THE ROUTES AND ROADS OF THE GOUGH MAP OF GREAT BRITAIN: GIS DATABASE

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General Guide

Introduction

This Geographic Information Systems (GIS) database captures a model of medieval routeways and features depicted on the Gough Map of Great Britain of *c*. 1400 (MS Gough Gen. Top 16[1]), namely the 'red lines' drawn between a number of settlement icons across England and Wales (Fig. 1).[2] We present an argument that these red lines correlate closely to medieval overland routes, which they therefore likely depict. This observation provides for important insights into the composition and development of the English and Welsh route network at a specific moment in time.

The Gough Map itself, so named after Richard Gough who bequeathed it to the Bodleian Library, Oxford, in 1809, is one of the oldest surviving maps of Great Britain. The cartographer (or cartographers) are unknown, though it may be possible to at least retrieve elements of their interests and authorship through a close reading of the map (see Delano-Smith *et al*. 2017 for an extensive analysis of the map as an artefact and for bibliography; also Weigelt, forthcoming, for analysis from authorship reconstruction perspective). The map is 115 cm x 56 cm in size on vellum, and depicts the coastline of the island of Great Britain, several smaller islands and parts

[1] See also the interactive and annotated high-resolution scan by the *Linguistic Geographies* project at http://www.goughmap.org/ [accessed July 2024].
[2] This general guide contains images and texts also published in Oksanen & Brookes (forthcoming). See the article for a further discussion of the Gough Map and of this database.

of the coastlines of Ireland and the Continent. Rivers are shown, and over 600 cities, towns and smaller settlements are represented by churches, fortifications or simple houses. Conventionally dated to *c*. 1360–70, it has been suggested on palaeographical grounds that the map was made one or two decades after 1400 (Smallwood 2010). There is evidence that portions of the map were redone and that work on it probably continued into the fifteenth century (Delano-Smith *et al*. 2017; Solopova 2012). The Gough Map is a unique and important survival, predating the next major cartographic work representing (as this database will demonstrate) overland routes by some two to three hundred years.

Figure 1. The Gough Map of Great Britain with the 'red lines' highlighted in yellow. Image and data by Linguistic Geographies, goughmap.org.

New GIS analysis and methodologies have enabled a complete reassessment of the evidence on travel and communications routes that the map presents. This database maps the red lines and the settlements they connect, and matches them with routeways reconstructed from documentary, archaeological and place-name evidence.

In the Gough Map *c*. 190 lines drawn in red connect together *c.* 180 settlement icons in England and Wales, or almost a third all the settlement icons depicted (Fig. 2). A few of the lines and settlements are so badly faded that their existence is not absolutely certain (see below). Nine-tenths of the lines are accompanied by a Roman numeral — accepted as a distance value — and in aggregate these have traditionally been seen as representing a sample of the English and Welsh overland route network (e.g., Hindle 2008, 31–35; Stenton 1936). Others have suggested the red lines indicate only a sense of connectedness between settlements (Delano-Smith *et al* 2017, 15–18; see also Delano-Smith 2006; Millea 2007; 2008), but as we will discuss it is possible to match them with evidence of historical travel.

It is important to note, however, that this "network" is neither fully interconnected nor complete, not even if only major thoroughfares would be considered. It represents only a sample of the total, chosen by its creator for reasons that are difficult to conclusively pin down. But as the database demonstrates, this is an important sample with wide spatial coverage. Joined with data on medieval bridges (Brookes *et al*. 2019) and navigated inland rivers (Oksanen 2017; 2019) archived in the Early Medieval Atlas,[3] as well as coastal routes, the combined transport network connects the vast majority of major urban and commercial sites in England and Wales. As such these resources form the basis and a key reference for reconstruction and evaluating the scope and character of the medieval travel system in these countries (for more detailed discussion, see Oksanen & Brookes, forthcoming).

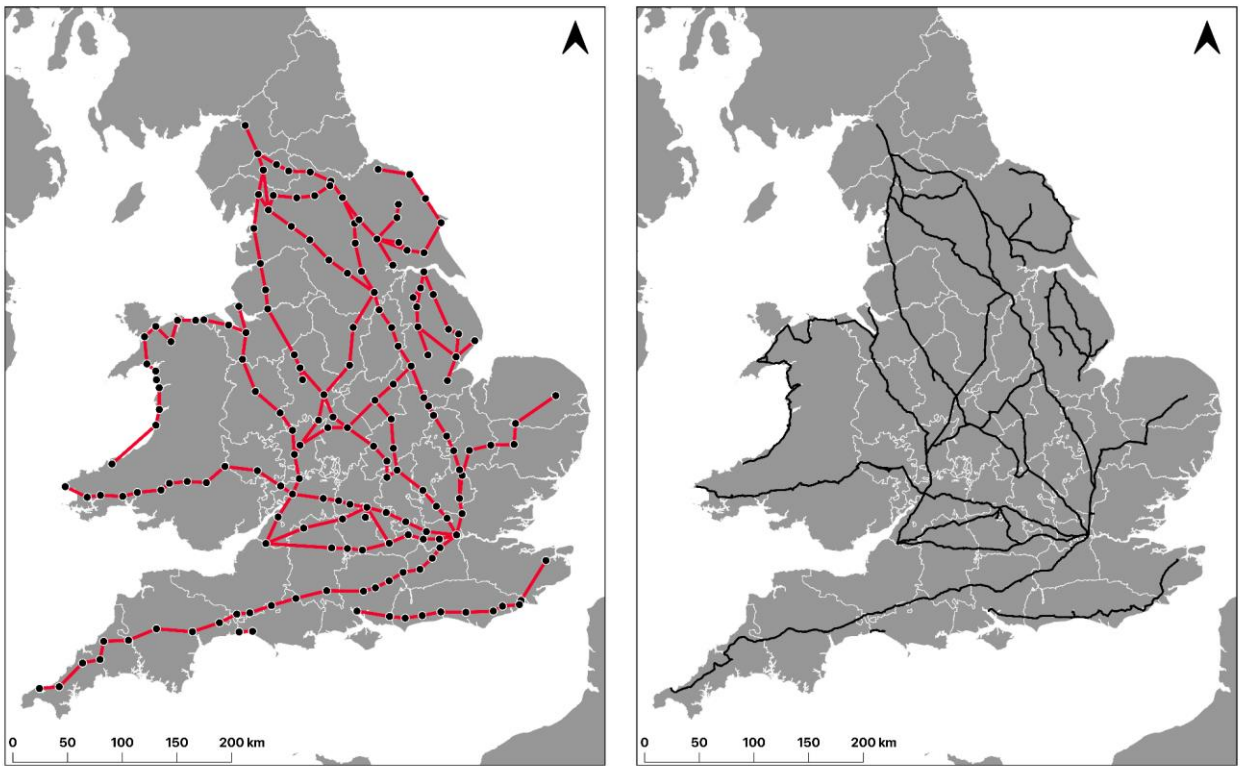

Figure 2. A schematic representation of the 'red lines' connecting settlement icons (left), and a reconstruction of the corresponding historical routeway network (right), representing the contents of this database. The basemap is a reconstruction of the medieval English shires from the Domesday Book also published by Early Medieval Atlas projects.

Methodology

Medieval England was no different from contemporary western Europe in having a road network created through several millennia of movement. Prehistoric routeways, Roman roads, and early medieval 'army-paths' (referred to as *herepæð*, *herestræt* or *hereweg* in Old English texts: Grundy 1918, 70–72; Baker & Brookes 2013, 140–152) all contributed to the formation

[3] Early Medieval Atlas: https://doi.org/10.5284/1055092

of a dense palimpsest of communications. Recent work, as part of the Leverhulme Trust funded project *Travel & Communication in Anglo-Saxon England* (RPG-2014-074; Brookes *et al*., forthcoming) has gone some way towards better understanding the development of this route network. By drawing together historical, archaeological, landscape, linguistic and literary sources it has been possible to define a model of the medieval travel infrastructure, including the chronological horizons at which individual routes are attested.

The main map source for constructing the GIS dataset was the Linguistic Geographies annotated online Gough Map (LGGM).[4] Since the Gough Map is damaged, both from historical damage and especially from fading for having been exposed to sunlight during the twentieth century, not all settlement descriptions are fully legible to visual inspection. Consequently, two earlier editions of the map, the first a copy and the second a facsimile created by the Ordnance Survey (OS), were also referenced (Parson 1958; Ordnance Survey 1870; 1875).

As this database shows, clear matches can be made between nearly all depicted red lines and other evidence for early routeways. There is also at least one clear instance of a water route where the red line clearly bends to trace the shape of the River Witham from Boston to Lincoln (Fig. 3).

Figure 3. A detail of the Gough Map depicting River Witham and the adjoining red line connecting Lincoln (bottom) with Boston (top), as well as several other red lines with their distance values. Image: Linguistic Geographies, goughmap.org

The digitisation process began with the identification of the red lines on the map and the settlements they connected. LGGM contains a highly useful annotated catalogue of both, although it is not without some minor errors, e.g., it overlooks the line connecting Oxford and Abingdon. All connected settlements were mapped into a GIS point dataset saved as a shapefile layer. The choice of the precise point coordinate location is to a certain extent arbitrary, as the points represent spatial settlement areas; to enhance interoperability the coordinates largely match those used in the 1334 Lay Subsidies dataset by Barry *et al.* (unpublished; see Campbell & Bartley 2006) and the 'Digital Gough' resource produced by the *Mapping the Realm* project (Lilley *et al*. 2009; Lloyd and Lilley 2009). In those areas not covered by the subsidy assessment

[4] Linguistic Geographies: https://www.manuscriptsonline.org/resources/gm/ [accessed July 2024].

coordinates derived from the 1291–2 Taxatio database were used.[5] The schematic network of red lines was then replicated by joining the points with vector lines, saved as another shapefile layer.

It should here be noted that owing to the damaged condition of the map there is some uncertainty of the south-westernmost extent of the red line network, beyond Okehampton. Following the interpretation of LGGM, based on the earlier editions and conventional practice (Delano-Smith *et al*. 2017), the network has been extended to St Ives. The final link between Redruth and St Ives is particularly unclear. Nevertheless, it is clear that a historical road must have reached St Ives, and the main route most likely passed through Redruth as the only settlement with a market and fair charter (since 1333 CE, see Letters 2003) in that part of Cornwall.

The major interpretative work was in identifying the historical routes and roads that the red lines may have corresponded to. Here this database draws from several published and unpublished polyline databases on historical road networks. The principal ones are: Cole 2013 and its digitisation by the *Travel & Communication in Anglo-Saxon England* (TCASE) project; Ancient World Mapping Centre (AWMC) Roman road dataset,[6] considerably enhanced with reference to Margary 1973 and other sources (e.g. Roman Roads Research Association[7]); and the Cary Road Map of England & Wales 1825 (Rosevear 2023)[8] which represents the Early Modern turnpike network dated 1667–1827.

First, medieval routeways identified from archaeological, documentary primary source or place-name evidence that matched with the Gough Map red lines were extracted from the TCASE database, and the historical course of River Witham was extracted from the GIS database *Inland Navigation in England and Wales before 1348* (Oksanen 2017; 2019). Second, empty sections were populated with derived Roman road data. Third, the remaining gaps were filled by the Cary Road Map (Rosevear 2023). A coverage of *c*. 99 per cent for the red line network was thereby achieved in the first draft.

Following this, each line length in this draft was examined against early and central medieval historical GIS data produced by the *Travel & Communications in Anglo-Saxon England* project and its various collaborators in order to verify and ground-truth physical roads. Principal sources included historical bridges from the *Bridges of Medieval England to* c*. 1250* also by *Early Medieval Atlas* (Brookes *et al*. 2019), Anglo-Saxon charter boundary clauses mentioning roads and, most significantly, the considerable work done on identifying place-names related to routeways (Cole 2013, revised and expanded by Eleanor Rye as part of the TCASE project). To these can be added routes referred to in medieval sources, including the Four Highways': four

[5] Taxatio: https://www.dhi.ac.uk/taxatio/ [accessed July 2024].
[6] AWMC: https://awmc.unc.edu/ [accessed July 2024].
[7] https://www.romanroads.org/empireresources.html [accessed July 2024].
[8] cf.: https://www.campop.geog.cam.ac.uk/research/occupations/datasets/catalogues/documentation/turnpikeroads16671892.pdf [accessed July 2024].

long-distance routes that were afforded special royal protection in law codes of the twelfth century (Cooper 2000; O'Brien 1999, 44–48); various Salt- and Drove-ways (cf. e.g. Hooke 1981; 1985); and the routes described in the twelfth-century *Itinerarium Cambriae* of Gerald of Wales (Bartlett 2006; see below). Comparison was also made with medieval commercial site and settlement dataset in *Gazetteer of Markets and Fairs in England and Wales to 1516* and the 1334 Lay Subsidy data (Letters 2003; Barry *et al*. unpublished).

Whenever close dating was possible, archaeological evidence was included, acknowledging that the ephemeral character of early medieval roads makes identification very difficult. More emphatic physical evidence is provided by causeways of earth or timber, wooden bridges, wharfs and piers, particularly in the waterlogged contexts of rivers and inter-tidal zones. In this regard, we are grateful to Historic England and Museum of London Archaeology (MoLA) who provided datasets of archaeological evidence for early medieval routeways that have been incorporated into the baseline data.

The attribute table was populated with evidence and information relating to the medieval route or road: e.g., presence of a place-name related to travel, its pre- or post-Domesday Book (1086 CE) attestation date, or comments on known historical settlements or travel infrastructure. This data provides a new vital dimension in understanding the character and presence of routeways at the local level.

Type No.	Type Period	N of segments	Length in meters	Percentage	Source
1	Roman routes	172	1,611,696	35.5%	AWMC data.
2	Early medieval (pre-1086)	60	593,325	13.1%	TCASE or Cary data verified by place-name, charter, bridge and archaeological evidence.
3	Post-Domesday Book (1086)	40	308,267	6.8%	TCASE or Cary data verified by place-name, charter, bridge and archaeological evidence.
4	Other medieval evidence	47	426,469	9.4%	Known historic routes (e.g., salt routes), undated medieval archaeological evidence, settlement data, Gerald of Wales itinerary.
5	Early Modern	124	1,474,905	32.5%	Cary data, Ogilby Atlas of 1675.
6	River Witham	1	61,508	1.4%	Inland Navigation data.
0	No historical evidence	11	65,842	1.4%	OS modern roads data.
TOTAL	—	455	4,542,012	—	—

Table 1. A chronological breakdown of the reconstructed Gough Map routeways sheds light into the long-term evolution of the overland travel and communications systems.

As a rule of thumb, the division of the route polylines into shorter individual segments was done at major road intersections or near way stations. Therefore, for example, a historical place-name such as *strǣt* ('street') would demarcate a road segment as medieval only between two intersections. For longer cross-country sections a segment could be up to a few dozen kilometres long, whereas near towns and transport nexuses that were surrounded by a complex cluster of routes a road segment might be only a few hundred metres in length. As part of this workflow, the chronological period of the earliest known evidence for the existence of a road or route feature along the line segment was encoded as a *period* attribute. The dataset can thereby be divided into several parts, as represented in Table 1.

It is important to understand that we do not propose that every specific MultiStringLine line in this GIS database must follow the exact path of a physical historical road. These are not frequently possible to reconstruct with such exactitude. There are, moreover, examples where the historical roadline may have shifted along the centuries. The most famous example may be the Icknield Way, an escarpment 'route' running roughly along a north-east to south-west diagonal from Norfolk to Berkshire and beyond to Wiltshire, which has been used since prehistoric times as a broad corridor of linear communications, comprising a bundle of parallel routeways (Dyer 1989, 345; Fowler 1998, 30; Harrison 2003, 1) in which, for example, a number of Roman-era routes (e.g., Margary 1973, routes nos. 168a, 168b, 333) formed threads in the skein.

We have used the best available evidence to trace the specific pathways as closely as is reasonable. But we are also making a distinction between a physical road line and a historical route. This latter can be conceptualized as a more generalised passage through a landscape that was subject to evolution across centuries, but which nevertheless provides critical information on the infrastructure, its relationship with demographic patterns, and the local experience of travel. More carefully approached, as a whole we present a database of routes rather than of roads; although there will be many instances where the spatial precision is that of actual roadlines, especially where the medieval track survived to the Early Modern period and is thereafter preserved in the modern road network.

As a final note, since the focus of this database is grounding physical route and road segments we have not leaned on medieval itineraries, despite the fact that especially royal itineraries provide a considerable amount of information on cross-country travel at a national scale (see e.g., Crockford 2011a; 2011b; Hindle 2008; and Linda Godden's online edition at the *The Gough Map*). Itineraries, by and larger, describe movement as occurring in hops between settlements or manors; they do not elucidate on the specific road or route being taken. The only major itinerary we have used is that of Gerald of Wales through Wales in 1191 CE, which was specially referenced owing to the lack of research into Welsh travel place-name and documentary records equivalent to that in England. A number of the Welsh routes in the Gough Map do,

however, match routes depicted in the Ogilby route atlas of 1675 (Ogilby 1675; Ordnance Survey 1930), which predates the construction of the Early Modern turnpike network and lends supporting evidence to the existence of these roads in the earlier period.

Data

The GIS dataset contains the following shapefile layers:

Layer name	Description
gough_way_stations	Point representation of settlement icons connected to a red line.
gough_red_lines	Schematic MultiLineString representation of the red lines marked on the Gough Map.
gough_routes	Ground-truthed MultiLineString representation of the historical routeways or roads that match the red lines.

gough_way_stations

The layer *gough_way_stations* contains observations on 179 settlements identified by an icon connected to a red line on the Gough Map as a Point feature, here termed as 'way stations'.

Not all settlement names were written down by the map's anonymous author or authors, and others have since become illegible. Identifications have been proposed for all way stations, however, by successive editors of the map (see in particular the Parson and the *Linguistic Geographies* project editions) and uncertainty is indicated in the 'legibility' attribute field.

Key to attribute table

id	Unique identifier for way stations
settlement	Modern name of the settlement.
county	Historic county in which the settlement is located. The Welsh historic counties of Denbighshire, Radnorshire and Brecknockshire were not formed from Marcher Lordships until the Laws in Wales Act of 1535 but are included for reference purposes.
legibility	0 = absent or illegible settlement name 1 = legible settlement name

gough_red_lines

The layer *gough_red_lines* contains observations on 188 connecting lines, as marked with red ink on the map between different settlements, as a MultiLineString feature. Again, some lines are badly faded and the database follows the conventions established in the scholarship for identifying them.

Most routes are accompanied by Roman numerals written in red ink. These probably marked the distance between the different settlements in 'computed miles', or rough popular estimates of the distance; the unit of measurement is unclear, but may be the old French mile equivalent to approximately 2 km (Stenton 1936; Millea 2007).

Key to attribute table

id	Unique identifier for red lines
value	The Roman numeral in red ink along most routes, indicating the distance of the route in 'computed miles'. This field is left empty where the mileage is either absent, faded or legible. In the latter cases this is noted in the 'notes' field.
notes	Supplementary notes. The mileage numeral has sometimes faded to illegibility and it is difficult to be certain what it was; in such cases this is noted as faded or illegible. 'LGGM' refers to the Linguistic Geographies annotated online Gough Map.

gough_routes

The layer *gough_routes* contains observations on 455 routeway lines as a MultiLineString feature. These lines match the red lines on the map to historical routes and roads, as identified from place-name, archaeological, documentary and historical cartographic evidence.

Key to attribute table

id	Unique identifier for route segments
period	Period type: 1 = Roman evidence 2 = Early medieval evidence, to the Domesday Book of 1086 CE. Based on place-names, charter boundaries or bridges. 3 = Post-Domesday Book evidence based on place-names, charter boundaries or bridges. 4 = Other medieval period evidence. 5 = Early Modern evidence to John Cary's 'New Map of England and Wales and Part of Scotland' of 1820–28. 6 = Historical course of River Witham, as identified in Oksanen 2019. 0 = No historical routeway evidence. Modern roadlines by Ordnance Survey used.
category	Source for the MultiLineString. See the methodology section in the General Guide.
margary_no	Ivan Margary Roman road number (Margary 1973).
place_name	Whether the route segment corresponds to a pre-or post Domesday Book (DB) of 1086 CE travel place-name. Place-names with the *here* ('army-path', as in *herepæð*, *herestræt* or *hereweg*) and *straet* ('street', indicating a former Roman road) place-name elements have been specially noted. See Cole (2013), Baker and Brookes (2013, 137–178), and Rye (2019) for more information on place-names.
comments	Further supplementary comments and evidence, including reference to Museum of London Archaeology (MoLA) baseline data.
length_m	MultiLineString segment length in metres.

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