

Mansfield Renewable Energy Potential Study

Contribution to Mansfield Climate Change Study

February 2026

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Executive summary

This Renewable Energy Potential Study has been produced for Mansfield District Council and covers the Mansfield District area. It has examined solar and wind renewable energy sources, to understand what the technical potential may exist in the area. It is accompanied by a Renewable Energy Policy Recommendations Report, which provides suggested policy wording which would help to encourage renewable energy in line with the recommendations of this report. Both are set within the context of a rapidly changing policy context, with the most recent version of the National Planning Policy Framework (NPPF) being released in 2024, and a proposed version currently being under consultation.

The results of the potential study show the maximum technical potential of renewable energy sources are as shown in Table 1.

Table 1: Maximum technical potential for different renewable energy sources in the Mansfield District

Renewable source	Area technically suitable (km ²)	Potential annual generation (GWh/yr)
Rooftop solar	-	364
Ground-mounted solar	24.2	961
Small wind	0.1	0.7
Medium wind	0.2	6.2
Large wind	0.1	8.8

This shows that solar energy is most likely the most appropriate renewable energy source in the Mansfield District, though there may be limited opportunities for wind energy. The areas most likely to be suitable are highlighted in Section 3.2 and Section 3.4. National policy encourages local capture of the benefits of any renewable energy development, and there is opportunity for Mansfield District Council to work alongside organisations such as the Midlands Net Zero Hub, and local groups such as Nottinghamshire Community Energy to use development as a route to improve the local area.

This report also examines the opportunity for renewable heat networks within the Mansfield District. The best locations for these seem to be in the urban centres of the District. Mansfield town has the greatest opportunity, with key anchor loads and secondary anchors providing both opportunity and flexibility for any potential schemes. Market Warsop provides a second opportunity area.

The results of this study lead to the following recommendations:

1. Consider using the identified areas as the basis for allocated areas of preferred renewable energy developments, as may be required under the revised NPPF currently being consulted on.
2. Consider communicating the results of this study, particularly the better potential of solar energy over wind energy, helping to build knowledge of the best solutions for the local area.
3. Consider using the Local Plan Review as an opportunity to set local standards for the development of renewable energy. This must be considered in the broader context of changing planning regulations, notably that the version of the NPPF currently being consulted upon aims to bring building standards to a nationally consistent form.
4. Consider the enabling role that MDC might take in encouraging local renewable energy. This is likely to involve working alongside the Midlands Net Zero Hub or the HNDU to help access funding for Mansfield. This may also involve taking a role of community leadership, helping to foster the growth of community groups in the area, and helping to develop networks.
5. Consider adopting the policy wording given in the accompanying Renewable Energy Policy Recommendations Report to demonstrate greater commitment to enabling local renewable energy as encouraged by both the 2024 NPPF revision, and the emerging NPPF as currently being consulted upon.

As noted above, the changing context of this study can make policy setting under the Local Plan difficult. However, we are confident these recommendations and those in the accompanying Renewable Energy Policy Recommendations Report reflect changing national ambitions. The direction of travel appears to be increasing development of renewables, and increased support for community approaches, both of which are reflected in these recommendations.

1. Introduction

101. This report presents the output of the renewable energy assessment undertaken by the Centre for Sustainable Energy (CSE) on behalf of Mansfield District Council (MDC). The findings are intended to become part of the evidence base supporting the review of the Mansfield District Local Plan.
102. The work herein updates the work completed across the East Midlands in 2011¹. The analyses within this report reflect changes in national policy, professional guidance and renewable technology capacities. The study provides technical evidence in support of the development of policies that encourage the use and generation of renewable energy across Mansfield. The outputs provide an indication of the renewable energy resources in the area, and the opportunities and constraints that impact their use.
103. An analysis of how MDC might support local development of renewable energy is included. This investigates both how Mansfield can support development through policy, but also through wider engagement or enabling works.
104. This study forms part of MDC's commitment to decarbonisation and will support the council in taking "action at a local level, but within a national framework"². MDC prioritise energy efficiency and renewable energy technologies in their local plan, in line with national targets to achieve a 68% cut in emissions by 2030 and to achieve net zero by 2050.
105. MDC declared a climate emergency in 2019,³ committing to cut emissions by 40% by 2030 and to make MDC a carbon neutral authority by 2040. MDC aims to ensure that communities benefit from measures taken to tackle climate change⁴, and appreciates the need for not only climate change mitigation, but also adaptation to its effects, particularly on the most vulnerable.
106. The Local Plan sits within the context of the National Planning Policy Framework (NPPF), as revised in December 2024⁵. This framework also places climate mitigation and adaptation at the heart of plan-making and encourages the transition to a low carbon future and the use of renewable resources. At the time of writing, the Ministry of Housing,

¹ <https://www.mansfield.gov.uk/downloads/file/510/low-carbon-energy-opportunities-and-heat-mapping-for-local-planning-areas-across-the-east-midlands-2011>

² <https://www.mansfield.gov.uk/downloads/file/1645/mdc-adopted-local-plan-2020>

³ <https://www.mansfield.gov.uk/climatechange>

⁴ <https://www.mansfield.gov.uk/downloads/file/1347/making-mansfield-towards-2030>

⁵ <https://www.gov.uk/government/publications/national-planning-policy-framework--2>

Communities and Local Government (MHCLG) is consulting on revisions to the NPPF⁶. The proposed changes signal further increased focus on climate mitigation and adaptation, including requirements in Local Plans to identify suitable sites for renewable energy. Whilst the consultation is still live, it is not certain these changes will be adopted. However, this suggests the direction of travel is greater focus on climate action within the planning system.

In Paragraph 165, the 2024 NPPF states:

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, and their future re-powering and life extension, while ensuring that adverse impacts are addressed appropriately (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.

107. In addition, in Paragraph 168, the 2024 NPPF states that there should be recognition of the role of small-scale and community-led projects in cutting greenhouse gas emissions. This study aims to support MDC in meeting these requirements.

108. The objectives of the study are set out across several sections. Section 0 charts existing renewables in the Mansfield District, while Section 3 analyses sites that could be technically viable for renewable energy generation in the future. Section 4 maps heat demand across the study area, along with potential heat sources for future heat networks. This section aims to indicate where networks might be most viable. Section 5 consists of recommendations for encouraging local development of renewable heat and power, both through the Local Plan, and through local community action.

109. Each section is intended to support the Mansfield Local Plan, and to guide decision makers on how to integrate the evidence into Local Plan policies.

⁶ <https://www.gov.uk/government/consultations/national-planning-policy-framework-proposed-reforms-and-other-changes-to-the-planning-system>

2. Existing renewable and low-carbon energy generation

2.1. Overview

201. In line with MDC's target of carbon neutrality by 2040, the council's Climate Change Strategy draws out energy generation as a priority⁷. The council has pledged to both take direct action on this issue and to work with local partners and communities to promote and enable renewable energy generation. The current Adopted Local Plan also indicates the council will respond favourably to sustainable developments⁸.
202. To chart the existing renewable energy capacity in the Mansfield District area, the Renewable Energy Planning Database (REPD)⁹ and the Microgeneration Certification Scheme (MCS) data dashboard¹⁰ have been used. These are considered the most robust and up to date sources of information on existing renewable energy capacity for large-scale and small-scale renewables respectively in the UK.
203. The REPD tracks the progress of UK renewable electricity projects over 150kW through the planning system¹¹. The REPD is published quarterly, with the most recent publication released in October 2025. This means that changes since the most recent publication will not be captured. Because the REPD is based on entries into the planning system, it also captures installations which may not proceed to operation. For this reason, we differentiate between installations which are active and inactive. Inactive projects are those with the status of application withdrawn, abandoned, application refused, or planning permission expired. These are considered inactive as any of those statuses imply the project is unlikely to go ahead. Revised applications are analysed separately to determine if they have been resubmitted. If resubmitted, they appear as a separate entry in the REPD, which may later either be granted or refused planning permission. All other statuses are considered active in the planning system.
204. The MCS is the UK's certification body for small-scale renewable energy. Their data dashboard provides an indication of current rooftop solar capacity across the district, as well as allowing comparison to capacity across England. MCS accredits rooftop PV installations up to 50 kW. The data dashboard is updated in near-real time. Data was last

⁷ <https://www.mansfield.gov.uk/downloads/file/2970/approved-draft-climate-change-strategy-september-2021>

⁸ <https://www.mansfield.gov.uk/downloads/file/1645/mdc-adopted-local-plan-2020>

⁹ <https://www.gov.uk/government/publications/renewable-energy-planning-database-monthly-extract>

¹⁰ <https://datadashboard.mcscertified.com/InstallationInsights>

¹¹ Note that prior to 2021, the threshold was 1 MW

inspected on 27th November 2025. Because MCS certification is required to access most renewable support such as the Smart Export Guarantee, most installations will be recorded. It is worth noting, as there is no requirement to become MCS accredited outside of these schemes, it is possible that not all installations will be recorded in the MCS data. Additionally, as there is a small gap between the size of MCS rooftop installations (up to 50 kW) and REPD installations (from 150 kW) some installations may not be covered.

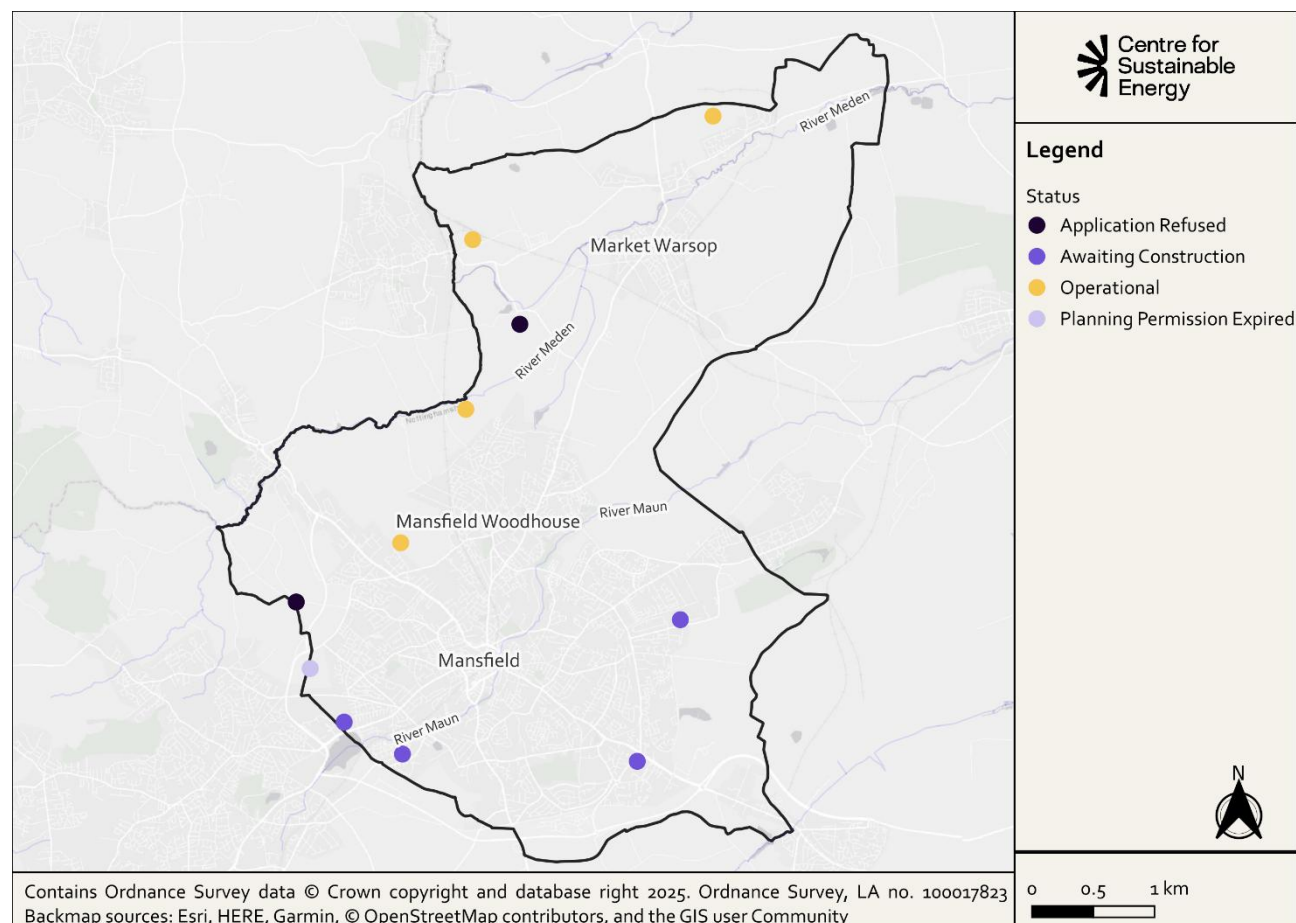
205. Evidence from the REPD shows there are four operational ground-mounted solar installations within the district. These are discussed further in Section 2.2. There are three larger roof-mounted solar installations as recorded in the REPD, with many smaller installations seen in the MCS data. These are discussed in Section 2.3. There is also a single energy battery storage facility, currently awaiting construction. Its capacity is not currently given in the REPD. From inspection of the related planning documents, the capacity of the site has not been made available at this time. The number of REPD-registered projects for each status and the total installed capacities of the renewable energy projects are shown in Table 2, with their locations shown in Map 1. A complete list of all REPD-registered sites is given in Appendix I: All existing renewable sites registered in the REPD.

Table 2: Number and installed capacity of renewable energy projects as recorded in the REPD released October 2025

Status	Number of installations	Installed capacity (MW)
Operational	4	25
Awaiting construction	4	0.9
Planning permission expired	1	5
Application refused	2	14

206. Note that renewable energy projects that are inactive in the planning system are also shown in Map 1. These have been included to provide information on where renewable projects have been initiated but have faced difficulties. Future Local Plan direction may wish to consider why these locations were found unsuitable in the past.

Map 1: The locations of REPD-registered renewable energy installations in the Mansfield District as of October 2025



2.2. Ground-mounted solar PV

207. Existing, planned and cancelled ground-mounted solar projects are examined in this section. Of the 30.1 MW of ground-mounted solar PV installation capacity noted in the REPD, 25.1 MW is already operational, across 4 sites. The existing and planned ground-mounted solar sites are shown in Map 2. The size of the points indicates the installed capacity of the site. An overview of all ground-mounted PV sites in the REPD are given in Table 3.

Map 2: The locations of existing and planned REPD-registered ground-mounted PV installations in the Mansfield District as of October 2025

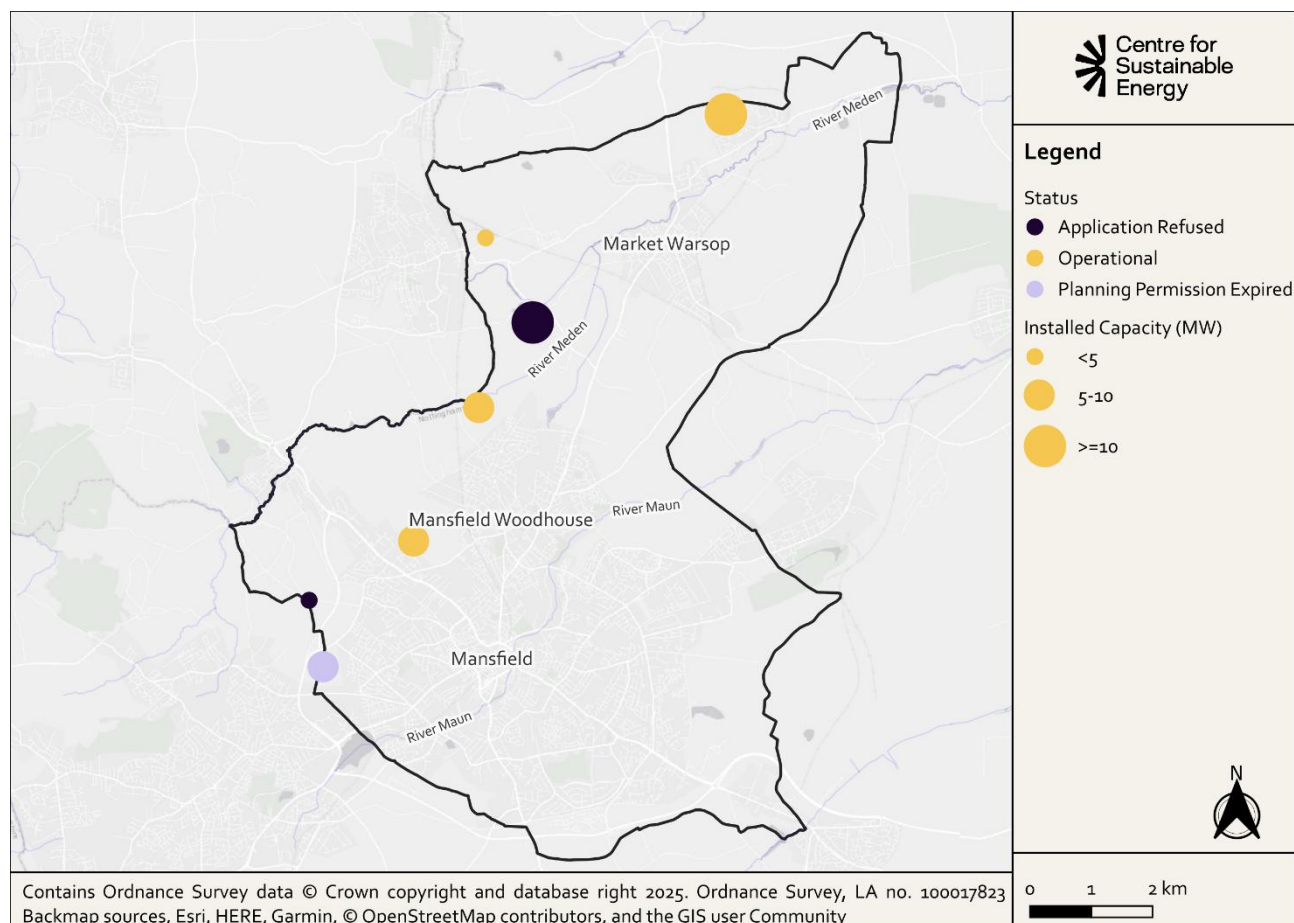


Table 3: Summary of all ground-mounted solar by status recorded in the REPD

Status	Installations	Installed Capacity (MW)
Operational	4	25.1
Permission expired	1	5
Permission refused	2	14

2.3. Rooftop solar PV

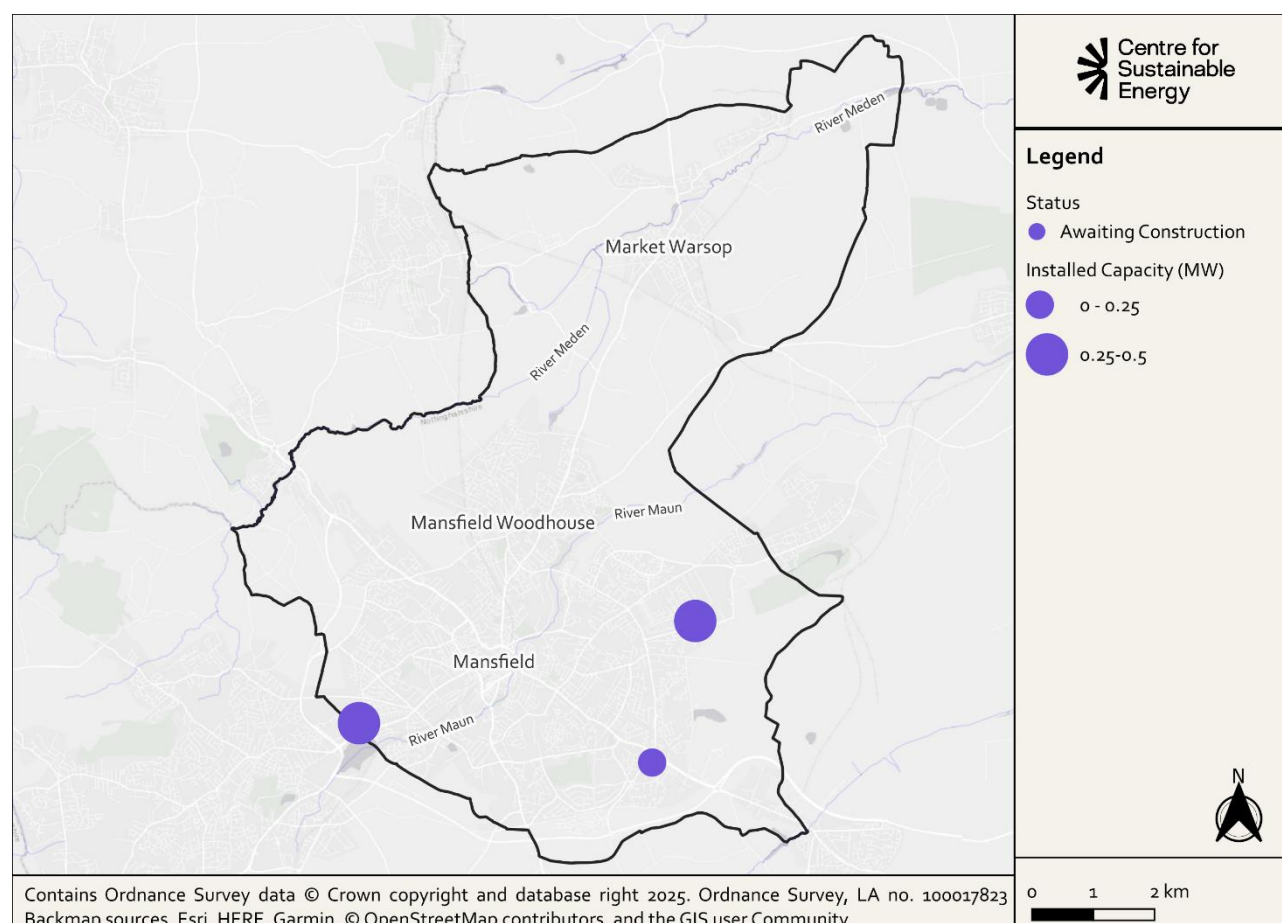
208. Existing rooftop solar PV installations, and those progressing through the planning system, are explored in this section. The REPD contains large-scale installations from 150 kW. These are discussed in Section 2.3.1. Smaller installations up to 50 kW are recorded in the MCS data, discussed in Section 2.3.3. Both datasets cover both domestic and non-

domestic sites. Note that due to the capacities each dataset covers, there may exist sites in the 50kW – 150kW range that are not included in these figures.

2.3.1. Rooftop solar PV in the REPD

209. There are three roof-mounted solar installations in Mansfield recorded in the REPD. These are all awaiting construction. These roof-mounted solar installations have a total capacity of 0.9 MW, and their locations are shown in Map 3. A visual inspection using Google Maps shows that these installations have been in place as of November 2025. However, it is unclear if these have become operational since the most recent update of the REPD, or if they are awaiting commissioning.

Map 3: The locations of existing and planned REPD-registered rooftop-mounted PV installations in the Mansfield District as of October 2025

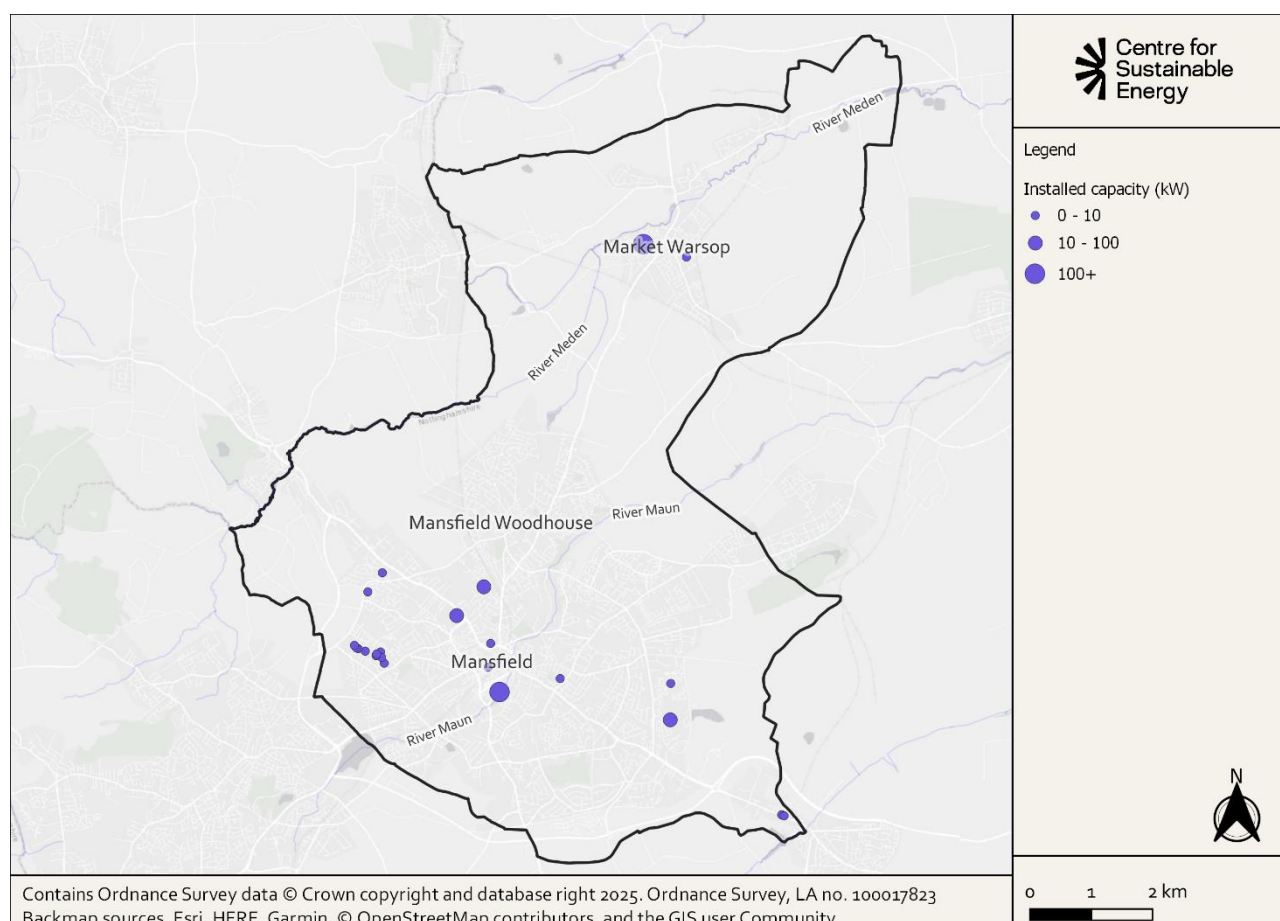


2.3.2. Rooftop solar PV on MDC assets

210. MDC has been involved in establishing solar PV on a number of buildings, helping to move towards their net zero goal. Several of these schemes have been established in conjunction with D2N2 Local Enterprise Partnership. The schemes involve a mixture of

small-scale arrays on council homes, to large arrays on the civic centre and leisure centres. The scale and location of these rooftop arrays are shown in Map 4.

Map 4: The locations of existing rooftop solar PV on MDC assets



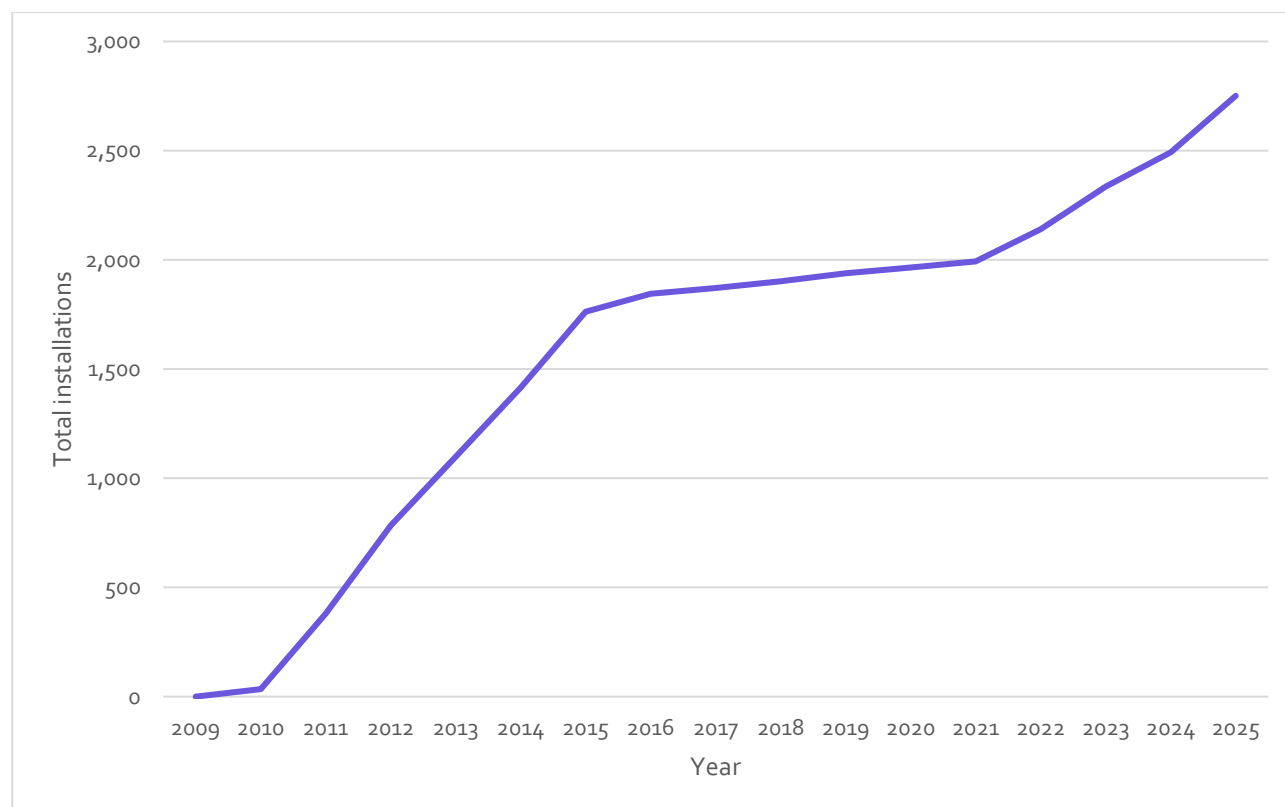
2.3.3. Rooftop solar PV recorded by the MCS

211. There have been 2,751 MCS certified solar PV installations recorded in Mansfield since 2009, when MCS records begin, as seen in Figure 1. Across England, there were high rates of installs between 2011 and 2015 due to the Feed-in Tariff (FiT), implemented in April 2010¹², which incentivised homeowners to generate their own solar power. Installation rates have started to increase again since the introduction of the Smart Export Guarantee (SEG) in 2020. Installations in Mansfield generally follow this trend, shown by steeper gradients in Figure 1. The proportion of households in the district with rooftop PV installations is similar to the average across England, around 6%. Costs of rooftop PV in Mansfield are also comparable to the rest of the country – around £1,750 per kW of installed capacity. This suggests rooftop PV in Mansfield is keeping pace with the rest of

¹² <https://www.greenbuildingrenewables.co.uk/history-of-solar-incentives/>

England. However, there is still opportunity to roll out further rooftop solar as explored in Section 3.3.

Figure 1: Cumulative number of MCS solar PV installations in Mansfield, 2009 - 2025



3. Renewable energy resource assessment

3.1. Approach

301. This study assesses the potential for renewable electricity across the Mansfield District. The current report updates a previous study conducted in 2011; *Low Carbon Energy Opportunities and Heat Mapping for Local Planning Areas Across the East Midlands*¹³. Since that report, much of the thinking about renewable energy within the UK has changed, and the methods in this report have been updated to reflect these changes. The changes to the NPPF (discussed further in Section 5) are a key change to considerations of renewable energy in planning. In addition, in the previous study, several resources were examined such as energy crops and woody biomass which do not appear in this study. Generally, these are no longer considered appropriate resources for development at any significant scale. Woody biomass can have significant negative impact on air quality and health in the local area¹⁴. Commercial-scale energy crops compete with agricultural land in much the same way that renewables such as wind or solar do. However, the best yields for energy crops are usually on best and most versatile agricultural land; with lesser agricultural land being largely unsuitable. As wind and solar are not impacted by agricultural land grade for their energy yields, these are more suitable under current guidance. For these reasons, this study focuses on wind and solar PV – both roof- and ground- mounted.
302. It should be noted that at the time of writing, a Local Area Energy Plan (LAEP) is also being developed for the area. It is anticipated that this will examine renewable energy, and so there may be overlap with this study. Due to differences in methodology and assumptions there may be differences between the results in this study and in the LAEP. It should also be noted that the objectives of the studies are different. This study seeks to inform an ongoing Local Plan Review and focuses more closely on the present and near-future. When comparing the two studies, these differences should be kept in mind.
303. The potential of different renewables explored in this report may overlap. For example, ground-mounted solar and wind potential may use the same land. The two technologies can co-exist, with solar panels filling gaps between wind turbines, but this would lead to a lower solar potential than expected. This is both due to shading caused by the turbines, and the physical space taken up by the turbines and associated

¹³ <https://www.mansfield.gov.uk/downloads/file/510/low-carbon-energy-opportunities-and-heat-mapping-for-local-planning-areas-across-the-east-midlands-2011>

¹⁴ https://eeb.org/wp-content/uploads/2021/09/Where-theres-fire-theres-smoke_domestic-heating-study_2021.pdf

infrastructure. These trade-offs should be considered on a site-specific nature when projects are being developed.

3.1.1. Ground-mounted solar and wind turbines

304. To establish the potential of ground-mounted solar and wind turbines, a desk-based GIS analysis was conducted. This involves first establishing the areas suitable for a technology using a series of constraints, described in Section 3.1.1.1. The resultant areas are then analysed to derive the potential installed capacity and annual generation of the renewables, described in Section 3.1.1.2.

3.1.1.1. Constraints

305. To establish where might be most appropriate for future renewable energy generation, several constraints have been applied to the Mansfield District. These constraints are spatial datasets, sometimes including buffers, indicating where renewable energy development may not be considered suitable use of the land. The constraints are based on legal or statutory requirements, as well as professional guidelines and judgement. For example, ancient woodland presents a constraint for both solar and wind sites as they are sites that cannot be replaced or relocated¹⁵, and so cannot be built on. An additional buffer is applied for wind sites to safeguard against turbines rotors having a detrimental effect on wildlife in the woodland, particularly bats. The constraints applied in this report have been updated since the 2011 report, reflecting current practice.
306. Applying these constraints to the Mansfield District identifies locations we consider most suitable for renewable energy generation, for each different technology. The resultant locations, as presented in maps throughout Section 3, should be considered as those least likely to have barriers to renewable development. The analysis does not consider site-specific factors, nor non-technical factors that might preclude development in each location. Depending on these factors, it may be possible to develop renewables outside of the derived locations, or these factors may block developments which otherwise could be possible.
307. Different constraint levels were used to mark locations as unsuitable for a given low-carbon technology. A full list of constraints is given in Table 4. The constraint levels can be described as:
- Physical constraints are areas we consider completely unsuitable for renewable energy to be developed, given physical, safety, or legal barriers to building.
 - Flood zones can increase the risk to a renewable development in a given location. However, emerging practice suggests renewable developments can be protected from flooding risks, enabling development in these locations. We separate this into moderate

¹⁵ <https://www.woodlandtrust.org.uk/trees-woods-and-wildlife/habitats/ancient-woodland/>

and high difficulty for flood risk 3a and 3b respectively. This is because emerging practice suggests that flood risk 3a is likely to be able to be developed for renewables, though site-specific factors may need to be considered. Flood risk 3b may be able to be developed for renewables, though this has been less common than 3a.

- Permissive constraints are areas where there are statutory consultees on renewable developments. These areas are not blanket bans on development in the area, but indicate there is one or more organisation that has the right to object to developments. For protected areas (e.g. Sites of Special Scientific Interest, SSSIs), this is normally Natural England.
- The National Air Traffic Service (NATS) is also a statutory consultee for development of turbines which might interfere with their air traffic control systems and is relevant for each turbine size in this report. This has been analysed separately to other permissive constraints due to the significant impact in the Mansfield District. For each turbine size, the lowest NATS exclusion zone has been used. These exclusion zone heights increase in intervals of 20m, so e.g. for a turbine tip of 38m, an exclusion zone height of 40m is used.

308. The area constrained by statutory consultees such as NATS is comparatively large (see Sections 3.2 and 3.4). However, these consultees highlight that they use their objections only where there is genuine risk of detriment.

309. As guidance, it is therefore most appropriate to consider that the available potential is likely to be somewhere between that when considering only physical constraints and when considering statutory consultees.

Table 4: Constraints applied to determine suitable areas for renewable energy development

Site Name	Constraint level
Wind speed	Physical*
Roads and paths	Physical
Rails	Physical
Residential properties	Physical
Water	Physical
Woodland	Physical
Scheduled monuments	Physical
Historic parks and gardens	Physical
Battlefields	Physical

Site Name	Constraint level
World heritage sites	Physical
Agricultural land grades 1 - 3a	Physical
Electricity lines and pylons	Physical*
Minerals and waste sites	Physical
Ministry of Defence (MOD) land	Physical
Other historic conservation areas	Physical
Existing settlements	Physical
Established employment sites	Physical
Planned and prospective renewable energy sites	Physical
MOD safeguarding areas	Physical*
Anticipated infrastructure	Physical
Housing allocation	Physical
Flood risk 3a areas	Moderate difficulty
Flood risk 3b areas	High difficulty
Special areas of conservation (SACs)	Permissive
Sites of special scientific interest (SSSIs)	Permissive
National nature reserves (NNRs)	Permissive
Special protection areas (SPAs)	Permissive
Ramsar sites	Permissive
Local Nature Reserves (LNRs)	Permissive
National parks	Permissive
Areas of outstanding natural beauty (AONBs) or national landscapes (NLs)	Permissive

Site Name	Constraint level
Other natural conservation areas	Permissive
NATS safeguarding areas	NATS*

* Indicates the constraint is only relevant for assessments of wind turbine suitability.

310. For each renewable energy resource considered in this report, flood zones cause no further restrictions than the physical constraints considered. As such, they have not been presented distinctly.

3.1.1.2. Determination of installed capacity and annual generation

311. Once all constraints have been applied, the suitable locations are derived and mapped. The area of these locations (in km²) is then calculated. These areas are then multiplied by a spacing factor to determine the available capacity. A spacing factor gives, on average, how much space is generally required for 1 MW of generation from a given technology. However, these cannot consider site specific factors. For example, a long, thin strip of land may be able to support more turbines than an area-based analysis implies, as the limiting factor for turbine distribution is the distance between turbines.
312. This total capacity is then compared to an average technology-specific load factor from the previous five years, which allows estimation of annual generation. A load factor is a number between 0 and 100% which compares how much electricity is generated accounting for impacts such as sunlight hours, windspeed, etc. compared to if the technology could generate at its installed capacity for 24 hours a day, 365 days a year. Load factors will vary year-on-year based on in-year weather and changes in technology. Due to changing weather patterns driven by climate change, it is possible that load factors will vary from historic patterns in the future. The exact impact is unknown due to the many detailed factors that will be impacted, so have not been enumerated in this report. The load factors used in this report are based on average historic load factors from Feed-in Tariff data for the East Midlands¹⁶.

3.1.2. Rooftop PV

313. When looking at rooftop PV, a different approach is required. It is necessary to consider the slope of the roof, the area that is suitable for solar panels, and any shading by nearby buildings. This allows an estimation of the potential of any rooftop for solar electricity generation. However, there are limitations to this approach. For example, it is not possible to check the condition or material of the roof, and this may mean it is not possible to mount solar panels - a roof might require repair or strengthening works before it can bear the weight of solar panels.

¹⁶ <https://www.gov.uk/government/publications/quarterly-and-annual-load-factors>

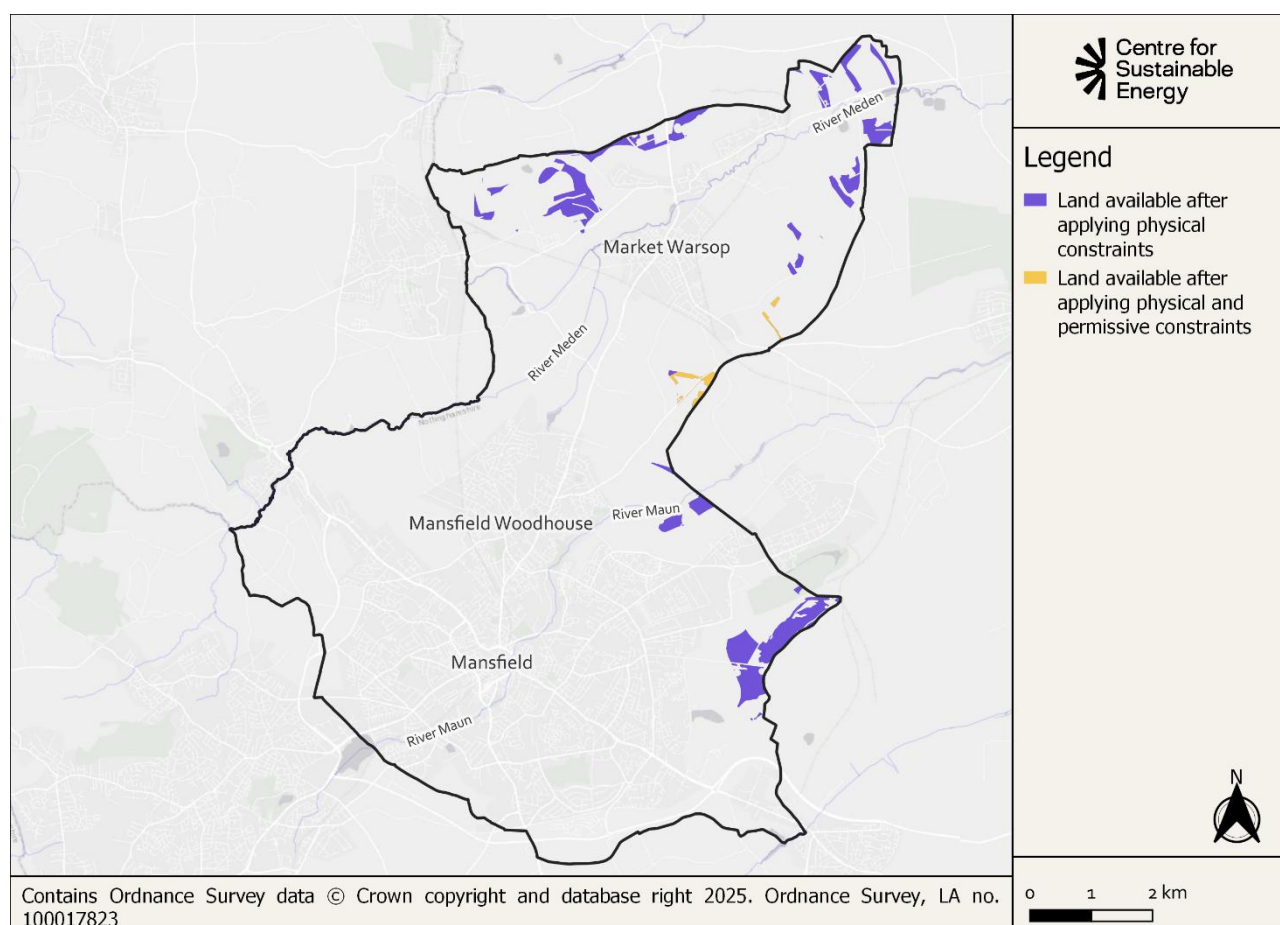
314. To determine which roofs are suitable for solar panels we have used Solar Wizard¹⁷, which is a modelling tool that estimates the technical potential for generating power on any rooftop in Great Britain (subject to dataset coverage). To do this, it examines the aspect (e.g. south-facing), angle, and size of the roof¹⁸.
315. This gives the technical potential of the panels. A financial model is then applied to the modelled arrays, which estimates the costs of installing the panels compared to the revenues that can be generated by the panels. By altering the inputs of this model, we can examine which arrays are the best investment.
316. Solar Wizard models polycrystalline PV, which is the least efficient (but cheapest) type of solar cell. Therefore, the results can be seen as a conservative estimate, with many systems outperforming the estimates provided.

3.2. Ground-mounted solar PV

317. Ground-mounted solar installations are those that place solar PV on frames that sit on the ground to produce electricity from the sun. These are commonly known as solar farms. While ground-mounted installations are generally less constrained than onshore wind farms (they can have larger coverage), they are able to produce less electricity from the same area. In other words, they are less space efficient.

¹⁷ <https://solarwizard.org.uk/>

¹⁸ Additional information on Solar Wizard's methodology is available here: <https://solarwizard.org.uk/about-solar-wizard/how-does-solar-wizard-work>

Map 5: Locations of technical potential for ground-mounted solar in Mansfield

318. Map 5 presents the area deemed appropriate for ground solar installation. North and east of the Mansfield District are found most appropriate. The largest existing ground-mounted solar installation is in the north-east of the district, at Welbeck Colliery.
319. The urban nature of the Mansfield District restricts the availability of a lot of land for ground-mounted solar PV, explaining the position of sites on the border of the district, away from Mansfield itself. Further limitations are caused by the presence of “best and most versatile” agricultural land, densest to the north-west and north of Mansfield town, and forested areas.
320. When also considering permissive constraints, the land considered suitable for ground-mounted solar PV development decreases to almost zero, compared to that available when only physical constraints are applied. These permissive restrictions are largely due to environmental conservation sites, which often have large protective areas. As discussed in section 3.1, the area available for ground-mounted solar is likely to be between the area figures given in Table 5, given the opportunity to work with relevant organisations and build on sites considered as permissive constraints in this report.

Table 5: Ground-mounted solar yield per constraint applied

Constraint level	Area technically suitable for development (km ²)	Potential capacity (MW)	Potential annual generation (GWh/yr)
Physical	24.2	1,211	961
Physical and permissive	0.1	6	5

3.3. Rooftop solar PV

321. Rooftop PV are panels placed onto the rooftops of homes, businesses, or other structures. These generate electricity as opposed to solar hot water, which warms water. Rooftop PV can be fitted to sloped or flat roofs and is generally more expensive per unit of capacity than ground-mounted solar. However, it has the advantage that of not competing with other land uses.
322. An initial examination of rooftops, completed with Solar Wizard, suggests there are an estimated 56,640 rooftops suitable for solar PV. This corresponds to an installed capacity of 424 MW, generating around 365 GWh of electricity per year.
323. As new homes are increasingly expected to have solar PV, it is useful to define targets for how this might be expected to perform. Some emerging Local Plans are defining an annual generation per m² of building footprint (kWh/m²_{fp}) as a key performance indicator. For example, Bristol City Council's (BCC) Local Plan¹⁹ (currently under review) sets an on-site renewable energy generation of 105 kWh/m²_{fp}. The kWh/m²_{fp} metric is affected by two key details – the profile of a roof (e.g. gable, hip, flat) and how much sun there is in an area. Generally, areas that are cloudier or further north will get fewer hours of sun and therefore generate less electricity. Based on our modelling of rooftop solar, we have investigated the range of values that are possible on Mansfield's current building stock. The current median value is 72 kWh/m²_{fp}. The maximum value possible with Mansfield's current roofing is 210 kWh/m². The performance is based on current building stock, and likely underestimates how much could be generated on new builds. Changes to roof design can maximise the amount of rooftop PV, and its annual generation. This is because PV size (and output) is heavily dependent on the design of the roof. For example, the common gable roof has two roof planes directly opposite one another. This means that if one plane is south-facing, half of the roof (and therefore half the building footprint) is not suitable for solar panels – essentially halving the kWh/m²_{fp} metric.

¹⁹ <https://www.bristol.gov.uk/residents/planning-and-building-regulations/planning-policy-and-guidance/local-plan/local-plan-review>

324. New buildings can have their roof designed to maximise PV area compared to the building footprint. This allows them to achieve much greater kWh/m²_{fp} than existing buildings could. Therefore, targets set for new builds can be higher than those that could be achieved with current roofs. The above kWh/m²_{fp} indicates good technical solar rooftop potential across Mansfield, but it is also worth considering the economics of the solar panels. Generally, the home hosting the solar panels will benefit more from solar panels if they use the electricity they generate, rather than exporting it to the grid. This is because the cost they pay for electricity is more than that they would get for exporting it. At the time of writing, the electricity price cap is around £0.27 per kWh. The smart export guarantee pays for exported electricity from MCS-accredited installations. This varies, but many suppliers offer around £0.15 per kWh. Therefore, if a household consumes the electricity rather than exporting it, it is worth around £0.12 more per kWh.

325. Because the amount of electricity consumed at home is so impactful on the revenue from generating electricity, it is worth examining a range of values. In this section we use three scenarios to examine this impact, as shown in Table 6.

Table 6: Summary of the rooftop PV scenarios examined

Scenario	Amount self-consumed	Household characteristics that might have this pattern
Low self-consumption	20%	Often not at home, low electricity consumption, gas heating
Moderate self-consumption	50%	Often at home, moderate electricity consumption, efficient electric heating
High self-consumption	80%	Mostly at home, high electricity consumption, e.g. electric vehicle, electric heating

326. Throughout this section we use internal rate of return (IRR) to gauge overall financial performance. This is an economic measure that considers how a capital investment would perform over its lifetime. IRR weighs the upfront costs of the solar panels, against the ongoing costs and profits – a higher IRR is better. One way to see IRR is a measure of how well an investment would perform against a different investment, such as investing it in the stock market. Over the past ten years, the consumer price index (CPI) has averaged 3.3% increase per year²⁰ – often referred to as inflation. This means that an investment that had an IRR of 3.3% would break even when compared to inflation. A higher IRR would mean it outperforms inflation, making it a more attractive solution.

327. The following tables show the number of rooftops in the district that meet a certain IRR, and how much electricity this would generate. Table 7 gives these for a 3.3%

²⁰ <https://www.ons.gov.uk/economy/inflationandpriceindices>

IRR, in line with inflation from the past ten years. Table 8 for a 7% IRR, Table 9 for 10%, and Table 10 for 15%.

Table 7: Rooftop PV statistics meeting a 3.3% IRR

	Number of roofs suitable	Installed capacity (MW)	Annual generation (GWh)
Low self-consumption	56,636	424	364
Moderate self-consumption	56,636	424	364
High self-consumption	56,636	424	364

Table 8: Rooftop PV statistics meeting a 7% IRR

	Number of roofs suitable	Installed capacity (MW)	Annual generation (GWh)
Low self-consumption	52,773	413	356
Moderate self-consumption	56,636	424	364
High self-consumption	56,636	424	364

Table 9: Rooftop PV statistics meeting a 10% IRR

	Number of roofs suitable	Installed capacity (MW)	Annual generation (GWh)
Low self-consumption	4,857	184	156
Moderate self-consumption	45,927	385	334
High self-consumption	56,597	423	364

Table 10: Rooftop PV statistics meeting a 15% IRR

	Number of roofs suitable	Installed capacity (MW)	Annual generation (GWh)
Low self-consumption	944	117	98
Moderate self-consumption	2,487	152	129

	Number of roofs suitable	Installed capacity (MW)	Annual generation (GWh)
High self-consumption	5,910	193	164

328. Assuming the average trend of CPI inflation continues, a 3.3% IRR is likely the minimum acceptable for the installation of solar panels, as it breaks even with inflation. Under this IRR, all the rooftops suitable for PV in Mansfield remain viable – regardless of self-consumption levels. This means there is good solar potential across the district.
329. At an IRR of 7%, the rooftop installations are a moderate investment. This means that they outperform inflation and offer small returns to the investor. An IRR of this level is often seen as suitable return for low-risk investment, such as solar panels. Around 4,000 rooftops do not meet this threshold in the low self-consumption scenario, but all meet it in other scenarios.
330. At an IRR of 10%, few rooftops meet the threshold in the low-self consumption scenario. However, most rooftops still meet this threshold in the moderate and high self-consumption scenarios. At an extremely good IRR of 15%, only about 10% of rooftops meet the threshold in the high self-consumption scenario, with less than 1,000 meeting the threshold in the low self-consumption scenario.
331. To contextualise these figures further, and where investment may originate, it is useful to highlight rate of return on various investments. The UK Infrastructure Bank targets an annual rate of return of 2.5-4%²¹. Bristol Energy Cooperative offered a 6% return on their latest share offer²². The S&P 500 (a stock market index) had an annual growth rate of 9%²³.
332. Given increasing electrification of heat and transport, as well as increased homeworking, demand for self-consumption of generated electricity is likely to increase. Therefore, a good guideline for many households might be that a moderate self-consumption scenario is most realistic. When this is considered alongside a 10% IRR outcompeting many alternative investments, nearly 46,000 rooftops in Mansfield (see Table 9) seem economically viable.

3.4. Onshore wind

333. Onshore wind involves using wind turbines of various sizes to convert the energy of the wind to electricity. This can be accomplished either by solitary turbines, or with many turbines in proximity, known as a wind farm. Taller wind turbines are more able to take

²¹ <https://www.nao.org.uk/reports/the-creation-of-the-uk-infrastructure-bank/>

²² <https://bristolenergy.coop/share-offer-2024/>

²³ <https://curvo.eu/backtest/en/market-index/sp-500?currency=gbp>

advantage of the greater windspeeds available at higher heights but may have greater visual impact.

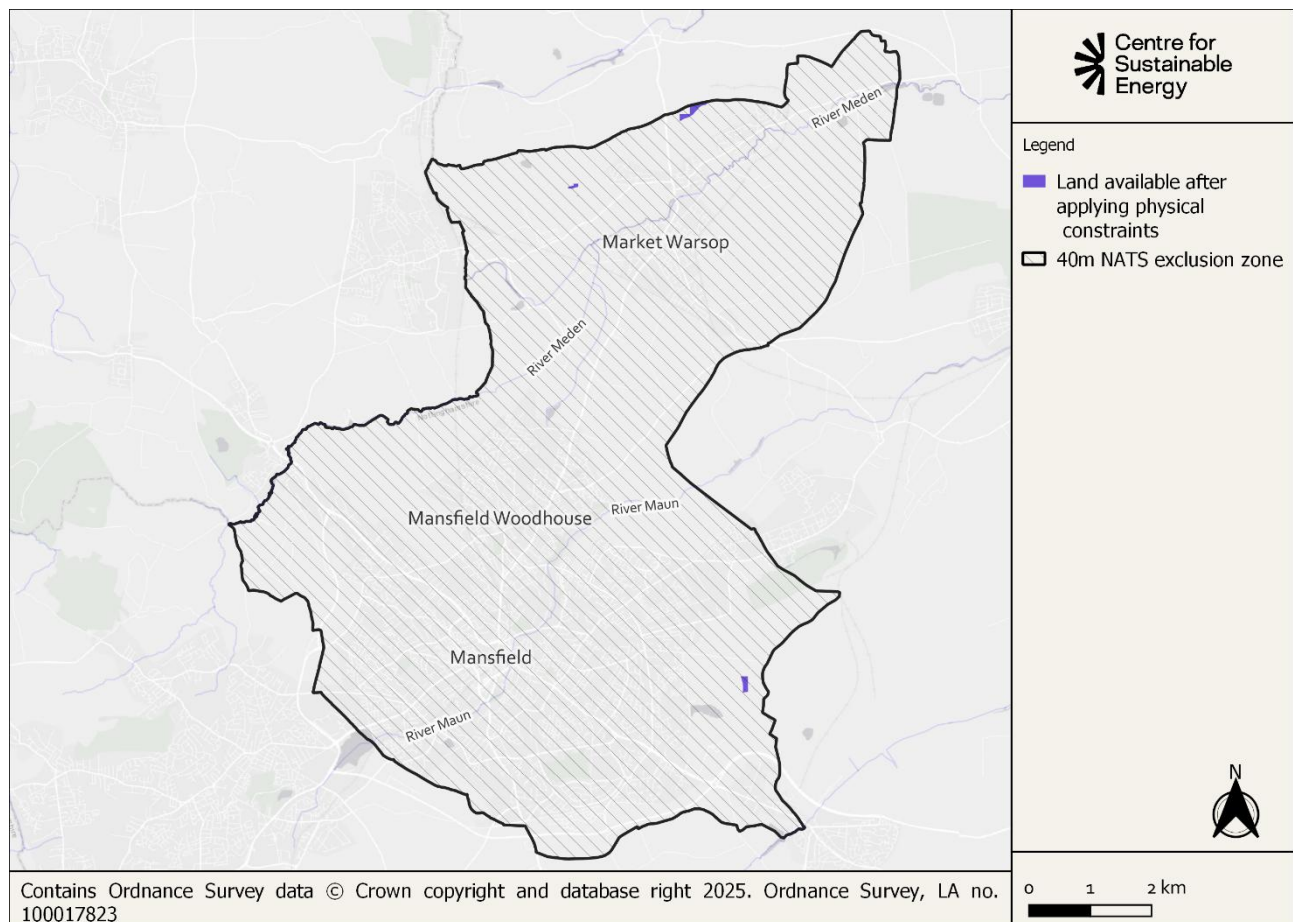
334. For this analysis, three differing wind turbine heights have been considered, presenting the suitable locations for each. This allows an insight into the effect constraints can have on illustrative turbine sizes (see Table 11), for more robust planning. This is important if weighing the potential generation against the impact of the turbines on a local area. These archetypes are based on a review of existing turbines, but these figures should still be considered as a guideline. Each turbine has unique sizing characteristics and so will vary.

Table 11: Turbine archetypes

Turbine size	Typical capacity (MW)	Hub height (m)	Rotor diameter (m)	Turbine tip height (m)
Small	0.05	25	25	38
Medium	1	46	61	77
Large	4.3	81	138	150

3.4.1. Small wind turbines

335. Small turbines are those that have a hub height of 25m, and a tip height of 38m. Map 6 presents the technically suitable areas for small wind turbines. There is limited availability for this turbine size after the removal of physically constrained areas, mostly due to insufficient wind speed at the relevant hub height. The resultant available capacity and annual generation under different constraint sets are shown in Table 12.

Map 6: Locations of technical potential for small wind turbines in Mansfield

336. Small regions of potential are available in the north and south-east, though applying permissive constraints leaves no remaining area suitable for small wind turbines due to a combination of these permissive constraints (such as SSSIs, which have large buffer zones). As such, for small wind turbines to be viable in the Mansfield District, engagement with relevant statutory consultees such as Natural England would be essential.
337. NATS' safeguarded areas also cover all of the Mansfield District. NATS excludes large regions across the East Midlands and therefore is a major consideration for renewable wind generation in the Mansfield District. Early engagement with NATS would be essential for any potential construction. This is not unexpected. NATS safeguarding protects air traffic control radar line of sight and aircraft approaches. As there are several major airports in the region (e.g. East Midlands, Birmingham), there is likely to be significant interaction. However, as Mansfield is in relative distant proximity to the airports, it is more likely that NATS will consent to turbine development.

338. We note that as part of the governments' objective to increase onshore wind development it has created an Onshore Wind Strategy²⁴ and taskforce with the objective of removing blocks to development. The strategy is exploring possible government interventions which might overcome blocks to onshore wind development caused by civil and military aviation, where this is possible. This may mean that areas previously blocked to development may in some cases be able to come forward.

Table 12: Small wind yield per constraint level

Constraint level	Unconstrained area (km ²)	Capacity (MW)	Annual generation (GWh/yr)
Physical	0.1	0.4	0.7
Physical and permissive	0	0	0

3.4.2. Medium wind turbines

339. Medium turbines are those that have a hub height of 46m, and a tip height of 77m. Map 7 presents the available area for medium wind, and gives the corresponding technical potential. Technically suitable land is found in similar areas as for small wind, in the north and southeast of the district. The higher windspeed at higher heights means a slightly larger area is available for medium turbines than small turbines under only physical constraints. Just as the Mansfield District's urban nature limited ground-mounted solar site availability, it does so for medium wind turbines. The urban nature is more constraining when applied to wind, because of the larger buffer required to safeguard against turbine toppling. This means roads, railway lines, and electricity lines limit wind turbine construction more than they do solar.
340. As with small wind, applying permissive constraints reduces the amount of technically suitable land to zero. As with solar, this is largely a result of nature conservation sites, which means engaging with organisations like Natural England will be important for capitalising on the opportunities available for medium wind in the district. Constraint by the NATS exclusion zone at the tip height of 77m also leaves no technically suitable space for medium wind turbines. This means early engagement with NATS will be vital to determine where they may object to wind development.

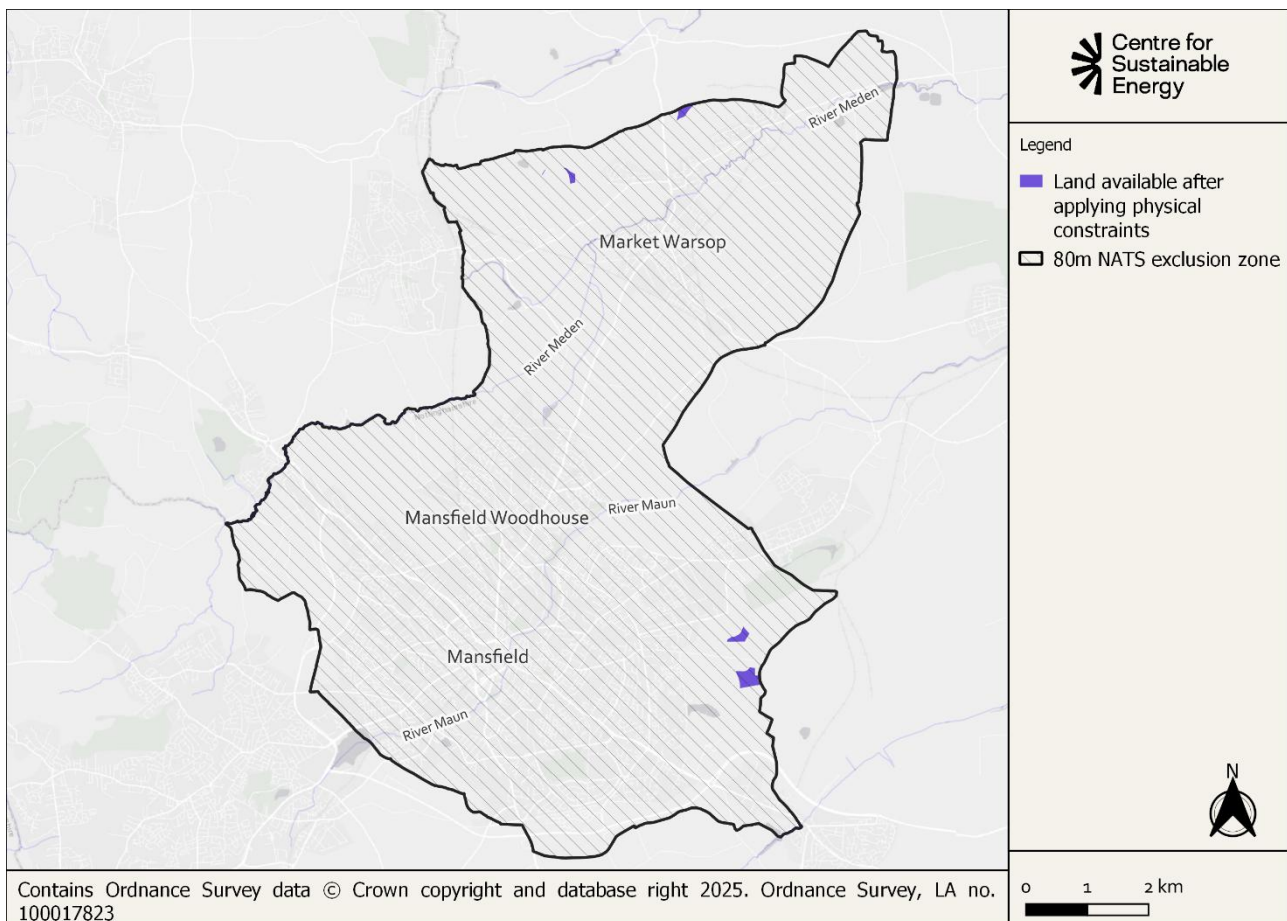
²⁴ Onshore Wind Strategy Taskforce Strategy (2025) – DESNZ - <https://assets.publishing.service.gov.uk/media/68678b6bd520affe4e581cc1/onshore-wind-taskforce-strategy.pdf>

Table 13: Medium wind yield per constraint

Constraint level	Unconstrained area (km ²)	Capacity (MW)	Annual generation (GWh/yr)
Physical	0.2	3.0	6.2
Physical and permissive	0	0	0

341. The larger available area for medium wind under different constraint sets, and the higher capacity means greater potential for medium sized turbines than from smaller turbines. This might make them a more attractive investment opportunity.

Map 7: Locations of technical potential for medium wind turbines in Mansfield



3.4.3. Large wind turbines

342. Large turbines are those that have a hub height of 81m, and a tip height of 150m. Map 8 presents the area available for large wind turbines and Table 14 shows the corresponding technical potential. Most of the area available after physical constraints are applied is found to the east of Mansfield town. The windspeed at the hub height of a large

turbine is sufficient for generating wind power across all of the Mansfield District, given higher windspeed at this hub height compared to either of the other turbine archetypes' hub heights. However, as seen in section 2.4.2, increased buffer zones for wind turbines reduce the land that makes building turbines viable, so the higher hub height of large turbines means an increased buffer is required.

343. As with small and medium wind, applying permissive constraints means no area is technically suitable, due to nature conservation sites. Applying the NATS exclusion zone at the appropriate height (the lowest above the turbine's tip) also excludes the whole of the Mansfield District from large wind turbine availability. As with all turbine archetypes, engagement with bodies like NATS and Natural England will be essential to determine potential sites for wind power generation in the Mansfield District.

Map 8: Locations of technical potential for large wind turbines in Mansfield

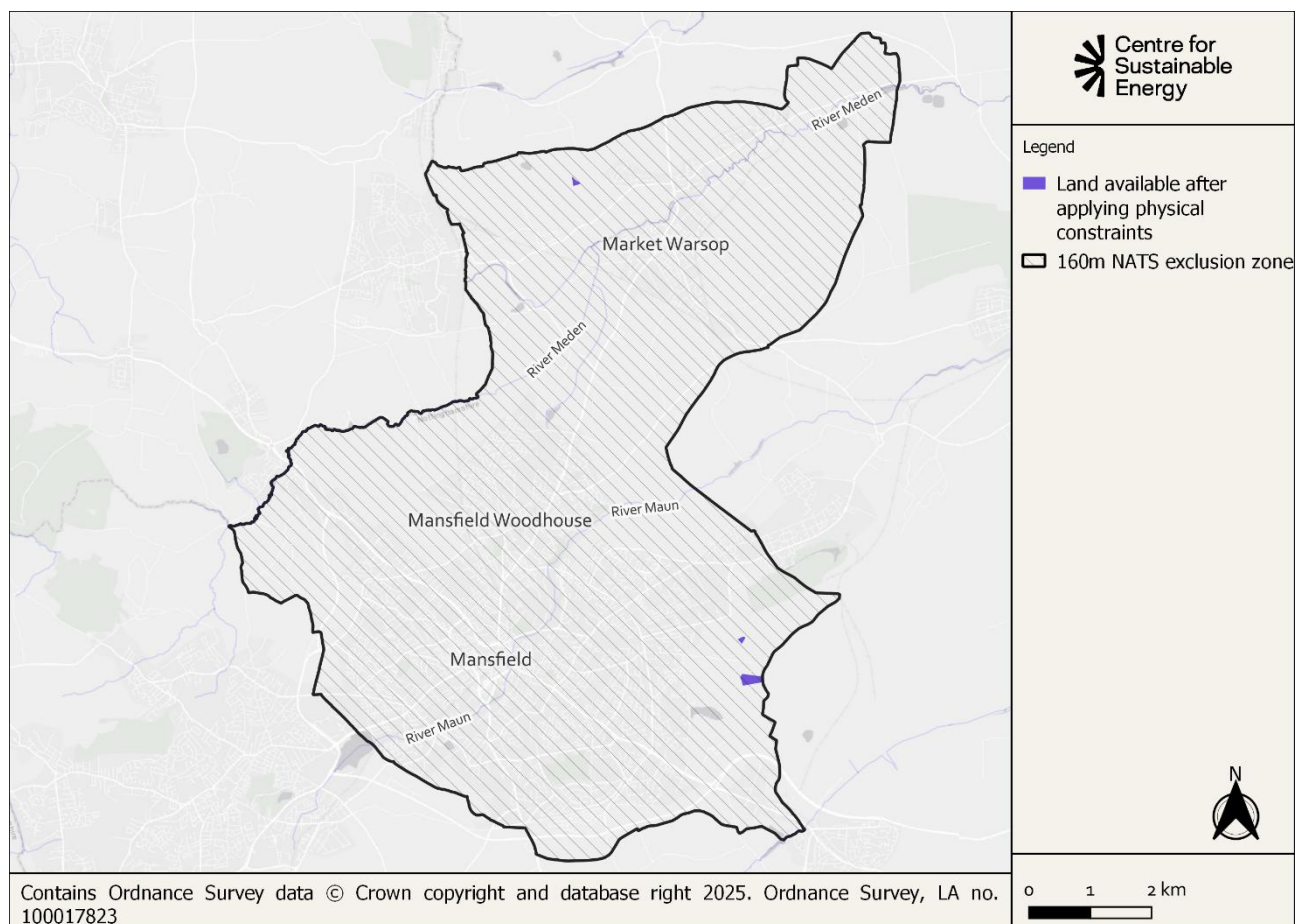


Table 14: Large wind yield per constraint

Constraint level	Unconstrained area (km ²)	Capacity (MW)	Annual generation (GWh/yr)
Physical	0.1	4.3	8.8
Permissive	0	0	0

344. While large turbines have a smaller technically suitable area, individually large turbines do produce the greatest generation (see Table 11). Therefore, site-specific factors may make larger turbines a more attractive investment opportunity, though this still needs to be weighed against the benefits and local impact of different technology types.

3.5. Summary of technical potential across technologies

345. Ground-mounted and roof-mounted solar PV installations, along with small, medium, and large wind turbines, all have potential for contributing to the renewable energy generation of the Mansfield District. A summary of the maximum technical potential of each resource is shown in Table 15. For clarity, this means the technical potential considering only physical constraints for wind and ground-mounted solar, and across all suitable buildings for rooftop PV.

Table 15: Summary of the maximum technical potential of renewable power in Mansfield

Technology	Potential capacity (MW)	Potential annual generation (GWh/yr)
Ground-mounted solar PV	265,550	210,574
Roof-mounted solar PV	424	364
Small wind turbines	441	906
Medium wind turbines	7,351	15,099
Large wind turbines	6,378	13,101

346. Given the relatively large proportion of the Mansfield District covered by urban areas such as Mansfield and Mansfield Woodhouse, there is a good opportunity for roof-mounted solar PV installations in the district on both existing and planned buildings. These installations can contribute to the renewable energy generation resource of the area without requiring land to be allocated specifically for this purpose, whilst providing direct benefits to the building it is built on in the form of reduced electricity bills. Given

51% of district emissions come from domestic sources²⁵, promoting the deployment of roof-mounted solar PV panels could make a significant impact towards reducing emissions within the district.

347. The urban nature of the district also restricts suitable locations for ground-mounted solar PV and wind turbines of all sizes. The areas considered suitable for each of these technologies is heavily reduced when applying permissive constraints. However, these constraints do not represent a complete inability to develop renewables. The evidence makes clear that early engagement with Natural England will be essential to all potential development in Mansfield.
348. For potential wind development, NATS might pose a major barrier. This is because, at all turbine sizes, NATS safeguarding impacts the entirety of the Mansfield District. Therefore, any wind development would need to be discussed at an early stage with NATS and the Civil Aviation Authority.
349. Amongst different wind turbine archetypes, medium and large turbines have greater technical potential. This is due to the greater windspeeds available at higher heights. Taller turbines are also able to generate more electricity for the same area than small turbines.
350. Larger wind turbines can generate more electricity than ground-mounted solar PV in the same space. However, wind turbines are often less visually acceptable than solar farms. Therefore, there are non-technical considerations that might be essential to the realisation of renewable potential in Mansfield. Community engagement can support the development of renewables, as discussed in Section 5.

²⁵ <https://www.mansfield.gov.uk/downloads/file/2970/approved-draft-climate-change-strategy-september-2021>

4. Heat demand and sources assessment

401. For the Mansfield District to become a net zero and carbon resilient Council by 2040, decarbonisation of heat will be essential. Whilst heat decarbonisation is not an explicit priority in the council's Climate Change Strategy, 51% of district emissions come from domestic sources which are heavily contributed to by heating.
402. Electrification is seen as the most viable solution for low and zero carbon heating. Whilst grid electricity currently has associated carbon emissions, national renewable electricity generation is rapidly increasing. The National Energy System Operator reports to be on track to be able to operate the grid with zero carbon electricity in 2025²⁶. The Government has defined a Clean Power target of 2030²⁷, meaning Great Britain will generate enough zero-carbon electricity to meet our total electricity demand.
403. Along with electrification, there is a need to reduce heat demand, as this eases the impact of electrification on the grid and reduces consumer bills. Generally, heat demand is reduced using insulation and other energy saving measures.
404. Heat networks can play a key role in achieving reductions in heating emissions from buildings. It is generally recognised that in high-density urban areas, they are often the lowest cost low-carbon heating option. They offer a solution that can provide shared heat to a range of buildings by capturing or generating heat locally²⁸.
405. Heat networks are largely technology agnostic, meaning their heat can come from different sources, such as industrial waste heat, heat pumps, biomass, etc. The potential large scale of the centralised system means they can access heat sources of a size not available for individual buildings and can achieve higher efficiencies than individual systems.
406. Where they are viable, heat networks provide a few additional benefits, especially for customers. In a domestic setting, connections to a heat network are generally cheaper than installations of individual heat pumps. This means heat networks require lower initial investment from building owners and occupiers. Moreover, when deployed at scale, they have the potential to deliver low-cost heat to customers. The centralised management can also lead to protections against breakdowns, leading to more reliable heat and more streamlined maintenance costs. There are some risks, such as a heat network being a

²⁶ <https://www.nationalgrideso.com/future-energy/our-progress-towards-net-zero/net-zero-explained>

²⁷ <https://assets.publishing.service.gov.uk/media/677bc80399c93b7286a396d6/clean-power-2030-action-plan-main-report.pdf>

²⁸ <https://www.gov.uk/government/collections/heat-networks>

monopoly, without consumers having the ability to switch provider. Regulation of heat networks by Ofgem is intended to lessen some of these impacts.

4.1. Approach

407. Understanding where efforts should be directed to decarbonise heat is essential. To make informed decisions, we start by considering heat demand density. This is because areas of dense heat demand are the best locations for developing heat networks. As well as this, heat demand can be aggravated by poor insulation, leading to greater need for heating. Therefore, heat demand density reveals the areas where there are opportunities for decarbonising heat and reducing consumer bills through retrofit or insulation. East Midlands Combined Country Authority has released a domestic retrofit strategy²⁹. Therefore, this study sits within the context of that strategy. The whole systems nature of the retrofit strategy will help ensure enabling conditions exist for retrofit across the Mansfield District. In particular, the strategy will help to develop the necessary supply chains and funding in the area which will enable local success in retrofit.
408. When considering heat networks, cheaper sources of heat can also reduce customer bills and are therefore worth identifying.
409. As noted previously, it should be noted that at the time of writing, an LAEP is also being developed covering the area. It is anticipated that this will examine heat provision, and so there may be overlap with this study. Due to differences in methodology and assumptions there may be differences between the results in this study and in the LAEP. It should also be noted that the objectives of the studies are different. This study seeks to inform an ongoing Local Plan Review and focuses more closely on the present and near-future. For example, the LAEP focuses on longer-term trends in heating and future heat provision, including growth of housing. Whereas this study focuses on heat demand as it is today. When comparing the two studies, these differences should be kept in mind.

4.1.1. Demand mapping

410. To identify areas where heat networks would be best implemented (i.e. those areas with the densest heat demand), heat demand mapping has been completed across the Mansfield District. For each building, Chartered Institution of Building Services Engineers (CIBSE)³⁰ energy demand benchmarks were used to estimate a heat demand. Where CIBSE benchmarks were not available, CSE's THERMOS model was used instead³¹. The maps in Section 4.2 present this heat demand density along with areas where the demand is in the top 5% or 10% of Mansfield's heat demand.

²⁹ <https://www.eastmidlands-cca.gov.uk/what-we-do/net-zero/domestic-retrofit/>

³⁰ <https://www.cibse.org/knowledge-research/knowledge-resources/knowledge-toolbox/benchmarking-registration>

³¹ <https://www.thermos-project.eu/home/>

411. Through this process, anchor loads were also identified, which are buildings with large, stable heat demands. These are beneficial to heat networks, as they represent a single, more reliable connection which can support their viability– reducing the risk from the high investment costs. Heat networks should target these sites as early as possible in their planning to assess their viability.
412. This report presents anchor loads in two levels; key anchors, which present the largest and most stable loads, and secondary anchors which are smaller and less stable, but which might still be suitable for consideration in the initial heat network planning stage. Key anchor loads are defined here as those with over 500 MWh/yr of heat demand, as well as any hospitals, further education sites, leisure centres with pools, and care homes. Evidence shows that these sites have characteristics that make them very good initial loads for heat networks. Secondary anchors are those with demands of 100 MWh/yr or higher and other education sites (such as schools or colleges). These sites still have good characteristics for supporting heat networks but are less likely to be able to justify a heat network alone.

4.1.2. Source mapping

413. Potential heat sources are also identified as part of this report. These heat sources might require upgrading with a heat pump to raise their temperature, or they might be of sufficient temperature to be directly usable such as waste heat from a crematorium. Heat sources that need upgrading with heat pumps have an associated coefficient of performance (CoP). Those with a greater CoP require less electricity to achieve the required temperature of a network and so provide better economic options for heat network operators. For high-temperature waste heat, there is no need to upgrade the temperature, and these are generally the cheapest heat sources.
414. Several sources such as the REPD, the Digest of UK Energy Statistics³² (DUKES), and the National Atmospheric Emissions Inventory (NAEI) were used to identify possible waste heat sites. However, none were located in the Mansfield District area. Additional investigation showed the crematorium may be suitable as a waste heat source.
415. Sites for water source heat pumps (WSHP) were also identified. To do this, first stationary bodies of water were identified using the Ordnance Survey MasterMap (OSMM) water dataset³³. Potential rivers were located using the National River Flow Archive³⁴. Heat availability from these sources was then estimated based on heat extraction rates, achievable by WSHPs without causing a drop in water temperature which might cause environmental impact. For each of these sites, conservative estimates have been used, such as flow rates which have been exceeded more than 95% of the time throughout the

³² <https://www.gov.uk/government/statistics/electricity-chapter-5-digest-of-united-kingdom-energy-statistics-dukes>

³³ <https://www.ordnancesurvey.co.uk/products/os-mastermap-networks-water-layer>

³⁴ <https://nrfa.ceh.ac.uk/>

monitoring period. This means there is low risk of even extreme events such as droughts preventing operation of the heat network. Similarly, when applying for abstraction and discharge permits from the Environment Agency, greater temperature drops may be allowable than used in these estimates. This means that the identified heat sources are likely to be able to provide more heat than estimated. Site-specific investigation would be able to confirm the suitability of the heat source. Multiple WSHPs can be present on the same river, as illustrated in this report. However, they will have a cumulative effect on the river temperature. Therefore, appropriate tests must be conducted to ensure there is not significant interaction between multiple WSHPs.

416. Ground source heat pumps (GSHPs) require a suitable area of open space. This is because a series of boreholes must be drilled. These boreholes may aim to access an aquifer, from which water is drawn and later returned. This is known as an open-loop system. They may also feature a closed-loop system, where water in pipes is passed through warmer rocks deeper in the earth, without being discharged. Generally, open loop systems have higher potential, though an aquifer must be available. Note that these are both forms of shallow geothermal, while deep geothermal relies on specific geological properties which Mansfield is not known to possess. We have identified areas of open space using the OS Open Spaces dataset³⁵. The areas were analysed to estimate the number of boreholes that could be drilled in the open space, and the heat potential estimated using the UK geothermal platform³⁶.

4.2. Results

4.2.1. Heat demand

417. The areas with the highest heat demand density can be found in Mansfield's town centre, along with, Mansfield Woodhouse high street, and the area surrounding the Sandlands Way ASDA. An area of particularly high heat demand is found around King's Mill Hospital, with this as a key load, though this falls slightly outside the Mansfield District boundary.
418. Map 9 indicates there are many key anchor loads within Mansfield town centre, which could improve the viability of a heat network in this region. This is supplemented when examining the secondary anchor loads in Map 10, which are populous both in this area and around the Mansfield Woodhouse high street.
419. Whilst there are several key demands, a few stand out as those that should be initially prioritised. The Four Seasons Shopping Centre is likely to be one of the most significant heat demands in the area due to its size and central proximity. Whilst slightly outside the boundaries of Mansfield, as noted above, the King's Mill Hospital is one of the

³⁵ <https://osdatahub.os.uk/data/downloads/sample/GRSPDL>

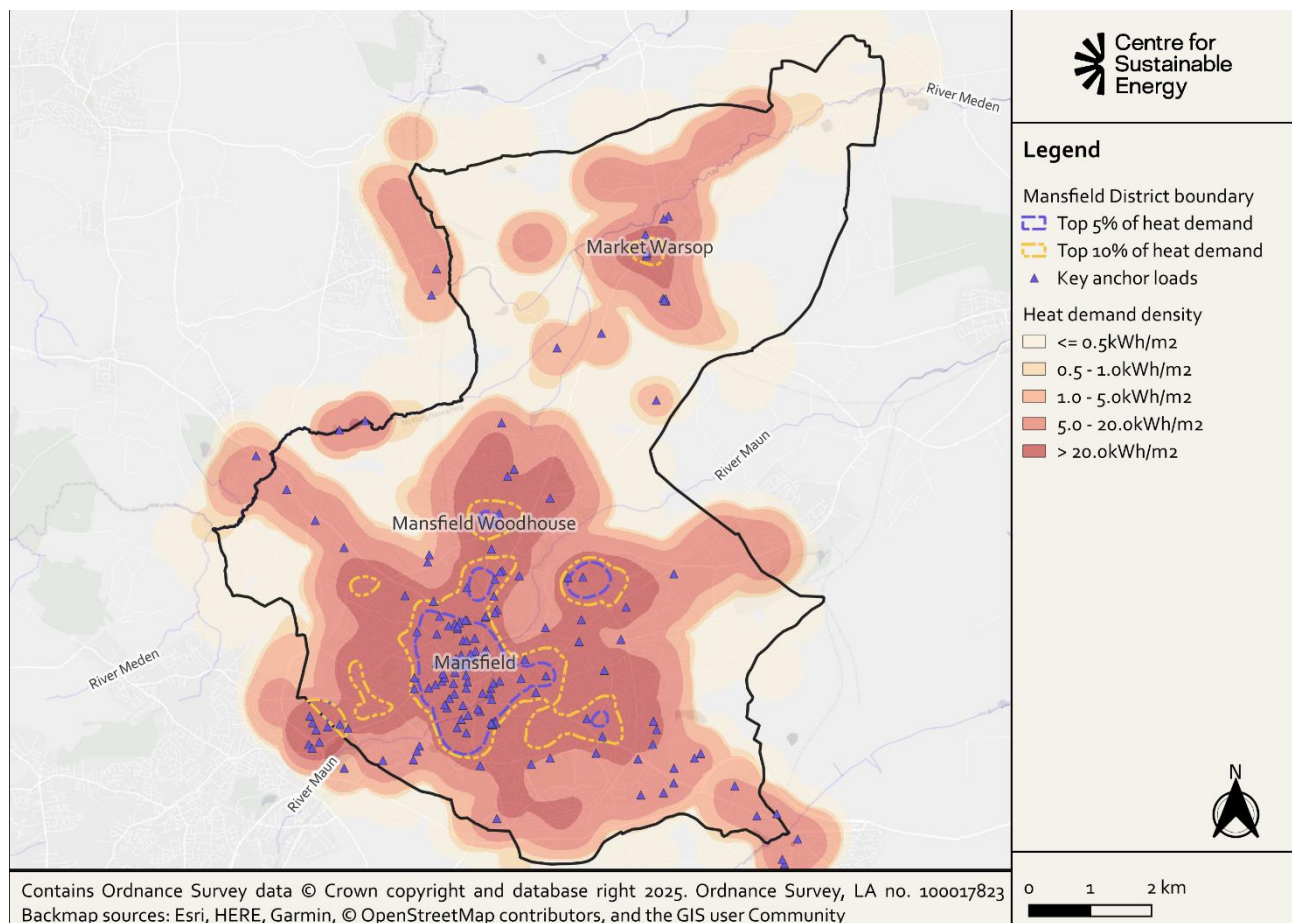
³⁶ <https://ukgeothermalplatform.org/>

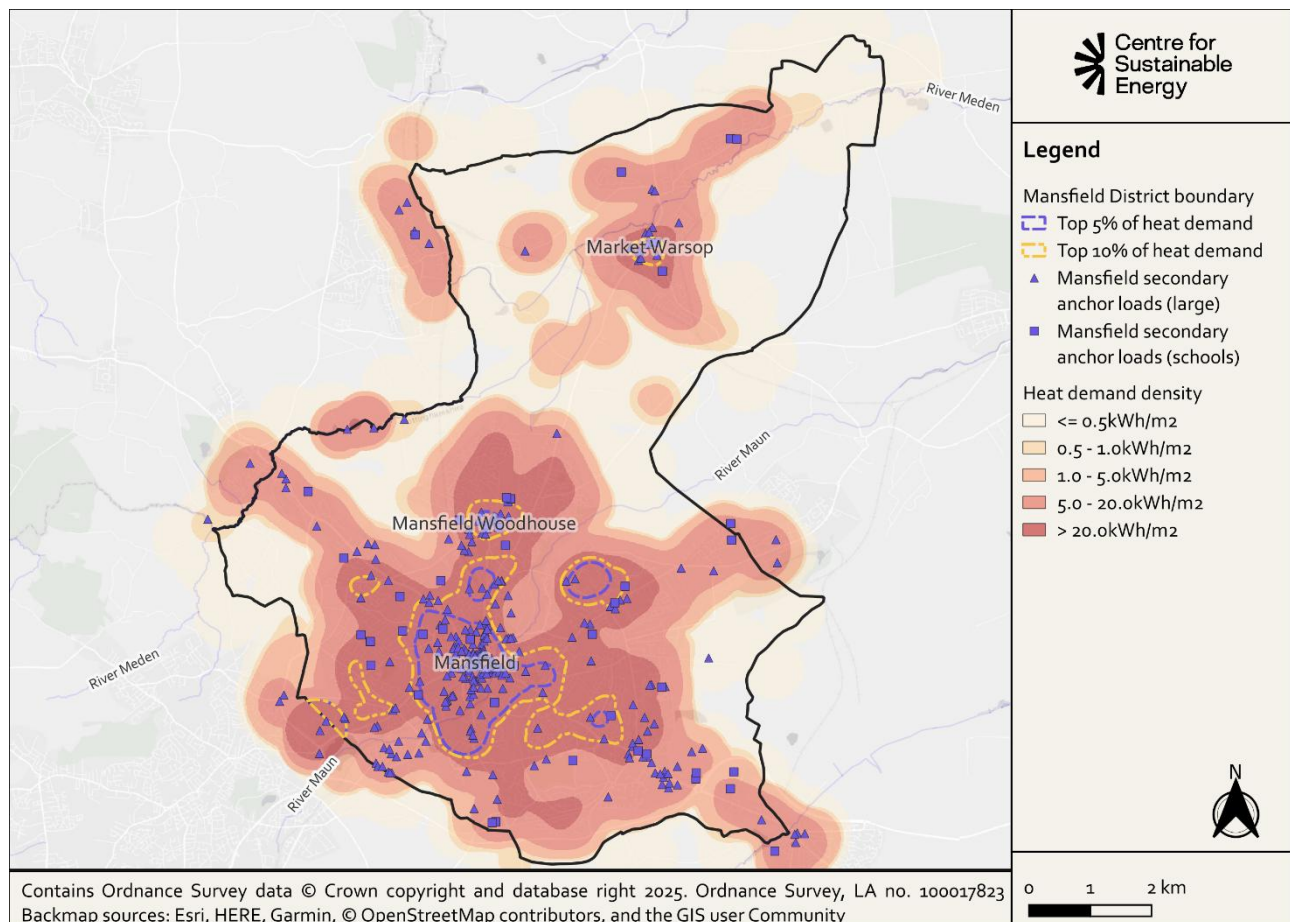
largest demands in the area. This means that it might be a key anchor for a network that could expand into Mansfield. Early engagement with the Sherwood Forest Hospitals Trust could reveal their decarbonisation plans. Due to the cross-boundary nature, working with Ashfield District Council, potentially enabled by Nottinghamshire County Council, would be an important step.

420. The Water Meadows Leisure Complex and the Rebecca Adlington Swimming Centre in Mansfield, and the Warsop Health Hub all have swimming facilities. Swimming pools are ideal loads for heat networks, with high, stable heat demand throughout the year. Additionally, these are all managed by a single trust – More Leisure Community Trust. This represents a key opportunity for early discussions with a single stakeholder that might be able to support multiple heat networks.

421. More detailed maps of the key and secondary anchor loads in the Mansfield Urban Area and the Warsop Parish Area are shown in Appendix II: Detailed anchor loads maps.

Map 9: Heat demand density in Mansfield showing key anchor loads



Map 10: Heat demand density in Mansfield with secondary anchor loads

4.2.2. Heat sources

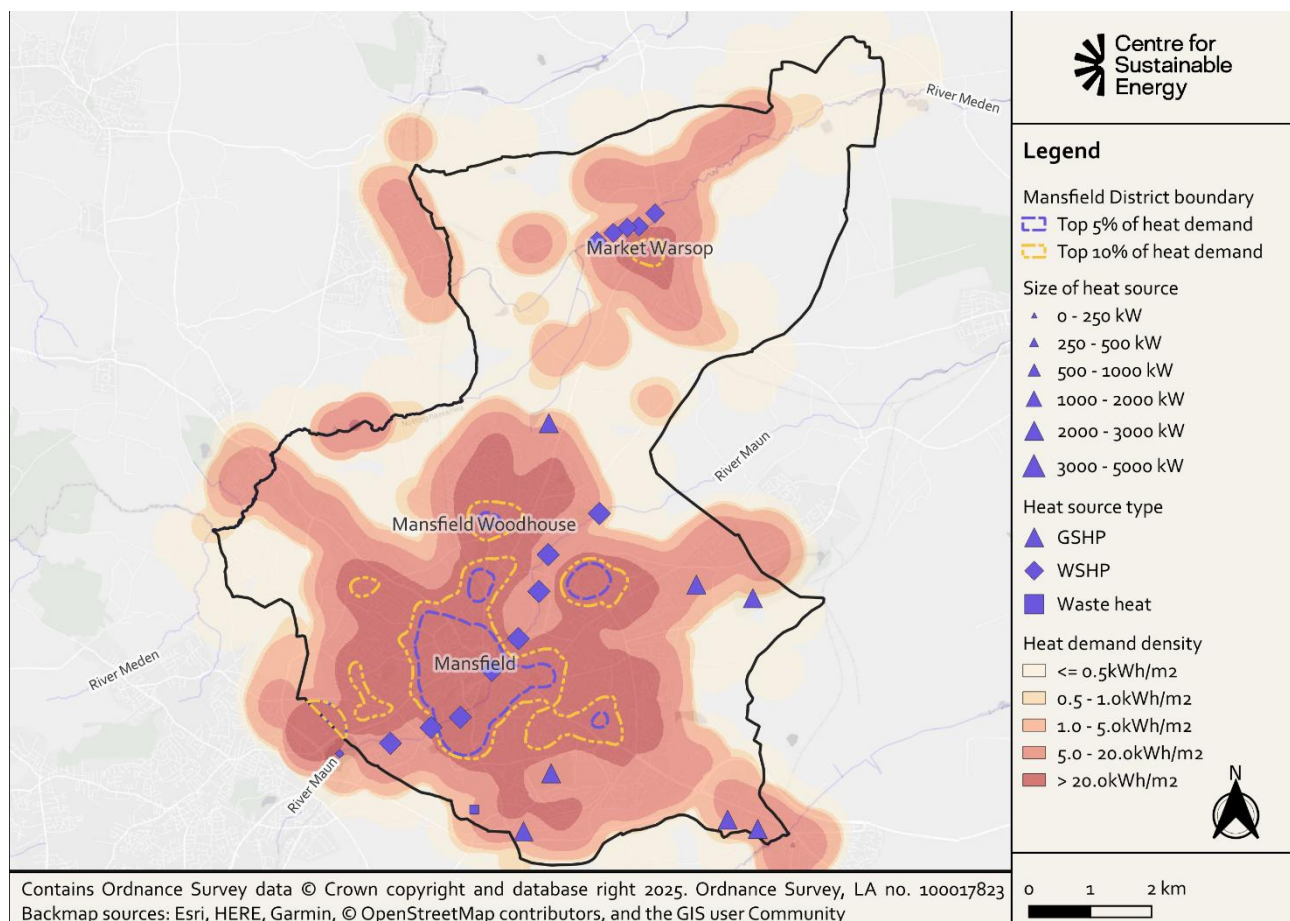
422. The potential heat sources identified are predominately GSHP and WSHP, with one waste heat site. These are shown in Map 11.
423. The waste heat site is the Mansfield and District crematorium. Crematoriums are known to produce high quality heat – heat that does not need to be upgraded by a heat pump. As a heat source, this makes heat available at relatively low cost to a heat network, meaning crematoriums can be efficient resources for meeting peak heat demand as part of larger district heating networks³⁷. In the case of Mansfield, the crematorium is located relatively far from the areas of densest heat demand which could limit its usefulness. The crematorium would also need modification to use as a heat source, which may incur significant costs.
424. WSHPs appear to have the greatest heat potential in Mansfield. These are found from King’s Mill Reservoir along the River Maun running through Mansfield. The location

³⁷ <https://www.sciencedirect.com/science/article/pii/S0360544224026604>

of these sources, along with the heat demand density across the district, indicates heat networks in Mansfield town centre could be feasible. There are additional sources found along the River Meden that could provide heat for Market Warsop. A small WSHP may also be possible in King's Mill Reservoir, though this is located slightly outside of the district boundary. As with King's Mill Hospital, engagement with the relevant local authorities could reveal key opportunities for collaboration.

425. GSHPs are more distributed around the district. They are located near relatively high areas of heat demand, but not the highest. Both open-loop and closed-loop GSHPs were considered. Across Mansfield, open-loop GSHPs seem possible, with greater heat supply potential than closed-loop GSHPs. Site-specific analysis would be required to establish the presence of suitable aquifers in these locations. If only closed loop systems were possible, the heat supply potential is lower – approximately one third of that shown for open-loop systems.

Map 11: Heat demand density in Mansfield with potential heat sources



5. Supporting development of renewable heat and power

501. This renewable energy potential study can help MDC to support development of renewable heat and power within the district. There are a few key routes towards this such as establishing positive planning policies in respect of renewable energy. Outside of the council's statutory planning functions they could support community groups to engage local people on what might be acceptable around them, start their own community energy groups; through to site finding and ultimately establishing their own schemes. MDC could also establish their own schemes.

5.1. Context

502. Recent policy changes indicate a much more supportive policy environment towards renewable energy development. The updated National Planning Policy Framework published in 2024 removed restrictions which had been characterised as a 'de facto ban' on onshore wind and furthermore clarified that 'significant weight' should be given to the benefits of low carbon energy and the proposal's contribution to a net zero future. Similarly, the National Policy Statement (NPS) for Energy confirms that there is a critical national priority (CNP) for the provision of nationally significant low carbon infrastructure, including renewable electricity generation. While primarily drafted for the consideration of nationally significant infrastructure projects, the NPS may be a material consideration in decision making on applications that fall under the Town and Country Planning Act 1990. This therefore may change the weight given to the environmental benefits of renewable energy projects in decision making.
503. A further key policy signal, which sets the context for the council's renewable energy policies and is capable of being a material consideration in planning decisions, is the government's Clean Power 2030 Action Plan³⁸. This aims to effectively decarbonise the power system by 2030, and sets out pathways towards achieving this objective, including a requirement to double onshore wind and quadruple solar capacity by 2030. The government's Local Power Plan³⁹, will set out the government's national strategy for supporting local communities to own, benefit from and develop small and medium-

³⁸ <https://assets.publishing.service.gov.uk/media/677bc80399c93b7286a396d6/clean-power-2030-action-plan-main-report.pdf>

³⁹ Due to be published in 2026, but referenced in Department for Energy Security and Net Zero's (DESNZ) Statement of Strategic Priorities to Great British Energy - <https://assets.publishing.service.gov.uk/media/68c80749027feb50d8d7ae7c/e03447954-gbe-statement-of-strategic-priorities.pdf>

scale renewable energy projects of up to 8 GW. This will include a support programme and funding for community energy groups and local authorities to develop their own projects. There are already community energy groups active in the local area, for example Nottinghamshire Community Energy⁴⁰.

504. While the renewable energy resource assessment indicates a fairly modest resource within the district for significant standalone renewable energy projects, the change in the policy environment could justify revisions to policy CC1 to make it more positive and bring it into line with national policy.

505. At the same time, nationally, there is strong public support for the introduction of renewable energy generation, with 80% of the population supporting renewable energy to some extent⁴¹. However, renewables can often face opposition in their local area. The reasons for this are varied and unique to the area in question. However, some general reasons that have been noted are:

- Remote decision making that does not consider a community's perspectives.
- Ignorance of local sentiments for landscapes.
- Lack of benefits felt by communities from hosting renewable projects.
- Confrontational, rather than collaborative, UK planning.

506. There is therefore clear reason to support a more local approach to renewable energy development. One way to build a local approach outside of statutory planning and consultation processes is to move up the citizen engagement ladder towards co-design and citizen power⁴². This ensures that the public has meaningful engagement with potential projects in the area and allows them influence to shape the impacts on their community.

507. CSE's Future Energy Landscapes (FEL) approach builds on the ladder of participation. It provides a free to access framework to help communities to understand where they might accept renewable energy projects and what might be acceptable locally⁴³. This can then be combined with technical analysis such as in this study to formulate where renewable projects might go ahead, and under what conditions.

508. This approach, or other citizen power approaches, can be used to bring communities on-board with renewables, and ensure that principles of justice in the energy transition are met. By providing forums for discussions about what people want to see in their area, this can encourage community action to develop renewables. This is often the first step towards increased community engagement with renewables, which can build

⁴⁰ <https://www.nce.coop/>

⁴¹ <https://www.gov.uk/government/statistics/desnz-public-attitudes-tracker-spring-2025/desnz-public-attitudes-tracker-renewable-energy-spring-2025-uk>

⁴² A Ladder of Citizen Participation, Arnstein 1969, <https://doi.org/10.1080/01944366908977225>

⁴³ <https://www.cse.org.uk/my-community/future-energy-landscapes/>

towards local development of renewable energy. FEL engagement approaches can also be integrated with formal planning consultation processes to support policy development.

509. In the following sections a distinction is made between renewable power (Section 5.2) and renewable heat (Section 5.3). While both come under renewable energy, there are some key differences in how to support each, as well as differences in how established they are. Renewable power specifically refers to the generation of electricity from renewable sources such as wind turbines and solar PV as discussed in this study. Renewable heat refers to moving away from fossil-fuelled heating systems such as natural gas. Normally, this is moving towards electrified heating systems such as heat pumps or decarbonised heat networks. Electrified heating systems are considered renewable because it is expected that the electricity powering them will ultimately come from renewable power.

5.2. Renewable power

510. The viable areas presented in Section 3 provide an indication of where renewable power generation developments could be appropriate. To capitalise on these opportunities, community engagement will be vital. Working in partnership with community groups within these areas will help the council identify locations that can be supported rather than opposed by the community. This not only means projects will be better supported and more likely to succeed, but it also means the benefits will be more directly appreciated by locals. An approach like that of FEL can support this process.
511. Given the area available for renewables around the Warsop Parish, engagement with communities in this area, such as Vibrant Warsop⁴⁴, could prove useful. Areas in the Warsop Parish are amongst the most deprived in the country⁴⁵, and it is vital these communities are not left behind in the renewable energy transition, which could entrench existing inequalities. Ensuring benefits from renewable energy development are captured locally would benefit such deprived areas. This could turn renewables from an obligation inflicted on an area into an asset from which the community benefits.
512. Local groups can own (either outright or co-own) renewables. This can help to ensure good governance of the renewable project, as well as capturing benefits locally. The Great British Community Energy Fund⁴⁶ has recently been granted additional funding with the aim to foster increased levels of local community ownership. This provides a potential source of funding for local community groups. While these projects should be community-led, MDC can act to foster relationships between local groups and the Midlands Net Zero Hub who administer this fund. This is likely to focus on the smaller

⁴⁴ <https://www.vibrantwarsop.org/>

⁴⁵ <https://www.gov.uk/government/statistics/english-indices-of-deprivation-2025>

⁴⁶ <https://www.midlandsnetzerohub.co.uk/what-we-do/community-energy/community-energy-fund/>

scales of renewables discussed in this study. Note that this is not the only source of funding possible.

513. Larger renewables are also able to be developed through community energy groups, which are groups that involve communities in the design and ownership of renewables, and this is most common amongst well-established groups, rather than nascent ones. However, many of these exist in the East Midlands⁴⁷. These often work alongside private renewable developers, acting as a bridge to communities. There are many options under these models, such as part ownership. Often members of a community are given a stake through the purchase of shares that fund the development of the renewable energy. This can distort participation, as share offers are often more open to wealthier citizens. They are also not always geographically constrained.
514. Finally, while less direct than the above community ownership models, the local planning authority can introduce policies that help to capture benefits of renewable development by larger parties. For instance, BCC has made available a renewable energy investment programme in its local area⁴⁸, giving the community the chance to invest in their programme of works. New Local Plan policies can also help raise funds for community energy investment. BCC's latest Local Plan Policy NZC2⁴⁹ (currently undergoing review) proposes an energy offset fund attached to their zero-carbon standard for new development, which goes beyond the requirements of the Future Homes Standard. The funds raised through this mechanism will be spent on delivering additional renewable energy generation within the city. As part of the Local Plan Review MDC are considering their approach to climate change policies. As part of this, the council could consider a similar mechanism to raise funds for increased renewable energy development.
515. While funding is an important issue, MDC may be able to support community energy in other ways. Other barriers to community energy often are related to the complexity of the planning system. MDC can help by providing guidance to community groups, making their applications more likely to be acceptable from a planning perspective and by publicising the benefits of community energy (and support available through the Local Power Plan) to local communities.
516. One way this might be enabled is to establish in the Local Plan locations where renewable development might be considered acceptable by MDC. These could function similarly to current housing allocations, setting out preferred technologies and scale of development. It should be noted that these are likely best set out in conjunction with community processes as described above. These preferred areas help local action because initial feasibility studies are expensive, so there is reasonable risk of investing in a project

⁴⁷ <https://communityenergyengland.org/our-members/?region=east-midlands>

⁴⁸ <https://news.bristol.gov.uk/press-releases/955534d8-ed87-4515-9ado-39e15b6bc81d/investing-in-a-greener-future-for-bristol>

⁴⁹ <https://www.bristol.gov.uk/residents/planning-and-building-regulations/planning-policy-and-guidance/local-plan/local-plan-review>

which may later be found unacceptable under planning review. Areas of preferred development reduce this risk, by highlighting areas where there will be lesser risk in the planning process.

517. The Local Plan can also be used to enable rooftop solar, though this may be limited to new buildings. Emerging Local Plans are establishing key performance indicators to encourage new developments to meet their energy requirements solely through on-site renewable energy generation. One such metric underpins the energy offset policy proposed by BCC referred to above. An on-site renewable energy target of 105 kWh/m²_{fp} per year is set as a minimum level for new developments. Such targets ensure that local renewable development becomes a requirement of developers. Some analysis on targets such as this for rooftop solar in Mansfield are discussed in Section 3.3.
518. It is accepted that the above suggested policies may be more extensive than possible under a Local Plan Review, and more suited to a new Local Plan. Therefore, more simple or short-term actions may be most appropriate at this stage. A key intervention would be for MDC to take on a role as a key contact and enabler – helping to make links between community groups and statutory consultees such as Natural England or NATS. MDC can also help interested community groups access other support such as Community Energy GO⁵⁰; a programme that provides free expert support for community energy organisations across England. The methods for this are varied and will depend on capacity and funding within MDC.
519. It will take time for local renewables action to grow. This is both because local action groups will need time and support to develop, and because many residents will need to see the benefits of initial local action before being convinced by it. By following the above guidance, MDC can:
- Help grow community groups, by providing forums for community members to meet and discuss how renewables might impact their area and their lives, spreading awareness of the benefits of community energy to new communities and referring communities to emerging community energy support functions funded by the local power plan. Bath and North Somerset Council and CSE have secured funding for a new Community Energy Network⁵¹ in Bath. We also helped establish the Bristol Energy Network. In our experience, such networks are highly effective in disseminating knowledge and learning and supporting project development.
 - Provide routes and foster relationships between local groups and funders such as the Midlands Net Zero Hub who administer the Great British Energy fund.
 - Signpost interested community groups to support structures such as Community Energy GO; a programme that provides free expert support for community energy organisations or

⁵⁰ <https://communityenergygo.org.uk/>

⁵¹ BANES Community Energy Network - www.bathnes.gov.uk/learn-about-community-energy-network

Community Energy England⁵², or support mechanisms likely to come forward through Great British Energy.

- Become an intermediary helping to represent smaller community perspectives to large stakeholders such as Natural England, National Air Traffic Control, including understanding whether current blocks on onshore wind development might be overcome through technical means, joined up approaches or top-down intervention from national government.

5.3. Renewable heat

520. Action towards renewable heat is less developed than that towards renewable power. Heat networks are relatively uncommon in the UK compared to many other European nations, however government is seeking to accelerate the take-up of renewable heat in existing and new homes.
521. Proposed revisions to the Building Regulations set out in the Future Homes Standard will require new homes to be built to a “zero-carbon ready” standard. Under the proposals, fossil-fuel heating systems (gas, oil, conventional boilers, hydrogen-ready boilers) will not meet the new standard for new dwellings. The intention is that low carbon heat pumps and heat networks will be fitted instead, and the Department for Energy Security and Net Zero (DESNZ) are set to designate heat network zones in England soon, which will identify areas where heat networks are expected to provide the lowest cost option for decarbonised heat⁵³.
522. Most homes in Great Britain rely on fossil-fuelled heating. This presents both challenges and opportunities for action on renewable heat. Actions that move towards renewable heat are by changing heating systems to decarbonised options – generally heat pumps for individual buildings, or decarbonised heat networks. These can be supported by reductions in heat demand – generally achieved through retrofit and insulation. Reduction in heat demand has a co-benefit of reducing the amount of heat required, which can reduce consumer bills. This is why heating requirement is one of the elements considered in determining fuel poverty⁵⁴.
523. Action on these is possible both through community efforts, and local planning policy. There is a key limitation in using the Local Plan to enable renewable heat development, in that by nature it is largely limited to influencing new development and regeneration. Most changes will need to happen in existing buildings, which are difficult to influence directly through the Local Plan Review.

⁵² <https://communityenergyengland.org/>

⁵³ Heat Network Zoning – AN Overview. DESNZ, January 2024. <https://www.gov.uk/government/publications/heat-network-zoning-overview>

⁵⁴ <https://www.gov.uk/government/collections/fuel-poverty-statistics>

524. For new developments the Local Plan Review is a very strong mechanism for ensuring renewable heat is a priority. The standards expressed in the Local Plan Review can directly influence which heat sources (e.g. gas boilers, heat pumps, heat networks) are considered by developers. Additionally, they can directly influence levels of insulation in new buildings, ensuring that consumers can have low-cost heating. Looking once again to BCC's emerging Local Plan, they have proposed a maximum limit on space heating demand of 15-20 kWh/m² per year, and of maximum energy use intensity of 35 kWh/m² per year. These are terms in their policy NZC2. As metrics such as these are only achievable with high levels of insulation, they directly influence the quality of this in new developments. These metrics also enable raising funds through energy and carbon offset funds, which may be able to be used to support other local action. Recent high court decisions have confirmed that there is nothing in law that prevents local authorities from going beyond current or planned building regulations in their development plan documents or adopting different energy efficiency metrics to those set out in national policy. However, the current version of the NPPF under consultation suggests that local standards may be discouraged in the future, with a preference for alignment with national standards. Note that the Uttlesford Local Plan 2021-2041 recently completed examination⁵⁵ with Space Heating Demand and Energy Use Intensity metrics regarded as justified, sound, and effective for delivering net zero operational carbon. Therefore, there remains uncertainty about if such metrics will be encouraged at the local level in the future. For now, it might be most appropriate at this time for MDC to ensure any locally set standards align with emerging national standards such as the Future Homes and Buildings Standards⁵⁶, due to the emerging nature of the NPPF consultation.
525. Local Plan policies can also directly encourage the establishment of renewable heat sources. They can also show specific support for development of district heat networks. District heat networks can be more easily established with known new developments as anchor loads. New developments represent key opportunities because they can be designed to be compatible with a decarbonised heat network. Existing buildings often require retrofitting, which can increase costs. Therefore, encouraging heat network connections in new buildings can help establish more district heat networks. This can then have a knock-on effect of easing decarbonisation of existing buildings. District heating networks generally produce better returns when expanded to more buildings. Therefore, after establishing the initial network with a new development, many heat networks look to existing buildings to expand – enabling decarbonisation of these buildings.
526. BCC's emerging Local Plan policy NZC2 establishes a hierarchy intended to encourage the development of heat networks, with other decarbonised heating systems

⁵⁵ https://www.uttlesford.gov.uk/media/14064/Local-Plan-Inspectors-Report/pdf/Uttlesford_Local_Plan_2021-2041_Examination_Report.pdf?m=1768841792443

⁵⁶ <https://www.gov.uk/government/consultations/the-future-homes-and-buildings-standards-2023-consultation/the-future-homes-and-buildings-standards-2023-consultation>

as fallback options. Their proposal is that connection to an existing heat network or new heat network from the point of occupation is preferred, where possible. Where it is not, they highlight that employing communal heat networks or individual renewable heating systems is an alternative option. BCC specifically exclude fossil-fuelled heating in new development. BCC also sets a requirement on development that larger developments (100 homes or 10,000 m² of floorspace) in certain growth or regeneration areas should consider creation of a new heat network. Here a feasibility study is required – with the heat network being mandatory if it is found feasible. Policies such as these can be used to encourage or require renewable heat for new developments, which can have knock-on effects for existing buildings.

527. While not specifically a planning policy, it is anticipated that national Heat Network Zoning⁵⁷ will also be a mechanism by which local authorities can support the establishment of renewable heat. It is still unclear where responsibility for the local zoning coordinator role will sit – it is proposed that these will sit within local government, but the tier of local authority (i.e. district or county) has not yet been explained. However, it is likely MDC will input to the proposed refinement process – whereby zones are modified to fit the local area. One key planning role will be aligning these zones with local development. Therefore, MDC's planning team may wish to consider this in establishing preferred housing options or similar mechanisms in their Local Plan Review.
528. As Local Plan policies primarily influence new developments, generally the minority of housing in an area, it is also worth looking at how MDC might influence increased uptake of renewable heat in existing buildings. One key way of doing this may be through supporting community initiatives for retrofitting with insulation and renewable heating systems. Generally, this is a less-established space than that for community renewable power.
529. The more commonly seen community heat schemes centre around group-buy schemes. In these, a community group identifies a series of properties that might need the same retrofitting work. For example, a terraced street all of which require solid wall insulation. The community group coordinates a large purchase of the relevant measure and procures installation (or provides this themselves). The advantages of this are it can attract decreased costs for measures or offer synergies for installers due to the scale. Therefore, end consumers benefit from lower costs. There are various ways this may work, such as the community group providing upfront capital instead of gathering this from households. The upfront payment is then recouped through a repayment scheme for homeowners. This offsets the investment cost, which can be a significant barrier to retrofitting homes. Either way, initial capital is one of the major barriers to this type of scheme. MDC may be able to help provide capital through grants or loans, funded by Local Plan instruments such as offset funds as discussed in Section 5.2.

⁵⁷ <https://www.gov.uk/government/publications/heat-network-zoning-overview/heat-network-zoning-overview>

530. More complex schemes may aim to establish a community-owned heat network. This can be very difficult because heat networks are highly complex and require large upfront investment. Generally, initial feasibility studies are required, and the technical nature of heat networks may mean that what is feasible does not align with community objectives. This is further complicated as retrofit is often required inside existing buildings for them to be suitable for heat networks, such as changing existing radiators for larger ones. Heat networks also have high upfront costs, and investments are often returned over even longer time periods than for renewable energy.
531. However, it is not impossible to establish community heat networks. In some nations such as Denmark community ownership of networks is the norm, not the exception⁵⁸. These are commonly established through consumer-owned companies, much like the community groups discussed in Section 5.2. These offer the opportunity for the consumers to directly influence the network, meaning the network directly reflects their priorities. This is not unique to Denmark – such networks do exist in the UK.
532. One example in the UK is the Swaffham Prior Heat Network⁵⁹. This was a project started by Swaffham Prior Community Land Trust, making Swaffham Prior the first village with a rural heat network in the UK. The Trust achieved funding through the Cambridgeshire and Peterborough Combined Authority and made successful applications to BEIS Heat Network Development Unit (HNDU) and Heat Network Investment Project (HNIP) for grant funding, with additional investment from Cambridgeshire County Council. The network is now available for new members within its heat delivery area, including homeowners and long-term and Housing Association tenants.
533. As in the case of Swaffham Prior, there are support funds out there that can be accessed. These are primarily aimed at public sector bodies, but MDC can work in conjunction with others to establish and develop heat networks. These funds can ease the burden of initial feasibility and high upfront costs. HNDU makes available funding for local authorities developing heat networks for techno-economic feasibility studies, and detailed project development⁶⁰. The intention is this funding can carry networks forwards to the point of commercialisation. A local authority must apply for this fund – though they may have partners.
534. The Green Heat Networks Fund (GHNF)⁶¹ can then be used to support commercialisation and construction of a heat network. The GHNF is open to all applicants, so long as certain metrics are met by the proposed network.

⁵⁸ <https://dbdh.org/how-to-help-communities-establish-district-heating-networks/>

⁵⁹ <https://www.cambridgeshire.gov.uk/residents/climate-change-energy-and-environment/climate-change-action/low-carbon-energy/community-heating/swaffham-prior-heat-network/about-swaffham-priors-heat-network>

⁶⁰ <https://www.gov.uk/guidance/heat-networks-delivery-unit>

⁶¹ <https://www.gov.uk/government/publications/green-heat-network-fund-ghnf>

535. Based on the current funding, there is a route for MDC to either establish its own heat networks, or support others such as community groups in establishing networks. There are many unique delivery vehicles that are being developed with local authorities to establish heat networks. For example, Bristol City Leap⁶² is helping Vattenfall develop heat networks in a public-private sector partnership. This delivery model has led to the development of several heat networks in Bristol, among other decarbonisation measures.
536. The information highlighted in Section 4 can help with establishing opportunities for heat networks. Key loads and potential sources around which a heat network may be formed are highlighted. In future, heat network zoning would also help with this determination by indicating areas where heat networks are the lowest cost route to heat decarbonisation.

5.4. Summary of supporting local renewable heat and power

537. Sections 5.2 and 5.3 provide detail of how MDC may be able to support the development of local renewable heat and power. While the two sectors are relatively distinct in actions, the actions MDC can take are similar.
538. The action most relevant to the Local Plan Review is for MDC to use the Local Plan to set standards and designate areas that are seen acceptable for development. For inspiration of these, MDC can examine emerging Local Plans such as that of BCC. The information contained in this report can help guide these policies. The technical potential maps in Section 3.2 and 3.3 can provide guidance if setting areas of preferred renewable development. Metrics such as the generation per unit footprint for solar rooftop in Section 3.3 can guide new policies establishing minimum allowable on-site renewable generation. Building standards metrics as discussed in Section 5.3 can boost development of renewable heat. Where funding may be required to support either MDC ambitions or community groups, ambitious offset funds may be able to be established in the Local Plan Review as discussed in Section 5.2.
539. Outside of the Local Plan, MDC can take up an enabling role for both renewable power and heat. This could be providing access to funding sources such as from HNDU or the Midlands Net Zero Hub. However, this could also be through somewhat simpler actions such as providing guidance to community groups and helping to foster networks where they may grow. It's specific role in this may also be to highlight areas where community action may be possible, or to remove barriers to participation wherever possible. One of the major barriers for many renewable developments is the complexity of the planning system, and the risk this can introduce for projects. MDC could work to clarify in its Local Plan Review where renewable developments are most likely to be supported,

⁶² <https://www.bristolcityleap.co.uk/>

helping to clarify the conditions under which planning applications may be more likely to succeed.

6. Conclusions and recommendations

601. Whilst the Mansfield District has some constraints on its renewable energy potential, there are still opportunities which could be exploited. Table 16 shows the maximum technical potential for the different renewable energy sources investigated in this Renewable Energy Potential Study. Maximum potential in this table means considering only physical constraints for ground-mounted solar and wind energy, and an IRR of 3.3% for rooftop solar (see Section 3.3 for details).

Table 16: Maximum technical potential for different renewable energy sources in the Mansfield District

Renewable source	Area technically suitable (km ²)	Potential annual generation (GWh/yr)
Rooftop solar	-	364
Ground-mounted solar	24.2	961
Small wind	0.1	0.7
Medium wind	0.2	6.2
Large wind	0.1	8.8

602. As can be seen, Mansfield has limited potential for the development of wind energy, although there may be the occasional scenario where this is still an appropriate solution. Ground-mounted solar has the largest potential. Rooftop solar provides a good opportunity for increasing Mansfield's local generation, though this is spread across a large number of rooftops, meaning realising this potential will likely involve many stakeholders.

603. In terms of the opportunity for heat networks, the most likely locations for development are in the urban centres, particularly in the centre of Mansfield town, and the centre of Market Warsop. There are several key anchor loads which could be contacted as important stakeholders, but which offer flexibility. This flexibility is further reinforced by the presence of many secondary anchor loads.

604. In light of this, there are some key recommendations for MDC. These recommendations should be read in conjunction with the accompanying Renewable Energy Policy Recommendations Report. The key recommendations are:

- Consider using the identified areas as the basis for allocated areas of preferred renewable energy developments, as may be required under the revised NPPF currently being consulted on.
- Consider communicating the results of this study, particularly the better potential of solar energy over wind energy, helping to build knowledge of the best solutions for the local area.

- Consider using the Local Plan Review as an opportunity to set local standards for the development of renewable energy. This must be considered in the broader context of changing planning regulations, notably that the version of the NPPF currently being consulted upon aims to bring building standards to a nationally consistent form.
- Consider the enabling role that MDC might take in encouraging local renewable energy. This is likely to involve working alongside the Midlands Net Zero Hub or the HNDU to help access funding for Mansfield. This may also involve taking a role of community leadership, helping to foster the growth of community groups in the area, and helping to develop networks.
- Consider adopting the policy wording given in the accompanying Renewable Energy Policy Recommendations Report to demonstrate greater commitment to enabling local renewable energy as encouraged by both the 2024 NPPF revision, and the emerging NPPF as currently being consulted upon.

605. As noted, the Local Plan Review is being conducted in a period of change of regulation for planners and for Local Plans. This does create a challenging situation. However, both the 2024 NPPF and the emerging NPPF revision indicate a direction of travel that both encourages renewable energy development, and greater local involvement and benefit from development. Therefore, our recommendations aim to be relevant both to current regulations and be future proof to this signalling. Overall, encouragement of renewable energy and community benefit are likely to strengthen the Local Plan.

Appendix I: All existing renewable sites registered in the REPD

Table 17: All existing renewable sites registered in the REPD

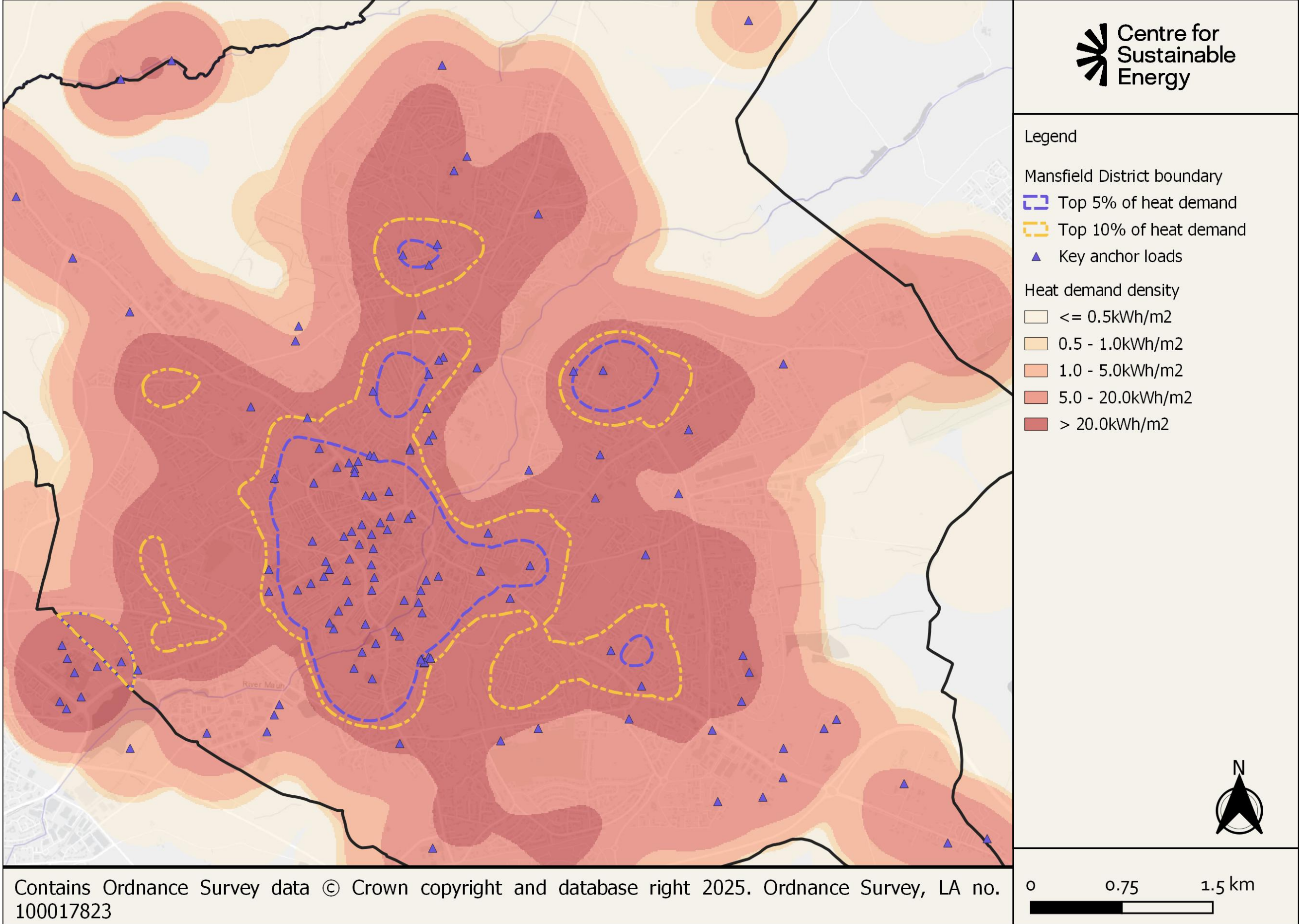
Site	Type	Capacity (MW)	Status
Welbeck Colliery	Ground-mounted solar PV	11.3	Operational
SPF Thirty Acres Farm	Ground-mounted solar PV	3.8	Operational
Land at Debdale Lane	Ground-mounted solar PV	5	Operational
Littlewood Lane Solar	Ground-mounted solar PV	5	Operational
Land West of Sookholme Road	Ground-mounted solar PV	10	Application Refused
Ashland Solar Farm	Ground-mounted solar PV	5	Permission Expired
Penniment House Farm/Water Lane Fram	Ground-mounted solar PV	4	Application Refused
Sutton Road Morrisons	Roof-mounted solar PV	0.41	Awaiting Construction
Mansfield Sand Company	Roof-mounted solar PV	0.33	Awaiting Construction
W&J Linney	Roof-mounted solar PV	0.2	Awaiting Construction

Kestral Road – Battery Energy Storage Facility	Stand-alone Storage Battery	-	Awaiting Construction
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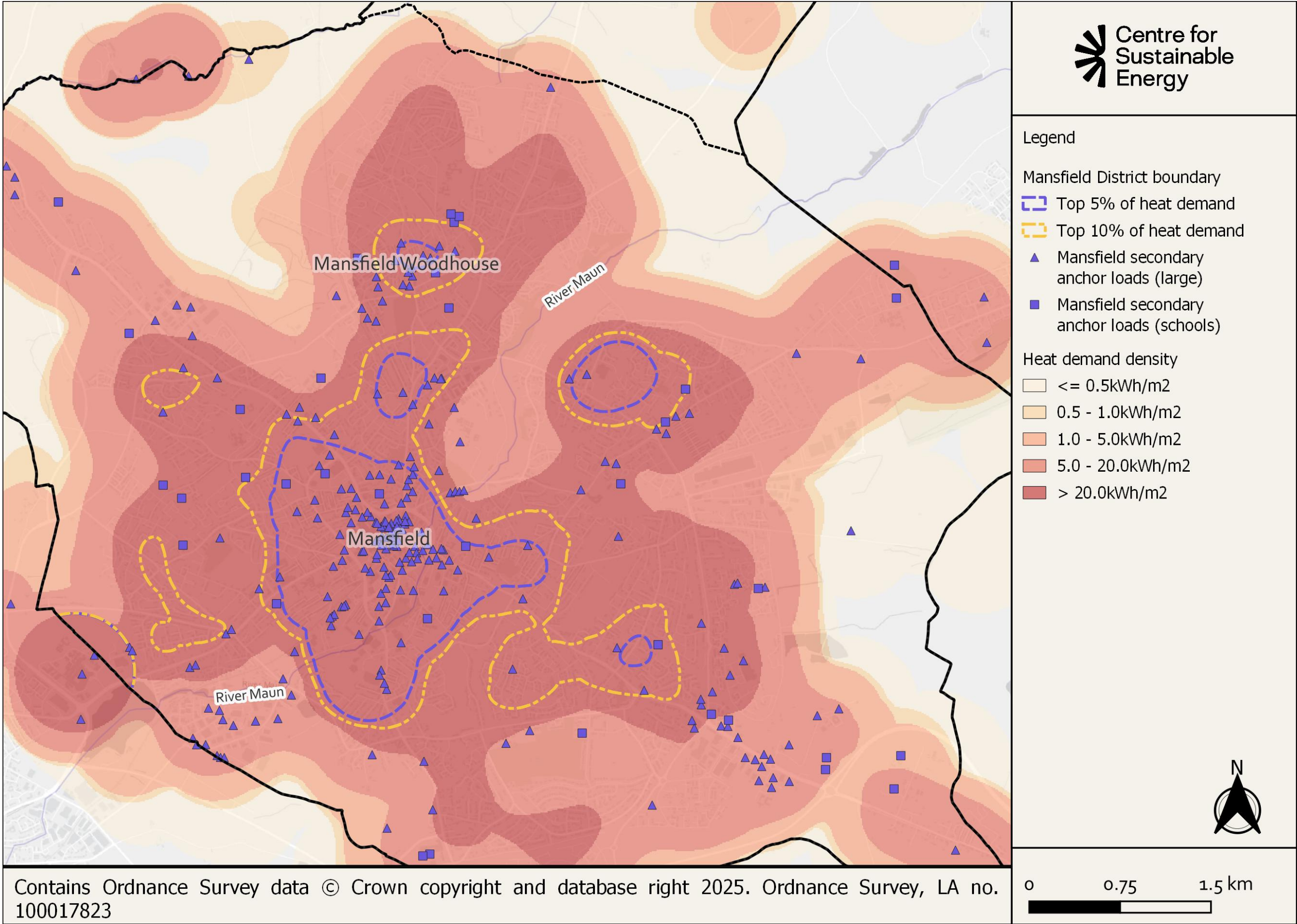
Appendix II: Detailed anchor loads maps

This appendix contains maps displayed in A3, showing more detail of the key and secondary anchor loads in the Mansfield Urban Area, and the Warsop Parish Area.

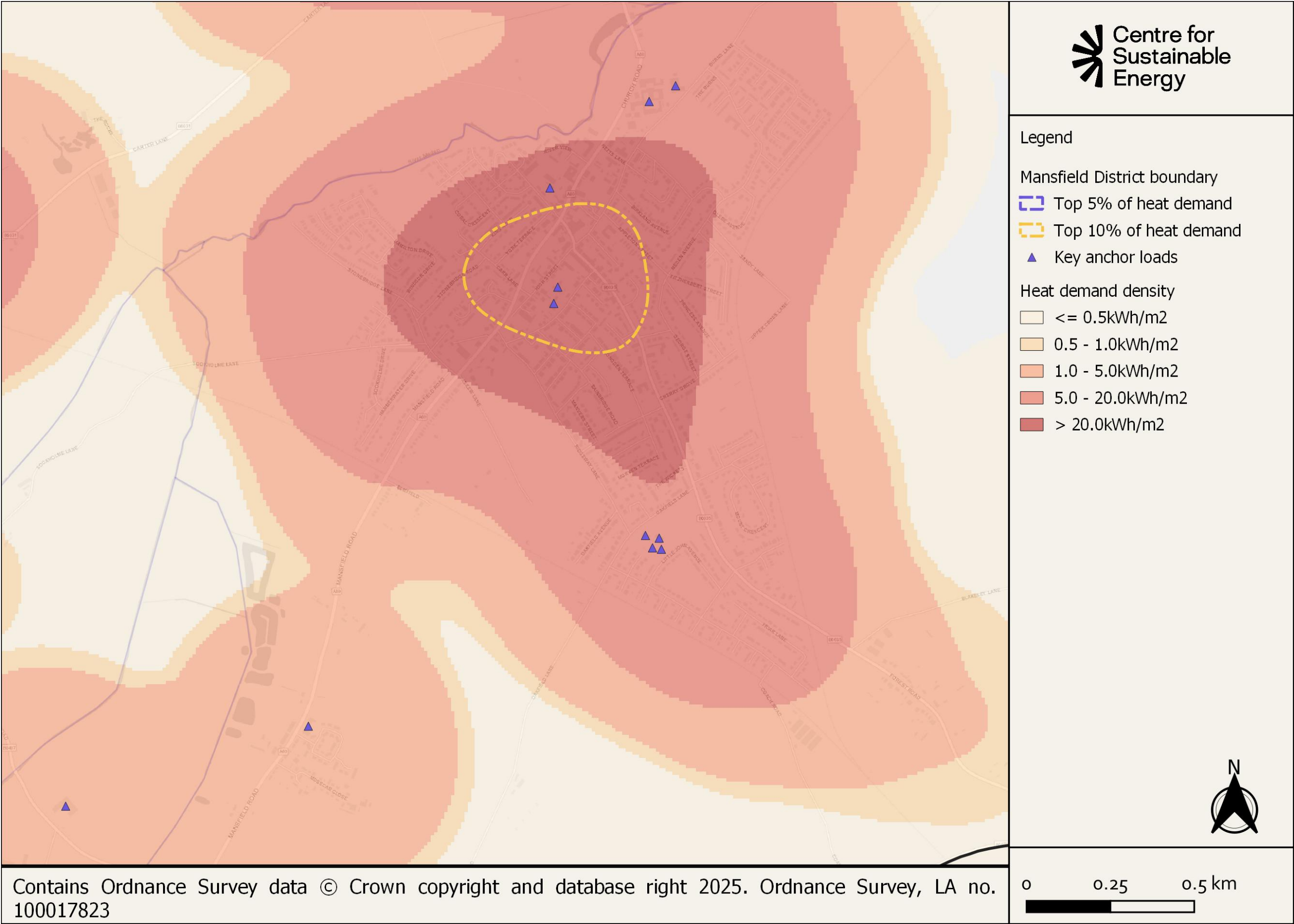
Map 12: Heat demand density in Mansfield urban area with key anchor loads



Map 13: Heat demand density in Mansfield urban area with secondary anchor loads



Map 14: Heat demand density in Warsop parish area with key anchor loads



Map 15: Heat demand density in Warsop parish area with secondary anchor loads

