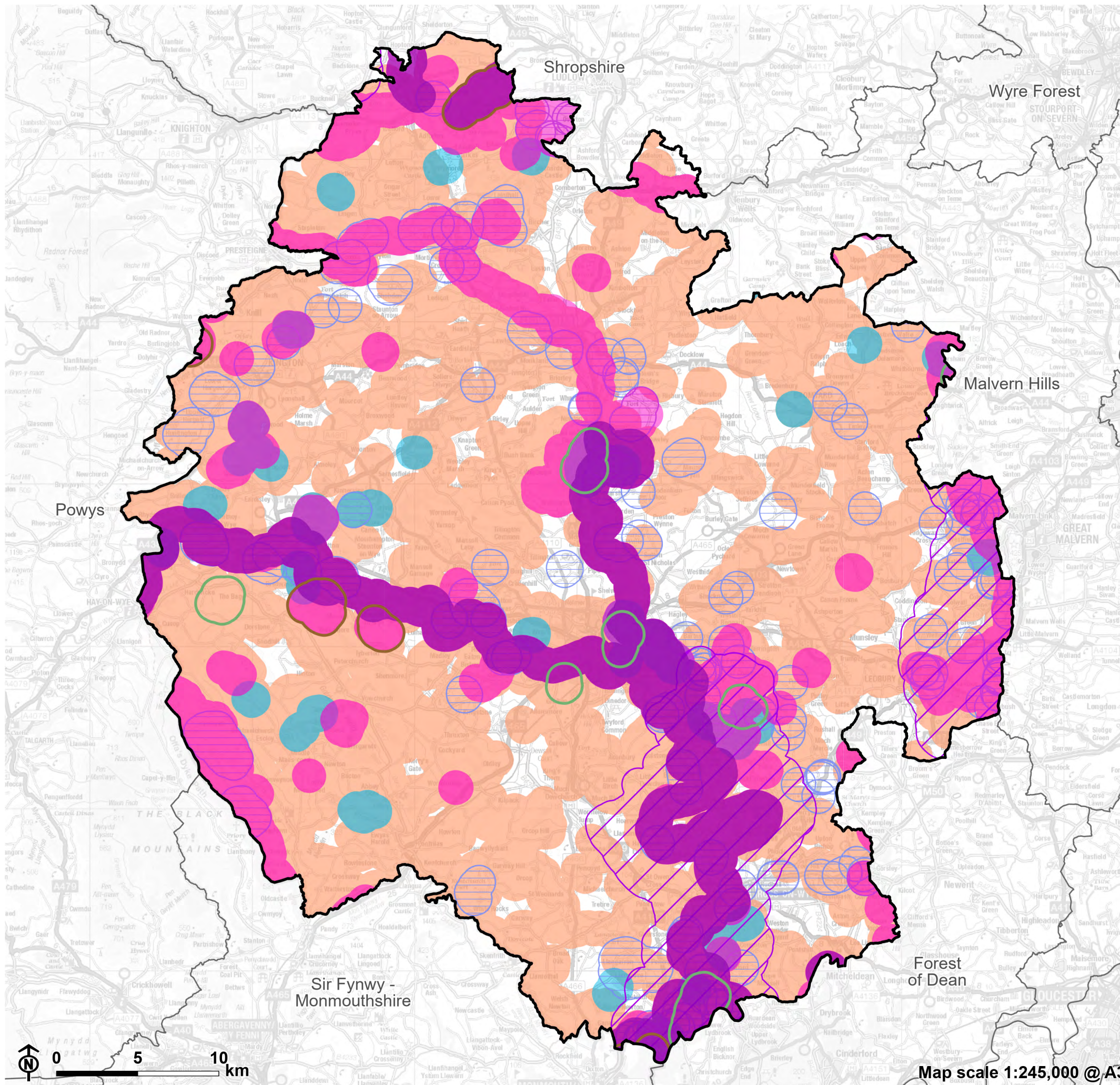# Appendix D

# Secondary Constraints and Opportunities
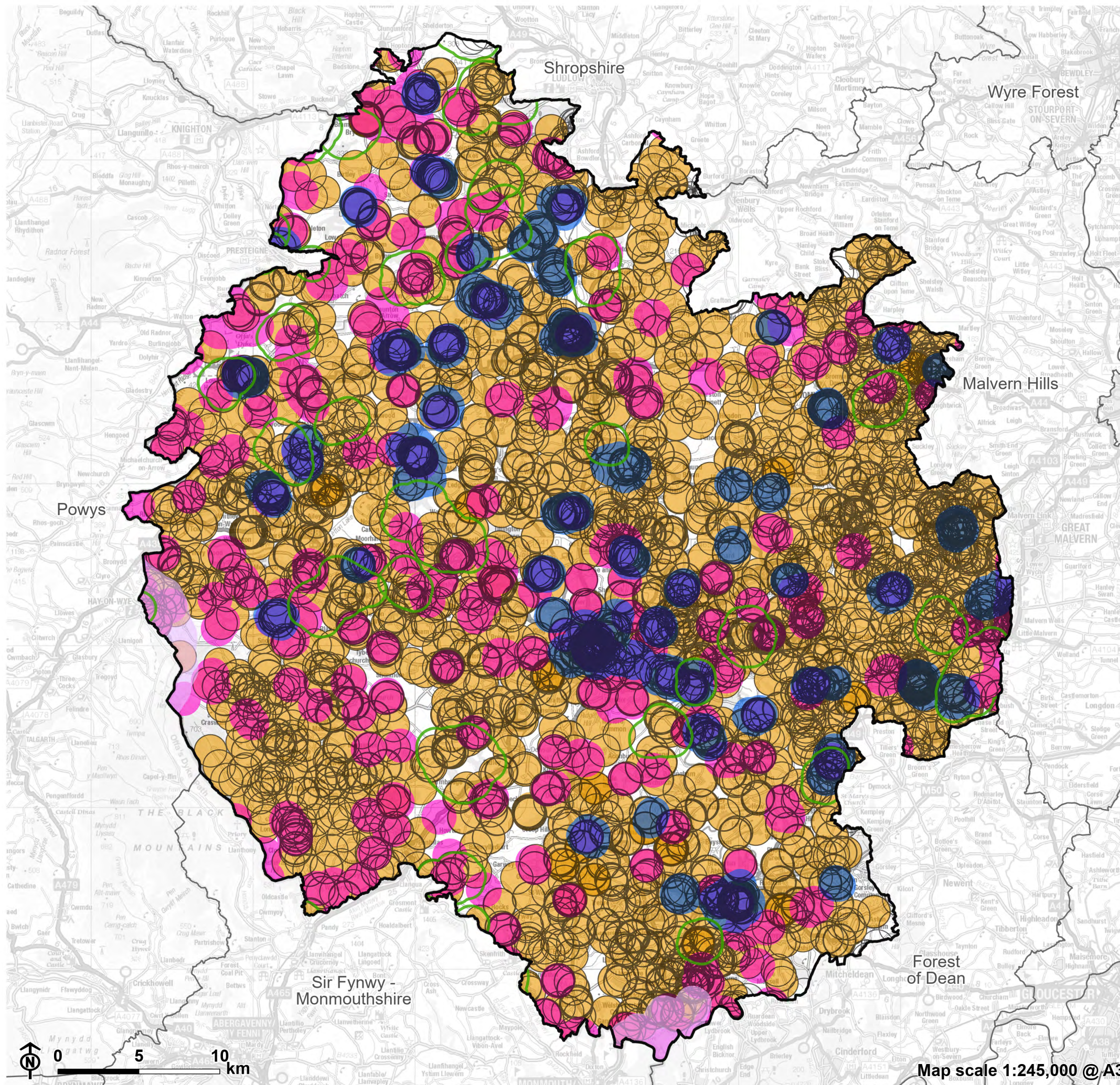
**Figure D.1: Secondary Constraints: Wind and ground mounted solar - Natural Heritage Constraints**

Local authority
Neighbouring local authority

**1km buffer around:**
National Nature Reserve
Local Nature Reserve
Site of Special Scientific Interest
Special Area of Conservation
Wildlife Trust Reserve
Local Wildlife Site
Local Geological Site
Area of Outstanding Natural Beauty

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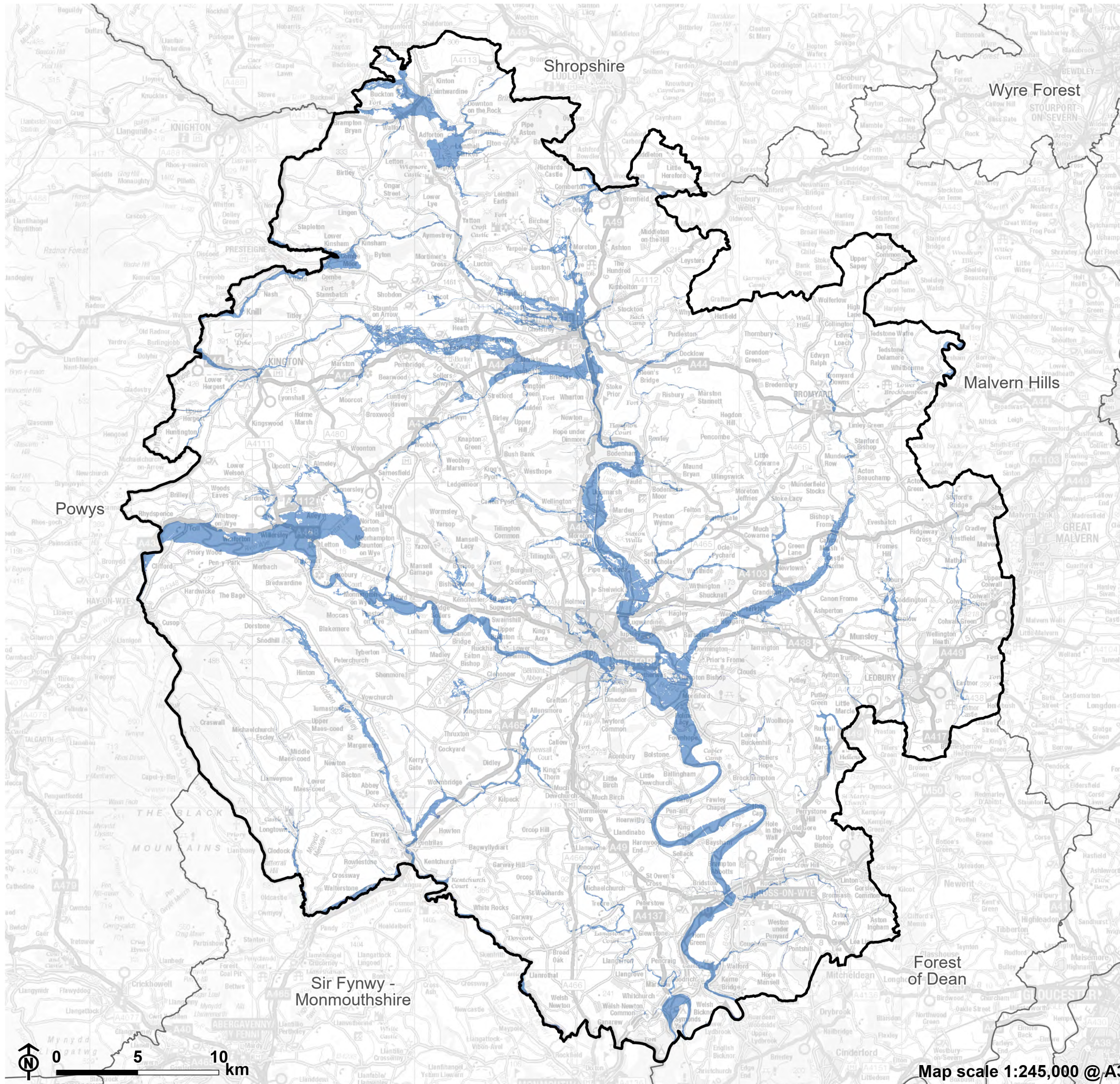Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

Map scale 1:245,000 @A3

12441_000_r0_SolarFigures 13/12/2023 EB:shayler_h

Renewable Energy Assessment
Herefordshire Council

**Figure D.2: Secondary constraints: Wind and ground mounted solar - Cultural heritage constraints**

Legend:
- Local authority
- Neighbouring local authority

**1km buffer around:**
- Registered Parks and Gardens
- Registered historic landscape
- Locally listed building
- Listed building
- Conservation area
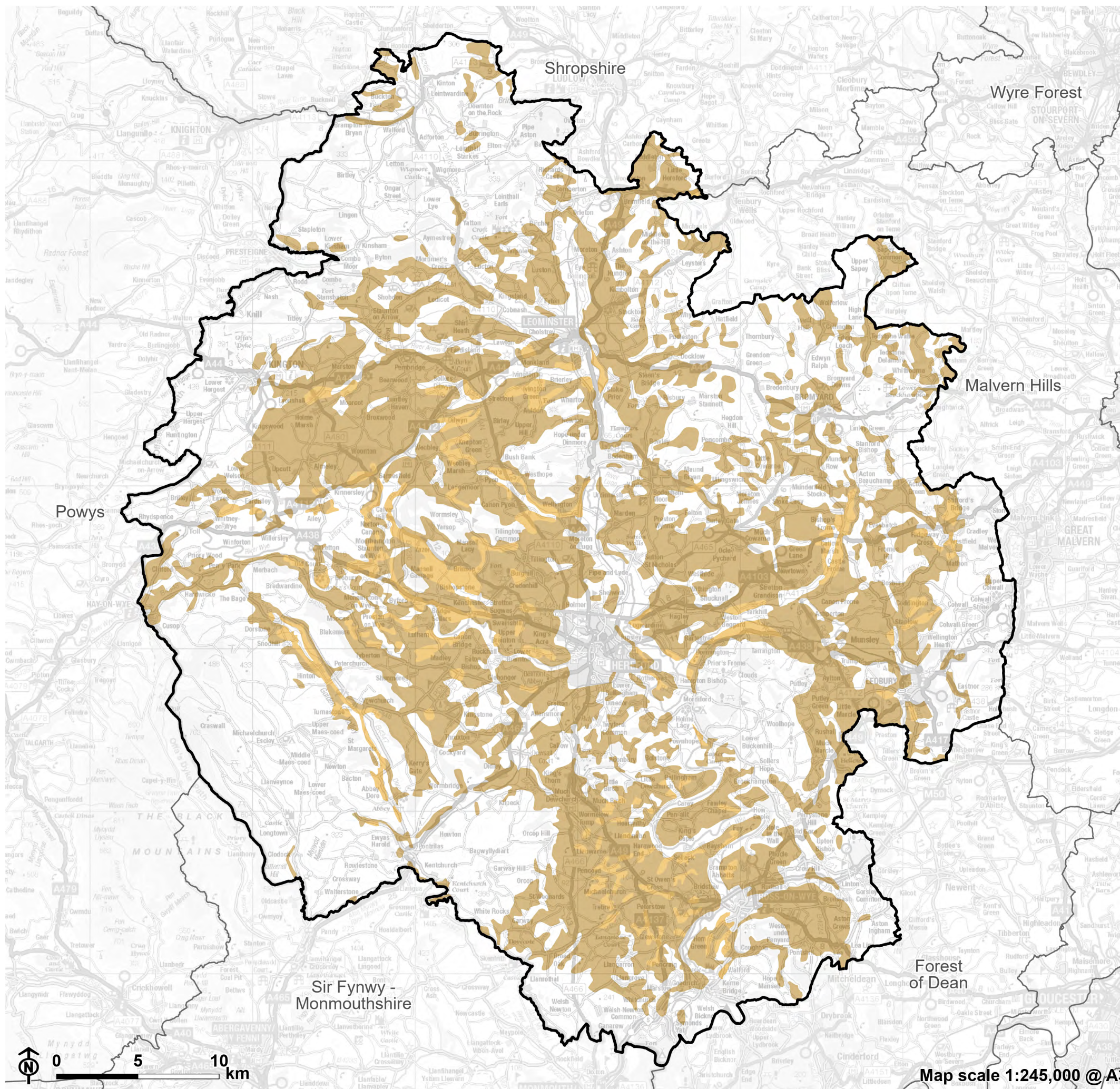- Scheduled monument

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

Map scale 1:245,000 @ A3

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**Figure D.3: Secondary constraints: Wind and ground mounted solar - Flood Zones**

Local authority
Neighbouring local authority
Flood zone 3

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

Map scale 1:245,000 @A3

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**Figure D.4: Secondary constraints: Wind and ground mounted solar - Agricultural Land Classification**

Local authority

Neighbouring local authority

Grade 1 - Secondary constraint to wind

Grade 2 - Secondary constraint to ground mounted solar and wind

**Notes**:
Grade 1 agricultural land was considered a constraint to the technical potential of ground mounted solar. Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

Map scale 1:245,000 @ A3

12441_000_r0_SolarFigures 13/12/2023 EB:shayler_h

**Figure D.5: Secondary constraints: Wind -
Sensitive noise receptors**
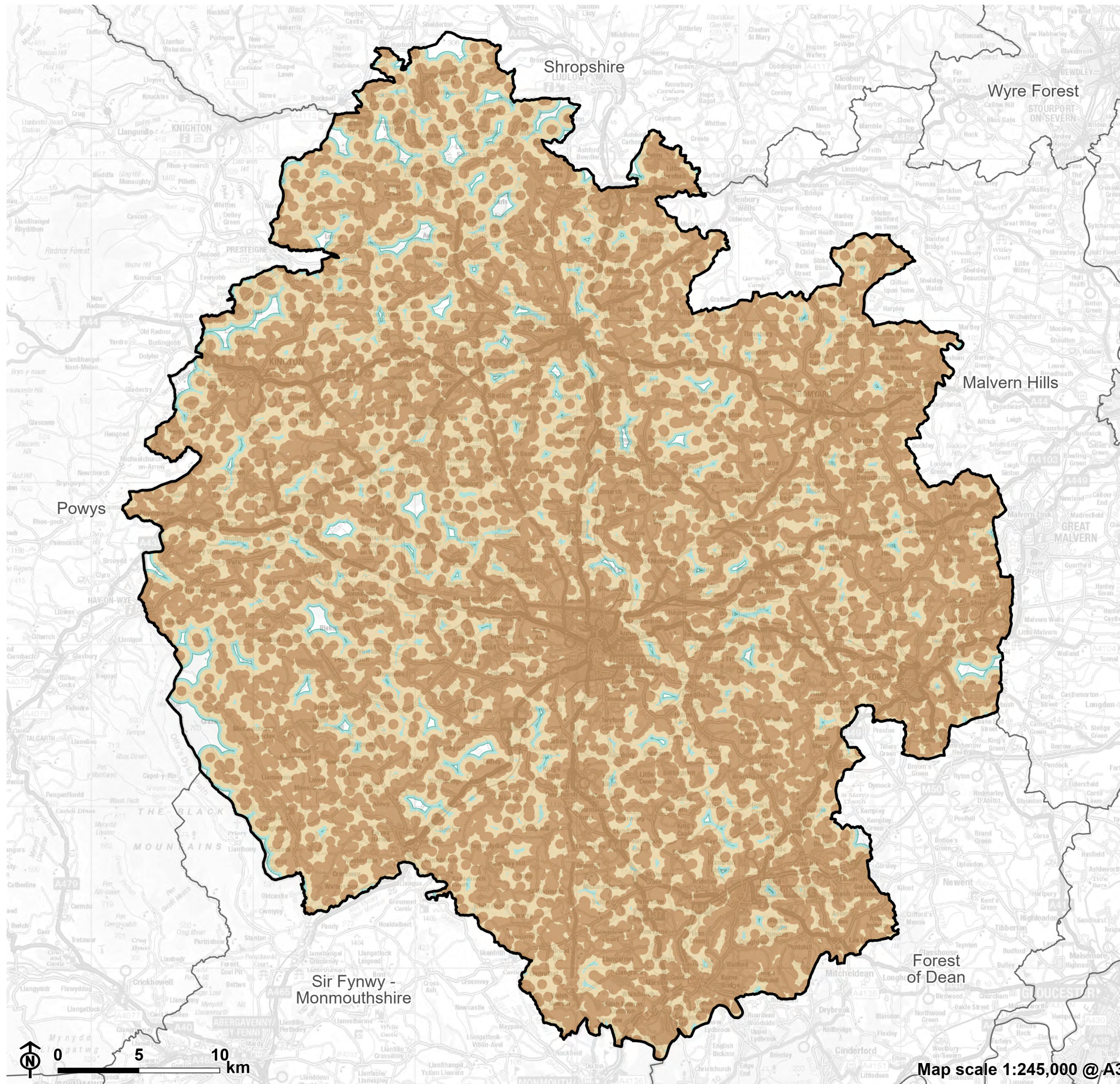
Local authority
Neighbouring local authority

**Sensitive receptor**
300m buffer
600m buffer
750m buffer
800m buffer

Shropshire

Wyre Forest

Powys

Malvern Hills

GREAT MALVERN

Sir Fynwy -
Monmouthshire

Forest
of Dean

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

0    5    10
km

Map scale 1:245,000 @ A3

12441_000_r0_SolarFigures 13/12/2023 EB:shayler_h

Renewable Energy Assessment
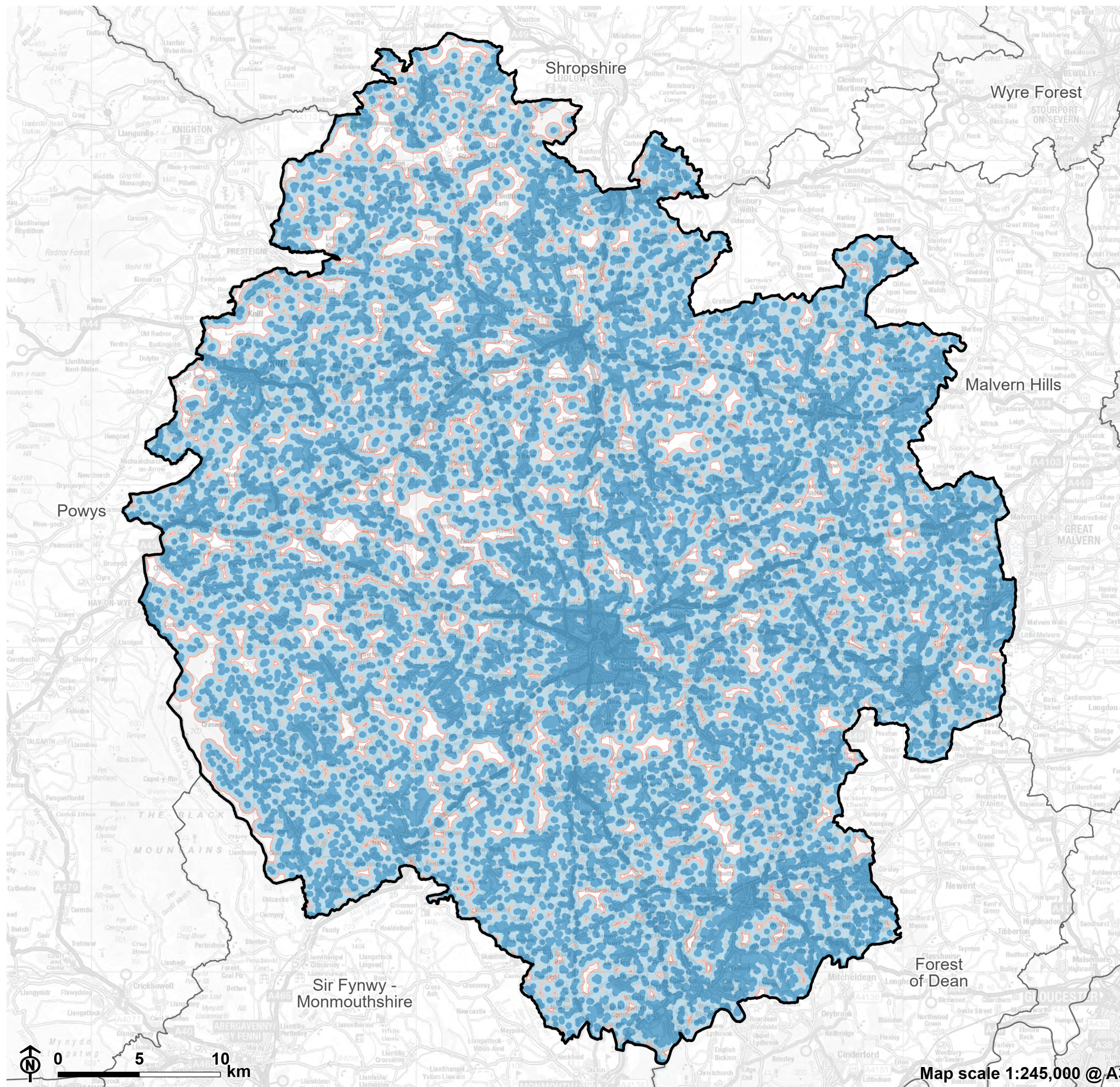Herefordshire Council

**Figure D.6: Secondary constraints: Wind -
Non-sensitive noise receptors**

☐ Local authority
☐ Neighbouring local authority

**Non-sensitive receptor**
- 180m buffer
- 400m buffer
- 480m buffer
- 500m buffer

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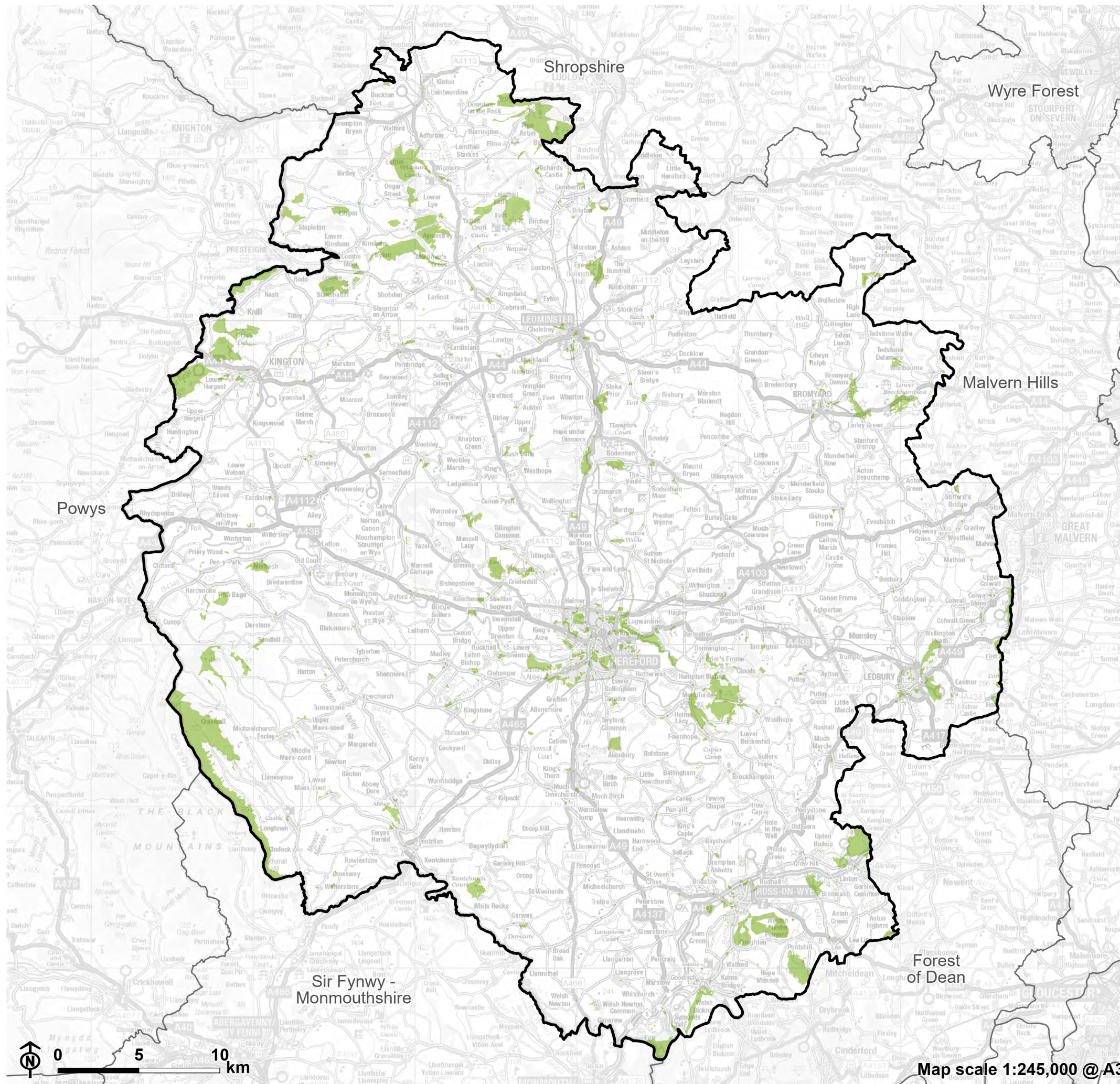assessment assumptions detailed in Appendix A.

Map scale 1:245,000 @ A3

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**Figure D.7: Secondary constraints: Wind - Open space**

Local authority

Neighbouring local authority

Designated open spaces

Shropshire

Wyre Forest

Malvern Hills

Powys

GREAT MALVERN

Sir Fynwy - Monmouthshire

Forest of Dean

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

Map scale 1:245,000 @A3

0      5      10
km
N

12441_000_r0_SolarFigures 13/12/2023 EB:shayler_h

**Figure D.8: Secondary opportunities: Wind - Roads**
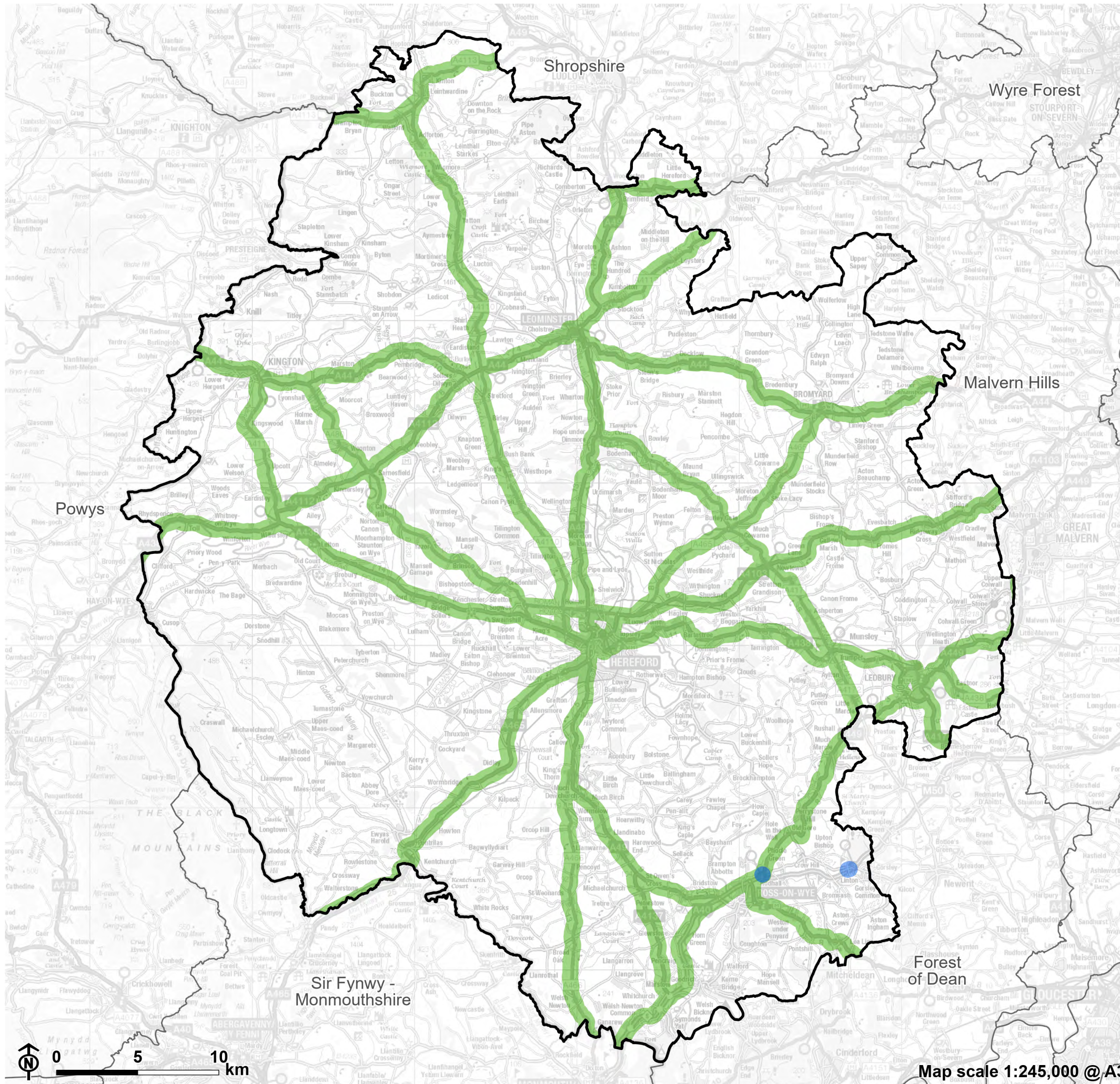
Local authority

Neighbouring local authority

**500m buffer around:**

Motorway junction

A Road

Shropshire

Wyre Forest

Malvern Hills

Powys

Sir Fynwy - Monmouthshire

Forest of Dean

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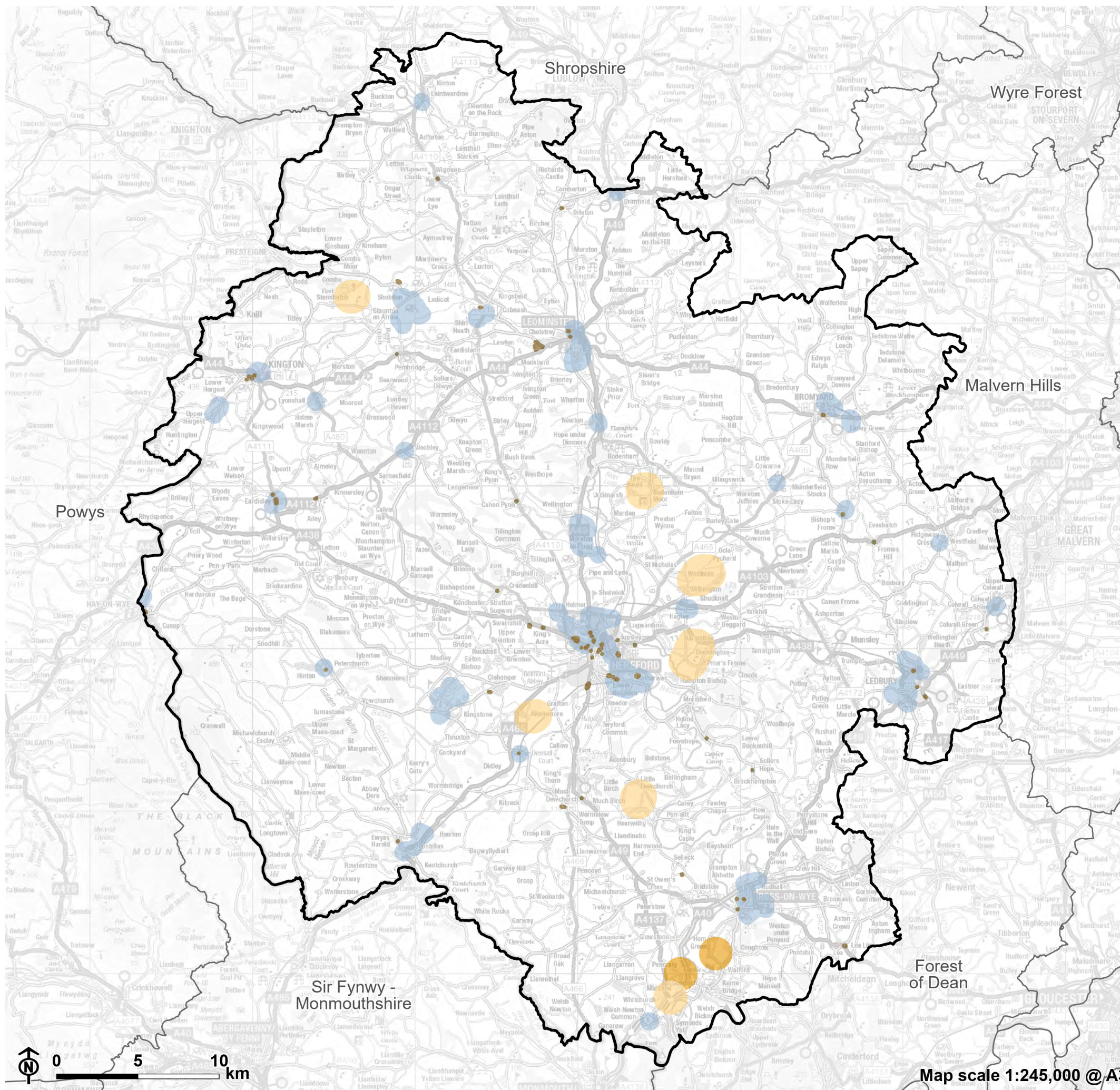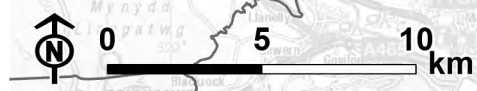Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

Map scale 1:245,000 @ A3

0    5    10
km

**Figure D.9: Secondary opportunities: Wind and ground mounted solar - Brownfield land, industrial sites, electricity grid and existing renewable energy developments**

Local authority

Neighbouring local authority

Brownfield land

**1km buffer around:**

Existing renewable development

Substation

**500m buffer around:**

Industrial site

**Notes**:
The only substations shown on this map are those included within the open National Grid Data. Refer to the local District Network Operator website for details on the locations of additional substations within Herefordshire. Please refer to this map in conjunction with the assessment assumptions detailed in Appendix A.

Map scale 1:245,000 @A3

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# Appendix E
# Data List

**E.1** The following data sources were used within this study. Refer to Chapter 2 and Appendix A for details on how each of these data sources were used:

- Additional data used by Geospatial Insight for the assessment of rooftop solar PV potential, including: BEIS Greenhouse gas reporting: conversion factors 2022 $CO_2$ factors, LiDAR data, NimbleFins imported electricity costs, Renewable Energy Hub exported electricity rates, Ordnance Survey building polygons and LiDAR.

- [BEIS (2023) Quarterly and annual load factors](.).

- BEIS renewable energy planning database.

- Cadw Listed Buildings, Registered Historic Landscape, Registered Parks and Gardens, Scheduled Monuments.

- Environment Agency Flood Zones, LiDAR DTM.

- Esri Aerial imagery.

- Forestry Commission National Forestry Inventory.

- Geospatial Insight estimated substation catchments.

- Global Solar Atlas solar irradiance.

- Global Wind Atlas/Vortex wind speeds.

- Herefordshire Biodiversity Record Centre Local Wildlife Sites.

- Herefordshire Council/University of Worcester Locally Important Geological Sites.

- Herefordshire Council brownfield land, Conservation Areas, industrial sites, Listed Buildings, minerals sites, open space, site allocations.

- Herefordshire Wildlife Trust Wildlife Trust Reserves.

**Appendix E   Data List**

- Historic England Conservation Areas, Listed Buildings, Registered Parks and Gardens, Scheduled Monuments.

- LUC industry experience.

- [National Grid (2023) Future Energy Scenarios: FES 2023 Data workbook – Key Stats; Annual average carbon intensity of electricity (five year forecast from 2022)](#).

- National Grid electricity lines, gas lines, substations.

- Natural England Agricultural Land Classification, Areas of Outstanding Natural Beauty, Ancient Woodland, Country Parks, Local Nature Reserves, National Nature Reserves, Open Access Land, Priority Habitat Inventory, registered common Land, Sites of Special Scientific Interest, Special Areas of Conservation.

- Natural Resources Wales Areas of Outstanding Natural Beauty, National Nature Reserves, Special Areas of Conservation, Sites of Special Scientific Interest.

- Ordnance Survey OpenMap airports and airfields, buildings, electricity lines.

- Ordnance Survey OpenRoads.

- Ordnance Survey VectorMap District railways.

- Ordnance Survey VectorMap Local waterbodies and watercourses.

- OS Addressbase.

- Research into turbine manufacturers.

- Welsh Government Conservation Areas.

# References

**1**   [Department for Levelling Up, Housing and Communities (2023) National Planning Policy Framework, footnote 54](#)

**2**   [Herefordshire Council (2015) Herefordshire Local Plan Core Strategy 2011-2031](#)

**3**   [Department for Business, Energy and Industrial Strategy (2013, updated 2023) Energy Trends: UK Renewables – Renewable electricity capacity and generation (ET 6.1 – quarterly) (September 20233)](#)

**4**   [BEIS (2023) Renewable Energy Planning Database (REPD): July 2023](#)

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

**6**   [BEIS (2023) Quarterly and annual load factors](#). The average of all the available load factors for the West Midlands was used.

**7**   [National Grid (2023) Future Energy Scenarios: FES 2023 Data workbook – Key Stats; Annual average carbon intensity of electricity (five year forecast from 2022)](#)

**8**   [Cleve Hill Solar Park (2020) Cleve Hill Solar Park granted development consent – 28/05/2020](#)

**9**   [Department for Business, Energy and Industrial Strategy (2013, updated 2023) Energy Trends: UK Renewables – Renewable electricity capacity and generation (ET 6.1 – quarterly) (September 20233)](#)

**10**  [Department for Business, Energy and Industrial Strategy (2014, updated 2023) Solar photovoltaics deployment](#). Using June 2023 data within Table 2, considering all FiTs (standalone), RO (ground mounted) and CfDs (ground-mounted) within the UK.

**11**  [BEIS (2023) Renewable Energy Planning Database (REPD): July 2023](#)

**References**

**12**  Department for Energy Security and Net Zero (2023) Draft National Policy Statement for Renewable Energy Infrastructure (EN-3)

**13**  BEIS (2023) Quarterly and annual load factors. The average of all the available load factors for the West Midlands was used.

**14**  National Grid (2023) Future Energy Scenarios: FES 2023 Data workbook – Key Stats; Annual average carbon intensity of electricity (five year forecast from 2022)

**15**  As of the 22nd November 2023, Areas of Outstanding National Beauty (AONB) are referred to as 'National Landscapes'. In legal terms they are still defined as AONBs.

**16**  HM Government (2015) The Town and Country Planning (General Permitted Development) (England) Order 2015

**17**  BEIS (2020) Sub-regional Feed-in Tariffs statistics: March 2019

**18**  BEIS (2023) Renewable Energy Planning Database (REPD): July 2023

**19**  NimbleFins (2023) Average Cost of Electricity per kWh in the UK 2023

**20**  The Renewable Energy Hub UK (2023) The Smart Export Guarantee in 2022

**21**  BEIS (2022) Greenhouse gas reporting: conversion factors 2022

**22**  Listed building point data was buffered 5m to estimate building footprints where they did not intersect or have the same name as Herefordshire locally listed building polygon data. In addition, listed building line data was buffered 0.5m to approximate the size of designated wall features. Where these or  Herefordshire locally listed building polygon data intersected Geospatial Insight's rooftop data it was assumed that these roofs were situated upon listed buildings.

**23**  It is assumed that the electricity generated from the identified wind potential would result in negligible carbon emissions and would replace that currently provided by the national grid, which has an emission factor of 0.183kgCO$_2$e/kWh (National Grid (2023) Future Energy Scenarios: FES

**References**

2023 Data workbook – Key Stats; Annual average carbon intensity of electricity (five year forecast from 2022))

24   It is assumed that the electricity generated from the identified wind potential would result in negligible carbon emissions and would replace that currently provided by the national grid, which has an emission factor of 0.183kgCO₂e/kWh (National Grid (2023) Future Energy Scenarios: FES 2023 Data workbook – Key Stats; Annual average carbon intensity of electricity (five year forecast from 2022))

25   It is assumed that the electricity generated from the identified wind potential would result in negligible carbon emissions and would replace that currently provided by the national grid, which has an emission factor of 0.183kgCO₂e/kWh (National Grid (2023) Future Energy Scenarios: FES 2023 Data workbook – Key Stats; Annual average carbon intensity of electricity (five year forecast from 2022))

26   It is assumed that the electricity generated from the identified wind potential would result in negligible carbon emissions and would replace that currently provided by the national grid, which has an emission factor of 0.183kgCO₂e/kWh (National Grid (2023) Future Energy Scenarios: FES 2023 Data workbook – Key Stats; Annual average carbon intensity of electricity (five year forecast from 2022))

27   It is assumed that the electricity generated from the identified wind potential would result in negligible carbon emissions and would replace that currently provided by the national grid, which has an emission factor of 0.183kgCO₂e/kWh (National Grid (2023) Future Energy Scenarios: FES 2023 Data workbook – Key Stats; Annual average carbon intensity of electricity (five year forecast from 2022))

28   The Geospatial Insight rooftop solar assessment assumes that the electricity generated from the identified solar potential would result in negligible carbon emissions and would replace that currently provided by the national grid, which has an emission factor of 0.193kgCO₂e/kWh (BEIS (2022) Greenhouse gas reporting: conversion factors 2022).

29   The Geospatial Insight rooftop solar assessment assumes that the electricity generated from the identified solar potential would result in

**References**

negligible carbon emissions and would replace that currently provided by the national grid, which has an emission factor of 0.193kgCO$_2$e/kWh ([BEIS (2022) Greenhouse gas reporting: conversion factors 2022](#)).

30   The Geospatial Insight rooftop solar assessment assumes that the electricity generated from the identified solar potential would result in negligible carbon emissions and would replace that currently provided by the national grid, which has an emission factor of 0.193kgCO$_2$e/kWh ([BEIS (2022) Greenhouse gas reporting: conversion factors 2022](#)).

31   The Geospatial Insight rooftop solar assessment assumes that the electricity generated from the identified solar potential would result in negligible carbon emissions and would replace that currently provided by the national grid, which has an emission factor of 0.193kgCO$_2$e/kWh ([BEIS (2022) Greenhouse gas reporting: conversion factors 2022](#)).

32   [Department for Levelling Up, Housing and Communities (2023) National Planning Policy Framework, footnote 54](#)

33   [Herefordshire Council (2015) Herefordshire Local Plan Core Strategy 2011-2031](#)

34   [Herefordshire Council (2023) Local Plan 2021-2041](#)

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