Wakefield Historic Landscape Characterisation Project Final Report

January 2017

Parts 1 & 2. Introduction and Methodology

West Yorkshire Joint Services

West Yorkshire Archaeology Advisory Service

Historic England

Part 1: Introduction

1.1 Background to Characterisation and Explanation of HLC Types

1.1.1 Background to Characterisation

Historic England (formerly English Heritage) has been funding a nationwide programme of Historic Landscape Characterisation (HLC) since 1992. These studies have been run alongside a programme of Extensive Urban Surveys (EUS) looking at urban locations in part of England (but not West Yorkshire).

Characterisation aims to record the modern landscape and show how aspects of the past still exist around us. One of the guiding principles of this process is the need to work on all parts of the landscape not just those areas considered to be 'special'. This is a move away from understanding and protecting specific sites or buildings, to considering the wider historic environment.

Our surroundings are dynamically changing; these changes are part of a long history of human influence on the landscape. In order to manage these changes it is important to have a good understanding of the evolution of the landscape that surrounds us. Characterisation is not about trying to prevent change but about ensuring that decisions are made on an informed basis, ensuring that areas retain their local distinctiveness. It can be used alongside other systems of heritage management, such as Listing and Scheduling of sites and buildings. It gives a background to such sites and buildings, drawing them into a wider landscape perspective.

In 2001 the government acknowledged the value of characterisation for the management of change in the historic environment in its policy statement, *The Historic Environment: a Force for our Future* (DCMS/DTLR 2001).

There have been several HLC projects carried out that have looked at both the rural and urban landscapes of a region. This combined approach which has been adapted for West Yorkshire, removes the artificial divide between rural and urban landscapes. An advantage of this approach is that it allows rural industrial and agricultural activities to be assessed alongside the development of the towns where the industrial work force lived.

In recent years, HLC projects have been carried out using GIS and database technology. This allows larger amounts of information to be recorded, and enables the data to be easily interrogated throughout the project and on its completion.

The West Yorkshire HLC Project methodology is largely based on the methods used in South Yorkshire. There are significant similarities in the landscapes and industrial activities within these two regions that justify this approach.

The South Yorkshire methodology was initially based upon the accepted best practice defined by the 2001-2 national HLC Method Review (Aldred & Fairclough 2003), and also through consideration of other HLC and EUS projects. One of the advantages in maintaining consistency in recording methodology between South and West Yorkshire is that it allows researchers and developers to carry out research across more than one administrative area. This is particularly important for the textile industry, which is very significant in West Yorkshire and in the north of the South Yorkshire area.

Principal Aims

The project was undertaken according to the following principles:

- Largely desk-based recording methodology.
- Record 'character', i.e. what it looks like, not what it is used for.
- Study ALL of the landscape not just 'special areas'.
- Value neutral – all aspects of the landscape are given equal weight.
- Present, not past - records the current landscape, but with reference to past processes by which it came to look as it does today.
- "Broad-brush" approach to historic characterisation of the urban and rural environment.
- The landscape is categorised into 'broad' character types, which are subdivided into 'narrow' HLC types. Attributes are recorded for each *broad type*.
- Outputs include a GIS map, linked with a database that contains additional information.
- Records the *legibility* of earlier landscape types; the amount by which earlier landscapes are visible in the present landscape.
- Record levels of *certainty* that the categorisation is correct.

Broad Character Type Definitions

The whole area of West Yorkshire was "polygonised", without overlaps or gaps, making use of MapInfo v.11 software during the period of April 2011 to December 2015. The data for the location and size for each polygon was then transferred to a bespoke SQL database which

created a unique record for that particular area. With reference to historic map sequences and literary sources the broad character type was defined from a pre-set list of 12 Broad Types which were then further subdivided into 109 HLC Types for both current and previous types. This list was refined from character types set by the previous South Yorkshire HLC project as outlined above. In addition, Attributes were recorded for each Broad Type, the two principles common to all Broad Types are the degrees of Certainty and Legibility. Broad Types, HLC Types and Attributes are explained in the appendices section below.

1.2 West Yorkshire Background Introduction

1.2.1 Current Statistics

The county of West Yorkshire covers an area of 2029 square kilometres. It is bordered on all sides by Lancashire, Greater Manchester, Derbyshire, South Yorkshire and North Yorkshire.

The area now represented by the West Yorkshire sub-region was from medieval times part of the West Riding of Yorkshire. In 1974 the West Riding County Council was abolished, and the West Yorkshire sub-region was constituted as a separate Metropolitan County, which was itself dissolved twelve years later and replaced by five unitary authorities: City of Bradford, Calderdale, Kirklees, City of Leeds and City of Wakefield. However, the metropolitan county continues to exist in law, and as a geographic frame of reference. West Yorkshire continues to form a metropolitan and ceremonial county with a Lord Lieutenant of West Yorkshire and a High Sheriff.

Since 1st April 2014, West Yorkshire has been a combined authority area, with the local authorities pooling together some functions over transport and regeneration as the West Yorkshire Combined Authority. West Yorkshire includes the West Yorkshire Urban Area, which is the most built-up and biggest urban area within the historic county boundaries of Yorkshire.

Wakefield's Parish Church was raised to cathedral status in 1888 and after the elevation of Wakefield to diocese, Wakefield Council immediately sought city status and this was granted in July 1888. However the industrial revolution led to the growth of Leeds and Bradford, which became the area's two largest cities (Leeds being the largest in Yorkshire). Leeds was granted city status in 1893 and Bradford in 1897. The name of Leeds Town Hall reflects the fact that at its opening in 1858 Leeds was not yet a city, while Bradford renamed its Town Hall as City Hall in 1965.

West Yorkshire shows a wide variety of population profiles within the sub region, but has had an overall growth of 11.2% in the last ten years, significantly above the UK average of 8.3%. Latest figures show that the total West Yorkshire population stands at 2,252,300 (2013 Office for National Statistics).

Bradford District is the fourth largest metropolitan district (in terms of population) in England, after Birmingham, Leeds and Sheffield, although the District's population growth is lower than other major cities. The district's population is growing, people are living longer and communities are becoming more diverse. Comprising the main towns of Allerton, Baildon, Bradford, Eccleshill, Heaton, Ilkley, Menston, Keighley, Silsden and Wyke. It covers an area of 141 square miles (36,520 hectares) and has a population of 526,400 (2013 Office for National Statistics (ONS) Mid-Year Estimates), equating to approximately 14.4 people per hectare. The latest ONS population projections estimate that the population of Bradford District could reach 554,600 by 2021, and 582,700 by 2031 (ONS Interim 2011 based population projections). Bradford has the second largest population in West Yorkshire, with 1 in 4 people in the area now being under 16. Bradford also has elevated growth rates, similar to Leeds, of 12.6% (last ten years), well above the UK average. Growth has been consistent since 2000, suggesting that growth is linked to increased birth rates reflected with an increasing population with a larger proportion of under 16s.

Bradford is in the top ten cities in England in terms of the size of its economy (as measured by GVA - Gross Value Added – the value of goods and services produced in a local area). The District also ranks among the top ten across a range of other economic indicators including total employee jobs, number of businesses and business births, for which it ranks fifth in England. The largest sector in Bradford is Public Services with 25% industry share and has seen a 4% increase in the past 6 years (2007-2013). Also of interest is Manufacturing which has contracted by -15% (14.5% share) and Professional Services which expanded in the same period by +7%. Overall Bradford has lost -9% in its total GVA since 2007.

Bradford has just over 208,000 homes across the District, housing around 200,000 households (2011). Nearly 66% are owner-occupied, with 33% in rented accommodation. Just under 27,000 homes were owned by a Housing Association to provide affordable social housing. In 2003 the Council transferred its housing to communities who now operate around two thirds of the social housing in the District. In comparison to regionally or nationally, Bradford has a low proportion of social housing (14.8%). Of housing types, by far the most numerous are semi-detached (35.6%) and terraced (34.4%), with detached

housing at nearly 14%. Bradford District has relatively few purpose built flats / apartments (2.14%).

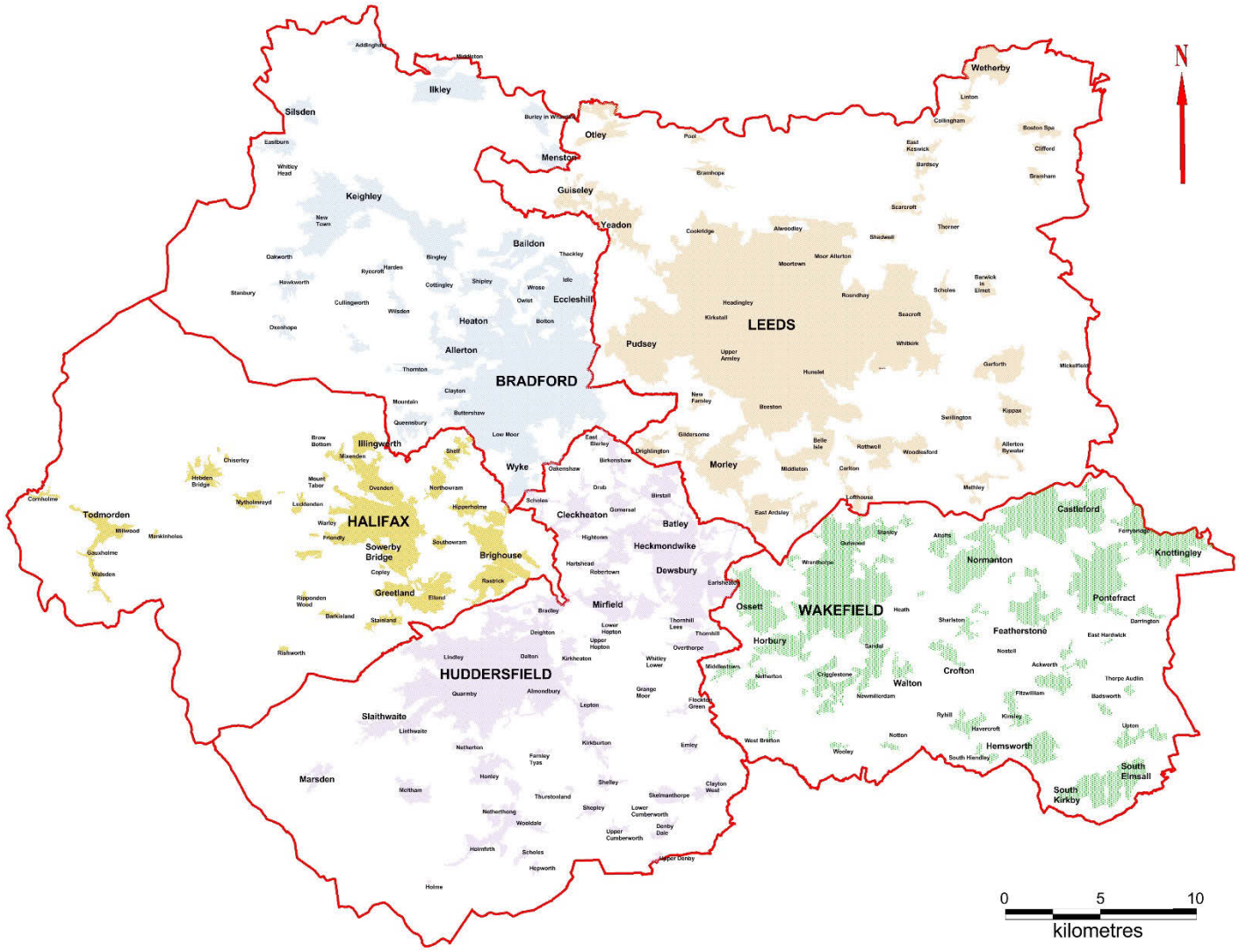

Figure 1. Principal settlement areas in West Yorkshire

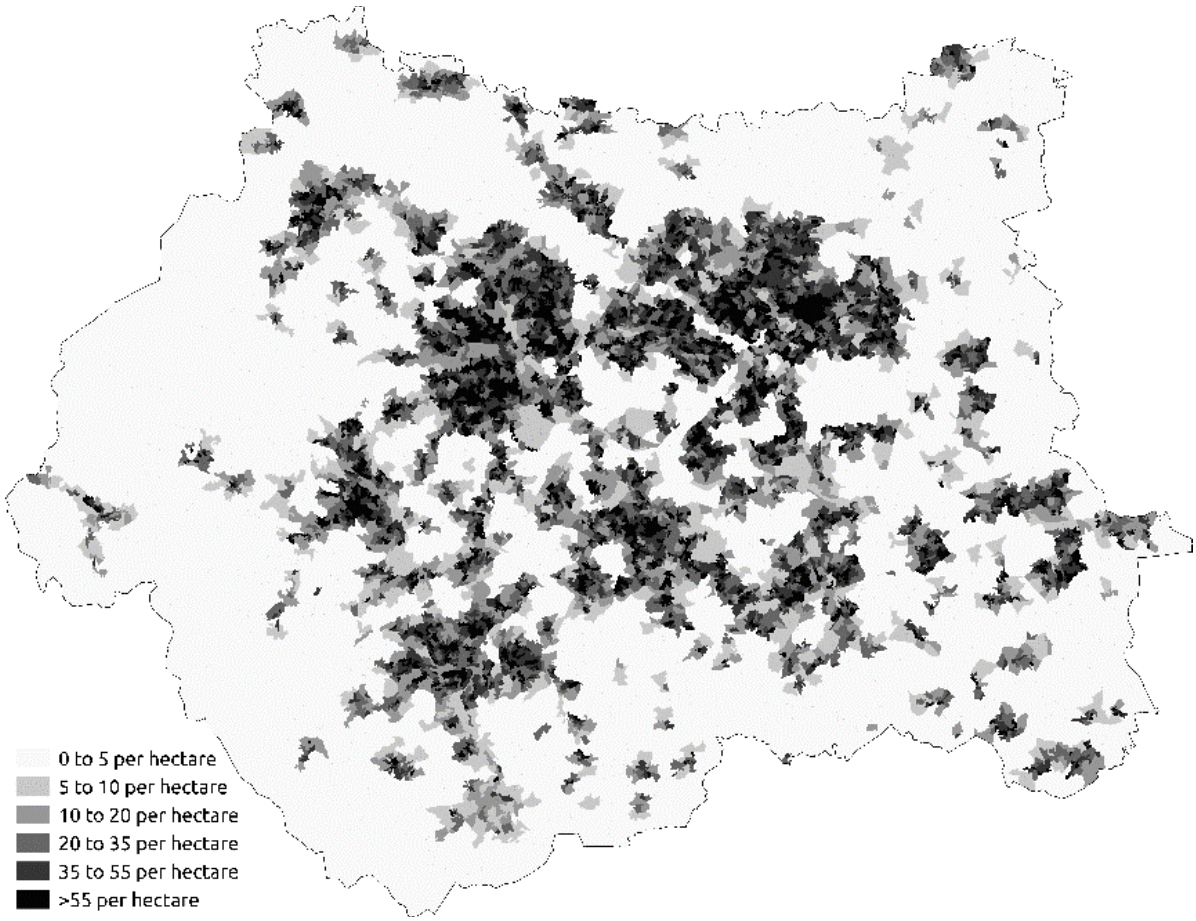

Figure 2. Population density in the 2011 census, West Yorkshire (By SkateTier) (http://creativecommons.org/licenses/by-sa/4.0)], via Wikimedia Commons)

Calderdale District comprises of the main towns of Brighouse, Elland, Halifax, Hebden Bridge, Illingworth, Sowerby Bridge and Todmorden. It covers an area of 140 square miles (36,280 hectares) and has a population of 206,400 (2013 Office for National Statistics (ONS) Mid-Year Estimates), equating to approximately 5.7 people per hectare. The latest ONS population projections estimate that the population of Calderdale District could reach 217,200 by 2021, and 228,600 by 2031 (ONS Interim 2011 based population projections). Calderdale has the smallest population in West Yorkshire of just 206,400 with a normal distribution of ages. The rate of population growth in the area has been 7.9%, below the UK average (8.3%) and the Yorkshire average (11.2%).

The largest industry sector in Calderdale is Finance and Insurance which has a 19.7% share of total GVA[1] (2013), but has seen a -13% contraction since 2007. Manufacturing also has a large share of the total industry in the area, but has also seen -7% contraction. Growth has

[1] Gross Value Added (GVA) is a measure of the value of goods and services produced in a given area, hence GVA provides a robust measurement of the financial size of the economy and the sectors within it.

occurred however in Public Services which have grown by 10%. Overall Calderdale has seen growth in its GVA output by 1%.

As of 2011, there were 92,310 household spaces in Calderdale District. Of these, nearly 67% were owner-occupied and 32% in rented accommodation. Calderdale has a relatively high percentage of terraced housing (nearly 43%), followed by semi-detached (27.3%) and detached (14.2%). Calderdale also has a higher percentage of purpose built flats or apartments compared to other districts (12.8%). Social housing (rented) accounts for 15.2% of tenure.

Kirklees District comprises the main towns of Batley, Cleckheaton, Dewsbury, Heckondwike, Huddersfield, Marsden, Mirfield and Slaithwaite. It covers an area of 157 square miles (40,720 hectares) and has a population of 428,300 (2013 Office for National Statistics (ONS) Mid-Year Estimates), equating to approximately 10.4 people per hectare. The latest ONS population projections estimate that the population of Kirklees District could reach 450,800 by 2021, and 475,800 by 2031 (ONS Interim 2011 based population projections). In Kirklees 20% of the population are under 16, elevated in comparison to other areas, but the overall age band proportions are within normal ranges.

Kirklees' economic growth rate since 2000 has been very similar to the UK average (8.3%) with a value of 8.1%. Public Services in Kirklees has the greatest share of output with 23.2% (2013) and has seen growth of 1% since 2007. Again manufacturing in the area is strong, however it has seen -5% contraction contributing to an overall -1% reduction in Kirklees' total output.

There were 181,545 households in Kirklees (as of 2011), of which 67.4% were owner-occupied and 30.8% living in rented accommodation. Nearly 34% of household spaces are terraced type (including end terraced), followed by semi-detached (32.8%) and detached (20.3%). Social housing accounts for 15.3% of household tenure.

Leeds District comprises the main towns of Guiseley, Morley, Leeds, Pudsey, Otley, Wetherby and Yeadon. It covers an area of 212 square miles (54,990 hectares) and has a population of 761,500 (2013 Office for National Statistics (ONS) Mid-Year Estimates), equating to approximately 13.8 people per hectare. The latest ONS population projections estimate that the population of Leeds District could reach 804,900 by 2021, and 853,300 by 2031 (ONS Interim 2011 based population projections).

Leeds has had the highest rate of growth since 2000, far above neighbouring local authorities, of 15.2%. This is significantly above the UK average of 8.3% and the next West Yorkshire authority, Bradford at 12.6%. Increased rate of growth was seen between 2004/5, with the city now having the lowest levels of individuals aged 0-15, but the highest proportion of 16-64 seen in the sub region. The Leeds economy was worth a total of £20.9 billion in 2013, forecast to grow by 12.4% in the next 5 years. In Leeds the largest single sector is Professional Services with 29.3% market share, and the strength of the sector in the area has shown with its resilience to the recession with 8% growth throughout the period. Despite this positive, there have been reductions in sector output for Finance and Insurance and others which have mediated overall growth to +1% in the period 2007- 13.

There were 320,596 occupied households in Leeds (2011), of which 58.2% were owner-occupiers and 39.9% are living in rented accommodation. Over three-quarters of households in the city live in whole houses / bungalows, for owner occupiers the rate is 94.1% while for those living in rented accommodation the rate is 57.1%. Three bedroomed homes are the most common in the city, with almost three quarters of the 3-bedroomed homes being owner-occupied and only a quarter in the rented sector. Semi-detached housing accounts for nearly 37% of housing types, followed by terraced (26.7%) and detached (14.5%). Nearly 18% are purpose built flats, maisonettes or apartments and 3% converted or shared housing.

Wakefield District comprises the main towns of Wakefield, Castleford, Crofton, Featherstone, Hemsworth, Horbury, Knottingley, Normanton, Ossett, Pontefract, South Elmsall and South Kirkby. It covers an area of 130 square miles (33,750 hectares) and has a population of 329,700 (2013 Office for National Statistics (ONS) Mid-Year Estimates), equating to approximately 9.7 people per hectare. The latest ONS population projections estimate that the population of Wakefield District could reach 342,700 by 2021, and 356,900 by 2031 (ONS Interim 2011 based population projections). With the second smallest population in West Yorkshire, Wakefield has witnessed low levels of growth since the millennium of just 5.7%, well below the UK average. Wakefield also has the lowest levels of under 16s at 18%, but the highest levels of 65+ residents.

Public Services has a considerable share of the market in Wakefield with 21.8% and this has retained its levels with 2% growth since 2007. Professional services has also been strong in the area, and both have helped to contribute to the overall 2% growth in Wakefield's GVA.

There were 146,538 households in Wakefield District, of which just over 64% were owner-occupied. Nearly 88% live in whole houses / bungalows. Semi-detached housing accounts for nearly 44% of housing types, followed by terraced (23.4.7%) and detached (20.7%). 10.1% are purpose built flats, maisonettes or apartments and 1.2% converted or shared housing. Social housing accounts for 23.6% of household tenure.

1.2.2 Historical Statistics

The agrarian base of West Yorkshire's medieval society is reflected in the close correlation between the fertility of the soils and the distribution of wealth and population in the 14th century, and between all three indicators and the settlement forms and field systems recorded from the 11th and 12th centuries onwards. The highest value communities recorded in the 1334 lay subsidy were concentrated to the east of Leeds and Wakefield, and along the River Wharfe, which forms much of the sub-region's northern boundary, between Wetherby and Otley. A closely comparable weighting in the distribution of population densities can be generated from the Poll Tax returns of 1379.

The distribution of wealth and population in the 14th century correlates well with the patterns of settlement and land use that can be identified in the earlier Middle Ages. Nucleated villages with highly regular and extensive open-field systems dominated the area east of Leeds and Wakefield, whereas the Coal Measures to the west supported much higher proportions of dispersed farmsteads and hamlets, with irregular 'core townfield' systems surrounded by far more enclosed fields, often cleared individually from woodland and scrub. The extreme western parts of the sub-region contained extensive tracts of common pasture, with a relatively thin distribution of dispersed farmsteads and hamlets confined to the valleys between the stretches of moorland. Further extensive stretches of open moorland were to be found between the northern edge of the Coal Measures and the Wharfe valley.

The industrial development of the sub-region, beginning towards the end of the Middle Ages, generated a marked reversal in the distributions of growth in population and wealth: the greatest increases in both were seen in the textile manufacturing areas to the west of Wakefield and Leeds. The impact of textile development during the 15th and 16th centuries was evident first in the upper Calder valley, in the parish of Halifax, but the process of transformation from an agrarian to an industrially based economy was already underway on the Coal Measures in the early 17th century. A general decline in the number of people employed in agriculture is common to many counties. In Yorkshire the number of agricultural labourers fell from 56,655 in 1861 to 46,622 in 1931, a decrease of 18%. By 1991, the

number of farmers and agricultural labourers accounted for less than 1% of Yorkshire's population.

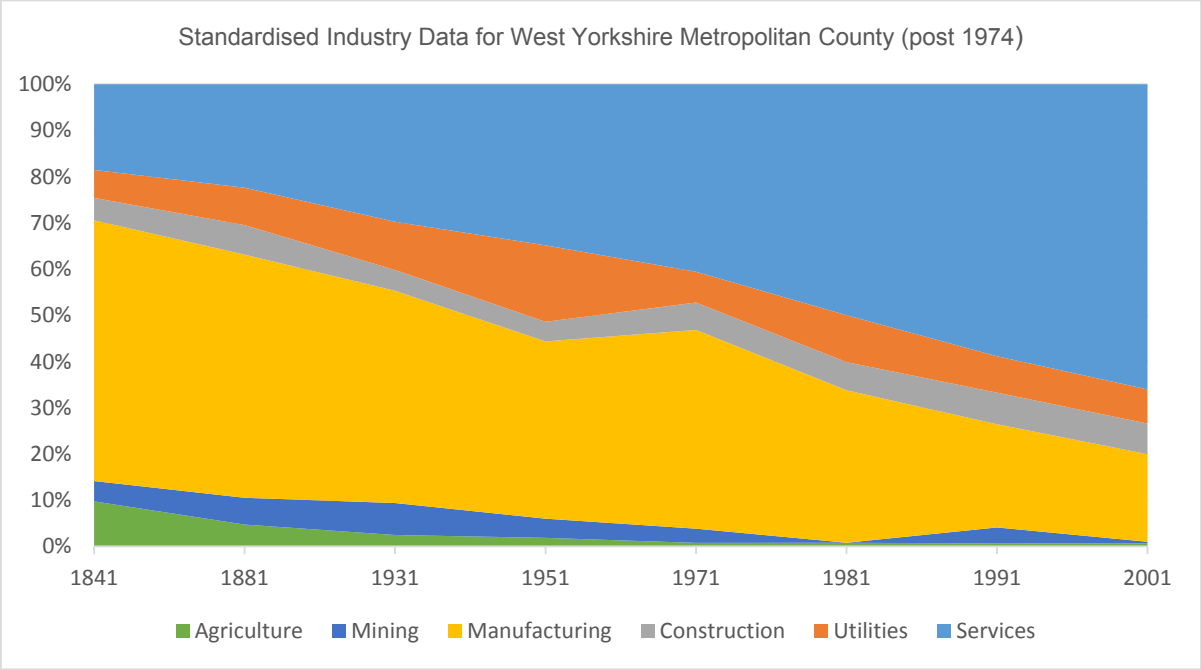

Figure 3. Standardised Industry in West Yorkshire 1841 to 2001. Source: A Vision of Britain through Time (www.visionofbritain.org.uk/unit/10056974/cube/TOT_POP)

Much early industry developed in rural settings, being dependent either on the location of minerals accessible to mining and quarrying, or on rivers and streams to power the refining and manufacturing processes. During the 19th century, however, the development of steam power freed industry from the need to be located on water courses, and led to the development of quite large agglomerations of textile mills around towns such as Leeds, Bradford and Halifax. These mills were, of course, accompanied by a range of related manufacturing businesses (such engineering shops and dyeworks), by warehouses and other commercial premises, by workers' housing and shops, and by churches, chapels, schools and public buildings.

The rapidity and scale of industrialisation is marked by a phenomenal growth in sub-region's population, particularly in the decades after 1850. The town of Morley, for example, more or less in the geographical centre of West Yorkshire, saw a doubling of its population between 1801 and 1851; but it doubled again between 1851 and 1871, and yet again between 1871 and 1891. Urbanisation progressed, its extent accentuated by ribbon development running along the roadsides between earlier centres of population. Nevertheless, there are still

significant areas of farmland behind the roadside housing, separating the main urban and sub-urban areas and creating an intricate interplay of rural and urban characteristics.

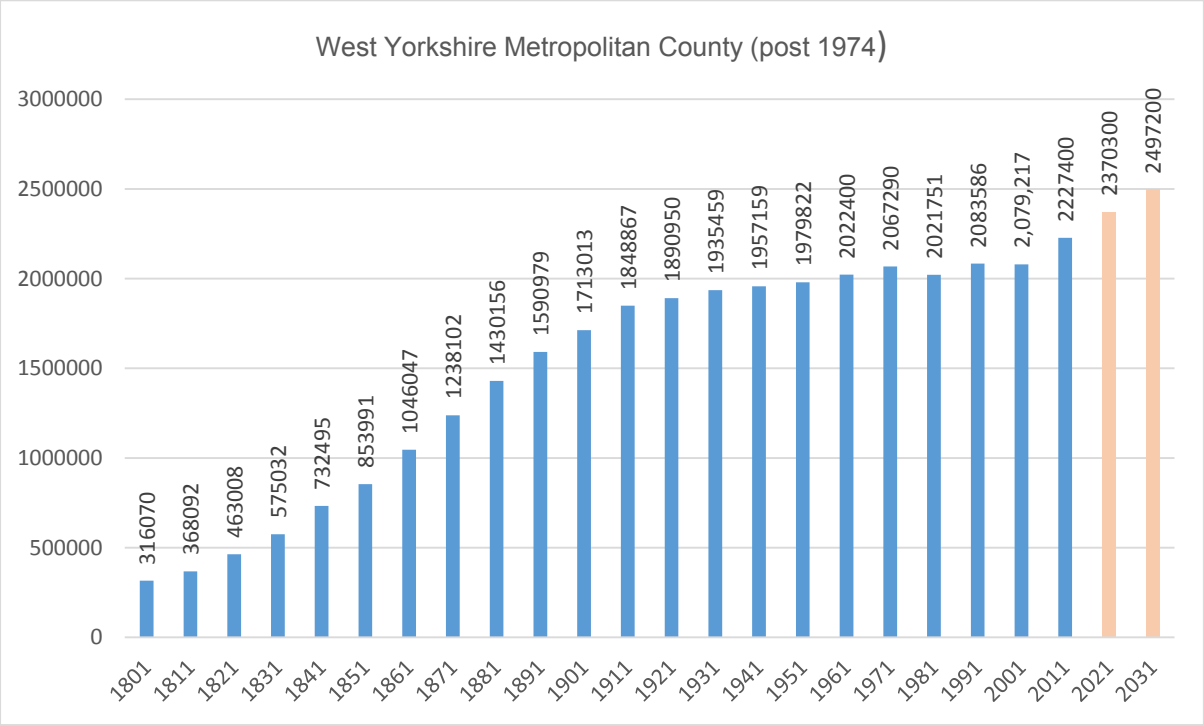

Figure 4. West Yorkshire Population Statistics from 1801 to 2031 (Source: *A Vision of Britain through Time* (www.visionofbritain.org.uk/unit/10056974/cube/TOT_POP) Projected figures for 2011 to 2031 are collated from the West Yorkshire Observatory (www.westyorkshireobservatory.org)

1.3 West Yorkshire Topography and Geology

1.3.1 Topography

The western borders are dominated by the high Pennine watershed which slopes eastwards towards the Vale of York. The height ranges from around 582m AOD at Black Hill to the west to around 30m AOD in the river basins in the low lands to the south east. The eastern Pennine slopes are dominated by four principal rivers which initially run in steep sided valleys to later merge and drain into the wider river basins to the east. These comprise (from north to south) the Wharfe, Aire, Calder, Colne and Holm. They drain eastwards onto the Humber levels. The valleys were of economic importance by providing access routes to the industrial towns situated in the high Pennine valleys and also for early water powered industry. The region can be separated into three distinct topographical bands of high, middle and lowlands which correspond with the underlying bedrock Geology. These are, from west to east, the Mill Stone Grit group, the Pennine Coal Measures (Lower, Middle and Upper) and the Magnesian Limestone Belt with undifferentiated Permian sandstones. The limestone belt ends abruptly beneath the clay, sands and gravels of the Lake Humber basin. These bands, and later superficial deposits, influenced later settlement, industry and economies, outlined below:

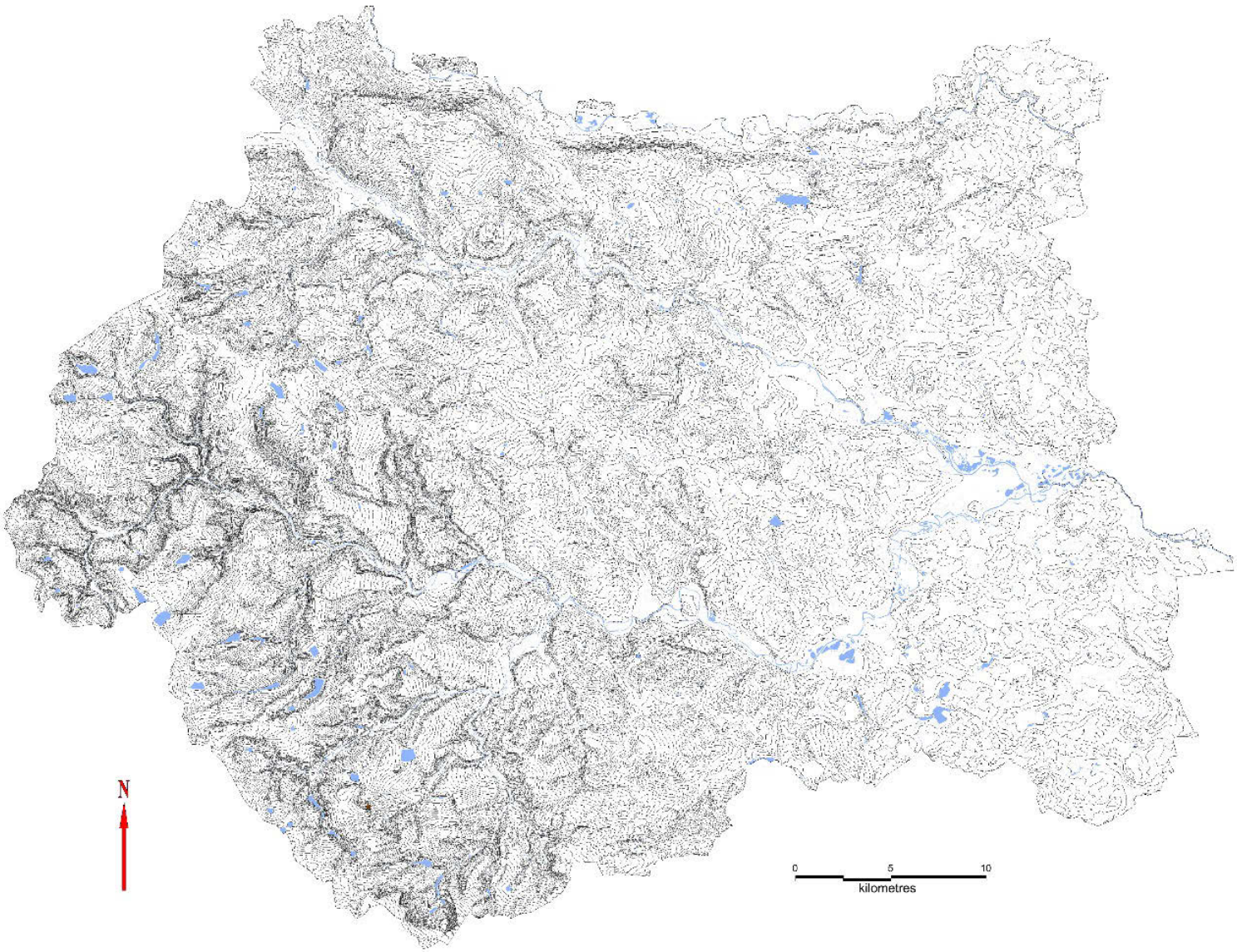

Figure 5. West Yorkshire Topography and Drainage

Based

1.3.2 Solid Geology

Millstone Grit

This term is used for a series of sandstones, siltstones and shales (mudstones) which date from the Namurian epoch of the Upper Carboniferous period and are about 320 million years old. The area that is now northern England lay in a subsiding basin between high mountain ranges. Rivers carried sediments which compressed under pressure of overlying rocks to give a rock sequence which is about 1700m thick. Deltas of sand built out over deeper waters in which clay and mud was deposited. Sea-level fluctuated because of global temperature changes, so alternating beds of mudstones and sandstones are found. River and delta sediments contain plant fossils, whereas mudstones contain marine fossils, particularly molluscs such as goniatites and shells.

The Carboniferous sandstones of the Millstone Grit and Pennine Coal Measures of Yorkshire have traditionally been extensively used as a source of building stone and today both disused and working quarries are a common feature of the landscape. There are currently around 45 working sandstone quarries in West Yorkshire, the largest concentration of quarries in Britain. Most quarries produce blockstone or a range of masonry products, and some crush and process significant amounts of sandstone to produce manufactured sand for aggregate use.

There are many sandstone units within the Carboniferous, but the Woodhouse Grit (Midgley or Brandon Grit), the Woodhouse Grit Flags (Scotland Flags), the Rough Rock, the Rough Rock Flags and the Huddersfield White Rock are the most extensively worked of the sandstones.

Historically, the area has been the UK's most prolific source of Carboniferous building sandstones, generally marketed under the generic term 'York Stone'. The Millstone Grit Group has been extensively quarried, associated with development of the principal industrial settlements of the area. Quarrying centred on Horsforth, Guiseley, Keighley, Halifax, Huddersfield and Holmfirth, in the north and the west, and Pontefract and Ackworth in the east. The best known sandstone of the Millstone Group is perhaps the Rough Rock, the principal source of building stone in Huddersfield, obtained from the quarries of Crosland Moor.

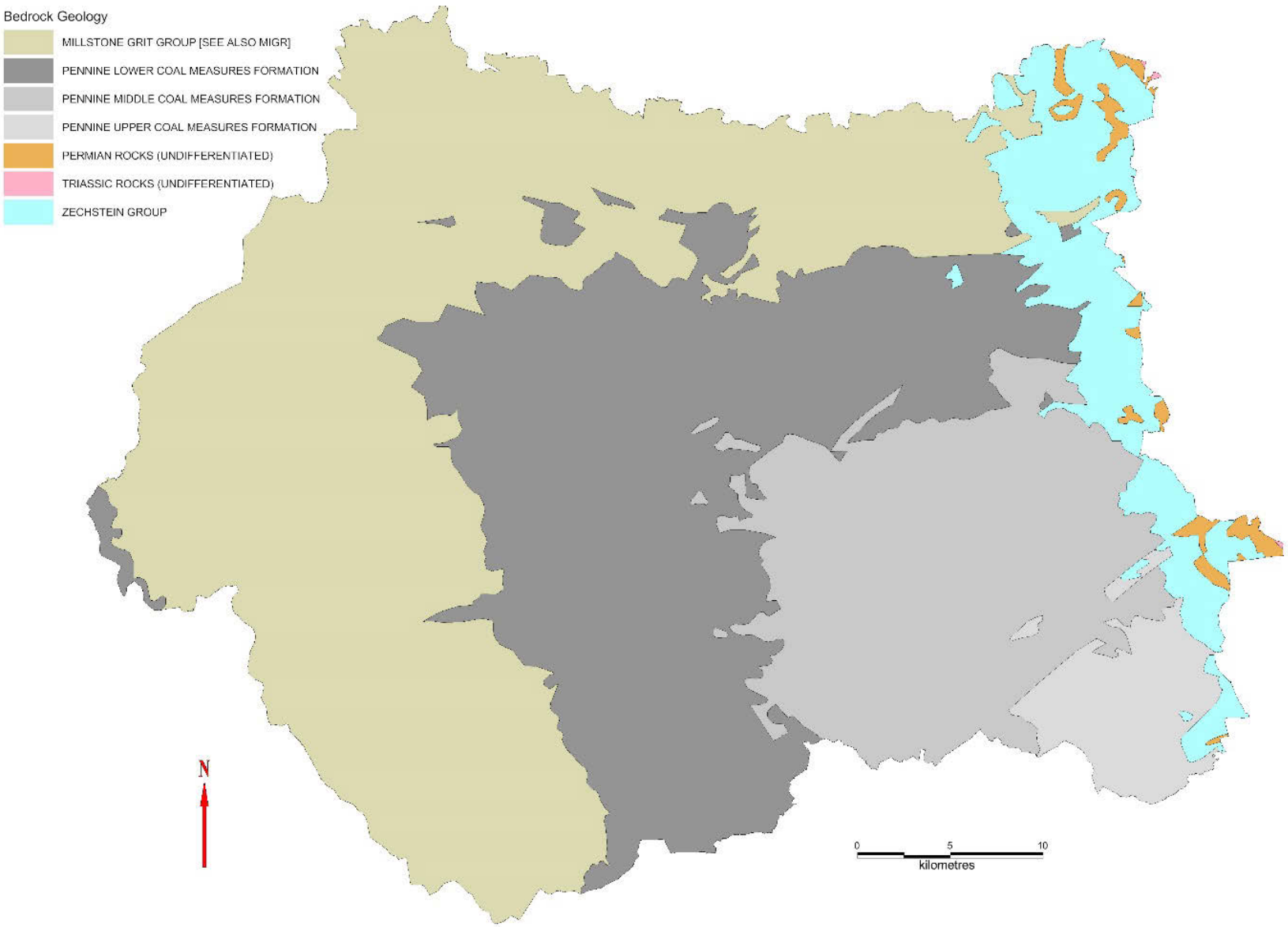

Figure 6. West Yorkshire Solid Geology

Based upon DiGMapGB-625 dataset, with the permission of the British Geological Survey. Reproduced with the permission of the British Geological Survey ©NERC. All rights Reserved

Coal Measures

After the Millstone Grit rocks were deposited the seas became shallower and deltas built out from the coastlines. Sands and muds brought down by rivers were deposited in huge channels, much like the present Amazon Basin. The continent was close to the equator, so the land surface was covered with luxuriant vegetation, such as tree ferns and other spore-bearing plants. In stagnant lakes and marshes, plant material decomposed without oxygen, so that carbon was retained in the muds. Carbon was locked into coal seams during later burial by sediments. Tree branch and root fossils are very common in river sandstones, whereas marine shell fossils are found in mudstones which were deposited in shallow seas, as sea-levels continued to fluctuate.

The Pennine Coal Measures succession has also been a prolific source of building sandstones in the past at Leeds, in the Harehills, Potternewton and Scott Hall quarries, and at Bradford, in for example the Bolton Woods, Fagley Flappit and Idle quarries. All of the many sandstones that occur in the succession have been used for local building purposes – the best known of these are the Gaisby Rock (Spinkwell Stone) and Elland Flags in the Leeds-Bradford area. In 1900 there were more than 40 Elland Flagstone quarries and mines operating around Halifax at Northowram, Southowram, Hipperholme and Brighouse.

Part of the East Pennine Coalfield is covered by the central and south-eastern parts of West Yorkshire. The coal-bearing strata are rocks of the Pennine Lower and Middle Coal Measures (Upper Carboniferous) and generally dip to the east or south. Coal seams crop out at the surface, except in the extreme east where they are concealed by younger rocks to a maximum depth of 1200m below OD. Coal seams are numerous and many are developed at a regional scale. Twenty-two coal seams are recognised in the Lower Coal Measures and nine in the Middle Coal Measures. The seams are mainly bituminous, with the coal produced having moderately high sulphur content.

Permian Rocks (Magnesian Limestone Belt)

The Permian period followed the Carboniferous period about 290 million years ago. Plate tectonic uplift of southern Europe formed large mountains, so that northern England lay above sea-level in a hot, arid climate. Wind erosion produced blown sand so the first Permian rocks are dune-bedded desert sands called the Yellow Sands Formation, found in a few places in the east of the county. In Late Permian times the land was flooded by a shallow, salty sea called the Zechstein Sea, which dried out regularly because of high

evaporation and sea-level fluctuations, leaving precipitated carbonates and other salts behind. The carbonates have been altered to yellow dolomitic limestones during later burial, interbedded with reddish mudstones. Fossils are rare, because not many forms of life could survive in such saline waters. The rocks are relatively soft, with high porosity and are frequently too weak and friable to make high quality aggregate. Nevertheless, they are quarried for low-grade applications such as sub-base roadstone and fill. Production in West Yorkshire is modest. As a building stone, the pale coloured dolostones have been extensively quarried, since Roman times, along much of their outcrop, most notably around Wetherby, Bramham, Castleford and Pontefract. Magnesian limestone is currently worked for building stone at Highmoor Quarry.

1.3.3 Superficial Geology

Glaciofluvial sand and gravel: West Yorkshire was affected by at least three glaciations although evidence for earlier phases has been largely obliterated by the final, Devensian phase. Earlier pre-Devensian glaciofluvial deposits occur south of Leeds and Bradford as thin bodies of sandy gravels with a variable content of fines. Small patches occur in the Calder Valley, at Hebden Bridge and north of Elland, where up to 5m of fairly well bedded gravel is preserved. It is thought that the same material may underlie the entire alluvial plain of the River Calder. Pre-Devensian deposits occur at lower elevations, for example at Castleford. Deposits also occur on the Pennine Coal Measure crop, near Oulton and Rothwell.

Later Devensian deposits occur north of Bradford and Leeds, buried in the former channels of the rivers Aire and Wharfe – the channels infilled with superficial deposits, locally in excess of 50m deep. The Wharfe valley has a narrow course and is incised into a gorge between Wetherby and Boston Spa. Upstream of Linton, erosion of pre-existing till deposits has created incised terraces and at wider points along the Wharfe valley terraces of sandy gravel were deposited. These deposits are worked at Firgreen for building sand and construction fill. A series of small late-glacial melt water channels are present in the valley sides and upland areas, forming an arc from west of Keighley to Bradford and Shipley.

Glaciolacustrine Sand: During the Devensian glaciation, ice occupying the present coastal zone farther east blocked the eastward-draining valleys creating ‘Lake Humber’ in the southern part of the Vale of York. Deposits associated with this glacial lake, termed glaciolacustrine deposits, occur in the easternmost part of West Yorkshire, around

Knottingley, forming undulating low ground at about 8m above OD. These deposits conceal local developments of older sand and gravel.

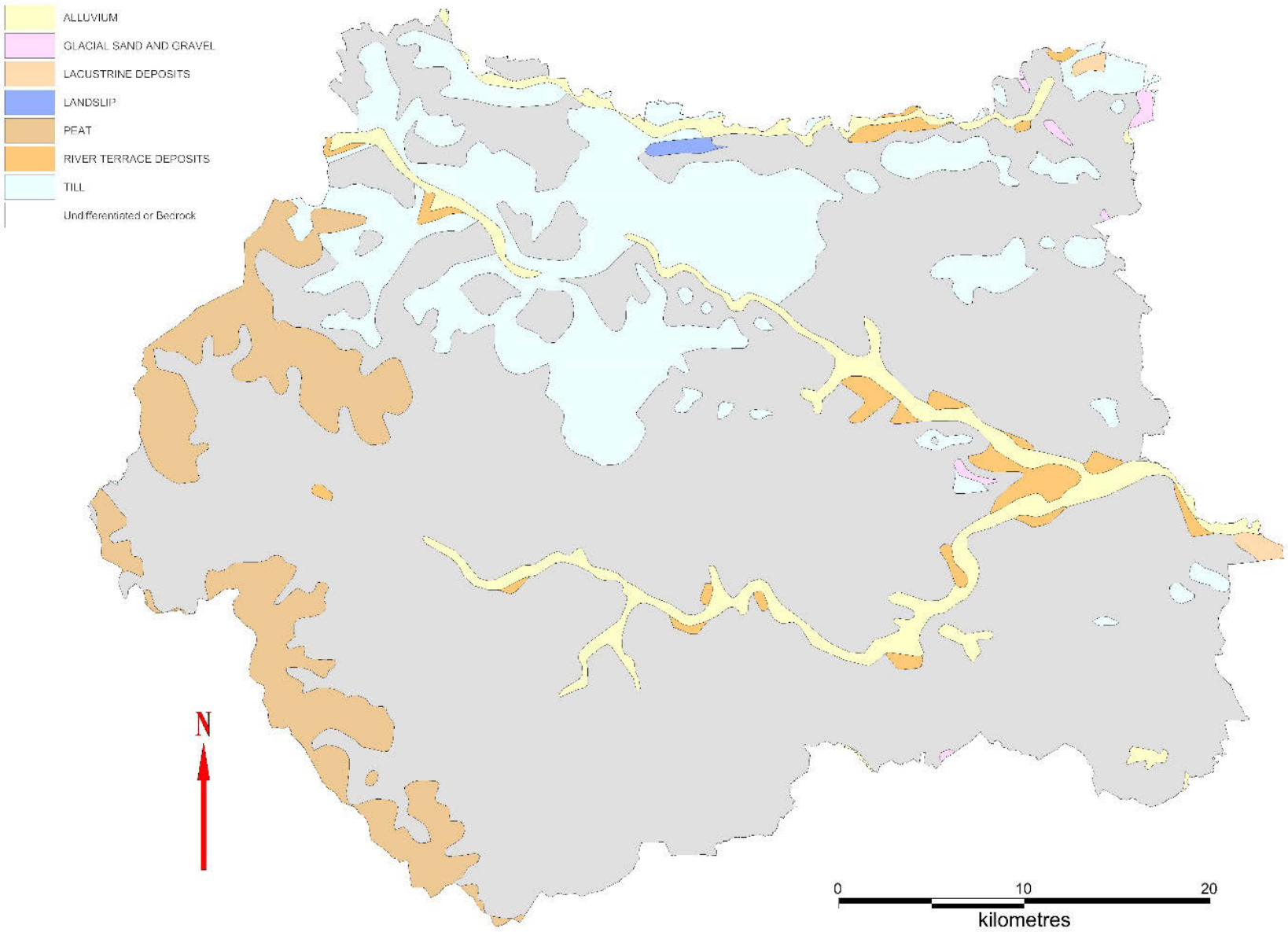

Figure 7. West Yorkshire Superficial Geology

Based

River sand and gravel: These resources occur in both raised river terrace sequences flanking modern floodplains and in flood plain terrace deposits associated with, and underlying, present day alluvium. The sequence is best developed along the rivers Wharfe, Aire and Calder with a succession of deposits formed in response to falling sea levels in the Pleistocene. The pattern of deposits was largely controlled by both the existing bedrock and newly formed glacial features. Three terraces occur in the Wharfe valley, between 3 and 12m above the present floodplain. In the Aire valley, the most extensive terrace deposits occur between Leeds and Castleford. In the Leeds area, much has been disturbed by urban development, but substantial deposits occur further downstream in the Oulton-Castleford area, particularly at the confluence between the rivers Aire and Calder. The deposits associated with the River Calder are worked at several localities, including Sands Land Quarry near Mirfield, Grange Farm near Wakefield and Methley near Mickletown.

Brick clay and fireclay: Brick clay has been worked extensively in the past, mostly from a number of mudstone horizons in the Pennine Coal Measures, and today the Coal Measures remain the principal brick clay resource in northern England. Brick clay resources are extensive in West Yorkshire and there are several large production centres of facing bricks near Elland, Leeds, Dewsbury, Normanton and Wakefield. Several quarries in the vicinity of Denby Dale and Holmfirth extract Coal Measures mudstone for use in the manufacture of vitrified clay pipes at a plant in South Yorkshire. Fireclays typically occur beneath coal seams and sources are confined to coal-bearing strata. The close association between coal and fireclay means that opencast coal sites are one of the few viable sources – resources of fireclay are thus coincident with opencast coal. Although originally valued as refractory raw materials, fireclay is now valued by the brick industry to produce buff coloured bricks. In the Halifax-Bradford-Leeds area all the fireclays from the Soft Bed to the Better bed have been worked in the past by shallow mining and surface extraction. Today, the only fireclay of economic importance is that associated with Hard Bed Coal. Hard Bed fireclay is worked on a small scale from both the Shibden No.2 mine in Halifax and the Dog and Gun Quarry at Oxenhope. Fireclay is also produced with brick clay from sites near Denby Dale and Normanton.

1.3.3 Natural Landscape Character

Millstone Grit

This is a transitional area with land falling from the Southern Pennines to the west down to the Coalfield Measures to the east. Maximum heights are around 514 m dropping down to

just over 30m. It can be divided into two distinct landform types: the Southern Pennines and the Southern Pennine Fringe.

Southern Pennines

The landform is a plateau deeply dissected by river valleys, often with distinct 'steps' where rivers have cut down below the level of earlier broader valleys, and showing signs of over-deepening by glacial meltwater. Most of these valleys are narrow but the Upper Aire Valley is wider, with some glacial till and moraine. The rocks dip to the east, resulting in a series of escarpments, steep to the west and sloping away to the east, forming some prominent rocky edges.

The solid geology is dominated by Carboniferous rocks. The Millstone Grit group of Namurian age comprises gritstones, sandstones and coarse grained sandstones formed by ancient river deltas. Between Todmorden and Bacup, Westphalian-age Coal Measures, a sequence of thin coals, shales and sandstones, overlies the Millstone Grit. The geology of the area is complex as these sedimentary rocks are of widely varying thickness and are cut by many faults. Coal and ironstone have all been worked from the rocks in the past, as well as stone for building and shales for brick making. Currently the only commercial extraction is of stone for road construction and building.

Most of the woodland cover within the area is found on the steep valley sides, with some copses sheltering the dispersed farmsteads on higher ground. There are only a few blocks of conifers in this area. The woodlands found within steep ravines or cloughs, are the small remnants of ancient woodland, which would have once covered much larger areas. These clough woodlands include areas of internationally important upland oak woodland, which are characterised by a mix of tree species including birch, alder, rowan and oak.

Field boundaries are predominantly drystone walls constructed with local sandstones from the Millstone Grit and the Coal Measure Series or in some localities, limestone. Walled tracks lead from the valley bottoms to the fell tops, giving access to the open moorland for summer grazing. There are very few walls on the moorlands, where ownership boundaries are often marked by lines of boundary stones. The upland pastures that fringe the moorlands are bounded by drystone walls and are generally small to medium in size, with localised areas of larger fields in regular geometric patterns dating from the 19th-century enclosures. While boundary walls are sound, internal field boundaries are often in poor condition due to

lack of maintenance. The number of farm holdings has declined over the past 10 years, in particular those holdings under 20 ha.

The moorlands are unpopulated, whilst there are scattered farmsteads around the moorland fringes. Older settlements, such as Heptonstall and Luddenden, based on a dual economy of agriculture and the early home-based wool industry, are located on the shelves of land above the valleys but below the higher moorland. Larger settlements, with terraces for workers, spread along the valleys when transport routes – canals, railways and roads – opened the valleys up and enabled the large-scale industrialisation of the textile industry. The largest town is Keighley, and others include Ilkley, Hebden Bridge and Todmorden.

On the open moor above c.350m AOD there is around 145 km^2 of upland peat. Peat formation began during the Mesolithic Period around 5000 BC (Barnes, B. 1982. 28-29). This area was utilised for hunting from this time. Mesolithic flint tools are found below the peat alongside the remains of former tree stands of oak, hazel and birch. Flint microliths have been found in abundance in this area because of the preservation of these delicate paleo-environments, and due to intense collector activity. In reality, Mesolithic activity was probably widespread throughout the region in accordance with seasonal variation. Much of the area was covered in woodland at this time. Wholesale woodland clearance at lower elevations probably began the early medieval period, though palynological evidence suggests small scale, often temporary, clearance from the later Neolithic period (Barnes, B. 1982. Pages 39 to 46). Evidence for later prehistoric settlement is occasional. The exception is the lower and more hospitable Wharfe Valley which contains evidence for Neolithic settlement (Keighley, J.J. 1981. 90). The frequent occurrence of Late Neolithic / Early Bronze Age carved rocks is characteristic, with those on Rombalds and Ilkley Moors of national significance. Potential evidence for Bronze Age settlement is found on Ringstone Edge in Calderdale. Iron Age settlement has been identified in several locations in this area. There is some evidence of late Iron Age and early Romano-British settlement in Ilkley.

The use of local hard sandstones which, are very suitable for building, in particular Millstone Grit, in all constructions, from drystone walls and farmsteads to terraced houses and factories, gives a high degree of visual coherence to the appearance of settlements and reveals a close connection with the underlying geology. Historic building traditions include the survival of 15th-century timber-framed houses due to encasing in stone. The laithe house tradition is characteristic for this area from the 17th through to the 19th century. Weavers' houses, with their wide windows especially on the first floor, to let light in for the home-based textile industry, are found in the older settlements.

Much of the land in the early medieval period was moorland waste or utilised for hunting parks with farming assarts clearances and 'stalls' (medieval cattle ranches) in the lower wooded areas. Early medieval settlement was low density and distributed largely on the more hospitable lower plateaus avoiding the valleys bottoms and moorland. Entries in the Domesday Survey of 1086 are less frequent here than in other parts of West Yorkshire. They are largely restricted to the Aire and Calder Valleys, with one or two entries in the Holme Valley. The majority of land in the region in the medieval period belonged to a small number of large estates administered from a distance. The rural economy was pastoral with infield subsistence hill farming with piecemeal enclosure and assarts, though small scale strip field farming can be identified associated with some of the hamlets and villages. Of the larger towns, Halifax was the administrative centre during the middle ages. Otley received a Market charter in 1227 (Silson, A. 2003. 55). The later rural land use pattern is one of open peat moor land with impoverished moorland edge intakes, surveyed enclosure and historic piecemeal enclosure with improved grassland. The settlement pattern is one of scattered solitary farmhouses and small towns. Sheep grazing became economically important through wool and domestic textile production. This became a significant industry in the post medieval period leading to the development of textile towns. With a few exceptions, valley bottoms were largely avoided until the industrial period, which then become important as a source of water, power and other resources and the focus of industrial settlement.

During the 19th century there was an expansion of dairy buildings and construction of some 19th-century model farms and also of striking non-conformist chapels. By the mid-19th century, the landscape was dominated by large mill buildings with chimneys and extensive rows of terraces clinging onto the hillsides, such as at Hebden Bridge and Todmorden. There was some depopulation of the higher land, some as a result of actions of the early water companies, as reservoirs were built across this area to supply the new mill towns. The decline of the textile industry, following the slump of 1920, left many mills derelict.

Southern Pennine Fringe

The most striking aspect of this landscape is the mingling of predominantly 'gritstone' industrial towns and villages with the strong valley forms and pastoral agriculture of the Pennine foothills. The gritstone industrial buildings and settlements bring a sense of visual unity to the landscape. The landscape is dominated by industrial buildings and structures such as factories, chimneys, railways and canals. Running west to east, there is a change from pastoral treeless hill tops, where drystone walls are the predominant field boundary, to wooded valleys, where large urban settlements such as Bradford, Huddersfield and Halifax

are focused in the valleys and were built up around the former industries such as coal mining and the woollen industry. The World Heritage Site of Saltaire stands as an example model town built with the wealth produced by the industries prevalent in this area.

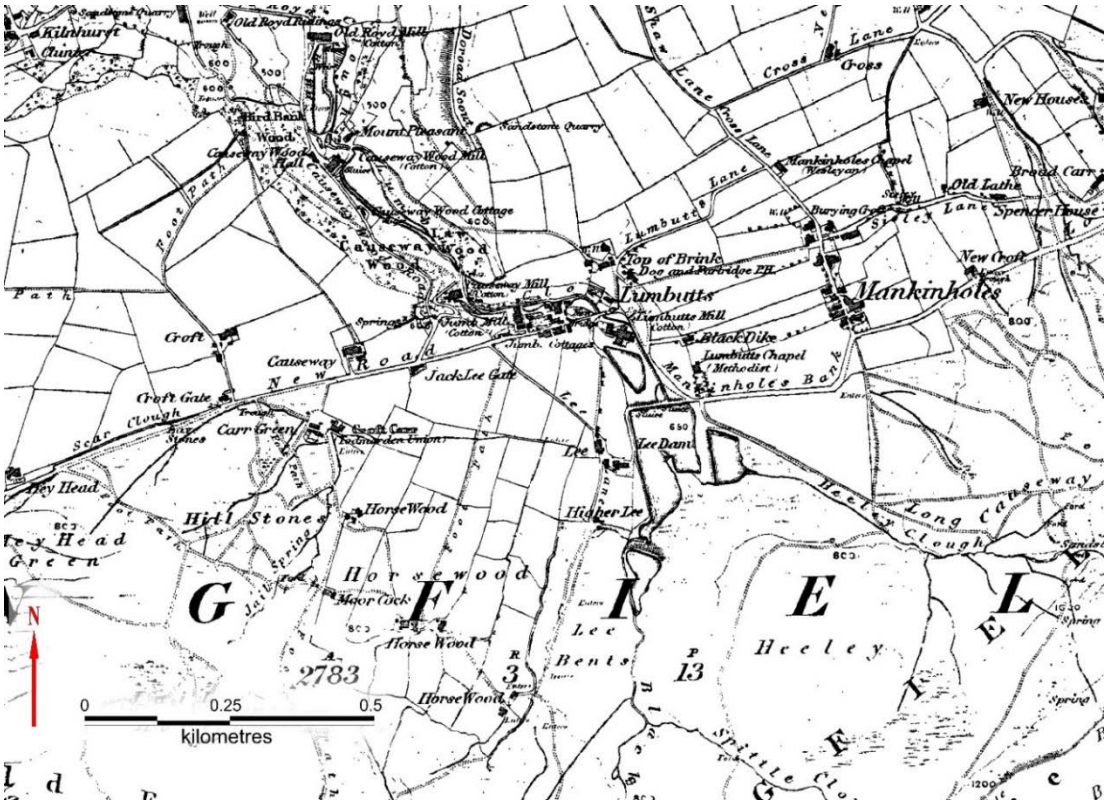

Figure 8. The moorside landscape around the settlement of Lumbutts (Calderdale), displaying a variety of historic enclosures types (OS 1st Edition 6" map, 1849). © and database right Crown Copyright and Landmark Information Group Ltd (all rights reserved 2016) Licence numbers 000394 and TP0024

The most striking aspect of the landscape is the close juxtaposition of predominantly gritstone industrial towns and villages with the strong valley forms and the pastoral agriculture of the Pennine foothills. The use of local gritstone for industrial buildings and houses gives a strong sense of visual unity and connection to the landscape. The sandstones and mudstones of Millstone Grit support extensive but poorly drained pasture land which is prominent in the west of the area; this is overlain by beds of sandstone, siltstone and mudstone in the east, giving rise to quality building stone and more fertile soils for agriculture.

In the east, settlements are separated by areas of arable farming with hedgerows and lowland meadows. The area is characterised by steep slopes that are cut through by narrow rivers, notably the Aire, Calder, Colne, Hebble Brook, Holme, Ryburn and Worth, which open

up into valleys on lower land. The river valleys provide links through the region from uplands into the towns and cities in the valleys, supplying not only water for the large population in these areas, but also opportunities for people to access and enjoy the natural environment.

The settled valleys contrast strongly with the treeless rough grazing and remnant moorlands on higher land and the extensive areas of pastures enclosed by drystone walls on the Pennine foothills. Here there are scattered farmsteads and hamlets, and the landscape has a more remote feel, even though towns are not far away. The farmhouses, barns and walls are all built of local sandstone and gritstone, again providing strong visual unity. On some areas of the plateaux there are distinctive patterns of regular rectangular fields delineated by drystone walls, for instance Holmfirth, Norland, Highroad Well Moor and Scammonden. In places there are extensive views out to the east over the adjacent towns and agricultural land of the Central Coal Measures.

Farming in the west is largely based on livestock, including some dairying, where the climate is wetter and cooler due to altitude. Here there are mosaics of grasslands enclosed by drystone walls. Many of the grassland habitats have been subject to agricultural improvements and have lost much of their biodiversity interest. Semi-natural habitats are generally interspersed in this landscape as small fragments of those found more widely in upland areas; for example, patches of upland heath, acid grassland and purple moor grass still exist. These patches of habitat are very important for wildlife locally, as recognised through their designation as Local Wildlife Sites. To the east there is more arable cropping, and hedges take over from walls as the predominant field boundary. The proximity of urban areas has led to horse grazing and other typical peri-urban land uses in places. Several reservoirs contained within narrow valleys contributing a distinct character as well as providing popular places to visit.

The pronounced landform gives rise to dramatic views, with long views over busy urban areas across valleys and over lower-lying land to the east. From within the towns there are views out to the surrounding hills, so that town and country are more obviously linked. Around Batley and Dewsbury, where the Coal Measures rocks are exposed, the hills and valleys are gentler and more rounded, and urban development has extended further. Here there is a complex mix of land cover, with small patches of open land, fields and woods separating areas of housing and industry.

Evidence of Iron Age and Roman habitation is still present on uplands, and old pack-horse routes that once joined settlements across the Pennines are still in place, or now forming

modern major road routes. Early settlement in this area seems to have been sparse, although prehistoric earthworks and rock art survive in the northeast and southeast of the area (Castle Hill at Almondbury, Old Bull Ring in Denby Dale, and at Hagg Wood and Myers Wood near Huddersfield). Flint scatters suggest that Mesolithic habitation sites may be preserved under peat in the uplands, while traces of Iron Age settlement are preserved on the undeveloped higher land to the west.

The woollen industry has been the main influence on the landscape since the 12th century. It arose due to the suitability of the land for sheep rearing, combined with the numerous watercourses running off the Millstone Grit which provided soft water suitable for wool preparation processes. The woollen industry was initially a home industry, in small settlements on the plateaux, with small intakes of land enclosed to support subsistence farming for the woollen trade workers. The laithe house (adjoined house and byre) building style is directly related to this lifestyle.

There is close conjunction between rural landscapes and the rich industrial heritage of the urban areas, including settlements associated with the textile industry, with large mills and tall chimneys, and large factories and forges associated with the iron, steel and manufacturing industries. Traditionally settlements in the Millstone Grit region were dispersed along valley bottoms. Linear settlements developed in the valleys alongside large nucleated gritstone towns based on the woollen industry, for example Halifax, Cleckheaton, Brighouse, Huddersfield, Honley, Holmfirth and Bradford. The impact of development is nearly always evident, with dense networks of roads where the landform permits, as around Batley and Dewsbury, and many main road, rail and canal routes cut across the area. The area contains a wealth of industrial archaeology which contributes significantly to the strong sense of historical character and identity, although this is disappearing in some of the more extensive urban areas. Urban development is generally constrained within valley floors and up-side slopes, with location and layout strongly influenced by the landform. The ready supply of water power led to the establishment of textile factories in the valleys. Later, coal for steam was exploited to drive machinery, which led to the massive expansion of the woollen industries. This was initially derived from shallow coal mines on the side slopes of the Pennines, then from larger mines that extended into the deeper, richer veins to the east.

Mass migration of people into the industrialised valleys followed, and an extensive programme of building – mills, factories and housing – took place. In the late 18th and 19th centuries, canals and then railways were constructed to move raw materials and manufactured goods, and reservoirs were built to provide drinking water to the conurbations.

Market gardens also supplied the cities, while quarries were opened up to supply building stone for both local use and export.

Coal Measures sandstones, notably the Elland Flags, provide excellent quality building stone. This was used extensively during the rapid growth of the large conurbations of Bradford, Halifax and Huddersfield and elsewhere. Some large quarries, both active and inactive, remain as features within the landscape, especially around Halifax.

Wealthy industrialists built major civic buildings (including several nonconformist chapels, institutes, schools and churches) and created a number of parks and gardens in the area during this period, which still contribute to the character of the landscape today. A notable example is the model town at Saltaire, which is now a World Heritage Site. In upland areas the continued sheep rearing resulted in large, regular, rectangular fields on the plateaux being enclosed by stone walls which form strong patterns in the landscape.

Central Coal Measures

Like the Mill Stone Grit group, the Carboniferous Pennine Coal Measures also contain alternating strata of sandstone, shale and coal. The divide between the western highland and eastern lowland zones runs through the middle of this area. The more elevated western slopes retain the shelf and step formations with a more gentle undulating terrain to the east dropping towards the wide river valleys and wetland basins to the east of Leeds and around Wakefield. The sandstone beds of the Coal Measures are rather thinner than those of the Millstone Grit and hence the escarpments that they form are less dramatic, lower and more rounded.

The landscape is underpinned by generally low and variable hills, escarpments and broad valleys. It is dominated by extensive urban influences and industry. There has been constant change and development since the Industrial Revolution, when there was rapid expansion of housing, workshops, large factories and transport networks. The result is a complex intermingling of rural and urban, of modern commerce with occasional industrial dereliction, the whole creating a mosaic of disparate land uses with fragmented semi-natural habitats dispersed throughout.

The clays, sandstones and mudstones of the Carboniferous Coal Measures give rise to mainly poor soils which traditionally supported pasture, but now there is more mixed farming. Arable cultivation is more common on the better soils to the north and east, while permanent

pasture is more frequent on the higher land to the west, with some stretches of relatively unspoilt pastoral landscape to the west. One particular local speciality is early forced rhubarb, which is produced in the 'rhubarb triangle' between Rothwell, Morley and Wakefield.

The Coal Measures are a mixed farming area. All arable and horticulture cropping represents 34 per cent of the holdings and livestock holdings represents 34 per cent. Holdings classed as 'other types' made up almost a quarter of the holdings in 2009. This was an increase from 18 per cent in 2000. These holdings mainly include those with only horses, with only grass or fodder crops or with only fallow and buildings. Due to the extensive urban areas, only 41 per cent of the total area is cultivated, and there are significant urban fringe issues. There has been a significant drop in dairy holdings; 168 in 2000 down to 93 in 2009. In 2009 almost half of the land was put down to grass or was uncropped (49 per cent), with one third cultivated for cereals (34 per cent). This land use pattern has been fairly stable over the past decade, with small increases in oilseeds and other arable crops which may be due to their relative market prices.

Overall field size and pattern is very variable, reflecting medieval clearance from woodland, the piecemeal enclosure of medieval strip fields, the importance of miners' and weavers' subsistence plots and, in contrast, late 18th- and early 19th-century enclosure of commons. As a result of the expansion of farms (especially since 1950) and peri-urban influences, there are few areas where the field patterns remain intact. Field boundaries vary from thick well-maintained hedges to close cropped or neglected hawthorn hedges and post and wire or post and rail fences.

In some areas broadleaved woodland creates a robust framework of calm, green backdrops to otherwise poor-quality development. Woodland is most notable on poorer soils on steeper slopes and in areas where concentrated planting has taken place. Pockets of Ancient Semi-Natural Woodland provide, through their well-developed ground flora, a refuge for many plant and invertebrate species not found elsewhere in the county. These woodlands tend to be small and fragmented, and are found on poorer soils or steeper slopes.

Often woodlands lie within corridors leading in to urban areas. This proximity, of many small areas of woodland close to urban areas raises some pressure on these habitats from inappropriate recreational use. Appropriate management is necessary to stop degradation of the woodland habitats, ensuring diversity of structure and the retention of deadwood to support important assemblages of invertebrates.

There are few semi-natural habitats within this NCA, and those that do survive tend to be small and scattered, the most frequently occurring being wet woodland along the river valleys.

Major rivers crossing the area have carved broad valleys with fertile flood plains created by alluvial deposits. However, the ridges generally run northwest to south-east, almost at right angles to the natural west to east flow of the rivers. In practice this gives rise to a characteristic pattern in the valleys where the rivers flow north or south until weaker sandstone or geological faults are encountered, when they will abruptly change course to flow into the next valley. Only in the north of the Coal Measures has glaciation contributed to the shaping of some valleys such as the Aire Valley near Leeds with glacial till deposits around Bradford and Leeds.

Two major rivers, the Aire and the Calder, flow in wide valleys from west to east through the Coal Measures, to eventually flow into the Humber Estuary. The valleys contain a mix of alluvium and river valley deposits, a source of later historic industrial extraction. Outside the urban areas, where rivers flow within more natural river valleys, habitat restoration work has been undertaken which provide important areas of interlinking wetland sites such as those found within the Aire and Calder Valleys.

The industrial history of the area gave rise to a large number of canals that transported raw materials and goods, notably the Leeds Liverpool Canal and the Aire and Calder Navigation.

Seasonal flooding would have restricted early historical exploitation of the valley bottoms. Upon the higher ground of the Pennine Coal Measures the land was more conducive to agriculture. It is likely that there was sparse but permanent settlement here from the Neolithic period as multiple evidence from areas such as the Denby, Holdsworth and Almondbury suggests.

Later prehistoric and Roman evidence is even more numerous with evidence for several Iron Age enclosures, hillforts and major Roman settlements (see Keighley, J.J. 1981 for further information).

The early settlement pattern is marked by high to very high density of dispersal, with levels of nucleation increasing to the south. Hamlets to the north are typically set around commons and greens and farmsteads along trackways; early hall-church foci of settlements are another distinctive feature of the area. Industrialisation, especially in the late-18th and 19th

centuries, led to nucleation and expansion of some settlements. New settlements in the early 20th century developed around coal mines.

The number of settlements appearing in the Domesday Survey of 1086 is greater in this area than to the west indicating a modest population in the later Saxon period. Saxon estates may have provided the origins of modern townships. The early medieval landscape was probably a mosaic of woodland, crop land and pasture with scattered farms and a few small urban cores which became radically transformed after the 11th century into a patchworks of village centred open fields. The pre-industrial village pattern we see today was probably established by this time. The intermediate areas were filled with scattered farms and piecemeal enclosure. Stripfields surrounding towns and villages occur frequently and on a larger scale suggesting an arable based economy in these areas. The enclosure of the open fields, commons and the wetland ings occurred wholesale from the 18th century. The land today is predominantly grass with some crops and horticulture.

Historical sources suggest Anglo-Saxon settlement at Leeds (possibly *Campodunum*) and Tanshelf, near Pontefract, and a Saxon settlement has been found at Garforth. Surviving ridge and furrow, wayside crosses, bridges, medieval granges and monastic houses, for example, Bentley Grange, Myers Wood and Sandal Castle from medieval times, can still be seen. This includes evidence of extensive early coal mining and iron extraction shown by bell pits, some associated with woods and commons such as at Middleton Park and Sharlston. Some coppiced woodland still remains, and several moated sites are known.

This area contains some of the county's larger later medieval settlements. Wakefield was an important administrative centre. Bradford and Almondbury received market charters in the 13th century (Silson, A. 2003. 55).

As the name suggests, the Pennine Coal Measures contain vast coal fields providing a source of fuel which generated economies and provided power for industry. The combination of fuel supply, raw materials such as wool and improving transportation (roads, packhorse trails and rivers and later canals and rail) were amongst the main influences for this area's success in textile and other industrial manufacture during the industrial period. Some evidence of the deep mine collieries remains, along with tramways and gin circles.

Much of the area is dominated by the extensive towns and industrial activity, with mills and factories tending to be located along river courses. The once-active coal mining industry has now largely closed, with colliery sites and spoil tips graded out and restored to woodland and

pasture, so that just a few tips are still in evidence. More recent engineering, manufacturing and light industrial uses, as well as commercial and retail sites, have extended out from the urban areas. As a result there is a dense network of roads, including the M1 running north–south and the M62 running east–west, railways and canals. Warehousing development around motorway junctions is a recent feature throughout and has a significant impact on the overall character of the landscape.

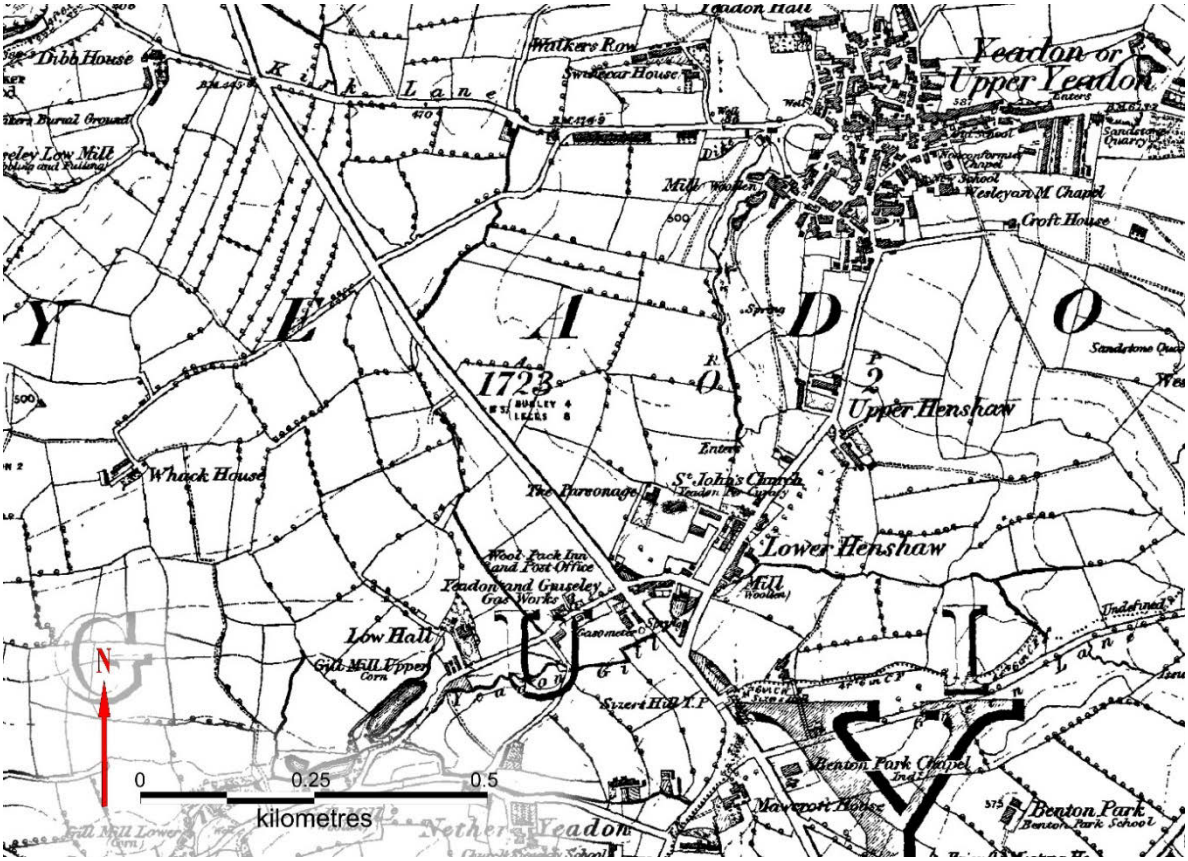

Figure 9. The rural landscape around Yeadon in the mid-19th century displaying a mix of enclosure types - piecemeal, strip and enclosed common (OS 1st Edition 6" map, 1848). © and database right Crown Copyright and Landmark Information Group Ltd (all rights reserved 2016) Licence numbers 000394 and TP0024

Historic buildings such as castle ruins, old churches, country houses and follies associated with country estates, and built with local sandstones, remain as important features and landmarks in the landscape. Many of the larger cities and towns, notably Leeds, Wakefield and Bradford, have striking urban centres, dominated by the grand 19th century architecture of their town halls, libraries, museums, schools and other municipal buildings, built with the wealth generated from mining, textile manufacturing and engineering. Industrial benefactors were responsible for many of these notable civic buildings, all constructed from local sandstones, as were some of the factories and mills.

Industrialisation in the 18th and 19th centuries led to nucleation of some settlements and development of mills, manufactories, workers' housing and associated infrastructure. Large country estates were built with the wealth generated from industry in the 19th century – some with medieval or Tudor origins – including Harewood House, Temple Newsam and Nostell Priory. On the northern edge of the Coal Measures there is an imposing 'model' village at Saltaire, now designated as a World Heritage Site, where mills, canteens, schools, hospitals, civic halls and libraries were built alongside terraced housing for workers.

To protect the heavy industries in the area during the two world wars in the early 20th century a number of anti-aircraft gun sites were established and one is now scheduled.

Magnesian Limestone Belt

The Magnesian Limestone Belt is a very long, narrow band stretching from Nottinghamshire in the south through north Derbyshire to North Yorkshire in the north. The limestone ridge runs roughly north to south and this elevation provides visual links to and from the lower-lying land to both the west and the east. It is not more than 13.5km at its widest point but extends along the entire eastern boundary of West Yorkshire.

The underlying Permian Magnesian Limestone forms a distinct but low ridge of land running north to south, cut through by rivers following some dramatic gorges. Towards the north the limestone is largely covered by drift deposits, so that the ridge is less obvious, but the whole area is unified by the widespread use of the local limestone as a building material. The well-drained soils and low altitude have given rise to a landscape of rolling landform, fertile farmland and well-wooded estates. The ridge forms an escarpment with a steep scarp face to the west and a gentle slope dipping to the east, elevated enough to give long views out over the more industrialised lowlands to the west and the farmed lowlands to the east.

The soils are free draining and very fertile, giving rise to productive arable cropping. The fields are generally large and geometric, bounded by low, flailed hawthorn hedges, although stone walls do also occur, for example as estate boundaries and in villages. Hedgerow trees are infrequent, which adds to the open character of the farmed landscape, and the hedges often emphasise the rolling landform.

Field boundaries are usually low, flailed thorn hedges although stone walls built of local limestone also occur in some places, as estate boundaries and around villages. Post and wire fences are also much in evidence.

Open field farming was extensive until late 17th century, after which the present day pattern of large scale fields, regular and geometric, was established. In places the hedges go over the low hills, emphasising the smooth, rolling landform. Smaller field patterns, dating from earlier periods of enclosure, also occur, for instance as strip fields around Pontefract. This is a highly productive area dominated by arable cropping, producing cereals for the quality and feed markets. Agricultural production is focussed on cereals (37 per cent of holdings) and other arable cropping, with some livestock rearing, including pigs and poultry (totalling 20 per cent). There has been a decline in dairy farms over recent years.

Woodland cover is reasonably high overall, often owing to the trees and woodlands in the grounds of the many large country houses that were established on the ridge plateau. Historical evidence suggests that woodland cover is currently higher than at the time of the Domesday Book records. Many are plantation woodlands, but oak, ash and lime typically form the canopy of deciduous woodlands. The few remnants of ancient woodland in this area have a particular abundance of the nationally scarce large-leaved lime.

The designed parklands and gardens, supported by estates, are a major influence on the landscape. With their extensive areas of woodlands, plantations and game coverts, in places they give the feel of a well-wooded landscape. Designed parklands include Bramham Park and Lotherton Hall.

Semi-natural habitats are limited and fragmented. Of particular note are the small areas of Magnesian Limestone (calcareous) grassland, which is characteristic of this landscape.

The river valleys that cut through the limestone ridge are picturesque, with some dramatic gorges with overhanging woodlands (Wetherby). The rivers continue to play an important role in connecting the industrial towns to the west with the Humber and the North Sea to the east. Historically the rivers were important transport corridors. Along some valleys, such as the Aire, there are widespread industrial influences including evidence of mining spoil, power lines, railways, roads, subsidence depressions and ings where sand and gravel have been extracted (such as at Fairburn Ings, now an RSPB Nature Reserve).

The light and fertile soils of the ridge favoured settlement in this area at the onset of farming around 4,000 BC. The Magnesian Limestone area probably provides the best evidence for prehistoric settlement in the county from the late Neolithic period. Crop mark surveys and other work in this area have revealed extensive prehistoric evidence throughout and include

henges, barrows, trackways, domestic enclosures, hut circles and fields (Berg, D, Deegan, A and Roberts, I. 2010).

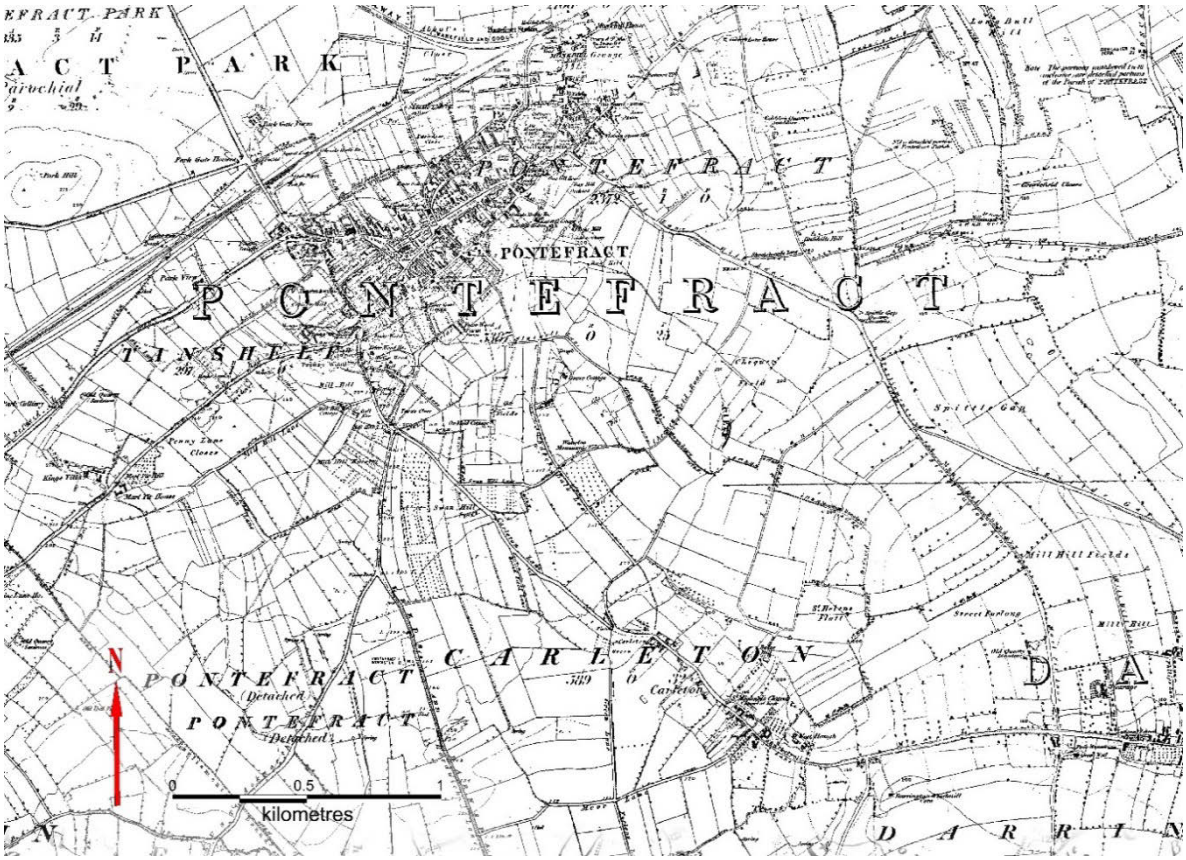

Figure 10. Strip fields in the Pontefract district (OS 1st Edition 6" map, 1849), © and database right Crown Copyright and Landmark Information Group Ltd (all rights reserved 2016) Licence numbers 000394 and TP0024

There is evidence that, from the Iron Age to well after the end of the Roman occupation, there was increased agricultural exploitation of the area with the use of ditches and banks to define settlements, stock pens, fields and tracks. In this period, the landscape had probably been cleared of much woodland and was occupied by single, quite widely spaced farmsteads with their associated field systems and ditched trackways leading outwards to the open pastures and woodland. Examples of important defensible hill forts remain from this period, such as at Barwick in Elmet.

The Roman occupation had a major influence on the landscape as the ridge was a favoured location for the making of Roman roads along with military camps and settlements (Castleford). The routes, later to become known as Ermine Street and Dere Street, were the basis for much of the route of the modern A1 which has a significant influence on the landscape today. The A1 (based originally on a Roman road) follows the slightly higher land

of the limestone through much of the Magnesian Limestone Belt, linking settlements such as Wetherby and Castleford. Several towns have grown up around the crossing points of the main rivers. Small nucleated villages are characteristic of the ridge, as well as larger villages such as Boston Spa and Aberford.

Arable-based open field farming, probably developed in the later Anglo-Saxon period, was extensive until the late 18th century, after which the present day pattern of large-scale fields and some dispersed farmsteads was established. Earlier small-scale and irregular enclosure patterns can still be seen around some villages.

Settlement has remained largely rural with the exceptions of Pontefract, Castleford, Knottingley and Wetherby. These were significant settlements in the medieval period. Wetherby, with its small castle received a market charter in 1240 (Silson, A. 2003. 55). Pontefract with its major castle was the largest town in West Yorkshire in the middle ages but remained small until the 19th century compared to other West Yorkshire market towns.

Wealthy landowners have also had a notable influence on the landscape by means of the fine buildings and designed parklands that they created from the 16th century. The wealth and resource includes a chain of country houses and designed parklands which runs along the ridge such as Bramham, Ledston and Lotherton to the east of Leeds, with later estates based on the industrial wealth earned from surrounding areas. Some of these houses, parks and estates were created by wealthy industrialists involved in coal mining and textile manufacture in areas to the west during the 18th and 19th centuries.

Former colliery communities such as Kippax, Garforth and Micklefield occur towards the south of the Magnesian Limestone Belt, where the Coal Measures were more easily accessible. Most of the settlements have more in common with the traditional former mining towns and villages lying to the west and grew up to service the large industrial towns. Only a few are rural limestone villages, with red pantile roofs. Limestone buildings can be found in towns such as Wetherby and Boston Spa, in the villages and isolated large farmsteads, and in estate boundary walls. These contrast with the later factories and terraces of workers' housing in urban areas which were built in brick with slate roofs.

Part 2: Methodology

2.1 Overview

Historic Landscape Characterisation (HLC) is a historic environment management tool, developed by English Heritage in the early 1990s and subsequently widely applied across England and the rest of the United Kingdom. It developed from the pre-existing technique of landscape character assessment (LCA), used by landscape architects and land management agencies to assess current landscape and land use. It is an approach and a process that recognises that the landscape itself can be historic (in addition to any historic features within it).

Recognising the historic character of a landscape is intended to allow the landscape, rather than just landscape features, to be managed and protected within spatial planning processes. Some landscapes had previously been recognised for their particular value, but this had often been for aesthetic or ecological reasons. The intentions of the developers of HLC were to move away from a traditional focus on the identification of 'special' landscapes to be recorded in a national register, and towards an approach based on universal character of all landscapes, serving many conservation purposes (Fairclough, Lambrick and Hopkins 2002, 70).

As a philosophical approach, this treats landscape as material culture, not only as a palimpsest leaving traces on the present-day view, but as a resource with chronological depth. This meant that historic depth and character could be incorporated into the pre-existing process of general landscape assessment, at a time when 'There had been rapid and continual improvements in the ability to manage change to the historic environment at site, monument and building level but there had been little success in extending this work from sites to their wider landscape context or to the whole historic landscape' (Fairclough, Lambrick and Hopkins 2002, 69).

Our surroundings are dynamically changing; these changes are part of a long history of human influence on the landscape. In order to manage these changes it is important to have a good understanding of the evolution of the landscape that surrounds us. Characterisation is not about trying to prevent change but about ensuring that decisions are made on an informed basis, ensuring that areas retain their local distinctiveness. It can be used alongside other systems of heritage management, such as Listing and Scheduling of buildings and archaeological sites. It gives a background to such sites and buildings, drawing them into a wider landscape perspective.

Historic Landscape Characterisation involves applying to aspects of landscape a long-established archaeological and historical method, the classifying and interpreting of material through identifying and describing essential or distinguishing patterns, features and qualities, or attributes. The sources used when doing this are comprehensive and systematic, like modern and historic maps or aerial photographs.

More detailed understanding of small parts of the historic environment, obtained through techniques like *landscape survey*, *analytical survey*, *geophysical survey*, *excavation*, *architectural investigation* and various forms of documentary and cartographic research is then applied to the types identified to extend that generalised understanding.

Characterisation typically covers the whole of an area quite rapidly in order to support a range of partners. They may use characterisation to support management, enjoyment, protection and planning, or to stimulate more detailed research.

In practical terms, Historic Landscape Characterisation data can be used for:

- Planning applications and development strategy.
- The conservation and management of heritage sites and landscapes.
- Academic research and local study.
- Community projects and initiatives.

The material is usually recorded and displayed as polygons on a Geographical Information System (GIS) with information on attributes stored in an attached database that allows queries to be made which then produce maps and other material, as required.

Characterisation has been applied by and for Historic England to landscape, the sea, towns and cities and particular types of complex. Characterisation may also be used to model other aspects, such as change (or constancy), present and past activity levels, and the sensed qualities of place, such as sound and smell.

The characterisation approach is closely linked to the development and application of the European Landscape Convention, which has landscape as an area perceived by people. Ways of valuing place vary between individuals and communities and change over time, so fixed measures of significance are not applied to the characterisation material. Instead the attributes that support it can be assessed and evaluated as different issues affect places.

County-wide and sub-regional Historic Landscape Characterisation (HLC) projects form part of a national programme supported and developed by Historic England (formerly English Heritage) but carried out by local government, chiefly by historic environment services that maintain Historic Environment Records (HERs). They aim, through a desk-based programme of morphological analysis and GIS mapping, to achieve an archaeologist's understanding of the cultural origins and historical development of the current landscape. They seek to identify material remains at landscape-scale that record the human activities which have generated the characteristics of the present landscape.

2.1.1 General Principles of Characterisation

- Largely desk-based recording methodology.

- Record 'character', i.e. what it looks like not what it is used for.

- Study ALL of the landscape not just 'special areas'.

- Value neutral – all aspects of the landscape are given equal weight

- Present, not past - records the current landscape, but with reference to past processes by which it came to look as it does today

- "Broad-brush" approach to historic characterisation of the urban and rural environment.

- The landscape is categorised into 'broad' character types, which are subdivided into 'narrow' HLC types. Attributes are recorded for each *broad type*.

- Outputs include a GIS map, linked with a database that contains additional information.

Urban Historic Landscape Characterisation (Metropolitan HLC)

HLC is now a fully GIS application, with an increasing level of complexity of databases, either linked flat files or incorporating geodatabases (object-oriented). The methodology is developing and maturing with greater experience and breadth of application. GIS also enables digital combination of HLC data with other datasets. A wide variety of outputs can be created, not just custom coloured maps creating schematic or thematic maps at various scales, but also analysis and statistics, which in turn generate charts and graphs, based on the underlying databases of information supporting the GIS mapping of HLC. There is increased flexibility and interoperability of systems, not only between GIS software but with other standard PC software. This facilitates data exchange and use. Consequently the HLC approach is under constant change and development in response to changes in thinking, political drivers and pressures, in parallel with improved GIS technology and data in order to create a better application and also one for wider and specialised use.

HLC was originally intended to be a technique used in rural, or largely rural, settings – the first application of the technique was in Cornwall, one of the least densely populated counties in England. HLC works well in a rural environment, where land parcels are easily distinguished by field boundaries that often themselves have considerable chronological depth, reappearing on successive maps. The English Heritage-led HLC process only began to be applied to the major urban centres in the Midlands and North of England in the first decade of the 21st century (Quigley & Shaw 2010, 27).

Urban Historic Landscape Characterisation is possible, using essentially the same methodologies as applied in rural contexts, using generalised character types and particular character areas or zones. Given the density of historic construction in urban areas, considerable additional data can be gathered and integrated, such as georeferenced photographs of buildings, although Quigley and Shaw (2010, 48) identify a series of key differences that exist between rural and urban areas that would need to be taken into consideration when designing urban HLC projects – there is a wider diversity of urban landscapes, which have had more complicated (recent) evolutions; the role of buildings and their reuse; and the abundance of linear transport features.

Historic England (and its predecessor English Heritage) has been supporting a wide range of survey work in historic towns, cities and suburbs. Three approaches have been developed,

all of which involve historic characterisation - Extensive Urban Surveys (EUSs), Urban Archaeological Databases (UADs) and, more recently, Urban (or Metropolitan) Historic Landscape Characterisation. The results of these projects can be used for a wide range of purposes, including strategic planning, development management, Conservation Area designation, appraisal and management, and research.

The major conurbations of England (those formerly covered by 'metropolitan' county councils) have recently been covered by 'Metropolitan' Historic Landscape Characterisation. The method is exactly the same as for rural landscapes, but the projects employed character types which are appropriate to the urban character of the area, and are at a larger scale that reflects the complexity of urban development.

Most of the major conurbations (such as Birmingham, The Black Country, South Yorkshire, Merseyside, Greater Manchester and Tyne & Wear) have now been covered by such projects, and reports and data are available on-line through the Archaeology Data Service.

2.1.2 Additional Principles Derived from Recent HLC Projects

Recent HLC projects have attempted to:

- Record the legibility of earlier landscape types; the amount by which earlier landscapes are visible in the present landscape.

- Record levels of certainty that the categorisation is correct.

The West Yorkshire Historic Landscape Characterisation Project (WYHLC)

West Yorkshire is an area of diverse landscape character including open moorlands, agricultural countryside, medieval villages, market towns, and the expanding metropolitan centres of Leeds, Bradford, Wakefield, Halifax and Huddersfield. The area now represented by the West Yorkshire sub-region was from medieval times part of the West Riding of Yorkshire. In 1974 the West Riding County Council was abolished, and the West Yorkshire sub-region was constituted as a separate Metropolitan County, which was itself dissolved twelve years later and replaced by five unitary authorities. These authorities are the Metropolitan Districts of Bradford, Calderdale, Kirklees, Leeds and Wakefield. Their combined area is over 202,000 hectares, and their total population is over 2.1 million.

The West Yorkshire HLC forms part of the ongoing and evolving national characterisation programme initiated by Historic England (English Heritage), justified 'by the need for improved understanding of the historic dimension of the landscape in order to help manage change in the whole archaeological and historic environment resource' (Fairclough, 2002). There have been several HLC projects carried out that have looked at both the rural and urban landscapes of a region. This combined approach which has been adapted for West Yorkshire, removes the artificial divide between rural and urban landscapes. An advantage of this approach is that it allows rural industrial and agricultural activities to be assessed alongside the development of the towns where the industrial work force lived.

2.1.3 Sources of Information

Characterisation is largely a desk-based survey that uses a range of sources including maps, the West Yorkshire Historic Environment Record (WYHER), Google Earth and Google Street View. The core of the analysis is based on a sequence of the Ordnance Survey 1:2500 and 1:10560 scale maps. Finer detail Town Plans at 1:500 (1851) and 1:1056 (1890) scales were used for urban centres. A range of unpublished maps, aerial photographs, documents and digital sources were also used. A list of all sources used appears in Part 6 (Appendix and Sources).

2.1.4 West Yorkshire HLC Methodology

The West Yorkshire HLC Project methodology is largely based on the methods used in South Yorkshire. There are significant similarities in the landscapes and industrial activities within these two regions that justified this approach.

The South Yorkshire HLC methodology was initially based upon the accepted best practice defined by the 2001-2 National HLC Method Review (Aldred & Fairclough, 2003), and also through consideration of other HLC and EUS projects. This methodology follows all of the general principles outlined above.

One of the advantages in maintaining consistency in recording methodology between South and West Yorkshire is that it allows researchers and developers to carry out research across more than one administrative area. This is particularly important for the textile industry, which is significant in West Yorkshire and the north of the South Yorkshire area.

Defining Polygons

The basic unit of analysis is the HLC polygon – each polygon covers a discrete geographical area containing a particular combination of HLC attributes that can be assigned a single historic landscape character type. Through the analysis of HLC attributes, polygons are assigned a single historic landscape character type, forming the basic building blocks for HLC. These units are not equivalent to Landscape Character Assessment 'character areas', because they are can recur in different areas. Like Character Areas, however, although much smaller in size, they will usually be defined – as described below in more detail - by one or more predominant attributes in the midst of combinations of other attributes, rather than being wholly homogenous, monolithic or single-theme. HLC polygons are defined as groups of modern land-parcels, each group possessing in general the same historic landscape character – in other words, the character of defined polygons will be heterogeneous, not homogenous but generalised. Minor diversity was overlooked in favour of the broad picture.

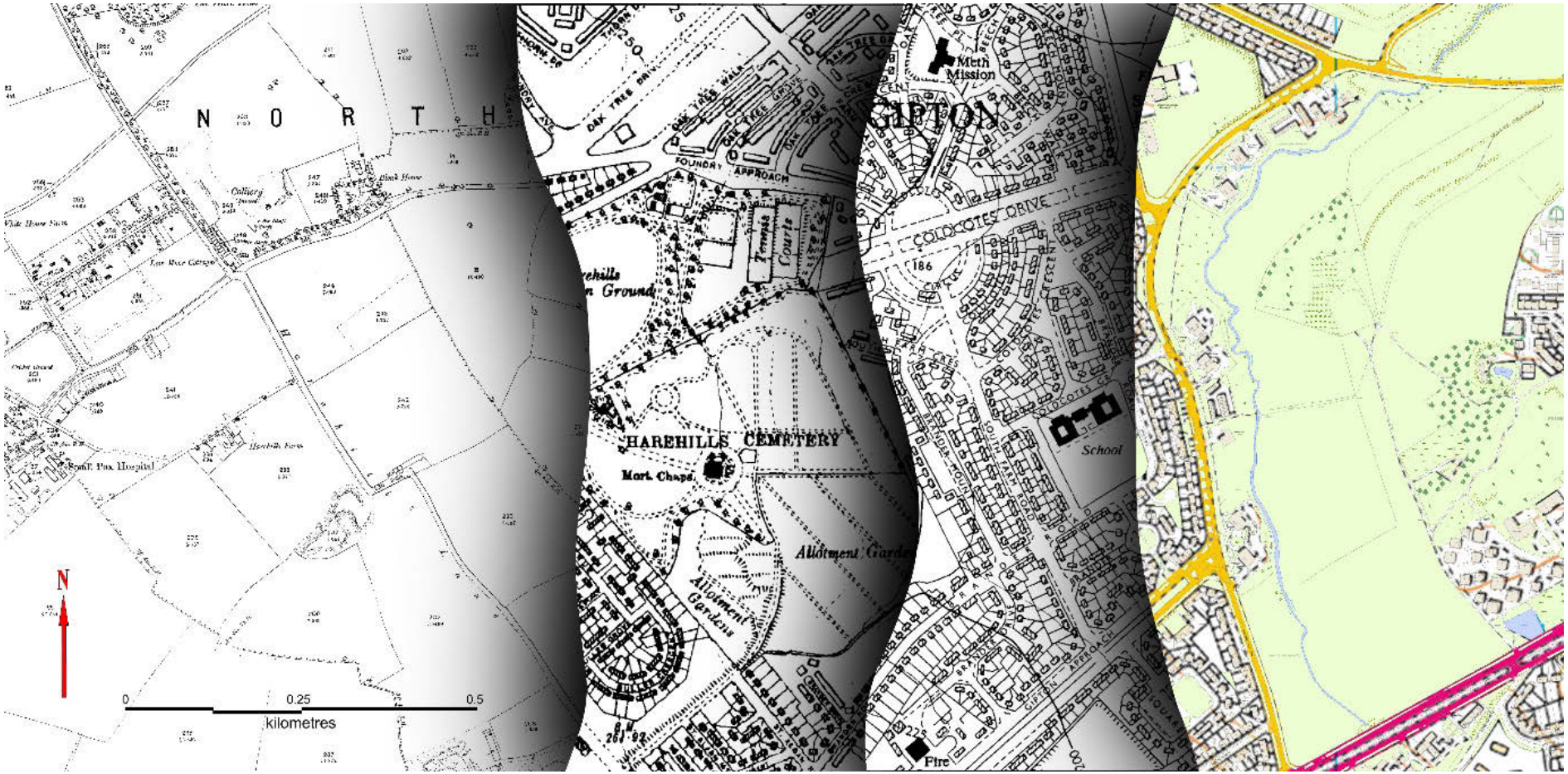

Figure 11. Polygon Creation Method. Use of overlaying historic map layers to provide time depth for the same point on the map (maps shown - OS 25" 2nd Edition c.1894, OS 4th Edition County Series 1948, OS 1st Edition 6" Imperial National Grid 1948 to 1978 and MasterMap© 2013

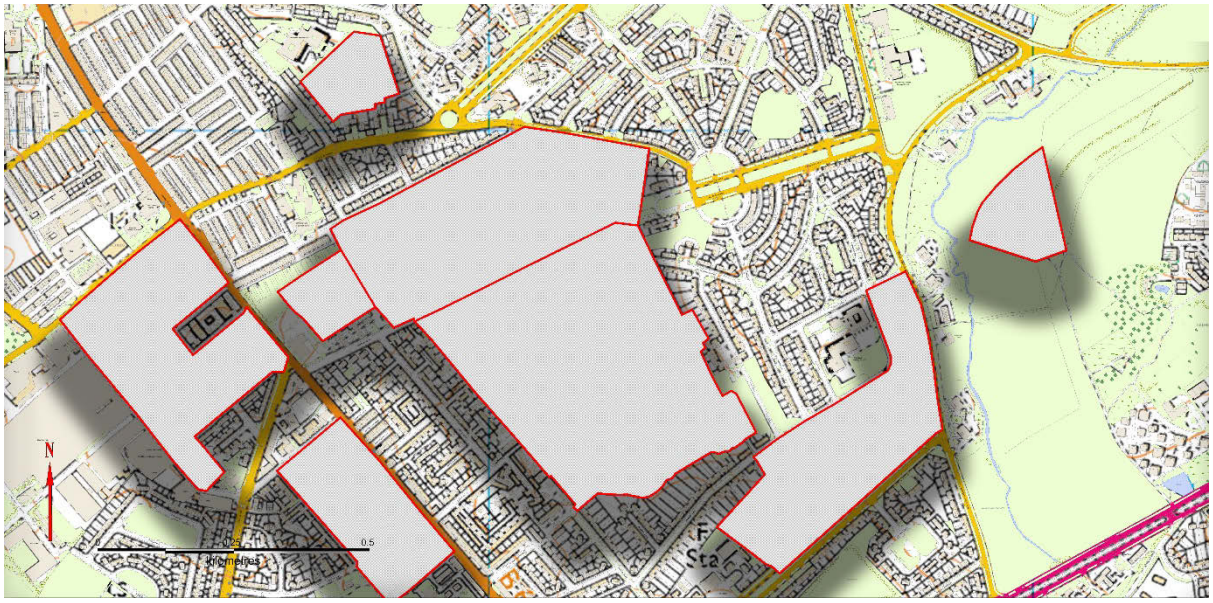

Figure 12. Character Areas Construction. Character areas are selected based on a pre-set glossary and defined as geographic regions (HLC polygons)

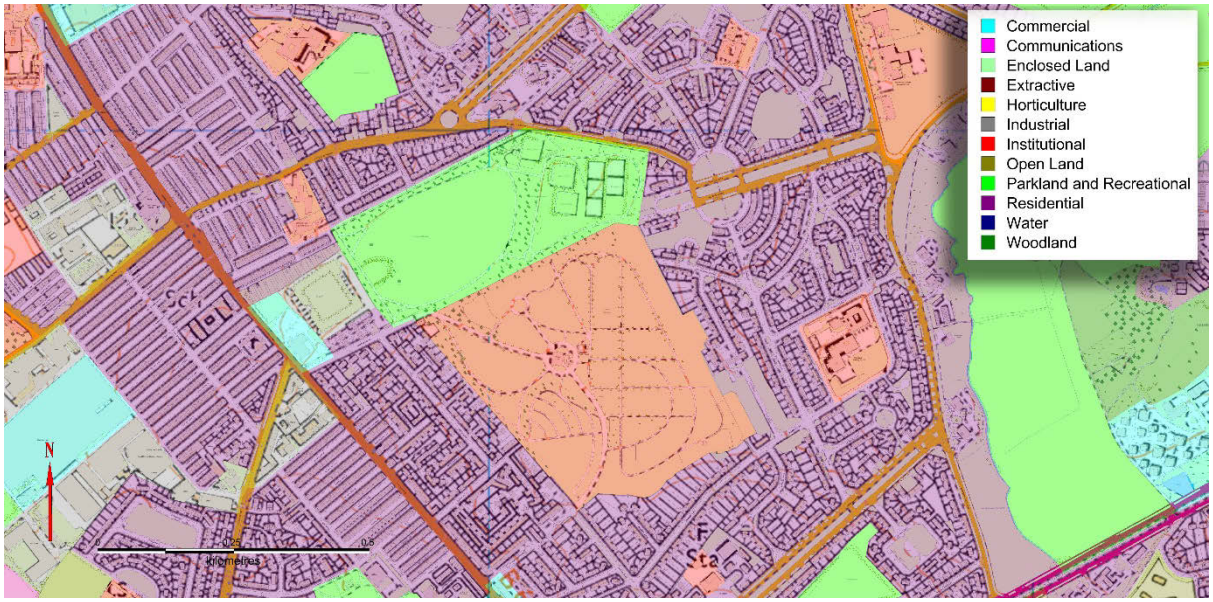

Figure 13. Character Areas. The entire landscape is characterised this way

Polygonisation Principles

- The whole of the West Yorkshire area was to be polygonised, without overlaps or gaps.

- Avoidance of cutting through current buildings, street patterns or field patterns unless there was the need to draw out patterns in the previous landscape or unless they straddled a district boundary.

- Adhere to district boundaries, trimming each polygon to each district boundary and then copying the polygon if necessary (not necessarily keeping to township boundaries where there are areas of shared character which straddled the boundary).

Transport Links

- Polygons were drawn based on the changes in the current or previous landscape character. However, where significant transport links cut through an area of a single character, the polygon was split and the record copied for each side of the transport link.

- Within the modern landscape polygonisation up to motorways, main trunk roads (green or orange roads on Google maps), canals, navigable rivers and railways. The edge of the polygon runs along the centre of the transport route.

- Urban areas motorways and major ring roads are polygonised where they cut through the previous street pattern. If an earlier road is later significantly widened this was generally not polygonised.

- Where railways or canals are no longer extant, polygonisation up to the former course of the transport link. This was also be the case for the course of any known packhorse routes, Roman roads or salt routes.

Dispersed Rural Settlement

- Separate polygons for clustered residential properties that are associated with a village name, or for known shrunken settlements.

Dates

- There should be no overlaps or gaps between the date ranges for Broad Types.

- All HLC records have a past type starting in 1066 or earlier. This is an arbitrary ‘medieval’ date.

- Where specific dates of origin for a particular landscape type are available these were used. The certainty box was only be ticked when there is evidence for a specific date of origin, not just the first map a landscape is seen on.

- For 19th to 21st century landscapes, map dates were used when there is no other dating information.

- When there was no specific evidence, the dates were designated according to generalisations outlined in the HLC definitions (see Date of Origin below).

Database

Each polygon has a number of attributes that are recorded in the project database. These include information about the polygon's location, 'interpreted' information about present and historical landscape character, and more 'objective' morphological observations of polygon features.

The project employed MapInfo v.11 (updated to v.12.5 by December 2015), linked to an in-house developed SQL database. The database has one core table that is split into a series of tabbed screens. The database allowed the landscape to be recorded as one of 12 Broad Types (see later). These are subdivided into 109 HLC types (see later). Each Broad type is associated with a number of attributes.

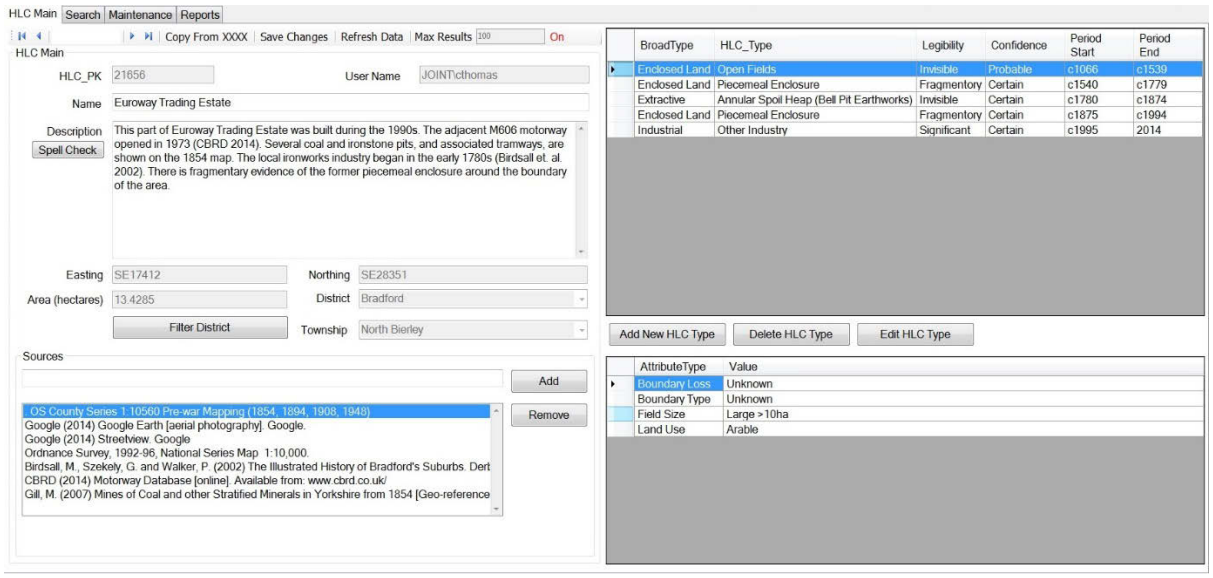

Figure 14. HLC Database Spreadsheet

Broad Types and HLC Types

As indicated above, the characterisation process begins by identifying physical patterns in the present landscape - from maps, plans and aerial photographs. GIS polygons are then drawn around areas with common characteristics; examples might include a large stand of ancient woodland, or an area of countryside featuring the characteristic straight boundaries of parliamentary enclosure. In urban environments each polygon may record a different type of housing layout, or a phase of industrial expansion. Each unique polygon is then allocated a 'Broad' character type. These 12 Broad Types can each then be subdivided into more specific HLC Types (109 in total). These lists evolved from the types stated in the initial project design, as further categories were found to be necessary in the early stages of the project. A complete list of Broad Types and their HLC Types, with scope notes, is found in Part 6: Appendix at the end of this report.

When a present-day polygon covered an area with more than one previous historic environment type, two or more polygons were actually drawn, to allow this difference to be highlighted. As the current historic character is the same, these polygons will have the same Broad Type and HLC Type but the database recorded the variation in past character. An example of where this might happen is when a large 'private housing estate' covers land that had previously been 'terraced housing' and 'allotments'; in these circumstances two polygons will have been drawn. The first polygon had a current HLC Type of 'private housing estate' with a previous HLC Type of 'terraced housing'. The second polygon had a present type of 'private housing estate' and a previous type of 'allotments'. This recording technique can be used to portray historic time depth, by allowing the categorisation of areas in the landscape using only features visible at specific periods of time, deconstructing the landscape and creating thematic HLC time-slices of these specific periods. This allows for general comparisons to be made about the development of the region over time (see Part 3: Themed Results).

Throughout the project, the *confidence* of decisions made about the historic character of each area has been recorded using the scale: *certain, probable*, *possible*. This has brought a degree of transparency into the characterisation process and allows general interpretations to be assessed on their likelihood.

Date of Origin

Each current character type and past character type recorded within the database is allocated a date of origin. With 19th and 20th century landscapes this will generally correspond to the earliest mapping that that character type is recorded on. Dates prior to the Ordnance Survey 1st Edition 6" to the mile mapping (c.1850) will have been given a specific date where this is known but will otherwise have been allocated a general date, depending upon the type of landscape involved. The dates 1066 and 1540 are typically used as the date of origin of medieval and post-medieval landscapes respectively; 1750 is often used for surveyed enclosure landscapes where no enclosure award data is known. These decisions were made based upon the specialist knowledge of the project officers. Where generalised dates are used, a measure of confidence in the dates should have been included; uncertain date ranges are qualified with a '?'. The inclusion of these generalised dates within the database allows 'estimated' pictures of past landscapes to be mapped.

Generalisations in dates and interpretation

The following generalisations were used where there was no other dating evidence:

Woodland

Spring woods/ Wood pasture

Used when 'spring' in name – refers to coppicing (Jones 2000: 53). Dated to 1066 to 1850 – Coppice management was the dominant form of woodland management until the mid-19th century when high forest plantation became common (Jones 1997, 48). Previously wood pasture when some other evidence, otherwise left as spring wood for simplicity - By the Domesday survey in 1086, there was unlikely to be any wildwood remaining in England. Woods were "part of the cultural landscape". Well wooded areas generally mostly wood pasture but there was coppicing (Rackham 1990, 55). Wood pasture ends 1540 – Coppicing replaced wood pasture as dominant woodland management in mid-15th century (Jones 1997, 48).

Wet Wood

'Carr' place name – wet wood (Jones, 2000: 53).

Plantation

'Plantation' on first edition maps of c.1850 is dated to 1825 – A time when oak prices were high because of the demand from tanners (Rackham 1990, 96).

Ancient Woodland

Irregular boundaries not fitting into later enclosure patterns, near parish boundaries or on steep slopes, valley sides or other land unsuitable for agriculture. (Kirby and Goldberg, 2006). Dated to 1066 for simplicity.

Enclosures

Assarts

Areas surrounded by woodland identified by placenames - *ley, hurst, feld, royd* (Rackham 1986, 82-3). Shaws – belts of deciduous woodland indicating clearance. Possibly retained for local demand for timber (Muir 2002, 24-5). Assarted woodland 1066 – expansion of rural population in early medieval period caused the establishment of new fields on former waste and woodland (Hey 1979, 72).

Open fields

Open fields are arbitrarily dated to begin at 1066 and end 1539. Enclosed strip fields begin 1540 – preserved pattern of strips may indicate enclosed by agreement gradually. Agreed enclosure occurred during 16th 17th century (Hey 1979, 72). By 1600 nearly half open fields enclosed (Jones 2000, 46).

Ancient enclosure

Farms on former waste. Association with early settlements. Small irregular enclosures, associated with single farmsteads. Ancient piecemeal enclosure is dated to 1066 - expansion of rural population in early medieval period caused the establishment of new fields on former waste and woodland (Hey 1979, 72).

Parliamentary/surveyed enclosure

Former moorland, from placename. Regular enclosure boundaries. Straight new roads especially across former commons. If a copy of the enclosure map was unavailable, the Parliamentary Award date of enclosure was used (if known). If very straight sided enclosures existed, but there was no date for the parliamentary award, then 1750 was used – most parliamentary enclosure occurred between the mid-18th to mid-19th century in Yorkshire (English, 1985: xi).

Open Land

Moorland

Majority of areas of known or suspected moorland lie in the west of the county. For land over 150m O.D, moorland is assumed to have developed by 43A.D. For land below 150m O.D, moorland is assumed to have developed by 1066.

Common

When common is used in placename generally use this as past HLC type. Common development date use 1066 (arbitrary date).

Extractive

Quarries

Small stone quarries with no known were ascribed a date of 1700 – By the end of the 17th century local stone used instead of timber as the most common building material in the west of West Yorkshire (Hey, 1981. English Heritage, March 2012)

2.1.5 Refinement of the South Yorkshire Methodology

Broad Types

The Broad Types were kept the same, excepting *Unenclosed Land*, which was renamed to *Open Land*. This term was used in the Black Country HLC project, and it was felt that it was a more accurate description of the character of landscapes within this category. These include small greens and disused industrial sites that can be described as having an open character, but are in fact enclosed. *Ornamental, Parkland and Recreational*, was changed to *Parkland and Recreational* for the sake of brevity.

HLC Types and Attributes

Some changes were just minor modifications of names to make the meaning more explicit, other changes are outlined below.

Communications

Train Station was amalgamated into Transport Interchange. Addition of Railway was only used as a past type where the current landscape follows the line of the railway through an urban area.

Enclosed Land

Land Use was added as an attribute as this was found to be important in the analysis of other projects. *Boundary Morphology* and *Pattern* were removed as it was felt that this was a duplication of information already implicit in the HLC Types.

Extractive

Since the extraction product is recorded within the attributes it was felt that *Deep Shaft Coal Mine*, *Open Cast Coal Mine*, Refractory Material Mine and Works and *Other Mineral Extraction and Processing* could become *Deep Shaft Mine* and *Open Cast Mine*.

Horticulture

Addition of *Rhubarb Farming* to draw out a locally important form of agriculture. It was felt unnecessary to record the presence or absence of glasshouses in the attributes or the *Field size*.

Industrial

The HLC Types within the Industrial Broad Type have altered the most from the South Yorkshire values. This partly reflects the need to draw out locally specific industrial specialisms, but it was also felt that improvements could be made to the structure of the categories.

Metal Trades (Light), Metal Trades (Heavy) and *Metal Trades - Support* become *Metal Trades*.

Brickworks/ Tile works was added for use in areas without associated extraction.

Water Powered Site was removed as it was felt that would be better recorded within the attributes of other industrial types with the addition of *Power* as an attribute.

Craft Industry was removed since there was overlap with metal trades (e.g. nail making) and textile trades (e.g. hand weaving).

Brickworks/Tileworks added for sites not associated with extraction

Food Processing, Engineering and *Paper/Printing* were added since these industrial fields were felt to be of too much significance for them to be combined within *Other Industry*. *Corn Milling* and *Brewery/Malting* can be identified within the attributes.

Institutional

Municipal Depot was thought to fit better in *Industrial* or *Commercial* HLC Types.

Open Land

Regenerated Scrub became *Derelict Land*, to more accurately reflect the nature of these sites. *Elevation* attribute was removed as it was felt that this was unnecessary data input.

Parkland and Recreational

Walled Garden was removed as it was felt these features should be recorded as part of an area of *Private Parkland*. The attribute *Building Size* was removed as it was felt to be unnecessary information.

Residential

Planned Estate (Social Housing) and *Private Housing Estate* were combined into the more general *Housing Estate*. Whether the development is privately built or social housing is now an attribute. This allowed private and social housing in all housing types to be identified. The range of options for recording *Private Open Space* were reduced since other projects showed that this level of detail was not possible within the scale that urban areas were recorded at.

Water Bodies

Artificial Lake was removed as these are recorded within private parkland or deer parks.

Woodland

Estate Woodland was added so that this could be more accurately identified in areas of private parkland. *Spring Wood* was removed and *Evidence of Coppicing* added as an attribute. This allows coppicing to be recorded within every woodland type. *Wood Pasture* was removed as it is rarely possible to differentiate from historic commons.

Structure of the Database

A key difference made to the West Yorkshire HLC project compared to South Yorkshire and other earlier projects is that *Legibility* and other attributes data was recorded for each HLC Type, rather than having one set of attributes for the record as a whole. This allowed more detail that could be queried within the database and GIS collected. Where a date was unavailable, attributes could not be filled in for previous HLC Types, but *Legibility* and *Certainty* could for all current and previous HLC Types. This allowed assessment of the confidence of each past type, and meant that specific landscape types could be assessed for their legibility in the modern landscape.

Attribute Data

By using an integrated database and GIS it was possible to attach a variety of attribute data to each polygon, allowing a variety of consistent attributes to be recorded quickly. Each Broad Type has a different selection of attributes, e.g. for 'Residential' Broad Types the following attributes are recorded: *Housing Density, Layout Pattern, Private Open Space, Public Spaces, Status,* and *Legibility; for* '*Open Land*' Broad Types, the attributes recorded are: *Elevation* and *Legibility.*

Of the various attributes recorded within the project database, perhaps the most important to discuss in detail is *Legibility*. This attribute was developed specifically for the West Yorkshire project, as a way to describe how much of a former landscape survives, and can be read, within the present landscape. Examples might include former field boundaries preserved as garden boundaries within a housing estate, or industrial features, such as spoil heaps, surviving within an area now dominated by public recreational use. The extent of such

legibility is recorded as *Significant*, *Partial*, *Fragmentary* or *Invisible*, depending on the ease with which such remains can be read in the modern landscape. Legibility refers to former historic character types recorded within the database for an individual polygon; details on the previous character type referred to should be documented within the database's description field. For example, legibility for the current landscape was always recorded as *Significant*. Where Cropmark evidence alone was used to assign a past HLC type, the legibility was recorded as *Fragmentary*.

2.1.6 Project Design

The West Yorkshire Historic Landscape Characterisation Project (WYHLC) was separated into four distinct Stages:

Stage 1 Pilot study which involves Familiarisation and Refinement of Project Methodology through mapping Pilot areas

Stage 2 Characterisation, Mapping Character and Digitisation

Stage 3 Review Analysis and Interpretation

Stage 4 Report, Archive and Dissemination

Stage 1. Pilot Areas (PILS) and Kirklees District

The original West Yorkshire HLC Project Design covered the setting up and framing of the West Yorkshire HLC project as a whole, but in terms of digitisation was focused on five sample (Pilot) areas and the complete digitisation of Kirklees District. Kirklees had been chosen because it has a very wide mix of industrial, urban and rural landscapes and therefore probably the best District in which to identify and address any methodological issues not picked up in the sample areas.

The five Pilot Areas (PILS) took the form of 5km x 5km squares, representing in total a 6% sample of the whole sub-region:

1. *Pontefract* – a borough and administrative centre since late Anglo-Saxon times on the eastern margin of the Coal Measures, now in Wakefield District. It is surrounded by nucleated villages formerly supported by developed open-field systems. It saw some development as a textile manufacturing centre in the 19th century but remains a distinct 'island' of urban development in a rural setting.

2. *Holbeck, Hunslet, Beeston and Middleton* – areas of former heavy manufacturing and extractive industries with associated housing and infrastructure, part of the Leeds conurbation south of the river Aire. Only the southern fringes of area retain any rural attributes, and the northern industrial and business parts have been subject to urban redevelopment over the past 15 years, transforming their character once more. This pilot may also provide an opportunity to benchmark the more detailed characterisation of part of central Leeds carried out with support from English Heritage's regional staff.

3. *Liversedge and Mirfield* – groups of dispersed settlements on the north side of the river Calder in Kirklees District, in the central part of the Coal Measures. These became heavily industrialised and semi-urbanised in the 19th century, and have a tendency to merge together at certain points although enclosed fields (including former core townfields and commons) are interspersed between the more developed parts.

4. *Haworth and Oxenhope* – groups of dispersed settlements on the Millstone Grit to the west of Bradford that saw some textile mill development in the valley bottoms but retained a broadly rural character, with relict core townfields surrounded by extensive anciently enclosed irregular fields as well as more regular fields enclosed from commons. Some abandoned farms in Oxenhope survive as relict landscape features.

5. *Halifax* – a once-insignificant settlement that established itself as one of the principal commercial centres in the north of England in the later Middle Ages, as the focus of Calderdale's domestic textile industry. The phenomenal growth of this industry in the 15th to 17th centuries accounts for the District having the greatest density of Listed buildings outside London, in the present town and in the surrounding clothiers' hamlets.

The sample areas were chosen to enable 'calibration' of polygonisation rates, and to confirm or refine estimates of the time needed to polygonise the whole sub-region (Stage 2). The project design envisaged the 'sample area' mapping being followed by the polygonisation of the remainder of one of the Districts, Kirklees, and the dissemination of the results for the District.

The sample areas were selected according to two criteria. The first resulted from a decision to sample areas of equal size from each of the Metropolitan District areas. This was to enable officers of each of the five District Planning Departments to familiarise themselves early on in the project with the products of the full polygonisation stage and their potential in terms of both strategic planning and casework.

The second criterion was the selection of samples representing the widest possible range of landscape types. There are marked differences in settlement and land-use history across the sub-region, from the sparse scattering of dispersed settlements and mainly late enclosure in the Pennine uplands of the west, to the largely nucleated, formerly open-field villages of the east. The other dimension of this criterion is the extent to which urban development, or more generally industrial development and associated housing, overlies these differing 'base' settlement patterns. It should be emphasised that these areas were the minimum coverage required to make reliable estimates for the main polygonisation stage.

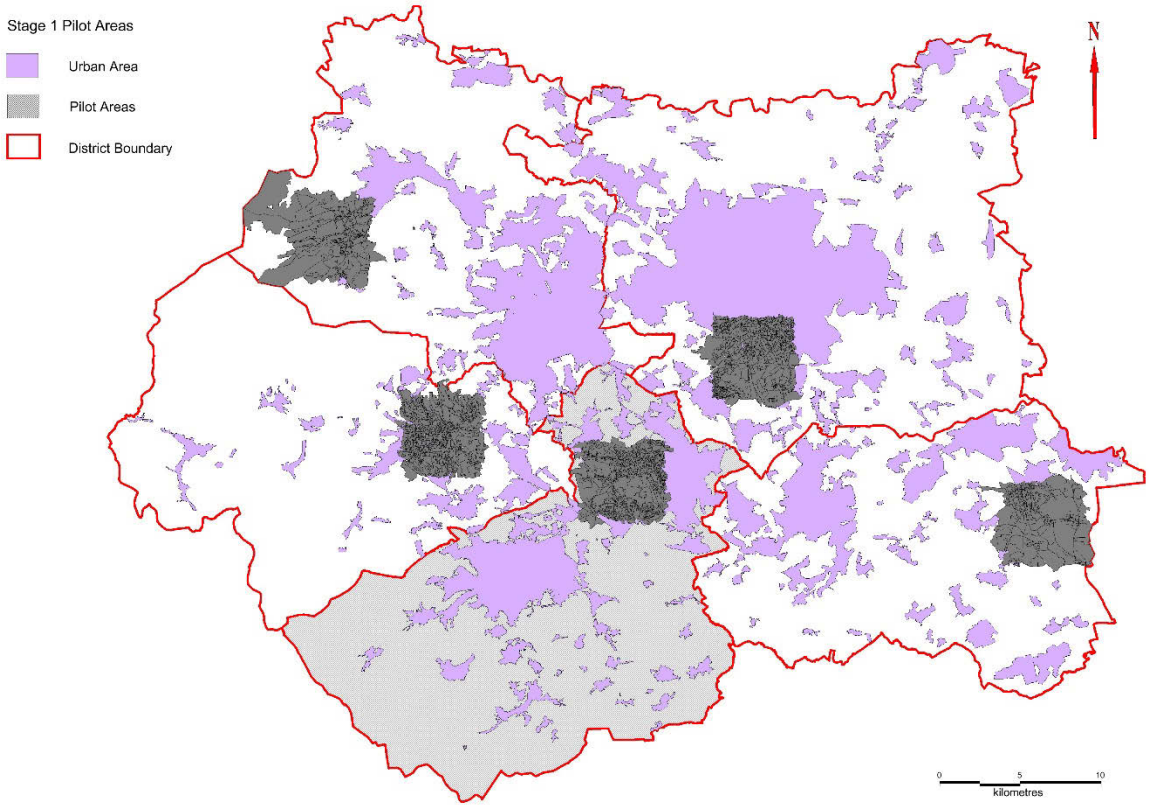

Figure 15. The Five Pilot Areas (PILs)

The key calculations used to establish the time requirement and therefore costs of the project were related to the size of the Districts and their breakdown into urban and rural hectares, given the significantly longer time required to create the (smaller) urban polygons as against the (larger) rural areas.

The following table (Table 1) quantifies those hectares that were polygonised in the PILS stage of the project (sample areas and part-characterisation of Kirklees District), and the urban and rural hectares for each of the remaining four Districts outside the sample areas (*nb* the area polygonised for the PILS sample areas was in excess of the 12500 hectares apportioned. The actual total was 14742 hectares, representing a 7% sample of the total area).

District	Total (ha)	Pilot Sample (ha)	Total Urban Area (ha)	Urban Area Done (ha)	Urban Area Left (ha)	Total Rural Area (ha)	Rural Area Done (ha)	Rural Area Left (ha)	Total Area Left (ha)
Bradford	36520	3730	10610	272	10338	25910	3458	22452	32790
Calderdale	36280	2625	4340	1306	3034	31940	1319	30621	33655
Kirklees	40720	2695	9925	5259	4666	30795	25688	5107	9773
Leeds	54990	2802	18570	1927	16643	36420	875	35545	52188
Wakefield	33750	2890	8836	574	8262	24914	2316	22598	30860
Total	202260	14742	52281	9338	42943	149979	33656	116323	159266

Table 1. Pilot Project (PILS) Statistics

These figures enabled a calculation to be made as to the time requirement for polygonisation of urban and rural hectares in each District sample area, and the requirement for the remainder of each District.

The calculations as to the average size of urban and rural polygons, and rates of polygonisation are set out below (for the five sample areas and completed parts of Kirklees District only). The figures in Bold are those estimated for the main stage of the project, based on the experience of polygonising the sample areas. In brackets are the estimates which were incorporated in the PILS project design, based on the final South Yorkshire figures (*nb* in South Yorkshire, the average rate of polygon generation was been 7.23 polygons per day per project officer, and the average size of polygons was 6.39ha in urban areas, and 54.12ha in rural areas):

District	Urban Area Done	Number of Urban Polygons	Average Urban Polygon Size	Rural Area Done	Number of Rural Polygons	Average Rural Polygon Size
Bradford	272	245	1.11	3458	252	13.72
Calderdale	1306	958	1.36	1319	323	4.08
Kirklees	5259	3222	1.63	25688	664	38.69
Leeds	1927	1202	1.60	875	162	5.40
Wakefield	574	298	1.93	2316	144	16.08
Total	9338	5925	1.53	33656	1545	15.60

Table 2. Average Size of Urban and Rural Polygons, and Rates of Polygonisation

	MAIN estimate.	*PILS estimate.*
Average number of polygons created per day:	20.17ha	(7.23)
Average polygon size in urban landscapes:	1.53ha	(6.39ha)
Average polygon size in rural landscapes:	15.60ha	(54.12ha)

Average number of urban hectares polygonised per day:	39.26ha	(46.2ha)
Average number of rural hectares polygonised per day:	439.13ha	(391.3ha)

It was evident that the average sizes of both urban and rural polygons were significantly smaller than those estimated in the PILS project design, but the number of polygons created each day proved to be much higher than estimated. The average number of urban hectares polygonised per day was lower (almost 39.26ha) than the estimate of 46.2ha, but the average number of rural hectares polygonised (439.13ha) was much larger than estimated (391.3ha).

Stage 1 of the project was commenced on 4th April 2011. The original team consisted of John Lord (JL) and Jennifer Marchant (JM). JL & JM left the project in early February 2012, having completed the 5 pilot areas, partial polygonisation of Kirklees District (82% completed) and parts of Calderdale and Bradford District.

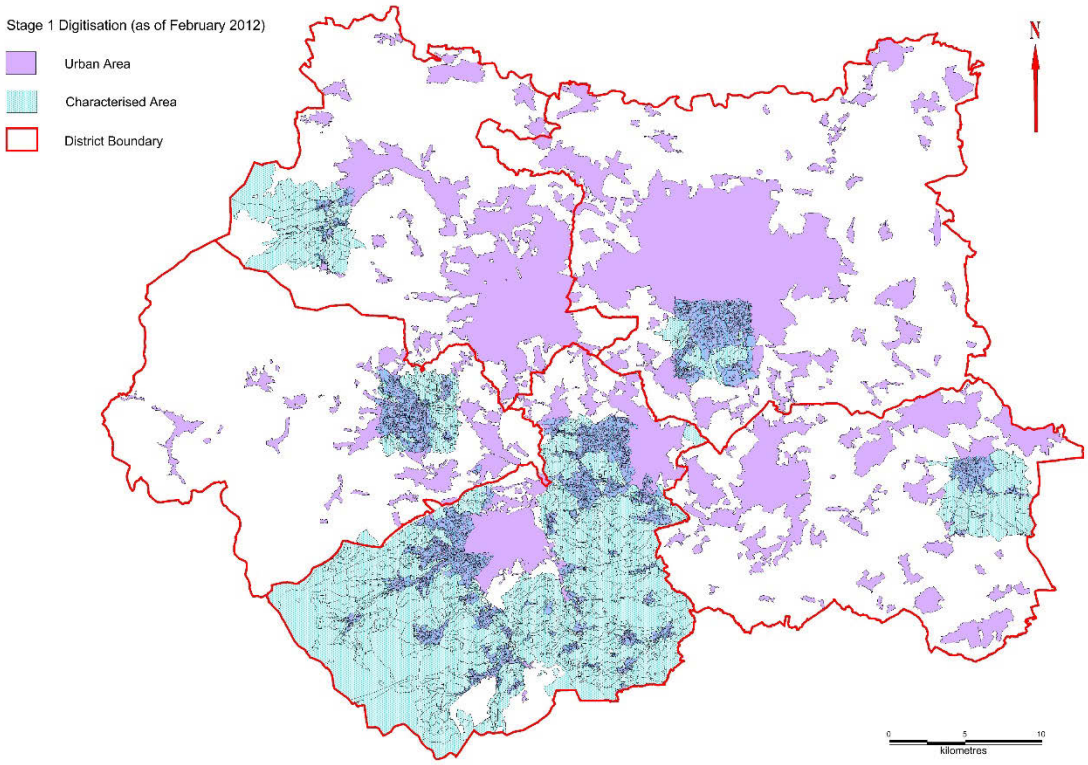

Figure 16. Characterisation at the end of February 2012

The project was suspended until the commencement of the replacement HLC officers, Christopher Thomas (CT) on March 12th and Edward Lewis (EL) on April 30th 2012.

Stage 1 was completed on Monday November 26th 2012. This represented a time-table slippage over the original project over nearly five months (including the time lost due to the absence of project staff after the departure of the original team). The remaining 18% of Kirklees District was predominantly urban in nature, with digitisation rates understandably reduced from the original PILS estimate. Furthermore, there was a corresponding decrease in polygon size for both urban and rural areas, but an increase in the number of polygons done per day.

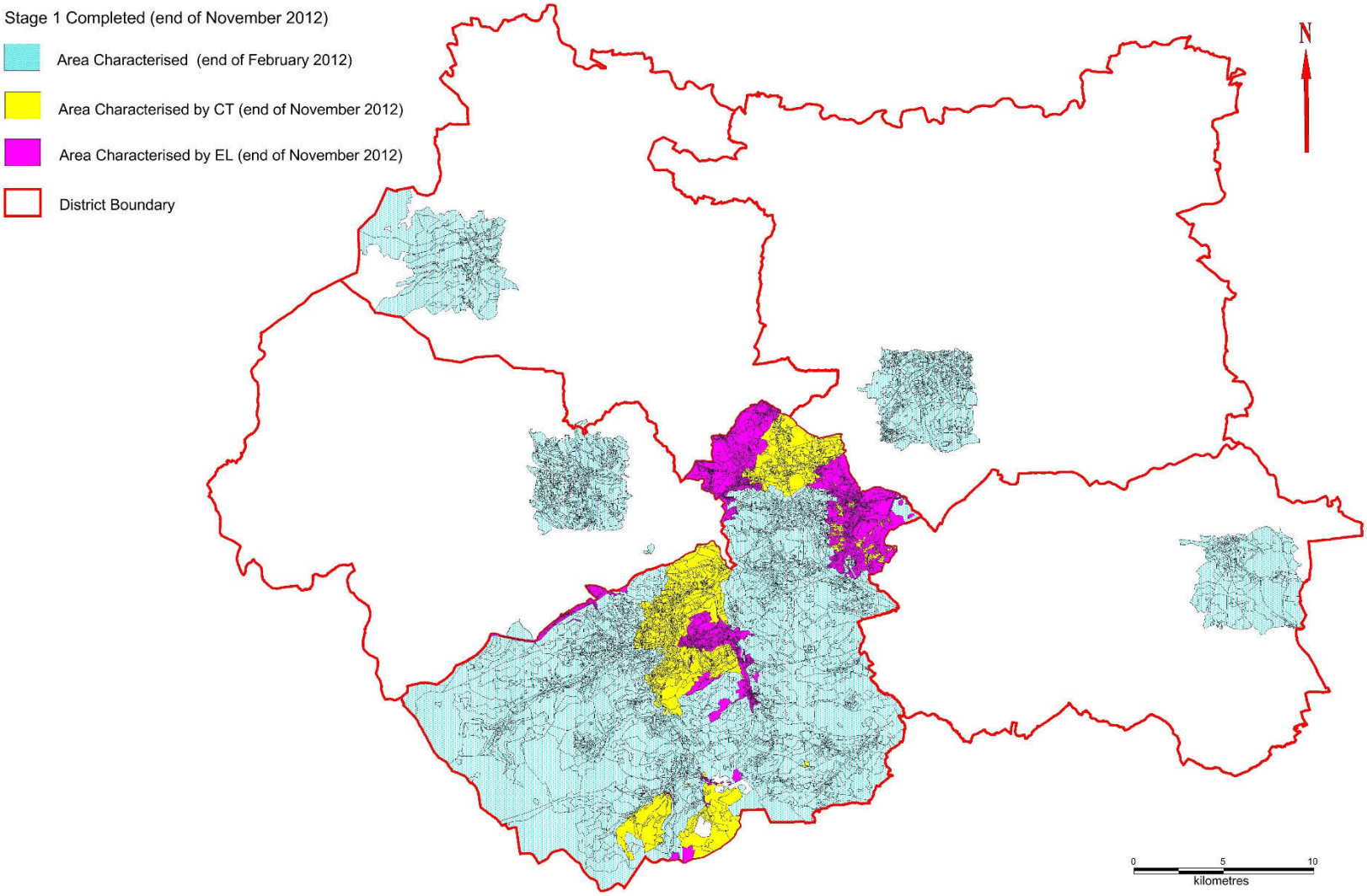

Figure 17. Stage 1 Completion

Stage 2. Characterisation: Mapping and Digitisation

Stage 2 was started on 3rd December 2012. The majority of time was spent finishing off the remaining area of Kirklees District and characterising the remaining districts, although some time was spent re-characterising (or re-casting) areas already covered (predominantly boundary changes, and deletion of gaps and polygon overlaps). Final polygonisation figures can be found in Table 3 below:

	Bradford	Calderdale	Kirklees	Leeds	Wakefield	Total
Commercial	870	305	653	1579	1068	4475
Communications	119	204	150	682	427	1582
Enclosed Land	15595	14282	20466	25018	18069	93430
Extractive	122	272	354	252	293	1293
Horticulture	27	27	27	92	28	201
Industrial	1224	721	1233	1858	1109	6145
Institutional	1097	408	914	1719	847	4985
Open Land	5772	12098	5263	2416	2088	27637
Parkland and Recreational	1978	1180	1621	5874	2408	13061
Residential	7681	3991	7370	12682	6169	37893
Water	273	592	339	276	122	1602
Woodland	1752	2218	2325	2523	1118	9936
Total	36510	36928	40715	54971	33746	202240

Table 3. Broad Type district area comparison. Units in hectares

	Bradford	Calderdale	Kirklees	Leeds	Wakefield
Commercial	2%	1%	2%	3%	3%
Communications	<1%	1%	<1%	1%	1%
Enclosed Land	43%	39%	50%	46%	54%
Extractive	<1%	1%	1%	<1%	1%
Horticulture	<1%	<1%	<1%	<1%	<1%
Industrial	3%	2%	3%	3%	3%
Institutional	3%	1%	2%	3%	3%
Open Land	16%	33%	13%	4%	6%
Parkland and Recreational	6%	3%	4%	11%	7%
Residential	21%	11%	18%	23%	18%
Water	1%	2%	1%	1%	1%
Woodland	5%	6%	6%	5%	3%

Table 4. Broad Type district area percentage comparison

The timetable for completion had slipped as there were many more hectares of what was effectively urban West Yorkshire than the mapping that WYAAS had obtained from the Districts had indicated when the original project design was being written. The urban / rural layer was found to have missed a number of urban cores, including some historic villages. Consequently the timetable for completion was always going to have been too optimistic as it under-estimated the amount of urban West Yorkshire.

Central historic cores of settlements were also extremely “bitty” and the average size of urban polygons in these areas were significantly smaller than average.

The key difference between the original polygonisation estimates and the final polygonisation results is in the degree of complexity in rural areas. The average polygon size for rural broad types is nearly half as small as was initially projected.

Broad Type	Area (ha)	Number of polygons	Average area per polygon (Ha)
Commercial	4475	3620	1.24
Communications	1582	644	2.46
Enclosed	93430	4049	23.07
Extractive	1293	152	8.51
Horticulture	201	71	2.83
Industrial	6145	2487	2.47
Institutional	4985	3736	1.33
Parkland and Recreational	13061	2586	5.05
Residential	37893	25676	1.48
Open Land	27637	1903	14.52
Water bodies	1602	256	6.26
Woodland	9936	1489	6.67
Total	202240	46669	6.32

Table 5. Polygonisation rates by Broad Type

During the latter parts of Stage 2 Characterisation, there was an awareness that polygons were getting too small to maintain the necessary rate of work and conscious efforts were continually made to increase the average size of polygons. The use of templates to help speed up data entry in the database for standardised landscape elements helped speed up the progress of work in 2015.

CT left the project after Christmas 2014 and was replaced by Karl Lunn (KL) on March 4th 2015. Consequently there was an additional time slippage against the amended planned completion of Stage 2 and a further time (not cost) variation was made on July 15th 2015, envisaging a completion date at the end of November 2015. Subsequently further time was lost caused by the partial migration of the West Yorkshire Joint Services' IT system to Leeds City Council's IT network. The digitisation phase of the project was completed by the end of December 2015.

Project staff (initials)	Number of polygons	Percentage of Polygons competed (%)	Area completed (ha)	Percentage of area completed (%)
EL	23295	49.9	102920	50.9
CT	8884	19	47012	23.2
KL	8042	17.2	10605	5.2
JL	3413	7.3	21170	10.5
JM	3017	6.5	20553	10.2
Total	46651	100	202260	100

Table 6. Final HLC product statistics (by Project Staff).

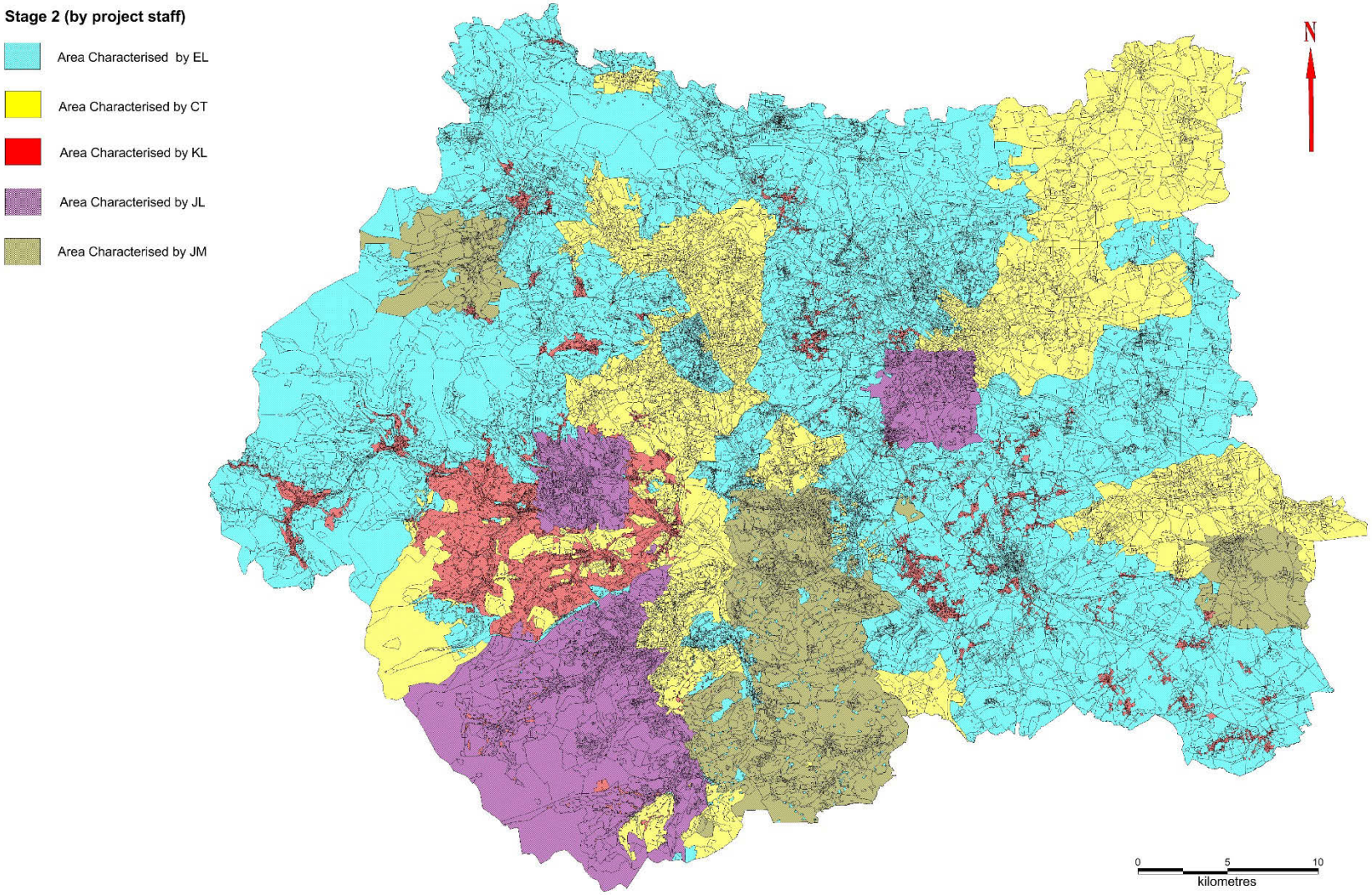

Figure 18. Final HLC product (by Project Staff)

Stage 3. Review, Analysis and Interpretation

Stage 3 of the project commenced on 4th January 2016 (completed by end of January 2017).

This stage consists of a review of the characterisation results and their analysis, leading to an assessment of their potential for further development:

- Demonstrates what the HLC can be used for
- Assesses the potential for further stages of more detailed work
- Describes how the HLC could be used to assist management and conservation of the historic landscape of West Yorkshire and the preparation of future management strategies
- Outlines a research agenda for the historic landscape of West Yorkshire to identify future, more detailed and focused projects.

Stage 4. Report, Archive and dissemination

The principal products of the project are a mapped GIS database, an archive of the raw survey data and a written report.

The mapped GIS database includes:

- Broad Characterisation Maps.
- Historic Character Maps (including characterisation sub types).
- Historic Character Area Maps.
- Time maps.

The report produced is a comprehensive Historic Landscape Characterisation for the whole of the sub-region, and in addition a summary report has been produced for each of the Character Areas within the five Districts.

The main body of the report is in four parts and contains:

- An introduction to HLC and an overview of HLC methodology.

- HLC Themed Results

- Settlement Analysis

- Guidance for local authority decision makers on the management and strategies to conserve their archaeological resource.

In order to disseminate the information, presentations have been given during the life time and at the end of the project to interested parties. Copies of the HLC for their areas has been given to each of the District Councils. Arrangements will be made to deposit the archive with the West Yorkshire Archive Service, which is developing repositories for digital data as well as paper records.

2.1.7 Critique of the Methodology

Subjectivity

The main drawback of HLC is the grouping of features and categorisation of HLC zones determined by the individual carrying out the process. The West Yorkshire HLC Project employed five project staff, the majority of whom had previous HLC experience (JM – South Yorkshire HLC, JL – Lincolnshire HLC, EL – Merseyside HLC, KL – Greater Manchester HLC, and CT – IT and GIS background, no previous HLC experience). Consequently, there were differing modes or styles of characterisation, which has led to some bias in the dataset. The employment of several project officers during the West Yorkshire HLC Project has, inevitably, led to:

- Differing interpretations (subjectivity)
- Differing digitisation rates
- Differing polygonisation (size of urban and rural polygons)
- Differing recording levels (description content)

Perhaps the most obvious bias can be found in the interpretation, and eventual characterisation, of specific HLC types. For instance, where one person has recorded a group of semi-detached houses as belonging to the “Semi-detached Housing” HLC type,

while another may have recorded the group as being part of a more generic, and equally correct, “Housing Estate” HLC type.

Throughout this project it has been the intention to characterise the historic environment in terms of how an average person would perceive the character. This is in line with the guiding principles of characterisation (Clark *et al* 2004, 6). However, specialist knowledge may have led to the characterisation of some landscapes that would not be well understood by members of the public. Where to generalise and where to go into detail, with smaller polygons, was also a subjective choice made by the project officers – using their knowledge and experience.

The sources used to categorise the historic landscape are qualified by interpretative assumptions or deductions derived from the general understanding of landscape history within the region. The resulting categories are either quasi-objective, derived from the data observable in the sources, or subjective, derived externally from the general understanding of historical processes and imposed upon the data. For instance, in plotting large-scale housing estates, the boundaries of an individual estate can be clearly observed and digitised directly from the Ordnance Survey map. This process can be regarded as objective or quasi-objective. On the other hand, a category such as “field patterns reflecting assarts” is derived from overarching knowledge and expectation of field systems in the region. The plotting of extents of such fields is dependent upon judgements on the degree to which their patterns conform to these criteria and where the boundaries of the pattern lie. This process is manifestly subjective. In many instances, categorisation is based on the shapes of fields shown on the source maps. However, this still involves decisions in discriminating between field shapes and consequently criteria are applied, consciously or sub-consciously. This is subjective and can result in inconsistency where differentiation in field shape, size and patterns is fine.

As with all archaeological work, HLC raises certain methodological problems. One of these is the difficulty of consistently identifying areas in the ‘correct’ categories. Even when a project is undertaken by a single researcher, it is possible for areas with similar historic characteristics to end up mapped as different ‘types’. This may be the result of error, but sometimes it is difficult to decide which ‘type’ a given block of landscape belongs in. One way to manage this problem is to base the pre-defined character types on a wide range of well researched case-studies.

The process of characterisation is inevitably one of subjective decisions. It must be stressed that any map derived from HLC is 'interpretation', not data, and should be treated as such. This does not mean that its relationship to the landscape is invalidated, for "landscape" is a perception, not reality, and there is more than one perspective upon "landscape", as the Countryside Agency's Landscape Character Assessment Guidance (Land Use Consultants 1999) illustrates. Furthermore, the European Landscape Convention, which was ratified by the UK government in 2006, states that: "… landscape means an area, *as perceived by people*, whose character is the result of the action and interaction of natural and/or human factors" (*our emphasis*).

Such subjective choices can never be entirely removed from the characterisation process. It is important to document the decision making processes followed, allowing users or future developers of the database to judge the validity of our decisions, based on future knowledge.

Overlap, Blurring and Missing Character Types and Attributes

Some areas may include features from several different eras that contribute strongly to overall character, so that it is unclear which 'type' should be mapped. This consideration also leads to problems associated with 'time-depth': a 'recent' landscape (e.g. fields created in the 19th century) may conceal strong elements of another kind of landscape (e.g. classical or medieval terraces). Various techniques have been tried to overcome this difficulty. We believe using GIS with an explanatory text in the description field provides an adequate solution.

Early use of the data from the West Yorkshire HLC project has indicated some difficulties with the Historic Environment Types. Some types overlap, making it difficult to pull all the relevant data from the GIS tables in a single query. An example of this is 'low rise flats'; these may either have been privately built or have been built as part of an area of social housing. In retrospect, it would have been more appropriate to make 'high rise flats' or 'low rise flats' an attribute within the *Private Housing* and *Planned Estate (Social Housing)* types, or for private or public to be recorded as attributes for *Low Rise Flats* and *High Rise Flats*.

During the latter parts of the project, it was noted that a generalised Historic Urban Core Broad Character type could have been employed, which combined several character types together (i.e. Residential, Commercial, Institutional and Industrial).

Historic Urban Cores, particularly those with medieval origins, are generally very small-scale, and often complex and have mixed piecemeal development. It was found that both the Broad Type and Historic Character Types employed did not adequately reflect this complexity. For instance, having to use the very broad-brush 'Vernacular Cottage' as a residential type for all housing from 1066 through to the mid-18th century. Moreover, many early historic cores were often a mix of residential, commercial and institutional types – without early mapping, characterisation was entirely subjective and, where done using exiting character types (and corresponding small-scale polygonisation), may have given a false impression of topography and development.

An overall "Historic Urban Core" Character Type, probably using the same parameters and boundaries of many Conservation Area Appraisals (Historic Zone Analysis) would have made the polygonisation process much easier and faster – a single polygon created in the GIS, with a generalised Broad Character 'Urban' Record created in the database. All relevant data (HLC Type and attributes, Listing Information, dating evidence, residential to commercial and/or industrial ratios) would have been placed in the description field (free text box). At a later date (during the analysis stage) it would then be the description field that could be interrogated as to what made-up the 'Historic Core'. Furthermore, the West Yorkshire HLC suggests that many of West Yorkshire's towns and cities would probably benefit from in-depth, and separate, Extensive Urban Survey (EUS) analysis.

Some urban HLC categories did not exist, particularly for modern (post 1980) development. Some distinction between these urban types would have been useful. For instance, urban greenspace were recorded as Parkland and Recreational ('Public Park'), medical centres recorded as Institutional ('Hospital Complex'), regenerated scrub recorded as Woodland ('Semi-natural Woodland') and urban derelict sites and demolition recorded as Open Land ('Derelict Land').

Small to medium-scale, late 20th and early 21st century mixed industrial and commercial developments were similarly problematic to record. Many recent industrial developments, particularly industrial and technology parks, have a commercial component and, likewise, some recent commercial ventures incorporate small-scale industrial premises. Perhaps a Mixed Industrial Industrial/Commercial HLC Type should have been created to accommodate this, rather than recorded as an attribute ('Industrial Sector '- Mixed Commercial/Industrial') within the overarching HLC type.

For rural areas, particularly towards the eastern parts of West Yorkshire region, HLC categories did not exist for modern landscape characters, such as nature reserves (often recorded as 'Derelict Land') or reconstituted fields (often recreated from reclaimed land).

Perhaps a clear distinction between mid-late 19th century and early 20th century housing types would have been useful. For instance, there was some confusion in characterising late Victorian and early Edwardian, high-status terraced villa houses – whether to record them in the higher social status 'Villa/Detached Housing' category, or the more ubiquitous and lower-status 'Terraced Housing' HLC type. Clearly not all terraced houses dating to this period were built as workers' housing. There was similar confusion regarding earlier townhouses, which were often incorporated into the 'Terraced Housing' HLC type. Once again, we believe using GIS with an explanatory text provided an adequate solution, although it wasn't always applied.

Moreover, a distinction between mid to later 20th century social housing estates, and late 20th to early 21st century private developments should have been employed – the two estate types had to be lumped together in the very generalised 'Housing Estate' HLC type, yet they are very different in character, development and morphology. More-often-than-not, mid to late 20th century housing estates are medium to large-scale, comprising a range of building types (a mix of detached and semi-detached housing, terraced blocks, and low- and high-rise flats) set in geometric patterns, and with reasonably large private spaces. Modern developments are generally small- to medium-scale developments, organic in plan, and have a more restricted range of house types (detached and semi-detached housing, or low-rise flats). Perhaps a separate "Modern Housing Development" HLC type should have been created at the beginning of the project, which would have helped in differentiating between estate types.

Farms

Certain districts were found to be under-recorded in the Pilot Phase, particularly regarding a single Historic Character Type. At first there was a tendency to lump together farms into the surrounding landscape. During the final stages of the project, EL and KL undertook 'enhancement' of Kirklees, Calderdale and Bradford Districts with the addition of numerous isolated farms and small, rural nucleated settlements. As a consequence, there was a reduction in the area characterised by JM and JL during the Pilot Phase (PILS), and areas produced by CT and EL in the early phases of Stage 2.

Gaps, Spurs and 'Phantom' polygons

A number of small gaps and polygon-spurs were created during the digitisation phase (particularly during the Stage 1 Pilot Stage).

The majority of gaps (both inter-polygon, and between polygons and district boundaries) were removed during the final stages of the digitisation phase. This was done both manually (a review of all layers), and through automatic 'Cleaning Objects' and' Snap/Thin' Commands in MapInfo. Unfortunately, not all gaps were eliminated, with a c.20ha undervalue at the end of the project. This represents less than 0.001% of the overall area (202260ha) and is statistically insignificant.

Similarly, multiple 'spurs' were created in the early stages of the project, where a "Snap To' Command was not employed in the polygonising process. The majority of these were removed at the end of the digitisation phase, either manually (a review of all layers) and through 'Node Thinning/Generalisation' Command in MapInfo. Once again, not all erroneous spurs were removed.

There is a small discrepancy between the number of polygons produced by Project Staff (46651 polygons, or rather, 46551 Records) and the calculated number in Table 5 above (46669 polygons). This may be a result of overlapping polygons not removed in the immediate pre-analysis stage (Stage 3). All efforts were made at the end of the project to remove 'phantom' records and their associated polygons. Unfortunately, due to time constraints, not all phantom polygons could be removed.

Sources

The temporal distribution and coverage of sources outlined above obviously have implications for the data which has been generated from them. The advantages this particular set of sources brings us include a relatively detailed record of the landscape in the late 19th and early 20th century. However, there are also limitations to this range of sources. Two in particular are worth highlighting here. Firstly, very few original surveys were available prior to Jefferys' map of 1775. This is significant because important early changes to the landscape, notably the growth of industry and mining, had already started by this point.

The second disadvantage concerned the other end of the period of development recorded by the West Yorkshire HLC: it was the relative unavailability of digitised mapping from the

second half of the 20th century. This has meant that certain changes in the landscape between the years 1938 and 2000 may be underrepresented in the West Yorkshire HLC data. This is particularly true for characterisation between 2007 and 2013 (the difference between versions of OS MasterMap® employed by the project), and for changes between 2013 and 2015. It follows that the majority of records, descriptions and maps produced by the West Yorkshire HLC which relate to the modern landscape are, in fact, representing the landscape around 2007, with enhancement for some areas to 2013. This is particularly true for areas characterised in the Pilot (PILS) and early Stage 2 Characterisation phases, where the 2013 version of MasterMap® was not available.

For rural areas, change between 2007 and 2015 has been piecemeal and largely recorded by the West Yorkshire HLC. Urban space, however, never stands still – particularly within historic settlement and commercial cores. The use of online historic mapping and aerial photography in the latter parts of the project certainly helped enhance our records in this regard.

In some instances characterisation occurred at the same time as development and could be mapped accordingly. For instance, the Wakefield One Council development (completed 2011), Wakefield Trinity Walk Shopping Centre (opened 2011) and Trinity Leeds Shopping Centre (2013) were characterised by the West Yorkshire HLC using 2013 mapping. For other urban centres, however, very recent urban developments have not been characterised (for example, the Bradford Broadway Shopping Centre, opened November 2015). There is an important point to be made here – that the HLC provides only a snapshot of West Yorkshire's historic landscape at the beginning of the 21st century. Since the landscape is not static, the HLC of any area needs to be reviewed and updated periodically.