



# The Marches Land Use Study

Prepared by TACP (UK) Ltd for  
The Marches Local Enterprise Partnership

Technical Appendix





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## List of Abbreviations

<b>Abbreviation</b>	<b>Full Description</b>
<b>OS</b>	Ordnance Survey
<b>LSOA</b>	Lower layer Super Output Area
<b>DTM</b>	Digital Terrain Model

# 1 INTRODUCTION

## 1.1 Overview

TACP (UK) Ltd (TACP) was commissioned in February 2023 by The Marches Local Enterprise Partnership (LEP) to review existing land use and assess opportunities for the creation of woodland and development of solar and wind farms across Shropshire, Herefordshire and Telford & Wrekin (The Marches).

To assess opportunities for the creation of woodland and development of solar and wind farms, areas were scored based on the suitability of the current land use for change, and the constraints which might influence this.

This is a supporting document to be read in conjunction with the Land Use Opportunity Report (61093\_REP\_LandUseOppReport). This document details the methods and assumptions made during the Assessment of Existing Land Use and Land Use Opportunity Assessment for Shropshire, Herefordshire, Telford & Wrekin (The Marches).

## 1.2 Assumptions and Limitations

The following assumptions and limitations of the analysis should be considered when interpreting the figures; Land Use Opportunity – Woodland, Land Use Opportunity – Solar and Land Use Opportunity – Wind, presented in the report.

### Study scale

This assessment was conducted at a county wide scale and identifies the strategic potential for land use change to woodland, solar and wind development. Sites identified as opportunities for land use change will require a site specific assessment to confirm the locations suitability.

### Data boundary

The Marches covers an area located along the English/Welsh border. Many of the datasets supplied for the analysis did not contain data for outside The Marches and thus, the unitary authority border of the three counties making up The Marches was the study area boundary. However, where data was available covering adjacent areas outside The Marches, a 25km buffer was used as the extent (e.g. data regarding the location of roads).

### Temporal resolution

The data used is accurate at the time of undertaking the analysis (February to August 2023) and are subject to change.

### Spatial resolution

The standard resolution used for raster datasets in this analysis was 5 x 5m cell size.

## 2 METHOD

### 2.1 Assessment of Existing Land Use

Ordnance Survey (OS) MasterMap data from 2023 was used to determine the current land use class for all counties in The Marches. Within the OS data, certain information categories (fields) were utilised in this analysis. Descriptive term (DescTerm) was used as the land use class wherever possible as it contains a greater level of detail, however where this information was not available the Descriptive group (DescGroup) was used as the land use class. This formed the Secondary Typology for the assessment of existing land use.

An example of a land use class list (Secondary Typology) derived from OS MasterMap can be seen below:

*Coniferous Trees, Rock (Scattered), Scrub*

Secondary Typologies were then categorised into broader Primary Typologies to display the land use class in its functional groups (Table 1). Trees and scrub took priority and professional judgement was applied to categorising the Secondary Typologies into the 7 Primary Typologies:

- Agriculture,
- Brownfield, Built,
- Non-Agricultural Vegetation,
- Scrub,
- Water,
- Woodland, and
- Other (Table 1).

**Table 1: Descriptions and/or examples for the land use classification typologies presented in the assessment of existing land use figures.**

Primary Typology	Descriptions/Examples
<b>Agriculture</b>	Agricultural land
<b>Brownfield</b>	Inactive mineral workings
<b>Built</b>	Manmade structures including buildings, transport links and active mineral workings
<b>Non-Agricultural Vegetation</b>	Heath, marsh, rough grassland
<b>Scrub</b>	Locations classified as containing scrub and not woodland



Primary Typology	Descriptions/Examples
<b>Water</b>	Water features both static and flowing
<b>Woodland</b>	Locations classified as containing coniferous and/ or non-coniferous trees
<b>Other</b>	Roadside, solid rock, shingle, scree, spoil, gardens, caravan parks, golf courses, solar power farms, open land in built-up areas, and land near runways/airports etc.

## 2.2 Assessment of Land Use Suitability for Conversion to Woodland, Solar and Wind

*Suitability in this assessment is defined as the ease of land use change and how suitable an area is for this land use change to function (disregarding the importance of habitats) (Table 2). This allows for maximum availability of the land for the constraints to then be applied.*

Secondary typologies were concatenated with information on whether the land use class was natural or manmade ("Make" in the OS Mastermap dataset) to further refine the assessment of suitability for land use class conversion to woodland, solar and wind.

An example of the Secondary Typology concatenated with "Make" can be seen below:

*Coniferous Trees, Rock (Scattered), Scrub (Natural)*

**Table 2: The suitability/ potential for land use change to woodland, solar and wind was scored between 1 (low suitability) – 10 (high suitability) and 0 (Unsuitable) following the assumptions below.**

Assumption	Suitability score
<b>Agriculture</b>	10
<b>Built</b>	0
<b>Water and trees</b>	1
<b>Water</b>	0
<b>Marsh</b>	1
<b>Rough grassland</b>	10
<b>Heath</b>	9
<b>Scrub</b>	5
<b>Rock</b>	Minus 1 off suitability
<b>Rock (Scattered) is dominant</b>	Minus 1 off suitability
<b>Coniferous trees are dominant</b>	4
<b>Non-coniferous trees anywhere in the list</b>	2
<b>Spoil heap suitable for Solar and Wind</b>	10
<b>Spoil heap with vegetation is suitable for Woodland, Solar and Wind</b>	>2

\* Trees take priority over other classes

### 2.3 Assessment of Land Use Constraints for Conversion to Woodland, Solar and Wind

Publicly available data as well as data from Shropshire, Herefordshire and Telford & Wrekin Councils and Herefordshire Biological Records Centre was acquired for the project. These data formed the suitability requirements (constraints) which were scored and weighted for woodland, solar and wind separately. Constraints were scored from 1 (low constraint) – 10 (high constraint) and 0 (Not possible/ Unsuitable) (Table 3).

For example, aspect (the direction the ground is facing) is a constraint for solar developments and thus a low constraint score was applied to south facing ground (more favourable) whereas a high constraint score was applied to north facing ground (less favourable) (**Error! Reference source not found.**). A summary of constraint scores and assumptions for each dataset can be seen in **Error! Reference source not found.**, a detailed list of constraint scores can be found at <https://www.marcheslep.org.uk/priorities/data-research/>.

**Table 3: Breakdown of constraint scoring (<https://www.marcheslep.org.uk/priorities/data-research/>) into the general constraint scoring of low, medium, high and unsuitable (**Error! Reference source not found.**).**

Low constraint Low				Medium			High			Not possible/ Unsuitable
1	2	3	4	5	6	7	8	9	10	0

To ensure areas which were recorded as 0 (not possible/ unsuitable) for one constraint, were carried through to all other constraint layers for that land use change (woodland, solar and wind), a conditional statement was used to ensure the areas of zero were classed as such once the constraints had been summed. The constraints were also weighted from 1-3 to allow key constraints for each land use change to have greater influence on the output. Constraints which were the most critical for the conversion to woodland, solar and wind and those which were from a reputable source, and with a greater spatial and temporal resolution were classed higher and this was based on professional judgement (<https://www.marcheslep.org.uk/priorities/data-research/>).

Table 4: Summary of assumptions and constraint scoring for each dataset.

Constraint	Score			Data source
	Woodland	Solar	Wind	
Riparian zone (10m buffer applied to river line data to resemble the riparian zone)	Not possible within the riparian zone.	Not possible within the riparian zone.	Not possible within the riparian zone.	Ordnance Survey OpenRivers [1].
	Low constraint outside the riparian zone.	Low constraint outside the riparian zone	Low constraint outside the riparian zone.	
Flood zones	Not possible within flood zone 3.	Not possible within flood zone 3.	Not possible within flood zone 3.	Environment Agency Flood Map for Planning (Rivers and Sea) Flood Zone 2 and 3 [2] [3].
	Medium constraint in flood zone 2.	Medium constraint in flood zone 2.	Medium constraint in flood zone 2.	
	Low constraint outside the flood zone 2 and 3.	Low constraint outside the flood zone 2 and 3.	Low constraint outside the flood zone 2 and 3.	
Aspect (sun)	No constraint.	High constraint on North facing slopes.	No constraint.	Environment Agency LiDAR Composite DTM 2022 – 2m spatial resolution [4].
		Medium constraint on East and West facing slopes.		
		Low constraint on South facing slopes and flat areas.		
Slope	Not possible in areas >45°.	Not possible in areas >10° [5].	Not possible in areas >15° [6].	

Table 4: Summary of assumptions and constraint scoring for each dataset.

Constraint	Score			Data source
	Woodland	Solar	Wind	
	Low constraint in areas <45°.	Low constraint in areas <10°.	Low constraint in areas <15°.	Environment Agency LiDAR Composite DTM 2022 – 2m spatial resolution [4].
Intervisibility	No constraint.	No constraint.	High constraint at maximum intervisibility.	Environment Agency LiDAR Composite DTM 2022 – 2m spatial resolution [4].
			Low constraint at minimum intervisibility.	
Wind speed (50m above ground level)	No constraint.	No constraint.	Not possible in areas of <5m/s wind speed.	Global Wind Atlas [7].
			Medium constraint in areas 5-10m/s.	
			Low constraint in areas 10-15m/s and Low constraint in areas >15m/s.	
Prominence	No constraint.	No constraint.	Not possible in areas <-30m prominence.	Environment Agency LiDAR Composite DTM 2022 – 2m spatial resolution [4].
			High constraint in areas <0 prominence.	
			Low constraint in areas >0 prominence.	

Table 4: Summary of assumptions and constraint scoring for each dataset.

Constraint	Score			Data source
	Woodland	Solar	Wind	
Distance from road (road is set as 20m wide and only includes motorways and A roads)	Medium constraint at the maximum distance from the road.	High constraint at the maximum distance from the road.	High constraint at the maximum distance from the road.	Ordnance Survey OpenRoads [8].
	Low constraint at the minimum distance from the road.	Low constraint at the minimum distance from the road.	Low constraint at the minimum distance from the road.	
Distance from public rights of way (PRoW)		High constraint in areas <50m from PROW.	High constraint in areas <50m from PROW.	Shropshire, Herefordshire, Telford & Wrekin Councils.
	Medium constraint at the maximum distance from the public rights of way.	Medium constraint in areas 50-300m from PROW.	Medium constraint in areas 50-300m from PROW.	
	Low constraint at the minimum distance from the public rights of way.	Low constraint in areas >300m from PROW.	Low constraint in areas >300m from PROW.	
Distance from cycle paths	Medium constraint at the maximum distance from the cycle paths.	No constraint.	No constraint.	SusTrans National Cycle Network [9].

Table 4: Summary of assumptions and constraint scoring for each dataset.

Constraint	Score			Data source
	Woodland	Solar	Wind	
	Low constraint at the minimum distance from the cycle paths.			
Distance from substations (only substations with an aggregated generation headroom of green or amber were included)	No constraint.	No constraint.	High constraint >3000m from substation point.	National Grid and Scottish Power Energy Network (SPEN) Primary Substations [10] [11].
			Low constraint <3000m from substation point.	

**Table 4: Summary of assumptions and constraint scoring for each dataset.**

Constraint	Score			Data source
	Woodland	Solar	Wind	
<p><b>Core habitat areas</b> (includes ancient and semi natural woodland, ancient, replanted woodland, local nature reserves, local wildlife sites, national nature reserves, priority habitats, RAMSAR sites, special areas of conservation, sites of special scientific interest)</p>	<p><b>Medium constraint within the sites. (The aim of the analysis is for new woodland sites).</b></p>	<p><b>High constraint within 500m</b></p>	<p><b>High constraint within 500m.</b></p>	<p>Shropshire Council provided their "Core Areas" layer which covered Shropshire and Telford &amp; Wrekin.</p>

Table 4: Summary of assumptions and constraint scoring for each dataset.

Constraint	Score			Data source
	Woodland	Solar	Wind	
	Low constraint outside the sites.	Low constraint in areas >500m.	Low constraint in areas >500m.	<b>Herefordshire:</b> Local Wildlife Sites were purchased from Herefordshire Biological Records Centre. Ancient woodland [12], Local Nature Reserves [13], National Nature Reserves [14], Sites of Special Scientific Interest [15] and Priority Habitats [16] from Natural England. RAMSAR sites [17], Special Protection Areas [18] and Special Areas of Conservation [19] from JNCC.
Greenspaces	No constraint.	High constraint within the sites.	High constraint within the sites.	Ordnance Survey Open Greenspace [20].
		Low constraint outside the sites.	Low constraint outside the sites.	
Agricultural land classification	Not possible in Grade 1 and Urban areas.	Not possible in Grade 1 and Urban areas.	Not possible in Grade 1 and Urban areas.	



Table 4: Summary of assumptions and constraint scoring for each dataset.

Constraint	Score			Data source
	Woodland	Solar	Wind	
	High constraint in Grade 2 areas.	High constraint in Grade 2 areas.	High constraint in Grade 2 areas.	Natural England Agricultural Land Classification [21].
	Medium constraint in Grade 3 and non-agricultural vegetation areas.	Medium constraint in Grade 3 and non-agricultural vegetation areas.	Medium constraint in Grade 3 and non-agricultural vegetation areas.	
	Low constraint in Grade 4 and 5 areas.	Low constraint in Grade 4 and 5 areas.	Low constraint in Grade 4 and 5 areas.	
Index of Multiple Deprivation (IMD) Decile (where 1 is most deprived 10% of Lower layer Super Output Areas (LSOAs))	Scaled from Low constraint in decile 1 LSOA's to high constraint in decile 10 LSOA's. Woodland should preferentially be created in areas that have lower access to accessible greenspaces.	No constraint.	No constraint.	Department for Levelling Up, Housing and Communities Indices of Multiple Deprivation (IMD) 2019 [22].
World heritage sites	High constraint within the sites.	High constraint within the sites.	High constraint within the sites.	Historic England World Heritage Sites [23].
		Medium constraint <1000m from the sites.	Medium constraint <1000m from the sites.	

Table 4: Summary of assumptions and constraint scoring for each dataset.

Constraint	Score			Data source
	Woodland	Solar	Wind	
	Low constraint outside the sites.	Low constraint >1000m from the sites.	Low constraint >1000m from the sites.	
Scheduled monuments	Not possible <50m from the sites.	Not possible <50m from the sites.	Not possible <50m from the sites.	Historic England Scheduled Monuments [24].
	Medium constraint between 50-500m.	Medium constraint between 50-500m.	Medium constraint between 50-500m.	
	Low constraint >500m from the sites.	Low constraint >500m from the sites.	Low constraint >500m from the sites.	
Parks gardens and	Not possible within the sites.	Not possible within the sites.	Not possible within the sites.	Historic England Parks and Gardens [25].
	High constraint <500m from the sites.	High constraint <500m from the sites.	High constraint <500m from the sites.	
	Low constraint >500m from the sites.	Low constraint >500m from the sites.	Low constraint >500m from the sites.	
Battlefields	Low constraint within the site. Low constraint outside the site.	Low constraint within the site. Low constraint outside the site.	Low constraint within the site. Low constraint outside the site.	Historic England Battlefields [26].
Conservation areas (INSPIRE)	Medium constraint within the sites. (The aim of the analysis is for new woodland sites).	High constraint within the site.	High constraint within the site.	Historic England Conservation Areas (INSPIRE) [27].

Table 4: Summary of assumptions and constraint scoring for each dataset.

Constraint	Score			Data source
	Woodland	Solar	Wind	
	Low constraint outside the sites.	Low constraint outside the site.	Low constraint outside the site.	
Listed buildings (5m buffer applied to the point data)	Not possible <50m from the sites.	Not possible <50m from the sites.	Not possible <50m from the sites.	Historic England Listed Buildings [28].
	Medium constraint between 50-500m.	Medium constraint between 50-500m.	Medium constraint between 50-500m.	
	Low constraint >500m from the sites.	Low constraint >500m from the sites.	Low constraint >500m from the sites.	
Certificates of immunity	Not possible <50m from the sites.	Not possible <50m from the sites.	Not possible <50m from the sites.	Historic England Certificates of Immunity [29].
	Medium constraint between 50-500m.	Medium constraint between 50-500m.	Medium constraint between 50-500m.	
	Low constraint >500m from the sites.	Low constraint >500m from the sites.	Low constraint >500m from the sites.	
National Trust land	Low constraint outside the sites. Low constraint within the sites.	High constraint within the site.	High constraint within the site.	National Trust (land always open and land with limited access) [30] [31].
		Low constraint outside the site.	Low constraint outside the site.	

Table 4: Summary of assumptions and constraint scoring for each dataset.

Constraint	Score			Data source
	Woodland	Solar	Wind	
Area of Outstanding Natural Beauty (AONB)	High constraint within the sites.	High constraint within the sites.	High constraint within the sites.	Natural England Area of Outstanding Natural Beauty [32].
	Medium constraint <500m from the sites.	Medium constraint <500m from the sites.	Medium constraint <500m from the sites.	
	Low constraint >500m from the sites.	Low constraint >500m from the sites.	Low constraint >500m from the sites.	

## 2.4 Assessment of Land Use Opportunity for Conversion to Woodland, Solar and Wind

To identify opportunities for changes in land use within the study area, land use suitability and land use constraint rasters of 5 x 5m cell size were combined. Land use opportunity for conversion to woodland, solar and wind was calculated by dividing the land use suitability for each cell in the raster dataset by the sum of the land use constraints for each cell in the raster dataset. This was calculated for each land use change (woodland, solar and wind) as each change has a different land suitability score and the constraints applied will also vary for each land use change.

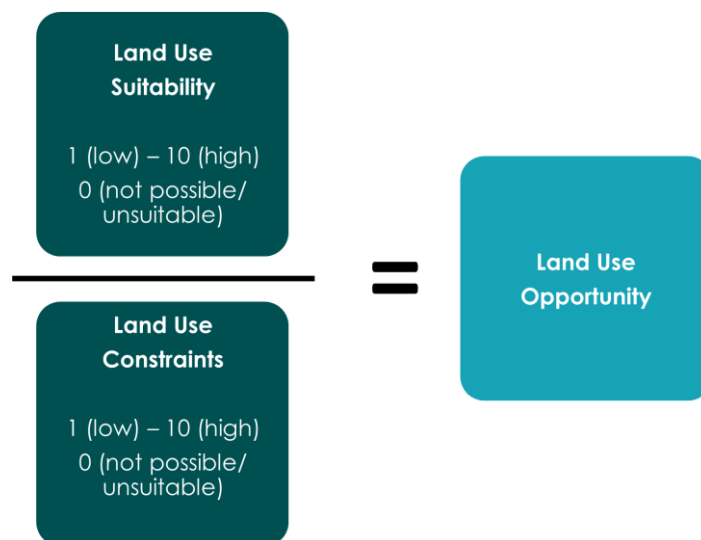


Figure 1: Land use opportunity assessment method.

Each land use change (woodland, solar and wind) output was averaged (mean) into 1km<sup>2</sup> hexagons for the final output as can be seen in the figures of the Land Use Opportunity Report (61093\_REP\_LandUseOppReport). This allowed for a clear distinction between locations of High and Low suitability for land use change opportunities at a county wide scale and lead to a greater accuracy in the mean of the data in each hexagon; as points on the border of hexagons were closer to the centroid than they would be if the data was aggregated into squares or triangles due to the more spherical nature of the hexagon tessellation [33]. A higher resolution output where the data was averaged (mean) into 0.1km<sup>2</sup> hexagons can be accessed here <https://www.marcheslep.org.uk/priorities/data-research/>.

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