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VineMAP Report

Customer name:	vinescapes
Email:	vinescapes
Telephone:	
Reference:	
Date:	8 October 2019

Products:

1. Topographic suitability & grading
2. Soil suitability information, landcover suitability and designated 'protected' areas
3. Flood risk and access maps
4. **All terrestrial reports (Reports 1 - 3)**
5. Climate (including Frost Risk / Report No.6)
6. Frost risk
7. All terrestrial and climate suitability reports

Area coverage:	70.4 hectares (ha)
Location:	Stanford le Hope, England, United Kingdom
National Grid reference:	TQ 685 855

Report description:

This report was generated using Vinescapes' Vineyard suitability Mapping and Assessment Program (VineMAP), powered by maploom. Maps, data, scoring and results within this report are provided to assist in viticulture suitability assessments. Where serious consideration is being given to establishing a vineyard on land evaluated within this report professional expertise should be sought from Vinescapes to advise on and undertake additional analysis. This includes detailed soil assessments, site and soil amelioration requirements, vineyard design, variety and planting material recommendations, business planning and project management. This report should not be relied on as the sole determinant for viticulture suitability, vineyard establishment or wine production business ventures.

Site Overview – Stanford le Hope, England, United Kingdom

Variable	Result	Suitability score
Topography	30.4 ha	7.1/20
Elevation	70.4 ha	17.4/20
Aspect	44.7 ha	10.0/20
Slope	49.5 ha	10.8/20
Dominant Soil	Slowly permeable seasonally wet	Requires further analysis
Suitable landcover	67.4 ha	
Area with no protected status	70.4 ha	
Excellent potential vineyard area	29.9 ha	
Good potential vineyard area	0.5 ha	
Low potential vineyard area	0.0 ha	

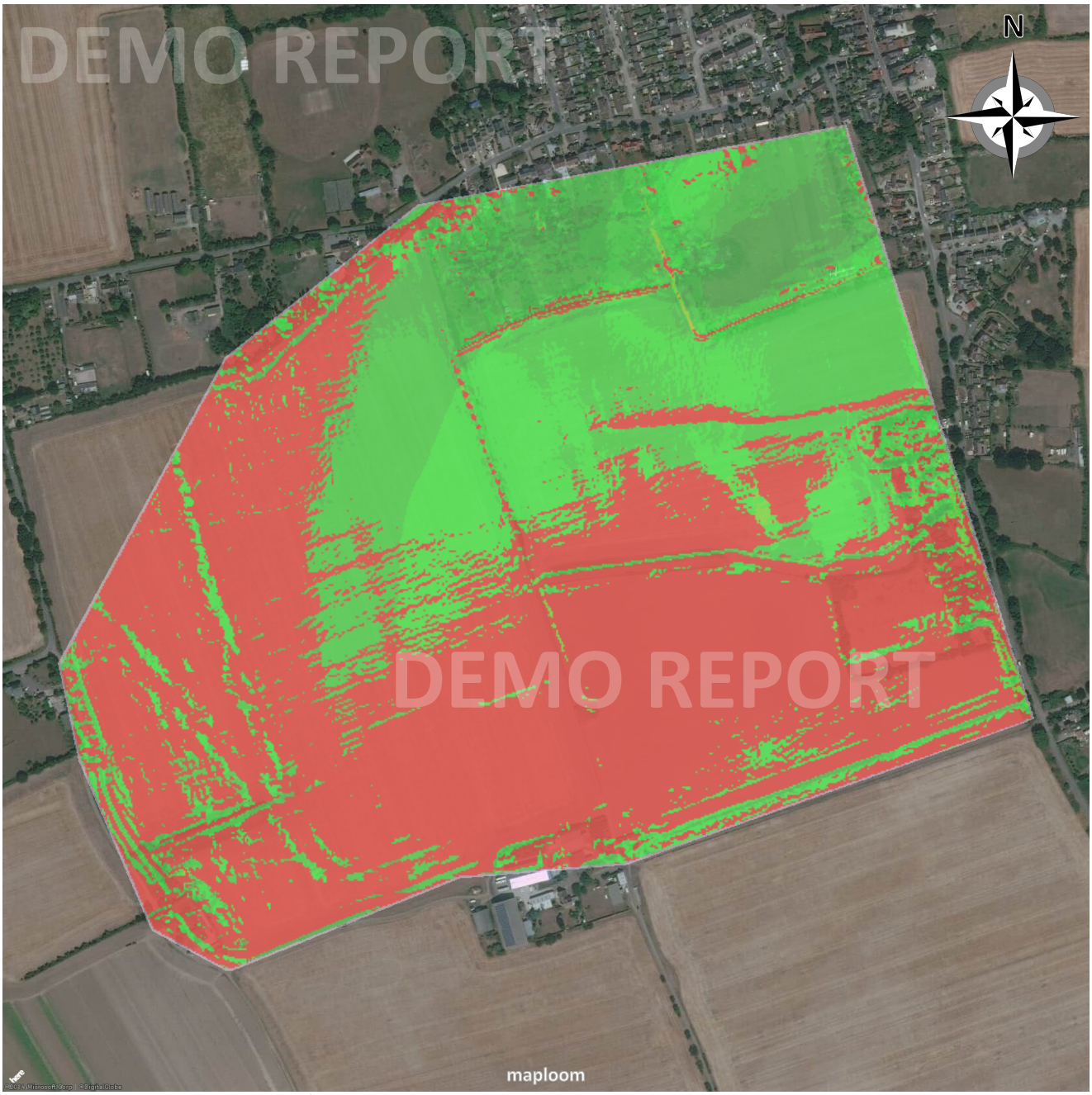
	10-year averages	Suitability score
Growing season* average temperature (GST)	-	-
Growing Degree Days (GDD)	-	-
15th March - 31st May frost days	-	-
Average frost temperatures	-	-
Growing season rainfall	-	-
June rainfall	-	-
Combined climatic suitability	-	-

* The growing season in England is roughly April to October

Combined topographic suitability map

Resolution: 2m
Data source: LiDAR Digital Terrain Model

0 m 500 m

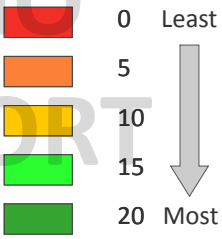


'The map shows the high and low topographically suitable viticulture areas taking into account land cover suitability and any protected status zones.

Please note that soil suitability is not included in this map/ model.

Score	Area (ha)
0/20	40.0
5/20	0.0
10/20	0.5
15/20	27.8
20/20	2.1

Suitability legend



Suitable area: 30.4 ha

Area average combined topography suitability score: 7.1/20

Site Overview: Access

Resolution:
Data source: Ordnance Survey

Topographic suitability criteria for cool-climate viticulture

Elevation: Vineyards in England and Wales are best sited below 100 and not above 150m, with between 25 – 75m being the preferred range. Elevation suitability is restricted by decreasing temperatures at higher altitudes and the greater potential for wind exposure where the surrounding terrain does not afford shelter. Both these variables can reduce yield and quality parameters which in turn may threaten commercial viticulture viability.

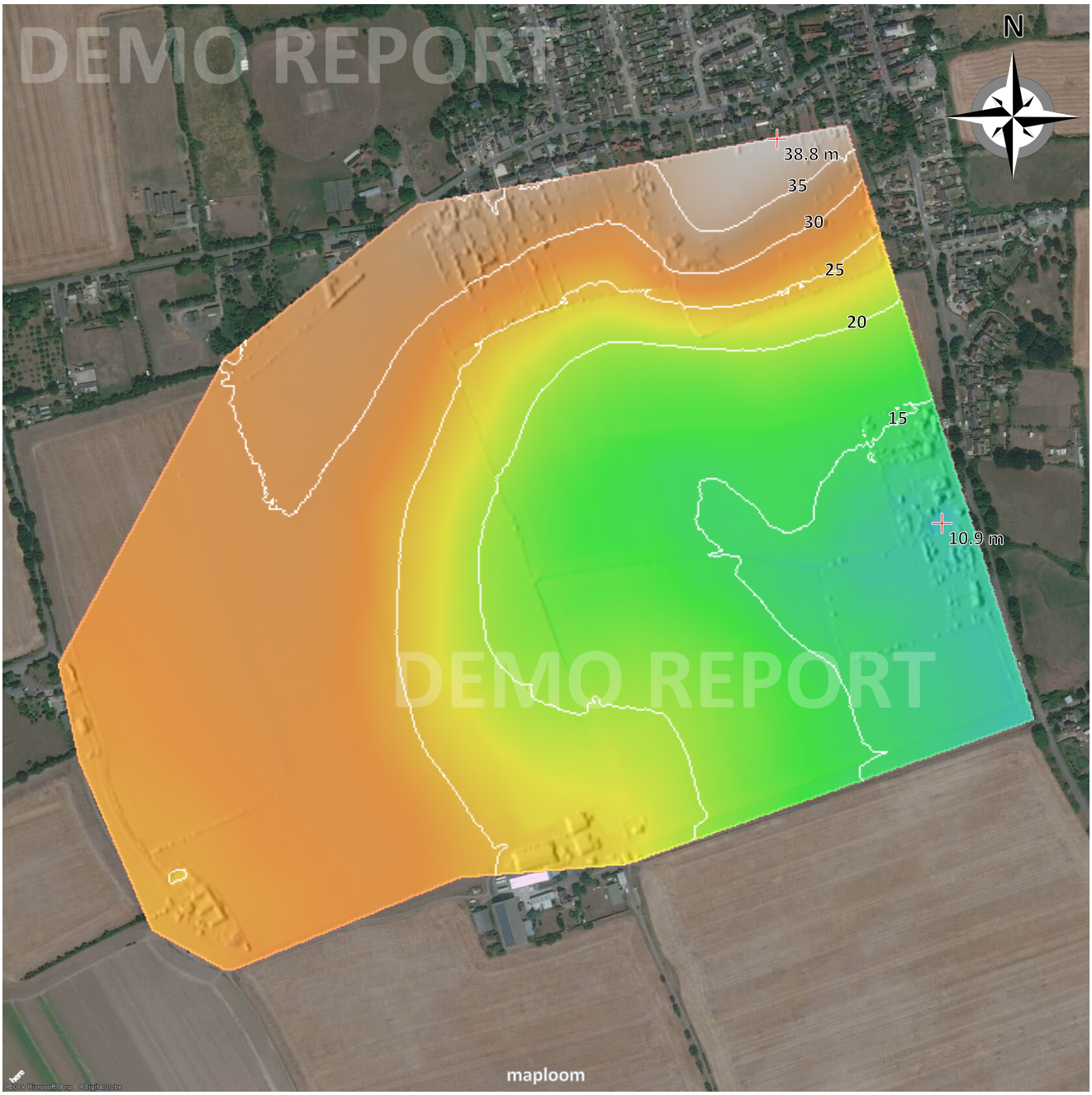
Aspect: At higher latitudes south facing slopes (in the northern hemisphere) have greater direct solar radiation gain potential due to their reduced angle of incidence (the angle between the sun's beam and an imaginary line perpendicular to the slope), particularly during the ripening period when the sun is higher in the sky. They are also conducive to reducing the lag phase during which a site heats up and dries out after a cold night. All else being equal such slope aspects are favourable to both yield and grape berry quality parameters. South-westerly facing slopes are at a higher risk of exposure to prevailing south westerly winds.

Slope: Optimum slopes for viticulture are 5 – 10%. The potential for mechanical vineyard management activity becomes limited on slopes greater than 10% and erosion risk increases. Below 1% there is an increased risk of cold air accumulation and potential frost damage.

Elevation and contour map

Resolution: 2m, Contour spacing: 5m
Data source: LiDAR Digital Terrain Model

0 m 500 m



Elevation suitability for English and Welsh vineyards is between 5 – 150m.

However, for land above 125m please contact the Vinescapes for additional advice.

Elevation range: 10.9 - 38.8m

Elevation (m)	Score	Area (ha)
< 5	0/20	0.0
5-25	15/20	37.1
25-75	20/20	33.3
75-100	10/20	0.0
100-125	5/20	0.0
125-150	0/20	0.0

Elevation legend

- 10.9-15.5 m
- 16.5-21.1 m
- 22.1-26.7 m
- 27.7-32.3 m
- 33.3-37.9 m
- 38.8-43.5 m

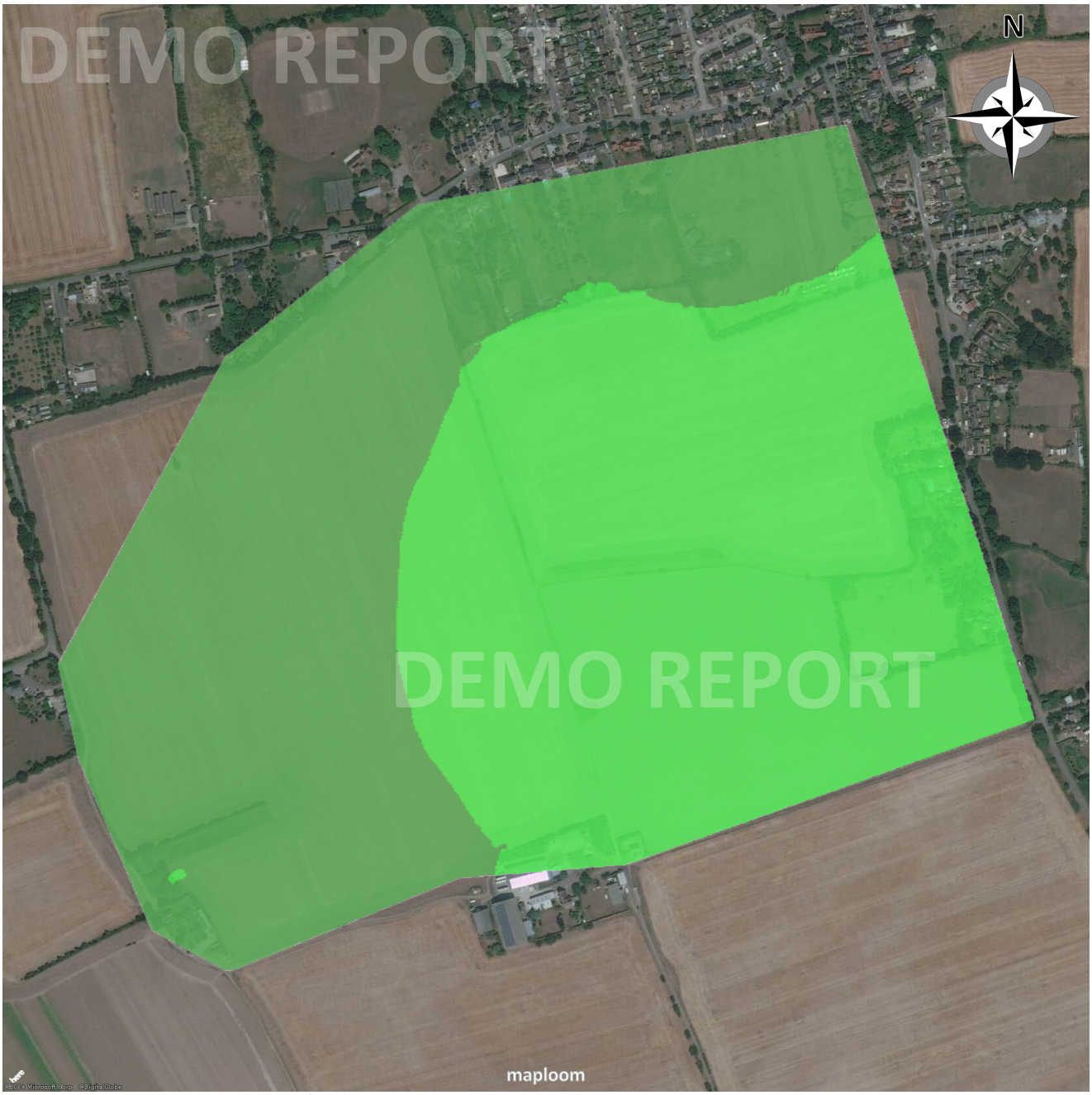
Suitable area: 70.4 ha

Area average elevation suitability score: 17.4/20

Elevation Suitability map

Resolution: 2m
Data source: LiDAR Digital Terrain Model

0 m — 500 m



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Elevation range: 10.9 - 38.8m

Elevation (m)	Score	Area (ha)
< 5	0/20	0.0
5-25	15/20	37.1
25-75	20/20	33.3
75-100	10/20	0.0
100-125	5/20	0.0
125-150	0/20	0.0

Suitability legend

0 Least
5
10
15
20 Most

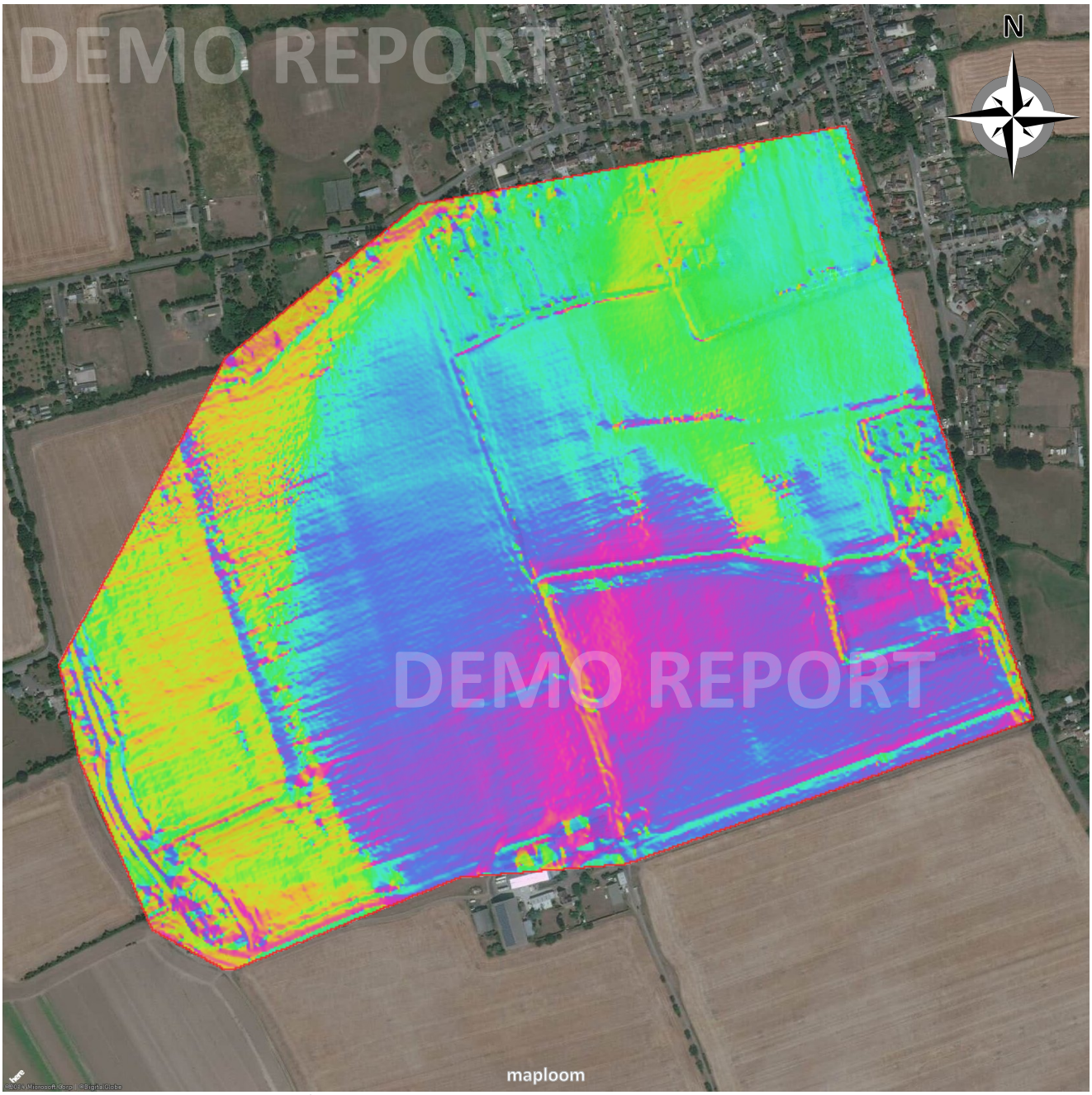
Suitable area: 70.4 ha

Area average elevation suitability score: 17.4/20

Aspect map

Resolution: 2m
Data source: LiDAR Digital Terrain Model

0 m 500 m



Aspect suitability for English and Welsh vineyards is southerly, between 90° – 270° (East – West).

For specialist advice on land with other aspects please contact the Vinescapes.

*higher scores can be awarded if the land is not exposed to prevailing south-westerly winds.

Aspect range: 0.0-360.0 degrees

Aspect (°)	Score	Area (ha)
< 90	0/20	20.9
90-135	15/20	13.8
135-180	20/20	14.7
180-225	15/20	8.6
225-270	10/20*	7.6
> 270	0/20	4.7

Aspect (degrees)
0-90
90-135
135-180
180-225
225-270
270-360

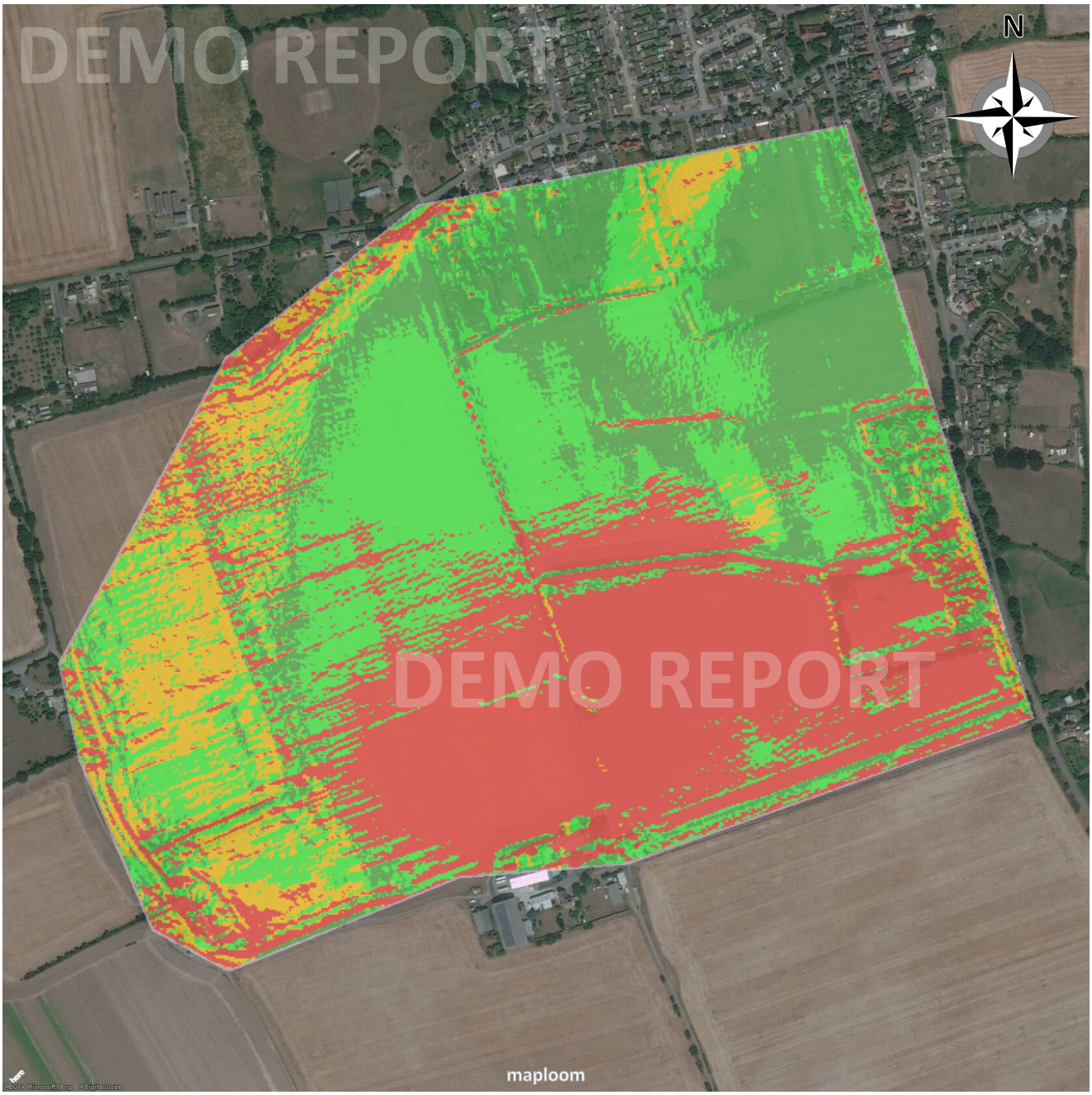
Suitable area: 44.7 ha

Area average aspect suitability score: 10.0/20

Aspect Suitability map

Resolution: 2m
Data source: LiDAR Digital Terrain Model

0 m — 500 m



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180-225	15/20	8.6
225-270	10/20*	7.6
> 270	0/20	4.7

Suitability legend

0 Least
5
10
15
20 Most

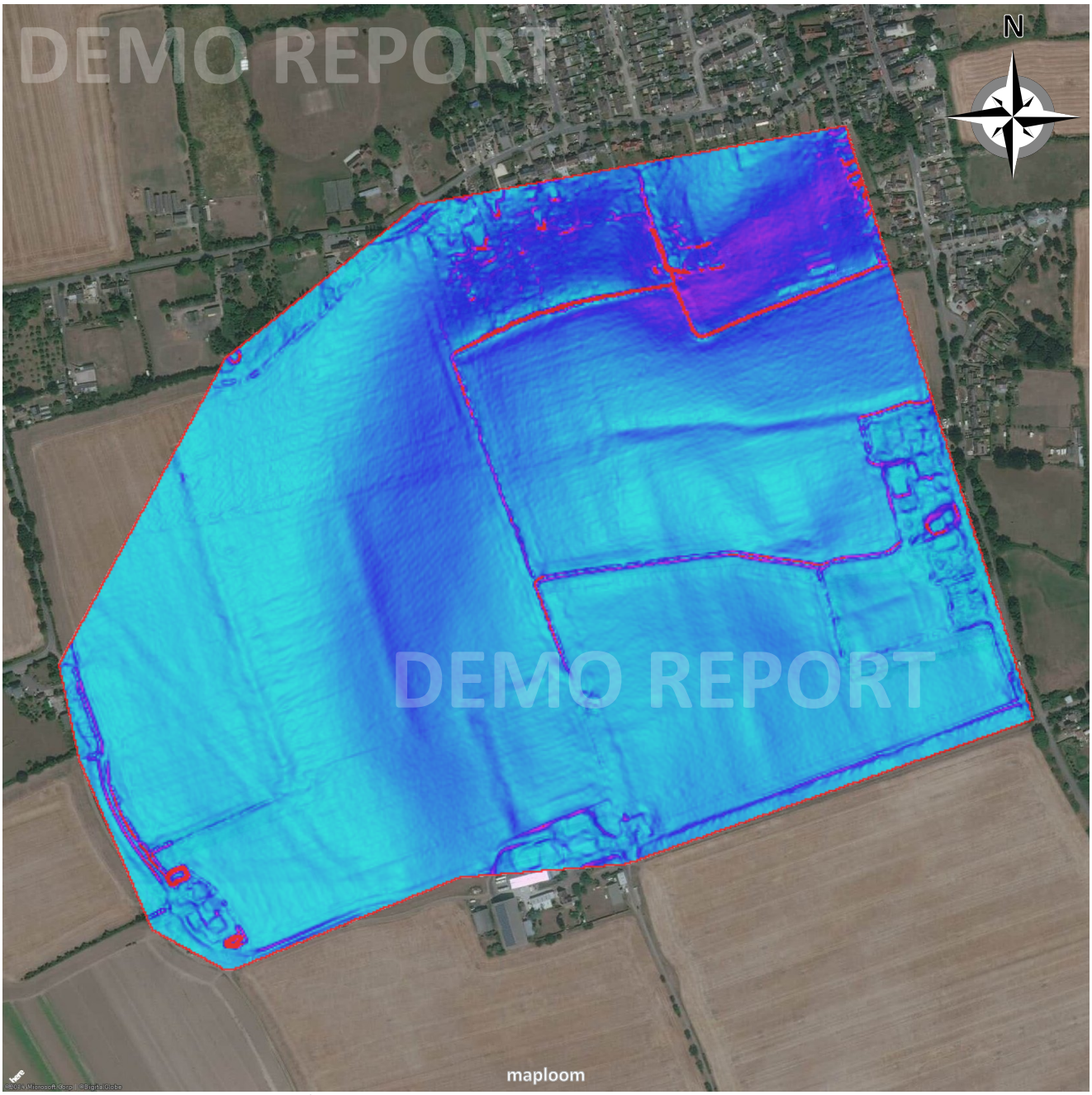
Suitable area: 44.7 ha

Area average aspect suitability score: 10.0/20

Slope map

Resolution: 2m
Data source: LiDAR Digital Terrain Model

0 m 500 m



Slope suitability for English and Welsh vineyards is between 1 – 15% (~0.5 – 8.5 degrees).

For advice on land with a flatter or steeper slope please contact the Vinescapes.

* Vineyard sites with such steep slopes can be dangerous and specialist equipment or terracing may be required.

Slope range: 0.0-32.3%

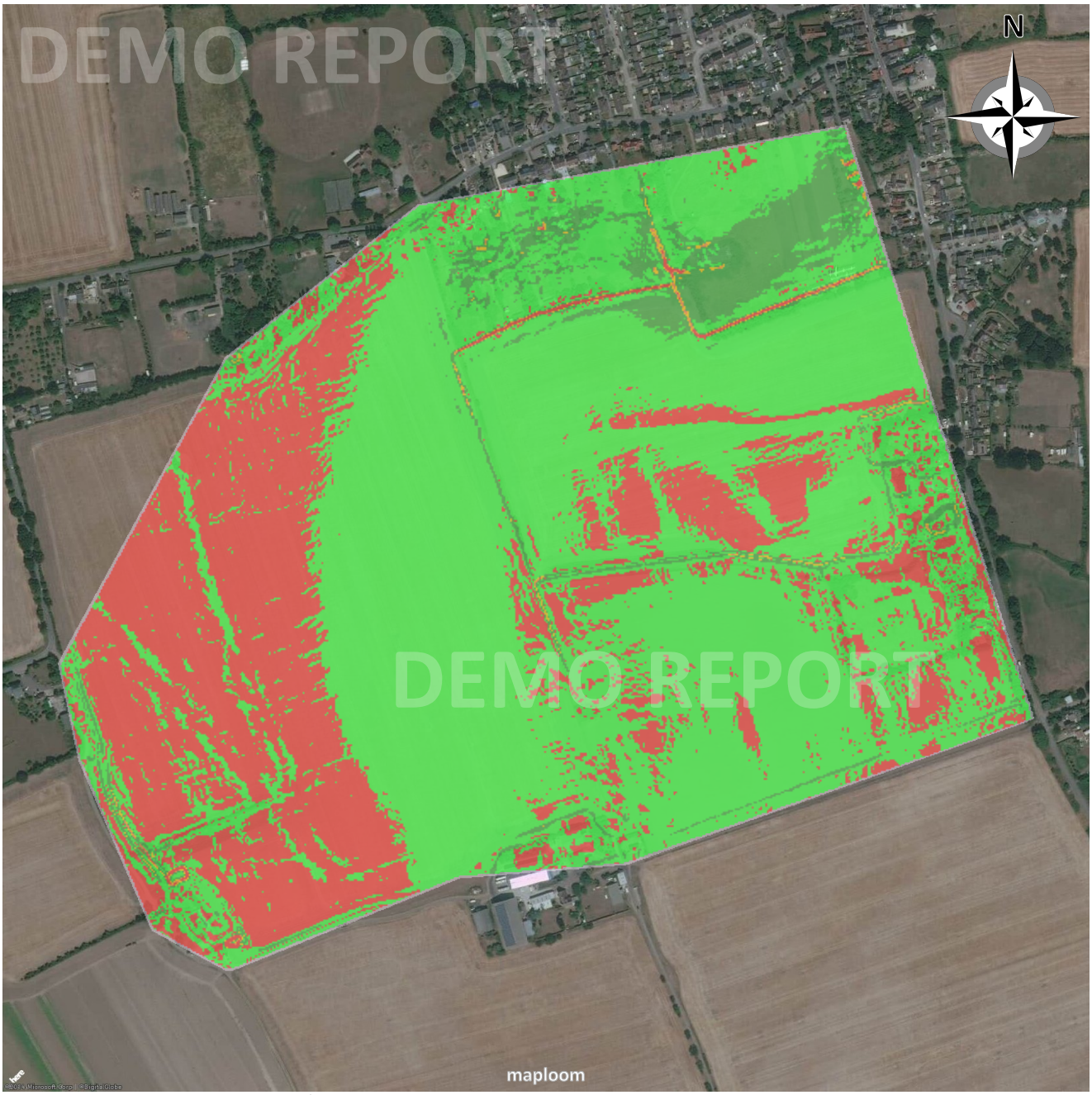
Slope (%)	Score	Area (ha)	Slope (percent rise)
< 1	0/20	20.7	
1-5	15/20	45.0	0.0%
5-10	20/20	4.1	5.0%
10-12.5	10/20	0.2	
12.5-15	5/20*	0.1	10.0%
> 15	0/20	0.2	

Suitable area: 49.5 ha

Area average slope suitability score: 10.8/20

Slope Suitability map

Resolution: 2m
Data source: LiDAR Digital Terrain Model



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Slope range: 0.0-32.3%

Slope (%)	Score	Area (ha)
< 1	0/20	20.7
1-5	15/20	45.0
5-10	20/20	4.1
10-12.5	10/20	0.2
12.5-15	5/20*	0.1
> 15	0/20	0.2

Suitability legend

0 Least
5
10
15
20 Most

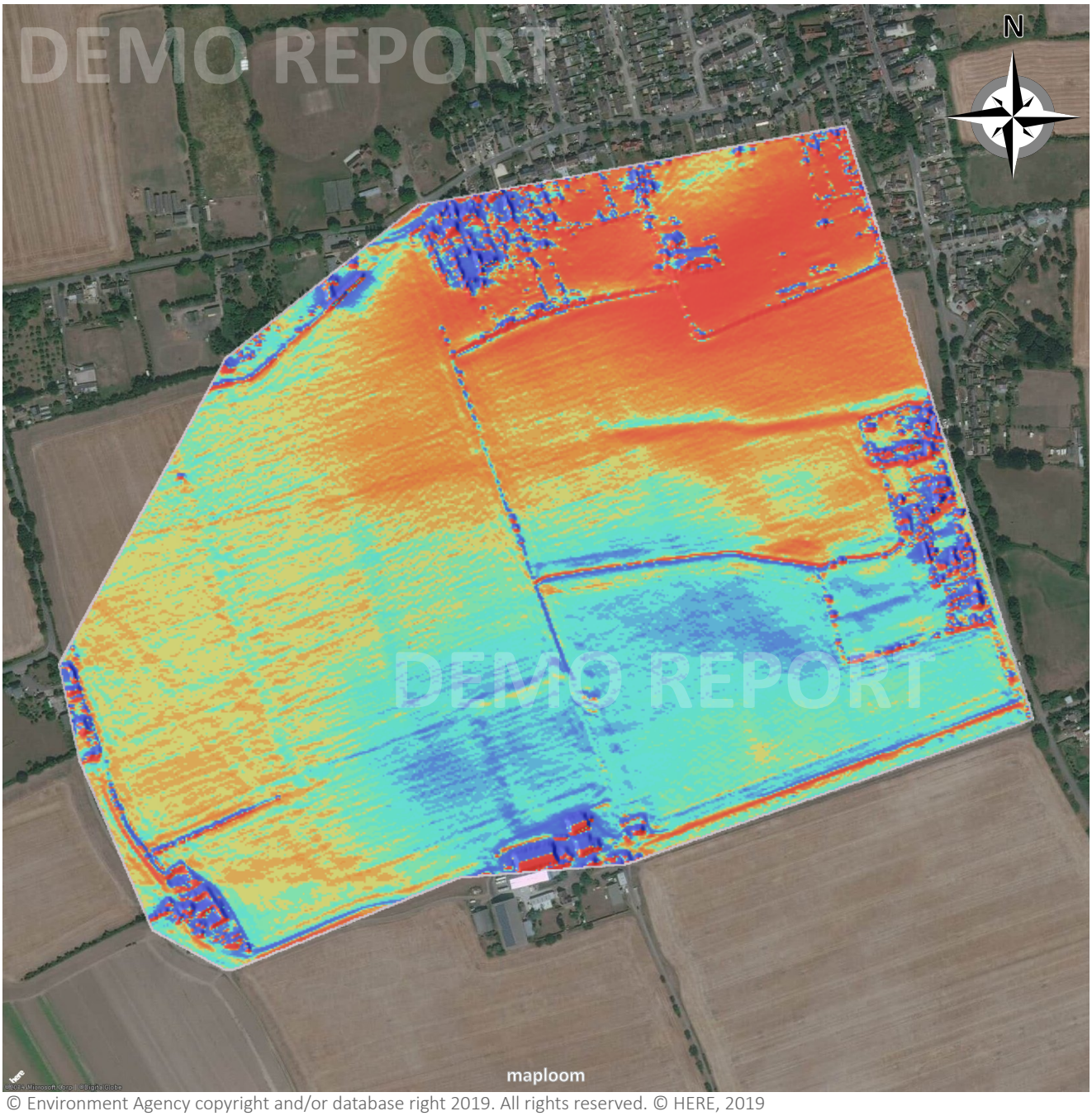
Suitable area: 49.5 ha

Area average slope suitability score: 10.8/20

Solar radiation

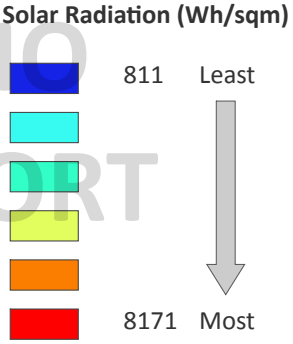
Resolution: 2m
Data source: LiDAR Digital Terrain Model

0 m 500 m



Solar radiation.

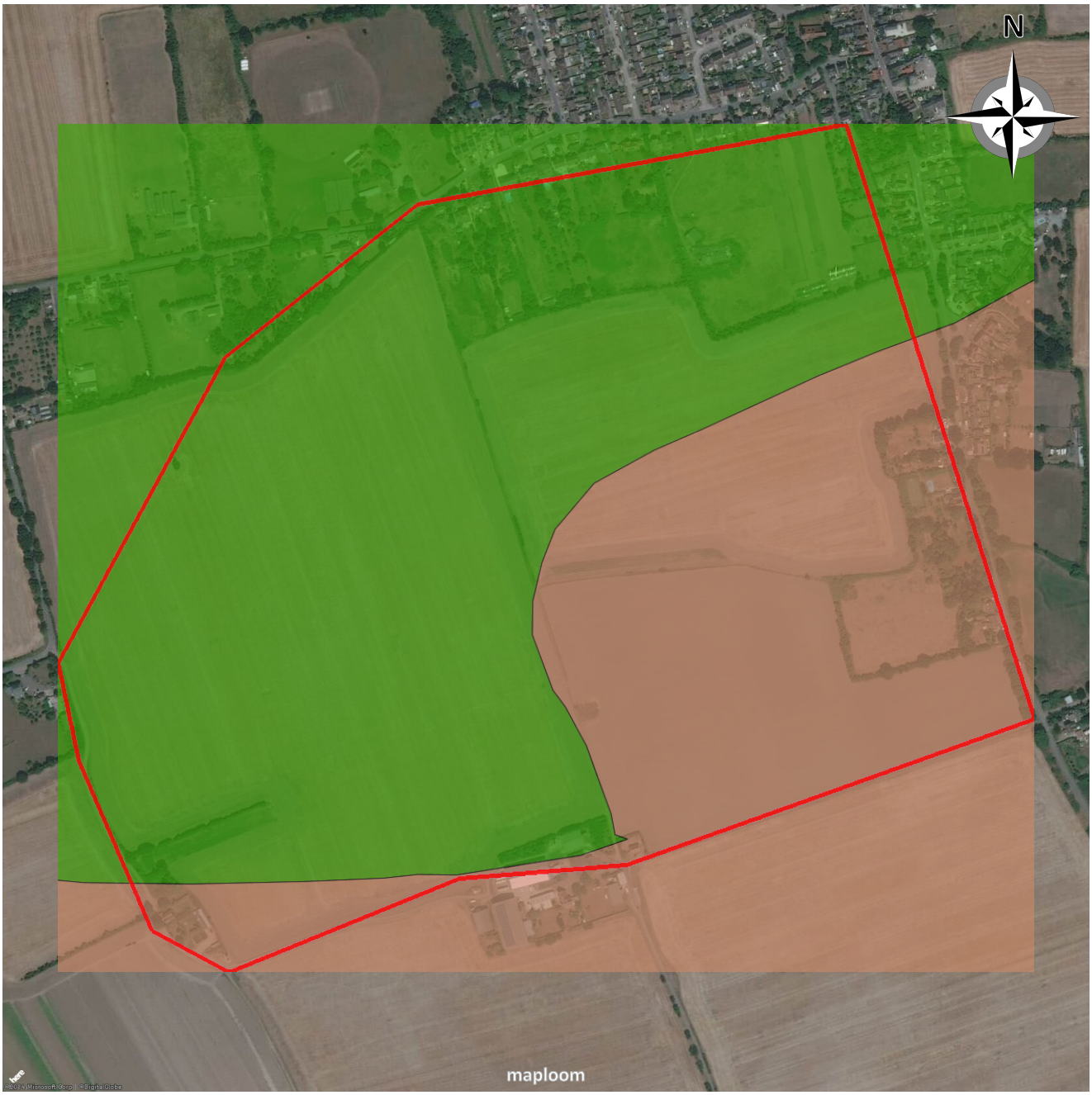
The measure of the potential solar radiation is calculated for the site based on an average of 3 specific days selected by our viticulture specialists (15 May, 15 July, 15 Sept). The calculation models the sun's track across the sky on these days and the potential solar radiation that would be received across the land surface. This varies based on the shading and scattering caused by surface features, particularly vegetation. The map shows variation of low (blue) to high (red) solar radiation values measured in (Wh/sqm). Areas which are potentially more in shade are shown in blue.



VineMAP soil type

Scale: 1:250,000
Data source: Cranfield Uni. LandIS, National Soil Map.

0 m 500 m



KEY

Freely draining slightly acid loamy soils
Coverage: 33 % - Suitable

Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils
Coverage: 67 % - Requires further analysis

VineMAP soil type

Soil: Soil texture, drainage, pH, fertility, nutrient and organic matter content are all important attributes in determining viticultural suitability. Their influences on vine nutrient and water availability, soil temperature and humidity, the solubility of metal ions and the supply of nutrient cations and anions, the number of beneficial microbes, and contributions to soil chemical, physical and biological properties all impact vine health, growth and productivity. Although a range of desirable soil characteristics exist for viticulture, for example it is generally accepted that soil pH should be between 5.5–8.0 for optimum vine growth and soil microbial composition, no one prescriptive 'ideal' set of soil properties exists. Rather a broad and generalised range is presented as being suitable under different environmental circumstances and for different rootstocks, clones, varieties, planting densities and training systems. It should also be noted that many soil characteristics, particularly nutrient availability, can be ameliorated via soil management activities to achieve desired traits.

Soil suitability for English and Welsh vineyards is considered to be one or more of the following soils, as described through the LandIS NATMAP SoilScapes (http://www.landis.org.uk/soilscapes/) product:

- Shallow lime-rich soils over chalk or limestone
- Freely draining acid loamy soils over rock
- Freely draining lime rich loamy soils
- Freely draining sandy Breckland soils
- Freely draining slightly acid but base rich soils
- Freely draining slightly acid loamy soils
- Freely draining slightly acid sandy soils
- Freely draining very acid sandy and loamy soils

Other soils that may be considered (on a case by case basis) are those classified as:

- Lime rich loamy and clayey soils with impeded drainage
- Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils
- Slowly permeable seasonally wet acid loamy and clayey soils
- Slightly acid loamy and clayey soils with impeded drainage

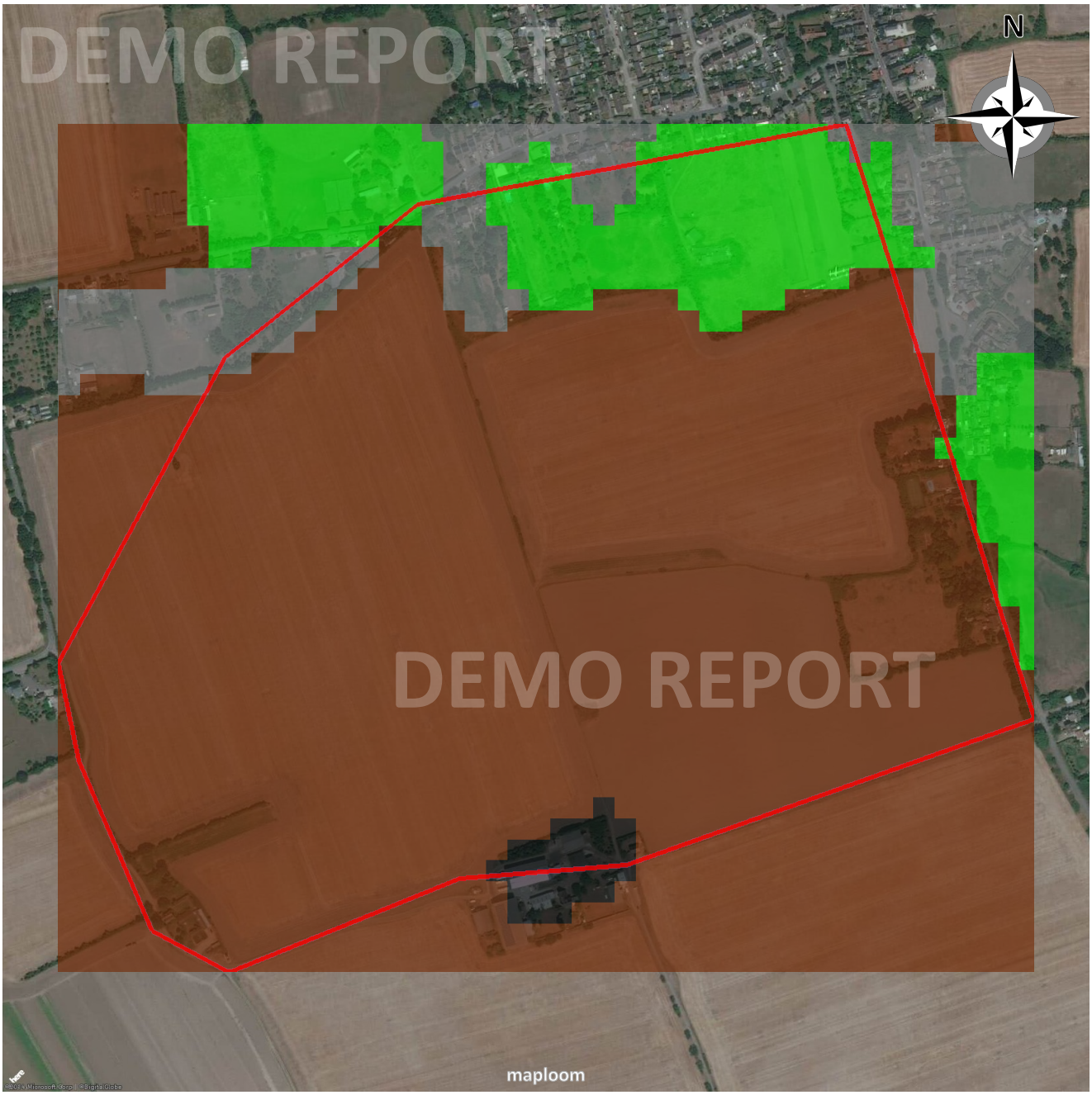
VineMAP uses the Cranfield university, LandIS, National soil Map of England and wales, datasource to provide an indicative measure of soil characteristics across land but please note that this dataset is not developed for micro field scale assessments and should therefore not be relied on as entirely representative of the soils in your selected area / field.

Soil characteristics can vary over a matter or meters and therefore all prospective vineyard sites require in-field soil sampling and assessment to determine site / field specific soil characteristics, amelioration requirements, rootstock, clonal and viticulture suitability. Please contact Vinescapes directly to discuss soil suitability further or/and to undertake this process.

Land Cover

Resolution: 25m
Data source: Centre for Ecology and Hydrology

0 m 500 m



Rowland, C.S.; Morton, R.D.; Carrasco, L.; McShane, G.; O'Neil, A.W.; Wood, C.M. (2017) Land Cover Map 2015 (25m raster, GB). NERC Environmental Information Data Centre. https://doi.org/10.5285/bb15e200-9349-403c-bda9-b430093807c7. © HERE, 2019

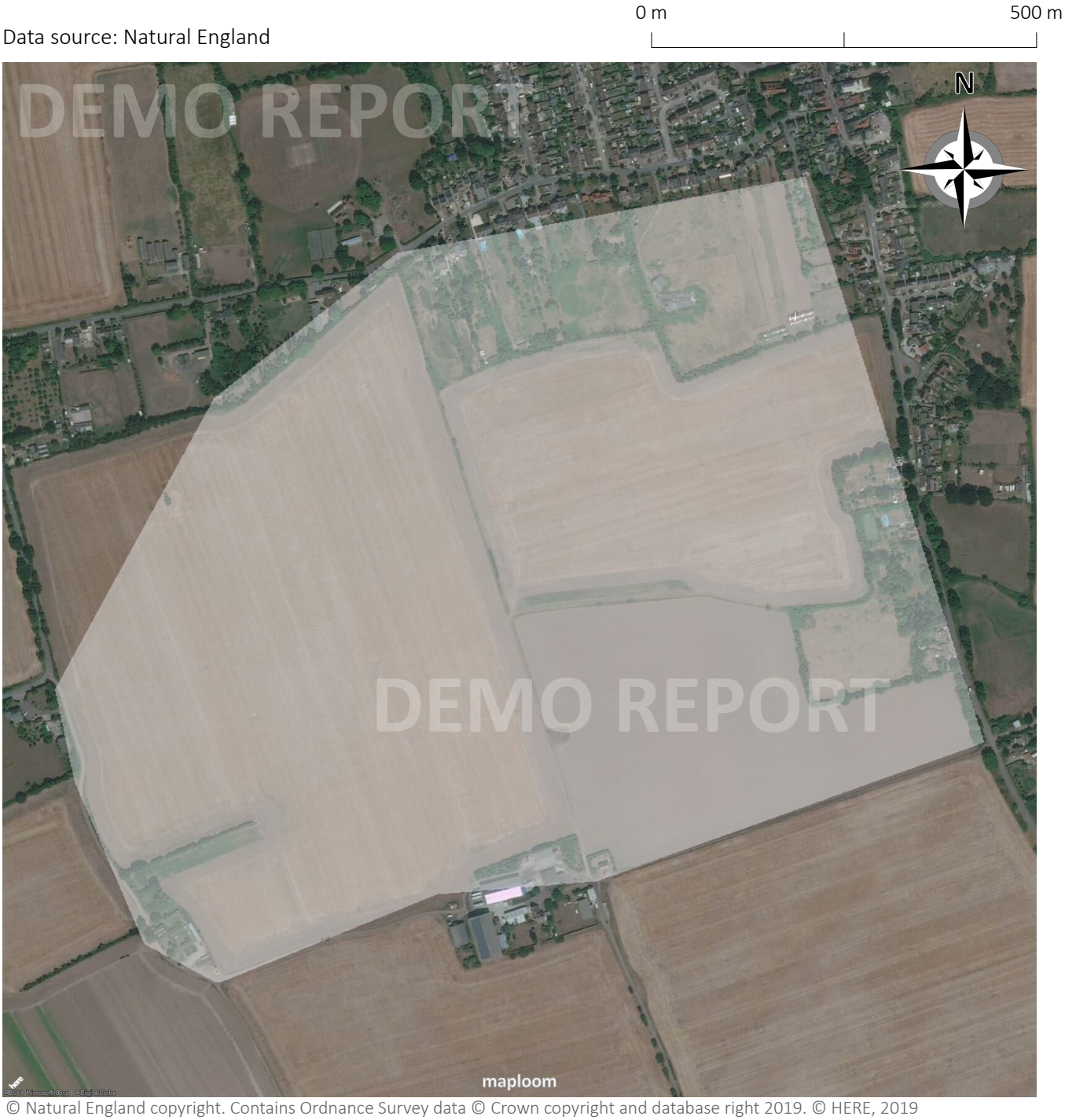
Landcover legend

Broadleaved woodland	Fen, Marsh and Swamp	Supra-littoral Rock
Coniferous Woodland	Heather	Supra-littoral Sediment
Arable and Horticulture *	Heather grassland	Littoral Rock
Improved Grassland *	Bog	Littoral sediment
Neutral Grassland *	Inland Rock	Saltmarsh
Calcareous Grassland *	Saltwater	UrbanSuburban
Acid grassland	Freshwater	Suburban

* Potentially suitable areas for viticulture are limited to those classified as arable, horticulture or grassland because they are deemed most likely to exhibit viticulture suitability parameters. Please note that the Land Cover data/classifications are from 2015 and may change with time and land use variations

Environmental designations

Data source: Natural England

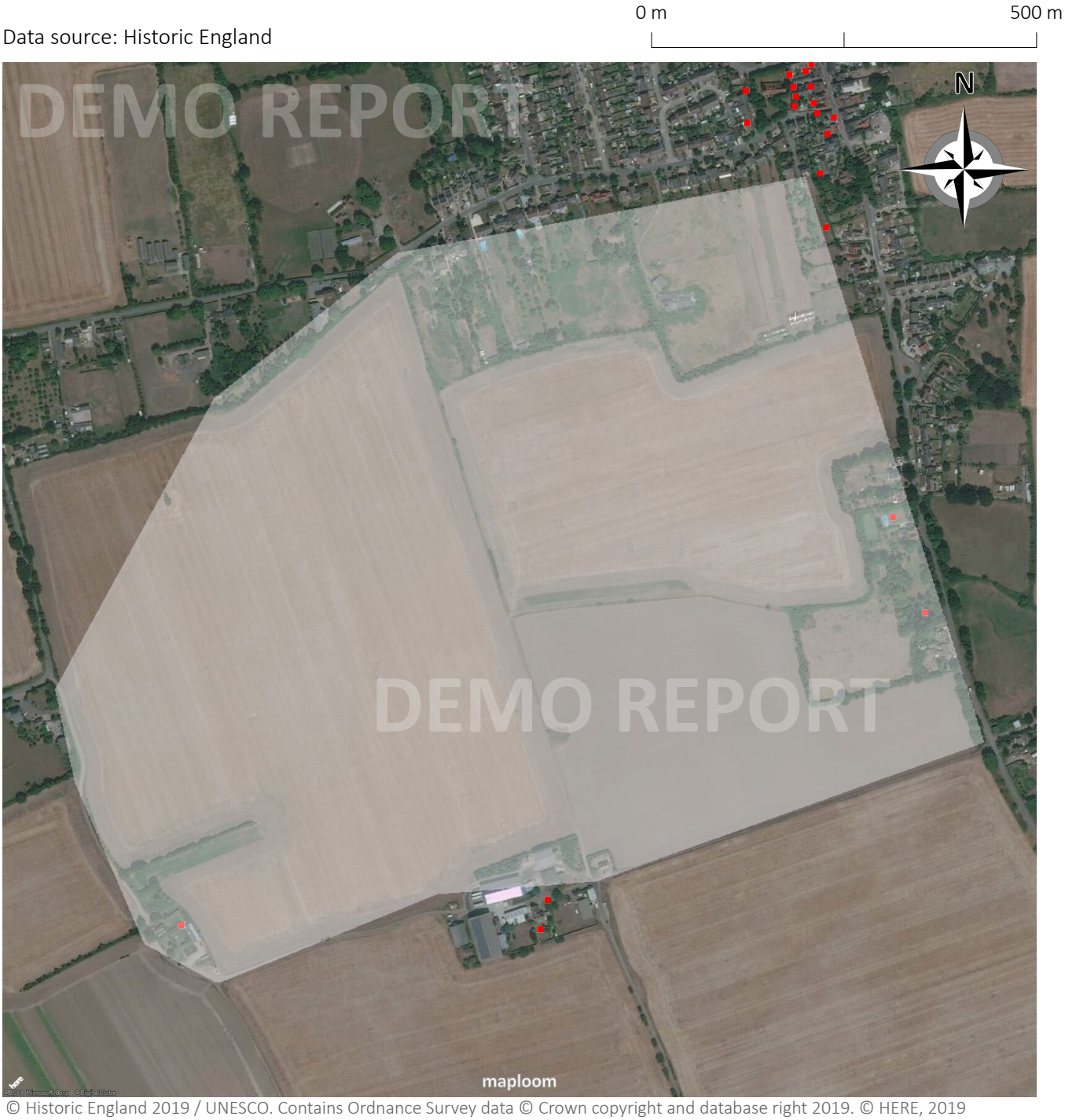


No environmental designations were detected within the site.

All land considered for viticulture and/or wine production related activities, whether or not areas are shown in this report as containing designated sites within or near the selected land, may have restrictions regarding viticulture and/or wine production related activities. Always seek advice regarding any restrictions or implications from the relevant authorities before deciding if the land is suitable for your desired purpose.

Historical / Heritage designations

Data source: Historic England



Designated sites	within	near by
Listed Buildings	3	20
World Heritage Sites	-	-
Parks and Garden	-	-
Battlefields	-	-
Scheduled Monuments	-	-
Building Preservation Notices	-	-
Certificates of Immunity	-	-

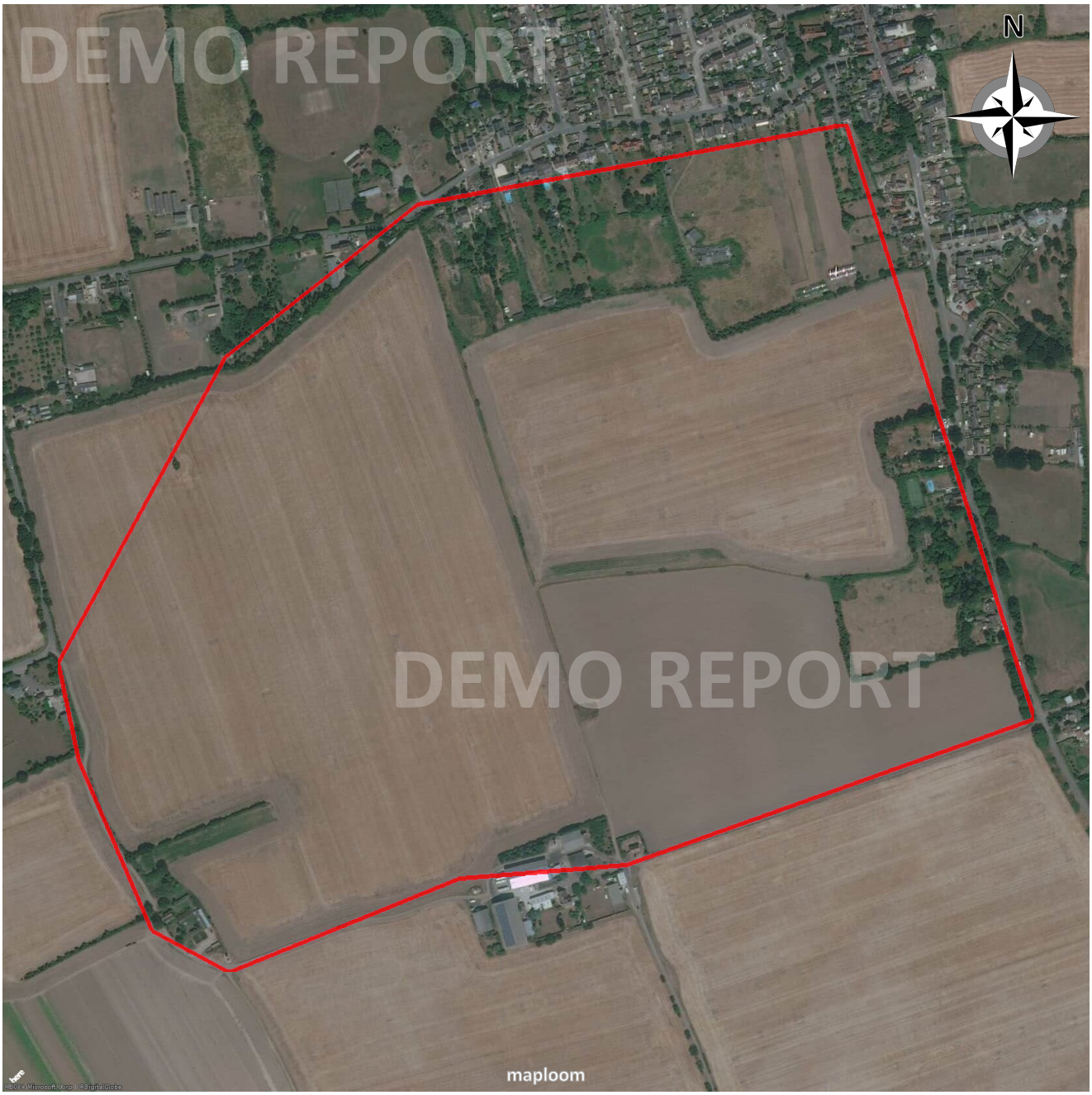
Where present, historical designations at the site are shown in the map above. This is based on Historic England open data maps for Listed Buildings, World Heritage Sites, Parks and Garden, Battlefields, Scheduled Monuments, Building Preservation Notices, Certificates of Immunity. Searches against these designations are shown in the table and provides both designations within the selected area and those nearby (within the wider map area).

All land considered for viticulture and/or wine production related activities, whether or not areas are shown in this report as containing designated sites within or near the selected land, may have restrictions regarding viticulture and/or wine production related activities. Always seek advice regarding any restrictions or implications from the relevant authorities before deciding if the land is suitable for your desired purpose.

Flood risk

Resolution:
Data source: Environment Agency

0 m 500 m



Flood Zone 3 is Environment Agency's best estimate of the areas of land at risk of flooding, when the presence of flood defences are ignored and covers land with a 1 in 100 (1%) or greater chance of flooding each year from Rivers; or with a 1 in 200 (0.5%) or greater chance of flooding each year from the Sea. Land within flood zone 3 includes land identified by Local planning authorities in their Strategic Flood Risk Assessments as areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.

Flood zones legend

flood zone 3

flood zone 2

Flood Zone 2. Land and property in flood zone 2 have a medium probability of flooding. This includes land with between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. Land falling within this zone requires a flood risk assessment as part of the planning process.

Flood Zone 1 defines areas which have a greater than 1 in 1,000 year flood risk. They are not shown on the map as effectively they are "everything else". A flood risk assessment may be required for developments in flood zone 1 and more than > 1 hectare; in an area with critical drainage problems as notified by the Environment Agency.

For further information visit: https://flood-map-for-planning.service.gov.uk/

Terms and Conditions

This report was produced under VineScapes VineMAP Terms and Conditions as accepted online by the customer prior to purchase. For further information regarding Terms and Conditions please contact info@vinescapes.com.

Mapping Overview

Mapping for this report was generated using the maploom platform. This is a cloud based geospatial analysis and modelling platform that uses open standards and open source analysis tools to deliver a wide range of location-based insights to non-specialist users. Further details can be found at www.maploom.com.

Mapping Datasets

The geospatial datasets used within the report are predominantly drawn from open source datasets. For each map, the data sources and relevant citations are provided.

Further details are summarised below:

Dataset	Map In report	Source	Credit / Disclaimer
Aerial Photography	Extensive use throughout the report	HERE	© HERE, 2019
LiDAR	Extensive use throughout the report	Environment Agency	© Environment Agency copyright and/or database right 2019. All rights reserved.
SSSI - Sites of Special Scientific Interest LNR - Local Nature Reserves NNR – National Nature Reserves SAC – Special Areas of Conservation SPA – Special Protection Areas	Environmental designations	Natural England	© Natural England copyright. Contains Ordnance Survey data © Crown copyright and database right 2019.
Registered Battlefields Registered Parks and Gardens Listed Buildings Scheduled Monuments Building Preservation Notices Certificates of Immunity	Historical Designations	Historic England	© Historic England 2019. Contains Ordnance Survey data © Crown copyright and database right 2019.
World Heritage Sites	Historical Designations	UNESCO	© Historic England 2019 / UNESCO. Contains Ordnance Survey data © Crown copyright and database right 2019.
OpenMap Local	Site Overview: Access	Ordnance Survey	Contains OS data © Crown copyright and database right 2019.
Flood zones 2 and 3	Flood Risk	Environment Agency	© Environment Agency copyright and/or database right 2019. All rights reserved.
LandIS, National Soil Map	Soil type	Cranfield Uni. LandIS	Soils Data © Cranfield University (NSRI) and for the Controller of HMSO 2019
CEH Land Cover Map 2015	Land Cover	Centre for Ecology and Hydrology	Rowland, C.S.; Morton, R.D.; Carrasco, L.; McShane, G.; O'Neil, A.W.; Wood, C.M. (2017) Land Cover Map 2015 (25m raster, GB). NERC Environmental Information Data Centre. https://doi.org/10.5285/bb15e200-9349-403c-bda9-b430093807c7

Vinescapes provide wine production services, knowledge and innovation to the English viticulture sector. Vinescapes work with prospective, new and established wine producers to achieve outstanding wine quality and successful business ventures. We can take your vineyard idea from conception to delivery starting from business planning & site selection through to the successful establishment of a vineyard & winery.

Our staff and partners are trusted experts with international acclaim and years of experience delivering the highest quality grape growing and winemaking. We combine to bring our knowledge, expertise and passion to wine businesses across the UK. We provide vineyard assessments (land & climate), vineyard project management & consultancy, winery design & construction, business planning and innovative research & training services.

Aware of the opportunities and risks in English wine production we bring a considered but enthusiastic approach to our work and provide a friendly, high-quality service.

Please contact us at info@vinescapes.com for more information or call us on 07967602670.