity of the resource in MW from the annual generation potential in MWh, a national capacity factor was applied, as based on national data for plant-sourced biomass **[See reference** 231**]**.

Parameter: Energy Crop Resource

Assumption

- Yields:
  - Miscanthus: 13 odt/ha/year
  - SRC: 9 odt/ha/year
- Ratio of crops per hectare:
  - Miscanthus: 80%
  - SRC: 20%
- Energy generation per hectare per year:
  - Miscanthus: 63 MWh/ha/year
  - SRC: 46 MWh/ha/year

Data source

- Forestry Commission

Justification and notes

- Miscanthus and SRC yields and assumed energy generation per hectare per year was derived from Forestry Commission data **[See reference** 232**]**.
- The average proportion of miscanthus and SRC grown in the UK was derived from Defra data **[See reference** 233**]**. The analysis assumed that of the land identified as suitable for energy crops, 4ha of Miscanthus would be delivered for every 1ha of SRC.

Parameter: Constraints

Assumption

- Agricultural land constraints for miscanthus:
  - Grade 1
  - Grade 2
  - Grade 5
  - Non-agricultural land
- Agricultural land constraints for SRC:
  - Grade 1
  - Grade 2
  - Non-agricultural land
- Physical constraints:
  - Roads
  - Railways
  - Common Land
  - Country parks
  - Local public green/open space

  - Buildings
  - Airports and airfields
  - MOD land
  - Future developments, safeguarded land and employment sites
  - Existing solar farms
  - Watercourses and waterbodies
  - Woodland and ancient woodland
- Natural heritage constraints:
  - Sites of Special Scientific Interest
  - National Nature Reserves
  - Local Wildlife Sites (LWS)
- Cultural heritage constraints:
  - Registered Parks and Gardens
  - Scheduled monuments
  - Listed Buildings
  - Conservation Areas

Data source

- Aerial imagery
- BEIS (now DESNZ)
- Forestry Commission
- Natural England
- Ordnance Survey OpenRivers
- Ordnance Survey OpenMap
- Ordnance Survey OpenRoads

- Melton Borough Council

Justification and notes

- The NNFCC energy crops report produced for DECC indicates that miscanthus planting should be restricted to good and moderate quality (Grade 3) and poor quality (Grade 4) agricultural land and that SRC can grow on this land as well as very poor (Grade 5) land **[See reference** 234**]**.
- Excellent quality (Grade 1) and very good quality (Grade 2) agricultural land has the potential to deliver the highest crop yields and as such it was assumed that food crops would be prioritised above energy crops on this land.
- Physical features preventing the planting of energy crops were excluded. With regards to existing renewable energy developments, only existing ground-mounted solar farms were excluded as their land take prevents crop planting. Wind turbines have a far smaller land-take and crops could in theory be planted beneath and surrounding turbines within a wind farm.
- In addition, designated sites were also excluded, as protected by:
  - Conservation of Habitats and Species Regulations 2017 (as amended)
  - Wildlife and Countryside Act 1981
  - Conservation of Habitats and Species Regulations 2017 (as amended)
  - NPPF
  - Natural Environment and Rural Communities Act 2006
  - 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
- It is noted that further site-specific study would be required to consider non-designated biodiversity and cultural heritage features.

- The following designations would also be considered constraints however none are present within the study area:
  - Special Protection Areas (SPA)
  - Special Areas of Conservation (SAC)
  - Ramsar sites
  - Potential SAC
  - Potential SPA
  - Proposed Ramsar sites
  - Local Nature Reserves
  - Registered Battlefields
  - World Heritage Sites (core sites)
- 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. In order to create a footprint from the railway centrelines data, it was assumed that railways were 15m in width. Listed building point data was buffered 5m to estimate building footprints.

Parameter: Heating Fuel Offset – Heating Only

Assumption

- Boiler efficiency assumed to be 77% **[See reference** 235**]**
- Heating fuel assumed to be offset:
  - Electricity: 45% of off-gas properties **[See reference** 236**]**
  - Oil: 55% of off-gas properties **[See reference** 237**]**
- Gas: All on-gas properties

Data source

- BEIS (now DESNZ)

Justification and notes

- Biomass boiler efficiency derived from research by BEIS (DESNZ) **[See reference** 238**]**.

Parameter: Fuel Offset – Combined Heat and Power (CHP)

Assumption

- CHP efficiency:
  - Electricity: 30%
  - Heating: 50%
- Heating fuel assumed to be offset:
  - Electricity: 45% of off-gas properties **[See reference** 239**]**
  - Oil: 55% of off-gas properties **[See reference** 240**]**
  - Gas: All on-gas properties

Data source

- Centre for Sustainable Energy

Justification and notes

- Average CHP efficiencies estimated from prior research undertaken by CSE **[See reference** 241**]**.

Biogas from Agricultural Residues – slurry resource assessment assumptions

A.38 As Melton is predominantly rural, agricultural waste is 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 2024 **[See reference** 242**]** and resulting slurry and biogas yields, an estimate has been made of the potential emissions savings.

A.39 To calculate the total capacity of the resource in MW from the annual generation potential in MWh, a capacity factor was applied, as based on national data for animal-sourced biomass **[See reference** 243**]**.

Parameter: Slurry Resource

Assumption

- Number of animals required to produce 1 tonne of slurry per day:
  - Cattle: 30
  - Pigs: 275
  - Poultry: 10,500
- Biogas yield:
  - Cattle: 20m3/tonne
  - Pigs: 20m3/tonne
  - Poultry: 65m3/tonne
- Energy content of biogas:
  - 6.7kWh per m3

Data source

- Shared Practice
- The Andersons Centre

Justification and notes

- The number of animals required to produce 1 tonne of slurry per day was derived from the average of the figure brackets provided in the Shared Practice Anaerobic Digestion Good Practice Guidelines **[See reference** 244**]**:
  - Cattle: 20-40
  - Pigs: 250-300
  - Poultry:
    - Laying hen litter: 8,000-9,000
    - Broiler manure: 10,000-15,000
- Biogas yields derived from the average of the figure brackets provided in The Andersons Centre data **[See reference** 245**]**:
  - Cattle: 15-25 m3/tonne
  - Pigs: 15-25 m3/tonne
  - Poultry: 30-100 m3/tonne
- Energy content of biogas also derived from The Andersons Centre data.

Parameter: Heating and Electricity Fuel Offset

Assumption

- CHP efficiency **[See reference** 246**]**:
  - Electricity: 30%

- Heating: 50%

- Heating fuel assumed to be offset:
  - Electricity: 45% of off-gas properties **[See reference** 247**]**
  - Oil: 55% of off-gas properties **[See reference** 248**]**
  - Gas: All on-gas properties

Data source

- The Andersons Centre

Justification and notes

- CHP plant efficiency derived from The Andersons Centre data **[See reference** 249**]**.

Energy from Waste

A.40 A.39 Any data the council holds on Melton Borough waste streams, such as municipal and commercial solid waste, recycled wood waste or food waste, was used to assess the technical potential of energy generation from waste.

Appendix B
Wind Maps

Climate Change Study
Melton Borough Council

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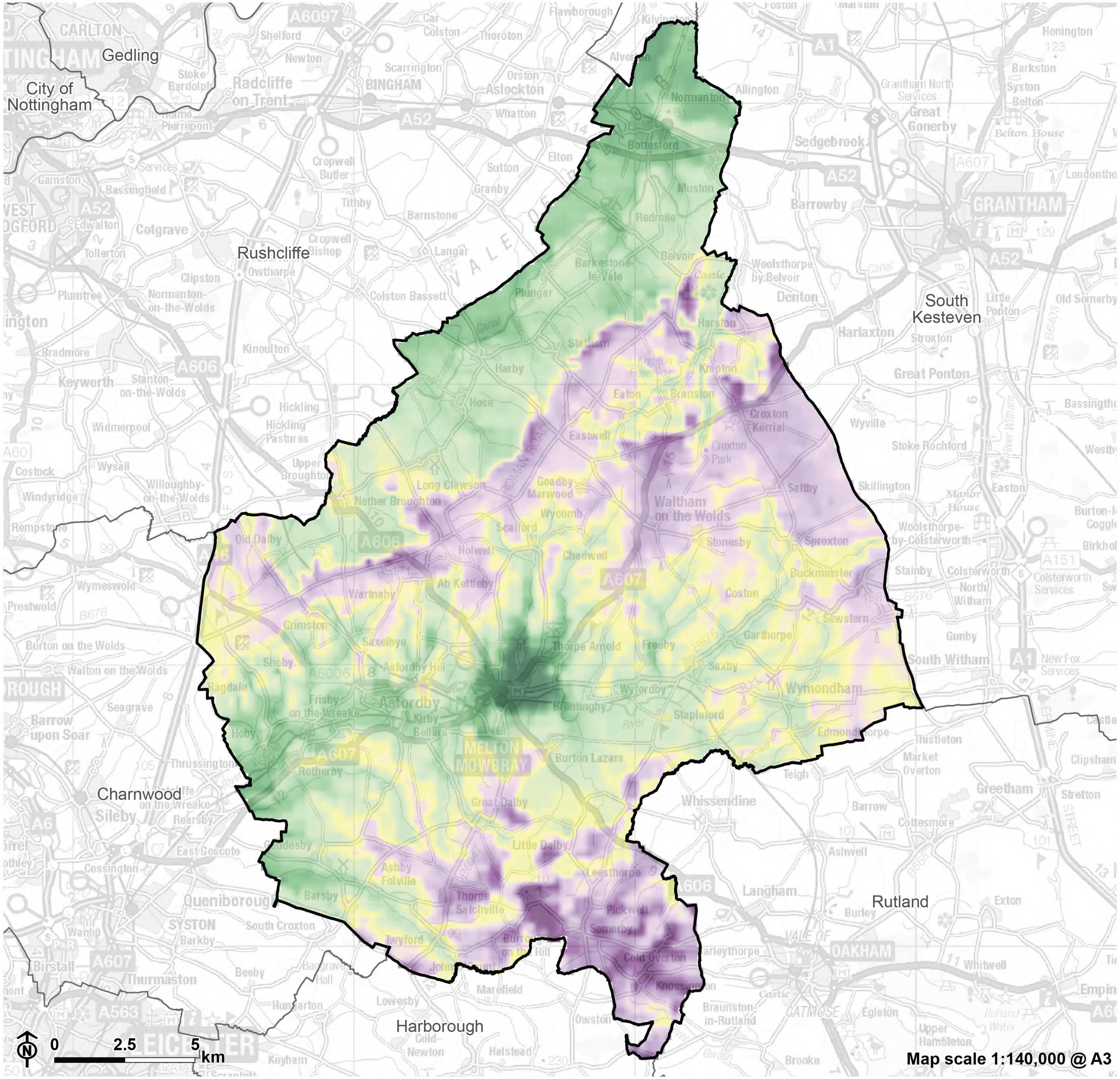
Figure B1: Wind Constraints - wind speed at 50m above ground level



Melton Borough

Neighbouring local authority

Wind speed at 50m above ground level

8.6 m/s

6.3 m/s

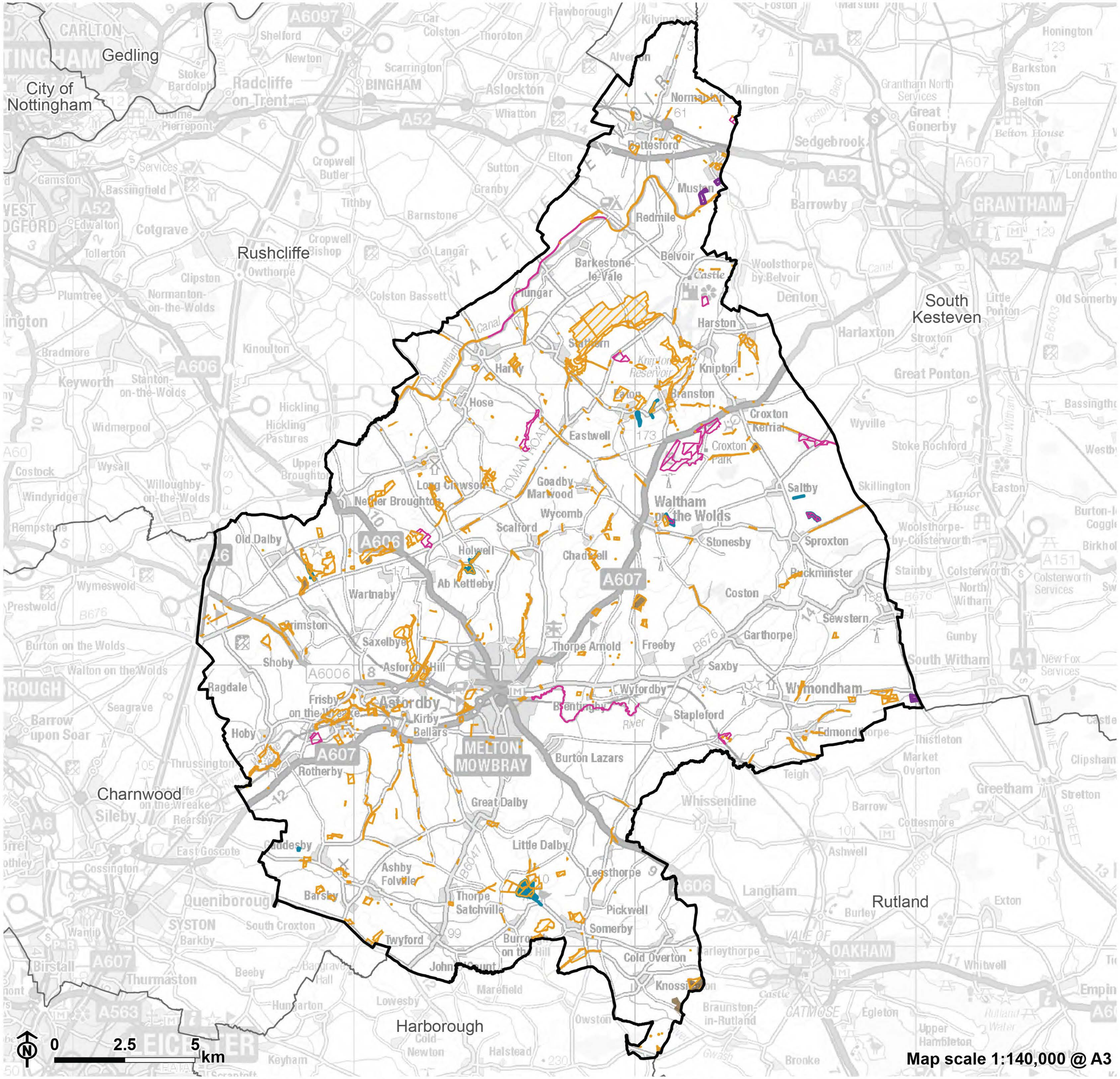
Notes:

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.

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

Climate Change Study
Melton Borough Council

Figure B2: Wind constraints - natural heritage constraints



- Melton Borough
- Neighbouring local authority
- National Nature Reserve
- Site of Special Scientific Interest
- Ancient woodland
- Regionally Important Geological site
- Local Wildlife Site

Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

12909_Wind_Figures 20/08/2024 EB:sparks_m

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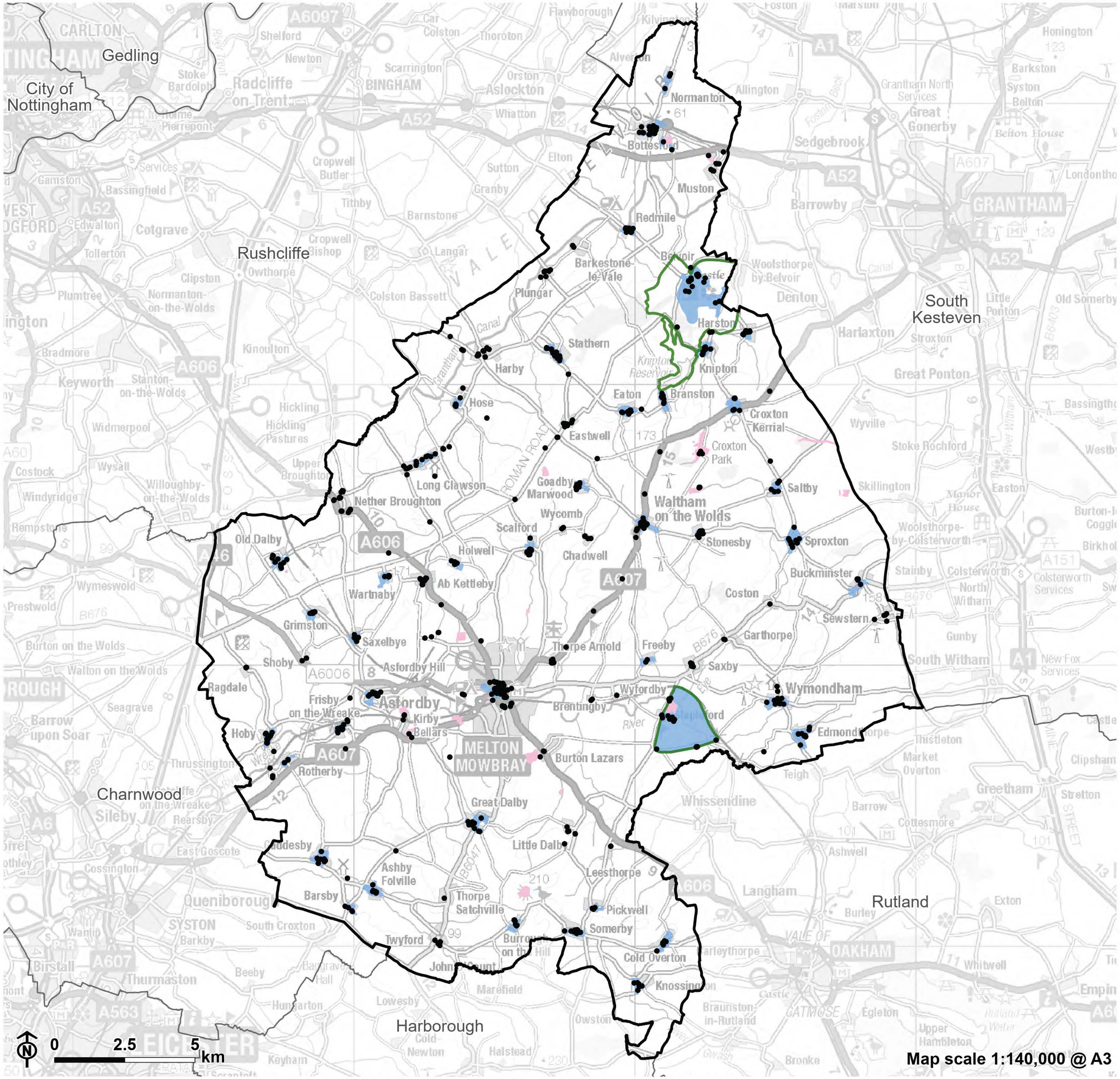
Figure B3: Wind constraints - cultural heritage constraints



Legend

- Melton Borough
- Neighbouring local authority
- Listed building
- Registered Parks and Gardens
- Scheduled monument
- Conservation area

Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

0 2.5 5 km

Map scale 1:140,000 @ A3

12909_Wind_Figures 15/08/2024 EB:sparks_m

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Melton Borough Council

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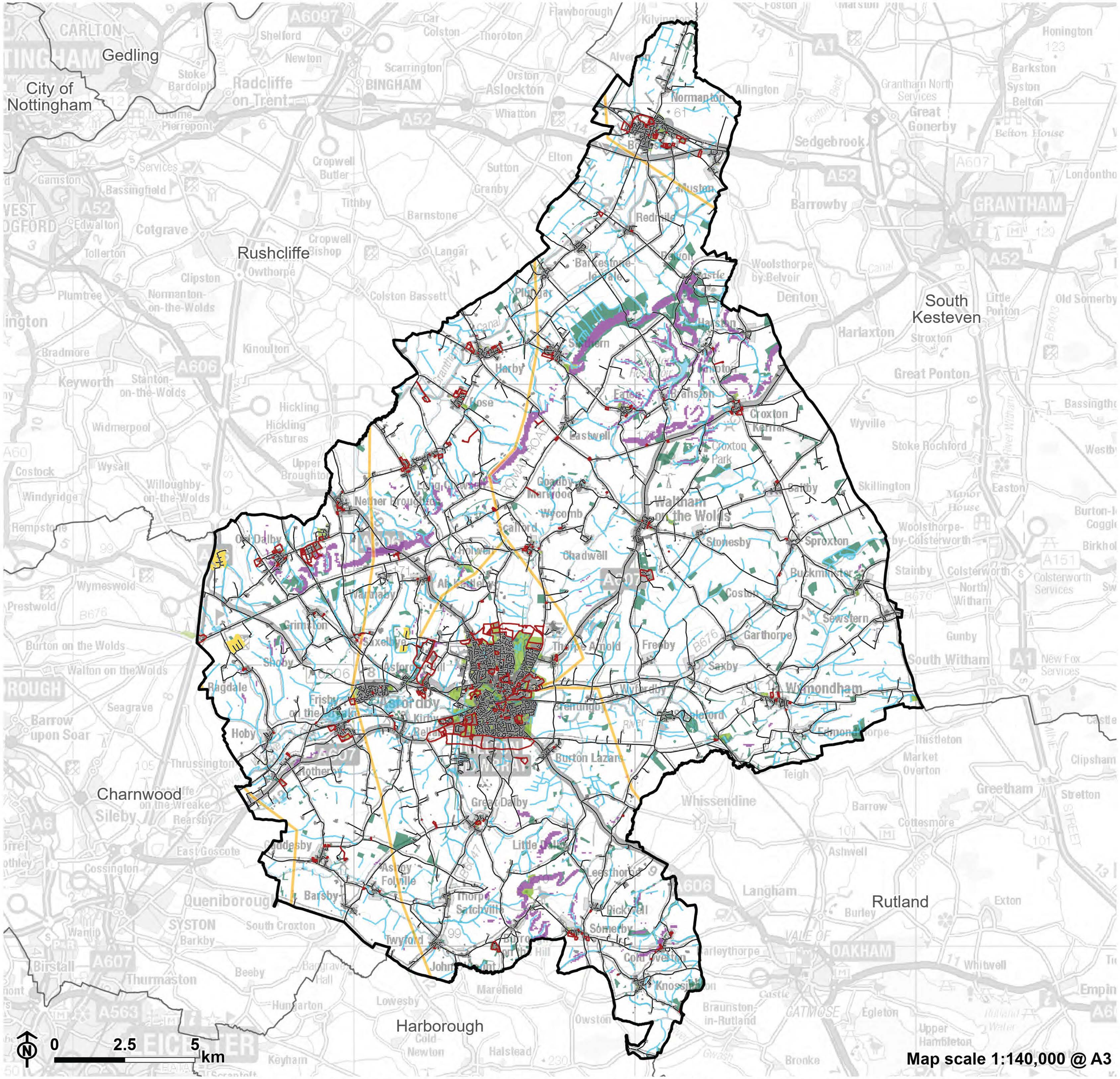
Figure B4: Wind constraints - physical constraints



- Melton Borough
- Neighbouring local authority
- Roads and railway
- Electricity line
- Building
- Slope above 15° or slope above 7° and north-east to north-west aspect
- Existing renewable development
- Woodland
- Open space, common land and other green space
- Watercourses and water bodies
- Future developments, safeguarded land and employment sites

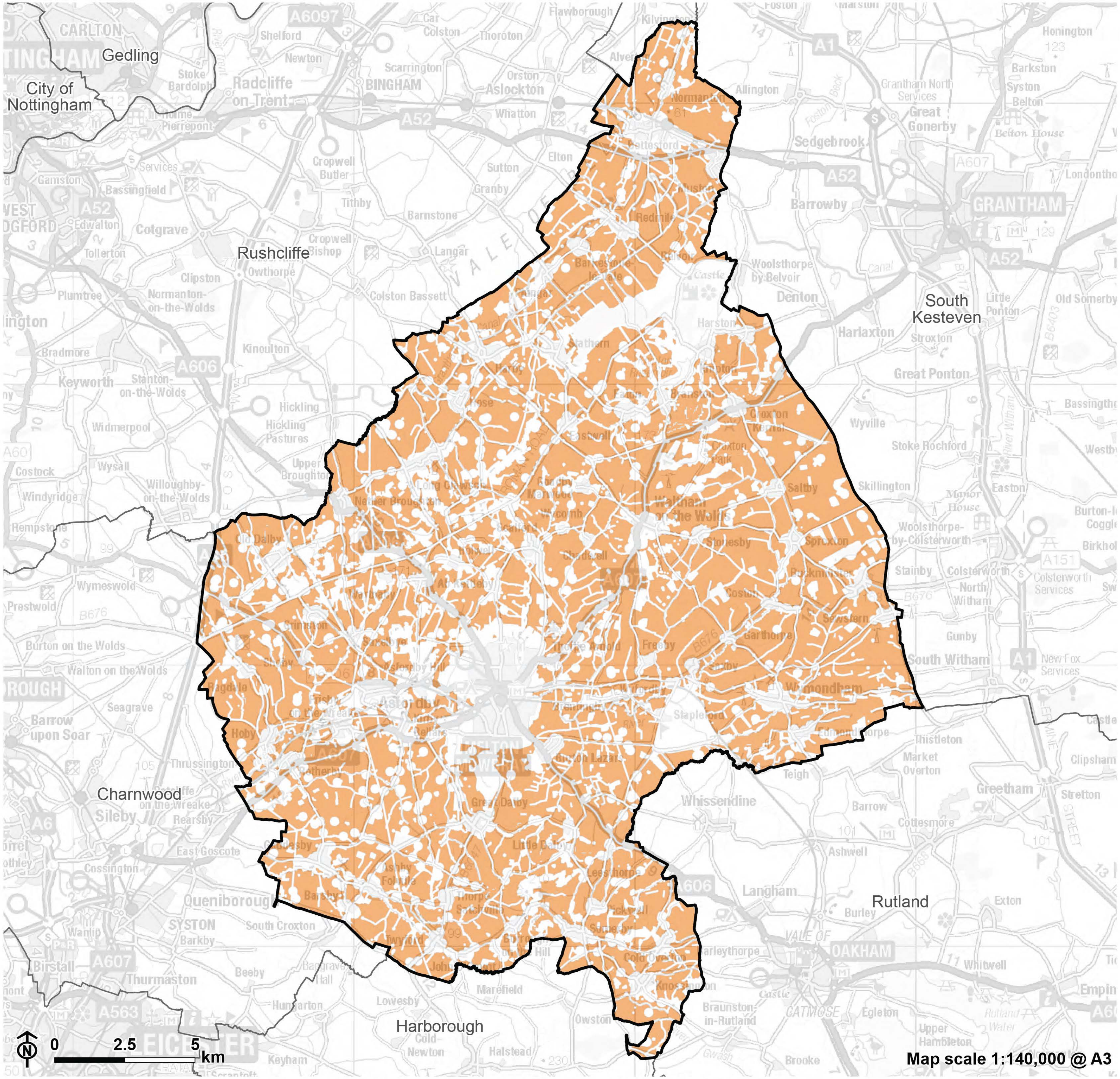
Notes:

Ministry of Defence land was also treated as a constraint in the assessment. However, due to the sensitive nature of this data this is not presented on this map.

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

Climate Change Study
Melton Borough Council

Figure B5: Opportunities and constraints - small scale (25-60m tip height) wind development

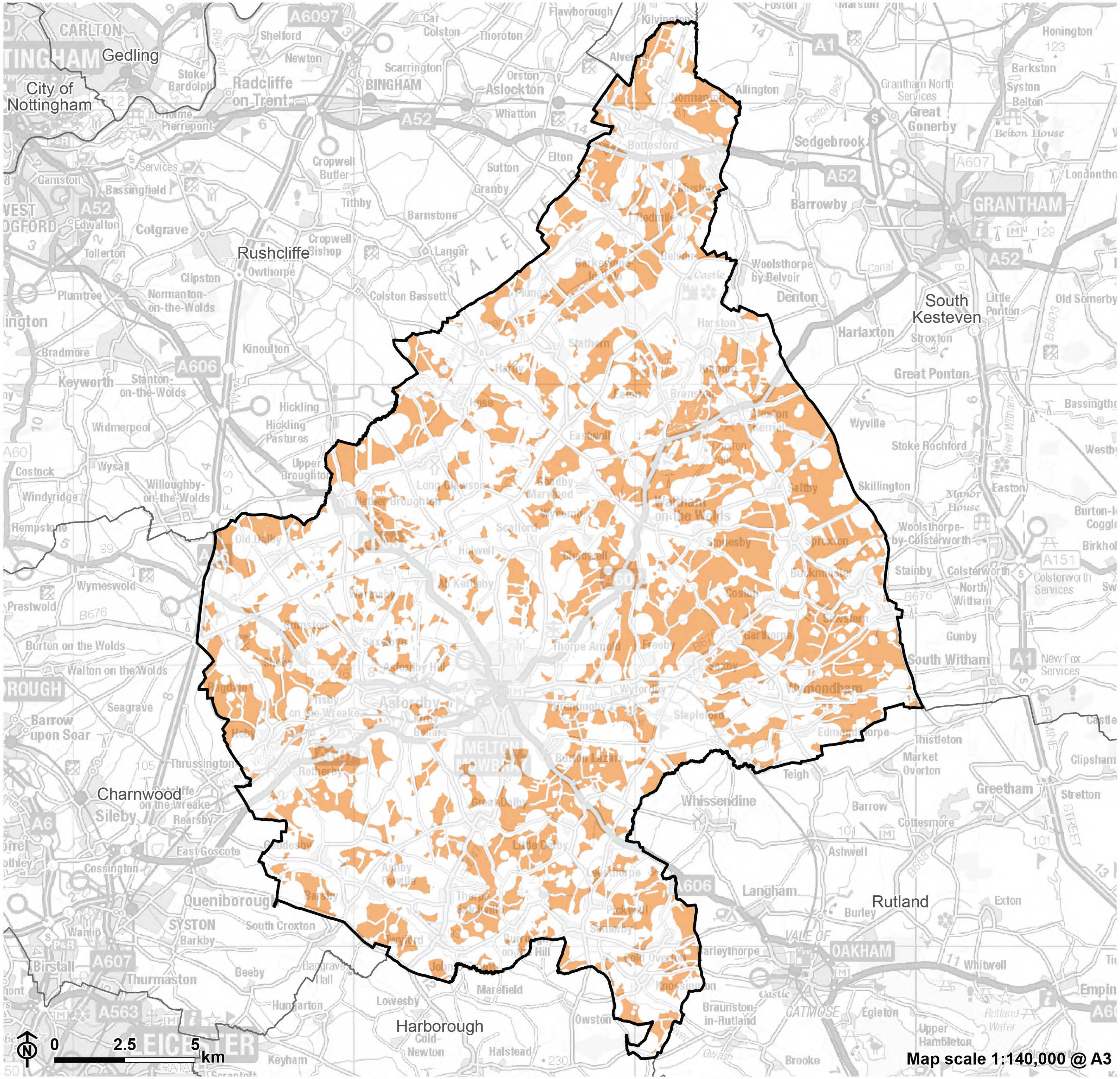


Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

Climate Change Study
Melton Borough Council

Figure B6: Opportunities and constraints - medium scale (60-100m tip height) wind development



Melton Borough

Neighbouring local authority

Technical potential within Melton Borough

Suitable area for small to medium turbines (25-100m tip height) only

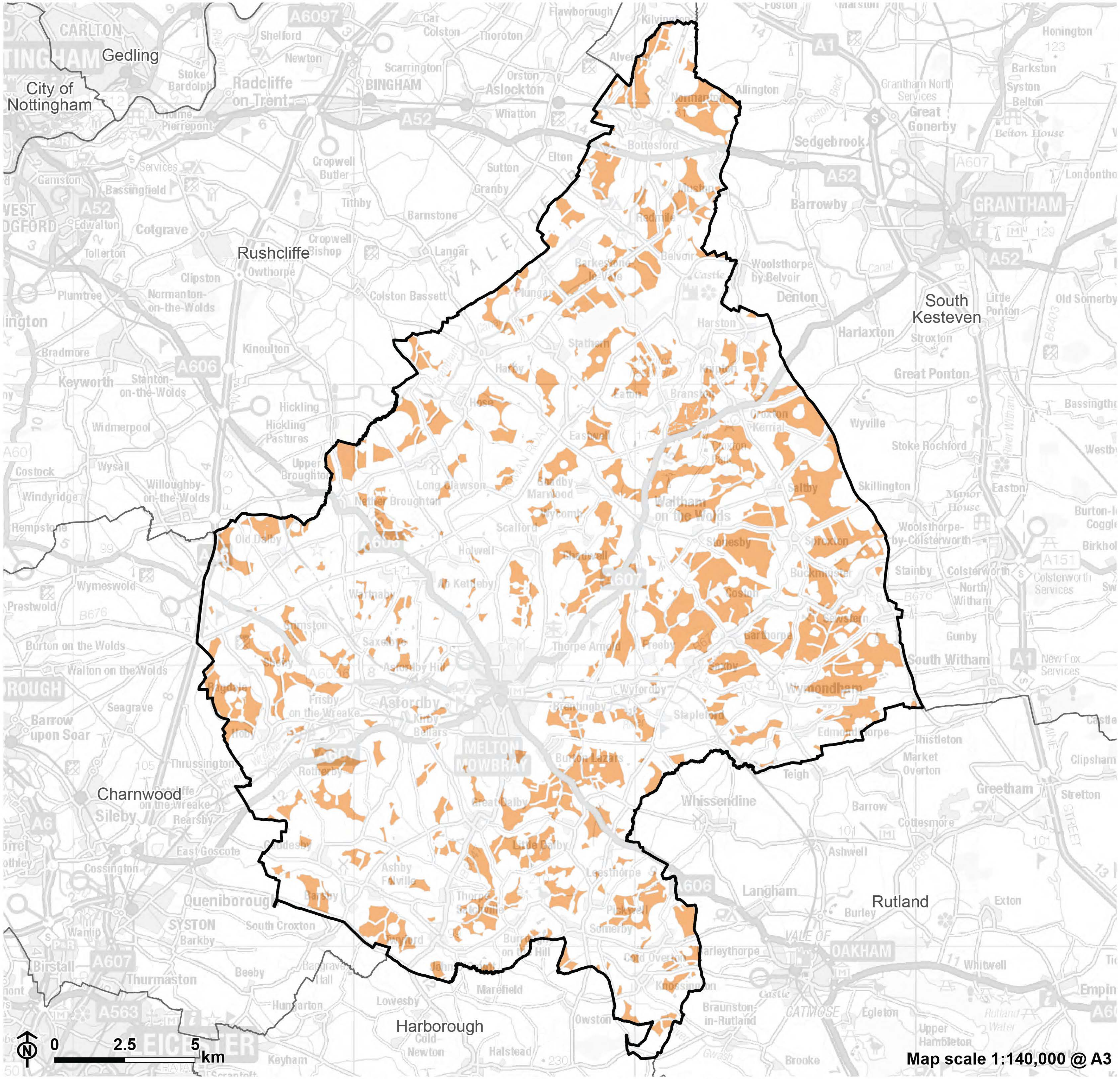
Constrained area for medium wind: no technical potential

Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

Climate Change Study
Melton Borough Council

Figure B7: Opportunities and constraints - large scale (100-150m tip height) wind development



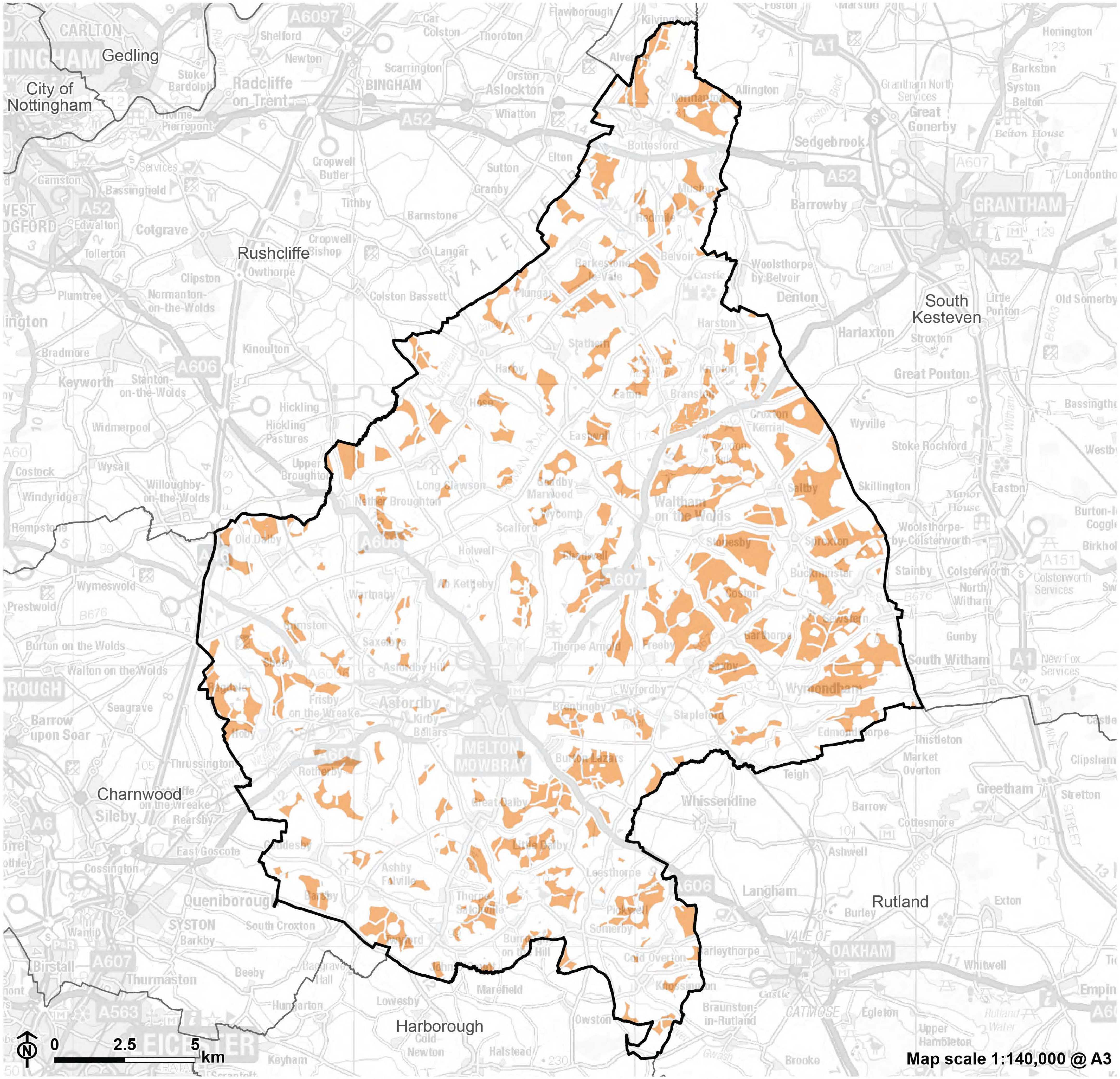
- Melton Borough
- Neighbouring local authority

Technical potential within Melton Borough

- Suitable area for small to large turbines (25-150m tip height) only
- Constrained area for large wind: no technical potential

Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.



Climate Change Study

Melton Borough Council

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Figure B8: Opportunities and constraints: very large scale (150-220m tip height) wind development

Melton Borough

Neighbouring local authority

Technical potential within Melton Borough

Suitable area for all turbine scales (25-220m tip height)

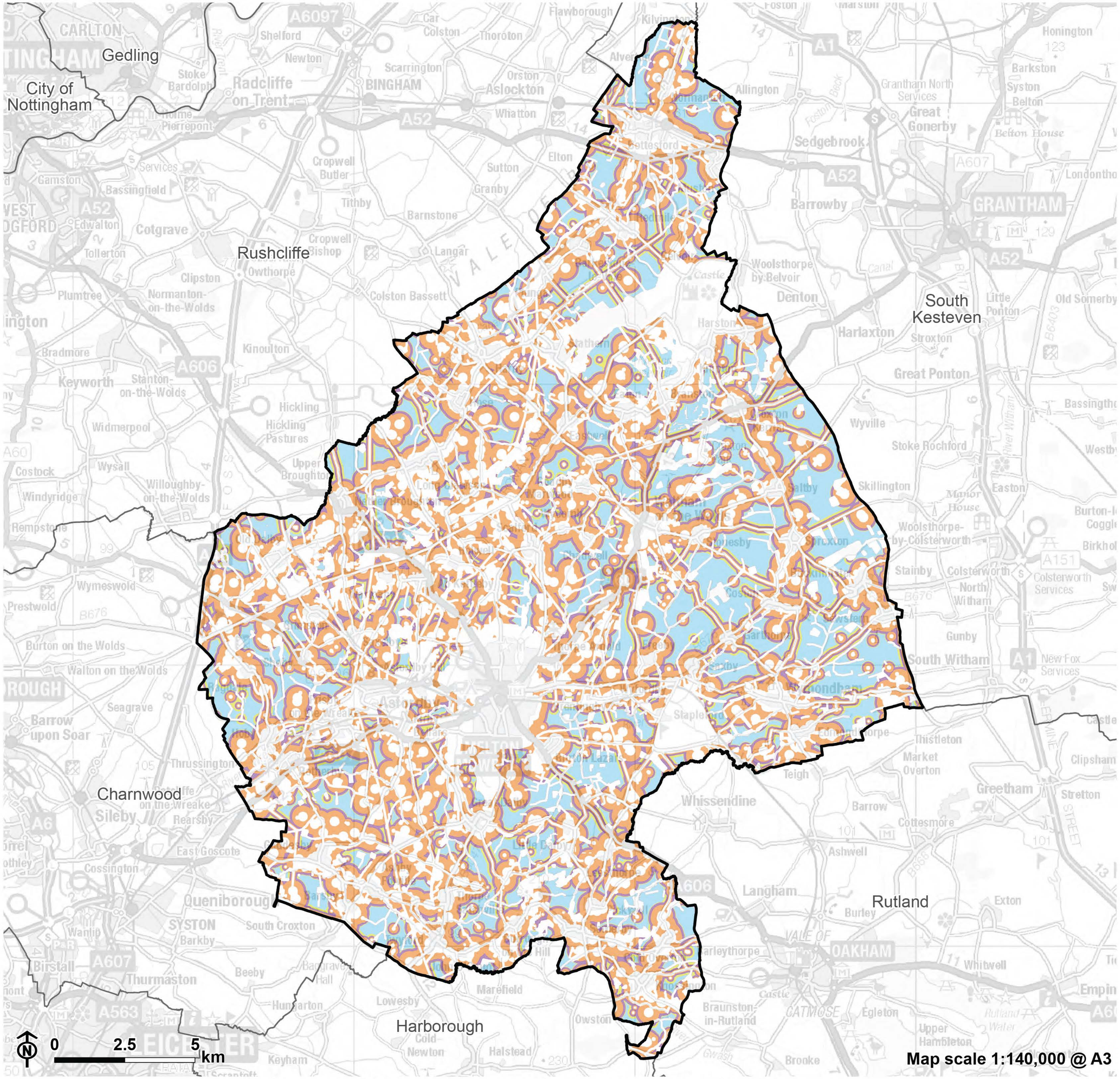
Constrained area for very large wind: no technical potential

Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

Climate Change Study
Melton Borough Council

Figure B9: Opportunities and constraints - all scales



- Melton Borough
- Neighbouring local authority

Technically suitable areas within Melton Borough

- Suitable area for all turbine scales (25-220m tip height)
- Suitable area for small to large turbines (25-150m tip height) only
- Suitable area for small to medium turbines (25-100m tip height) only
- Suitable area for small turbines (25-60m tip height) only
- No technical potential

Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

Climate Change Study
Melton Borough Council

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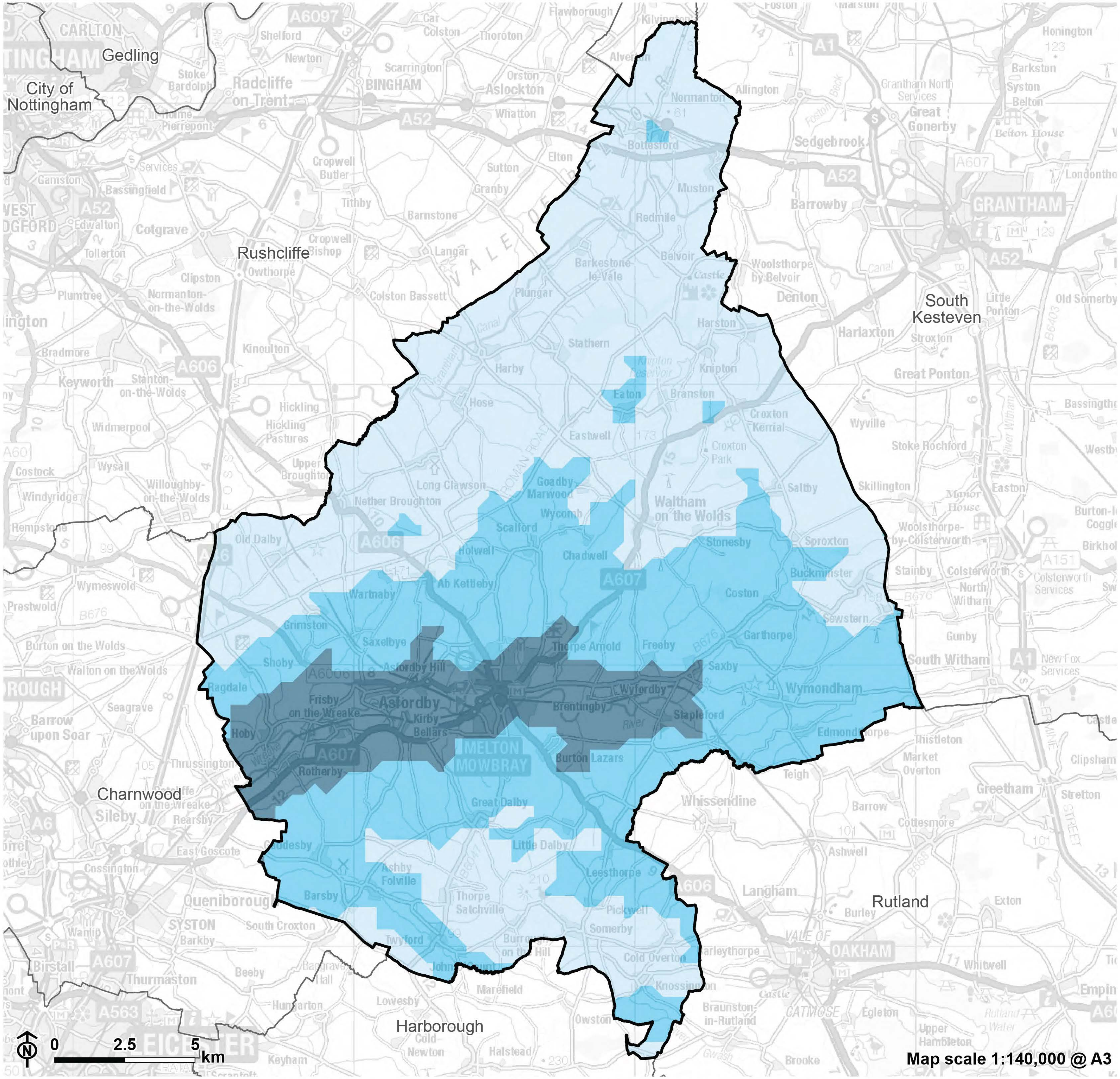
Figure B10: NATS Safeguarding Area



- Melton Borough
- Neighbouring local authority

NATS Safegurading Area

- 20m turbine height
- 80m turbine height
- 140m and 200m turbine height

Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

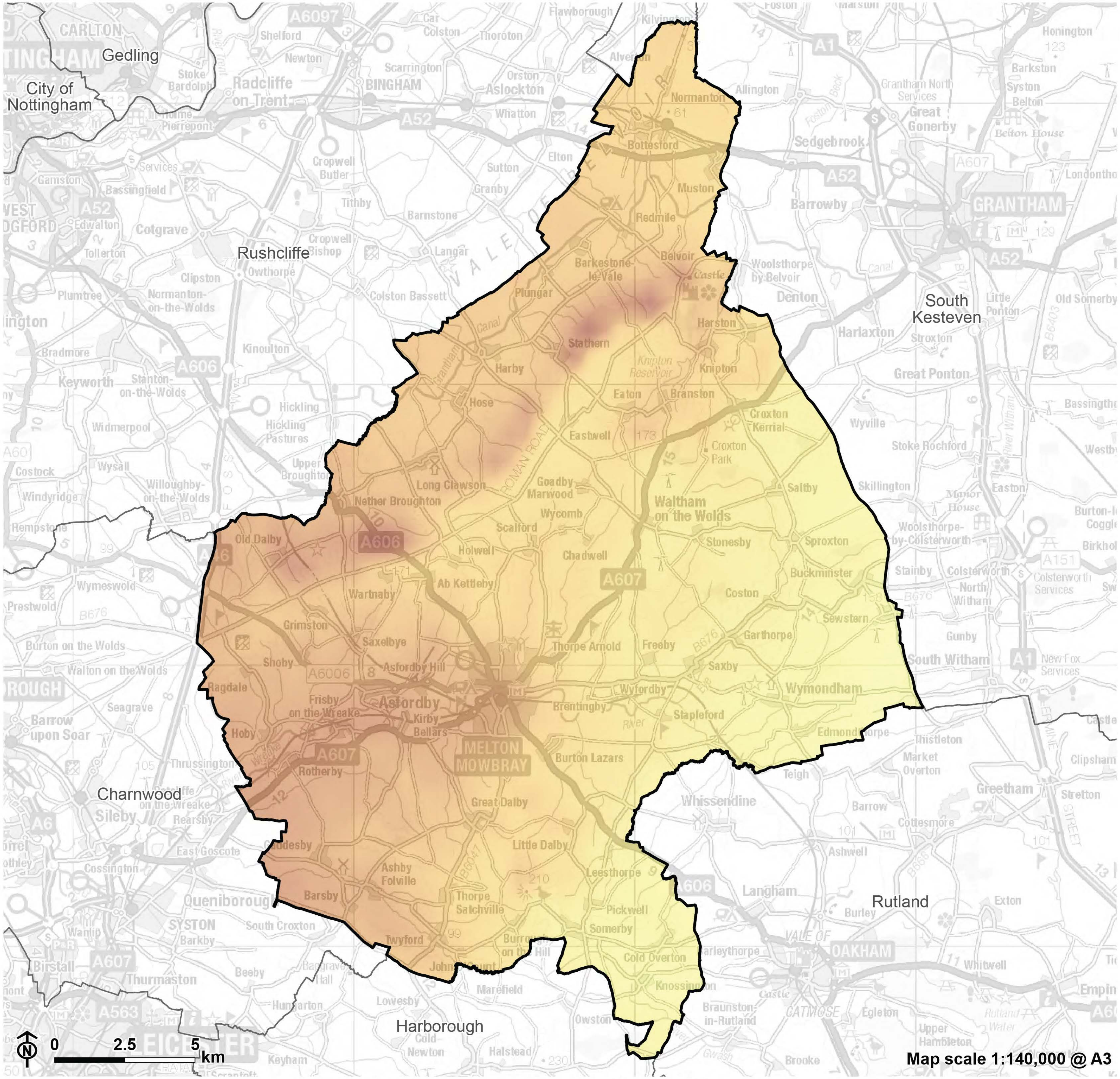
12909_Wind_Figures 20/08/2024 EB:sparks_m

Appendix C

Solar Maps

Climate Change Study
Melton Borough Council

Figure C1: Annual solar irradiance



Melton Borough

Neighbouring local authority

Annual solar irradiance

1015 kWh/kWp

971 kWh/kWp

Notes:

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

12909_Solar_Figures 20/08/2024 EB:sparks_m

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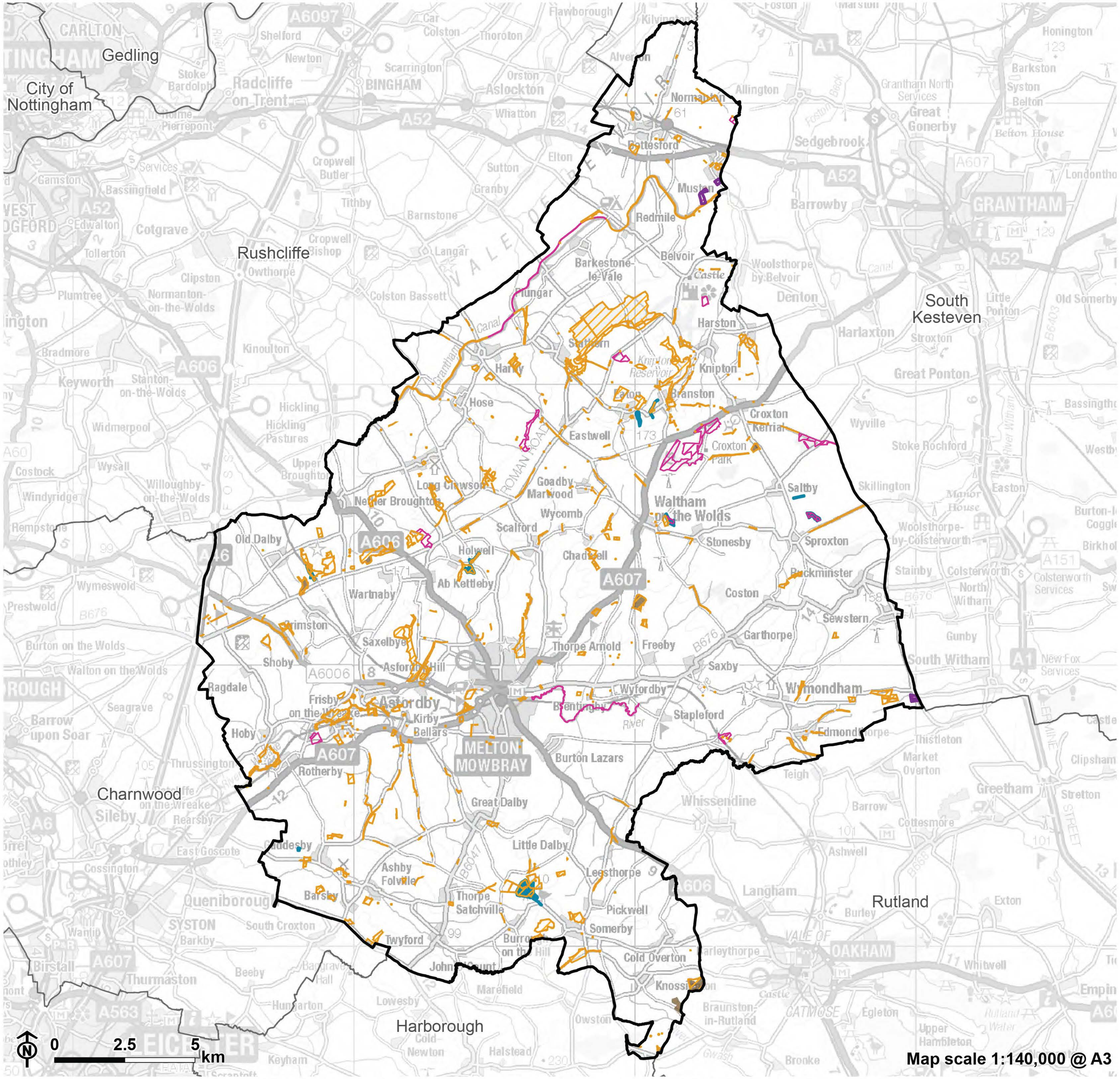
Figure C2: Solar constraints - natural heritage constraints

- Melton Borough
- Neighbouring local authority
- Site of Special Scientific Interest
- National Nature Reserve
- Ancient woodland
- Regionally Important Geological site
- Local Wildlife Site

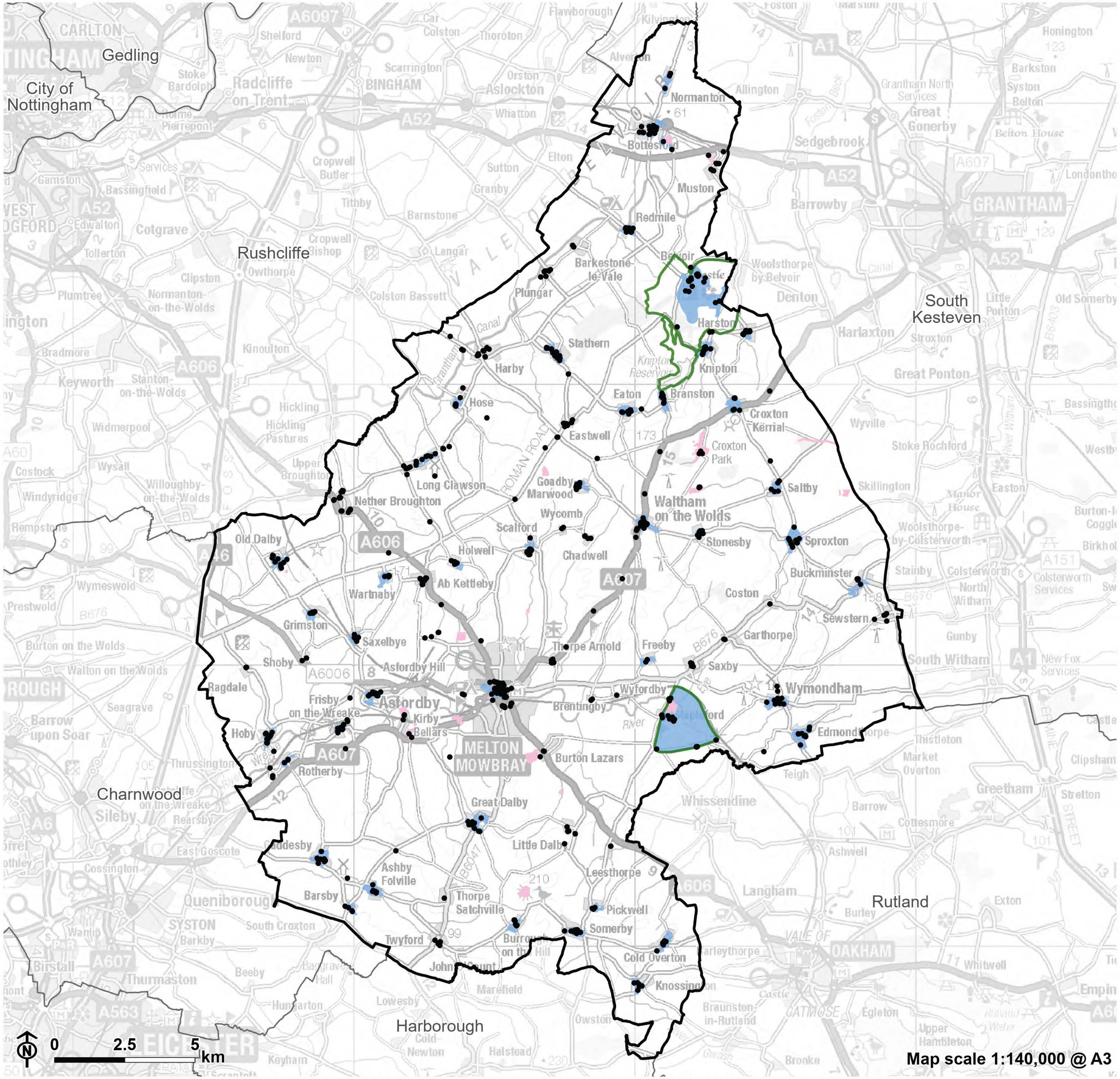


Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

Climate Change Study
Melton Borough Council

Figure C3: Solar constraints - cultural heritage constraints



- Melton Borough
- Neighbouring local authority
- Listed building
- Registered Parks and Gardens
- Scheduled monument
- Conservation area

Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

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Melton Borough Council

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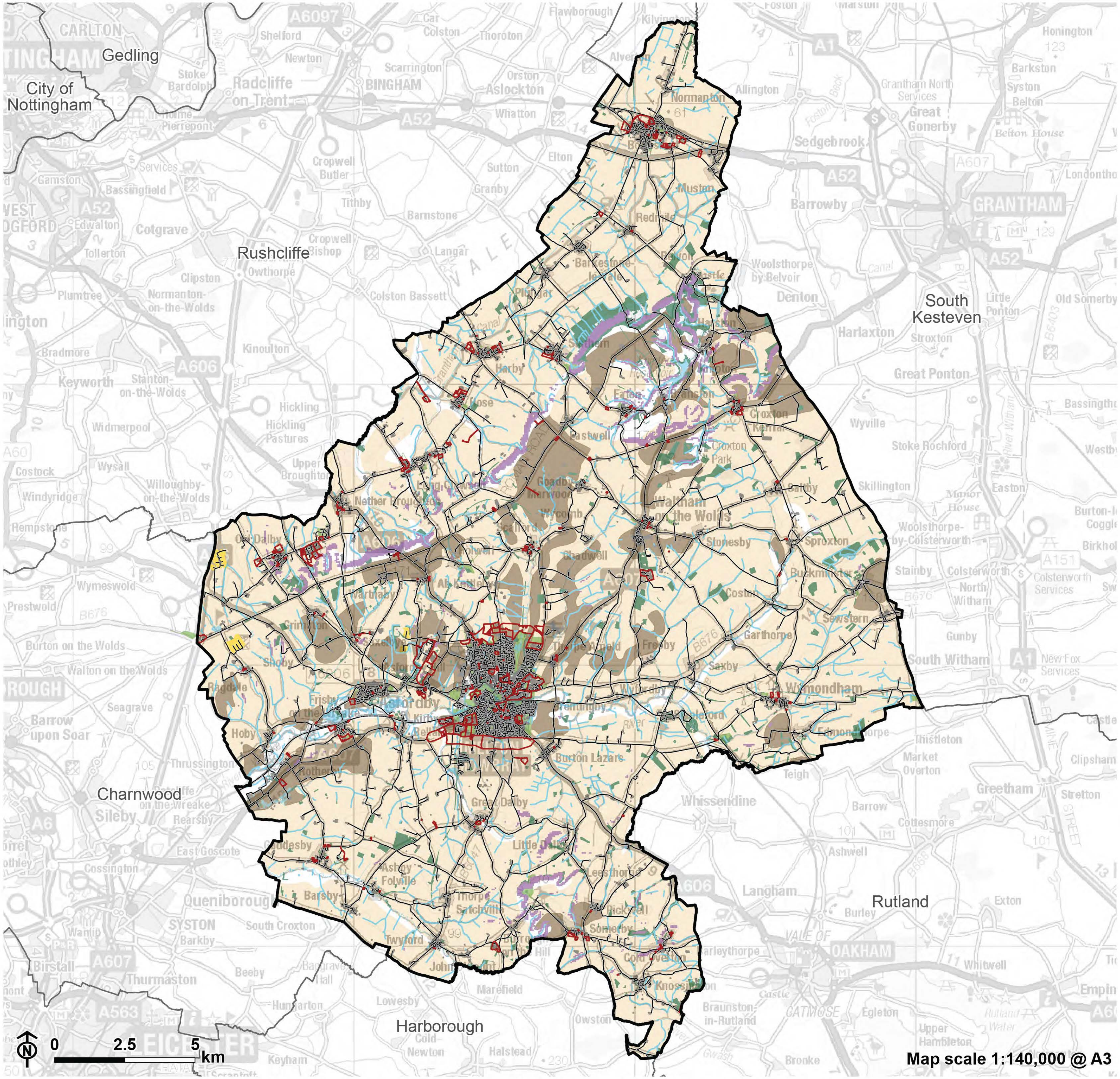
Figure C4: Solar constraints - physical, land use and infrastructure



- Melton Borough
- Neighbouring local authority
- Road network
- Building
- Slope above 15° or slope above 7° and north-east to north-west aspect
- Existing renewable development
- Woodland
- Open space, common land and other green space
- Watercourses and water bodies
- Grade 1 and 2 agricultural land
- Future developments, safeguarded land and employment sites
- Grade 3 agricultural land*

Notes:

*This was not treated as a constraint to solar development, however developers may need to make further consideration of this land and determine whether this is Grade 3a or Grade 3b (See Appendix A)

Ministry of Defence land was also treated as a constraint in the assessment. However, due to the sensitive nature of this data this is not presented on this map.

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

12909_Solar_Figures 20/08/2024 EB:sparks_m

Climate Change Study
Melton Borough Council

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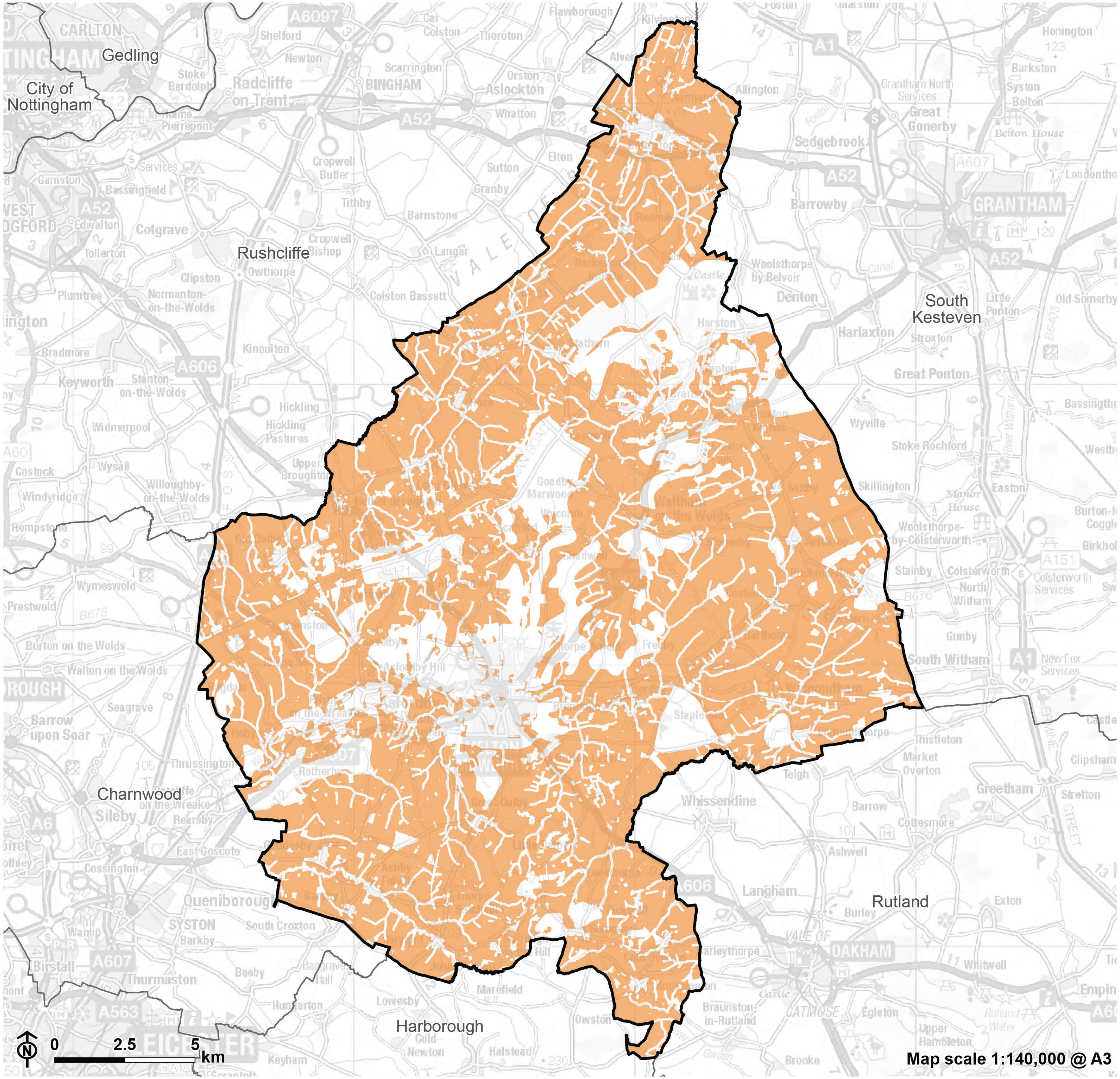
Figure C5: Opportunities and constraints - solar development

Melton Borough
Neighbouring local authority

Technical potential within Melton Borough

Area with potential for solar development
Constrained area for solar development: no technical potential



Notes:

Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

12909_Solar_Figures 16/08/2024 EB:sparks_m

References

1 IPCC (2018) Global Warming of 1.5°C [online]. Available at: https://www.ipcc.ch/sr15/

2 Committee on Climate Change (2020) The Sixth Carbon Budget: The UK's path to Net Zero [pdf]. Available at: https://www.theccc.org.uk/publication/sixth-carbon-budget/

3 HM Government (2008) Climate Change Act 2008, c.27 [online]. Available at: https://www.legislation.gov.uk/ukpga/2008/27/contents

4 HM Government (2019) The Climate Change Act 2008 (2050 Target Amendment) Order 2019 [online]. Available at: https://www.legislation.gov.uk/uksi/2019/1056/contents/made

5 Department for Energy Security and Net Zero (2024) Available at: https://www.gov.uk/government/news/new-publicly-owned-national-energy-system-operator-to-pave-the-way-to-a-clean-energy-future

6 Department for Energy Security and Net Zero (2023) Powering up Britain [online]. Available at: https://www.gov.uk/government/publications/powering-up-britain

7 The EU Energy Union is a project of the European Commission to coordinate the transformation of European energy supply. On 31st January 2020, the UK left the EU and is no longer part of the Energy Union. However, there are still UK policies and measures in force relating to the five dimensions of the EU's Energy Union.

8 HM Treasury (2024) Autumn Budget 2024 Fixing the Foundations to Deliver Change. Available at: https://assets.publishing.service.gov.uk/media/672232d010b0d582ee8c4905/Autumn_Budget_2024__web_accessible_.pdf

9 Based on a future scenario with high level of decarbonisation and societal change. As set out in the National Grid Distribution Future Energy Scenarios Report for Melton. Available at: https://www.nationalgrid.co.uk/distribution-future-energy-scenarios-application

10 Department for Transport (2020) Government takes historic step towards net-zero with end of sale of new petrol and diesel cars by 2030 [online]. Available at: https://www.gov.uk/government/news/government-takes-historic-step-towards-net-zero-with-end-of-sale-of-new-petrol-and-diesel-cars-by-2030

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55 This assumes: 100% wind potential, 100% GM solar potential, 100% rooftop solar potential (assuming all roofspace used for solar PV as this is a more popular technology than solar water heating), 100% slurry potential (assuming all used for CHP), 100% woodfuel potential (assuming all used for CHP), 100% energy crops potential (assuming 80% miscanthus, 20% SRC, all used for CHP). This is not realistic as technologies will require the same land-take in places to be delivered, and so deployable will likely be much lower.

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122 This assumes: 100% wind potential, 100% GM solar potential, 100% rooftop solar potential (assuming all roofspace used for solar PV as this is a more popular technology than solar water heating), 100% slurry potential

(assuming all used for CHP), 100% woodfuel potential (assuming all used for CHP), 100% energy crops potential (assuming 80% miscanthus, 20% SRC, all used for CHP). This is not realistic as technologies will require the same land-take in places to be delivered, and so deployable will likely be much lower.

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155 This assumes: 100% wind potential, 100% GM solar potential, 100% rooftop solar potential (assuming all roofspace used for solar PV as this is a more popular technology than solar water heating), 100% slurry potential (assuming all used for CHP), 100% woodfuel potential (assuming all used for CHP), 100% energy crops potential (assuming 80% miscanthus, 20% SRC, all used for CHP). This is not realistic as technologies will require the same land-take in places to be delivered, and so deployable will likely be much lower.

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170 Ofgem (2024) Average gas and electricity usage. Available at: https://www.ofgem.gov.uk/average-gas-and-electricity-usage. Assuming an average home uses 2,700kWh electricity per year.

171 Encon (2024) Calculation of CO2 offsetting. Available at: https://www.encon.eu/en/calculation-co2. Assuming one tonne of CO*2* can be offset by 31 to 46 trees. The median of 38.5 trees per tonne of CO*2* was used.

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173 Encon (2024) Calculation of CO2 offsetting. Available at: https://www.encon.eu/en/calculation-co2. Assuming one tonne of CO*2* can be offset by 31 to 46 trees. The median of 38.5 trees per tonne of CO*2* was used.

174 This assumes: 100% wind potential, 100% GM solar potential, 100% rooftop solar potential (assuming all roofspace used for solar PV as this is a more popular technology than solar water heating), 100% slurry potential (assuming all used for CHP), 100% woodfuel potential (assuming all used for CHP), 100% energy crops potential (assuming 80% miscanthus, 20% SRC, all used for CHP). This is not realistic as technologies will require the same land-take in places to be delivered, and so deployable will likely be much lower.

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178 Excluding ancillary buildings, car parking, garages, house boats, caravans and chalets. Other dwellings could not be considered in in the rooftop solar and air source heat pump assessments as data was not available to determine if all properties were suitable.

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186 BEIS and DESNZ (2023) Quarterly and annual load factors. Available at: https://www.gov.uk/government/publications/quarterly-and-annual-load-factors. The average of all the available load factors was used.

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195 An energy generator's 'capacity factor' can be defined as the actual energy yield produced over a period of time expressed as a proportion of the energy yield that would have been produced if the generator had operated at its full generation capacity continuously over the same period. This was averaged at 22.9% for the East Midlands over the past 12 years. BEIS and DESNZ (2023) Quarterly and annual load factors. Available at: https://www.gov.uk/government/publications/quarterly-and-annual-load-factors

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199 Non-relevant addresses that have no applicable noise receptors were excluded, identified via the LLPG data, including: ancillary buildings, car parking, garages, non-buildings.

200 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.

201 The area of unconstrained land is treated as a single block of land which may not be the case in reality. This singular block is created from merging many polygons, which are not simple shapes of equal width. This means some slivers, or areas smaller than the required width, may be present in the results adjoining to suitably sized areas of land.

202 An energy generator's 'capacity factor' can be defined as the actual energy yield produced over a period of time expressed as a proportion of the energy yield that would have been produced if the generator had operated at its full generation capacity continuously over the same period. This was averaged at 9.59% for the East Midlands over the past 12 years. BEIS and DESNZ (2023) Quarterly and annual load factors. Available at: https://www.gov.uk/government/publications/quarterly-and-annual-load-factors

203 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.

204 Based on current standard developer practice.

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212 DESNZ (2024) RHI monthly deployment data: March 2024 (Annual edition). Available at: https://www.gov.uk/government/statistics/rhi-monthly-deployment-data-march-2024-annual-edition

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224 BEIS and DESNZ (2018) Measurement of the in-situ performance of solid biomass boilers. Available at: https://www.gov.uk/government/publications/biomass-boilers-measurement-of-in-situ-performance. As this study is calculating the potential energy generation from a known amount of fuel, as opposed to an infinite energy supply such as wind, only the boiler efficiency was considered to calculate the overall energy generation potential, not the load factor for biomass boilers, which considered the percentage of time a boiler is operating at peak output annually.

225 ONS (2023) Main fuel type or method of heating used in central heating, England and Wales. Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/housing/datasets/maifueltypeormethodofheatingusedincentralheatingenglandandwales. This excludes consideration of other heating sources used by off-gas properties, as there is lack of data on these and they provide heating for only a small percentage of properties.

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236 ONS (2023) Main fuel type or method of heating used in central heating, England and Wales. Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/housing/datasets/mainfueltypeormethodofheatingusedincentralheatingenglandandwales. This excludes consideration of other heating sources used by off-gas properties, as there is lack of data on these and they provide heating for only a small percentage of properties.

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the CHP efficiency was considered to calculate the overall energy generation potential, not the load factor for biogas CHP units, which considered the percentage of time a boiler is operating at peak output annually.

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Report produced by LUC

Bristol
12th Floor, Beacon Tower, Colston Street, Bristol BS1 4XE
0117 389 0700
bristol@landuse.co.uk

Cardiff
1.04, 1st Floor, Brunel House, 2 Fitzalan Rd, Cardiff CF24 0EB
0292 254 0920
cardiff@landuse.co.uk

Edinburgh
Atholl Exchange, 6 Canning Street, Edinburgh EH3 8EG
0131 326 0900
edinburgh@landuse.co.uk

Glasgow
37 Otago Street, Glasgow G12 8JJ
0141 403 0900
glasgow@landuse.co.uk

London
250 Waterloo Road, London SE1 8RD
020 7199 5801
london@landuse.co.uk

Manchester
4th Floor, 57 Hilton Street, Manchester M1 2EJ
0161 802 2800
manchester@landuse.co.uk

Sheffield
32 Eyre Street, Sheffield, S1 4QZ
0114 392 2366
sheffield@landuse.co.uk

landuse.co.uk

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