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Stockton and Darlington Railway Heritage Action Zone Aerial Investigation & Mapping Report

Dave Knight

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STOCKTON AND DARLINGTON RAILWAY HERITAGE ACTION ZONE
Aerial Investigation & Mapping Report

Dave Knight

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For more information contact Res.reports@HistoricEngland.org.uk
or in writing to:
Historic England, Fort Cumberland, Fort Cumberland Road, Eastney, Portsmouth PO4 9LD

SUMMARY

The Stockton and Darlington Railway (S&DR) opened in 1825, establishing a legacy of rail transport that remains today. The railway was chosen as one of Historic England's Heritage Action Zones (HAZs) in 2017; the HAZ launched in May 2018 and will run for five years. The overarching aim of the HAZ is to better manage, preserve and utilise the heritage assets with a view to stimulating economic growth, especially in the build-up to the railway's bicentenary in 2025. One of the first projects undertaken for the HAZ was an aerial investigation & mapping project of the heritage assets along the original line of the railway plus its pre-1831 branch lines (the 'core network'). The work was undertaken by Historic England's Aerial Investigation and Mapping (AIM) team and this report summarises its findings.

Thousands of historic aerial photographs and visualisations of lidar data were analysed to produce a spatially accurate archaeological map with accompanying records for a 1km-wide corridor centred on this core network. This will inform the research strategy for the HAZ by providing an understanding of the historical and current condition of the infrastructure of the original railway within its broader archaeological and landscape context.

The study identified and mapped many elements of original railway infrastructure, including bridges, buildings, crossings, embankments, cuttings and trackside boundaries. The aerial investigation also identified a broad range of features ranging from prehistoric enclosures to Second World War military remains. Coal mines on the Durham Coalfield within the study area were also mapped as these were the main driver for the construction of the railway: to transport the mined coal to staithes at Stockton and Middlesbrough for onward shipment. The project area included part of the complex archaeological landscape at Cockfield Fell, one of the largest scheduled areas in the country, and the extensive medieval remains north of Middleton St. George. The project created 198 new monument records and amended a further 60 in the National Record of the Historic Environment (NRHE).

CONTRIBUTORS

The interpretation and mapping were undertaken by Dave Knight and Sally Evans of Historic England's AIM team; Dave Knight, Project Manager for the AIM input into the project wrote the report and produced the illustrations. The text has been edited by Helen Winton and Matthew Oakey for AIM, and by Marcus Jecock, Project Manager for Historic England's research input into the S&DR HAZ. Eric Branse-Instone of Historic England's Listing Team has also made comments.

ACKNOWLEDGEMENTS

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ARCHIVE LOCATION

Historic England Archive, The Engine House, Firefly Avenue, Swindon, SN2 2EH.

DATE OF SURVEY

The Aerial Investigation & Mapping element of the project began in June 2018 and completed in February 2019.

CONTACT DETAILS

Historic England, The Engine House, Firefly Avenue, Swindon, SN2 2EH

Dave Knight
Telephone: +44 1904 601944
david.knight@HistoricEngland.org.uk

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INTRODUCTION

The birth of the railway

When writing the first official history of the Stockton and Darlington Railway (S&DR) in 1875, Jeans (1974, vii) stated: 'Fifty years ago there were only twenty-five miles of public railroad open in the world – the Stockton and Darlington line … It is estimated that there are now constructed one hundred and sixty thousand miles of railway …'

Along a route partly devised by George Overton and adapted and built by George Stephenson (Fig 1), the S&DR opened with great ceremony on 27 September 1825. A train of 12 wagons of coal was hauled by horses from Phoenix Pit, Etherley, to the foot of the Etherley North Incline. The train was pulled up the Incline by a stationary steam engine and lowered down the South Incline to West Auckland where another wagon was hitched to the convoy. The train was again pulled by horses to the foot of the Brusselton Incline, where the process was repeated. By this point, there were thousands of onlookers – some hopping aboard. Once the train had been lowered down the Brusselton Incline to New Shildon, it was hitched to a further 21 wagons, laden with passengers, and to the steam locomotive, *Locomotion No. 1*. With Stephenson as the driver, the train began its slow journey to Stockton and into the annals of history (Semmens 1976, 121; Archaeo-Environment Ltd 2016b, 2).

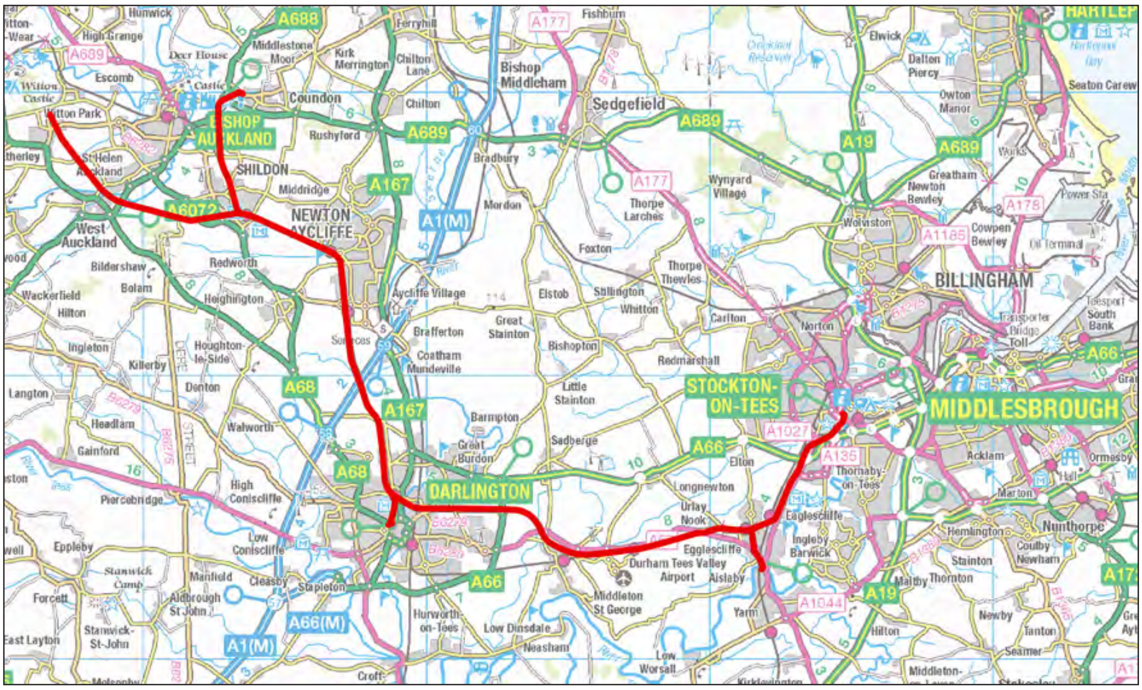

Fig 1: George Stephenson's 1822 proposed line for a railway between Witton Park and Stockton-on-Tees. Base map © Crown Copyright and database right 2019. All rights reserved. Ordnance Survey Licence number 100019088.

The significance of the S&DR is not in its use of new technology or mode of traction: the first railway to be constructed following an Act of Parliament (as opposed to a series of wayleave agreements with individual landowners) was the Middleton Railway in Leeds in 1758; malleable (wrought) iron rails had been in use in Coalbrookdale for horse-drawn railways since at the least the 1760s, and these were carrying steam locomotives by 1802; there was also a public railway authorised in Surrey in 1803 and one authorised to carry passengers in Swansea in 1807; the first steam locomotive to pull passengers was in Euston Square in 1808, though this was for entertainment purposes only; the Middleton Railway was also the first sustained commercial steam railway by 1812 (Hoole 1975, 12, 39; Jeans 1974, 273; Archaeo-Environment Ltd 2016a, 20; Semmens 1976, 109; Kinchin-Smith 2014, 19). Instead, the importance of the S&DR lies in the fact that in 1825 it brought all of these developments together, offering the world's first steam-locomotive public railway service. The railway operated a steam-locomotive service between Shildon and Stockton for freight from the outset (traction west of Shildon was initially by horse and stationary steam engine), but passenger services were exclusively horse-drawn until 1833. Such was the legacy of the S&DR and George Stephenson's engineering, that much of the original line and infrastructure remains in use today. It set a precedent that would change the world.

The opening of the railway between Witton Park Colliery in the west and Stockton in the east in 1825 marked an important point in the history of industrialisation and transport. The line was devised in response to the need for a cost-effective way to transport coal from the mines located on the Pennine-fringe to staithes on the River Tees from where it could be shipped to non-local markets. From the outset, the railway also operated a passenger service which laid the foundations for the public rail network across the country. By 1830, the line had been extended to the new purpose-buiilt coal staithes at Port Darlington, Middlesbrough, and by 1831 the last of a number of short branch lines, mainly connecting additional collieries in to the railway (namely the Haggerleases Branch, Black Boy Branch, Copy Crooks Branch/ Surtees Railway, Croft Branch and Yarm Branch), had also been completed (Fig 2).

In subsequent decades this core pre-1831 network underwent many re-routings and closures, with the result that it is now only the stretches between Shildon and Darlington, Middleton St George and Eaglescliffe, and Stockton and Middlesbrough that remain in use as 'live line' (ie form part of the national rail network).

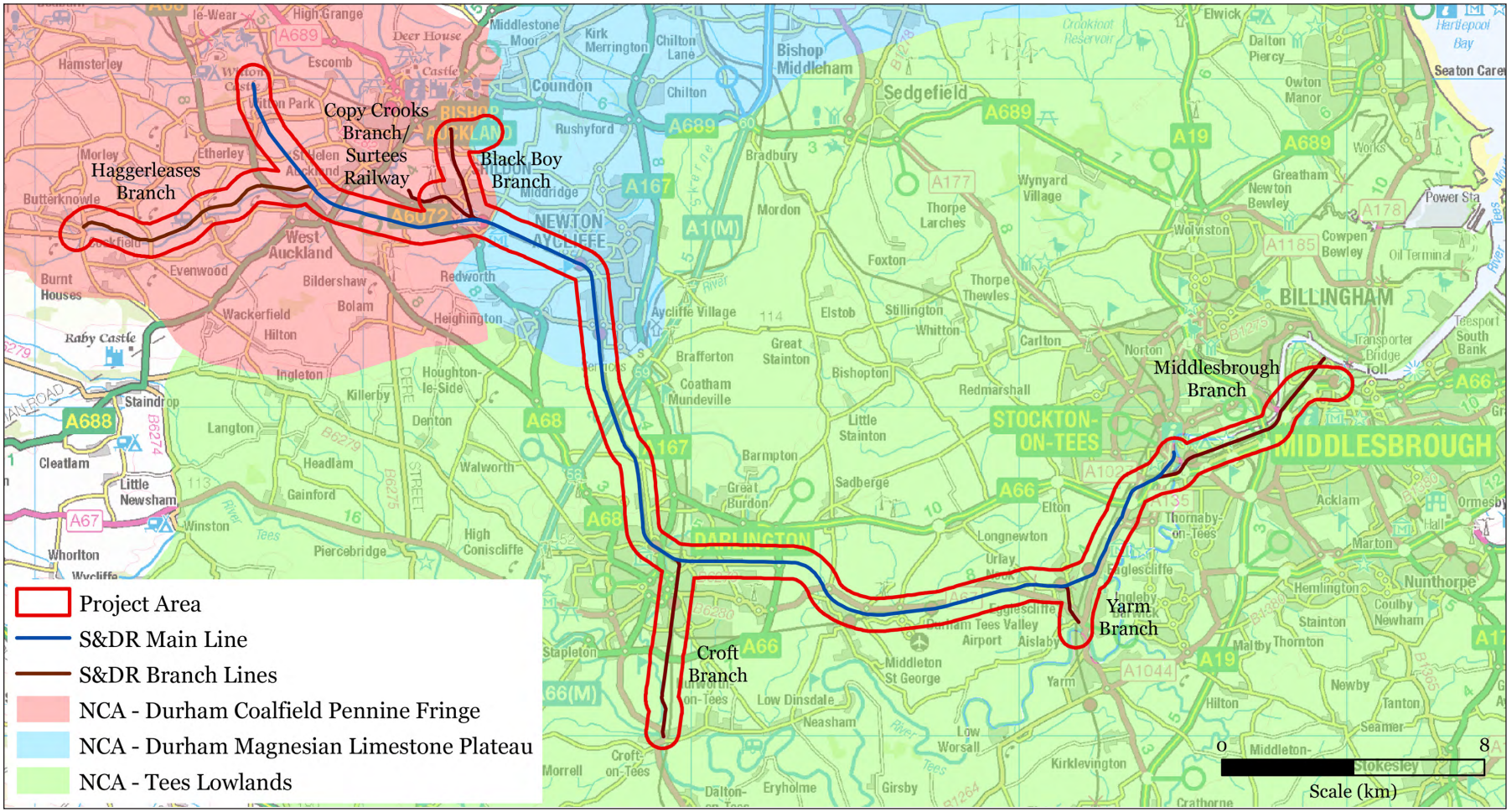

Fig 2: The core S&DR network comprised the 1825 main line and a series of branch lines, constructed up to 1831. NCA data © Natural England; Base map © Crown Copyright and database right 2019. All rights reserved. Ordnance Survey Licence number 100019088.

Background

The S&DR Heritage Action Zone (HAZ) programme was developed by the Stockton and Darlington Railway Heritage Board, which includes the Steam Locomotive Trust; the Bishop Line Community Rail Partnership; Darlington Borough Council; Durham County Council; Friends of Stockton and Darlington Railway; Hitachi; Network Rail; Northern Rail; Science Museum Group (Locomotion); Stockton Borough Council; Tees Valley Combined Authority; and Virgin Trains. Through their collaborative effort, the railway was a successful candidate for Historic England's 2017 round of HAZs.

The HAZ initiative is working with local people and partners to breathe new life into places that are rich in heritage, to unlock their potential and make them more attractive to residents, businesses, tourists and investors. Launched in May 2018 and running for five years, the S&DR HAZ is intended to help rejuvenate this historic railway and realise its potential as a major heritage attraction, especially in view of the railway's upcoming bicentenary in 2025.

The aim is to better manage, preserve and utilise the heritage assets of the railway. A key stage in this process involves research to establish a baseline of information by building on existing work and through new survey. Part of this was the aerial investigation and mapping project described in this report. The work was carried out by the Historic England Aerial Investigation and Mapping (AIM) team.

The project builds upon the Historic Environment Audit (HEA) undertaken by Archaeo-Environment Ltd on behalf of three of the four modern Local Authorities through whose administrative areas the early core S&DR network runs (Archaeo-Environment 2016a-g). The HEA outlined the significance of the railway, assessed its surviving physical assets, provided an audit of information available, added 566 records to the local Historic Environment Records (HERs), and provided recommendations for future management.

The project area: topography, geology and soils

The project area stretches over a length of 66.5km of former and current railway, between Butterknowle and Middlesbrough (Figs 2-3). It includes the length of the 1825 main line and principal early subsidiary lines, namely the Haggerleases Branch (1830), Black Boy Branch (1827), Copy Crooks Branch/Surtees Railway (1831), Croft Branch (1829), Yarm Branch (1825) and the Middlesbrough Extension (1830) (Fig 2). The project includes a 1km-wide mapping corridor along the railway covering a broad range of landscapes. These are here outlined using Natural England's National Character Area (NCA) profiles, which are defined by topographical boundaries, but also include cultural and economic aspects of the environment (Fig 2).

The western end of the project area lies within the Durham Coalfield Pennine Fringe NCA. This comprises rolling uplands, with pastoral farming on higher ground and mixed farming in the valleys. Industrial activity dominates this area, not only in rural areas, but also through the development of towns and settlements (Natural England 2013a, 6).

Moving eastwards, the area around Newton Aycliffe falls within the southern half of the Durham Magnesian Limestone NCA. This region is mainly devoted to arable farming, but is also closely associated with past industrial activity, notably coal mining (Natural England 2013b, 6).

Most of the rest of the project area falls within the Tees Lowlands NCA. This is largely low-lying with mixed farming. There are major industrial centres around Teesmouth in the east of this region (Natural England 2013c, 6).

The highest point, at 215m above sea level, is in the extreme west of the project area, on Cockfield Fell – open moorland formed on sandstones of the Pennine Lower Coal Measures overlain by slowly permeable and seasonally wet acid loamy and clayey soils. The Lower and Middle Coal Measures (Fig 4) – a mixture of mudstones, siltstones and sandstones – extend as far east as Shildon and define the industrial heart of the project area. The coal mines were directly responsible for the construction of the S&DR, to transport the coal to market via staithes on the Tees. The Haggerleases branch line for example, the most westerly element of the railway, was built to serve the collieries around Cockfield Fell. The topographic relief of the landscape falls away to the east of Shildon, and pastoral land-use increasingly gives way to arable farming. The solid geology is dominated by dolostones, mudstones and limestones between Shildon and Darlington, with sandstone further to the east, and an outcrop of mudstone around Middlesbrough.

Devensian Till is the dominant superficial geology across most of the project area (Fig 4), with slowly permeable and seasonally wet acid and base soils, with narrow bands of glaciofluvial sands and gravels along the river valleys. The main rivers in the project area are the Gaunless, which flows through Butterknowle and West Auckland; the Skerne which flows through Darlington; and the Tees which flows through Yarm, Stockton-on-Tees and Middlesbrough. The coastal flats lie partly on tidal deposits of sands, silts and clays, and the soils are loamy and clayey with natural ground water (www.bgs.ac.uk, www.landis.org.uk).

Methods, scope and sources

The principal aim of the current project was to produce a spatially accurate baseline dataset, with accompanying records, outlining the historical and current condition of the infrastructure of the original core railway network, but the project also aimed to place the railway within its broader archaeological and landscape context. It did this by analysing thousands of aerial photographs and visualisations of lidar data to create an archaeological map of the project area.

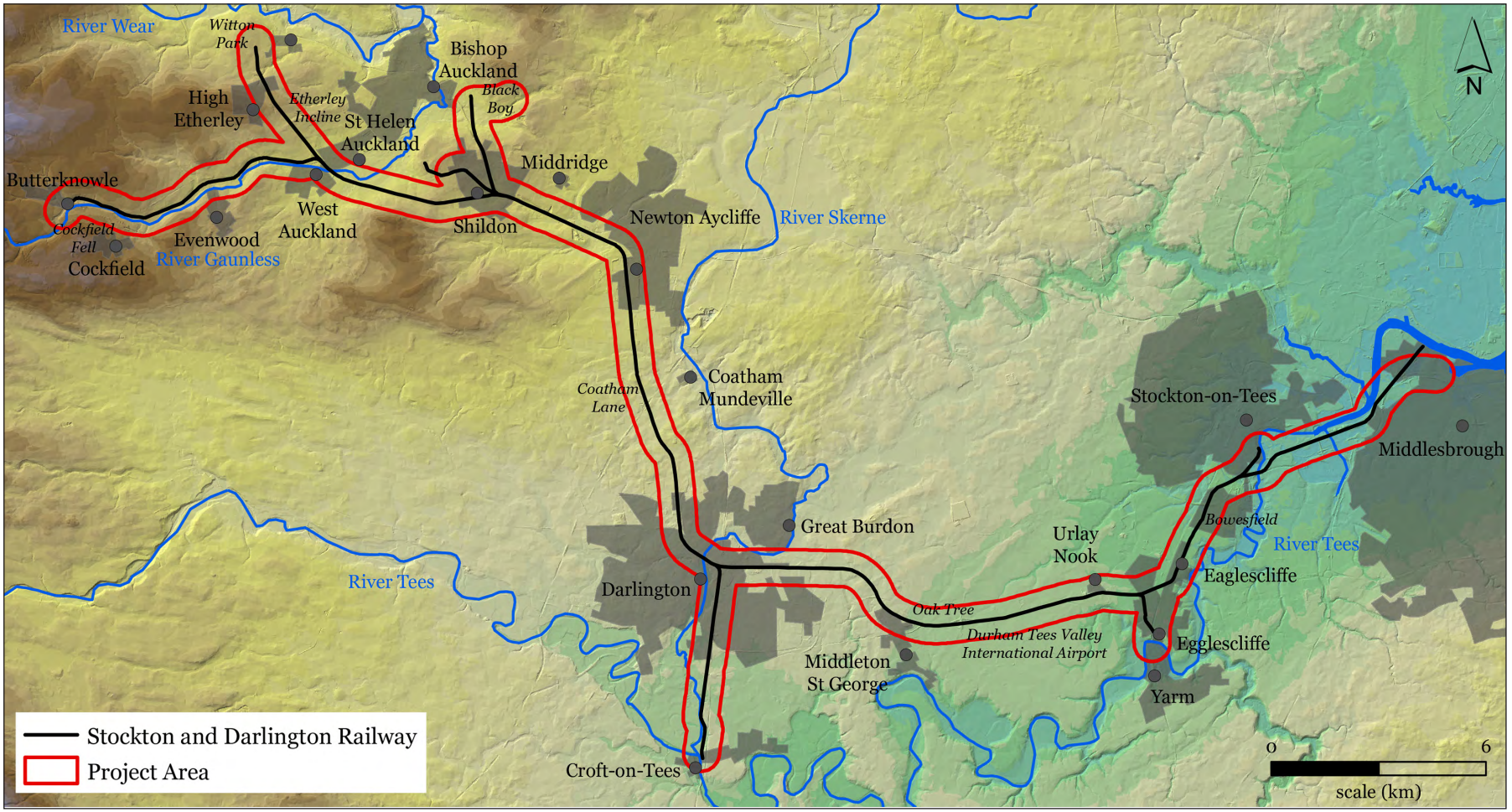

Fig 3: The project area covers a broad transect of landscape stretching from the Pennine fringe to Teesmouth. Height data ©Bluesky International/Getmapping PLC.

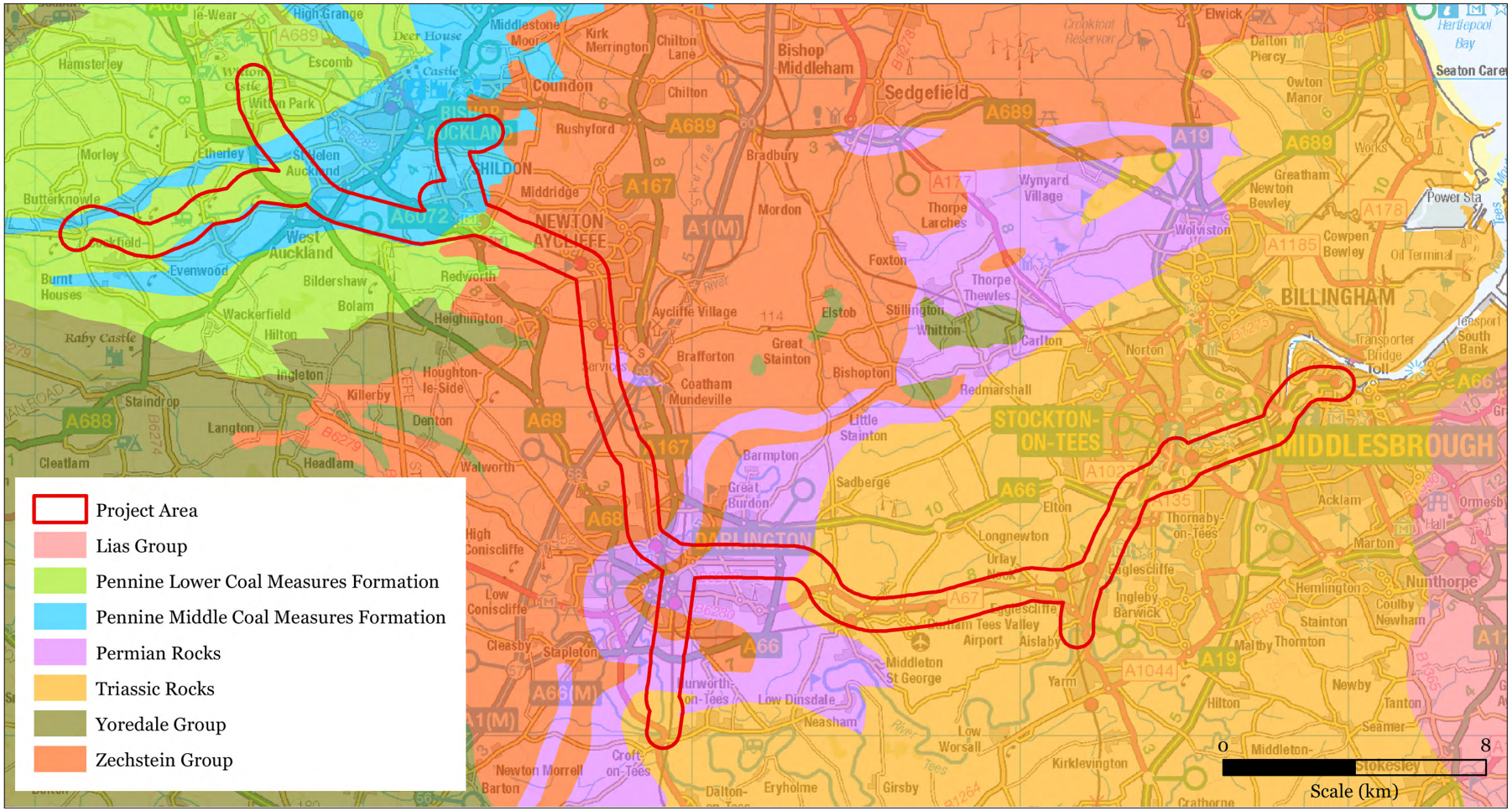

Fig 4: The geology of the Stockton and Darlington Railway. Contains British Geological Survey materials © UKRI 2019; Base map © Crown Copyright and database right 2019. All rights reserved. Ordnance Survey Licence number 100019088.

The primary sources used for mapping were historical vertical and oblique aerial photographs that have been taken by multiple agencies over the past 80 years or so and are now held by the Historic England Archive, as well as more recent aerial reconnaissance photographs taken by Historic England's AIM team. In addition to this, where available, Environment Agency lidar data was visualised as 2D raster images to show earthwork features in relief. Where lidar data was not available, 2m-gridded height data supplied through the Aerial Photography for Great Britain (APGB) agreement by Next Perspectives were visualised instead.

The aim of this project was to assess all archaeological features visible on aerial photographs and lidar, whether related to the original railway or not. This included buried remains recorded as cropmarks or soilmarks, and surface remains seen as earthworks or structures. Archaeological features were digitally mapped and described in monument records. Where good coverage of historical aerial photography allowed, a photogrammetric technique called 'Structure from Motion' was used to rectify and combine multiple vertical photographs (dating to 1945 and 1948) to create orthophotographs for examination of extensive areas. This was more time-efficient than performing multiple rectifications of each frame.

Full technical details of methods, scope and sources are available in Appendix 1.

Mapping the railway

AIM projects normally assess railway infrastructure on a case-by-case basis and map it only if it is felt that this will aid understanding of the remains of the railway or the archaeology of the landscape through which it passes. In this case, making a record of the railway was the main reason for the project.

The S&DR has undergone many changes, re-routings and extensions. It would not be possible to map all these elements of the railway, and most are recorded on historic Ordnance Survey (OS) maps. Only those features believed to be part of the original railway of 1825 (and subsequent branch lines constructed between 1825-31) were therefore mapped. These remains include: railway buildings with associated features such as engine ponds; crossings (level crossings, occupation crossings, and railway underbridges and overbridges); culverts, where marked on the earliest plans or where the recess, structure or line of the waterway is still clearly visible; the trackside boundaries where visible as a wall or hedgerow; and embankments and cuttings. A glossary of specialist terms is included at the end of this report.

The main line was originally laid as a single track, but by 1831 had been dualled along its entire length (Daniels 1996). However, there is no evidence to suggest that the civil engineering was widened at the same time, which was therefore presumably designed and constructed to accommodate double-track working from the outset. The branch lines in contrast were built to permit only single-track working.

The Thomas Dixon survey of 1838-40 (Fig 5) was used as the guide for identifying remains of the original railway and to distinguish them from the many later changes to the line and associated infrastructure. The Dixon survey was drawn up as a series of plans, each covering a particular section of line. All the main railway features are depicted, including the permanent way, boundaries, buildings, mileposts, signal posts, gates and crossings, and bridges, but not major landscaping such as cuttings and embankments. The Dixon plan for the area between Yarm and Bowesfield is missing, so the 1850s first edition OS maps were used as a proxy to identify original features. By the 1850s this part of the line was disused, but elements were still mapped, so the OS map is probably the most accurate record we possess of the line's original extent and form.

Adequate stock-proof barriers were required on all railways, and accordingly the S&DR constructed boundaries along the length of the line. Between Witton Park and Shildon, these were mostly drystone walls; further east a mix of fences, hedges and walling occur (Holmes 1975, 134; Whishaw 1969, 416). Deciding whether a boundary visible on a 1948 photograph is the same physical feature as that shown on Dixon's survey is difficult to determine from aerial sources alone, therefore boundary features were mapped wherever they coincided with the line depicted on the Dixon plans.

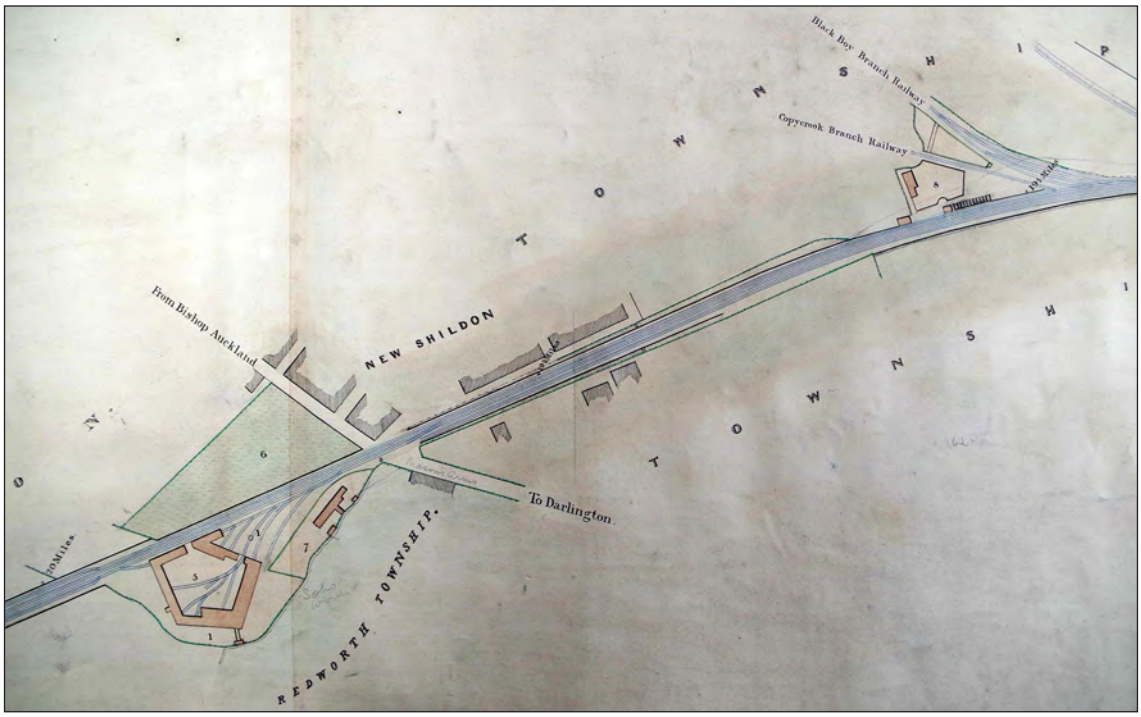

Fig 5: Extract from the 1839 Thomas Dixon plan of the S&DR between St Helens Auckland and Simpasture Junction. The detail and accuracy of the survey was invaluable for identification of features visible on aerial photographs. Source: Archaeo-Environment Ltd. Reproduced with kind permission of The National Archives, ref. RAIL 1037/453.

Major pieces of civil engineering such as embankments and cuttings were not illustrated on any of the Dixon plans. Where visible on aerial photographs and lidar, within the confines of what were deemed the original boundaries, they were taken as original and mapped.

The permanent way itself was not mapped because the rails and sleepers visible on 1940s aerial photographs were evidently not the same as those laid over a century earlier, and indeed even the track plan is likely to have changed from that shown on the Dixon surveys. In any case, the permanent way was hard to see clearly on aerial photographs. However, original sleeper stones, where visible on recent orthophotographs adjacent to Brusselton Engine, were mapped.

Small structures such as mileposts and signal posts are not usually visible on aerial photographs and were therefore not mapped, even though their positions are recorded by Dixon.

Occupation crossings are depicted on the Dixon surveys by schematic gate symbols (Fig 6). These often correspond to gaps in the lineside boundary identifiable on early aerial photographs. As the gates would have had structural elements, for the purposes of the current project they were mapped as points. According to Whishaw's survey of British railways in 1839 (Whishaw 1969, 416), level crossings at that time were not gated – they were served by signal-posts. As a result, structural elements visible on aerial photographs cannot be original but these crossings (where still in use or visible on aerial photographs) were still mapped as a point.

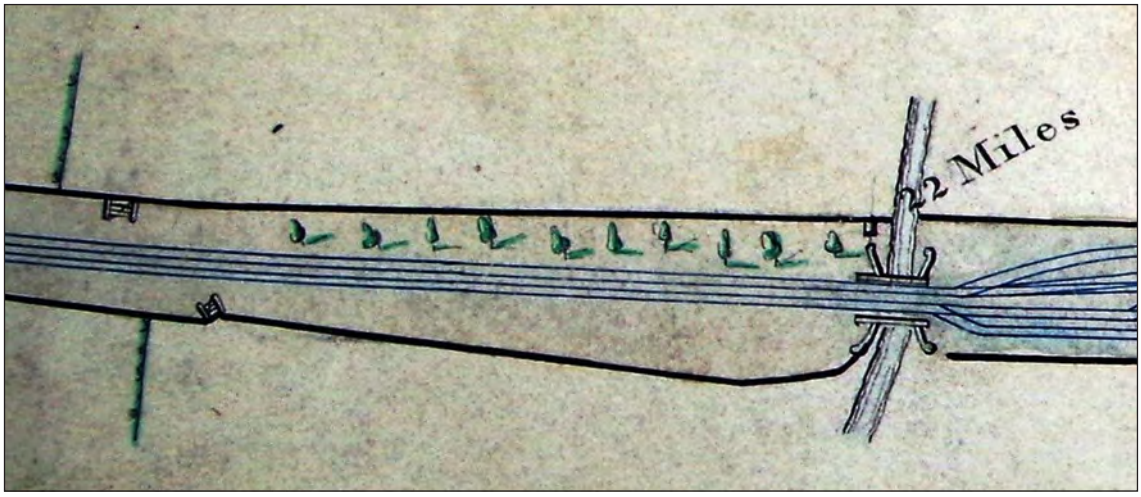

Fig 6: This extract illustrates some of the detail of railway features included in the Dixon survey including bridges, milestones and occupation crossings. The latter is shown schematically on the left as opposed gates. Detail of 1839 Thomas Dixon map of the S&DR between St Helens Auckland and Simpasture Junction. Source: Archaeo-Environment Ltd. Reproduced with kind permission of The National Archives, ref. RAIL 1037/453.

For the purpose of the mapping, railway buildings were depicted as closed polygons. Bridges were mapped as points except where structural elements were visible, in which case these were mapped as closed polygons. All culverts and crossings, where visible, were marked by a central point. Where stretches of railway boundary were visible, these were depicted as single lines. Earthwork cuttings and embankments were illustrated by schematic t-hachures depicting the extent and direction of the slope (Fig 7).

Due to the complexity of the railway infrastructure and time implications, a unique NRHE record was not created for every individual feature mapped. An NRHE record already existed for the main line of the railway and one record for each of the branch lines. Therefore, any feature along a stretch of line (whether a crossing, a bridge or an embankment) was incorporated within that parent record. For the sake of this project however, individual features were assigned a unique number to allow them to be identified in the GIS and gazetteer. These feature numbers are prefixed with 'AIM'. This does not include cuttings, embankments and boundaries, which were mapped but were too extensive to number individually. AIM features are concorded with their Historic Environment Audit (HEA) equivalents in the accompanying gazetteer (*see* Appendix 2).

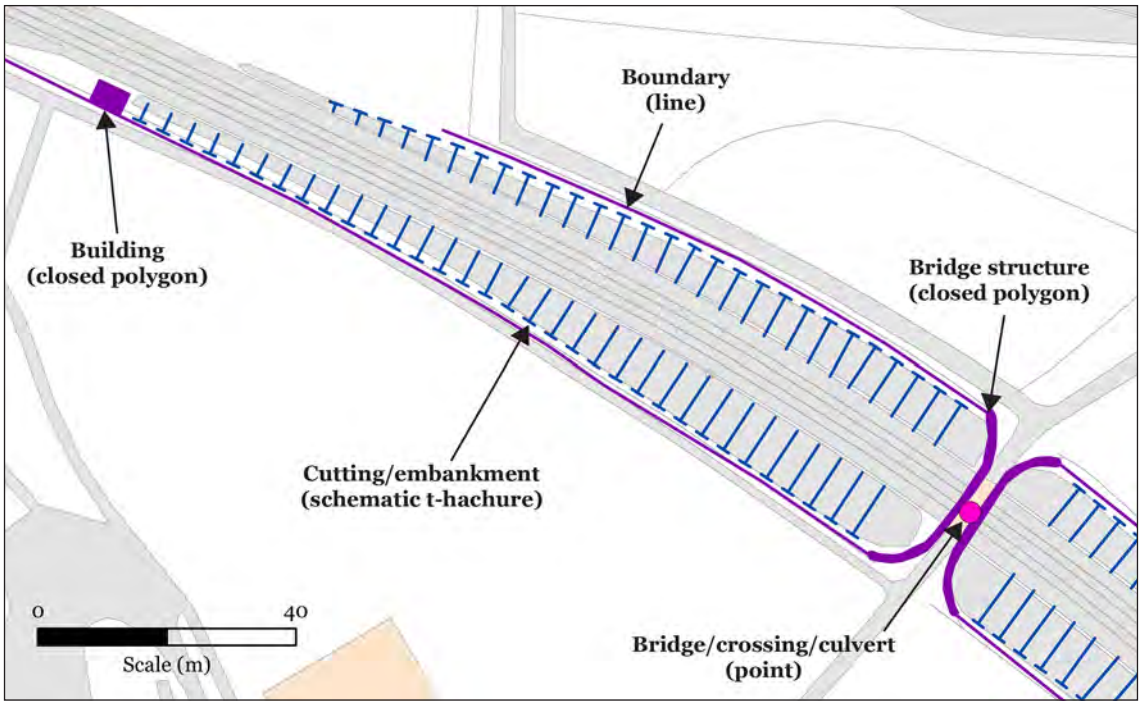

Fig 7: Mapping symbology used points, lines and polygons to depict the railway infrastructure. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2019.

Land use

The S&DR played a major role in shaping the 19th-century and later landscape. The railway was constructed largely to service the collieries of the Pennine fringe in the west – which continued to operate and expand throughout the 19th century – and transport the coal produced to the port of Stockton-on-Tees in the east. This subsequently led to the creation of new ports further downstream (Port Darlington and Middlesbrough Dock), while Darlington and Shildon became important railway hubs. OS mapping from the 1850s onwards illustrates these transformations as they show new railways, collieries, quarries, and the expansion of the urban centres. By the 1940s, the might of the late Victorian industrial boom was waning, but much of the infrastructure remained intact. As a result, 1940s vertical aerial photographs capture a unique glimpse of this landscape before many elements were levelled or demolished in the later 20th century.

There are extensive remains of coal mining in the western third of the project area, stretching from Butterknowle to Shildon. The vast works of the 19th and 20th centuries moulded much of the landscape, comprising spoil heaps, tramways, pit heads, surface workings and domestic housing. This is recorded on 1940s vertical photographs. Following the decline of the coal industry, largely post-Second World War, not only were the pits removed, but all surface traces, often including workers housing, were also demolished. Pastoral and arable fields were reinstated and much of the land returned back to its pre-industrial agricultural use. To the east, the railway supported expansion of the urban centres, changing the landscape enormously.

As discussed in more detail below, much of the project area was cultivated during the medieval and/or post medieval periods, visible in the archaeological record as extensive areas of ridge and furrow. These undulating earthworks were formed by the action of repeated ploughing. However, by the 1930s, land-use maps produced by the OS show most of the project area to be pastoral with pockets of arable interspersed (www.visionofbritain.org.uk). The large areas of grassland, with little or no ploughing, meant that many medieval and post medieval archaeological features survived as earthworks into the 1940s and 1950s to be recorded on aerial photographs. However, over the last few decades of the 20th century, intensive land improvement and a shift to arable farming has levelled many of these earthworks (Fig 8). In addition, opencast mining physically removed large tracts of the landscape, probably including elements of the original railway main line. Other previously rural areas have been encroached on by urban expansion around West Auckland, Shildon, Newton Aycliffe, Darlington, Stockton-on-Tees and Middlesbrough, especially in the post-Second World War period.
Due to a combination of the geology and the water retention of the slowly permeable and seasonally wet till and clay, the soils within the project area are generally not conducive to cropmark formation over buried archaeological remains. Where cropmarks have been found, it is usually on the gravels that line the floors of river valleys.

Previous study

The wider archaeological landscape

Due to the size of the project area, a large number of archaeological interventions are recorded within it. The most relevant of these are summarised below.

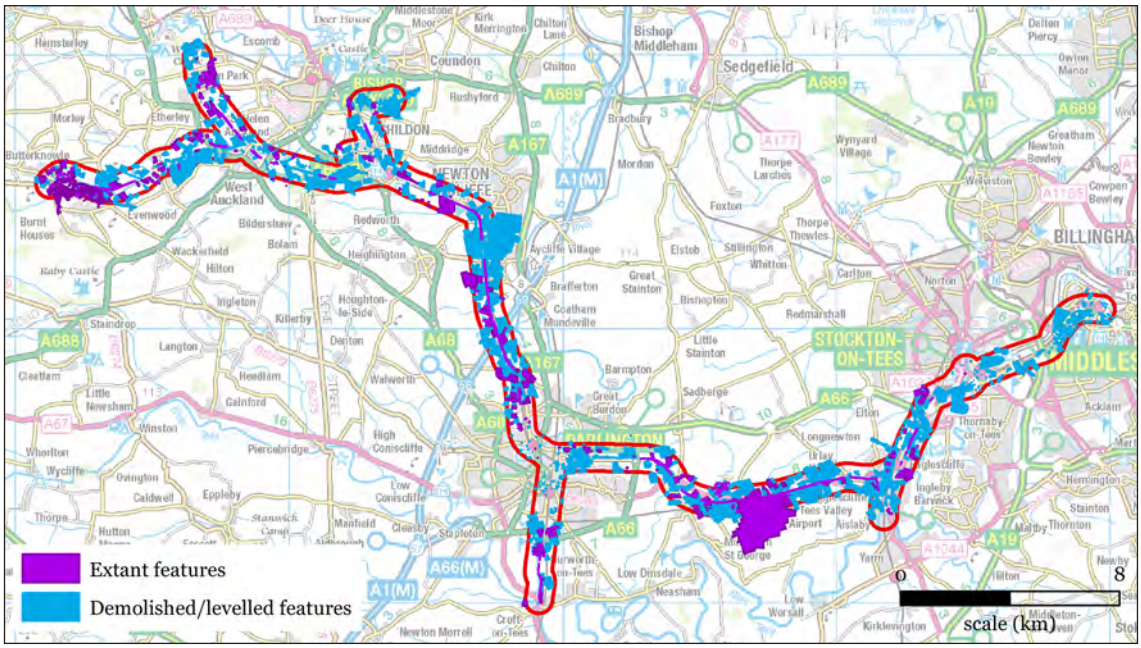

Fig 8: Only approximately one third of features mapped from historical aerial photographs are extant on the latest imagery. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2019.

A significant area, in terms of multi-period archaeological remains, is Cockfield Fell. The Fell has been known to be a rich archaeological landscape for some time, and was placed on the National Heritage List for England in 1973 (NHLE 1002314). The first detailed study was based on aerial photographs (Roberts 1975). Earthwork surveys were also undertaken by the Royal Commission on the Historical Monuments of England (RCHME) in 1983 and 1984 (RCHME 1984). These surveys aided interpretation of about two-thirds of Cockfield Fell that fell within the project area.

Other notable studies have taken place mostly on medieval settlement sites, either as part of rescue excavations or for research purposes. These include the medieval earthworks of East Thickley (surveyed by RCHME at 1:1,000 in 1983) and excavations at Old Towns in 1974 and 1976, where pottery fragments suggested earlier origins for the 18th- and 19th-century earthwork remains (Roberts and Clark 1976, 21-2). Red Hall moated site was also excavated in 1966-7 prior to development (Wilson and Hurst 1968; Still and Pallister 1978). The most extensive and complete settlement earthworks in the project area are at West Hartburn. This linear medieval settlement underwent small-scale excavation in 1962 (Still and Pallister 1964) and was surveyed in 1991 by the RCHME.

The largest study touching upon the project area was the Durham Aggregates Levy Sustainability Fund (ALSF) mapping project (Radford and Pallant 2008), an aerial investigation & mapping project undertaken between 2006-7, which covered approximately one third of the S&DR project area, between West Auckland and Coatham Lane. The ALSF project used many of the same sources as this HAZ assessment, but the current project benefits from aerial photographs that have been taken and/or accessioned since the completion of the ALSF project and access to Environment Agency Lidar, which was not assessed by the ALSF project. As a result, the cross-over area was re-examined by the current project.

The railway

The history of the S&DR has been the subject of numerous research projects and publications. It is not the intention of this report to repeat that, but to discuss the archaeological context of the railway. There have been few assessments of the physical remains of the railway until recently.

Parts of the disused sections of the railway were scheduled from 1976 onwards, including remains associated with the Etherley and Brusselton Inclines (NHLE 1002315). This covers the westernmost 4.5km of the railway from Low Etherley to Burnshouse Lane, and includes both Etherley North and South Inclines and Etherley Engine. An additional 220m stretch of the line was scheduled under the same number to the north of Low West Thickley Farm. This covers a short stretch of the Brusselton West Incline, but does not cover the Brusselton Engine infrastructure which also remains largely intact. However, the Brusselton engine house and cottage are listed buildings and also protected by Conservation Area status. Many of the other surviving buildings of the S&DR are similarly protected by Conservation Area status or are listed buildings in their own right. The Skerne Bridge is currently protected by scheduling (NHLE 1002331).

Preston Park underwent a Desk-Based Assessment which identified the presence of the railway embankment through the woods (Daniels 1996). Subsequently, a small excavation of this earthwork took place in 2005, establishing the make-up of the embankment.

The Friends of the Stockton and Darlington Railway was formed in 2013 and this provided the impetus for the proposal of the railway as a HAZ. Comprising a committed body of enthusiasts, the Friends' vision is to 'develop the 1825 Stockton & Darlington Railway line as an educational, cultural and historic site of international significance and to develop its recreational, economic and tourism potential' (www.sdr1825.org.uk).

A conference in 2015 held by the Friends of Stockton and Darlington Railway led Darlington Borough Council, Durham County Council and Stockton-on-Tees Borough Council to commission a study of the historical significance of the S&DR. This resulted in a Historic Environment Audit (HEA) undertaken by Archaeo-Environment Ltd. To date, the audit has covered the main line of the railway

(Archaeo-Environment Ltd 2016a-g) and the Middlesbrough Extension (Archaeo-Environment Ltd 2018), with the Croft Branch survey in progress. The audit includes field work and desk-based research led by Archaeo-Environment Ltd with aid from local community groups, in particular the Friends of the Stockton and Darlington Railway (Archaeo-Environment Ltd 2016b, 1).

This aerial study and report builds on the information supplied by the HEA and earlier studies, and provides a broad landscape narrative for the setting of the railway.

AERIAL SURVEY OF THE STOCKTON AND DARLINGTON RAILWAY

This chapter gives an overview of the physical remains of the S&DR main line (including the 1830 extension to Middlesbrough) and the associated pre-1831 branch lines, as recorded on aerial photographs and lidar. The original main line of 1825 (from Witton Park to Stockton-on-Tees) is discussed first, followed by the branch lines and finally the Middlesbrough extension. Description of the 1825 main line is subdivided into six sections following the areas devised by the Historic Environment Audit (Archaeo-Environment Ltd 2016b-g; Archaeo-Environment Ltd 2018), and proceeds from west to east.

Witton Park to the River Gaunless (Fig 9)

The western terminus of the S&DR main line was at Witton Park Colliery (labelled as the Old Colliery on Dixon's plan and Witton Keep/East Park on modern OS maps). Coal was hauled from here by horse-drawn wagon to the base of the Etherley North Incline (present-day Phoenix Row) and the wagons drawn up the incline by a stationary steam-engine (labelled Etherley Engine on the Dixon plan). The wagons were then lowered down to the River Gaunless at St Helens Auckland/ West Auckland. This inclined section of railway was superseded in the decade or so after 1842 by the Bishop Auckland and Weardale Railway and connecting spurs which provided an alternative, more level, route between Shildon and West Auckland traversable by steam locomotives. Consequently, Etherley Engine ceased operations in 1843 (Archaeo-Environment Ltd 2016b, 14). The disused incline, from Phoenix Row to Burnshouse Lane, just beyond the River Gaunless, currently forms part of the scheduling NHLE 1002315.

A number of buildings relating to Witton Park Colliery are visible on 1940s aerial photographs, but nothing of the railway infrastructure itself. The Historic Environment Audit (HEA) identified earthworks relating to the railway to the south of the colliery site, but these could not be discerned on aerial photographs. However, the eastern boundary wall between East Park and New Inn Farm remained extant into at least the 1940s. Sloshes Lane, immediately to the south of New Inn Farm, crossed the railway by an overbridge, though this was removed before 1859 – presumably when or shortly after this section of the railway went out of use in 1842 (ibid). South of the farm, the original western boundary to the railway would have followed the course of the current hedgerow bounding the east side of the road, opposite Softley Dene Farm, but it would appear that the original boundary wall has been removed.

South of Phoenix Row, the railway deviated to the south-east to pass through Low Etherley. This marks the start of the inclined section (Fig 10). Here, the course of the railway is well preserved, first as a broad tree-covered earthwork embankment extending almost to the modern B6282 road, and south of the road as a shallow cutting as far as the engine house at the incline summit. The B6282 formerly crossed the railway by an overbridge, but the bridge was removed with the closure of the incline in the mid-19th century. The line of the railway boundary is also visible along most of this stretch as hedgerows, which may cover original wall foundations beneath.

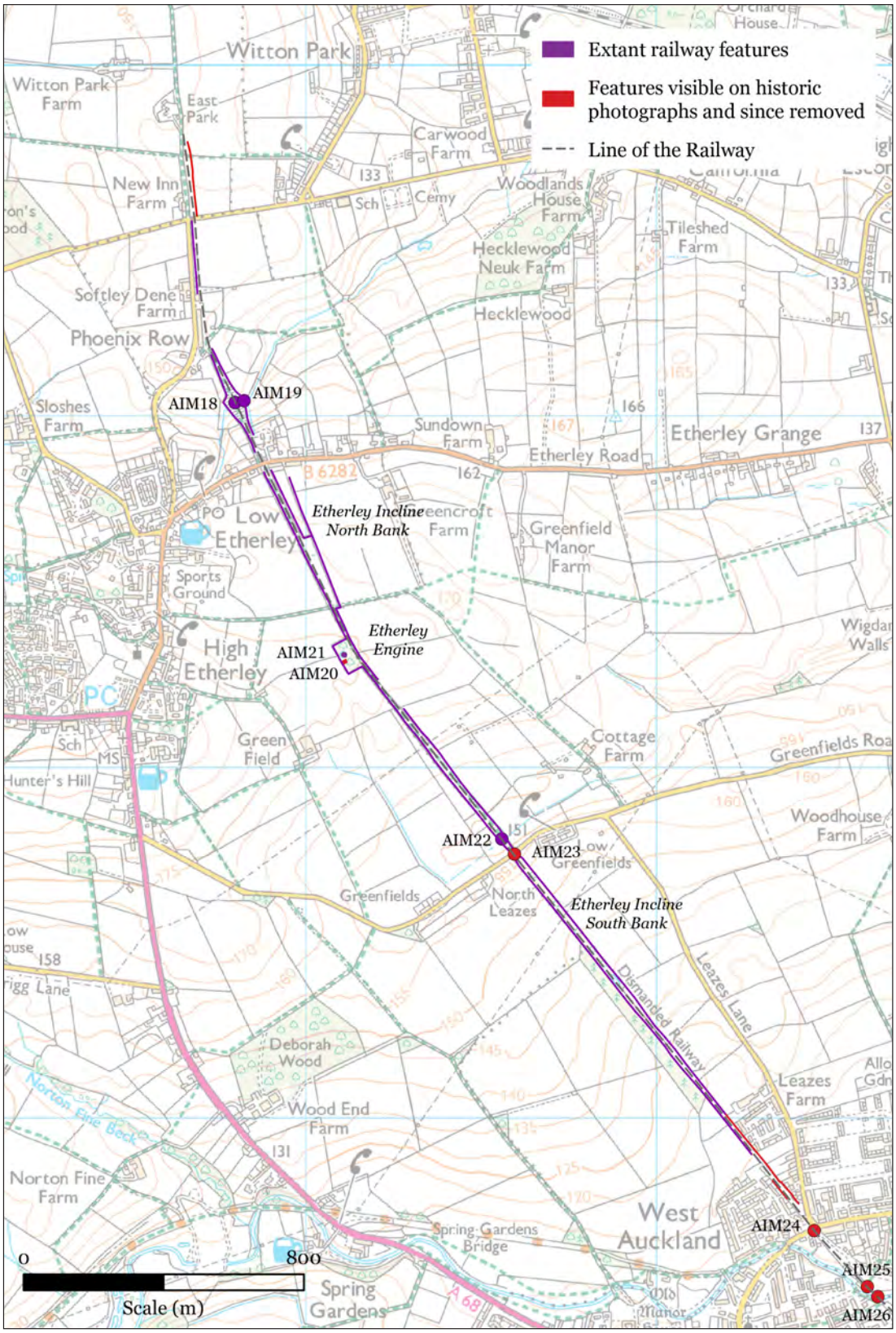

Fig 9: Features visible on historic aerial photographs relating to the original S&DR railway between Witton Park and the Gaunless Bridge. Cuttings and embankments are not depicted. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2019.

Fig 10: Etherley Incline as viewed from Low Etherley looking south-east. The site of Etherley Engine is at centre-right, inside the rectangular enclosure that adjoins the kink in the line of the railway at the summit of the incline. 17712/33 13-MAR-2002 © Historic England Archive.

The remains of the boundary wall around Etherley Engine are visible (Figs 11-12), although the engine house seems to have been mostly ruinous before 1896 (Ordnance Survey 1897). One of two ponds that provided water for the engine is also visible on aerial photographs as a shallow earthwork (AIM21; HEA27; Grade II listed as NHLE 1159141), though now partly obscured by tree cover. The second pond (HEA 28) is not visible from the air although still traceable on the ground as a shallow depression (Marcus Jecock, pers comm). The Engineman's House (AIM20; HEA506) was still standing and was mapped from 1948 vertical aerial photographs; it reportedly remained intact in to the 1980s (Archaeo-Environment Ltd 2016b, 13-14), but has since been demolished.

The Etherley South Incline is aligned to the south-east. It is slightly embanked as it approaches Greenfields Road, which it originally crossed via a level crossing. A small culvert carrying the railway over a drain (AIM22; HEA 502) just north of the road remains intact, although the level crossing (AIM23; HEA516) does not.

Fig 11: The Etherley Engine consisted of the Engine House, the Engineman's House and two ponds to supply the water for the steam engine. All that is visible on modern aerial photographs are the partly levelled earthworks of the southern pond and the enclosure wall. Left: 1839 Thomas Dixon plan. Source: Archaeo-Environment Ltd. Reproduced with kind permission of The National Archives, ref. RAIL 1037/451; Right: NZ1728 11-JUN-2015 © Bluesky International/Getmapping PLC.

Fig 12: The original railway boundary wall to the south of the Etherley Engine. Ground inspection revealed most of the coping stones are in place. March 2019 © Historic England.

Between Greenfields Road and St Helens Auckland the railway survives as first a 520m-long cutting and then as an embankment. These earthworks are best viewed on the lidar as they are largely obscured on aerial photographs by dense vegetation. The railway boundary walls can be traced on aerial photographs for most of the length of the South Incline, though some of the southern section appears to have been removed.

In the centre of St Helens Auckland, the railway buildings illustrated on the 1839 Dixon survey all appear to have been demolished. Here, the railway crossed the junction of Station Road and Manor Road by a level crossing (AIM24; HEA517). This crossing, still extant in the 1940s, was also the point at which the Haggerleases Branch joined the main line of the S&DR, but these went out of use with the closure of this section of line in the 1960s. This was also the point at which the West Auckland (Tunnel) Branch Railway deviated from the old line. On the approach to the River Gaunless, the railway was embanked, passing over a narrow accommodation underbridge 30m north of the river (AIM25, HEA2; *see* Fig 15). The pedestrian way is still in use, leading to a footbridge over the river, but the accommodation bridge has been removed.

Fig 13: The bridge over the River Gaunless was the world's first iron railway bridge. It is now preserved at the National Railway Museum, York. October 2018 © Historic England.

An underbridge carried the railway over the River Gaunless; one of the world's first iron railway bridges and the first to use an iron truss (Chrimes 1991, 45) (AIM26; Fig 13). This section of railway, to the east of West Auckland, fell into disuse following the opening of the West Auckland (Tunnel) Branch Railway in 1856, which linked West Auckland to Shildon by a more level approach via the Shildon Tunnel, part of the Bishop Auckland and Weardale Railway (Hoole 1975, 38). The

Gaunless bridge survived however until 1901 when the iron deck was replaced by a stronger structure with the re-opening of part of the line to serve Brusselton Colliery (ibid, 11). The old superstructure was then removed, though the original stone abutments were retained (Archaeo-Environment Ltd 2016b, 27). The original deck structure is now preserved at the National Railway Museum, York (Hoole 1975, 38).

River Gaunless to the Shildon Tunnel Branch Junction (Fig 14)

From the river, the railway ran east-south-east, ascending the south-east side of the Gaunless valley via the Brusselton West Incline to the summit at Brusselton Engine, north of High West Thickley. From here the railway descended eastwards towards Shildon where it was joined by the Black Boy Branch line coming in from the eponymously named colliery to the north. Lengths of this section, from the River Gaunless to Burnhouse Lane, and immediately adjacent to Low West Thickley Farm, are currently included in the same scheduling as the Etherley Incline, under NHLE 1002315.

The Brusselton West Incline was formally abandoned in 1858, as part of the West Auckland to Shildon closure following the construction of the West Auckland (Tunnel) Branch Railway as part of the Bishop Auckland & Weardale Railway. The line was however maintained until the 1880s as a backup in case of a blockage in the tunnel, and also to preserve rail access to St Helen's Colliery (Archaeo-Environment Ltd 2016c, 20). The depiction on OS maps suggests that by 1897 the track had been lifted between Oakley Cross Beck and Low West Thickley, and the branch line to St Helen's Colliery had also been removed. However, a short length of the railway to the east of the Gaunless bridge re-opened in 1901 as a line to Brusselton Colliery (later Ladysmith Colliery), and this presumably continued in use until the closure of the colliery in 1949 (Durham Mining Museum 2019b). The track on the Brusselton East Incline was still intact as far west as Brusselton Cottages until at least 1939, although by the 1940s the main line coming from the east terminated at the Shildon Wagon Works. The stretch of line between the works and Shildon Station where the later Shildon Tunnel Branch deviated from the original line, remained in use for works access only until the closure of the works in 1984 (Sansick 1990, 30).

Because of the complex history and early closure of part of this section of the S&DR main line, the survival of features to the east of the River Gaunless is variable because of later land-use. After crossing the river, the railway ran along an embankment, which remains visible as earthworks for over 400m. Immediately east of the Gaunless, a narrow underbridge is visible on 1940s photographs (AIM27; HEA16; Fig 15), although the HEA lists this feature as partially destroyed by 2015. 80m to the south-east, Oakley Cross Beck flows beneath the railway embankment via a culvert (AIM28; HEA87; Fig 15). Another accommodation underbridge lay 190m east of the culvert (AIM29; HEA78; Fig 15), and although recorded on historic aerial photographs, is reportedly now buried (Archaeo-Environment Ltd 2016c, 5). This section of the line is included in scheduling NHLE 1002315.

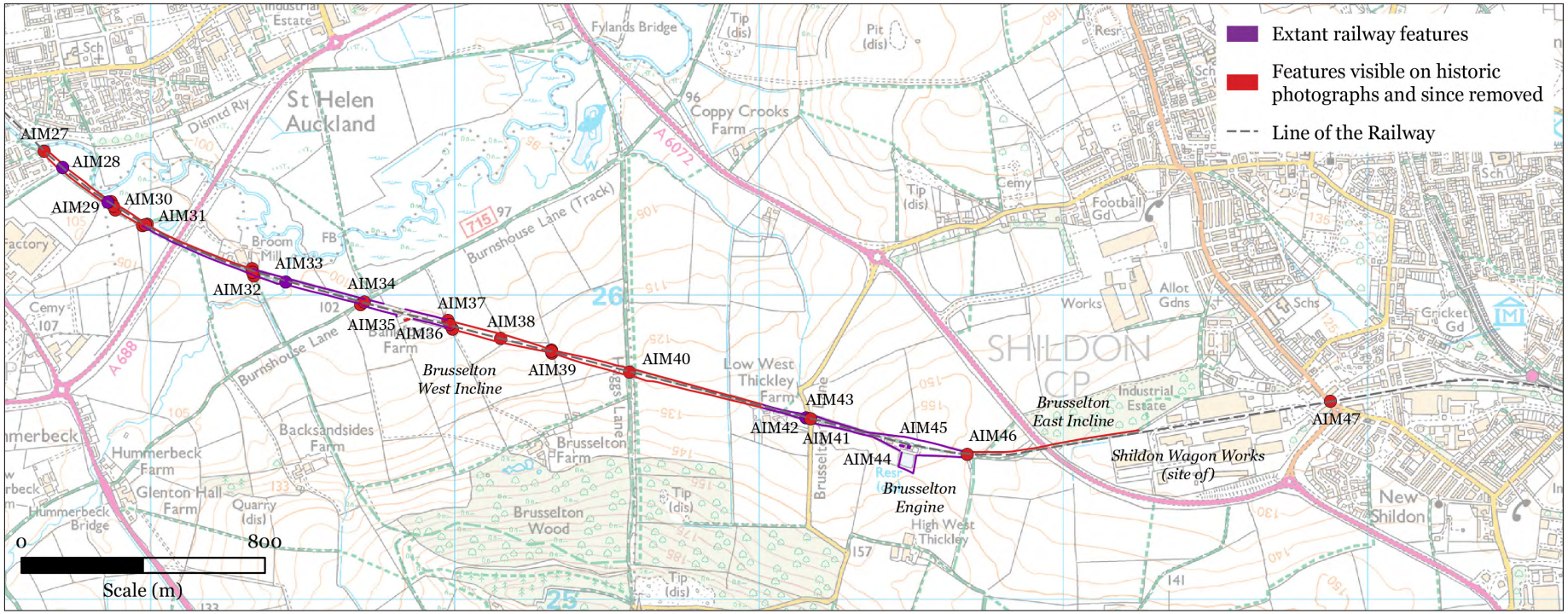

Fig 14: Features relating to the original S&DR railway mapped from aerial photographs between Gaunless Bridge and Shildon. Cuttings and embankments are not depicted. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2019.

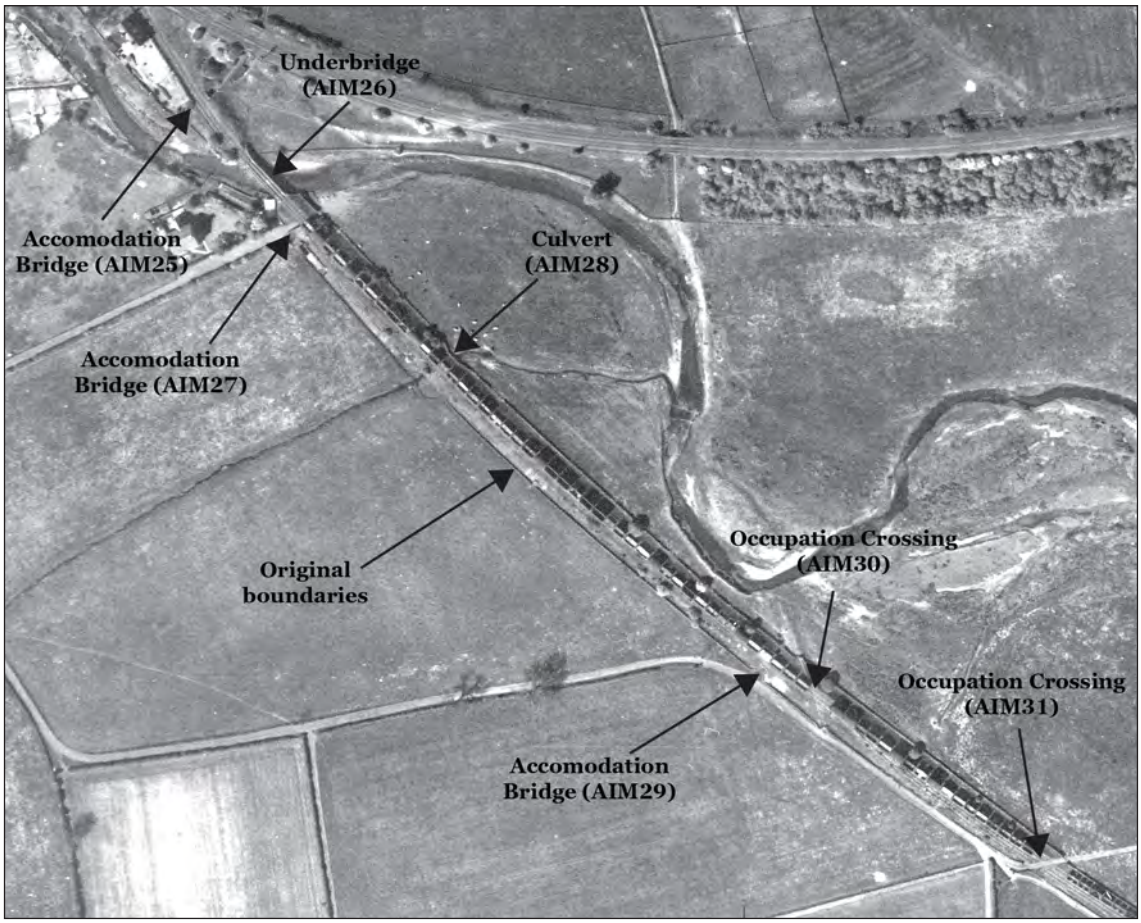

Fig 15: The railway to the east of West Auckland went out of use as the main line by 1856, but reopened in 1901 as a branch line to Brusselton Colliery (coal wagons are visible on the track). Detail of RAF/58/B/37 V 5192 17-MAY-1948 Historic England Archive (RAF Photography).

The 1839 Thomas Dixon survey shows an occupation crossing immediately adjacent to the first underbridge. This crossing (AIM 30) is visible on 1940s vertical aerial photographs (Fig 15). The southern gate appears since to have been removed. The north gate is recorded on 2015 aerial photographs, though how original it is, is unknown. The HEA records a stone gatepost with metal hinge near this location (HEA85), but as this lies 30m to the west, it is presumably a different and later feature and was not mapped. Another occupation crossing 100m to the east is recorded on early vertical aerial photographs, but no longer exists (AIM31; HEA86; Fig 15).

The point at which the modern A688 passes over the line of the old railway denotes the start of the branch line to Brusselton/Ladysmith Colliery. To the east of this point, as far as Brusselton Engine, the railway was largely disused from the 1880s onwards, but much of the infrastructure remained intact until the 1940s, allowing it to be mapped from aerial photographs.

The 1839 Dixon survey shows an occupation crossing at Broom Mill. The crossing (AIM32; HEA127) is still visible on 1995 vertical aerial photographs, but the original gateposts were presumably removed when the lineside boundaries were demolished. A slight embankment east of Broom Mill carried the railway over Hummer Beck: the original underbridge remains extant (AIM33; HEA 128). There was a level crossing for Burnhouse Lane (AIM34; Fig 16). Unusually for a level crossing, there was a gate on the south side, as illustrated on the 1839 survey, which appears to have been intact when recorded on 1948 vertical aerial photographs but seems to have been removed when the track was widened shortly afterwards.

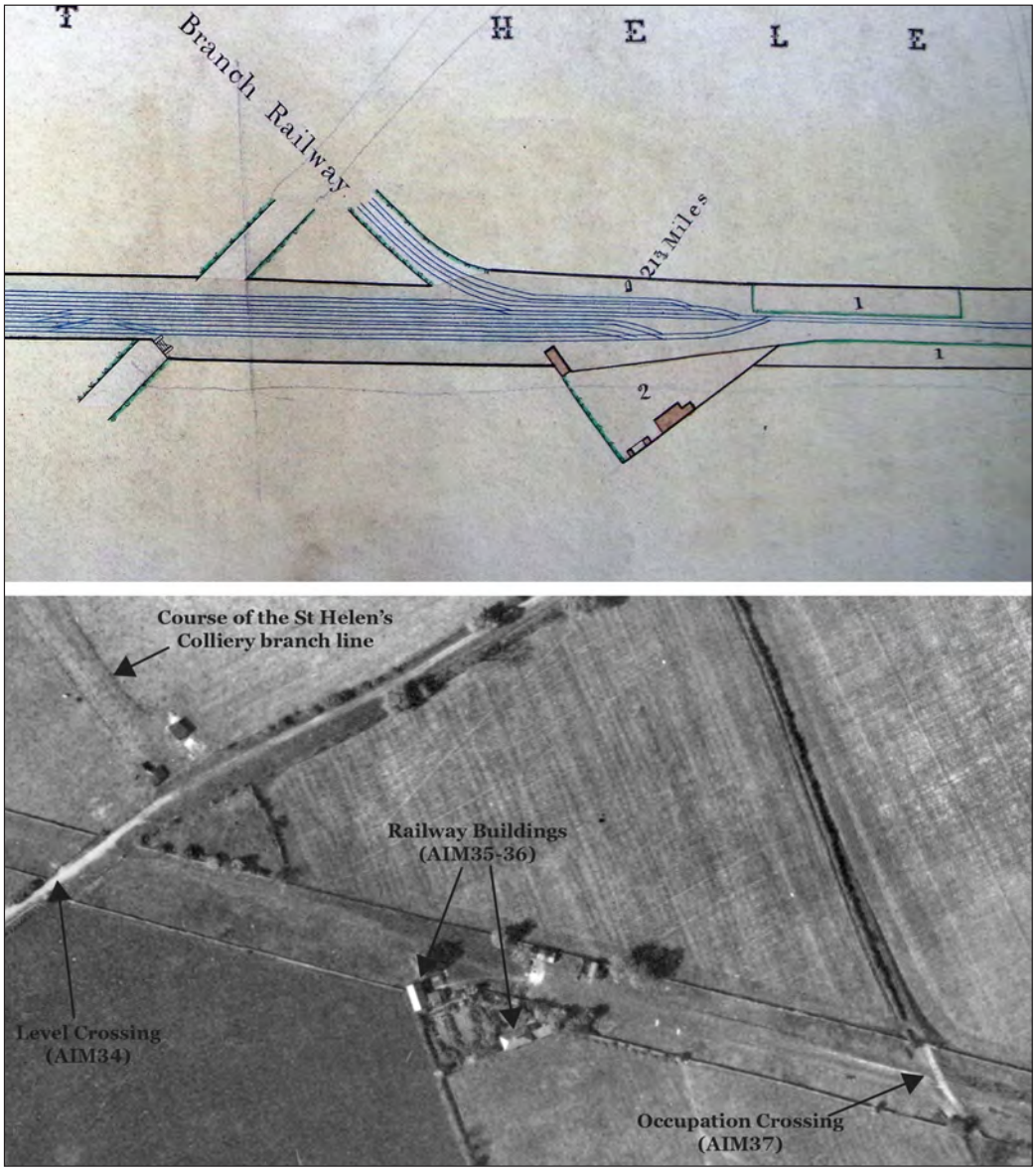

Fig 16: Bankfoot Farm marks the western base of the Brusselton Incline. The railway track had been removed by the end of the 19th century, but the boundaries and buildings remained intact. One of these buildings, although modified and extended, appears to remain occupied today. Top: 1839 Thomas Dixon plan. Source: Archaeo-Environment Ltd. Reproduced with kind permission of The National Archives, ref. RAIL 1037/453; Bottom: Detail of SfM RAF/58/B/37 V 5029-5379 17-MAY-1948 Historic England Archive (RAF Photography).

Two railway buildings are shown on the Dixon survey immediately to the east of this crossing. Located at the bottom of the Brusselton West Incline, these were presumably the site at which the railway wagons would be hitched up to the rope that would pull them up the incline (Archaeo-Environment Ltd 2016c, 10). These buildings became Bankfoot Farm after the closure of this section of the railway. The two buildings remained intact until the 1970s, but one (AIM36; HEA131; Fig 16) has since been demolished. The other (AIM35; HEA90) may have been extended and altered to form one of the current farm buildings. There was an occupation crossing (AIM37) immediately east of the farm (Fig 16). The trackway still crosses the line of the railway, but the gates have been removed. This short length of the railway line is not included within the current scheduling.

Fig 17: Much of the Brusselton West Incline west of Haggs Lane/Dere Street has disappeared from the landscape, either destroyed by opencast coal mining or simply levelled. Top: Detail of SfM RAF/58/B/37 V 5029-5379 17-MAY-1948 Historic England Archive (RAF Photography); Bottom: NZ1925-2126 11-JUN-2015 – 06-MAY-2016 © Bluesky International/Getmapping PLC.

East of this crossing, much of the original railway infrastructure remained intact in the 1940s. As the track joined the West Incline, it crossed an embankment, some 325m in length, that incorporated an accommodation underbridge recorded on 1940s vertical photographs (AIM38; HEA519). There was an occupation crossing at the eastern end of the embankment, which carried a farm track across the railway line (AIM39; HEA133), beyond which the railway entered a cutting. This allowed the railway to pass under Hagg's Lane (a section of Roman Dere Street), which traversed the line by a narrow overbridge (AIM40; HEA94; Fig 17). This was reputedly so low that passengers had to duck to avoid injury (ibid). The cutting levelled out west of Low West Thickley Farm. The HEA suggested that this entire stretch, between Bankfoot and Low West Thickley – a distance of 1.1km – may have been removed by open-cast coal mining in the late 1940s. However, the extensive surface workings visible on the 1948 aerial photographs stop to the south of the railway and a length of the railway boundary remains visible as a cropmark on 2009 Google Earth imagery, which implies that the railway has not been quarried away but its remains were simply flattened or grubbed out and covered over when the earlier field pattern was reinstated (Fig 17).

Fig 18: Original stone sleepers from the 1825 railway along the Brusselton West Incline. March 2019 © Historic England.

To the east of Low West Thickley Farm, the railway is embanked in order to take the line across two bridges. The westernmost is an accommodation underbridge allowing access to the farm (AIM42). This remains extant and is said by the HEA to be one of the finest examples surviving on the S&DR (Grade II listed as NHLE 1160402). Surprisingly, it is far more elaborate than the adjacent underbridge that carried the railway over Brusselton Lane (AIM43; HEA98). This latter bridge is visible on early vertical aerial photographs but was demolished in 1954 (Archaeo-Environment Ltd 2016c, 11). The embankments, accommodation bridge and abutments are currently included in the scheduling with the Etherley and Brusselton Inclines, NHLE 1002315.

This is also the only location on the S&DR line where any of the original stone railway sleepers are visible on aerial photographs (AIM41; Fig 18). The Brusselton Incline Group exposed the stone blocks in 2014 by clearing the surrounding vegetation (ibid, 12); they are clearly visible on recent aerial photographs (*see* Fig 81). The stretch is included within the scheduling NHLE 1002315.

The Brusselton Engine was located 300m to the east of this crossing (Fig 19). Much of the associated infrastructure remains intact, including the boundaries, the cutting in which the engine and associated features lay and elements of both of the original buildings. The engine was originally fed from two circular ponds, but these were quickly replaced by the present, much larger, square reservoir (not mapped by this project as it does not relate to the original railway). The Engineman's House (AIM44; HEA111; Grade II listed as NHLE 1121494) is now converted to a modern dwelling. The Engine House (AIM45; HEA111; Grade II listed as NHLE 1160153 and 1121493), though much reduced in size from the building illustrated on the 1839 map (which was an 1831 upgrade to the original engine house), is also now a residential dwelling.

Two small terraces of houses, known as Brusselton Cottages are located in the cutting for Brusselton Engine. These were probably built for workers of the nearby Shildon Wagon Works.

Most of the original railway boundary walls between the River Gaunless and Brusselton Engine are recorded on 1940s vertical aerial photographs. As discussed above, a large section of the railway may have been removed by opencast mining in the late 1940s. Of the remaining boundaries, several appear to have been removed in subsequent decades, or have become covered in vegetation. The HEA identified numerous stretches of boundary wall surviving along this section of the railway, but the degree of survival varies, with many sections ruinous and only visible as foundations (ibid, 4). There are sections, such as to the east of Broom Mill, where the wall foundations are visible on the most recent colour vertical aerial photographs, but they appear to have little or no height.

A small accommodation overbridge to the east of Brusselton Engine is visible on 1940s vertical aerial photographs and corresponds with a crossing noted on the 1839 survey (AIM46; HEA113). The HEA noted that some of the abutments to the bridge survive despite removal of the decking in the late 1950s (ibid, 20).

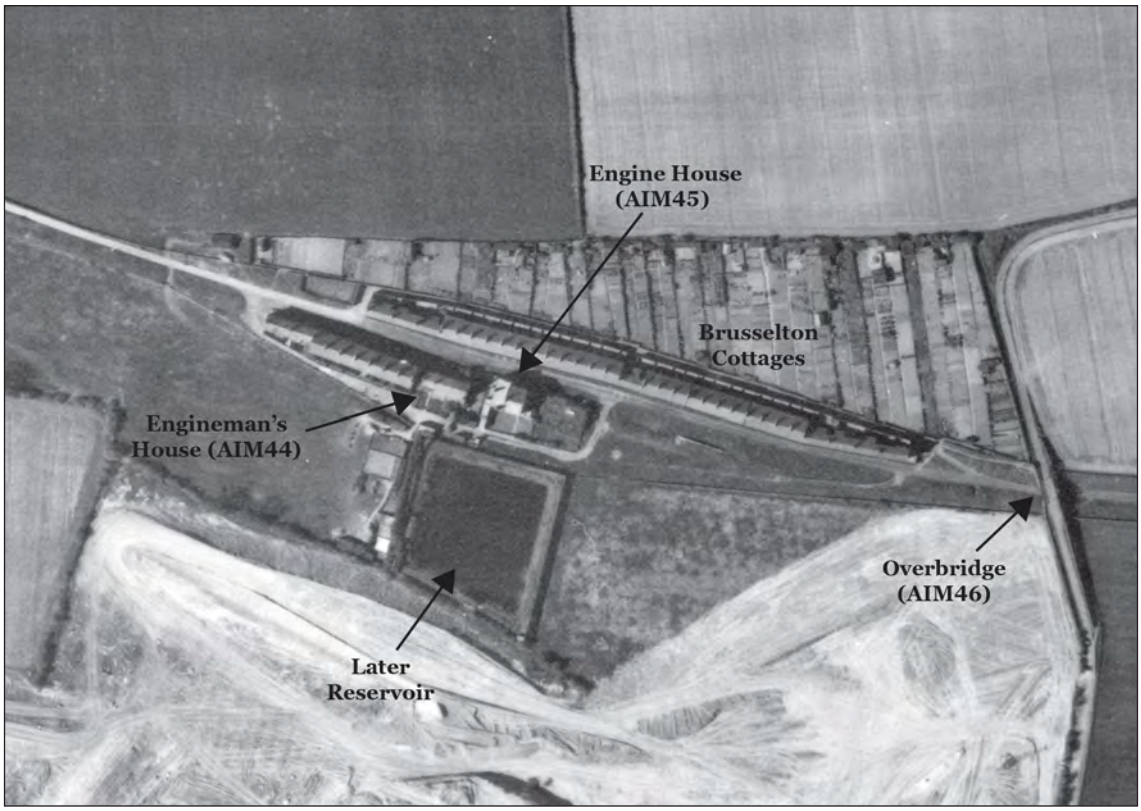

Fig 19: In 1825, Brusselton Engine comprised the Engineman's House, the Engine House and two circular ponds. By the end of the century, two terraces of houses, named Brusselton Cottages, had been added and the ponds enlarged into a single, square, reservoir. The Engineman's House, parts of the Engine House, the later reservoir and a number of the cottages are still there. Opencast coal mining can be seen to the south of the reservoir. Detail of RAF/58/B/37 V 5277 17-MAY-1948 Historic England Archive (RAF Photography).

Shildon Tunnel Branch Junction to Coatham Lane (Fig 20)

Shildon was the start of the original steam-hauled railway of 1825. It was here, after a journey by horse and steam-powered inclined plane, that the passenger and goods wagons were hitched up to Locomotion No.1 in September 1825, whence they continued their journey to Stockton by steam locomotive.

New Shildon developed as the home to major railway works over the century that followed. The first of these was the Shildon Works (Fig 21), which opened in 1825, later becoming the Wagon Works. By the late 19th century, the works comprised several large workshops and an extensive area of railway sidings. This later development removed any vestiges of the pre-1831 railway. The works were the initial home of the S&DR Locomotive Department (Archaeo-Environment Ltd 2016d, 4).

Timothy Hackworth, who was initially employed by the S&DR Company, independently established what became the Soho Engine and Foundry Works in 1833 at the junction with the Black Boy Branch. The engine works were absorbed in to the S&DR in 1855 (ibid, 4, 15).

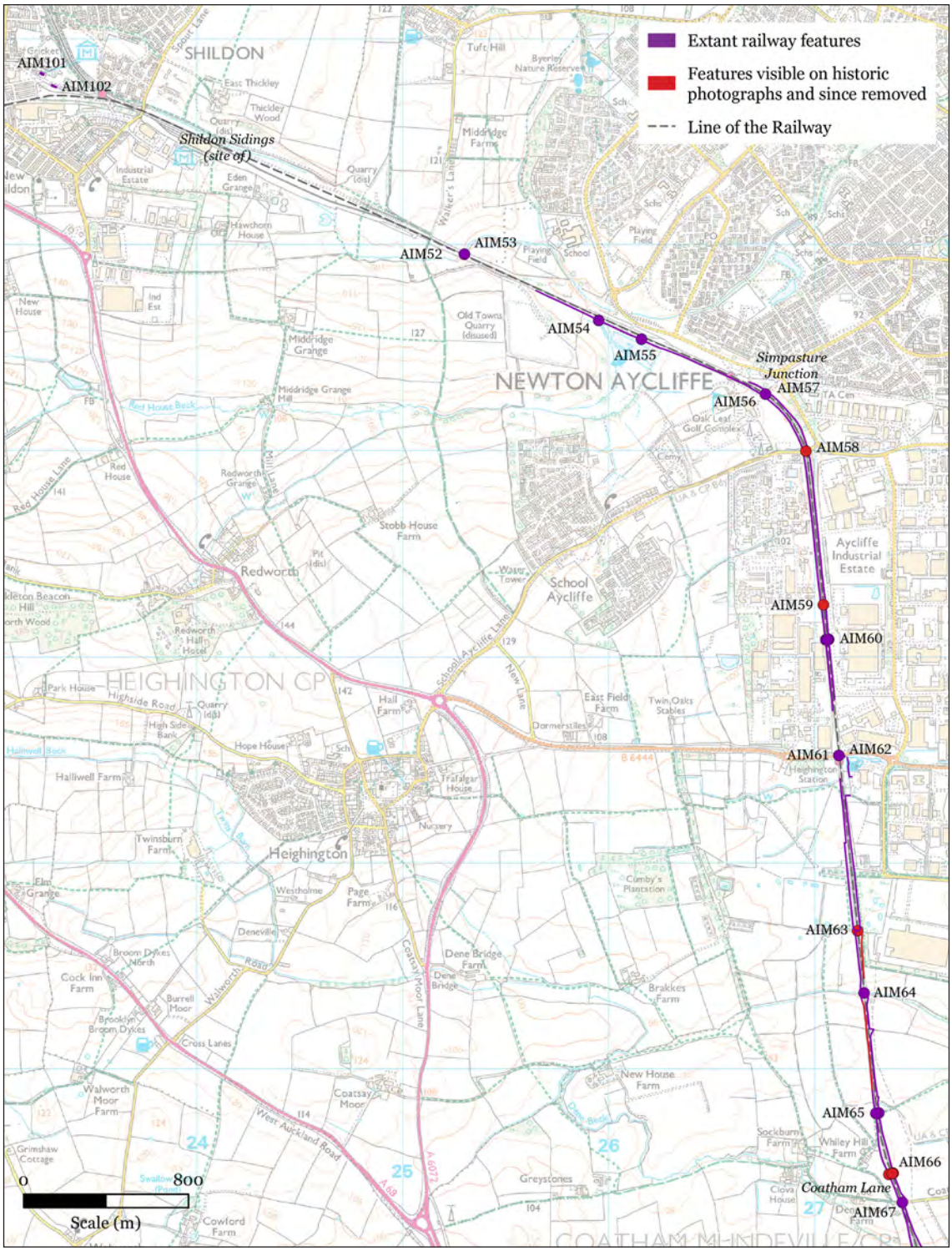

Fig 20: Features relating to the original S&DR railway mapped from aerial photographs between Shildon and Coatham Lane. Cuttings and embankments are not depicted. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2019.

Fig 21: The Shildon Wagon Works operated from 1825 to 1984. Detail of RAF/58/5640/PSFO-0066 01-MAR-1963 Historic England Archive (RAF Photography).

The railway originally entered Shildon from the west via the Brusselton Incline. This section of the railway was however removed by the late 19th century and the line stopped at Brusselton Cottages. OS mapping surveyed in 1939 suggests that the railway track between Brusselton Cottages and the Shildon Wagon Works was still intact, but 1948 vertical aerial photographs shows that the track west of the works had been removed by then. The Shildon Works remained in operation until the 1980s and had rail access until this point.

East of the works, the Black Boy Branch and Copy Crooks Branch/Surtees Railway joined the main line before passing over Byerley Road via a level crossing (AIM47). No further features belonging to the original 1825 main line were noted on aerial photographs between the wagon works and the branch line junction in Shildon.

Subsequent railway development, urban expansion and development of brownfield sites have removed almost all original features relating to the S&DR in Shildon. There is a tentative length of boundary on the south side of Station Street, but confirming this as original to the 1825 railway is impossible from aerial photographs. Soho House (AIM101; Fig 20; NHLE 1160335) was Timothy Hackworth's home whilst employed by the S&DR Company, and he oversaw the construction of a number of buildings, of which the engine shed also remains (AIM102; Fig 20; NHLE 1310628). These two buildings were incorporated in to the Soho Works in 1833. Both buildings now form part of the National Railway Museum in Shildon and are Grade II listed. There are two small buildings to the east of the Soho Works site which are discussed under the '*Black Boy Branch Line*' below.

To the east of Shildon, the line was moderately level, continuing south-eastwards before turning almost due south at Simpasture Junction, south of the 1947 New Town of Newton Aycliffe, and proceeding straight as far as Coatham Lane. The entire length of this section of the railway remains in use today.

Little survives to the east of Shildon that is recognisable on aerial photographs as original to the railway. By the late 19th century, the original three-track railway had expanded into the Shildon Sidings (Fig 22), a 130m-wide span of track-bed (comprising 27 miles of track), thought at the time to be the largest marshalling yard in the world (Archaeo-Environment Ltd 2016d, 19). The yard has gone and the railway has contracted back to a narrow two-track bed; the line of the railway now runs slightly to the south of its original course. A footbridge, seen in Fig 22 crossing the marshalling yard, dates to 1857 and outside the scope of this study.

Fig 22: The construction of the Shildon Sidings removed all traces of the 1825 railway. Detail of SfM RAF/58/B/37 V 5029-5379 17-MAY-1948 Historic England Archive (RAF Photography).

There was a small building located east of Walker's Lane, not far to the east of the sidings (AIM52; HEA570). Most likely a platelayers' hut, this building is extant on the 1940s aerial photographs, but has since been demolished. Woodham Burn passes beneath the railway via a culvert (AIM53; HEA538) some 80m to the east of the hut. As with many of the culverts on extant sections of the railway, this is likely to be an original feature.

There are traces of the original line to the north of Old Towns Quarry. The south side of a railway embankment, thought to relate to the original railway, is visible as an earthwork on lidar stretching from here to Newton Aycliffe Station. The original southern boundary is visible on 1940s vertical photographs, though this is now under tree cover and it is uncertain whether any original walling survives. The north face of the embankment and associated boundary appear to have been removed or buried by the widening of the railway in the early 20th century. An occupation crossing gate (AIM54; HEA571) and culvert (AIM55; HEA225) are visible on 1940s aerial photographs along the south boundary, but these are now under dense vegetation and their current condition unknown. A platelayers' hut (AIM56; HEA572; Fig 23) was located at Simpasture Junction, adjacent to the modern Newton Aycliffe Station. This is recorded on 1948 vertical aerial photographs but has since been demolished.

Simpasture Junction formed the point at which the Clarence Railway (opened 1833) joined the S&DR. To the immediate east of the junction there is a narrow accommodation underbridge (AIM57; HEA227; Fig 23). Although the decking has been replaced at least twice (ibid, 28), the abutments are thought to be original to the 1825 railway. It still carries foot traffic between Newton Aycliffe and the OakLeaf Sports Complex.

From Simpasture Junction the line makes a turn to the south. It would appear that much of the original railway structure from here to Coatham Lane has been retained as it is still in use by the current railway. The line enters a 1.2km-long cutting at Simpasture Junction, exiting at the southern end of the Aycliffe Business Park. There are numerous original crossing points along this section of the railway, recorded on aerial photographs. An overbridge carrying School Aycliffe Lane across the railway was widened in the 19th century, but the HEA (ibid, 31-2) states that the original structure appears to survive within the current bridge (AIM58; HEA230; Fig 23). A little further south, another bridge carried a road to Aycliffe Wood House, but the structure visible today (AIM59; HEA219) appears to be a late 19th-century rebuild (ibid, 32). Less than 200m to the south, there is an occupation crossing (AIM60). Aerial photographs record that this was in use in the 1940s, but the location is now under dense tree cover and the current condition of the gates is uncertain. The HEA did not note anything at this location, but some areas may have been inaccessible to ground inspection due to this section of railway being live line.

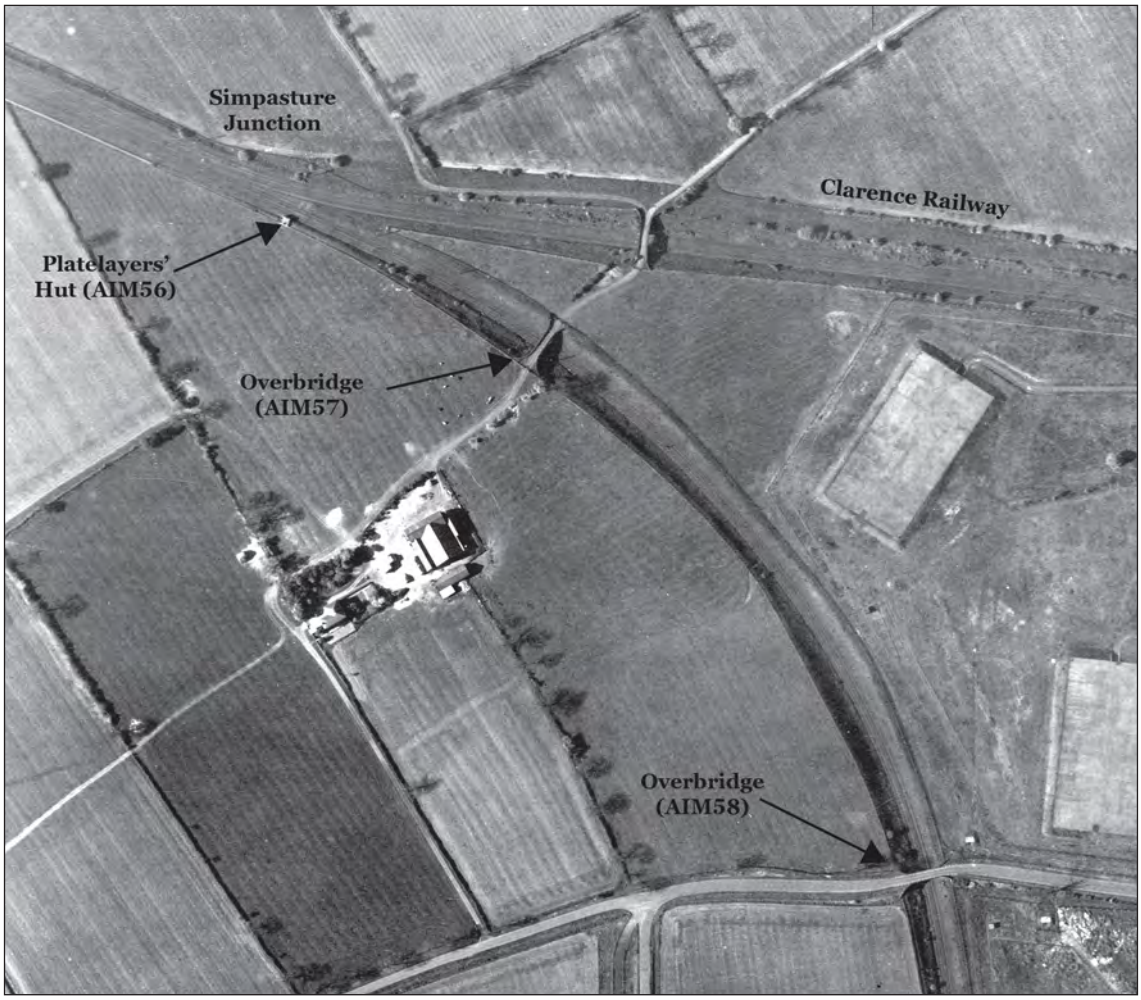

Fig 23: Simpasture Junction is where the Clarence Railway joined the S&DR. To the south of the junction, the overbridge abutments remain intact, although the decking has been replaced. Detail of RAF/58/B/37 V 5379 17-MAY-1948 Historic England Archive (RAF Photography).

The level crossing at Heighington Lane (AIM61) remains in use today, though as stated earlier, road crossings did not have gates in the early years of the railway, so the gates here cannot be part of the original 1825 infrastructure. A public house (now *Locomotion No. 1*; AIM62; HEA203; Grade II listed under NHLE 1322808) is sited immediately south of the crossing. It was constructed in 1826 as one of three railway taverns on the line and initially doubled up as Heighington Station (Archaeo-Environment Ltd 2016d, 34). The current footprint of the building is considerably larger than the 1826 structure.

Fig 24: The bridge adjacent to Moordale Park (AIM63) was intact in the 1980s (left). By the mid-1990s, the decking had been removed (middle), but the stonework abutments were intact. The entire structure was then demolished in around 2014 in connection with track improvements (right). Detail of OS/89263 V 39 11-JUN-1989; Detail of OS/93209 V 77 06-JUN-1993 © Crown copyright. Ordnance Survey; Detail of NZ2721 06-MAY-2016 © Bluesky International/Getmapping PLC.

To the south of the crossing, the line enters another cutting. The original boundaries can be identified on 1940s aerial photographs as far south as Kitchener's Point, though large sections of these appear to have since been removed. An accommodation overbridge crossed the railway south of Moordale Park (AIM63; HEA220; Fig 24), but was removed around 2014 as part of the Hitachi rail improvements (ibid, 43). This illustrates the potential issues with preserving original features on the working parts of the railway line. The railway track exits the cutting 230m to the south and proceeds on to an embankment. These earthworks are particularly well preserved and can clearly be discerned on the lidar. The boundaries that flank this stretch of railway are on the line of the 1825 boundaries and may retain some original structure. At the north end of the embankment, an original culvert carries a narrow beck beneath the railway (AIM64; HEA221). The Dixon survey depicts an occupation crossing located at the southern end of the embankment, north of Whiley Hill (AIM65; HEA546). Gates visible on early vertical photographs have since been removed and replaced with a different configuration as the crossing remains in use.

The line enters another cutting, 260m in length, before emerging on to an embankment as far as Coatham Lane. An occupation crossing was located at the junction of cutting and embankment, as marked on the Dixon survey (AIM66). The crossing and the gates remained in use into the 20th century, but are no longer visible. The railway then crosses Coatham Lane via a level crossing (AIM67).

Coatham Lane to Darlington North Road Station (Fig 25)

From Coatham Lane, the railway continues southwards across mostly low-lying and level ground, entering Darlington from the north-west. It is still in use today. This section of the report discusses the railway line to just outside North Road Station in Darlington.

The line is embanked to the south of Coatham Lane. An original culvert (AIM68; HEA336) through this embankment carries Dene Beck under the railway. A short distance to the south, a narrow accommodation underbridge crosses the line (AIM69; HEA190). The original 1825 bridge structure survives, although the wing walls retaining the embankment have been rebuilt (Archaeo-Environment Ltd 2016e, 5).

The A1 Motorway was sunk into a deep cutting when it was built, destroying a 75m length of the original railway at Stanley Farm – the line now being carried over the motorway by a modern underbridge. To the south of the A1, the original east boundary to the railway appears intact. The west boundary is visible on 1945 aerial photographs, but has been removed and realigned as part of more recent railway works. There is an accommodation underbridge adjacent to the ruins of Myers Flat/Coatham Grange (AIM70; HEA194; Fig 26). This retains the original curved abutments as illustrated on the Dixon survey, though a ground assessment as part of the HEA revealed that the decking has been replaced (ibid, 7).

The railway continues on an embankment for 250m to the south of Myers Flat. A small building recorded from 1940s aerial photographs (AIM71; HEA198) appears to relate to one illustrated on the 1839 survey and was presumably a platelayers' hut, but has since been demolished. The line continues through a cutting to the east of Whessoeville. It is crossed by a narrow accommodation overbridge linking Little Whessoe with Whessoe Holme (AIM72; HEA344). Although there was a bridge marked at this location on the Dixon survey, the bridge visible on aerial photographs appears to be of a different size and plan, and is possibly a later 19th century replacement.

There are parts of original boundaries adjacent to Kitchener's Point and they continue intermittently to the south. The line enters another cutting west of Drinkfield, but no remains are visible beyond an occupation crossing (AIM 73; HEA251) which once served a track to the now-levelled Huntershaw Farm. This crossing remains in use, though it is unlikely that any of the original gate structures survive. No further original features are visible from this point to Darlington because the line is live and has been substantially remodelled.

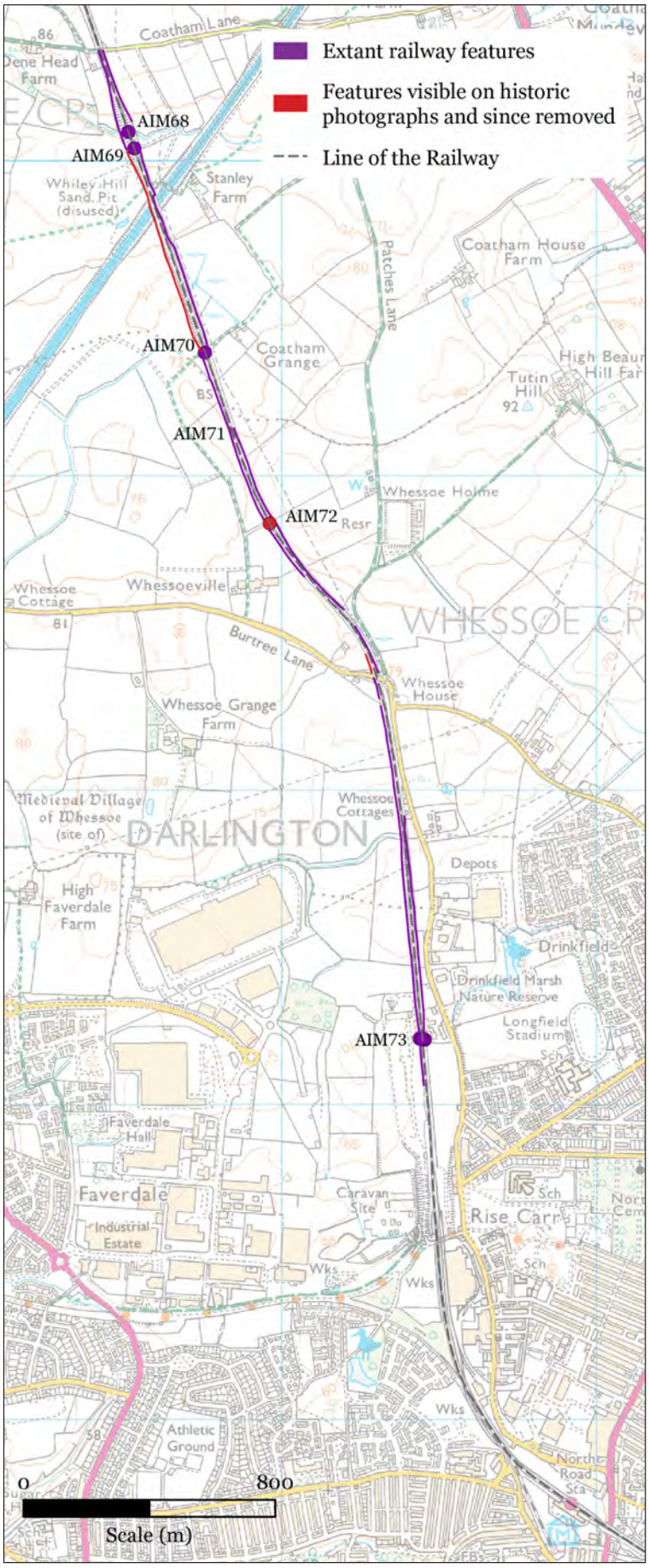

Fig 25: Original features of the S&DR railway visible on aerial photographs between Coatham Lane and Darlington North Road Station. Cuttings and embankments are not depicted. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2019.

Fig 26: The underbridge that served access to Coatham Grange/Myers Flat (seen in ruins to the right) retains its original curved abutments, though the decking has been replaced (AIM70; HEA194). Detail of NZ2719 06-MAY-2016 © Bluesky International/Getmapping PLC.

Darlington to Low Goosepool Farm (Fig 27)

Prior to the development of the S&DR, Darlington was only a small market town, but it rapidly expanded to become one of the major railway hubs in the north of England (MacRaild and Purdue 2006, 96). The town was not only the junction for the 1829 Croft Branch Line, but also for the later Darlington and Barnard Castle Railway, The Great North of England Railway and the Darlington and Saltburn Railway. The latter was built as a diversion between Darlington and Oak Tree Junction in 1887 (Hoole 1975, 15), but the original S&DR line eastward out of the town remained in use as the Fighting Cocks Loop Line. This was identified for closure in the Beeching Report. It is marked as still partly intact on the 1971 OS map, although this might be because this map was only partly revised from an earlier edition where the railway was still extant

Nothing of the railway earthworks or boundaries in the centre of Darlington can be identified as original from the air, but a number of important early railway buildings do survive (Fig 28). These include the Goods Shed (Grade II* listed as NHLE 1121262), which was built in 1833 (AIM74) and is now owned by Darlington Borough Council and is home to the Darlington Railway Preservation Society (Archaeo-Environment Ltd 2016f, 10-11) and the Railway Tavern (AIM76), one of three taverns/ticket offices constructed on the line, which still functions as a public house today. Other early railway buildings shown on Dixon's map (coloured red on Fig 28) that no longer survive include: to the south of the line, the original Goods Depot of 1827 (demolished 1864); and to its immediate north, a building of uncertain purpose entered by six rail spurs, which OS maps show had been demolished before the turn of the century.

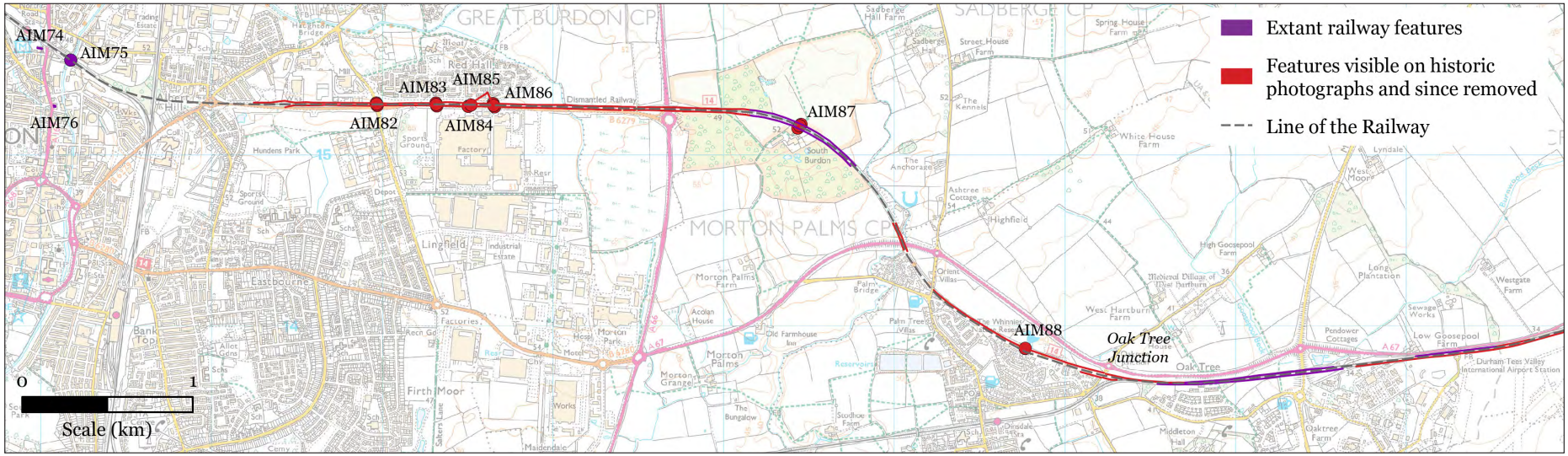

Fig 27: Original S&DR railway visible on aerial photographs between Darlington North Road Station and Low Goosepool Farm. Cuttings and embankments are not depicted. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2019.

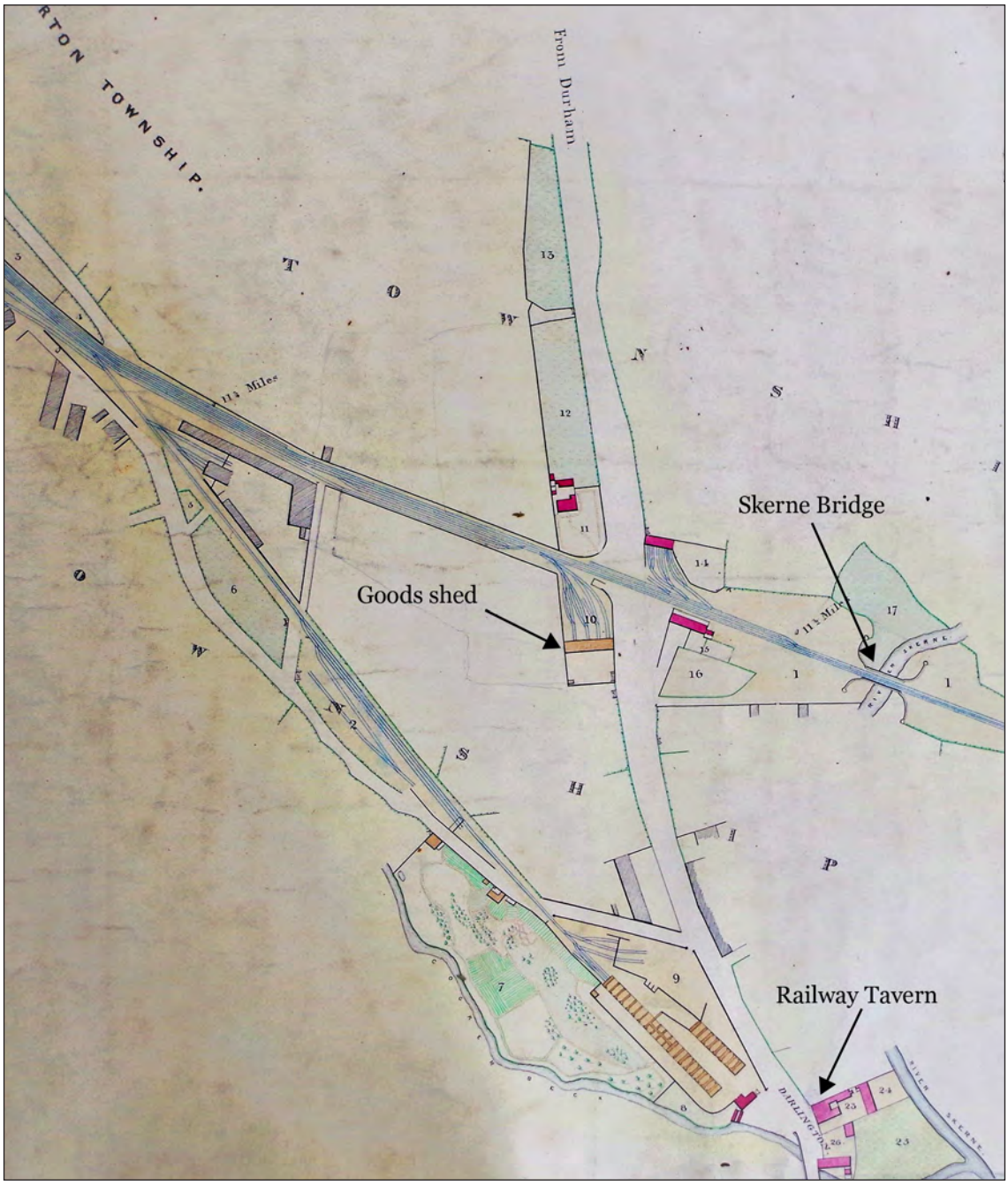

Fig 28: Darlington was an important centre for the S&DR. Of the original infrastructure, as illustrated on Thomas Dixon's 1839 plan, the goods shed, the Railway Tavern and Skerne Bridge remain extant. Source: Archaeo-Environment Ltd. Reproduced with kind permission of The National Archives, ref. RAIL 1037/456.

Less than 200m to the east of these buildings is Skerne Bridge (AIM75) – the oldest purpose-built railway bridge in the world still in use (ibid, 14), which is scheduled as NHLE 1002331 (Figs 29-30). This bridge featured in many paintings and engravings of the inaugural opening of the railway in 1825 (*see* cover image), although comparison of these with the present southern elevation of the structure (Fig 29) suggests the existing wing walls are a later rebuild. The north elevation of the bridge is disfigured by later track and bridge widening, since removed (Fig 30).

Fig 29: The Skerne Bridge (AIM75) is the oldest purpose-built railway bridge in the world to remain in use. It featured in a series of prints and paintings depicting the opening of the railway in 1825 (see front cover). Detail of 28985_002 22-FEB-2018 © Historic England.

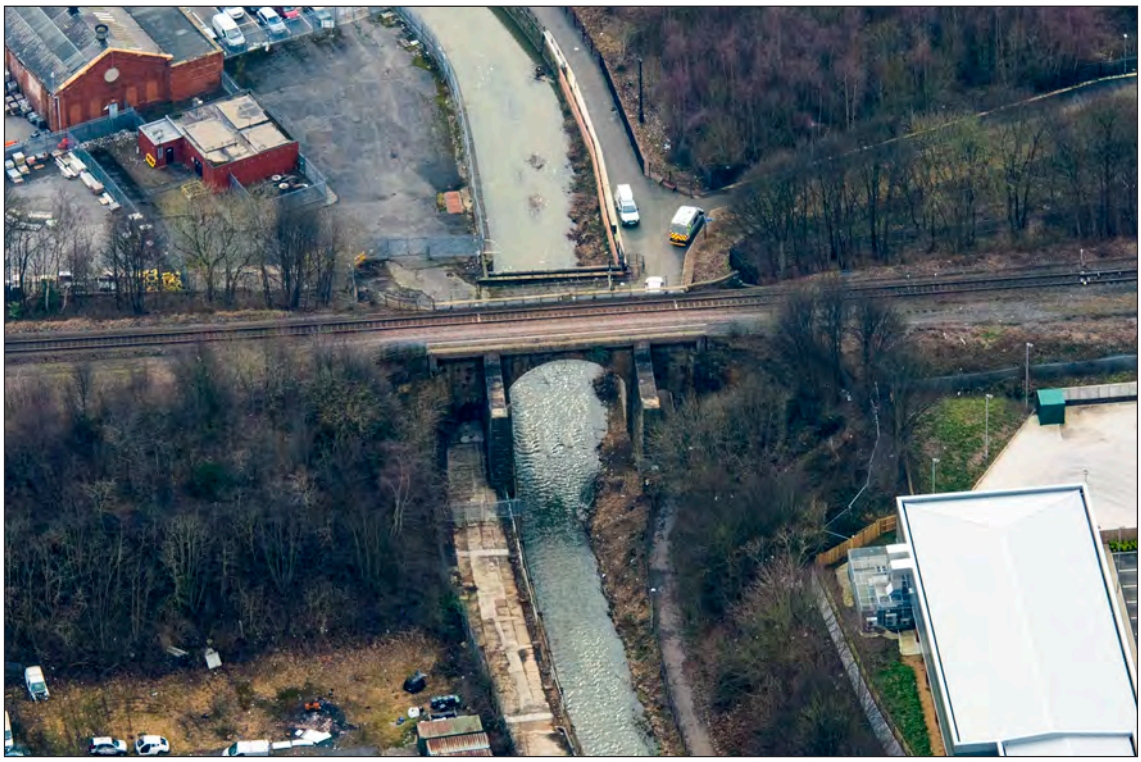

Fig 30: The north elevation of the Skerne Bridge (AIM75) shows late 19th century supports for the widening of the bridge. Detail of 28985_009 22-FEB-2018 © Historic England.

The S&DR continued eastwards out of the town, to the south of Albert Hill. At this point, there are no traces of the original railway on aerial sources. The present railway diverts south and east along the route of the old Croft Branch and later Darlington and Saltburn Branch Railway, and by the late 19th century the original S&DR route had been reduced to the status of a loop line before finally being axed following the Beeching Report.

The remains of an accommodation underbridge were incorporated within Arnold Road Subway (Archaeo-Environment Ltd 2016f, 32-3), but are not visible on aerial sources so the site was not mapped. The boundary to the original railway was extant in the 1940s from the southern end of Wolsingham Terrace eastwards. Here, the railway passed over a short length of embankment. A level crossing existed where McMullen Road crossed the railway (AIM82; HEA314), and the Dixon survey suggests that it had gates, but this along with the boundaries were demolished when this section of the railway closed.

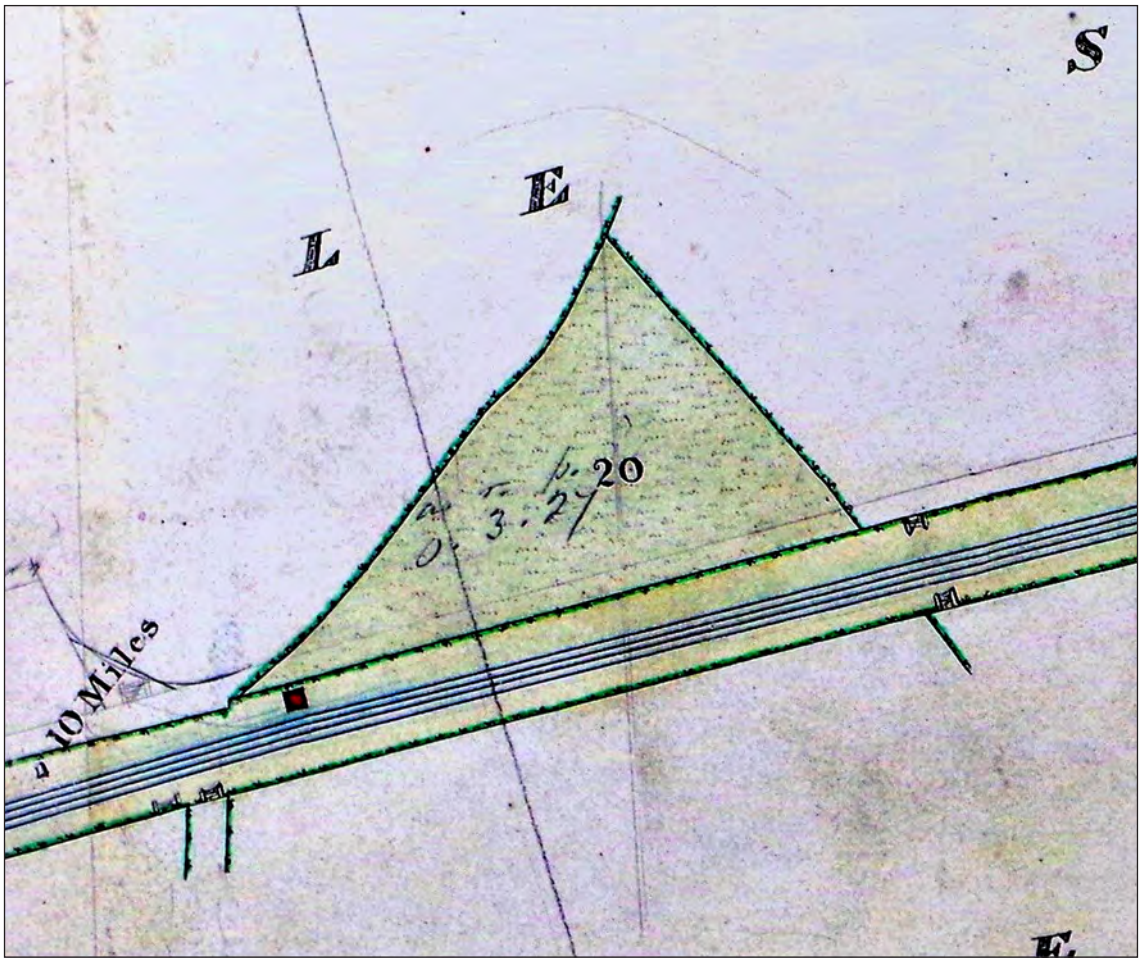

Fig 31: A small building marked on Dixon's 1839 plan of the railway to the south of Red Hall was probably a platelayers' hut (AIM85; HEA362). The gated access to this and adjacent occupation crossing remained extant until the closure of the railway in the 1960s. Source: Archaeo-Environment Ltd. Reproduced with kind permission of The National Archives, ref. RAIL 1037/456.

The line entered a cutting to the south of Coombe Drive, and there were several occupation crossings or gated access points through the boundaries serving farm access and trackways along this stretch, all of which were extant in the 1940s but have since been demolished (AIM83/HEA361; AIM84/HEA548; and AIM86/HEA363). A small building, presumably a platelayers' hut, was located adjacent to an access gate, which also remained visible on 1940s vertical aerial photographs but has since been removed (AIM85; HEA362; Fig 31). This length of the railway, between McMullen Road and the A66 was removed after the closure of the railway and the construction of the B6279.

East of the A66, despite closure, elements of the original railway are still visible on recent aerial photographs. The line entered a cutting, arcing to the south-east (Fig 32). An occupation crossing was located adjacent to South Burden Farm (AIM87; HEA368), but this went out of use with the railway. The railway cutting earthworks can still be traced for some length to the south-east of here, as can some of the boundaries, though several of these appear to have been removed. South of the A67, the line of the railway is still used as a footpath. To the north of Middleton St George, the north boundary remained intact into the late 20th century and is recorded on vertical aerial photographs. A short length of the railway cutting is preserved along this stretch, recorded on lidar beneath dense tree cover. An occupation crossing is illustrated on the Dixon survey, roughly to the north of the modern road, Yeadon Walk. The north gateway of this crossing is visible on 1940s vertical aerial photographs (AIM88; HEA408), but appears to have since been removed. The modern railway follows the line of the old Darlington and Saltburn Branch Railway and rejoins the old S&DR line at Oaktree Junction before continuing east along the route of the original line.

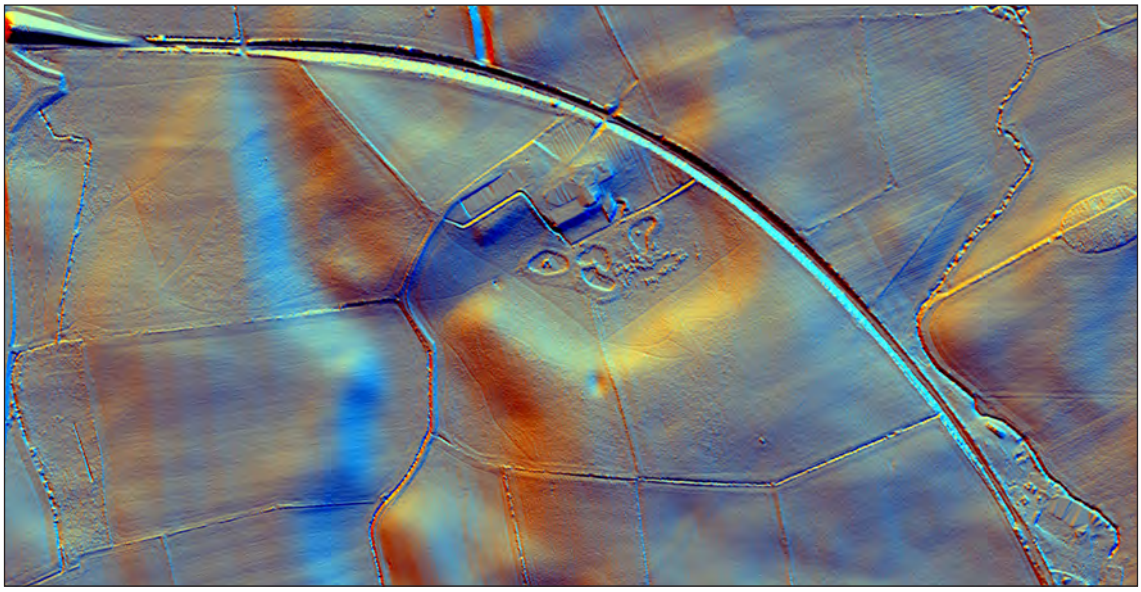

Fig 32: Much of the original S&DR infrastructure between Darlington and Oak Tree Junction was removed following the closure of this section of line in the 1960s, although between the A66 and the A67 the line of the railway is preserved as a footpath and the original cutting is extant. LIDAR DTM 30-NOV-2008 © Historic England; source Environment Agency.

Low Goosepool Farm to Stockton (Fig 33)

From Low Goosepool Farm the line of the S&DR is followed by the course of the modern railway as far as Allens West Station, where the old Yarm Branch diverged from the main line. To the east, the railway continued as far as the modern A135, turning north, following a course roughly parallel to the modern road. The railway continued for nearly 3km before turning north-east. This 3km stretch went out of use following the opening of the Leeds Northern Railway in 1853 (Hoole 1975, 12). At Bowesfield Junction the railway made a slight turn towards Stockton, where it terminated at the coal staithes on the River Tees.

There is no Dixon plan for the 4km stretch of railway between the Yarm Branch junction and the Bowesfield Junction. Therefore the map nearest in date to the time the railway was built is the 1857 OS map. Although this is several years after the line had already been abandoned, it preserves a record of the route of the railway.

The modern railway appears to pass through an original S&DR cutting that extends along the entire northern side of Durham Tees Valley Airport. Most of the original boundary structures remain intact along this stretch. To the east of West Brocks Farm, Carter's Lane ran right up to the railway. Dixon illustrates the lane as leading to an access gate through the boundary serving two buildings on the north side of the railway line. Although the buildings are demolished, there is a level crossing at this location today (AIM89).

There was an occupation crossing (AIM90) 430m to the east, which served as access for East Brocks Farm. Although visible on 1940s vertical aerial photographs, it appears to have since been removed. Another crossing was located 280m further to the east (AIM91), but again evidence from aerial photographs shows this was removed in the latter half of the 20th century. A further occupation crossing, also now removed, was visible to the south-west of Urlay Nook, presumably for farm access (AIM92). This was also the location of a small building visible on the 1839 map and on early vertical aerial photographs (AIM93), which was likely a platelayers' hut.

There is a level crossing at the junction of Long Newton Lane and Urlay Nook Road, which remains in use today (AIM94; HEA437; Fig 34). Walls appearing to follow the original boundary are extant on 1940s aerial photographs along this section, but have since been removed. The broad railway embankment to the east of Urlay Nook, visible on the lidar as earthworks, presumably relates to the original railway, though it may have been enhanced or enlarged subsequently. The embankment is visible as far as the old Yarm Branch junction – the site of the present Allens West Station. Durham Lane crosses the railway at this location, but although the level crossing is still in use, it is unlikely that any original features survive (AIM95).

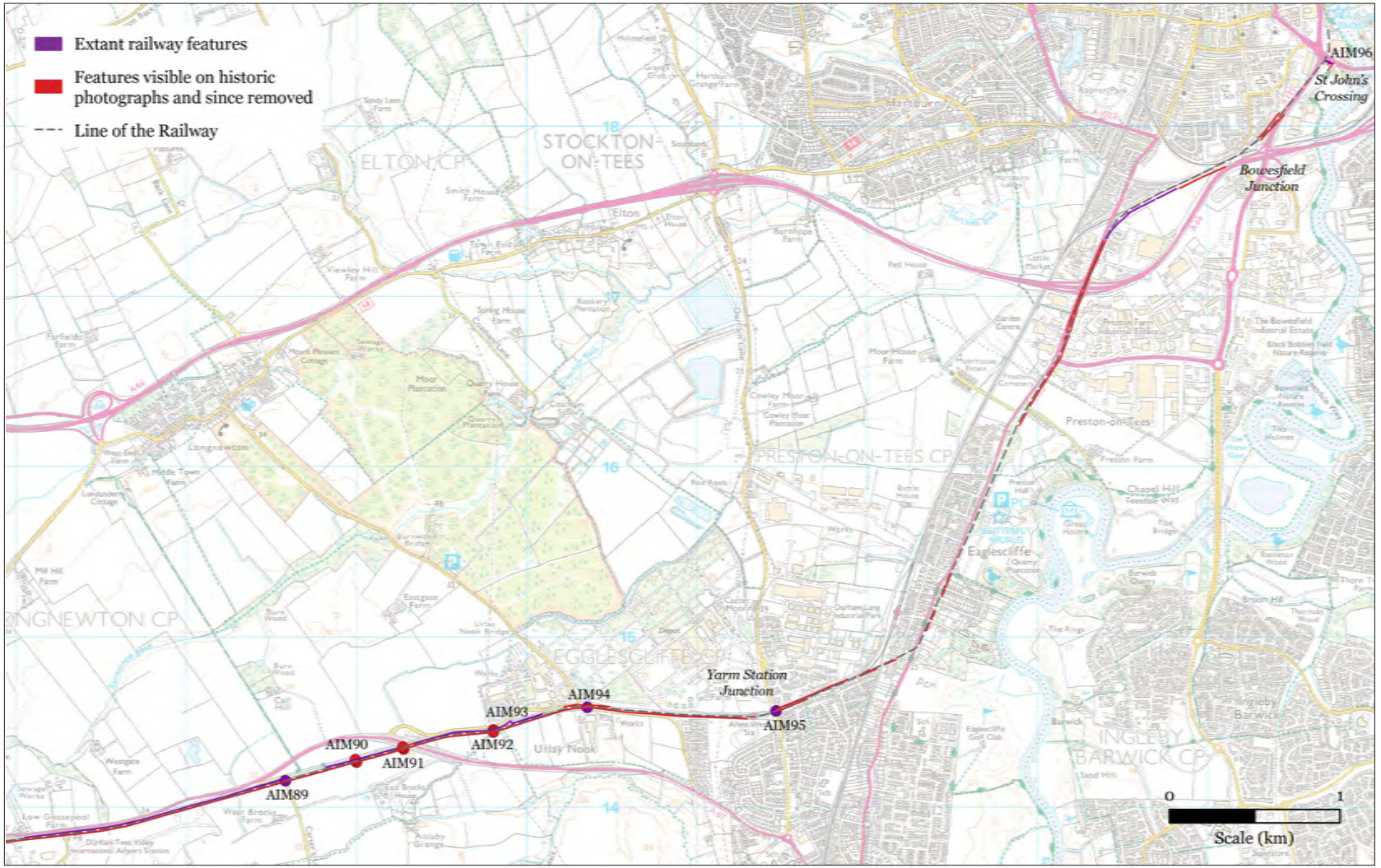

Fig 33: Original S&DR railway features visible on aerial photographs between Low Goosepool Farm and Stockton-on-Tees. Cuttings and embankments are not depicted. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2019.

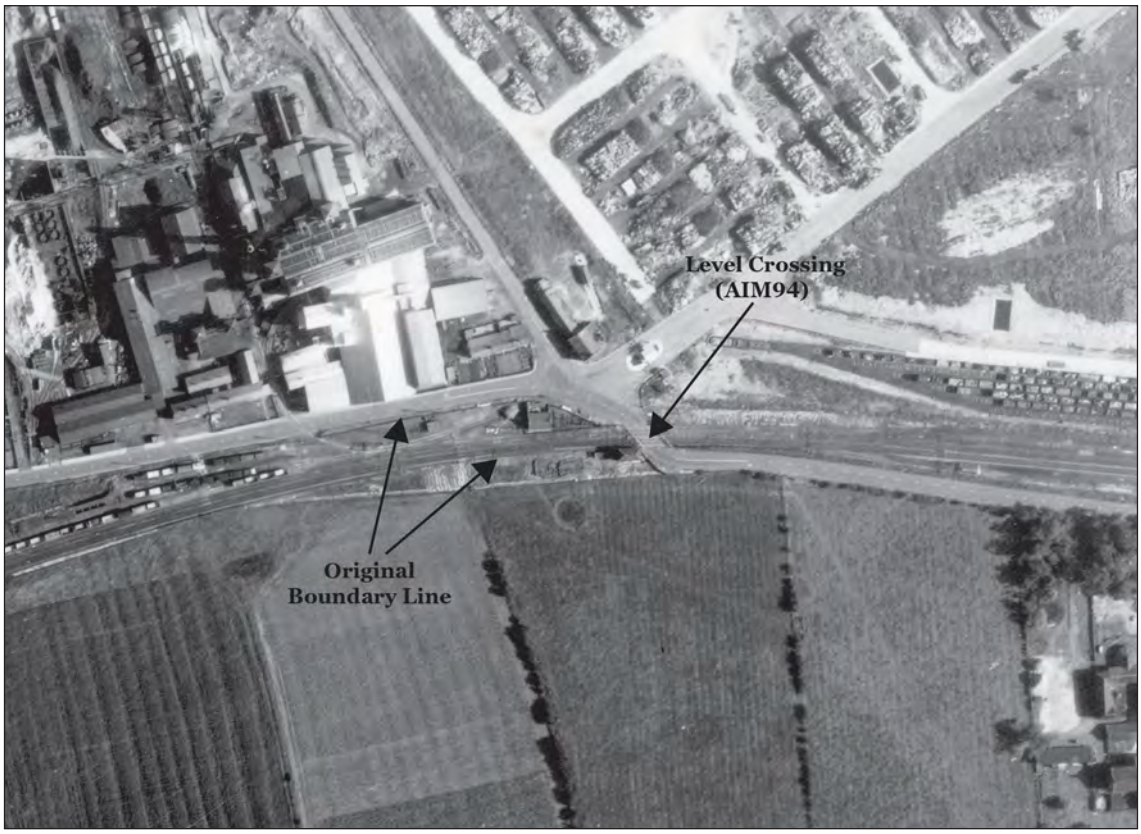

Fig 34: The level crossing at Urlay Nook (AIM94), and some of the original boundaries remained intact into the late 20th century. The crossing remains in use, but most of the boundaries appear to have been removed. Detail of RAF/106G/UK/481 RP 3013 06-JUL-1945 Historic England Archive (RAF Photography).

East of Allens West Station, elements of the original boundaries can be traced on 1940s vertical aerial photographs as far as Clarence Road, but these appear to have largely been removed. There are intermittent traces of the railway to the east of the A135. Short sections of the original boundary are visible on 1940s aerial photographs, but these have all now gone. Despite being abandoned for over 160 years, a long stretch of railway embankment is preserved in woodland along the western edge of Preston Park, and was mapped using lidar (Fig 35). North of here, traces of the railway have largely been removed by widening of the A135 road, though some of the boundaries are still visible on 1940s aerial photographs. Without a contemporary plan of this section of the railway, it is impossible to determine whether there were any occupation crossings.

To the north of Preston Farm industrial estate, the original route of the railway, though probably little or none of the original infrastructure, is once again preserved beneath the modern railway. It is possible that some original railway boundary features were preserved into the 1940s, but these have since been removed by roadway developments.

Fig 35: The Yarm to Bowesfield stretch of the railway was abandoned in 1853, but the earthwork remains of the embankment can still be traced in woodland in Preston Park. Left image: NZ4215-4316 09-MAY-2016 © Bluesky International/Getmapping PLC; Right image: LIDAR DTM FEB-2011 © Historic England; source Environment Agency.

Prior to entering the timber yards adjacent to the staithes in Stockton-on-Tees, the railway crossed the present A1130 at St John's Crossing (Fig 36). Here there are some of the most important buildings associated with the railway (AIM96). Although added to over the years and with elements rebuilt, the original features within a row of buildings include what was once the Railway Tavern and the Weigh House (Archaeo-Environment Ltd 2016g, 14). The staithes were located on the site of the present-day Castlegate Quay. Although superseded by the staithes and dock at Middlesbrough, the Stockton staithes were still extant in 1857 when surveyed by the Ordnance Survey, but had been removed by the end of the century.

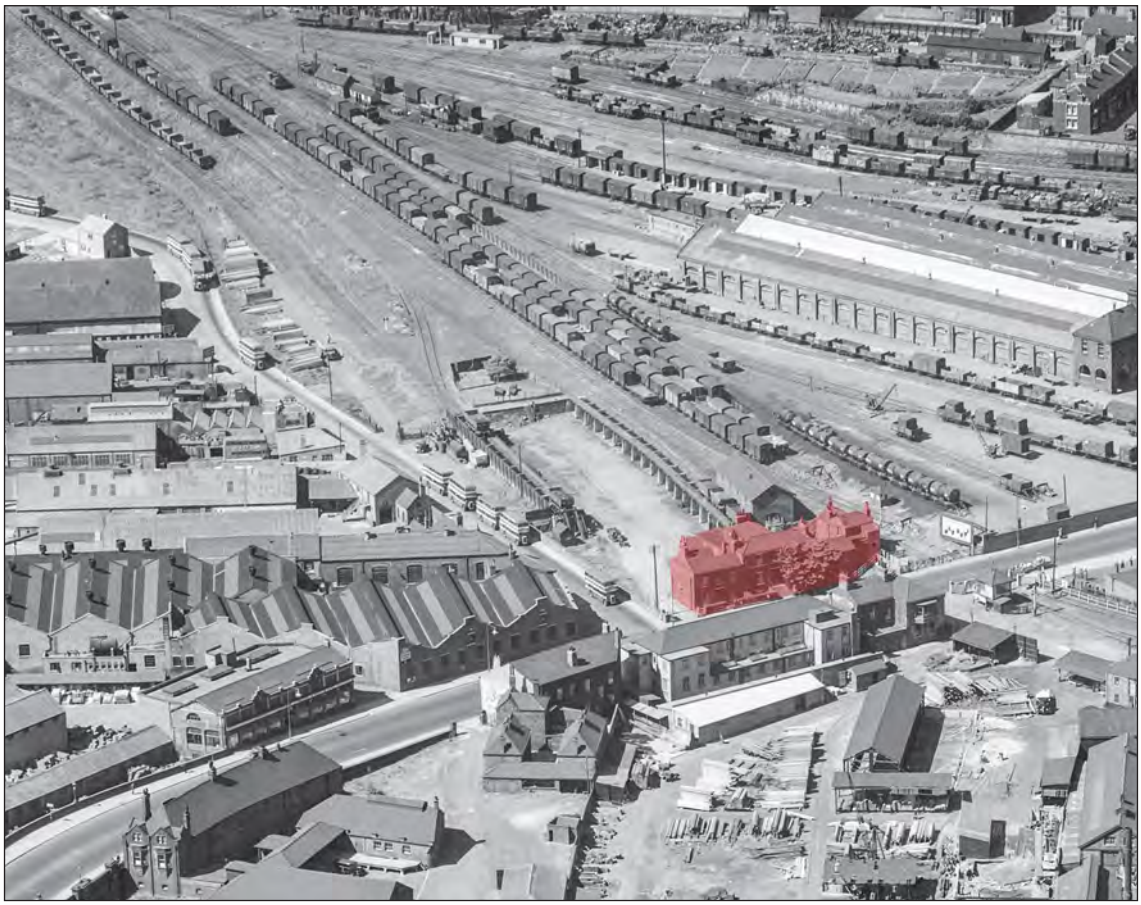

Fig 36: The row of buildings at St John's Crossing (highlighted in red) formed the original terminus for passengers on the S&DR. It is shown here surrounded by the disused Coal and Lime Drops and later Goods Depot. EAW043770 05-JUN-1952 © Historic England Archive. Aerofilms Collection.

Yarm Branch Line (Fig 37)

The Yarm Branch Line was the first branch of the S&DR to open, only a month after the main line. It left the main line near to the modern Allens West Station, and ran south for nearly 750m to a coal depot on the north side of the River Tees opposite the town of Yarm (*see* Fig 39). The railway did not proceed across the river to Yarm itself, but it did offer a short-lived horse-drawn passenger service from 1826, with passengers able to continue on foot across the bridge to the town (Wall 2001, 109).

When steam locomotives were introduced for passenger services on the main line in 1833, they did not use the Yarm branch. Instead, passengers had to alight at 'Yarm Station' (Fig 38) which was located on the main line at the head of the branch, and walk the remainder of the way (Semmens 1976, 109; Hoole 1975, 12). The opening of the Leeds Northern Railway in the 1840s offered an alternative route for passengers between Yarm and Stockton, and the old S&DR station closed in 1862 with the entire Branch closing in 1871 (Wall 2001, 110).

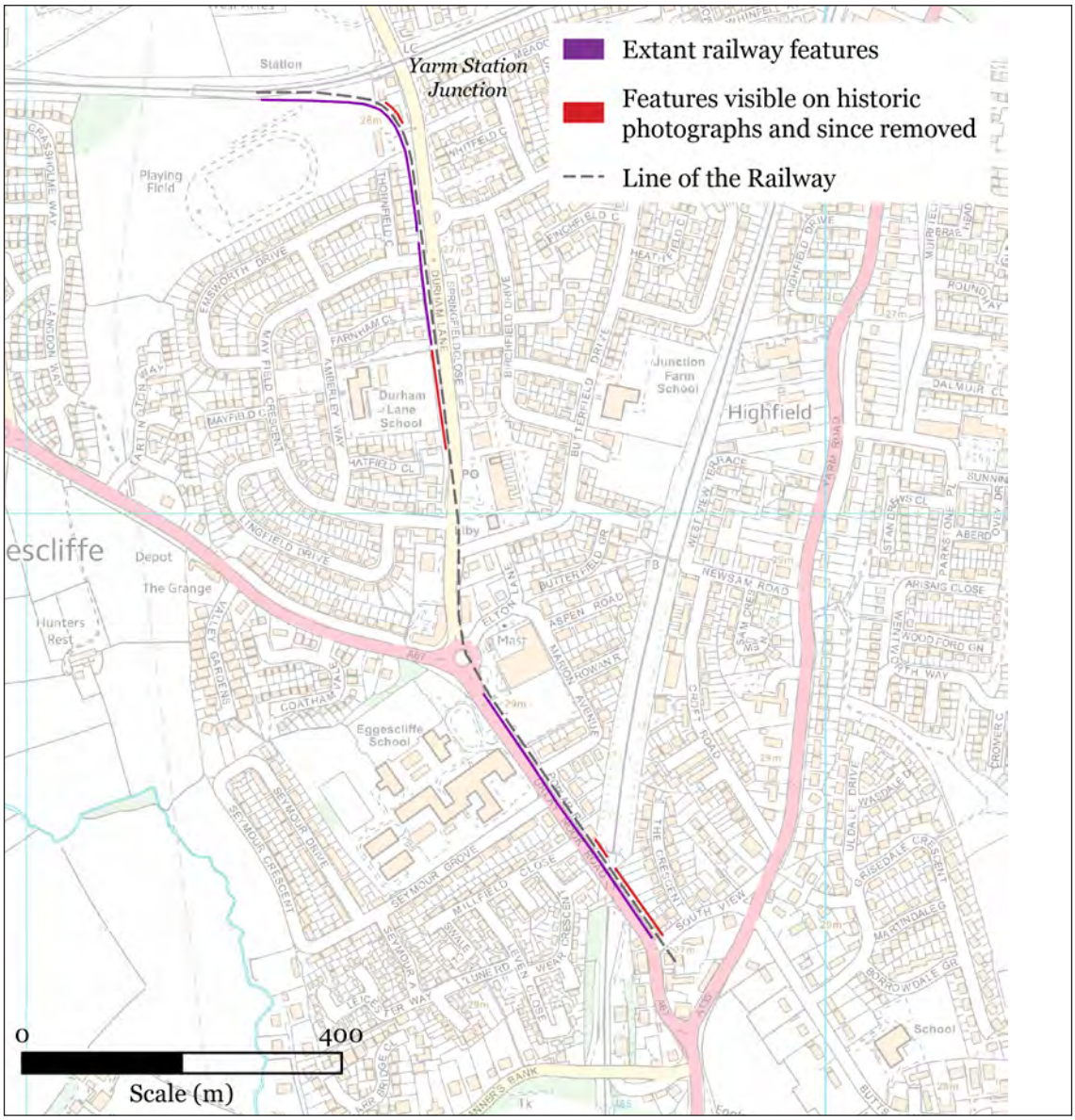

Fig 37: Features relating to the Yarm Branch Line visible on aerial photographs. Cuttings and embankments are not depicted. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2019.

There is no Dixon survey for the Yarm Branch, but the line is illustrated on the 1855 first edition OS map and also on the 1841 tithe map for Egglescliffe, Aislaby and Newsham (Durham University 2019a). Despite being out of use for nearly 80 years, elements of the railway are still visible on 1940s vertical aerial photographs, notably adjacent to Urlay Nook Road, though these appear to have since been removed. Some of the original embankment immediately south of Allens West Station can still be traced as very slight earthworks adjacent to Durham Lane on lidar. No further traces of the original railway can be seen on aerial sources.

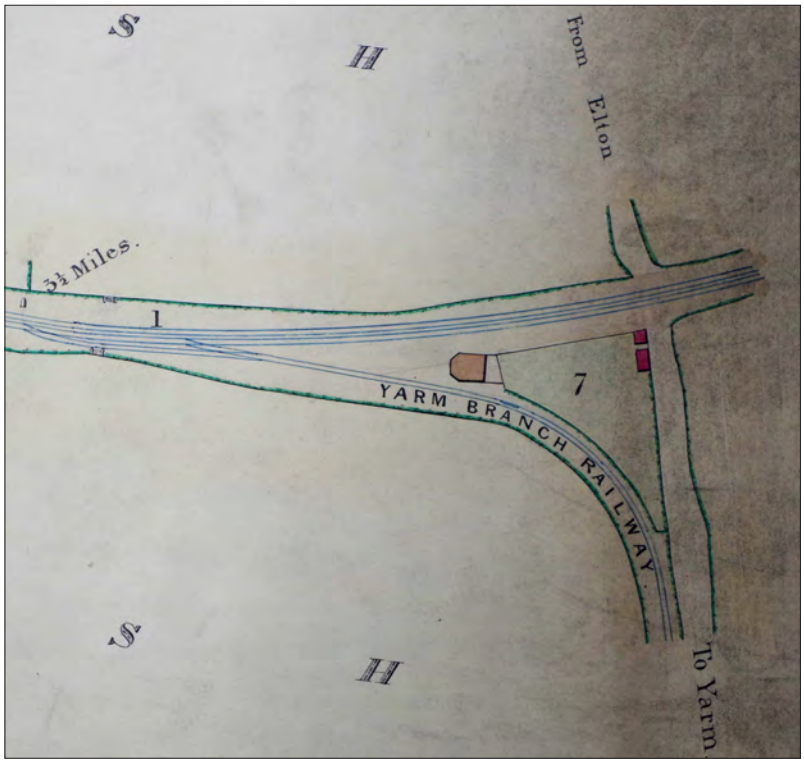

Fig 38: The Yarm Branch line left the main line roughly where Allens West Station now is. 1839 Thomas Dixon plan. Source: Archaeo-Environment Ltd. Reproduced with kind permission of The National Archives, ref. RAIL 1037/457.

Fig 39: The S&DR Yarm Branch terminated at a coal and lime depot to the north of Yarm Bridge. Both branch and depot were closed following the opening of the Leeds Northern Railway, which opened its own station nearby and formed a more direct route between Yarm and Stockton. © and database right Crown Copyright and Landmark Information Group Ltd (All rights reserved 2019) Licence numbers 000394 and TP0024 reproduced by permission of the National Library of Scotland.

Black Boy Branch Line (Fig 40)

The Black Boy Branch line opened in July 1827 to transport coal from collieries in the area now called Coundon Grange to the main line at Shildon. The line was originally entirely horse-powered, but shortly afterwards two stationary steam engines, similar to those operating on the Etherley and Brusselton Inclines, were installed (Wall 2001, 110). Like the later Haggerleases Branch Line, the Black Boy line was surrounded by a dense concentration of collieries, and went through numerous alterations as these collieries expanded and new spurs serving them were constructed (Fig 41). By the end of the 19th century, the northern half of the branch line was disused, and the rest reduced to a short loop between Shildon and the Bishop Auckland and Weardale Railway north of the town, possibly only retained to service the locomotive coal drops in Shildon. Historic maps denote numerous tramways and mineral railways branching from the railway. The project mapped the tramways (as part of the mapping of colliery infrastructure) but the mineral railways were not mapped as they relate to later phases of the S&DR.

Two small structures are located at the southern end of the branch line, in Shildon, immediately east of the Soho Works (now part of the National Railway Museum's Locomotion site). The smaller of the two (AIM104) appears to relate to a structure shown on the Dixon plan and is suggested by the HEA to be a banksman's cabin (Archaeo-Environment Ltd 2016d, 12). The building was vandalised in 1985 and remains without a roof. The slightly larger structure, which comprises two adjoining buildings (AIM103), is listed as a stable for the Black Boy Branch, but is not illustrated on the Dixon plan. Both structures are located at the point where the coal-wagons coming off the Brusselton and Black Boy Inclines were hitched to the steam-locomotive that would pull them eastwards, and are currently Grade-II listed as NHLE 1322863.

Many of the boundaries to the original Black Boy Branch Line remained intact into the 1940s, visible on RAF vertical aerial photographs. These boundaries can be traced from Shildon northwards, though most have since been removed. There was an occupation crossing for a footpath across the railway between St. John's Church in Old Shildon and Red House (AIM51). This site, located between Ash Grove and Windsor Terrace, was recorded on 1940s vertical aerial photographs, but has since been demolished.

The stationary engine that hauled the wagons up the incline from the colliery was located north of Fulton Court, at the southern end of Eldon Bank Top. The Dixon survey shows three buildings and a pond as part of the engine complex. The footprint of one of the buildings, when traced through a series of successive OS maps, could potentially relate to Rose Cottages, which remain extant (AIM50). However, the outward appearance of the building on Google StreetView does not suggest that it has any great age, though it may be that it is an original building heavily altered (Archaeo-Environment Ltd 2016a, 64). Some of the original boundary appears to remain extant near Eldon Bank Top. The cutting for the railway along this stretch is still apparent as earthworks on lidar. Less than 200m to the north is a fourth building that is visible on aerial photographs (AIM99). This again appears to relate to a building marked on the 1839 Dixon survey.

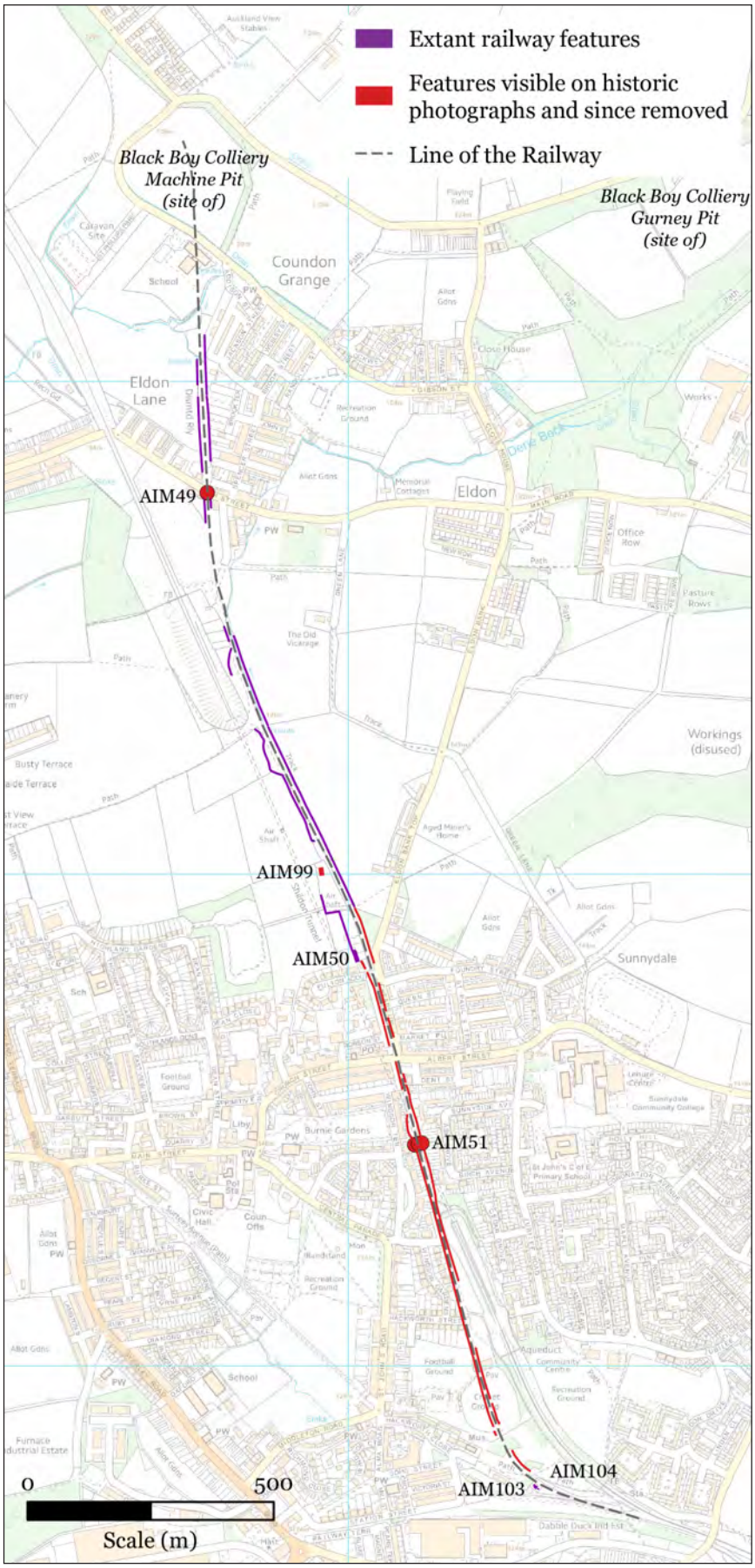

Fig 40: Features relating to the Black Boy Branch Line visible on aerial photographs. Cuttings and embankments are not depicted. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2019.

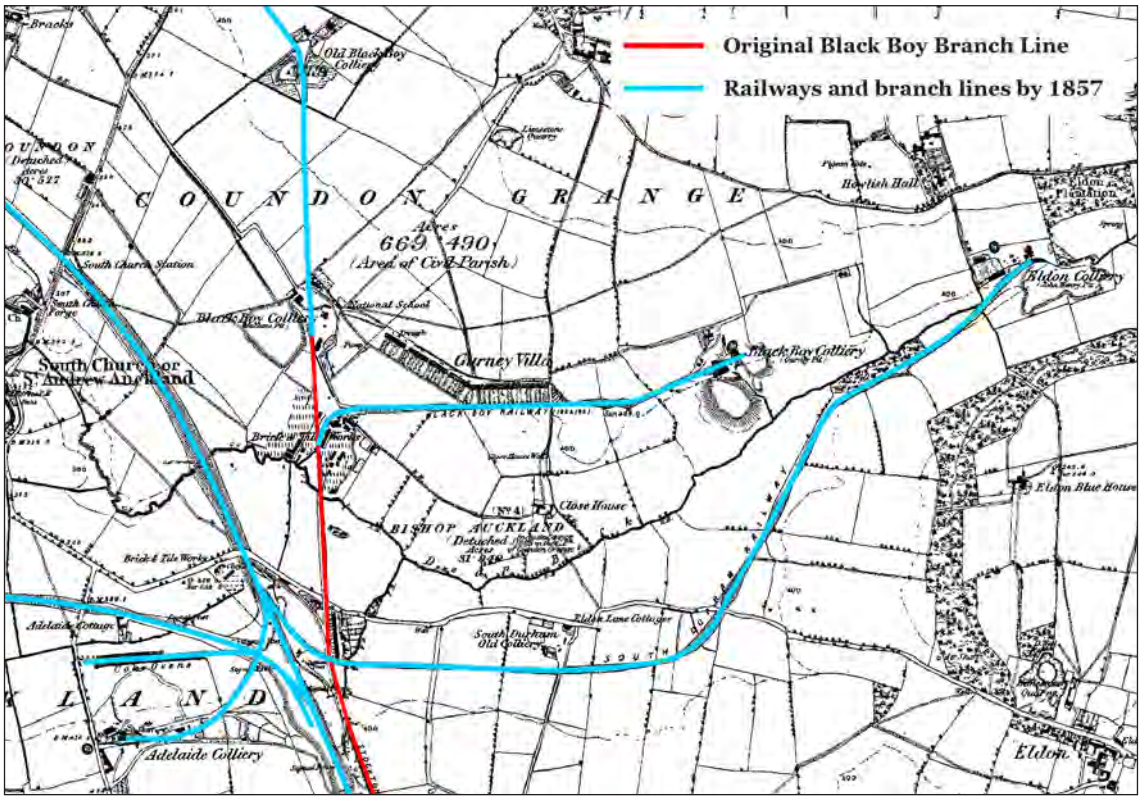

Fig 41: The Black Boy Branch originally terminated at 'Machine Pit' of Black Boy Colliery (centre-left), with a series of mineral railways serving the other nearby pit-heads. By 1857, the Bishop Auckland and Weardale Railway and numerous branch lines had also opened. © and database right Crown Copyright and Landmark Information Group Ltd (All rights reserved 2019) Licence numbers 000394 and TP0024.

The level crossing which carried High Street, Eldon, across the railway was already out of use by the 1940s (AIM49; Fig 42). Immediately north of the crossing, a 275m length of railway boundary can be traced. This alignment can still be seen on recent aerial photographs, though it looks as though any of the original wall or hedging has probably been replaced by modern fencing. All remains of the original line to the north of this were removed by late 19th- and early 20th-century colliery workings.

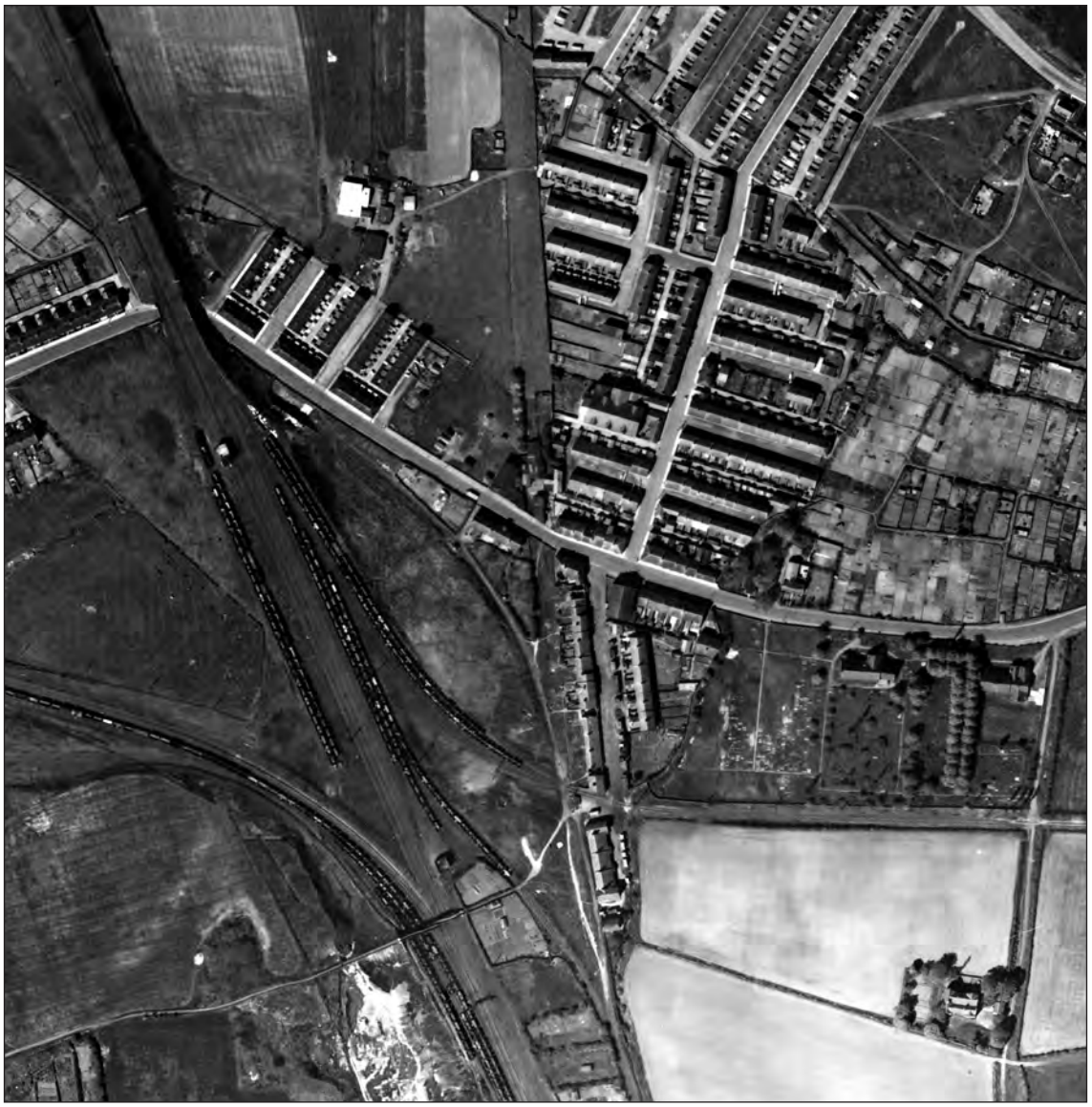

Fig 42: The northern section of the Black Boy Branch line was already out of use by the end of the 19th century as the colliery railways now all fed into the Bishop Auckland and Weardale Railway. Detail of SfM RAF/58/B/37 V 5029-5379 17-MAY-1948 Historic England Archive (RAF Photography).

Croft Branch Line (Fig 43)

The Croft Branch Line was an early concept, with some of the length being included on George Stephenson's initial survey for the proposed S&DR main line (*see* Fig 1). The branch opened in October 1829 (Hoole 1961) to bring coal to Croft-on-Tees, from where it could be transported across the Tees into North Yorkshire. There was a brief passenger service in 1833, which was reintroduced in 1837 (Wall 2001, 111). The start of the line was incorporated into the Great North of England Railway (now the East Coast Main Line) in 1841 (Holmes 1975, 43) (*see* Fig 72), but the rest remained in use as a separate branch until the latter half of the 20th century. The branch left the S&DR main line to the north of Darlington town centre at what was later Parkgate Junction (Fig 44), heading almost directly south, though making a small dogleg around the River Skerne. The line terminated at Hurworth Place, adjacent to the bridge crossing to Croft.

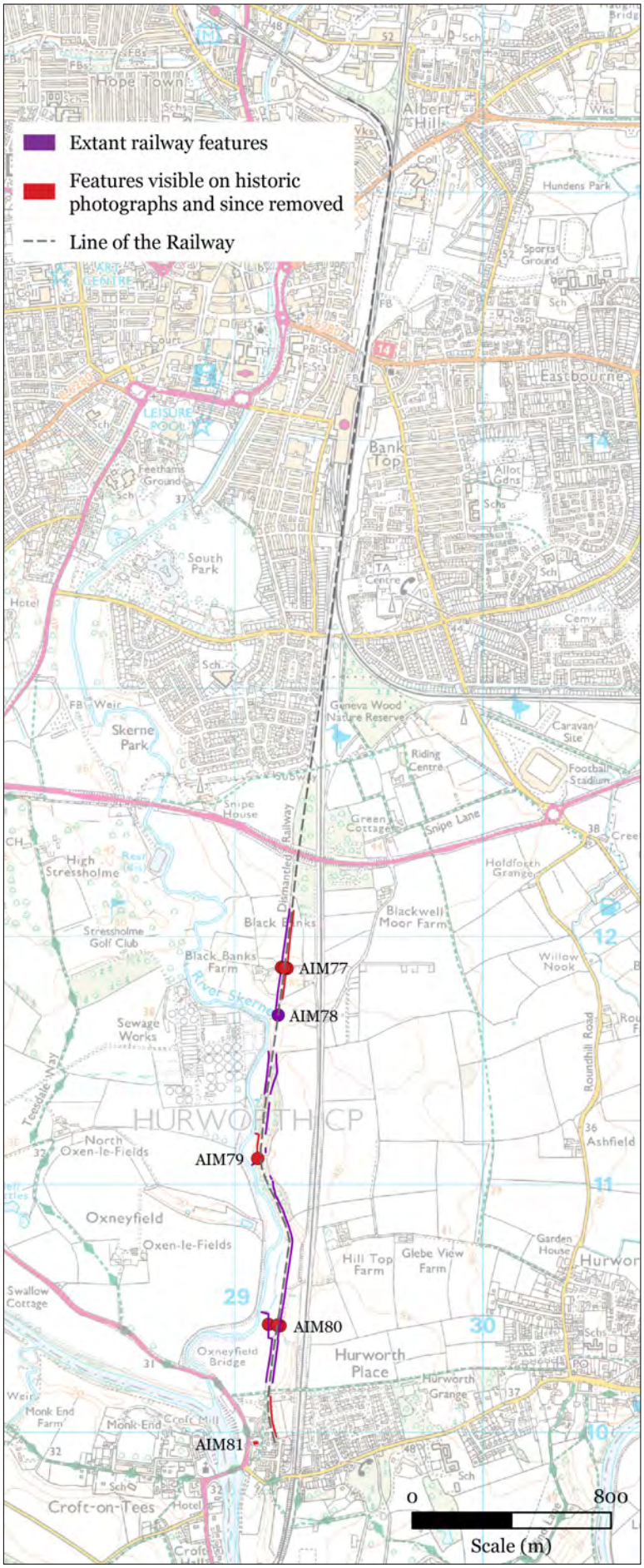

Fig 43: Features relating to the Croft Branch Line visible on aerial photographs. Cuttings and embankments are not depicted. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2019.

There are no traces of the Croft Branch line through Darlington, mostly due to the subsequent development of the Great North of England Railway and urbanisation. The first evidence for features relating to the original 1829 railway is to the south of the A66. At Black Banks, a section of cutting is visible on lidar. The flanking boundaries can be seen on 1940s aerial photographs, but some of these appear to have since been removed. There was an occupation crossing serving Black Banks Farm, as illustrated on the 1838 Dixon survey of the branch line (AIM77). This crossing remained intact until the branch railway closed.

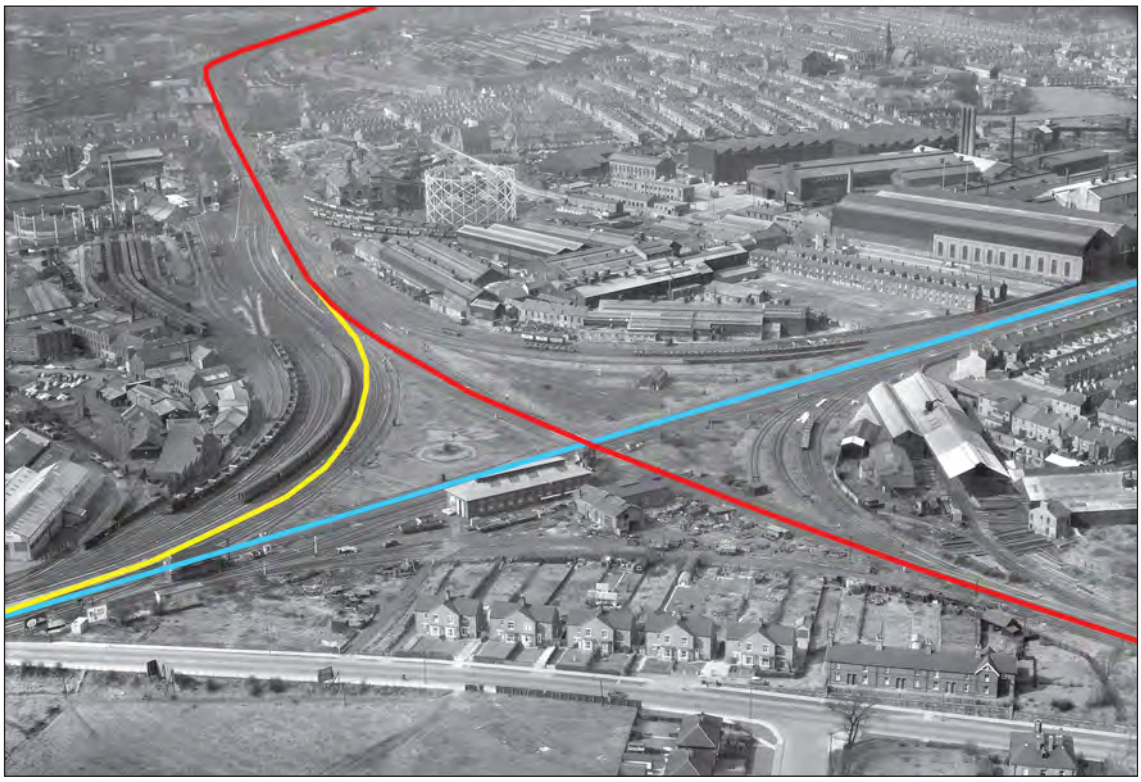

Fig 44: Looking west over Parkgate Junction, where the Croft Branch (in yellow) left the S&DR main line (in red). The Great North of England Railway (cyan), which opened in 1841 used part of the Croft line. EAW124514 01-APR-1964 © Historic England Archive. Aerofilms Collection.

Intermittent sections of boundary and earthworks associated with the original railway can be traced on aerial sources to the south of Black Banks, as far as the northern edge of Hurworth Place where any remains appear to have been removed by development. A little to the south of Black Banks Farm there was a small accommodation underbridge (AIM78). This is visible on 1940s aerial photographs, but it is now under dense tree cover, and its condition is unknown.

There was an occupation crossing 580m further south. The westernmost access gate is visible on 1940s vertical aerial photographs but appears to have since been removed (AIM79). The eastern gate is under dense tree cover on all available aerial photographs, and it is uncertain whether any of that structure remains intact. South of the crossing, the railway continued on an embankment, the southern end of

which now forms the road Linden Drive, before passing over a further occupation crossing (AIM80), again visible in the 1940s but since removed. There is dense tree cover at this location, so it is possible that some of the original gate infrastructure will survive intact.

The line of the railway as it neared its terminus at Hurworth Place (Fig 45) has been heavily redeveloped, removing any obvious original railway features that might have been visible on aerial photographs. One building (AIM81), which appears to relate to one denoted on the 1838 survey, was recorded on aerial photographs taken in the latter half of the 20th century, but has since been demolished.

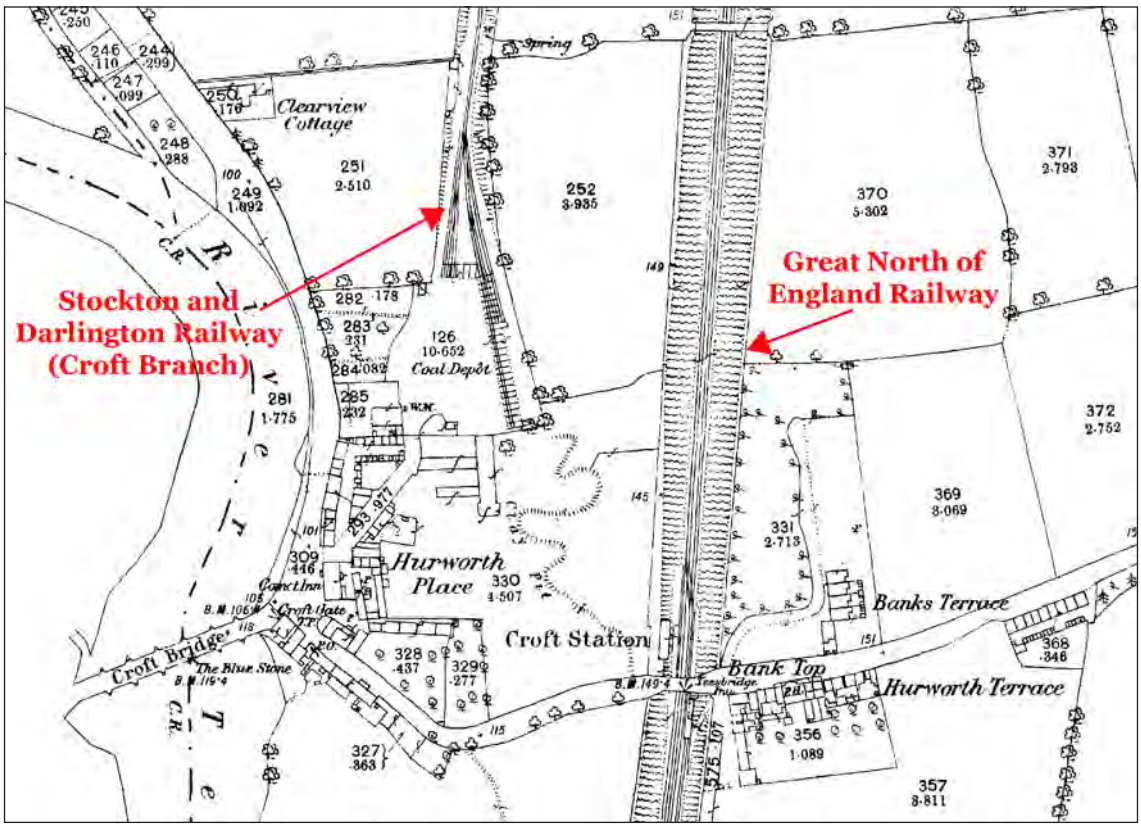

Fig 45: The southern end of the Croft Branch line ran alongside the Great North of England Railway (which re-used part of it further north), terminating at a coal depot north of Hurworth Place, as shown on the 1895 OS map. © and database right Crown Copyright and Landmark Information Group Ltd (All rights reserved 2019) Licence numbers 000394 and TP0024.

Haggerleases Branch Line (Fig 46)

The Haggerleases Branch Line was the most westerly section of the S&DR. Part of the line opened in May 1830, with the remainder opening in October (Wall 2001, 113). The line ran from Haggerleases Station, largely following the north bank of the River Gaunless, to join the main line at St Helen Auckland. The primary role of the line was to transport coal from the large number of collieries on and around the edge of Cockfield Fell, but it also operated a limited passenger service until 1872 (ibid). It was also the last section of the S&DR to move over to steam traction in 1856, having used horse power prior to this (Hoole 1975, 39). The rapid decline and closure of the collieries after the Second World War would have had a dramatic impact on the scale of traffic on the railway, but despite this it remained in operation until the 1960s.

Although the railway officially began at Haggerleases Station, numerous tramways serving several collieries joined the line from further west. Elements of original boundary around the station are recorded on 1940s aerial photographs but have since gone. Immediately to the east of the station, the line crossed the River Gaunless via a bridge (AIM1) which remains intact, though its southern elevation was somewhat altered in the late 19th century to accommodate the turnout to a new siding (Fig 47). Immediately east of this was an occupation crossing (AIM2) marked on the 1839 Dixon survey (Fig 47). This crossing point remains in use today, although the boundary and gates are now marked by modern fencing only. It is uncertain whether the original boundary to the railway at this point was walled or hedged.

The railway continued eastwards on a shallow and broad embankment recorded on lidar, to the next crossing point over the Gaunless, known as Swin Bridge (AIM3; Fig 48). This bridge is mistakenly described on the first edition OS map as 'Swing Bridge', but it is actually a skew-arch bridge – a local term for 'skew' being 'swin' (Wall 2001, 113). The bridge is a very early example of a skew railway bridge and is listed at Grade II (NHLE 1121831).

The railway boundaries are visible continuing to the east of the bridge on 1940s aerial photographs, and appear to relate to those on the 1839 survey. However, many appear to have since been removed, especially the south boundaries adjacent to the river (Fig 49). The line was routed along a cutting terraced in to the hillside between Low Butterknowle Farm and Low Lands, which remains visible as earthworks. This turns into an embankment north of Lands Farm, which can be traced as far as the Craggwood Caravan Park. The road from High Lands crossed the railway via a level crossing (AIM100), which gave access to a ford over the River Gaunless. This went out of use when the railway closed. A little to the west of Craggwood Caravan Park, the line passed over an accommodation underbridge (AIM4) which appears to have remained intact until the closure of the railway, but has since been removed. A small building adjacent to this bridge is visible on 1940s aerial photographs, and appears to relate to a structure illustrated on the 1839 survey (AIM5). This was most likely a platelayers' hut, but has also since been demolished.

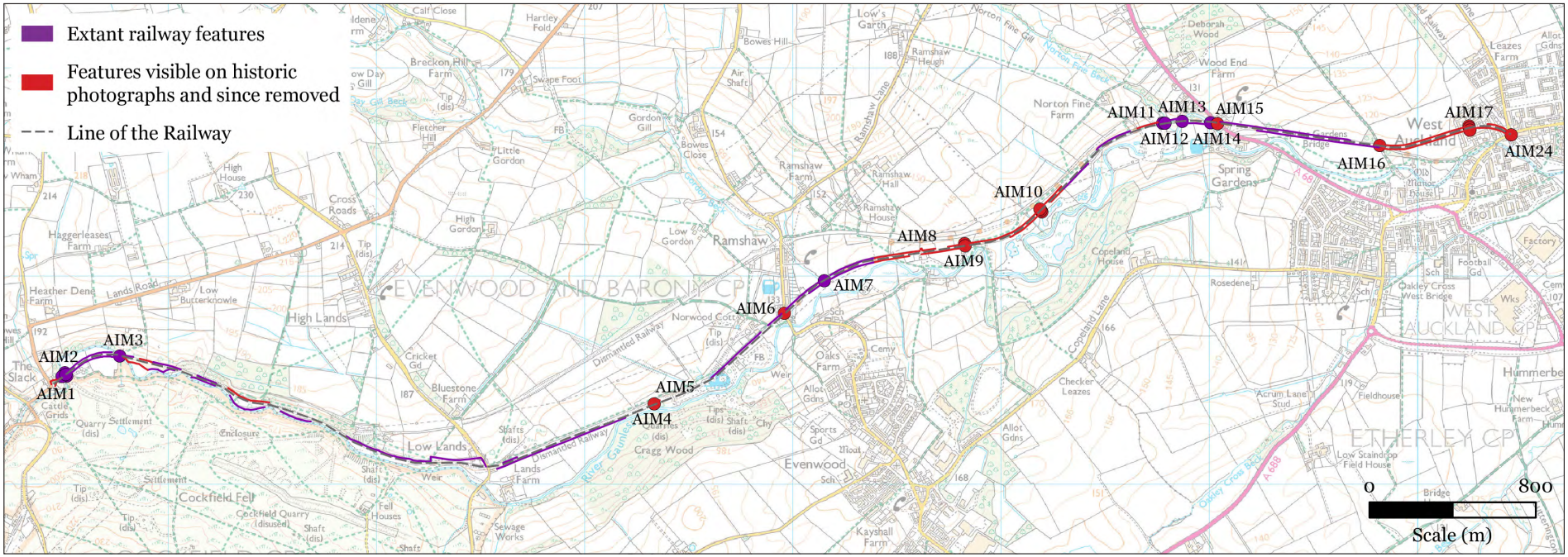

Fig 46: Features relating to the Haggerleases Branch Line visible on aerial photographs. Cuttings and embankments are not depicted. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2019.

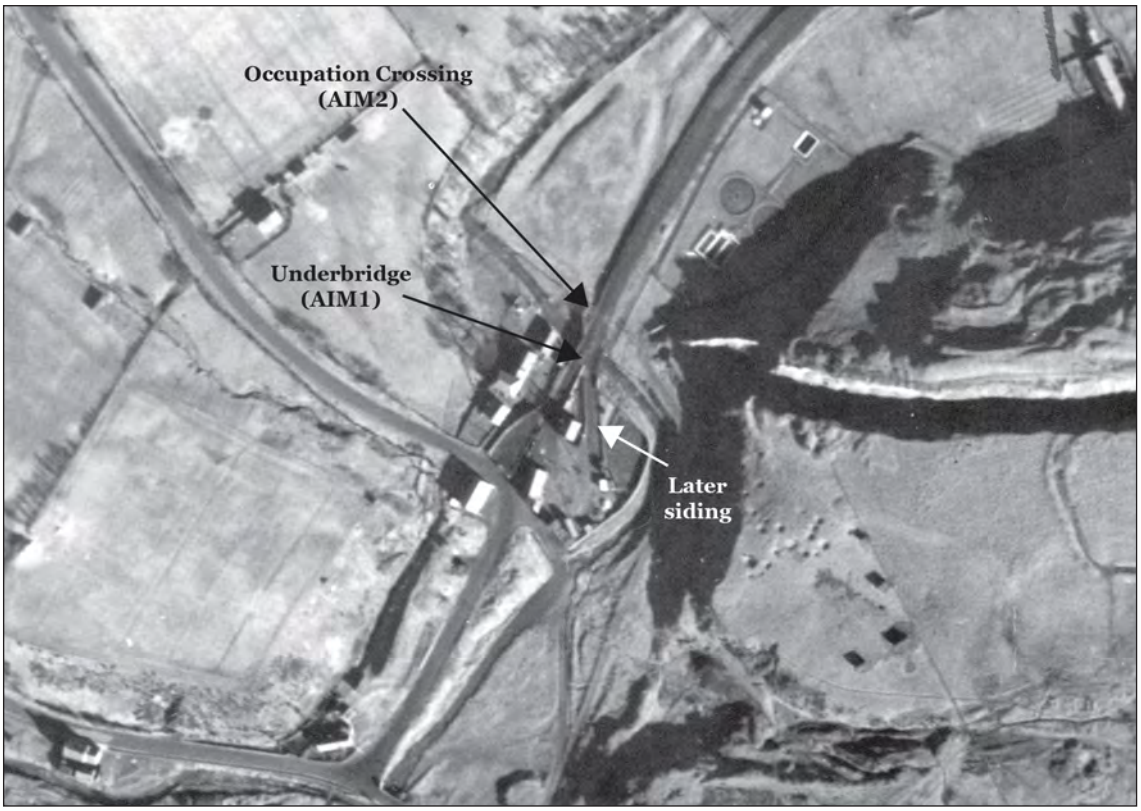

Fig 47: Haggerleases Station (centre) was the westernmost terminus for passenger services. A mineral railway continued to the south-west to serve Copley Colliery. By the end of the 19th century, the Butterknowle Colliery Railway also joined the S&DR at Haggerleases. Detail of RAF/106G/LA/127 RS 4079 10-FEB-1945 Historic England Archive (RAF Photography).

Fig 48: Swin Bridge over the River Gaunless remains intact. Detail of NZ1125 11-JUN-2015 © Bluesky International/Getmapping PLC.

Fig 49: The course of the Haggerleases Branch line is visible as a path extending obliquely across the photograph. Part of the original boundary wall can be bordering the River Gaunless. NMR 20641_44 07-FEB-2007 © Historic England Archive.

The original north boundary to the railway appears to remain intact, extending along much of the length of the caravan park to Gordon Lane. There was a level crossing here (AIM6) which remained in use until the closure of the railway. The boundaries of the railway continue to the east of the crossing, as far as Gordon Beck. The railway passed over the beck via a small underbridge (AIM7). There is still a trackway passing over the beck at this point, but it is unclear whether the bridge is intact.

The trackside boundaries can be traced continuing to Haggerleazes Farm on historic aerial photographs, but have since been removed. On the opposite side of the railway to the farm (which did not exist in the 1830s) a railway building is shown on the 1839 survey (AIM8). The function of this building is uncertain, but it remained extant until the early 2000s. It has since been demolished and replaced by modern housing. There is an occupation crossing to the east of this building marked on the Dixon survey (AIM9). The north gate to the crossing is visible on 1940s aerial photographs, but appears to have since been removed. There is a further occupation crossing 400m further along the line to the east (AIM10), but this is also no longer extant. Most of the boundaries along this stretch have been removed since the closure of the railway, but are extant on 1940s vertical aerial photographs.

South of Norton Fine Farm there was a further occupation crossing (AIM11) and although neither of the gates is visible on 1940s aerial photographs, the location of the crossing is nevertheless indicated by a path across the old railway line (Fig 50). Immediately adjacent to this, the railway passed over Norton Fine Beck by a narrow underbridge (AIM12; Fig 50). After passing through a short cutting, the railway then crossed the Gaunless twice more via small underbridges (AIM13 and AIM14) where the river makes a tight 'U'-bend to the south of Wood End Farm (Fig 50). The line was embanked for the 110m distance between the two crossing bridges. The modern footpath that follows the line of the Haggerleases Branch crosses the beck and river at the same points, so it is reasonable to assume that the original bridges are still intact, but this can only be confirmed by ground assessment.

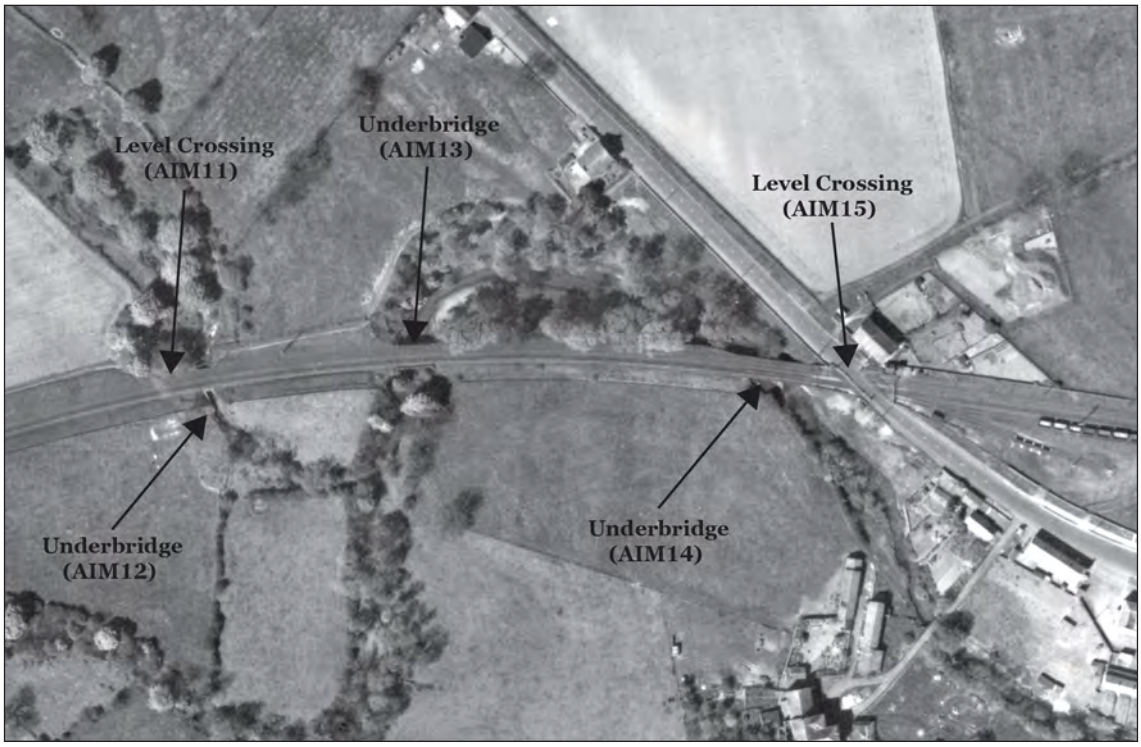

Fig 50: East of Norton Fine Farm, there are several crossing points, either spanning the River Gaunless or allowing access across the railway. Detail of SfM RAF/58/B/37 V 5029-5379 17-MAY-1948 Historic England Archive (RAF Photography).

There was a level crossing (AIM15) immediately east of the river bridges, which took the railway across Etherley Bank road (Fig 50). East of the road crossing, the line continued on an embankment which remains visible as earthworks. The boundary lines here also appear to remain intact as walls, but it is unclear if these are original. A level crossing carried a trackway between West Auckland and North Leazes across the railway (AIM16). The crossing is recorded as in use on 1940s aerial photographs but has since gone, although the track remains in use.

The railway then entered another cutting, leading almost to the junction with the main line at Shildon. The cutting and boundaries are visible on 1940s aerial photographs but are no longer extant. There was another occupation crossing on this stretch (AIM17), but this area is now the site of modern housing.

Middlesbrough Extension (Fig 51)

It soon became clear that the staithes on the Tees at Stockton were unable to cope with the amount of coal being brought down the S&DR from the coalfields on the Pennine fringe. This, and a problem with silting of the river, led to the decision to construct new staithes further downstream and to extend the railway to link with them (Fig 52). The new staithes, christened Port Darlington, plus the extended rail line, opened in 1830 (Jeans 1974, 107). The town of Middlesbrough was established nearby on the site of a farm of that name to house labour for the new port. The staithes were an economic success and rapidly expanded, but already by 1838 were themselves struggling to meet demand. This led to the construction nearby of the Middlesbrough Docks which opened in 1842. The Docks were taken over by the S&DR company in 1849 (Wall 2001, 119; Hoole 1975, 54).

The railway extension serving all these new facilities left the main line at Bowesfield Junction on the west bank of the Tees just south of the original Stockton terminus of the S&DR. The modern railway follows much of the S&DR route, though at Dock Junction, near the present-day Metz Bridge, the original line projected in a straight line north-east, terminating at the Port Darlington staithes, now the site of Dawson's Wharf Industrial Estate (Fig 53).

This length of the railway has been much altered from the original, so very little of the 1830 line remains visible on aerial photographs or lidar. The original bridge which carried the railway across the River Tees (AIM97) has been replaced several times, and currently comprises the now-redundant Tees bridge and the Surtees Bridge which continues to carry rail traffic. To the east of the bridges, intermittent stretches of original boundary can be traced on 1940s vertical aerial photographs as far as the A1130, but almost all of these sections appear to have been removed.

East of Thornaby Station, the modern railway sweeps to the south-east to run adjacent to Middlesbrough Road. The original line extended straight to the north-east, parallel to Princeton Drive, but all that remains here are the large railway embankments relating to a later Victorian remodelling of the railway. The railway crossed the Old River Tees via a small underbridge (AIM98; HEA597) which was replaced in the 19th century. Nothing further can be identified of the original railway from this point eastwards, as the line and staithes have been dramatically redeveloped over the years.

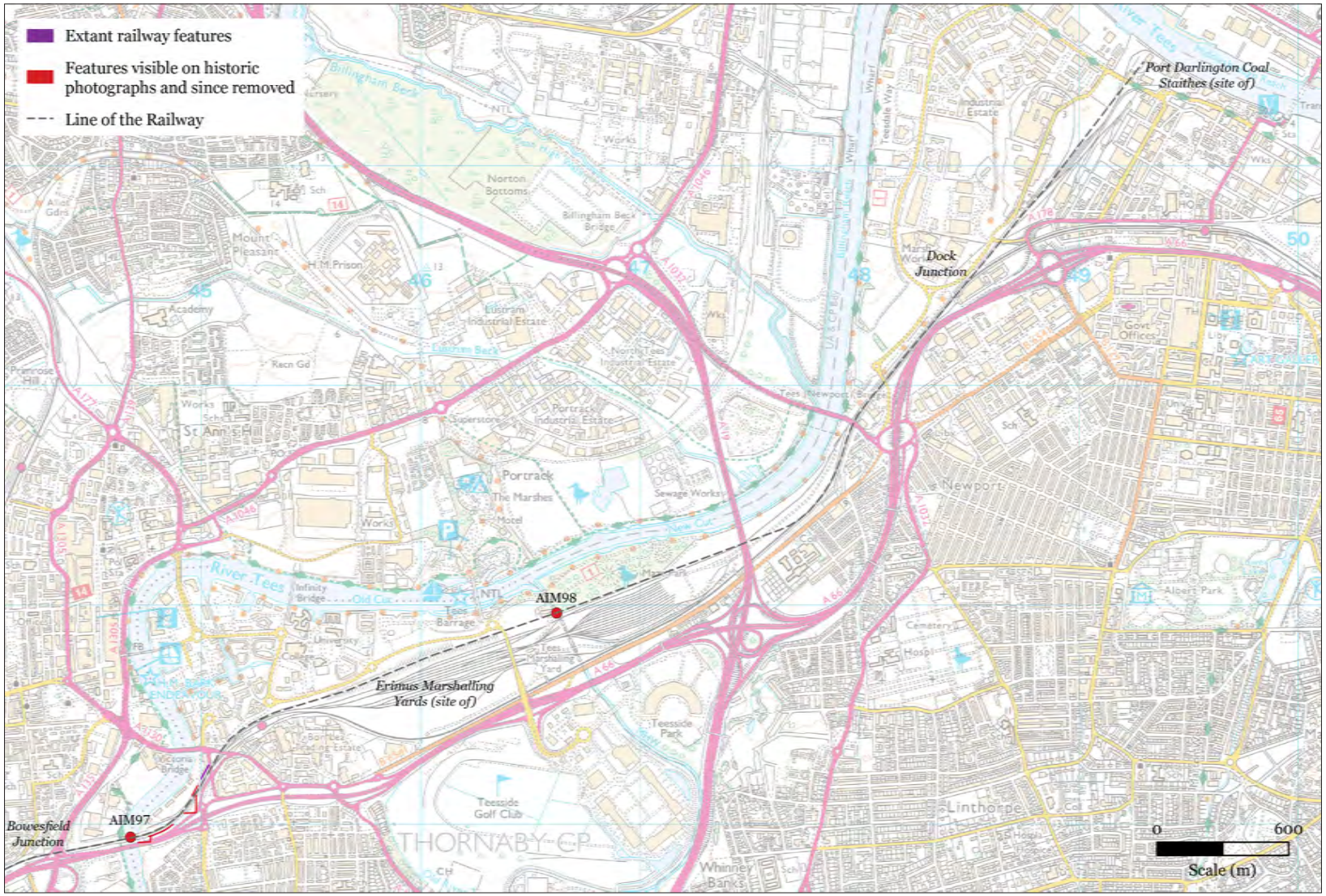

Fig 51: Features relating to the Middlesbrough Extension visible on aerial photographs. Cuttings and embankments are not depicted. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2019.

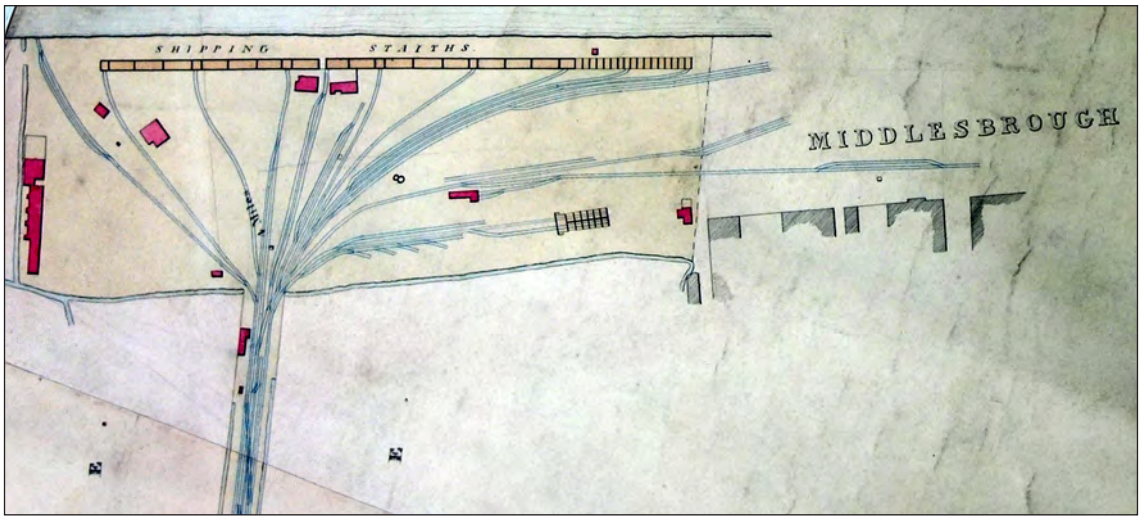

Fig 52: The original railway terminus at the coal staithes at Port Darlington, Middlesbrough. 1839 Thomas Dixon plan. Source: Archaeo-Environment Ltd. Reproduced with kind permission of The National Archives, ref. RAIL 1037/459.

Fig 53: The coal staithes originally known as 'Port Darlington' remained in use as a series of wharfs following the opening of Middlesbrough Dock in 1842, though they were much remodelled over the following century. The site is now an industrial estate. Detail of RAF/58/2249/PSFO-0129 21-AUG-1957 Historic England Archive (RAF Photography).

Copy Crooks Branch or Surtees Railway (Fig 54)

This branch line is marked on the 1839 Dixon survey as 'From Copycrook Colliery', though it was already named the Surtees Branch Railway on the 1842 tithe map for Shildon (which was also drafted in 1839) (Durham University 2019b). This was the shortest of the branch lines, but it still operated a passenger service. The line opened in 1831 to transport coal from Copy Crooks and Shildon Lodge Collieries to the S&DR main line (Fig 55), which it joined at the same junction in Shildon as the Black Boy Branch. Daniel Adamson constructed a coach house, which acted as a station and a shed (Grade II listed as NHLE 1365641), part way along the branch line, and the railway remained in use until 1930 (Hoole 1975, 41). By 1859, the line as far Copy Crooks Colliery had already gone out of use, the railway now terminating at Shildon Lodge Colliery.

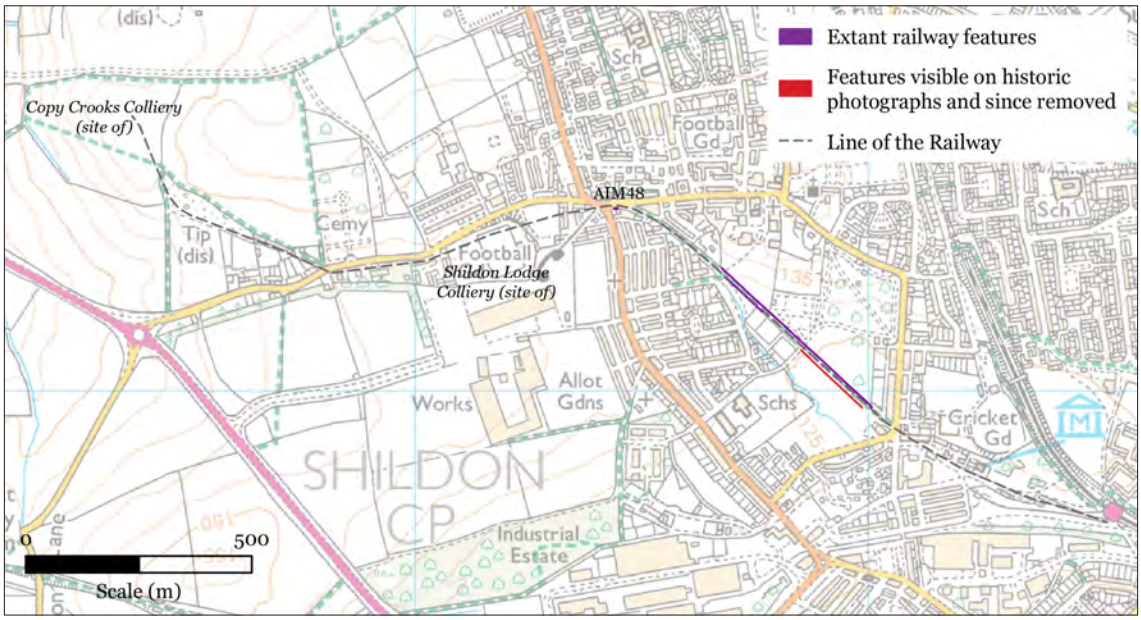

Fig 54: Features relating to the Copy Crooks Branch/Surtees Railway visible on aerial photographs. Cuttings and embankments are not depicted. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2019.

Fig 55: The Surtees Railway (in red) as shown on the 1876 OS 6-inch map. It was built to serve Copy Crooks Colliery, but by the 1850s only went as far as Shildon Lodge Colliery. © and database right Crown Copyright and Landmark Information Group Ltd (All rights reserved 2019) Licence numbers 000394 and TP0024.

The only physical remains of the line visible on aerial photographs are a length of trackside boundary between Middleton Road and Granville Avenue (probably not original, though on the same line as the original) and Adamson's coach house (AIM48).

THE LANDSCAPE CONTEXT OF THE RAILWAY

This section concentrates on the archaeological context of the landscape through which the S&DR passes, not on the railway itself. The following discussion is ordered by period and theme. Numbers in brackets relate to Historic England's National Record of the Historic Environment (NRHE) unique monument identifier; As part of the ongoing Heritage Information Access Strategy (HIAS), work is currently underway to transfer the NRHE to local authority Historic Environment Records (HERs). The individual records are available via the HER or Heritage Gateway (www.heritagegateway.org.uk) as Historic England Research Records. The mapping is accessible via the HER and the Historic England Archive.

The later prehistoric and Roman landscape

Much of the evidence for this period is masked by large areas of medieval and post-medieval ridge and furrow, or lies on soils not usually conducive to the formation of cropmarks. Only one buried pre-medieval feature was recorded as a cropmark from aerial photographs, located adjacent to where the A688 crosses the River Gaunless. Defined by a circular narrow-ditched enclosure with a diameter of 17m, this feature appears to have had an entrance to the east (NRHE 1622938). It probably represents the buried remains of the drip-gully formed by, or dug to catch, rain water running off the roof of a later prehistoric or Roman round-house.

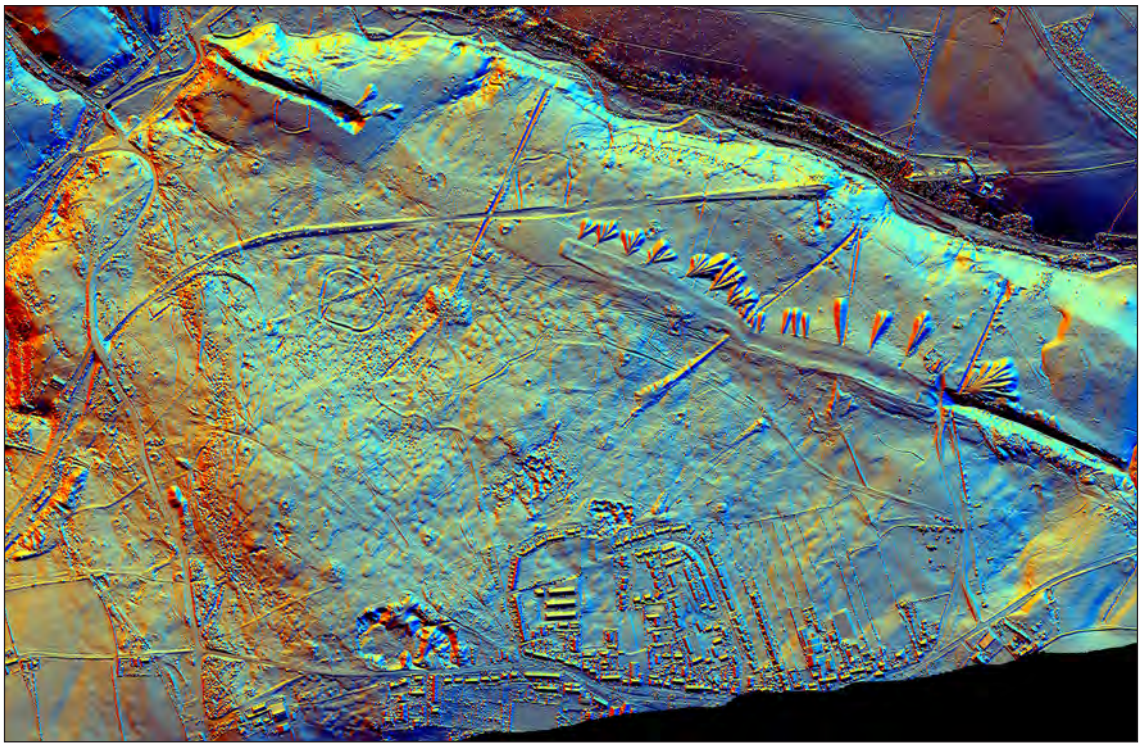

Fig 56: Cockfield Fell is a lowland moor and multi-period archaeological landscape. Numerous archaeological monuments remain visible as earthworks. Some are thought to originate in the Iron Age, but many relate to medieval and later coal extraction and stone quarrying. LIDAR DSM 30-NOV-2008 © Historic England; source Environment Agency.

The only extensive area within the project with known prehistoric and later archaeological remains is Cockfield Fell (Fig 56). Located at the extreme west of the project area, the fell is low-lying moorland nestled on the slope below Cockfield village, overlooking the River Gaunless. The fell has been common land for centuries and is remarkable in that it has never been enclosed or put under the plough (Roberts 1975, 48). Therefore archaeological features of many periods survive today as earthworks, although about one third of the scheduled area of the fell lies outside the S&DR project area and therefore not all features were mapped.

There are a number of enclosures on the Fell that have probable prehistoric origins. Two fall within the project area and have been attributed an Iron Age or Roman date. The most intact is sub-rectangular in plan, comprising a ditch flanked by internal and external banks (NRHE 21981; Fig 57). The northern side of the enclosure was destroyed by late 19th-century quarrying, but it is depicted in full on the earlier 1874 OS map, which indicates that it originally measured approximately 88m by 85m. A larger, but much more mutilated enclosure is visible 400m to the east (NRHE 21988). This rectilinear enclosure is also defined by a ditch with intermittent evidence for internal and external banks. The south side of the enclosure was removed when a cutting was made for the South Durham and Lancashire Union Railway in the mid-19th century. The surviving earthworks enclose an area measuring 105m by 115m.

Fig 57: A possible Iron Age enclosure on Cockfield Fell (NRHE 21981), which has been partly destroyed by whinstone quarrying. Detail of 28112_039 18-JAN-2011 © Historic England Archive.

The medieval landscape

In the western half of the project area, there are isolated pockets of medieval open-field system seen as areas of ridge and furrow ploughing. These include Spring Gardens Bridge, West Auckland (NRHE 1622862); south of St Helen Auckland (NRHE 1622937 and 1622862); Eldon Lane (NRHE 1623361); Shildon (NRHE 1622996); west of Newton Aycliffe (NRHE 1623428); west of Aycliffe Village (NRHE 1443668); adjacent to Coatham Lane (NRHE 1623542); adjacent to Drinkfield, Darlington (NRHE 1623562); and at Red Hall (NRHE 1623639). Most of these fragments were identified as earthworks on historic vertical photographs and have since been levelled.

Much more extensive evidence of medieval cultivation was recorded between Middleton St George and Stockton. Early aerial photographs record large areas of medieval ridge and furrow ploughing at Oak Tree (NRHE 1624195), West Hartburn (NRHE 25649; Fig 58), north of Durham Tees Valley Airport (NRHE 1624216), Egglescliffe (NRHE 1624228) and south of Stockton (NRHE 1624244 and 1624249). Aerial photographs taken between 2015 and 2016 indicate that less than 20% of medieval cultivation mapped from earthworks on historic aerial photographs from the 1940s remains extant, leaving isolated pockets.

Fig 58: Remnants of a medieval open-field system, visible as ridge and furrow (NRHE 25649), surround the deserted settlement of West Hartburn. Many of the earthworks were ploughed level during the latter part of the 20th century. Detail of RAF/CPE/UK/1835 RS 4237 13-NOV-1946 Historic England Archive (RAF Photography).

A good example of medieval settlement visible as earthworks is at West Hartburn (NRHE 25649), located on the west bank of Goosepool Beck (Figs 58-9). The village comprised two rows of buildings and their associated plots arranged either side of a central green. The northern through-road forms the present-day Mill Lane. The village was formerly surrounded by medieval ridge and furrow, and hollow ways extended to the north-west and south. Many of the earthworks visible on 1940s photographs have since been levelled. A detailed survey and some excavation took place in 1962 (Still and Pallister 1964) recording earthworks to the north and south of the road. Aerial photographs show that by 1974 the north field was under the plough, and although the features were probably still extant as shallow earthworks, they show up mostly as recently formed soilmarks. By the time the site was surveyed again in 1991 by the RCHME, only the southern half of the settlement remained visible as earthworks. These remaining earthworks are scheduled as NHLE 1011257. This site illustrates the value of using historic aerial photographs to record lost elements and allow a more complete survey of the deserted settlement (Fig 59).

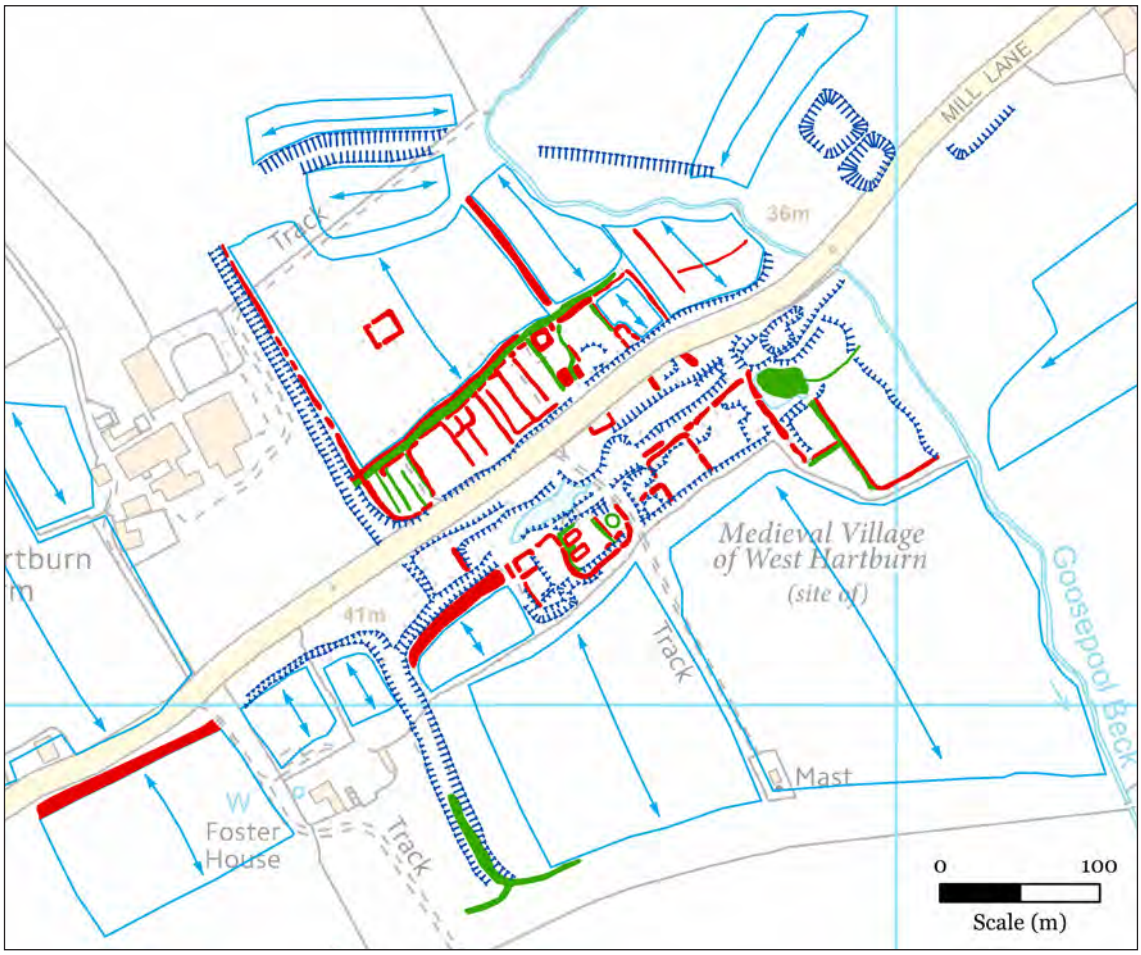

Fig 59: The medieval settlement of West Hartburn was mapped from a number of aerial sources ranging in date from 1941 to 2011. The earthworks to the north of Mill Lane were plough-levelled in the 1960s. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2019. All rights reserved. Ordnance Survey Licence number 100019088.

Another settlement whose medieval elements survive as earthworks is East Thickley (NRHE 23953). Less extensive than those at West Hartburn, the earthworks nevertheless comprise building footprints, routeways and numerous boundaries. It is possible that some of the settlement was removed during limestone extraction for Thickley Quarry.

There was a farmstead at the site of Old Towns, north of School Aycliffe (NRHE 24024), which is depicted as ruins on the 1859 OS map, but may have been extant on the 1840s tithe map. The earthwork remains include the footings of at least two buildings, which only partly relate to the ruins visible on the early OS maps, and a hollow way extending to the east. It is sited within an area of medieval open field system, which if contemporary would support a medieval origin, although it is probable that the farmstead is later than the field system (Fig 60).

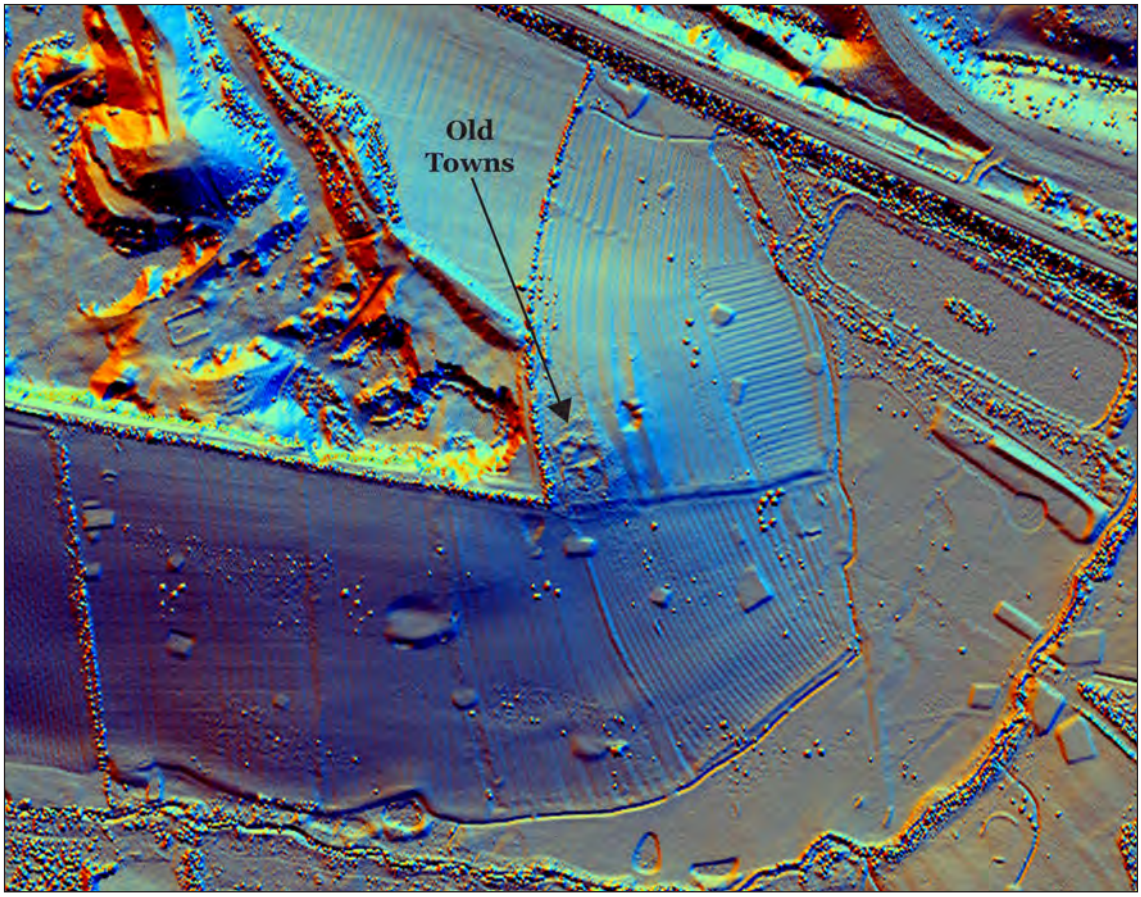

Fig 60: The site of Old Towns (centre) is probably a late farmstead, but it may have had medieval origins. The platforms within the fields of ridge and furrow relate to a modern golf course. LIDAR DSM 8-DEC-2008 © Historic England; source Environment Agency.

The earthworks of a moated site at Red Hall (NRHE 25605) were mapped during the project. Now partly levelled, the site was recorded from historic vertical aerial photographs. The moat was up to 8m wide in places and defined a square area measuring 75m by 92m. The south-west corner of the moat appears to have been levelled by the construction of Red Hall Farms. Numerous earthworks were visible within the moat, though these have now been almost entirely levelled. Limited excavation took place between 1966 and 1967 revealing two buildings and pottery ranging in date from the 12th to 14th centuries (Wilson and Hurst 1968, 188; Still and Pallister 1978, 99).

A low mound is visible 60m to the north-east of the moat (NRHE 25617). This was previously identified as a possible prehistoric funerary monument, but this seems doubtful considering the lack of evidence for others in the area, the general lack of earthwork survival of prehistoric features in this landscape, and its location on the corner of a tight meander of an active river (now diverted). Measuring nearly 20m in diameter, and although slight, the mound does appear to be raised above the level of the river plain, so is considered artificial. It seems most likely, due to the proximity of the moated site, that the two are associated. It may perhaps have been a medieval windmill mound or a later ornamental garden feature.

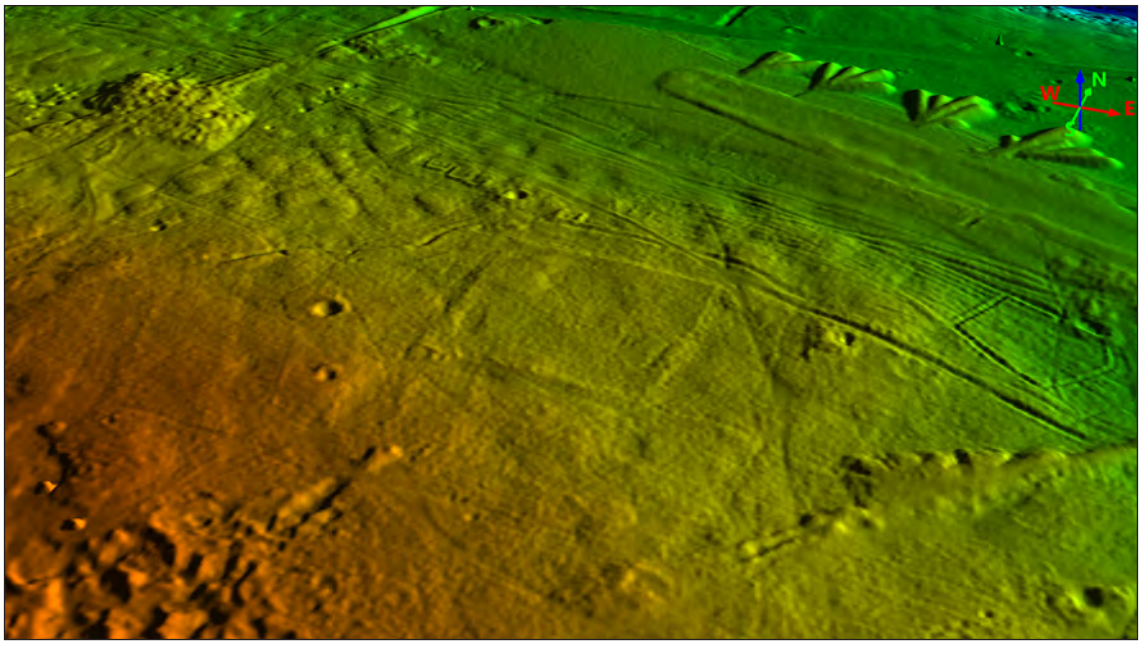

Fig 61: A large rectangular enclosure on Cockfield Fell may be a medieval or post medieval garth (22089). LIDAR DSM 30-NOV-2008 © Historic England; source Environment Agency.

A large rectangular enclosure (NRHE 22089; Fig 61) on Cockfield Fell was once suggested to be a Roman camp. However, this was reinterpreted by the RCHME as more likely to be a medieval or post-medieval garth (an enclosure) with adjoining house due to the lack of rounded corners and entrances (RCHME 1984, 6). The enclosure earthworks are very slight, but can be seen from the air on lidar images, and the foundations of a building are visible in the south-west corner of the monument. The northern boundary of the enclosure is skirted by a sinuous boundary ditch and bank (NRHE 873995) that appears to avoid the corner of the enclosure. The boundary adjoins another small rectilinear enclosure (NRHE 22074), which is probably post medieval in date. Numerous small 'U'-shaped embanked enclosures are located immediately to the north of the possible garth (NRHE 882410). With internal 'comb'-like banks, these features are unusual, but they do appear to overlie and post-date the sinuous boundary discussed above and are presumably post medieval in date. Some of these features may relate to industrial activity on the fell.

The industrial landscape

Digging for coal

The visual impact of the coal industry on the western part of the project area is notable on the aerial photographs. They record not only the sheer number and scale of the 19th- and 20th-century collieries, but also the remodelling of the landscape after the demise of the industry.

Coal mining occurs widely across the western half of the project area, as far east as Middridge. Several different forms of coal extraction are recorded on aerial photographs: concentrated groups of irregular pitting, often very extensive and sporadic in form; shafts and shaft mounds, often in concentrations; drift mines dug into the sides of hills; deep mines accessing the coal via vertical shafts; and opencast mining. Trying to date any of these features based on morphology alone is problematic as it was a long-lived and varied industry. Coal mining is documented on Cockfield Fell from at least 1375 (Roberts 1975, 49).

Despite this, it is generally believed that the densely-packed irregular pits are earlier in date (Griffin 1971, 3-5), but it is not possible to establish whether they are medieval, post-medieval, or even a combination of the two, from morphological analysis alone. Therefore, they have all been attributed a broad medieval/post medieval date. There are examples of irregular pits at several locations – most extensively on Cockfield Fell (Fig 62). They stretch over much of the southern half of the fell (NRHE 1622781) and comprise several hundred pits of varying sizes broadly concentrated in two clusters. Sporadic isolated smaller groupings also occur, though some of these may be for prospection. There is some evidence for the extraction truncating a series of braided hollow ways, but as the dating of these is also uncertain, this does not help in dating the coal mining.

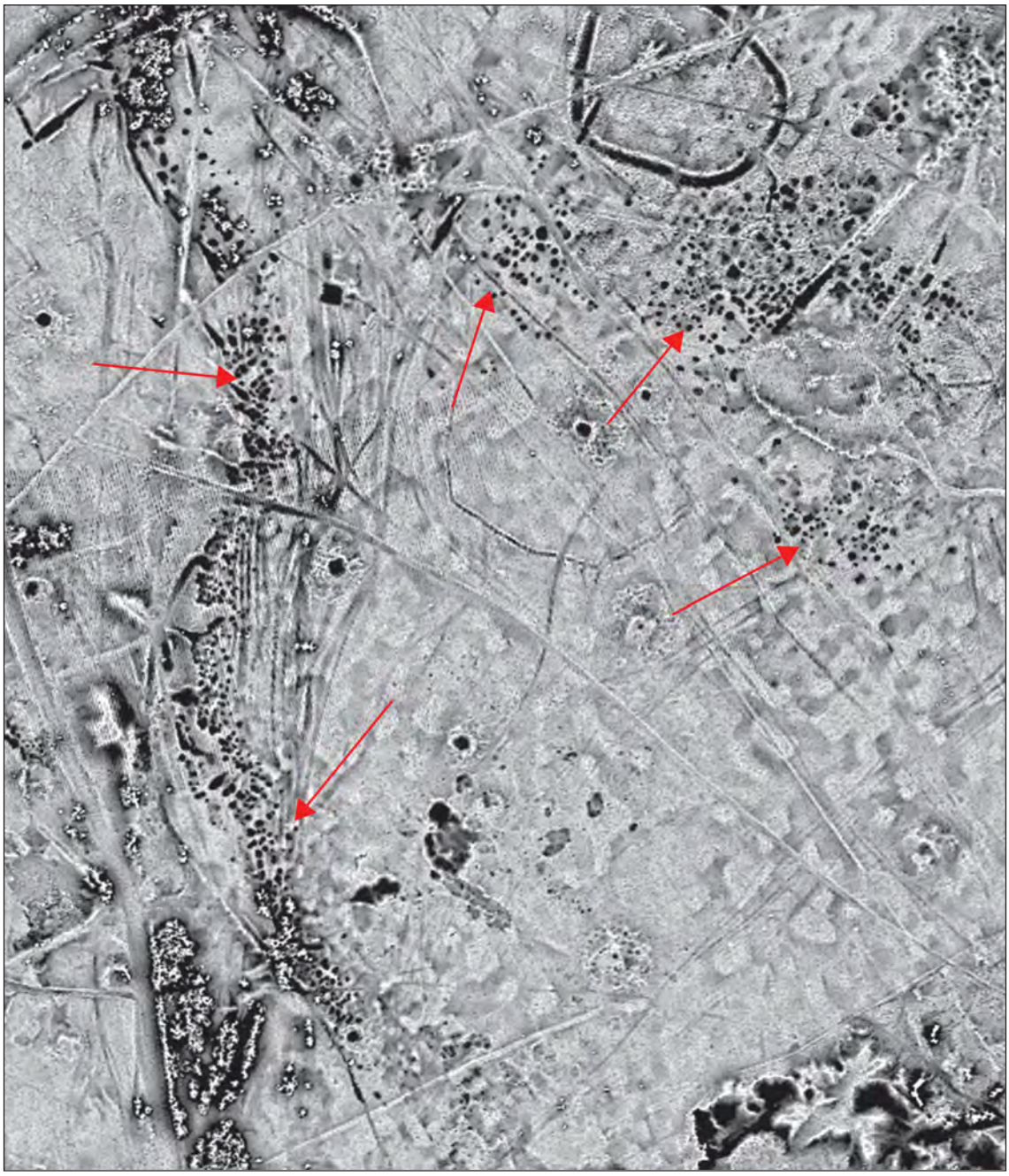

Fig 62: Lidar visualised using positive openness reveals the dense concentration of coal mining pits on Cockfield Fell (NRHE 1622781), some of which may be medieval in origin. LIDAR DSM 30-NOV-2008 © Historic England; source Environment Agency.

Similar patterns of densely clustered coal mining pits were mapped at several other locations in the west of the project area:

- West of Ramshaw (NRHE 1622821). Around 300 pits covering an area of approximately 2.4ha are visible on historical vertical aerial photographs. These pits are now levelled and much of the area turned over to tree plantation.

- North of Witton Park Farm (NRHE 1622891). The pits here are more amorphous in shape than other examples, and in places are clearly of recent date as they cut post medieval narrow ridge and furrow. They are possibly prospection pits.
- Between Burnshouse Lane and Dere Street, north of Brusselton Farm (NRHE 1441850; Fig 63). A large cluster of nearly 300 pits forms an arc; they are now levelled, but were mapped from earthworks visible on historical aerial photographs. There is no obvious association with other features, though soil marks on aerial photographs and undulating ground faintly visible on lidar suggests that extraction was originally much more extensive. If so, the pits pre-date the extant field system which appears to be post medieval in date.
- Between Lambton Street and West Auckland Road (NRHE 1622960). This small area of workings, mapped from historical aerial photographs, has also now been levelled. It appears as though some of the pits cut through an area of ridge and furrow thought to be medieval in date.
- South-east of Ramshaw Heugh (NRHE 1457400). This is a large area of surface extraction defined partly by pitting but also by shallow opencast mining. Most of the extraction cuts through post medieval ridge and furrow, so is relatively late in date, but there is potential for elements to have early post medieval or medieval origins.

Fig 63: Extractive pits for coal (NRHE 1441850) near the junction of Burnshouse Lane and Dere Street Roman roads could potentially have medieval origins. Detail of SfM RAF/58/B/37 V 5029-5379 17-MAY-1948 Historic England Archive (RAF Photography).

Shaft mounds are a recognised indication of sub-surface extraction involving digging a shallow shaft, with the waste material dumped around the shaft head to form a doughnut-shaped mound. These are typically arranged in clusters or at regular linear intervals, and some would probably have been linked underground by galleries radiating out from the base of each shaft. Evidence from excavation and remains exposed during opencast mining provide some understanding of these underground arrangements. This form of extraction dates from at least the 15th century and it is likely it continued into the 18th century (Griffin 1971, 6-8). Therefore the examples noted in this study were attributed a date of medieval/post medieval.

There are examples of shafts and shaft mounds at several locations throughout the west of the project area, and they are particularly extensive on Cockfield Fell. Approximately 50 were identified on the moor (NRHE 1622781). They vary in size, and are often arranged in clusters or in regularly spaced rows. Further examples were noted to the north and west of Witton Park Farm (NRHE 1622891), in and to the west of Brusselton Wood (NRHE 1622943), south of Coppy Crooks Farm (NRHE 1622954), east of Low Deanery Farm (NRHE 1622974), and north of Sunnydale (NRHE 1441888).

Drift mining for coal was more common in hilly terrain where the coal seam was accessed via a near-horizontal adit dug into a slope. The coal was often removed by rail from the drift mouth or adit. Drift mining was taking place by the 12th century, but was particular common in the 18th and 19th centuries (ibid, 2, 21) – some were still in use in the 20th century. For most cases in the project area, drift mines noted on early edition OS maps had usually been removed or subsumed by later deep-shaft colliery workings, so were rarely visible on aerial photographs. However, several examples were mapped on Cockfield Fell (NRHE 882400, 1622699, 882393, 1622727 and 1622599), Evenwood (NRHE 1622823), and at Copeland Colliery (NRHE 1622859) and Brusselton/Ladysmith Colliery (NRHE 1622939).

In the North-East, the method of boring deep shafts for coal mining dates back to at least the early 17th century, but the advent of steam power in the early 1800s made the process more efficient (ibid, 26-7). The resultant expansion in production and increased quantities of coal being extracted meant that greater infrastructure was required to transport the coal, which led to the development of the S&DR.

The collieries in the area are far too numerous to describe in detail, but it is important to note their impact on the landscape and their relationship with the railway (Fig 64). Between the 1830s and the closure of the last mines in the late 20th century, there were over 50 collieries either in or around the project area. Of these, nearly 40 were physically linked to the railway in some form. Those situated alongside the line had sidings leading directly on to the railway. Larger colliery complexes led to the construction of branch lines, including the Black Boy and Haggerleases Branches and the Surtees Railway. The remainder were connected to the S&DR by mineral railways or tramways.

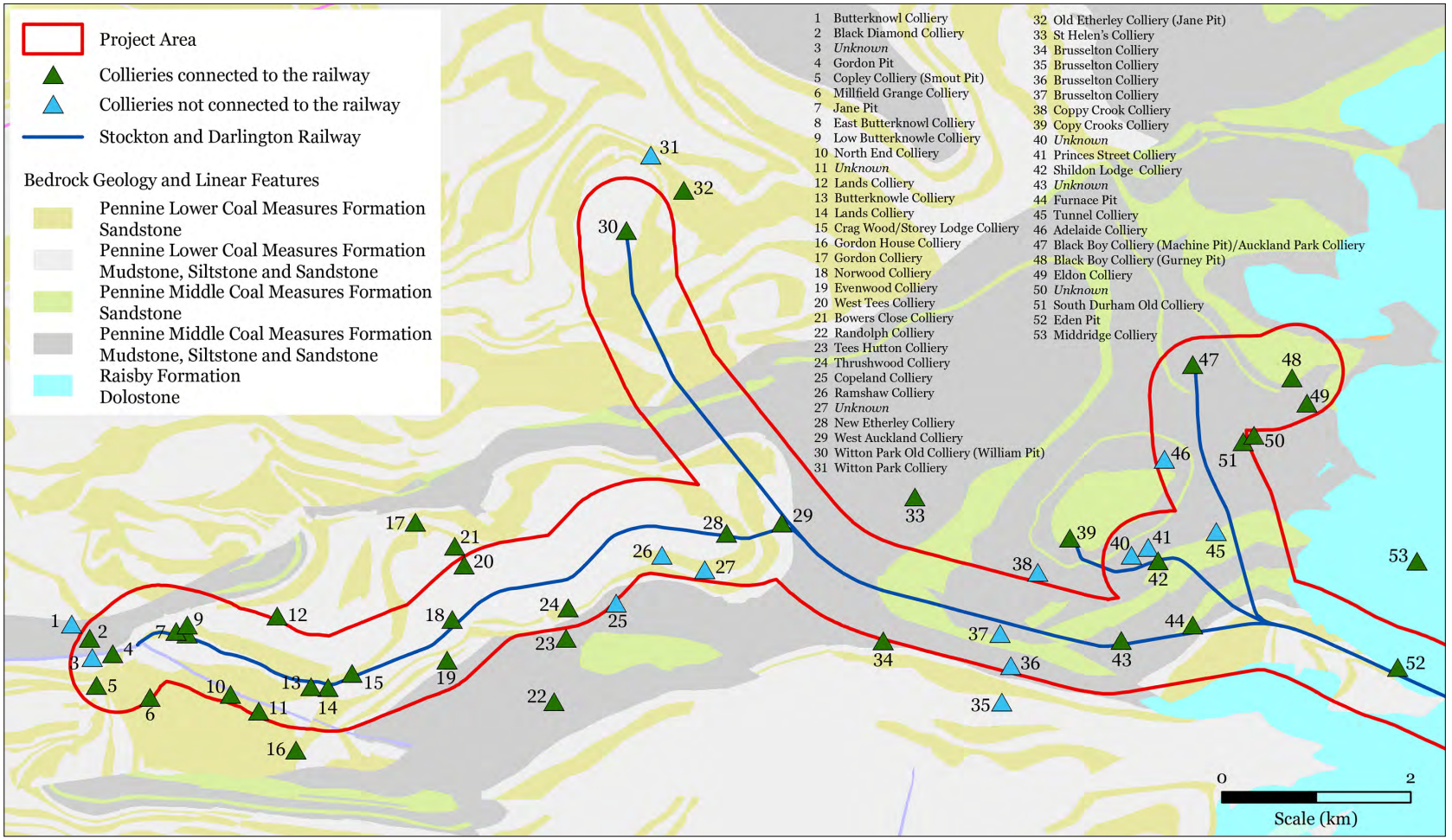

Fig 64: The western end of the S&DR main line and the Haggerleases, Black Boy and Copycrook Branches, showing the collieries served. Those not served directly were linked to the railway by wagonways, tramways or mineral railways. Contains British Geological Survey materials © UKRI 2019.

Fig 65: The landscape around the Black Boy collieries has changed a great deal since the closure of the final colliery in 1946, but the pattern of roads can still be seen. Top: SfM derived orthophotograph RAF/58/B/37 V 5029-5379 17-MAY-1948 Historic England Archive (RAF Photography); Bottom: NZ2227-2428 mosaic 06-MAY-2016 ©Bluesky International/Getmapping PLC.

A number of the earlier collieries linked to the railway were drift mines. Most of the later collieries were deep-shaft mines. The earthwork remains relating to coal extraction often comprise amorphous surface workings and spoil heaps, pit-head buildings and other forms of infrastructure such as roads, tramways and ventilation shafts. Most of these sites were mapped from 1940s vertical aerial photographs, when many of had already gone out of use but their physical remains were largely still extant. Whilst viewing recent vertical aerial photographs, it seems remarkable that there were ever any collieries, as almost all have been levelled and all physical traces removed. Nowhere is this more evident than with the collieries on the Black Boy branch line. When a series of vertical aerial photographs were taken of the area in May 1948, all of the collieries had closed – the last being Auckland Park Colliery in 1946 (Durham Mining Museum 2019b) but the buildings, earthworks and rail/tram networks remained intact. Fig 65 shows the stark contrast between this coal mining landscape and that which is visible today. Not only have the buildings, earthworks and basic infrastructure of the collieries been removed, but also much of the workers' housing.

Few recognisable physical remains of 19th-century collieries can be traced today. Those that are upstanding are either in areas now covered by dense woodland, such as Evenwood Colliery (NRHE 1622823), or are preserved because they lie in remote areas with reduced pressure to re-use the land, such as Cockfield Fell. Here, the earthwork remains of Millfield Grange Colliery (NRHE 882393) and several others whose names are not recorded on maps, are clearly visible on lidar. The easternmost colliery in the project area was Eden Pit, one of the pit-heads of Middridge Colliery, but all surface features associated with this site, bar a ventilation shaft, appear to have been destroyed by the re-opening and expansion of Middridge Quarry (NRHE 1623425) in the latter half of the 20th century.

After the closure of the deep mines, coal mining switched to opencast methods through the later 20th century. Opencast workings were excavated and backfilled over a very short period, and therefore appear only fortuitously on aerial photographs often taken infrequently and at intervals from the 1940s onwards (Fig 66). The largest identified area of open casting was to the south-west of Shildon (NRHE 1441869). Here, 75ha of opencast workings were recorded on late 1940s aerial photographs, although the workings may have covered a much greater area at their maximum extent and it has been argued that they removed a significant length of the S&DR Brusselton Incline (*see* page 31). There was another extensive area of opencast mining in the 1990s between Evenwood and West Auckland (NRHE 1455011), but even in the short period of time since its closure, the area has been landscaped and returned to agriculture. Smaller areas of late 20th-century opencast coal workings were mapped north of Etherley (NRHE 1455015), west of Witton Park Farm (NRHE 1622931) and possibly even on Cockfield Fell (NRHE 1622781).

Fig 66: Opencast coal extraction was taking place as late as the 1990s between Evenwood and West Auckland. OS/91128 V 9 03-AUG-1991 © Crown copyright. Ordnance Survey.

Additional industrial extraction

Second to coal extraction, the most dominant industry was iron and steel production, which was concentrated around Teesside. The first ironworks was opened in Middlesbrough in 1841 because of ready access to the port and railway which brought in coking coal for fuel, limestone for flux, and pig iron from Scotland or iron ore from Witton Park, the North York Moors, and later Eston (North 1975, 17-19).

There were ironworks as far west as Drinkfield (NRHE 1623559). The remains of additional works were recorded from aerial photographs at Palm Bridge (NRHE 1623889) and north of Middleton St George (NRHE 1623883), which is now under a housing estate. The major iron and steel works were concentrated along the Tees. These include the North Yorkshire Iron Works (NRHE 1624177) south of the Surtees Bridge, the Thornaby Iron Works (NRHE 1623941; Fig 67) which was linked to the S&DR by multiple branch lines feeding in to the Erimus Marshalling

Yard, and the Newport Iron Works (NRHE 1623958) a short distance from the docks. Another large concentration of multiple works was on the site of the present-day Bowesfield Industrial Estate. This site contained the Bowesfield Iron Works, the Richmond Iron Works and the Tees Bridge Iron Works (NRHE 1623924).

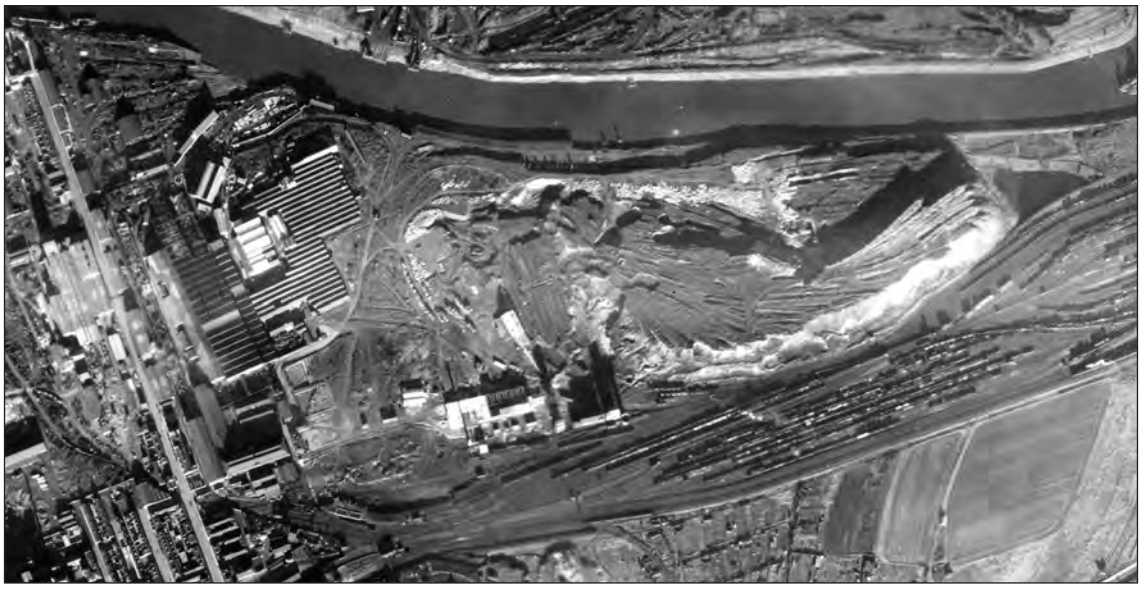

Fig 67: The Thornaby Iron Works (NRHE 1623941) was just one of many situated along the River Tees. In common with many other industries along the S&DR (and later extensions/incorporations), it linked directly into the railway. Detail of RAF/CPE/UK/1835 RS 4213 13-NOV-1946 Historic England Archive (RAF Photography).

Although coal mining dominates the western half of the project area, other minerals were also extracted. On Cockfield Fell for example, there are a series of long linear whinstone quarries (NRHE 1466221 and 1466218; Fig 68). Established in the late 19th century to supply rock for road construction, these quarries were expansive, being over 2.6km in length, and were linked to the Haggerleases Branch Railway by a tramway. They remained in use into the 20th century. Unlike most of the other industrial activity on the fell, large stretches of the quarries were back-filled but elements survive to the north of Blackburn Bridge and east of The Slack. Many of the associated earthworks, such as a series of finger-dump spoil heaps, also remain extant. Whinstone was also quarried north of Urlay Nook and in the grounds of Preston Park (NRHE 1623913 and 1623918). The latter quarrying was already active by 1822 and linked to the railway when it opened in 1825 (Daniels 1996). Limestone was also quarried in the centre of the project area. Both Middridge (NRHE 1623425) and Old Town (NRHE 1443698) Quarries were in operation by the 19th century, and remained in use either continually or intermittently until the latter half of the 20th century. Thickley Quarry (NRHE 1622986) was operating lime kilns into the latter half of the 19th century.

Fig 68: 19th and 20th century whinstone quarrying extended across Cockfield Fell, cutting through many earlier archaeological features. NMR 17072/24 02-FEB-1998 © Crown copyright. Historic England Archive.

Other industries visible on aerial photographs include brickworks and their associated clay pits. The brickworks at Eldon was constructed adjacent to and partly on what had been Eldon Colliery (NRHE 1623362) and may have been re-using colliery waste to make its bricks. An extensive but short-lived brickworks was located south of Haughton Road in Albert Hill (NRHE 1623631) and recorded as earthworks on aerial photographs, but has been levelled. Other brickworks, often with associated clay pits, were recorded to the north of Kitchener's Point (NRHE 1623536), at Palm Bridge (NRHE 1623890), and there is a very large works with multiple clay pits west of Bowesfield Junction (NRHE 1623920 and 1623921). Less intensive industrial activity recorded during the survey includes a gravel pit at South Burdon Farm (NRHE 1623662). This may have had a tramway linking to the S&DR as there are the remains of two linear embankments extending from the pit. There was also a sand pit at Whiley Hill, west of Stanley Farm (NRHE 1623536).

Farming in the post-medieval period

The dominant form of archaeological remains visible on aerial photographs in the western half of the project area is ridge and furrow, mostly classified as post medieval in date (medieval cultivation remains are discussed above, under '*The medieval landscape*'). Much of this is in the form of narrow ridge and furrow. As discussed in '*The impact of the railway on the landscape*' below, all of this is considered to post-date the railway and to have been formed by the use of steam-powered traction engines pulling the plough, a technology that took off several decades after the opening of the railway.

The Second World War

There is extensive evidence of wartime activity along the S&DR. The railway acted as an important line of communication, and was one of the reasons why military sites such as the Royal Ordnance Filling Factory No. 9 Aycliffe (NRHE 1075763) were sited alongside it. The factory was established in 1941 and occupied land on both sides of the S&DR, south of Newton Aycliffe (Fig 69). The layout of the site is partly preserved in the Aycliffe Business Park, but little remains of the original factory bar a handful of buildings.

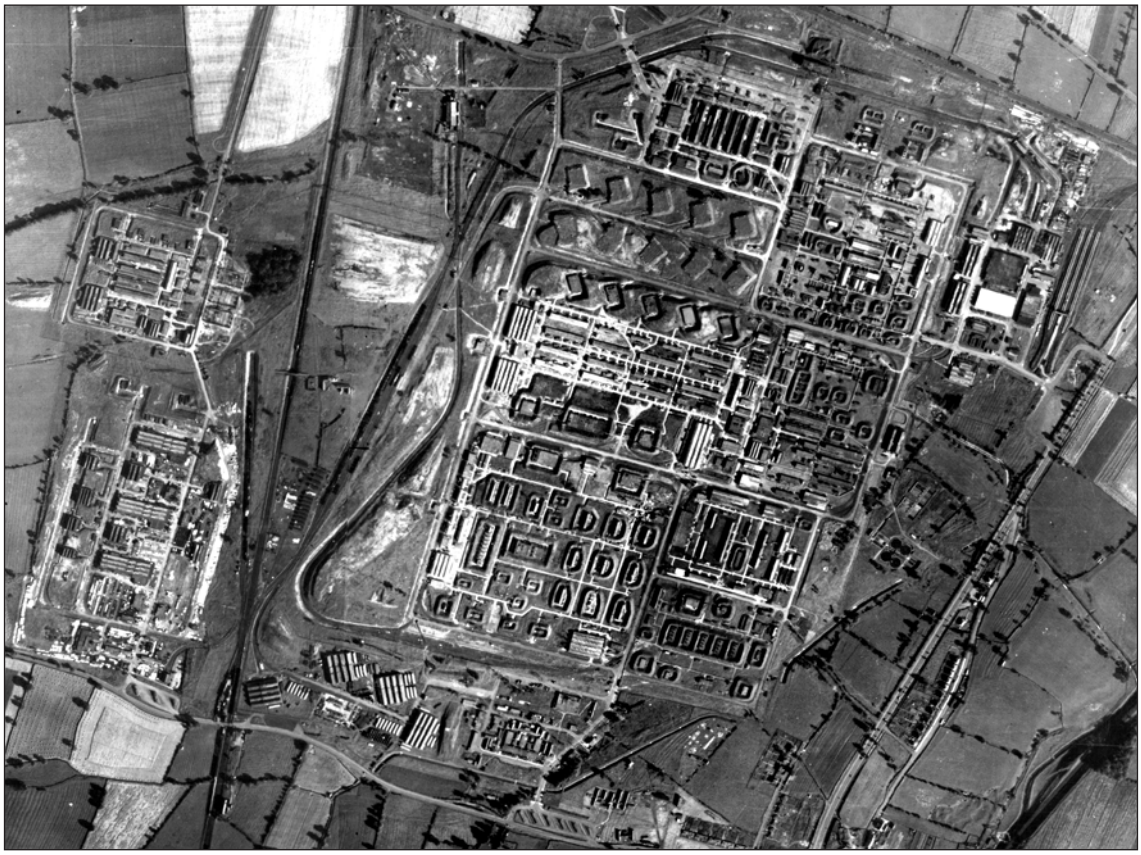

Fig 69: The Royal Ordnance Filling Factory No. 9, south of Newton Aycliffe was deliberately positioned adjacent to the S&DR to allow munitions to be transported around the country. RAF/106G/UK/1700 RS 4091-2 27-AUG-1946 Historic England Archive (RAF Photography).

Other military installations were also sited along the railway to take advantage of communication links. The largest was Royal Air Force Middleton St George (NRHE 1406315), which covered 29ha to the south of Oak Tree (Fig 70). Although much remodelled for use as a civilian airport in 1966 (it is now Durham Tees Valley Airport), the original military airfield is recorded on historical aerial photographs. It comprised runways, support buildings for the airfield and numerous ancillary camps to the west (NRHE 1623861, 1623862 and 1623863). Five masts (NRHE 1623876), arranged in a quincunx pattern, south of Oaktree Junction, may be associated with the airfield, though probably part of a wartime telegraph station.

Fig 70: RAF Middleton St. George shortly after the end of the Second World War. The runways are top right of frame. The S&DR extends along the northern boundary of the airfield to the top-left of the image. EAW001005 06-JUN-1946 © Historic England Archive. Aerofilms Collection.

The concentration of industrial sites around the mouth of the Tees and along the railway made it an obvious target for enemy aircraft, resulting in various forms of civil and military defence systems being constructed. This included a Starfish Bombing Decoy east of Red Hall (NRHE 1413365). The decoy, which opened in 1941 and remained in use until at least 1943, was used to simulate burning buildings and divert enemy bombers away from Darlington. It comprised a series of 'fire baskets' in an enclosure, which would be set on fire to represent burning targets on the ground. Although already out of use when photographed in 1948, the site of the decoy can still be seen as a series of scorch-marks on the ground (Fig 71). The command centre is located 500m to the north. It originally consisted of a concrete bunker covered in earth with a small side building, perhaps a generator or guard building (NRHE 1377270). The bunker remains intact, though now devoid of its earth covering.

Middlesbrough was a prime target during the war because of its major role in supplying Britain's wartime resources. Although only a small part of the town lies within the study area, over 650 air raid shelters were mapped (grouped under NRHE records 1624160, 1623966, 1623968 and 1623960). Almost all of these were concrete surface shelters, and were arranged along the residential streets to the south of the railway. The vast iron and steel works to the north of the railway probably had their own shelters inside the factories. Eleven emergency water supply tanks were also identified and mapped in the residential and industrial areas. They were designed to supply water to fire fighters during and after bombing raids.

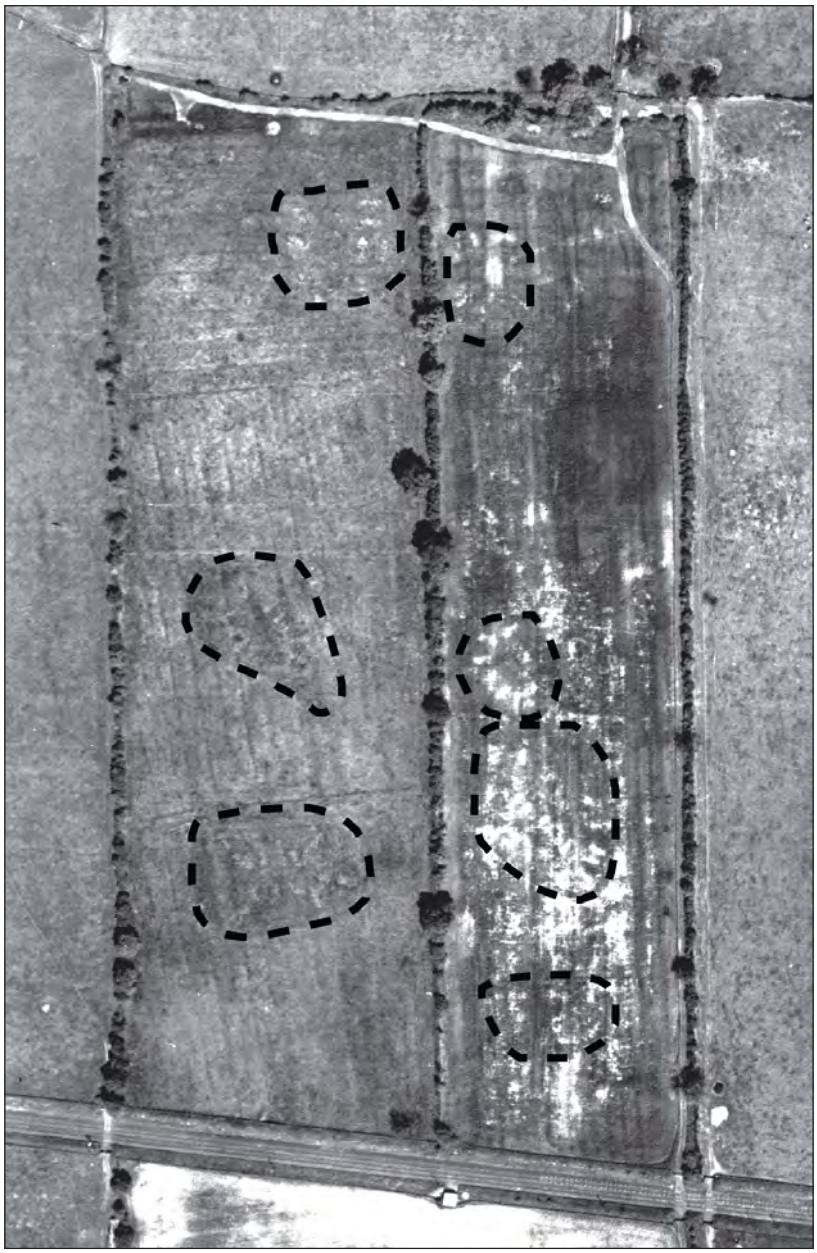

Fig 71: The scorch marks of the bombing decoy (dashed outline) east of Red Hall were still visible in 1948 despite being out of use for several years. Detail of RAF/58/B/49 V 5022 12-JUN-1948 Historic England Archive (RAF Photography).

Several barrage balloon sites (NRHE 1623957, 1623963, 1623965, 1623969 and 1624153) are visible on vertical photographs taken immediately after the war. These were the tethering points for balloons that were intended to steer enemy aircraft away from targets in the city and/or towards anti-aircraft batteries. They were therefore mostly located close to the river, the railway line and the docks, or surrounding the steel factories. A further barrage balloon site (NRHE 1623956) stood to the north of Marsh House, on the site of what is now the carpark to Teeside Leisure Park. This probably protected the Erimus Marshalling Yards, which were a major enemy target during the war.

Further civilian air raid shelters are visible in Thornaby-on-Tees (NRHE 1623961), though far less extensive than in Middlesbrough. In the smaller towns they were usually located in school grounds, and were a mix of concrete surface and earth-covered trench shelters. Examples of these can be found in Eaglescliffe (NRHE 1623903), Darlington (NRHE 1623572), Shildon (NRHE 1622983, 1441822, 1622981, 1441826, 1623351 and 1441830), and West Auckland and St Helen Auckland (NRHE 1622936). Of the hundreds of shelters in the project area constructed during the war, only two can be identified as still surviving from aerial photographic sources. These are both located in the grounds of Gurney Pease Academy, Darlington.

Three small trenches to the rear of Byerley Road in Shildon are visible on post-war 1940s vertical aerial photographs (NRHE 1622978). These are in the grounds of St Thomas Church, outside the church hall. The classic zigzag or 'V' plan denotes them as most likely military. Six 'V-plan' trenches (NRHE 1623574) are also visible to the rear of Union Place, Darlington, on ground that belonged to the London and North East Railway Assembly Rooms. Because they lack obvious defensive purpose, these earthworks were probably practice trenches dug by local Home Guard.

DISCUSSION

The aim of this study has not been to compile a detailed history, but to chart and contextualise from the air the physical survival of the pre-1831 S&DR main line and branch lines (the core S&DR network) from a combination of documentary material, aerial photographs and lidar. Though, in order to understand the present remains of the railway, it is important to know something of the changes that were happening around it over the century and a half following its opening.

The S&DR was an immediate success, and within three decades, numerous new lines had been constructed (Fig 72), several of which were independently owned but had running rights over sections of the S&DR. One such example was the Great North of England Railway in 1841, which utilised a section of the Croft Branch Line as it passed through Darlington. This company was absorbed into the York and Newcastle Railway in 1845, then into the York, Newcastle and Berwick Railway in 1847, which then merged to form the North Eastern Railway (NER) in 1854. Most of the other local railways were either set up as sub-companies to, or later absorbed into the S&DR, until 1863 when the S&DR was itself taken into the NER (Holmes 1975, 44).

The coal mining industry began to decline by the late 19th century. However, the S&DR had by this point developed a healthy passenger service to compensate for the loss of some of its freight traffic. Despite this, railway improvements and the opening of new routes and branches increasingly diverted traffic away from the original S&DR line. This was the case with the northern end of the Black Boy Branch railway, where the opening of the Bishop Auckland and Weardale Railway (which was operated by the S&DR) diverted most of the mineral railways and tramways away from the original branch line. Similarly, both the Etherley Incline and the Brusselton Incline were abandoned in favour of the West Auckland Branch Railway (also called the Tunnel Branch), which opened in 1842, originally as a private enterprise and then bought by the S&DR in 1847 (Railcentre 2019).

On a different tangent, the Yarm Branch railway closed as a combination of only operating a horse-drawn passenger service and being superseded by the Leeds Northern Railway (LNR), which allowed a service directly to Yarm from 1852. The opening of the LNR also led to the closure of the old S&DR line between Yarm Station and Bowesfield in 1853 – the S&DR now sharing the LNR line and the station at Eaglescliffe (Hoole 1974, 126).

The Surtees Railway was more reliant on the coal industry. It appears to have only extended as far as Copy Crooks Colliery for a very short period, whilst the eastern half of the railway remained in use until 1930, finally going out of use following the closure of Shildon Colliery in 1924 (Durham Mining Museum 2019c).

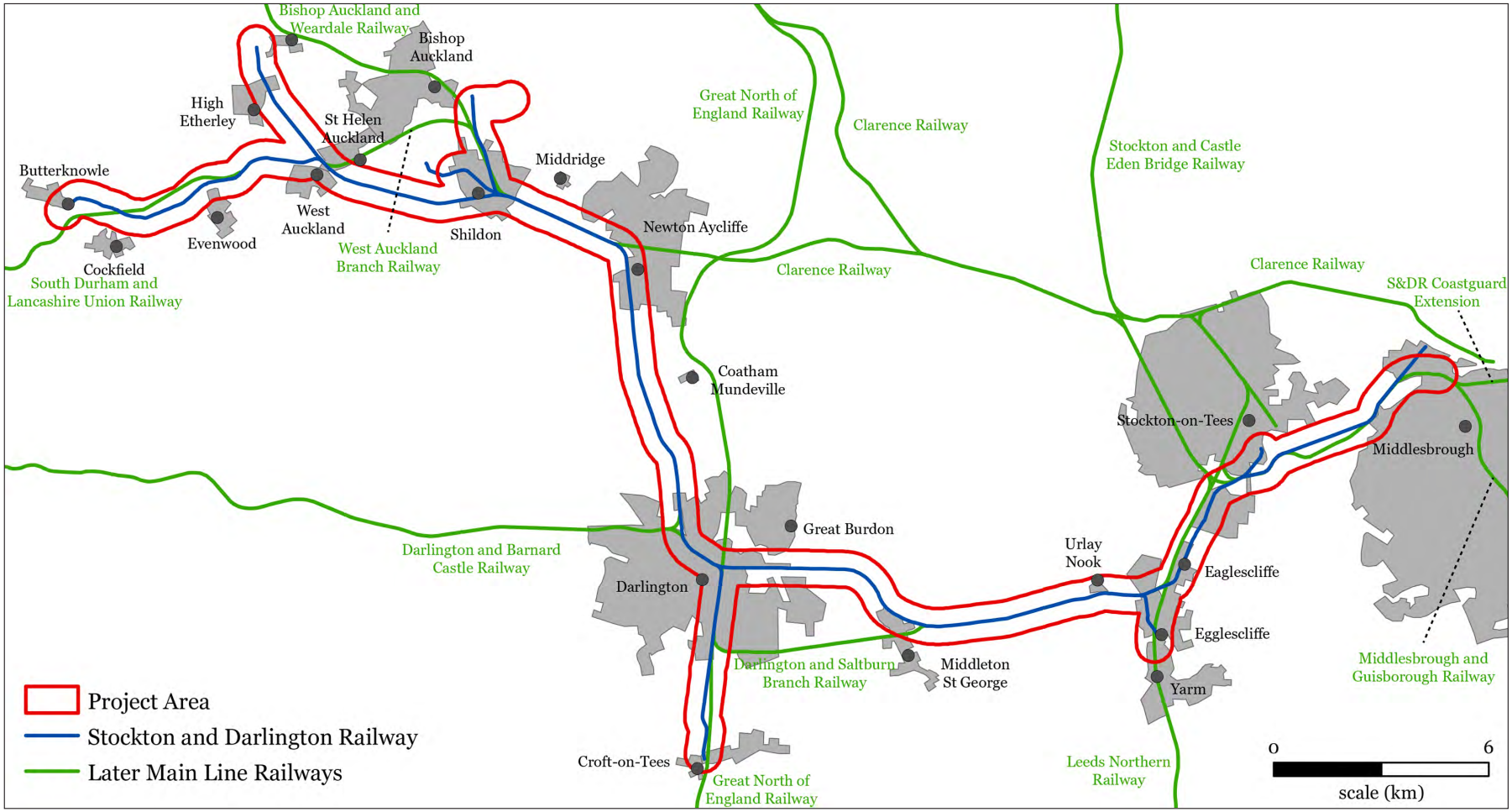

Fig 72: Within only a few decades of the opening of the S&DR, new railways had been constructed.

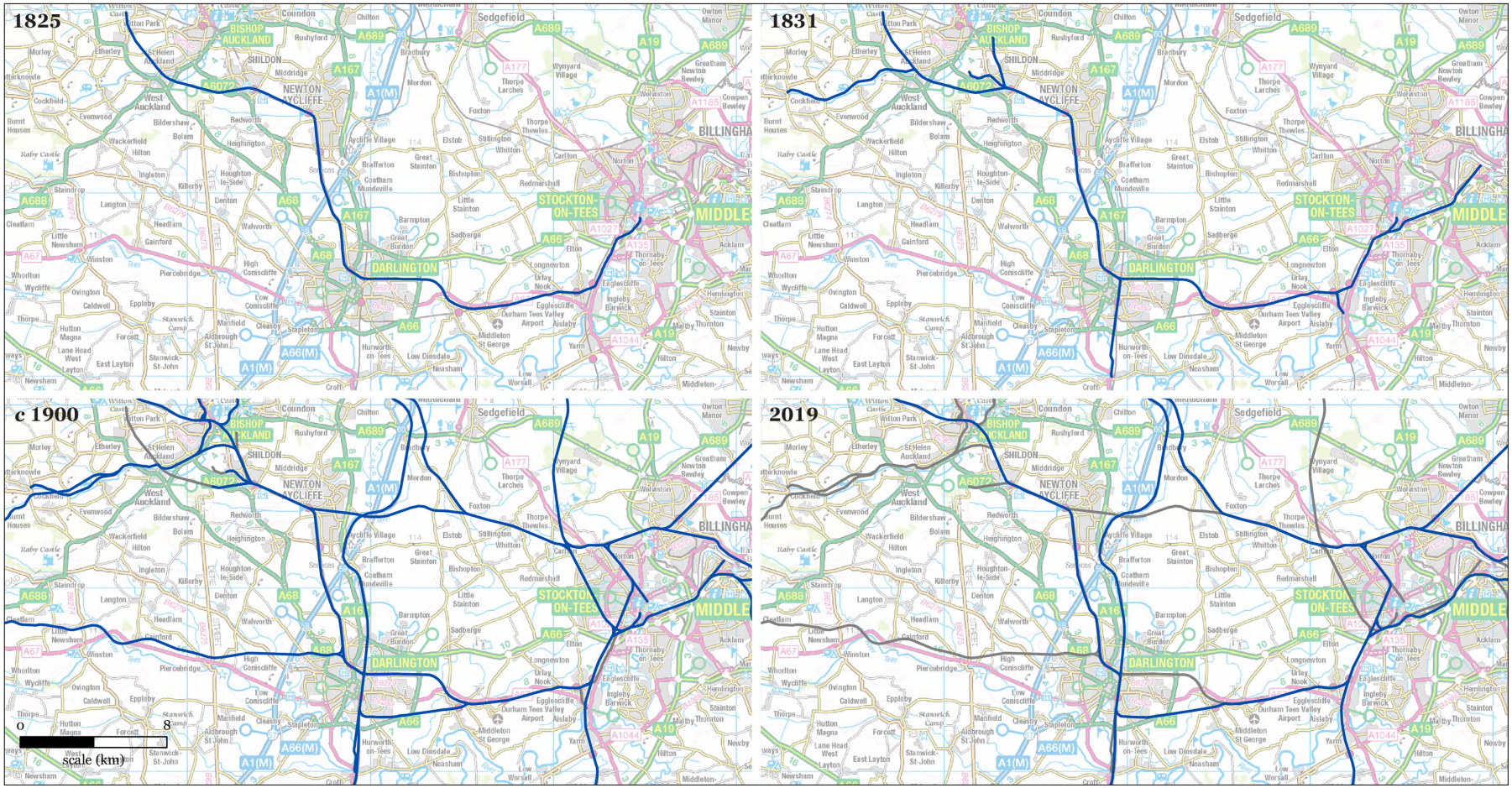

Fig 73: The main phases of railway growth and retraction in and around the Stockton and Darlington area. Active lines are in blue, the sections of line that became disused are in grey. Base map © Crown Copyright and database right 2019. All rights reserved. Ordnance Survey Licence number 100019088.

The physical infrastructure and layout of the railway remained moderately stable until Dr Richard Beeching's 'The Reshaping of British Railways' report in 1963 (British Railway Board 1963). Despite the reduction of railways across the country, the original S&DR main line fared moderately well – the only closure being the short section of line between Darlington and Oak Tree Junction, which duplicated part of a parallel route to the south (the Darlington and Saltburn Branch Railway). The surviving branch lines, however, were less fortunate – the Haggerleases and Croft Branches were both completely closed. The modern railway continues to follow the original 1825 route (with minor migrations in areas) between Shildon and Darlington, Oak Tree Junction and Eaglescliffe, and Stockton and Middlesbrough.

Despite the alteration and closures that happened to the S&DR over nearly two centuries, a remarkable amount of the original infrastructure survives as earthwork embankments and cuttings, buildings in the form of goods sheds or taverns, or as other structural features including bridges and culverts (Fig 74).

Various factors affected the degree to which original railway features survive, and in what form. Sections of railway that went out of use in the mid-19th century have some of the best-preserved infrastructure of the original railway. Conversely, where the railway has remained in use to the present day, continued track upgrades, expansion or remodelling has removed original features. This is particularly the case in the urban centres of Middlesbrough, Darlington, Stockton and Shildon, where almost all traces of the original railway had probably already been removed or replaced by the mid- to late 19th century. Another impact on the survival of features was the closures that took place following Beeching's 1963 report. In these cases, where sections of the railway were closed, the infrastructure was often very deliberately removed, with the demolition of bridges, boundaries, crossings and the levelling of earthworks.

The use of aerial photographs, primarily from the 1940s, allows a unique snapshot into the railway at its height, as they record many elements that existed at the end of the 19th century but have subsequently been demolished. This survey allows us to look at four major phases of the railway:

- The original railway of 1825 which extended from Witton Park to Stockton.
- The branch lines and Middlesbrough Extension that were constructed between 1825 and 1831 to expand the area – and particularly the number of collieries – served by the S&DR, and to improve distribution of the coal.
- The railway network at its height at the end of the 19th century into the first decades of the 20th century. This infrastructure was effectively preserved until the 1960s and is recorded on vertical aerial photographs.
- The current railway, which reflects the post-1963 closures.

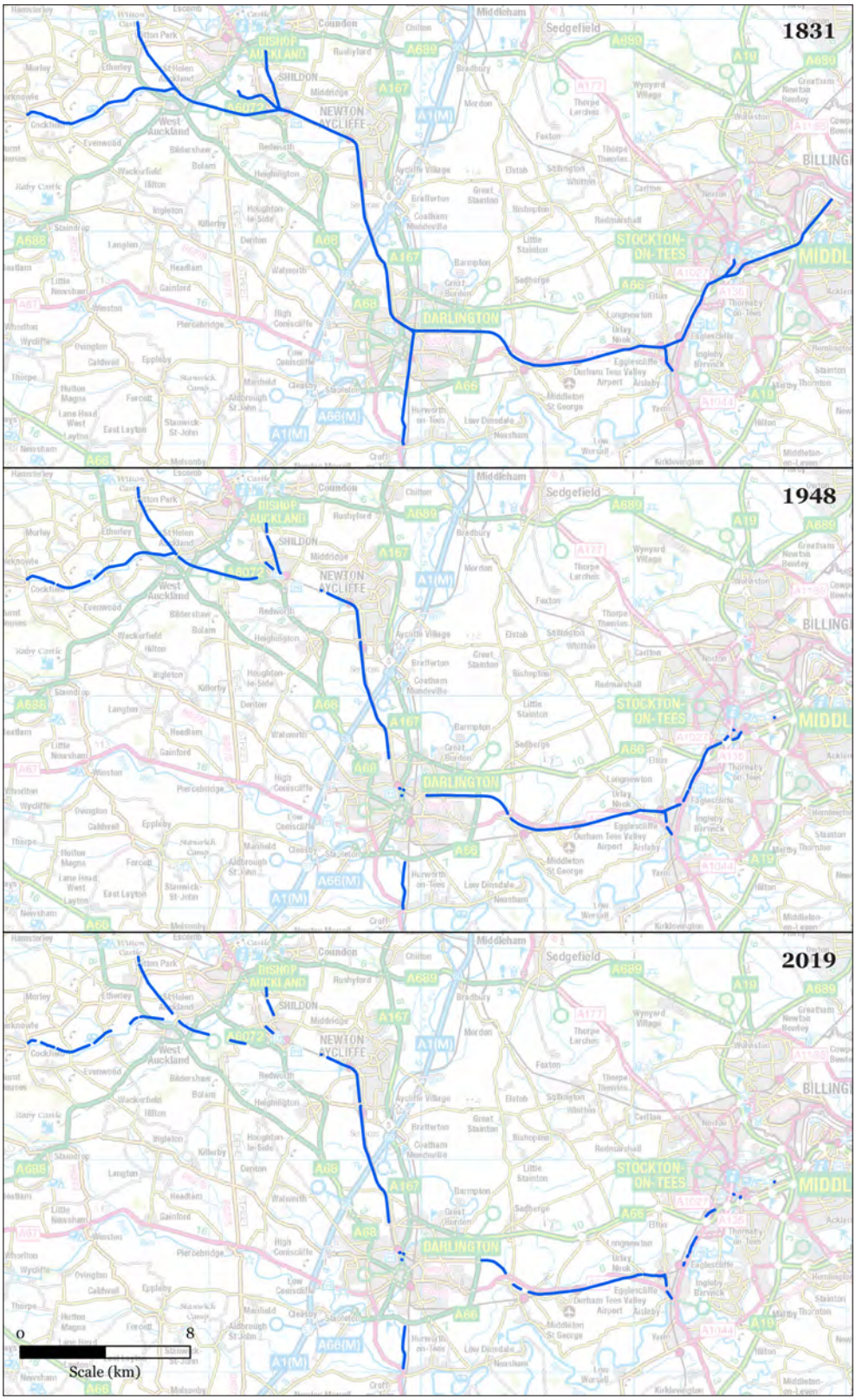

Fig 74: Of the original S&DR core network, much of the structural and earthwork remains were intact in some form on the 1948 aerial photographs. Since the 1940s, the physical remains of this core network have continued to gradually disappear. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2019. All rights reserved. Ordnance Survey Licence number 100019088.

The impact of the railway on the landscape

When the construction of the railway began in 1822, the landscape was very different from that we see today. The urban centres were far smaller: Shildon did not exist in its present form but was a village two miles from the railway, Darlington and Stockton were small market towns, and Middlesbrough was simply a farm. The rural landscape was predominantly pastoral, which is reflected in the largely earthwork-rich archaeological landscape through which the railway passed. Much of this survived to be recorded on 1940s aerial photographs as it had not then been put under the plough. Numerous coal mines were in operation on the Pennine Fringe before the construction of the railway, but the construction of the railway led to a great increase in production through the 19th century.

It was coal that transformed the region through the creation of the railway. Numerous means of transporting the coal to the River Tees had been discussed, including a canal. George Overton proposed a circuitous route for a 'tramroad', but it was George Stephenson who suggested a more direct route and the use of steam locomotives. The route of the railway was very carefully chosen, not only topographically, but also to serve as many collieries as possible.

But the railway also served the settlements it connected (and which gave their name to it). It never passed directly through a town, rather skirting around the edge. Subsequent urban development gradually enveloped the railway. The S&DR passed between West Auckland and St Helen Auckland, and bypassed the village of Shildon to the south. In the beginning, Shildon was the western terminus for the steam-locomotive-hauled railway and became a focus for works and sheds associated with the railway. Initially the settlement expansion was called New Shildon, but it soon became the focus for further branch lines (the Black Boy Branch and Surtees Railway) and coal traffic, and over time merged with the pre-existing village and became just Shildon. Newton Aycliffe did not exist in 1825 – the area was defined by enclosed post-medieval fields with dispersed farms. The 'New Town' was founded in 1947 (Alexander 2009, 49) and located to the north-east of the railway. In Darlington, the railway now runs through the town, bordered by housing and industrial estates. In the early 19th century however, the railway passed to the north of the town and the Croft Branch to the east. At Stockton-on-Tees, the coal staithes were located to the south of the town, and as described above, Middlesbrough was effectively simply a farm until the construction of the Port Darlington staithes and the railway extension. In both instances, the towns have now expanded to absorb the railway.

The interaction between the railway and the landscape was complex – the topography dictated where the railway would be built, and the railway brought land-use change as it aided the development of local industries. Along the Haggerleases Branch, the railway hugged the north bank of the River Gaunless in the valley bottom as far as West Auckland (Fig 75), with numerous collieries feeding into the railway by tramways and road. Between Witton Park and Shildon, the topography was too steep to traverse by early steam-locomotives, so the inclines

were constructed, allowing the goods wagons to be hauled up the slopes using a stationary steam-engine, whilst, again serving numerous collieries. These inclines were also the first sections of the railway to go out of use, when the opening of the Shildon Tunnel allowed a level route for steam-locomotives to travel.

Fig 75: The Haggerleases Branch railway follows the River Gaunless in the valley bottom. March 2019 © Historic England.

The impact on the agricultural landscape is particularly evident from Witton Park to Middlesbrough. The early edition OS maps show where fields have clearly been cut in half by the railway (Fig 76). This was one reason why the railway needed an Act of Parliament for its construction. In some sections, the course of the railway was slightly less invasive. Between Low Goosepool and the Yarm Branch, the line extended parallel to a pre-existing road, therefore impacting the field systems less. Similarly, much of the line between the Yarm and Bowesfield junctions also ran alongside pre-existing roads, though this section of the railway was short-lived, closing in 1853. Where the railway did bisect pre-existing fields, numerous accommodation bridges or crossings had to be constructed to allow farm traffic access to land on either side.

Despite the clear impact that the railway had on the landscape, there is relatively little evidence for archaeological remains being impacted. The railway inevitably cut through some buried archaeological deposits but these would not then have been routinely recorded as they would be today. The archaeological evidence recorded on aerial sources along the railway shows features with a physical relationship with the line such as industrial sites, including quarries, coal mines, brickworks and iron works. In every instance of an industrial site abutting the railway, they appear to have been directly associated with the line, using it to transport their goods.

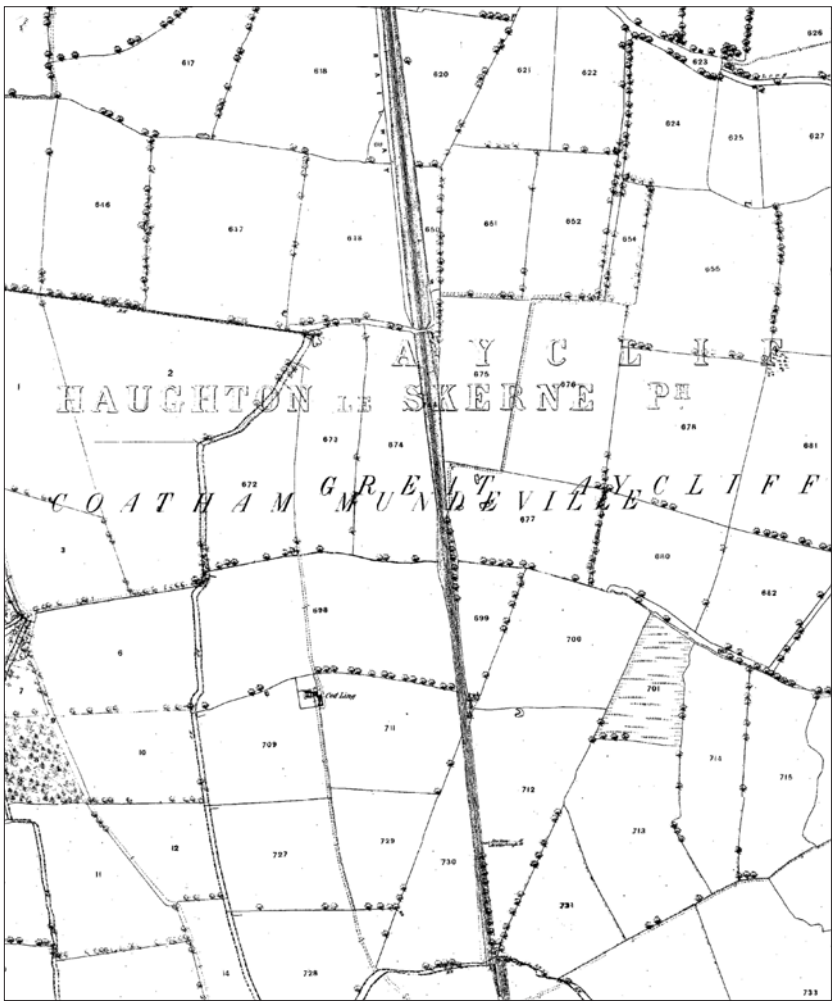

Fig 76: Most of the 1825 railway simply sliced through the pre-existing agricultural landscape of post medieval enclosure. © and database right Crown Copyright and Landmark Information Group Ltd (All rights reserved 2019) Licence numbers 000394 and TP0024.

The relationship between the railway and ridge and furrow is slightly more complicated depending on the age of the cultivation. There are numerous instances where the railway can be seen bisecting medieval ridge and furrow – such as at Ramshaw, Whiley Hill, Red Hall, Oak Tree, and Preston-on-Tees. Establishing any form of a relationship with post medieval cultivation is less clear. There are a number of locations where post medieval ridge and furrow can be seen in fields flanking the railway. However, the ploughing appears to be later in date. For example, at Bankfoot Farm, narrow ridge and furrow is visible on both sides of the railway and appears to be aligned – which could suggest that the cultivation was bisected by the railway (Fig 77). However, the field to the north of the railway is broader than that to the south, and this widening can only have occurred after the closure of the St Helen's Colliery Railway, which passed through the corner of this field. The date for the closure of this railway which branched from the S&DR is uncertain, but it is likely to have been around 1858 or shortly afterwards, when part of the Brusselton Incline became disused. Therefore, the cultivation post-dates that closure, and also the S&DR.

In most instances, the earthwork evidence more often shows different directions of ploughing on either side of the railway, such as north of Whiley Hill (Fig 78). Most of the post-medieval ridge and furrow mapped by the project was narrow in form. The regularity and spacing (generally between 2.5m and 4m in width) of this

narrow ridge and furrow is suggestive of ploughs being pulled by steam traction engines, a technology which did not become the norm until the mid-19th century. Therefore, this would suggest that most of this form of cultivation post-dates the railway. There are however instances, although not physically associated with the railway, where the ridges and furrows are less regular and more widely spaced. Dating these is more difficult.

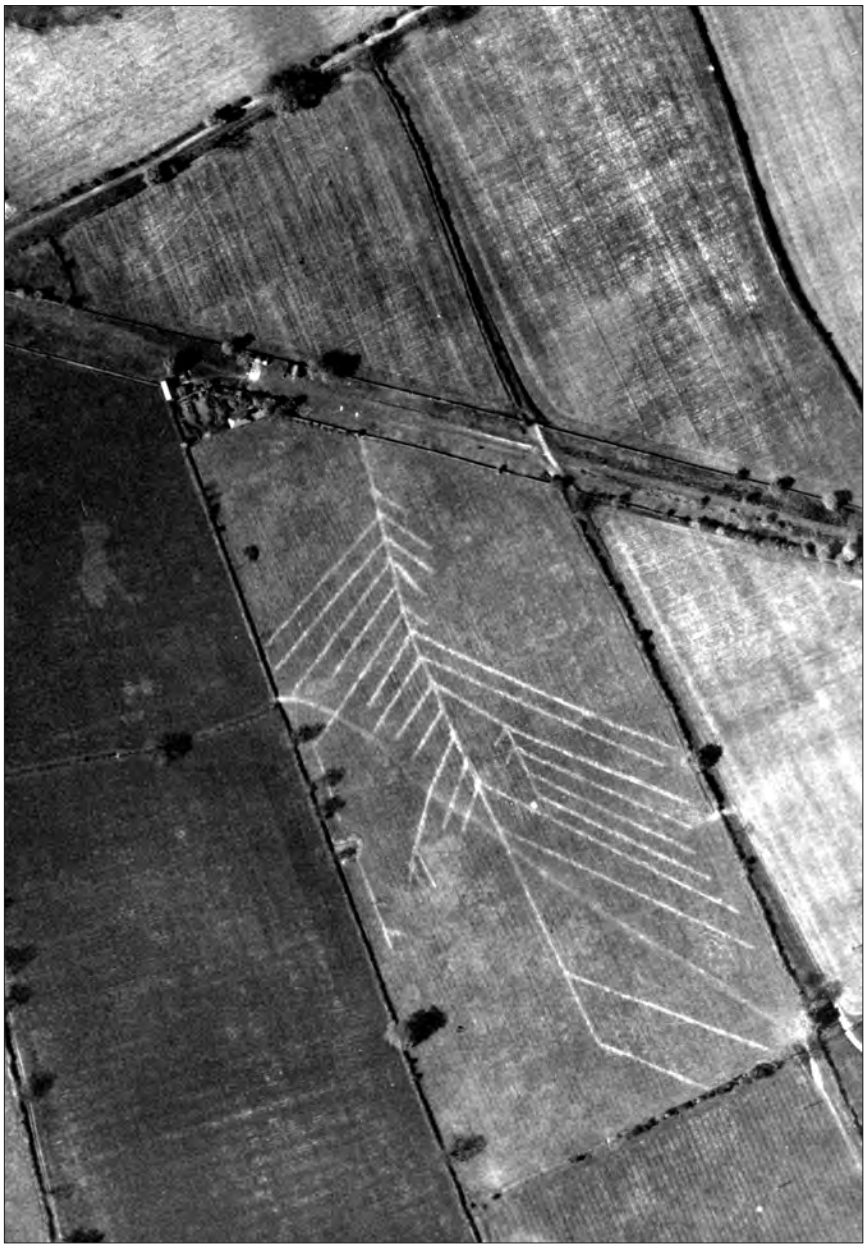

Fig 77: Narrow ridge and furrow can be seen in fields to the north and south of the railway at Bankfoot Farm. Despite the common orientation of the rig, this cultivation post-dates the railway. The lighter pattern of marks, centre of image, relate to recent field drains. Detail of SfM RAF/58/B/37 V 5029-5379 17-MAY-1948 Historic England Archive (RAF Photography).

Although the railway was put in place primarily to serve the pre-existing collieries, it afterwards became the focus for exploiting more seams, often at quite some distance from it (*see* Fig 64). Logistically, it made sense that these were linked into the S&DR to allow the transportation of the coal. This resulted in numerous mineral railways to the larger collieries, and a complex network of tramways serving others (Fig 79). Of the few collieries in the region that were not linked to the railway, they either had branch lines to other later railways or were short-lived small late-19th/early-20th

century collieries that transported their coal by road, such as several of the examples west of Shildon. Despite the decline of the coal industry from the late 1800s onwards, this had relatively little impact on the railway to begin with. The heaviest coal traffic came down the Haggerleases and Black Boy Branches. The Haggerleases Branch continued in use until the 1960s closures, while after 1842 collieries around Black Boy were more effectively served by the Shildon Tunnel Branch, part of the Bishop Auckland & Weardale Railway, which remains in use today linking Shildon to Bishop Auckland.

Although many of the smaller collieries were short-lived and already disused by the 1940s, many of the surface features remained largely intact when the first extensive aerial photographic coverage was captured. They were gradually levelled over the next few decades and the land either turned over to housing or returned to agriculture.

Fig 78: North of Whiley Hill, post medieval narrow and straight ridge and furrow can be seen extending in different directions on either side of the railway, suggesting this cultivation post-dates the railway. The fields to the bottom of the image however show curving medieval ridge and furrow bisected by the railway. Detail of RAF/543/396 F22 132 SEP-1958 Historic England Archive (RAF Photography).

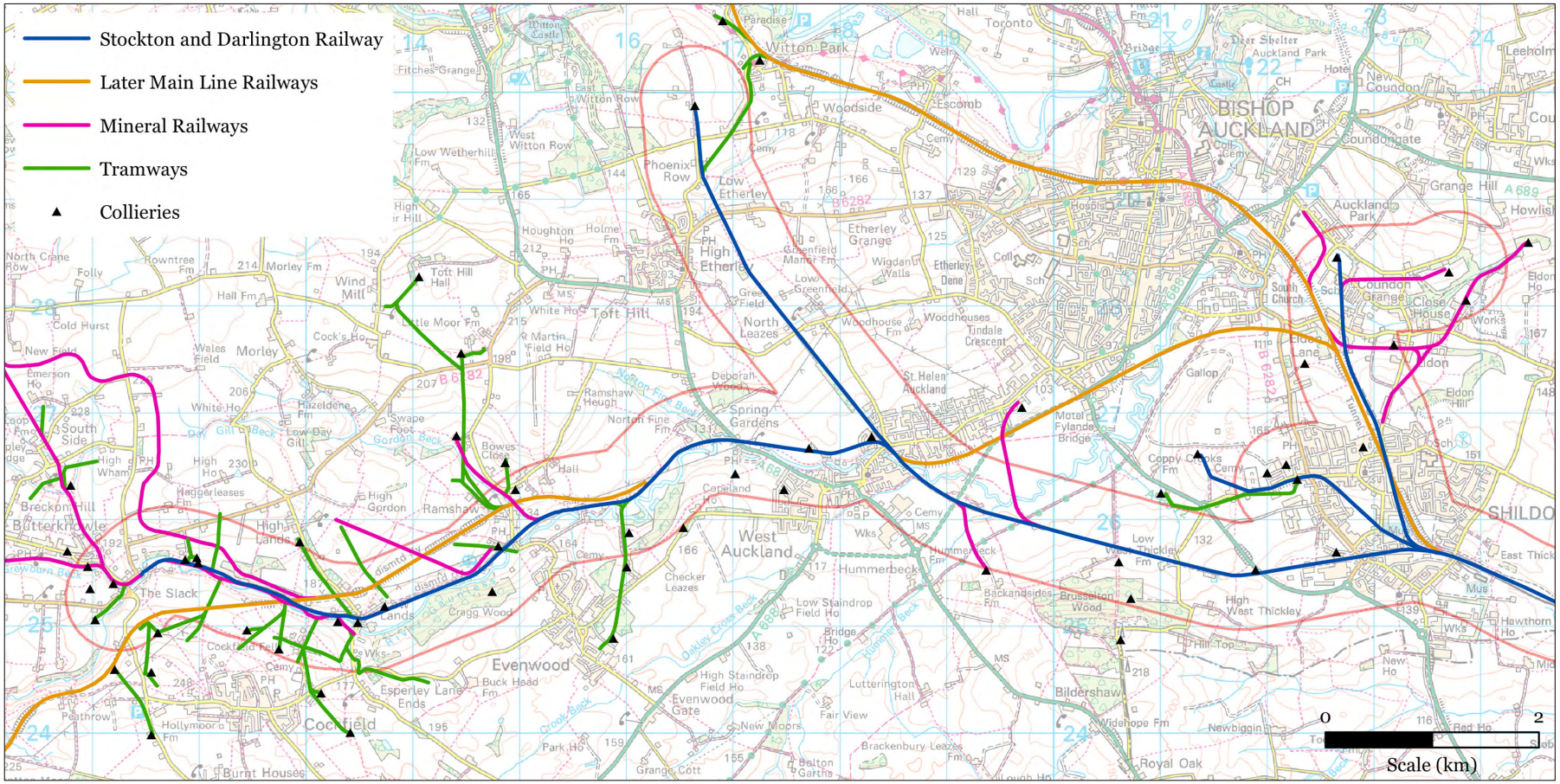

Fig 79: Most of the collieries in the region were linked to the S&DR by a network of tramways and mineral railways. Base map © Crown Copyright and database right 2019. All rights reserved. Ordnance Survey Licence number 100019088.

EVALUATION OF THE AERIAL RESOURCE

Aerial photographs are a remarkably useful source when assessing the history of the S&DR, but as emphasised in the above sections, it would have been impossible to identify and map the original features associated with the railway from the photographs alone. The simple identification of features relating to the original railway was only possible because of the Dixon surveys. These, combined with the use of other historic mapping, including tithe maps and historic OS maps, and the HEA data, enabled the team to maximise the returns from studying historic aerial photographs.

The aerial photographs for the project area range in date from 1924 to 2018. The vertical photographs were taken by the RAF from the 1940s to the 1960s, by the OS from the 1950s to 1990s and by Meridian Airmaps Limited (MAL) from the 1960s to 1970s. These were taken for mapping purposes or environmental reasons. From an archaeological perspective, the usefulness of vertical aerial photographs varies greatly, but they were particularly useful for mapping the railway. The structural railway features, such as bridges and boundaries, where not obscured by tree cover, were visible on historic vertical aerial photographs due to the contrasting tone between the stonework/hedgerow and surrounding landscape. The earthwork cuttings and embankments however were less easy to see, either due to flat light failing to create shadow or because they were under vegetation. Therefore, most of the earthwork elements were mapped from lidar – specifically digital terrain model (DTM) lidar, where the vegetation has been removed. Oblique aerial photographs provided an aesthetic and easily interpretable view of the railway (Fig 80), as well as a unique historic record, but they require transformation to a plan view for mapping purposes. The vertical aerial photographs provided a more complete view of the railway and were transformed and combined to provide a true plan view for mapping.

For the project, the most important factor was the year in which the photography occurred, ie before or after 1963. 1940s RAF aerial photographs were the main source for mapping as they provided a near-comprehensive record of the railway before the 1963 Beeching closures. Crucially, during this period the line and infrastructure were nearly the same as at the height of the railway at the end of the 19th century.

The clarity of the RAF photography varies greatly. This might be due to a number of factors:

- The altitude of the aircraft affects the scale of the photography, with small-scale images showing less detail.
- The camera and film used and the printing process might result in poor quality imagery, sometimes resulting in grainy images or scratches on the photographs.
- The weather conditions vary throughout sorties flown on different dates. Cloud cover obscures features on the ground, or casts strong shadows masking features.

- The physical condition of the photography varies. The prints used for mapping purposes are over 70 years old. Some are torn, have crease marks, or are badly curled. This will all affect the quality of the scans used for mapping.

Therefore, only a handful of sorties carried out between 1945 and 1948 were used for mapping the railway, being the best quality and showing the most detail and clarity, as well as having the widest coverage.

Fig 80: This 1929 oblique photograph of the S&DR south of Drinkfield provides a rare and detailed record of part of the railway line and associated structures. EPW029511 SEP-1929 © Historic England Archive. Aerofilms Collection.

Most of the aerial photographs supplied by the Historic England Archive were original prints. A handful of sorties, where the negatives are not held, were supplied as laser copies from prints, as the originals cannot leave the archive. The laser copy images did not have enough clarity to map from so the original prints were re-scanned in Swindon at a high resolution so that they could be assessed in more detail on the computer monitor. The downside to this is that they could not be viewed in stereo using a handheld stereoscope. In a couple of instances however, the digital images were viewed in stereo on-screen using 3D software, but this was not a time-efficient way of viewing all of the scanned photographs.

The subtle detail available on these photographs was quite exceptional. In instances, structural features relating to bridges, such as parapets, could be discerned, and gateways in the boundaries were moderately easy to identify. Despite this, the actual railway track was often difficult to distinguish due to the lack of contrast between it and the track-bed, but it was obvious that none of the track extant in the 1940s would have related to that which was laid for the opening of the original railway in 1825, and therefore no track was mapped. The extensive change in the landscape between the time of the Dixon survey and the 1940s, especially in complex urban areas, made it hard to interpret some features that might relate to the original railway.

The OS and MAL vertical photographs span that crucial period when the railway was facing a series of section closures in the 1960s. They illustrate the transition from the extant railway, to closure, to its reclamation either by nature or by the subsequent development of the land, though none of the photography actually shows the physical removal of the railways.

With the exception of earthwork features drawn from lidar (this data typically dates to the mid-2000s), the latest source used for a condition statement was the orthophotography supplied through the Aerial Photography for Great Britain (APGB) agreement by Next Perspectives, which date to 2015-2016. The usefulness of this photography varied due to the nature of the features that were being assessed. For example, in many instances it was impossible to state whether the original boundaries remained extant due to the growth of vegetation. Similarly, the location of occupation crossing gates were often beneath tree and shrub growth on this most recent photography. However, the clarity of the photography, for some of the area up to 12.5cm resolution, made the detail of features that were visible exceptional. This is demonstrated with the visibility of stone sleepers on the Brusselton Incline (Fig 81).

Fig 81: Where the S&DR spanned Brusselton Lane is the only place in the project where the original stone sleepers were visible on aerial photographs. They were exposed recently by a local volunteer group and are not visible on historic aerial photography. Detail of NZ2125 06-MAY-2016 © Bluesky International/Getmapping PLC.

Where cuttings and embankments remain as earthworks, lidar was particularly useful for mapping. Most of the project area was covered by 1m resolution lidar, and although this is not particularly useful for small earthworks, it was sufficient to map larger features. Crucially, since the demise of many sections of the railway, these cuttings and embankments have become largely overgrown with vegetation. As a result, the earthworks are only visible on the DTM lidar data, which has removed surface features to reveal the terrain.

Fig 82: Many of the original railway embankments and cuttings remain intact and in use, as with this section, west of Coatham Mundeville (top left to bottom right). LIDAR DTM 08-DEC-2008 © Historic England; source Environment Agency.

Supporting sources

This study would not have been possible using aerial photographs and lidar alone. Determining original railway features was only possible because of surveys undertaken by Thomas Dixon between 1838 and 1840, which detailed every structural aspect of the railway. By the 1850s, when the first OS maps were being published for this area, the railway had already undergone a large number of changes. However, such is the detail and accuracy of both the Dixon and OS surveys, that they have allowed detailed map regressions, which were useful in determining whether a feature, such as a bridge, might be original due to its location, shape and size. Studying the OS maps was also useful in determining where and when features have been changed, moved or demolished.

As highlighted at several points in this report, the work undertaken by the Historic Environment Audit (HEA) was invaluable as an aid to mapping. The HEA not only undertook a historical assessment, but also subjected most of the railway main line to a ground assessment, building on the knowledge-base of the Friends of the Stockton and Darlington Railway. The results revealed subtle features that are not visible from the air such as mile-markers, stone sleepers, reused or moved railway infrastructure etc. The use of aerial photographs has allowed us to broaden the landscape understanding of the railway, not only in its topographical setting, but in relation to the surrounding archaeology. The use of points, lines and polygons provides an easy to read plan of the remains of the original railway visible on aerial photographs or lidar. The aerial photographs also give a historical perspective of the most recent changes to the railway, providing snapshots at intervals before and after the major changes resulting from the Beeching report. Together, the aerial investigation and mapping and the HEA will be a useful asset in aiding the understanding of the railway.

CURRENT RECOGNITION AND FURTHER RECOMMENDATIONS

The historical importance of the railway is of international significance, and much has been done over recent years, largely by the Friends of the Stockton and Darlington Railway and Archaeo-Environment Ltd, to promote the railway and its heritage. Walking guides along the railway between Witton Park and Stockton-on-Tees are available to download online (www.sdr1825.org.uk) and the HEA can be accessed via the Darlington Borough Council website (www.darlington.gov.uk). The aerial assessment outlined in this report has contributed to this knowledge, adding a historical and landscape analysis for the railway setting. The details from these studies combined have created a detailed record of the railway features that remain extant, and outline their importance as well as indicating threats. However, the record is still incomplete, and further fieldwork is required.

Recognition and protection

Most of the Etherley Incline is already scheduled, along with a short length of the Brusselton Incline (NHLE 1002315). This scheduling encompasses all of the surviving earthwork elements of the Etherley Incline and the Etherley Engine. In addition, one of the two engine ponds at Etherley is listed as NHLE 1159141. At Brusselton Incline, much less of the original railway remains extant. However, there are considerable earthwork remains around and to the west of Brusselton Engine. These include an original cutting and embankment, as well structural features such as the engine buildings, an underbridge, boundary walls and stone sleepers. The current scheduled area covers a 220m length of the incline. This includes the embankment, accommodation underbridge (also listed as NHLE 1160402) and most, but not all, of the stone sleepers, as these were presumably exposed post-scheduling. It does not currently include Brusselton Engine itself where the original cutting is visible as earthworks, as well as sections of wall that may relate to the original boundary. The Engineman's House (NHLE 1121494) and Engine House (NHLE 1160153 and 1121493) are however listed, and all the surviving elements of the incline fall within the Brusselton Conservation Area (Archaeo-Environment Ltd 2016a, 79).

Along the main line, further to the east and south-east, there are a handful of listed buildings associated with the early history of the railway, along with many more later structures that have not been covered in this report. There is a concentration in Shildon, centred on the National Railway Museum, which incorporates a small engine shed (NHLE 1310628) and Soho House (NHLE 1160335), both of which were originally constructed for the S&DR in the 1820s. Two small buildings, also within the museum confines, at least one of which appears to relate to the early railway, are listed as NHLE 1322863. All four of these buildings are located within Shildon Conservation Area.

Additionally, there is the public house on Heighington Lane (NHLE 1322808), which was also an early ticket-office. In Darlington, the Goods Shed is Grade II* listed (NHLE 1121262) and Skerne Bridge is scheduled (NHLE 1002331), but the tavern, which was subsequently altered, is not. However, all three fall within the Darlington Northgate Conservation Area. In Stockton-on-Tees, a group of adjoining buildings at St John's Crossing are listed. These include 48 Bridge Road, which was the original booking office to the S&DR and Grade II listed (NHLE 1139963).

All of the scheduled areas for the S&DR are due to be reviewed and revised in the next few years, with the possibility that new areas may be recommended for addition to the schedule. In Preston Park, Preston-on-Tees, a length of original railway embankment survives in the woodland. Although this is not a conservation area, the earthworks are recognised by the local authority and are currently under no threat. The various listings of the S&DR are also due to be reviewed and, where required, reassessed. A small number of new listings are expected to be recommended for addition to the NHLE.

The branch lines have far less recognition. On the Haggerleases Branch, the Swin Bridge is Grade II listed (NHLE 1121831), but large stretches of original embankments and cuttings also remain intact. The Haggerleases Branch has not benefited from a ground assessment and audit, and it is possible that there are various other original features remaining intact, such as a series of underbridges that carried the railway over the River Gaunless and Norton Fine and Gordon Becks. A short stretch of the line, north of Cockfield Fell, falls within a scheduled area (NHLE 1002314), though this, and the entire section of line between The Slack and Low Lands is within the Cockfield Conservation Area.

On the Surtees Railway, only Daniel Adamson's Coach House is currently listed (NHLE 112184), but this is not surprising, as it was such a short branch line and there appears to be little survival of any original railway features. However, again this stretch of railway has not been subject to walkover survey. Very little survives of the Black Boy Branch also. What does, comprises a 550m length of cutting earthworks and possible original boundary walls. It is possible that the core of Rose Cottages, at the junction of Fulton Court and Eldon Bank Top, may contain traces of an original building of the 1827 line. The situation is similar on the Croft Branch, where some earthworks and possible structural elements survive, but these are not currently within any areas of protection.

Threats

Where most of the infrastructure of the original railway remains intact, this is largely on sections of live railway. Much of the railway has been remodelled and updated since 1825, but the threat to what remains of the infrastructure remains current. This was demonstrated as recently as 2014 with the demolition of an original overbridge adjacent to Moordale Park due to rail improvements (Archaeo-Environment Ltd 2016d, 43). This perhaps suggests that the parts of the line that are most at threat are those which are still in operation today. As has been outlined above however, where earthworks and structures survive elsewhere, most notably along the Haggerleases Branch, there is little statutory protection afforded.

Overall however, assessment of recent aerial photography and lidar as part of the current project does not indicate that there are any immediate threats to most of the railway at this stage. In the urban centres, most of the original railway has already been removed and the surviving structures are either listed, scheduled or are located within a conservation area, thus offered some form of protection. For the remainder of the line, most of the adjacent modern land use is agricultural, and the railway remains are mostly located on the periphery of farmed fields and therefore not subjected to the plough (the one main exception being a length of the Brusselton Incline which has been removed). Perhaps the biggest impact of agricultural land use are farm trackways that usually follow the same course as when the railway was constructed, and were originally served by accommodation bridges or occupation crossings. Where these trackways remain in use, any remaining earthworks or structures might be subject to modification or vehicle erosion.

Recommendations

This aerial survey and report, combined with the HEA, provide a dataset through which the heritage of the S&DR might be better recognised, understood, and potentially put forward for further protection. Both have outlined the large degree of survival of railway infrastructure of that early period of 1825-31, and have identified a number of risk factors that may threaten the future of some of the railway. The following is a very broad list of recommendations based on the aerial mapping results alone, and is separate to and less detailed than those listed by the HEA. Specific site recommendations are included within the Gazetteer (Appendix 2).

- Further ground assessments are required of the disused stretches of the railway where no audit has taken place. These include the Haggerleases Branch, the Surtees Railway, the Black Boy Branch and the Yarm branch. The aerial mapping can be used as an initial point of guidance, along with the Dixon survey where possible. An emphasis here could be placed on the Haggerleases Branch, where the aerial mapping suggests that there might be considerable infrastructure remaining intact.
- Attempt to gain access to areas of the live railway in order to assess the extent of survival of original features along these sections, as the HEA was restricted to areas that were publically accessible. This might be targeted based on the aerial mapping results in conjunction with the Dixon survey. Access might be sought via adjacent agricultural property rather than getting access to the track-side directly.
- Look into the possibility of publishing the aerial mapping data as an online GIS story map. Using the recently successful Staffordshire County Council/Historic England project 'The Chase Through Time' (Carpenter *et al* 2018) as a basis, this would be a publically viewable platform, which could include the survey mapping, the HEA point data, historical mapping, paintings and links to informative websites. It might allow public uploads of ground photographs and observations to enhance the information available. This may help to signpost the railway in order to boost tourism.

- To pass on the project results to Historic England colleagues in Listing in order to support their reviews of existing schedulings and listings.
- To assess whether any remains identified by the aerial survey might be considered for local or national designation. This might include features that are on the line of the live railway, in which case the implications of protecting any of these features must be considered.
- Consider whether archaeological intervention may be necessary along the stretch of the Brusselton Incline where the railway has been suggested to be destroyed by opencast coal mining. Cropmark evidence may suggest that the railway was simply levelled and not destroyed by mining. Geophysical survey or a series of test pits may indicate the nature of the survival (if any) of sub-surface features.
- Consider the better recognition of features that are no longer in situ. This could include the superstructure of the world's first iron railway bridge that crossed the River Gaunless at West Auckland. This was removed in 1901 and is now located in the car park of the National Railway Museum, York, but has no display board to indicate the importance of the bridge.
- Rose Cottages in Shildon would benefit from an architectural assessment to establish whether they have railway origins. If so, these would be the only standing building remains from the original railway not yet listed or part of a conservation area.

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APPENDIX 1. METHODS AND SOURCES

Archaeological Scope

Mapping and recording was carried out for a 1km wide corridor along the length of the 1825 S&DR and its associated branch lines, covering a total area of approximately 66sq km. The scope included all archaeological features visible as earthworks, cropmarks, soilmarks and structures visible on aerial photographs and lidar. These ranged in date from the late prehistoric to the 20th century.

Mapping broadly adhered to Historic England's Aerial Investigation & Mapping (AI&M) standards (*see 'Methods, scope and sources'*). Railways and their infrastructure are assessed on a case-by-case basis during AI&M projects, and they are mapped if it is felt that this will aid better understanding of the remains of the railway and the archaeology of the area. Due to the nature of this project, the scope was widened to include all features associated with the Stockton and Darlington Railway and its branch lines, as it was first conceived between 1825-1831.

Earthworks

All archaeological earthworks, including features that were visible on early aerial photographs that have since been levelled, were mapped. This included features that were depicted on historical OS maps when they were deemed to be within the AI&M sphere of interest.

Cropmarks and soilmarks

All sub-surface archaeological remains visible as cropmarks and soilmarks were mapped.

Buildings and structures

Standing and roofed buildings and structures were not normally mapped. Exceptions to this were in specific archaeological contexts, such as industrial complexes, military and wartime features, those associated with the S&DR, or when associated with other archaeological features.

Ridge and furrow

Medieval and post medieval ridge and furrow was mapped, regardless of preservation. The extent of a contiguous block of ridge and furrow was defined by a closed polygon, with a single polyline indicating the direction of the cultivation.

Post medieval field boundaries

Field boundaries (upstanding or levelled) that are depicted on historical OS mapping were not generally mapped unless they were specifically associated with other archaeological features.

Industrial features and extraction
All extraction was mapped. Industrial complexes, such as collieries, iron works and brick works were mapped as seen, including structures. These were generally mapped from aerial photographs showing the maximum extent of the complex, but did not include the surrounding infrastructure, such as housing and roads.

Second World War and military features
Military features up to and including the Cold War were mapped as seen, including roofed structures. The large complexes of the Newton Aycliffe Royal Ordnance filling factory and RAF Middleton St George were depicted with a polygon defining the maximum extents of the site, with no details mapped except for the runway depicted for the airfield. All wartime civil defence features were mapped as seen.

Railway features
All structural and earthwork features relating to the original railway of 1825-1831 were mapped. The earthwork cuttings and embankments were denoted by schematic t-hachures. The railway boundaries were depicted by a single line convention. Buildings and structural remains were mapped as closed polygons. Bridges, crossings, gates and culverts were depicted by a single point.

Natural features
Geological and geomorphological features were not mapped.

Sources

Aerial Photographs
The aerial photograph collections of the Historic England Archive, Durham HER and Tees Archaeology HER were assessed. A total of 4,249 vertical and 1,037 oblique photographs were loaned by the Historic England Archive. Of these, 4,220 were supplied as original prints, 346 as laser prints and 720 digitally. The vertical photographs ranged in date from 1940 to 2017 and were predominantly RAF, Meridian Airmaps and OS photography, with recent coverage supplied through the APGB agreement. The oblique photography ranged from 1924 to 2018 in date, and came from many sources, though the most recent was reconnaissance photography taken by Historic England or its predecessors.

The aerial photography held by the Durham HER is not catalogued, so was visited in person to assess the coverage, but no photographs were considered useful for mapping purposes. Tees Archaeology HER supplied a catalogue of aerial photographs that fell within the project area. The only photographs held were vertical images, and duplicates of those held by and accessed through the Historic Archive, so this collection was not viewed.

In addition to these collections, full coverage of digital ortho-rectified photography at 12.5cm and 25cm resolution was supplied as TIFF files through the APGB agreement by Next Perspectives, ranging in date from 2015 to 2016. This imagery was used to assess the latest evidence attribute in the mapping, and was also used as control for the rectification of print aerial photographs. Google Earth orthophotography was also assessed.

A detailed assessment of the importance and impact of using aerial photographs to map the railway is discussed under '*Evaluation of the aerial resource*'.

Evaluation of photographs
All vertical print photographs were viewed under magnification and stereoscopically where possible. Images supplied digitally were viewed in 2D on screen. In some exceptional circumstances, digital vertical stereo pairs were assessed using the NVIDEA 3D Stereo Generator, but this was deemed inefficient time-wise for all digital photography.

Rectification of photographs
In order to map from an aerial photograph, it must first be rectified to remove distortions and georeference the image. Rectification of vertical and oblique aerial photographs was undertaken using Aerial 5.36. Control was derived from 25cm resolution APGB orthophotography. Digital height data, derived from the APGB 5m digital terrain model was incorporated to improve the accuracy. The accuracy of rectified images is normally to within ±2m of the source used for control, but this error may be larger in areas with a larger topographic variation. Consequently, the accuracy of mapped features relative to their true ground position will depend on the source used for mapping.

To attempt to streamline this process, the project experimented with using Structure from Motion (SfM) to mosaic and rectify multiple vertical images at once. This is a digital photogrammetric method of rendering a single mosaicked orthophotograph from a series of images using Agisoft PhotoScan Professional 1.4.3. Control was taken from a combination of APGB orthophotography, lidar, and 5m height data. This process was undertaken on three sorties of photography, two of which were successful. The resulting orthophotographs had a locational accuracy ranging from 22cm to 70cm and were output at 25cm-30cm resolution. These accuracies are nominal figures, as it was discovered when overlaid with OS MasterMap data, that some areas of the orthophotographs were less accurate, simply because they required more control.

The result was that a nearly a quarter of the railway was mapped from a single sortie of photography, mosaicked into one raster image (Fig 83). The photogrammetry process worked best using good quality large-scale vertical aerial photographs with good clarity and no cloud cover. It was unsuccessful on grainy small-scale photographs where the detail was not enough to align the photos correctly. The scale of the photographs was such that it was not possible to create an accurate terrain model.

Fig 83: A large portion of the western half of the railway was mapped from one single sortie of RAF photography, mosaicked and georeferenced using Structure from Motion. SfM RAF/58/B/37 V 5029-5379 17-MAY-1948 Historic England Archive (RAF Photography).

Lidar and height data

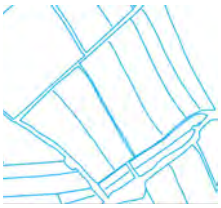
Environment Agency lidar at 1m resolution was downloaded from the Government DEFRA Survey Data Download website (DEFRA 2019) in ASCII grid format. This came as digital surface model (DSM) and digital terrain model (DTM) data. The DTM allowed a view of the ground beneath vegetation cover and was particularly useful in mapping mining remains in woodland and the railway cuttings/ embankments where they were under tree cover on photographs. Where lidar was not available, 2m interval height supplied by Next Perspectives through the APGB agreement was used to produce digital elevation models (DEMs).

The lidar and height data were processed using Relief Visualisation Toolbox 1.3 (Kikalj and Somrak 2019; Zakšek *et al* 2011) to produce 2D GeoTIFF images. The visualisations used were 16 direction hillshade, slope, simple local relief and positive openness. Lidar was also viewed as 'live' data in Quick Terrain Reader v8.0.4.

Mapping from aerial sources

The georeferenced imagery was imported into ArcGIS 10.3.1 where features were digitised. All archaeological features were mapped as closed polygons, apart from scarps, where a schematic t-hachure was used, and the polyline denoting the direction of ridge and furrow. For the railway features, structures (including all buildings and some bridge infrastructure) were mapped as closed polygons. The railway boundaries were mapped using a single line depiction, and all crossings, gates, culverts and bridges were denoted by a single point. Cuttings and embankments were depicted using a schematic t-hachure. Closed monument polygons encompass features within a NRHE record. Railway features were not given monument polygons. Due to the inability to create linear arrays of t-hachures in ArcMap, the tops and bottoms of slopes were depicted as lines and exported to AutoCAD Map 3D 2015 in order to illustrate the schematic t-hachures, which were then reimported as line data to ArcMap.

Table 1: Mapping layer content and drawing conventions, based on AI&M standards.

Layer name	Layer content	Layer colour	Feature type	
MONUMENT_ POLYGON	Polygon encompassing features within a single NRHE record	Black	Polygon	
BANK	Embanked features such as banks, platforms, mounds and spoil heaps	Red	Polygon	
DITCH	Cut features such as ditches, hollows, pits or hollow ways	Green	Polygon	
EXTENT_OF_ FEATURE	Polygon outlining a feature or group of features such as industrial complexes	Orange	Polygon	
RIDGE_AND_ FURROW_AREA	Polygon outlining a single plot of ridge and furrow	cyan	Polygon	
RIDGE_AND_ FURROW_ ALIGNMENT	Polyline depicting the direction of ploughing within a plot of ridge and furrow	cyan	Polyline	
STRUCTURE	Structural features including stone, concrete, metal and wood	Purple	Polygon	
SCARP_SLOPE_ EDGE	Schematic t-hachure depicting break and direction of slope	Blue	Polyline	
RAILWAY_LINE	Polyline depicting the line of railway boundaries	Purple	Polygon	
RAILWAY_POINT	Point depicting centre of railway features including crossings, bridges and culverts	Purple	Point	

All vector elements of the mapping had attribute data, as defined in Table 2. The monument polygons simply had the NRHE_NO attached.

Table 2: Aerial mapping attribute data

Attribute	Description	Sample data
NRHE_NO*	National Record of the Historic Environment Unique Identifier (UID)	1010178
HER_NO	Historic Environment Record concordance UID	308
PERIOD	Date of feature (HE Thesaurus)	POST MEDIEVAL/20TH CENTURY
NARROW_TYPE	Specific monument type for individual features (HE Thesaurus)	LEVEL CROSSING GATE
BROAD_TYPE	Broader monument type to enable grouping of individual features (HE Thesaurus)	RAILWAY
EVIDENCE_1	Form of remains as seen on PHOTO_1 (HE Thesaurus)	EXTANT STRUCTURE
PHOTO_1	Source feature was mapped from	SfM RAF/58/B/37 5029-5379 17-MAY-1948
EVIDENCE_2	Form of remains as seen on PHOTO_2 (HE Thesaurus)	DEMOLISHED STRUCTURE
PHOTO_2	Latest available source to give indication of current state of preservation	Next Perspectives APGB Imagery 09-MAY-2016
LAYER	Mapping layer in which feature has been mapped	STRUCTURE
SDR_HEA	Historic Environment Audit UID	519
SDR_AIM**	AI&M mapping UID	62

* The NRHE No. is attached to every feature. Railway features are numbered under the parent record for that particular line.
** SDR_AIM refers to the number assigned to railway features only for the purpose of this project and relates to the Gazetteer in Appendix 2.

Recording the archaeological monuments

Archaeological monuments were recorded in the National Record for the Historic Environment (NRHE) database to Historic England Data Standards. Where relevant, records were concorded with HER data. In total, 198 new monument records were created and 59 were amended. NRHE monument records are available via the HER or Heritage Gateway (www.heritagegateway.org.uk) as Historic England Research Records.

Historical Mapping

The key sources used to identify what features belonged to the original S&DR (as opposed to later developments of the railway) were a series of maps produced in 1838-1840 from a survey conducted by Thomas Dixon, which are held in the National Archives. Such was the speed of the development of the railway, that by the time of the first edition OS maps in the 1850s a great deal of change had already occurred. Crucially, the Dixon surveys were specifically of the railway, and depicted detail such as level crossing gates, milestones and signal posts, as well as buildings related to the railway. Surviving Dixon plans cover almost the entire project area, including most of the branch lines, with the exception of the section of the main line between the Yarm Station junction and Bowesfield Junction, the Yarm branch line and the Surtees Railway.

A large number of tithe maps relating to parishes in the county of Durham from the 1830s and 1840, held in the Special Collections Section of Durham University Library are available online. A number of these were consulted to aid the interpretation and dating of features.

Historic OS maps proved to be an extremely useful resource. Dating from the 1850s onwards, they were useful in charting the changes in the railway line – its development, closures and expansion. They were also particularly useful for the identification of the many collieries that existed along the S&DR, as well as other industrial complexes within the project area.

Digital data sources

From the outset of the mapping, a number of digital data resources were loaded in to the ArcMap drawing document and routinely consulted throughout. These included the point, polygon and polyline monument record and event data for both the Durham and Tess Archaeology HERs and for the NRHE. The National Heritage List for England (NHLE) was also consulted, primarily for information relating to scheduled monuments and listed buildings.

The Historic Environment Audit (HEA) for the S&DR was published by Archaeo-Environment Ltd in 2016 and 2018. This includes shapefile point data with attributes of features that were assessed on the ground. Where these points relate to features mapped by this project, the relating audit PRN number was attached as an attribute to the mapping (with the prefix SDR_HEA), and is also referred in the main text of this report.

A large part of the project area had previously been mapped from aerial photographs in 2006-2007 as part of the Durham ALSF mapping project (Radford and Pallant 2008) and the vector mapping data from this was also routinely consulted. Those features that were mapped by the ALSF project were remapped as part of this survey using current AI&M mapping conventions and attributes.

APPENDIX 2. GAZETTEER OF RAILWAY FEATURES MAPPED FROM AERIAL SOURCES

This list is of those features that were visible and mapped from aerial photographs and lidar alone, and does not constitute a full gazetteer for surviving remains of the railway.

AI&M Feature Number	Heritage Audit PRN	NRHE	NRHE Child	HER	List Entry	NGR		Line	Name	Monument type	Disused/ Live Line	Description	Extant	Additional work
						Easting	Northing							
1		1375672		63713		411490	525517	Haggerleases Branch		Underbridge	Disused	Stone bridge crossing the River Gaunless. The HER states that it was altered in the late 19th century. The north parapet remains of the original bridge.	Partly	
2		1375672				411508	525526	Haggerleases Branch		Occupation crossing/gate	Disused	An occupation crossing in the same location as one marked on the 1839 Dixon survey. Denoted by gates through the railway boundary. There is still a right of access at this location, though the original boundary and gates appear to have been removed.	No	
3		1375672		36266	1121831	411768	525615	Haggerleases Branch	Swin Bridge	Underbridge	Disused	1830 dated stone skew-arch bridge across the River Gaunless. Incorrectly labelled as a Swing Bridge on the 1857 OS map.	Yes	
4		1375672				414332	525386	Haggerleases Branch		Underbridge	Disused	Presumed to have been an original accommodation underbridge as marked on the 1839 Dixon survey. It remained extant until the late 20th century, but appears to have since been demolished. The site is now in a caravan park.	No	
5		1375672				414359	525403	Haggerleases Branch		Railway building	Disused	A small square railway building which corresponds with a building marked on the 1839 Dixon Survey. Probably a platelayers' hut, the building appears to have been demolished in the late 20th century.	No	
6		1375672				414959	525822	Haggerleases Branch		Level crossing	Disused	A level crossing where the railway crossed Gordon Lane. This crossing remained intact until the late 20th century.	No	
7		1375672				415151	525977	Haggerleases Branch		Underbridge	Disused	An underbridge carrying the railway over Gordon Beck. The bridge may remain extant as the footpath continues over the beck, but this is uncertain.	Uncertain	Ground assessment may establish whether the original bridge remains intact.
8		1375672				415617	526128	Haggerleases Branch		Railway building	Disused	A building which corresponds with one shown on the 1839 Dixon survey as a cottage within a garth. The building remained extant into the late 20th century, but appears to have been demolished at some point between 2009 and 2015 and the site redeveloped.	No	
9		1375672				415825	526147	Haggerleases Branch		Occupation crossing/gate	Disused	An occupation crossing as denoted on the 1839 Dixon survey. This allowed right of access to Haggerleases Farm. The north gate of the crossing was extant into the late 20th century, but has since been demolished along with the railway boundary.	No	
10		1375672				416190	526316	Haggerleases Branch		Occupation crossing/gate	Disused	An occupation crossing as denoted on the 1839 Dixon survey. The crossing and associated gates were extant into the late 20th century, but have since been demolished.	No	
11		1375672				416774	526733	Haggerleases Branch		Occupation crossing/gate	Disused	An occupation crossing as denoted on the 1839 Dixon survey. The crossing is visible on historic vertical photography but is no longer extant. The north gate to the crossing is under tree cover on all photography, so its condition is uncertain.	No	Requires ground assessment to establish whether any original gate infrastructure survives.
12		1375672				416787	526734	Haggerleases Branch		Underbridge	Disused	A bridge carrying the railway over Norton Fine Beck. It is uncertain whether the structure visible on historic photography was that of the original bridge, or whether the original structure remains intact today.	Uncertain	Ground assessment may establish whether the original bridge remains intact.

13		1375672				416868	526743	Haggerleases Branch		Underbridge	Disused	A bridge carrying the railway over the River Gaunless. It is uncertain whether the structure visible on historic photography was that of the original bridge, or whether the original structure remains intact today.	Uncertain	Ground assessment may establish whether the original bridge remains intact.
14		1375672				417005	526738	Haggerleases Branch		Underbridge	Disused	A bridge carrying the railway over the River Gaunless. It is uncertain whether the structure visible on historic photography was that of the original bridge, or whether the original structure remains intact today.	Uncertain	Ground assessment may establish whether the original bridge remains intact.
15		1375672				417038	526732	Haggerleases Branch		Level crossing	Disused	A level crossing for Etherley Bank, which corresponds with a crossing point marked on the 1839 survey. The road appears to have been widened in recent decades, probably removing any surviving elements of the crossing.	No	
16		1375672				417818	526626	Haggerleases Branch		Level crossing	Disused	A level crossing across a track between West Auckland and North Leazes. The track remains a right of access, but the crossing is no longer extant.	No	
17		1375672				418246	526713	Haggerleases Branch		Occupation crossing/gate	Disused	An occupation crossing as denoted on the 1839 Dixon survey. The crossing appears to have led between West Auckland Colliery and cottages to the south of the railway line. The crossing and associated gates have since been demolished and the site is now under a housing estate.	No	
18	44	1010178				416799	529039	Main line		Culvert	Disused	A culvert for a small beck running under the railway embankment. Remains intact.	Yes	
19		1010178				416823	529044	Main line		Gate	Disused	A gap in the railway boundary on historical photography appears to denote a gate. The line of the boundary does not quite match that on the 1839 Dixon survey, though it is uncertain whether the boundary has moved or whether the original survey is inaccurate. The 1839 survey denotes a gate along this stretch of boundary, but not quite in the same location as the one mapped. The feature is now under dense tree cover.	Uncertain	Assessment on the ground to see whether any gate structure remains intact and whether it relates to the original railway.
20	506	1010178				417111	528298	Main line	Etherley Engine Man's House	Railway building	Disused	The engine man and blacksmiths cottage on the Etherley Incline. This building remained intact in the latter half of the 20th century, but has since been demolished.	No	
21	27	1010178		36360		417109	528320	Main line		Pond	Disused	A large circular pond that formed one of two reservoirs supplying water for the steam engine of the Etherley Incline. This feature remains intact and still holds water.	Yes	
22	502	1010178				417559	527795	Main line		Culvert	Disused	A culvert carrying the railway embankment over a narrow beck. The HEA records this as original and intact.	Yes	
23	516	1010178				417595	527753	Main line		Level crossing	Disused	A level crossing across Greenfields Road, as denoted on the 1839 Dixon survey. The crossing was already out of use by the time of the earliest photography, but the right of access follows the same route.	No	
24	517	1010178				418450	526678	Main line		Level crossing	Disused	Two adjacent level crossings across Station Road/ Manor Road, as denoted on the 1839 Dixon survey. The western crossing served the junction of the main line with the Haggerleases Branch, and the east crossing was for the main line coming from the Etherley Incline. The crossing was still in use on 1940s vertical photographs, but has since gone out of use.	No	

25	2	1010178			1002315 (within)	418601	526519	Main line		Underbridge	Disused	Accomodation underbridge as denoted on the 1839 Dixon survey. The bridge remained intact into the latter half of the 20th century, but is currently under vegetation. A photograph in the HEA appears to suggest that the bridge is no longer extant.	Uncertain	Already assessed by the HEA, but uncertain when the bridge remains intact.
26		1010178				418631	526491	Main line		Underbridge	Disused	The world's first iron railway bridge, replaced in 1901 and now preserved in the National Railway Museum. The HEA records the stone revetments as being intact.	Partly	
27	16	1010178			1002315 (within)	418650	526474	Main line		Underbridge	Disused	An accomodation underbridge visible on historical vertical photography. The HEA records this bridge as partially destroyed in 2015, and the condition is not apparent from the latest aerial photography.	Partly	
28	87	1010178			1002315 (within)	418711	526418	Main line		Culvert	Disused	A culvert carrying the railway over the Oakley Beck. The HEA records this feature as remaining extant.	Yes	
29	78	1010178			1002315 (within)	418858	526306	Main line		Underbridge	Disused	An accomodation underbridge relating to one shown on the 1839 Dixon survey. The HEA has recorded this bridge as being infilled but largely intact.	Yes	
30		1010178			1002315 (within)	418877	526292	Main line		Occupation crossing/gate	Disused	An occupation crossing as denoted by two opposing gates marked on the 1839 Dixon survey. The gates and crossing remained intact on the early vertical photography. The crossing went out of use after this, and the southern gate appears to have been removed. There is still a gate at the location of the north gate, but it is unclear whether this retains any original features. The HEA recorded a stone gatepost in this area, but a little further to the west (HEA85) - it is possible that this is simply a wrong co-ordinate, though this seems unlikely.	Uncertain	
31	86	1010178			1002315 (within)	418982	526230	Main line		Occupation crossing/gate	Disused	An occupation crossing relating to one denoted on the 1839 Dixon survey. This is marked by two opposing gates crossing the railway diagonally, which remained intact into the second half of the 20th century, but appear to have since been demolished.	No	
32	127	1010178			1002315 (within)	419335	526075	Main line		Occupation crossing/gate	Disused	An occupation crossing relating to one denoted on the 1839 Dixon survey. This appears to have been a crossing point for Broom Mill. It is marked by two opposing gates , which remained intact into the second half of the 20th century, but appear to have since been demolished. The trackway remains a right of access.	No	
33	128	1010178			1002315 (within)	419444	526043	Main line		Underbridge	Disused	A bridge carrying the railway over the Hummer Beck. This feature remains extant.	Yes	
34		1010178				419701	525976	Main line		Level crossing/gate	Disused	A level crossing serving Burnshouse Lane. This crossing was already out of use by the time of the earliest vertical photography, but the south gate remained visible. The track remains in use, crossing the line of the old railway but there is no evidence for the level crossing or gate on the latest photography.	No	
35	90	1010178				419812	525932	Main line		Railway building	Disused	A railway building, probably a cottage as labelled on the 1839 Dixon survey. This building appears to remain extant, but has been altered and extended.	Yes	
36	131	1010178				419847	525918	Main line		Railway building	Disused	A railway building, probably a cottage as labelled on the 1839 Dixon survey. This building was visible on early vertical photography, but has since been demolished.	No	

37		1010178				419984	525903	Main line		Occupation crossing/gate	Disused	An occupation crossing relating to two opposing gates on the 1839 Dixon survey, crossing a trackway. The trackway remains intact, crossing the line of the old railway, but the gates are no longer extant.	No	
38	519	1010178				420151	525858	Main line		Underbridge	Disused	Accomodation underbridge as denoted on the 1839 Dixon survey. The bridge was visible on 1948 vertical photography, but appears to have been removed along with this stretch of railway, or destroyed by opencast coal mining.	No	
39	133	1010178				420317	525813	Main line		Occupation crossing/gate	Disused	An occupation crossing and associated gates in the railway boundary relating to a crossing marked on the 1839 survey. The gates and crossing were visible on 1948 vertical photography, but have since been removed or destroyed by opencast coal mining. The trackway remains a right of access.	No	
40	94	1010178				420574	525747	Main line		Overbridge	Disused	An overbridge that carried Haggs Lane (the line of Roman Dere Street) over the railway. This bridge remained intact in the late 1940s, but has since been removed.	No	
41		1010178				421221	525579	Main line		Sleepers	Disused	A length of original stone sleepers excavated and exposed by volunteers.	Yes	
42		1010178			1160402 1002315 (within)	421153	525596	Main line		Underbridge	Disused	An accomodation underbridge illustrated on the 1839 Dixon survey. Visited by the HEA and remaining extant.	Yes	
43	98	1010178				421169	525591	Main line		Underbridge	Disused	An underbridge carrying the railway over Brusselton Lane. The site was assessed by the HEA but the bridge was demolished in 1954 for the widening of the road.	No	
44	111	1010178			1121494	421474	525504	Main line		Railway building	Disused	The Engine man's and blacksmith's cottage on the Brusselton Incline. This building remains intact.	Yes	
45	111	1010178	1545847	35574	1160153 1121493	421496	525499	Main line		Engine house	Disused	The original engine house to the Brusselton Incline. The building remains extant.	Yes	
46	113	1010178				421683	525476	Main line		Overbridge	Disused	A bridge carrying a track over the railway. Assessed by the HEA - the decking was removed in the 1950s, but the supporting stone structure remains largely intact.	Yes	
47		1010178				422877	525650	Main line		Level crossing	Disused	This level crossing relates to one illustrated on the 1839 Dixon survey. There was still a level crossing here in the late 1940s, but this appears to have related to the later much widened railway.	No	
48		1545840		35944	1365641	422443	526402	Surtees Railway	Daniel Adamson's Coach House	Railway building	Disused	Railway coach house built c1831 on the Copy Crooks Branch/Surtees Railway. The building remains extant.	Yes	
49		1375692				422712	527773	Black Boy Branch		Level crossing	Disused	A level crossing corresponding with one illustrated on the 1839 Dixon survey as crossing High Street. The crossing point was visible but already out of use by the time of the earliest aerial photography.	No	

50		1375692				423014	526832	Black Boy Branch	Rose Cottages	Railway building	Disused	The footprint of the present day Rose Cottages appears to match that of a building illustrated on the 1876 OS map, which may in turn relate to a railway building illustrated on the 1839 survey. However, on Google Steet View this building does not appear to show any external early features, which was also noted by the HEA. This is thought to be the site of the engine house and cottage where the waggons were hauled by stationary steam engine.	Yes	This building would require further assessment to establish whether its core is that of the building associated with the original railway.
51		1375692				423141	526451	Black Boy Branch		Occupation crossing/gate	Disused	An occupation crossing denoted by two opposing gates on the 1839 Dixon survey. This crossing point remained visible on 1940s vertical photography but has since been removed.	No	
52	570	1010178				425222	524983	Main line		Railway building	Live	A platelayers' hut, visible on early aerial photography and relating to the building illustrated on the 1839 Dixon survey. The building has since been demolished.	No	
53	538	1010178				425300	524955	Main line		Culvert	Live	A culvert carrying the railway over Woodham Burn, or Rise Burn according to the HEA. The aerial evidence for this feature is scant, but the HEA suggests that it remains extant under the modern railway line.	Yes	
54	571	1010178				425959	524650	Main line		Occupation crossing/gate	Live	A gate relating to one shown on the site of an occupation crossing on the 1839 Dixon survey is visible on historic vertical photography. The site is now under tree cover and the current condition cannot be discerned. The HEA did not pick up any feature here, but access may have been limited due to it being live line.	Uncertain	
55	225	1010178				426159	524542	Main line		Culvert	Live	A culvert marked on the 1839 Dixon survey and the 1895 OS map. The southern side of the culvert appears as a filled in earthwork on 1948 vertical photography - the railway having been widened at the end of the 19th century. The site is now under dense tree cover, but the HEA could not find any evidence for the culvert.	No	
56	572	1010178				426630	524337	Main line		Railway building	Live	A platelayers' hut, visible on early aerial photography and relating to the building illustrated on the 1839 Dixon survey. The building has since been demolished.	No	
57	227	1010178				426763	524275	Main line		Overbridge	Live	An accomodation overbridge carrying a track over the railway. The HEA states that the decking has been replaced twice, but some of the supporting structure may be original to the 1825 railway.	Partly	
58	230	1010178				426959	523998	Main line		Overbridge	Live	A railway bridge carrying School Aycliffe Lane over the railway. The historical photography clearly shows that the road has been windened considerably. The HEA states that perhaps some of the bridge is original to 1825.	Partly	
59	219	1010178				427043	523254	Main line		Overbridge	Live	An accomodation overbridge carrying a track over the railway to Aycliffe Wood House. This relates to the location of a bridge on the 1839 Dixon survey. The bridge visible on historic aerial photography appears to relate to that which still stands, which is probably a mid-19th century replacement.	No	

60		1010178				427062	523084	Main line		Occupation crossing/gate	Live	A crossing as denoted by two opposing gates on the 1839 Dixon survey. The gate positions remain visible on early vertical photography, but they are now beneath dense tree cover. Nothing was recorded here by the HEA, but this area may have been inaccessible due to the live line.	Uncertain	
61		1010178				427119	522523	Main line		Level crossing	Live	A level crossing is denoted on the 1839 Dixon survey at this point, crossing Heighington Lane. This is still a level crossing today, though it is unlikely that any original features survive.	Partly	
62	203	1010178	497723		1322808	427138	522516	Main line	Heighington Station	Railway building	Live	The Railway Tavern (now called Locomotion No.1) which was shown on the 1839 Dixon survey. Constructed in 1826 and still extant.	Yes	
63	220	1010178				427210	521670	Main line		Overbridge	Live	An accomodation overbridge. Original to the 1825 railway, this bridge was only removed in around 2014 as part of the Hitachi track improvements.	No	
64	221	1010178				427242	521368	Main line		Culvert	Live	This culvert is not marked on the 1839 Dixon plan but is presumed have been an original feature of the 1825 railway anyway, as the embankment was constructed over the narrow beck at this time. The HEA assessed this on the ground and established it to remain intact.	Yes	
65	546	1010178				427304	520782	Main line		Occupation crossing/gate	Live	An occupation crossing denoted by two opposing gates on the 1839 Dixon survey. The gates remained intact on the early vertical photography, but appear to have since been removed, though the crossing is still a right of access.	Partly	
66		1010178				427377	520491	Main line		Occupation crossing/gate	Live	An occupation crossing as denoted by two opposing gates as marked on the 1839 Dixon survey. The gates and crossing remained intact on the early vertical photography, but appear to have since gone out of use and been removed.	No	
67		1010178				427427	520350	Main line		Level crossing	Live	A level crossing is denoted on the 1839 Dixon survey at this point, crossing Coatham Lane. This is still a level crossing today, though it is unlikely that any original features survive.	Partly	
68	336	1010178				427513	520093	Main line		Culvert	Live	Culvert carrying Dene Beck beneath the railway embankment. The feature remains extant and was assessed on the ground by the HEA.	Yes	
69	190	1010178				427531	520039	Main line		Underbridge	Live	An accomodation underbridge carrying the railway over a track. The bridge remains intact and has been assessed by the HEA.	Yes	
70	194	1010178				427756	519392	Main line		Underbridge	Live	A bridge carrying the railway over a track from Myers Flat. This bridge displays broad arcing support walls, still visible on aerial photography, which appear to match those shown on all early edition OS maps and that on the 1839 Dixon survey. The HEA states that the decking has been replaced, but much of the masonry appears original.	Partly	
71	198	1010178				427835	519147	Main line		Railway building	Live	A small building is visible on historical photography, which appears to relate to a building illustrated on the 1839 Dixon survey. This may have been a platelayers' hut. It has since been demolished, though there might be foundation rubble evident on the photography.	No	A ground assessment may establish whether any of the footings remain intact.

72	344	1010178				427962	518849	Main line		Overbridge	Live	Location of an accomodation overbridge carrying a track over the railway illustrated on the 1839 Dixon survey. The present bridge does not appear to reflect the shape and size of the original bridge on the early survey and is probably a later 19th century replacement.	No	
73	251	1010178				428447	517210	Main line		Occupation crossing/gate	Live	The site of an occupation crossing as denoted on the 1839 Dixon survey. The crossing remains extant, though it is unclear whether any of the original gate structure survives or whether the current gates are later in date.	Yes	A ground assessment might establish whether any original infrastructure survives.
74		1010178		34834	1121262	428993	515624	Main line		Railway building	Disused	The goods shed in Darlington, constructed in 1833, remains extant though extended to the north.	Yes	
75		1010178	1010231	811	1002331	429175	515556	Main line	Skerne Bridge	Underbridge	Live	The oldest purpose built railway bridge in the world to remain in continuous use. Constructed in 1824-5, the bridge still carries the railway over the River Skerne.	Yes	
76		1010178	1510697	7301		429078	515286	Main line	The Railway Tavern	Railway building	Disused	Tavern built by and original to the railway. The building remains extant.	Yes	
77		1375373				429197	511874	Croft Branch		Occupation crossing/gate	Disused	An occupation crossing as denoted by the marking of two opposing gates on the 1839 Dixon survey. These relate to a crossing point which remained visible on the early vertical photography. Although the railway is no longer in use, the track remains a right of access.	Uncertain	Ground assessment may establish whether any original gate infrastructure survives.
78		1375373				429173	511682	Croft Branch		Underbridge	Disused	An accomodation underbridge as marked on the 1839 Dixon survey. The bridge remained intact on early vertical photography, but is now beneath dense tree cover, so the condition is uncertain.	Uncertain	Would benefit ground assessment to see if any of the structure remains intact.
79		1375373				429090	511108	Croft Branch		Occupation crossing/gate	Disused	An occupation crossing is denoted on the 1839 Dixon survey as two opposing gates. The westernmost of these was visible on early vertical photography passing through the railway boundary, but appears to have since been removed. The crossing does not appear to have been in use on the 1948 photography. The eastern gate is under tree cover and is not visible on aerial photography.	Uncertain	Both gates would benefit ground assessment to see whether any original gate infrastructure survives.
80		1375373				429171	510430	Croft Branch		Occupation crossing/gate	Disused	An occupation crossing as denoted on the 1839 Dixon survey by two opposing gates. This crossing is still visible on early vertical photography, but appears to have since been removed. The trackway however remains a rght of access with moderately dense tree cover around, so it is possible that some of the original gate structures may survive.	Uncertain	A ground assessment may establish whether any of the original gate fabric may survive.
81		1375373				429083	509956	Croft Branch		Railway building	Disused	A building visible on the early vertical photography appears to relate to a building labelled as a house within a garden on the 1839 Dixon survey and on subsequent OS maps. The building has since been demolished and the area redeveloped.	No	
82	314	1010178				430967	515295	Main line		Level crossing/gate	Disused	A level crossing carrying McMullen Road across the railway, as marked on the 1839 Dixon survey. The level crossing remained in use on the early vertical photography, but appears to have been demolished when the railway went out of use in the late 20th century.	No	

83	361	1010178				431316	515296	Main line		Occupation crossing/gate	Disused	An occupation crossing carrying a track across the railway, as marked on the 1839 Dixon survey. The level crossing remained in use on the early vertical photography, but appears to have been demolished when the railway went out of use in the late 20th century.	No	
84	548	1010178				431502	515286	Main line		Gate	Disused	Gated access to the lineside illustrated on the 1839 Dixon survey, probably as access to a platelayers' hut (AIM85). The gate remained intact on early vertical photography but has since been demolished, now largely under the B6279.	No	
85	362	1010178				431538	515304	Main line		Railway building	Disused	A small building visible on early aerial photography appears to relate to a structure shown on the 1839 Dixon survey. This was probably a platelayers' hut, but has since been demolished.	No	
86	363	1010178				431653	515291	Main line		Occupation crossing/gate	Disused	An occupation crossing marked on the 1839 Dixon survey carrying a track across the railway. The crossing was still intact on early vertical photography, but has since been demolished.	No	
87	368	1010178				433444	515170	Main line		Occupation crossing/gate	Disused	An occupation crossing as denoted on the 1839 Dixon survey by two opposing gates. This crossing is still visible on early vertical photography, but has now gone out of use. The trackway to South Burdon Farm, which crosses the line of the now-disused railway, remains in use, but the HEA record no evidence of the original features.	No	
88	408	1010178				434768	513867	Main line		Occupation crossing/gate	Disused	An occupation crossing is depicted on the 1839 Dixon survey as two opposing gates. The north gate remained visible on historic vertical photographs, but has since gone out of use. There is a still a gate marked at this location, but the HEA did not mention any surviving original features.	No	
89		1010178				438579	514155	Main line		Level crossing	Live	The 1839 Dixon survey shows a road entering and terminating on the edge of the railway line, which appears to relate to access to a railway building. A level crossing is now located here.	No	
90		1010178				438994	514271	Main line		Occupation crossing/gate	Live	An occupation crossing as denoted on the 1839 Dixon survey, visible as two opposing gates. This crossing and the gates were visible on the earliest vertical photography, but appear to have been removed.	No	
91		1010178				439270	514347	Main line		Occupation crossing/gate	Live	An occupation crossing as denoted on the 1839 Dixon survey, visible as two opposing gates. This crossing and the gates were visible on the earliest vertical photography, but appear to have been removed.	No	
92		1010178				439802	514446	Main line		Occupation crossing/gate	Live	An occupation crossing as denoted on the 1839 Dixon survey, visible as two opposing gates. This crossing and the gates were visible on the earliest vertical photography, but it appears to have been since removed.	No	
93		1010178				439912	514487	Main line		Railway building	Live	A building visible on the early vertical photography appears to relate to a building shown on the 1839 Dixon survey and on subsequent OS maps. Probably a platelayers' hut, the building has since been demolished.	No	

94	437	1010178				440352	514587	Main line		Level crossing	Live	A level crossing at the junction of Long Newton Lane and Urlay Nook Road. This crossing remains in use though it is unlikely that any of the original infrastructure survives.	Partly	
95		1010178				441464	514565	Main line		Level crossing	Live	A level crossing for Durham Lane. This crossing remains in use though it is unlikely that any of the original infrastructure survives.	Partly	
96		1010178	1129211	1278	1139963	444710	518375	Main line		Railway building	Disused	The original booking office for the S&DR. The building remains extant.	Yes	
97		1375662		4979		444679	517942	Middlesbrough Extension	Tees Railway Bridge	Underbridge	Live	The site of the original suspension bridge carrying the railway over the River Tees. This was replaced in the mid-19th century, and no original features are visible on aerial photographs.	No	
98	597	1375662				446620	518963	Middlesbrough Extension		Underbridge	Disused	The 1839 Dixon survey shows an underbridge crossing the Old River Tees. This appears to have been replaced in the latter half of the 19th century, possibly with a tunnel. There is still a crossing over the river at this location, but the HEA states that there is no evidence of the original bridge.	No	
99		1375692				422944	527002	Black Boy Branch		Railway building	Disused	A building visible on early aerial photography appears to correspond with one illustrated on the Dixon survey. The building has since been demolished.	No	
100		1375672				413540	525070	Haggerleases Branch		Level crossing	Disused	A level crossing taking the road from High Lands to a ford over the River Gaunless. The crossing ceased to be used when the railway closed.	No	
101		1038508		35608	1160335	423249	525831	Soho Works	Soho House	Railway building	N/A	Pair of houses originally built for the S&DR. One became the home of Timothy Hackworth who then established the Soho Works which incorporated these houses in 1833. Now part of the National Railway Museum in Shildon.	Yes	
102		1038520		35625	1310628	423307	525771	Soho Works		Engine shed	N/A	Engine shed constructed for the S&DR in 1828 and becoming part of the Soho Works in 1833. Now part of the National Railway Museum in Shildon.	Yes	
103		497740		35933	1322863	423380	525753	Black Boy Branch		Railway building	Disused	Two adjoining buildings, where wagons were hitched up to the trains of Brusselton and Black Boy Inclines. This may be an early feature of the railway but was not included on Dixon's plans, though was in place by the first edition OS map. Extant but roofless on the latest aerial photographs.	Partly	
104		497740		35933	1322863	423385	525748	Black Boy Branch		Railway building	Disused	A small building located at the hitching point between the Brusselton and Black Boy Inclines and the steam-locomotive railway. Probably a platelayer's hut, this might be illustrated on Dixon's plan. Remains extant on latest photographs.	Yes	

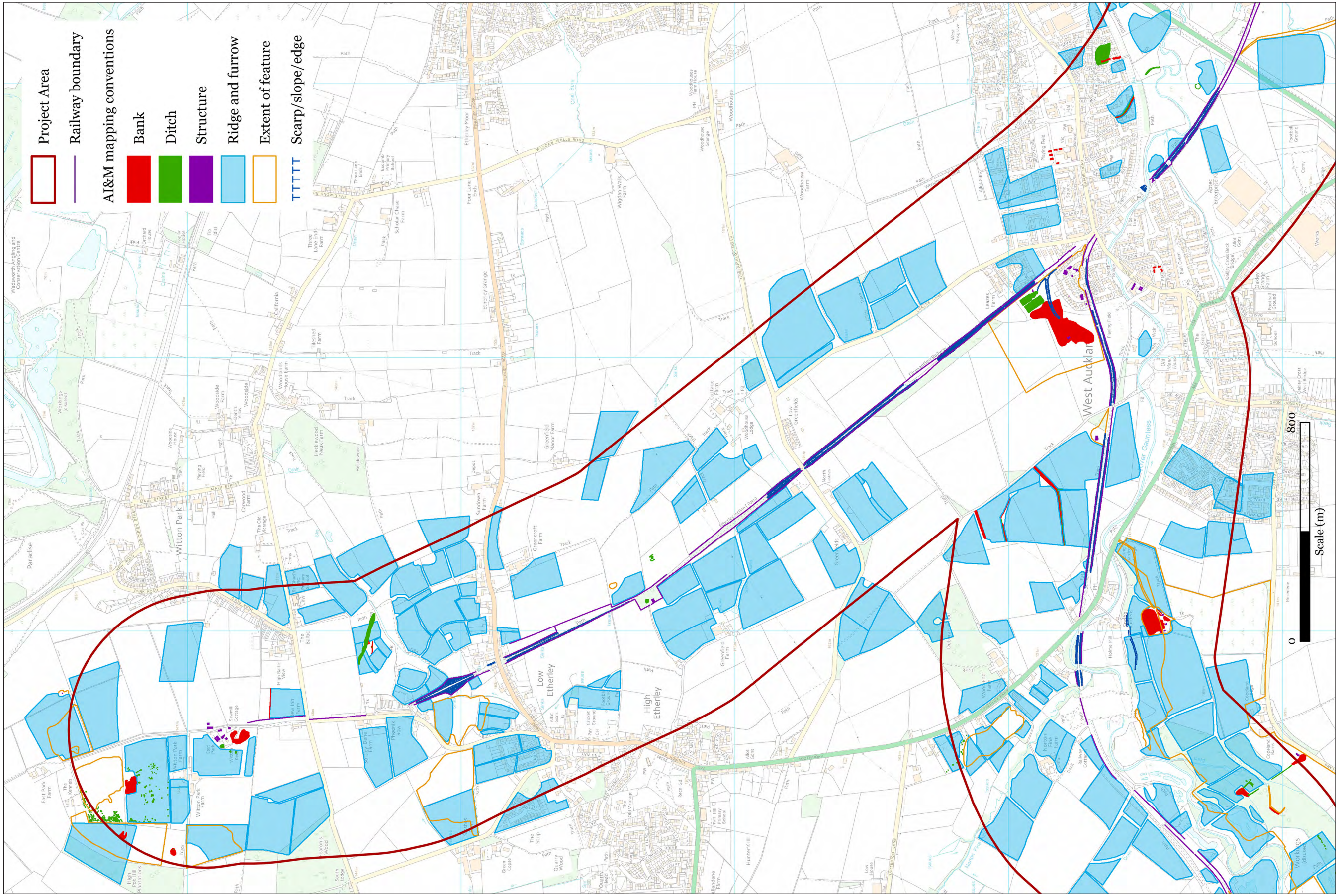


Fig 84: Archaeological and railway features visible on historic aerial photographs between Witton Park and the Gaunless Bridge. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2019.

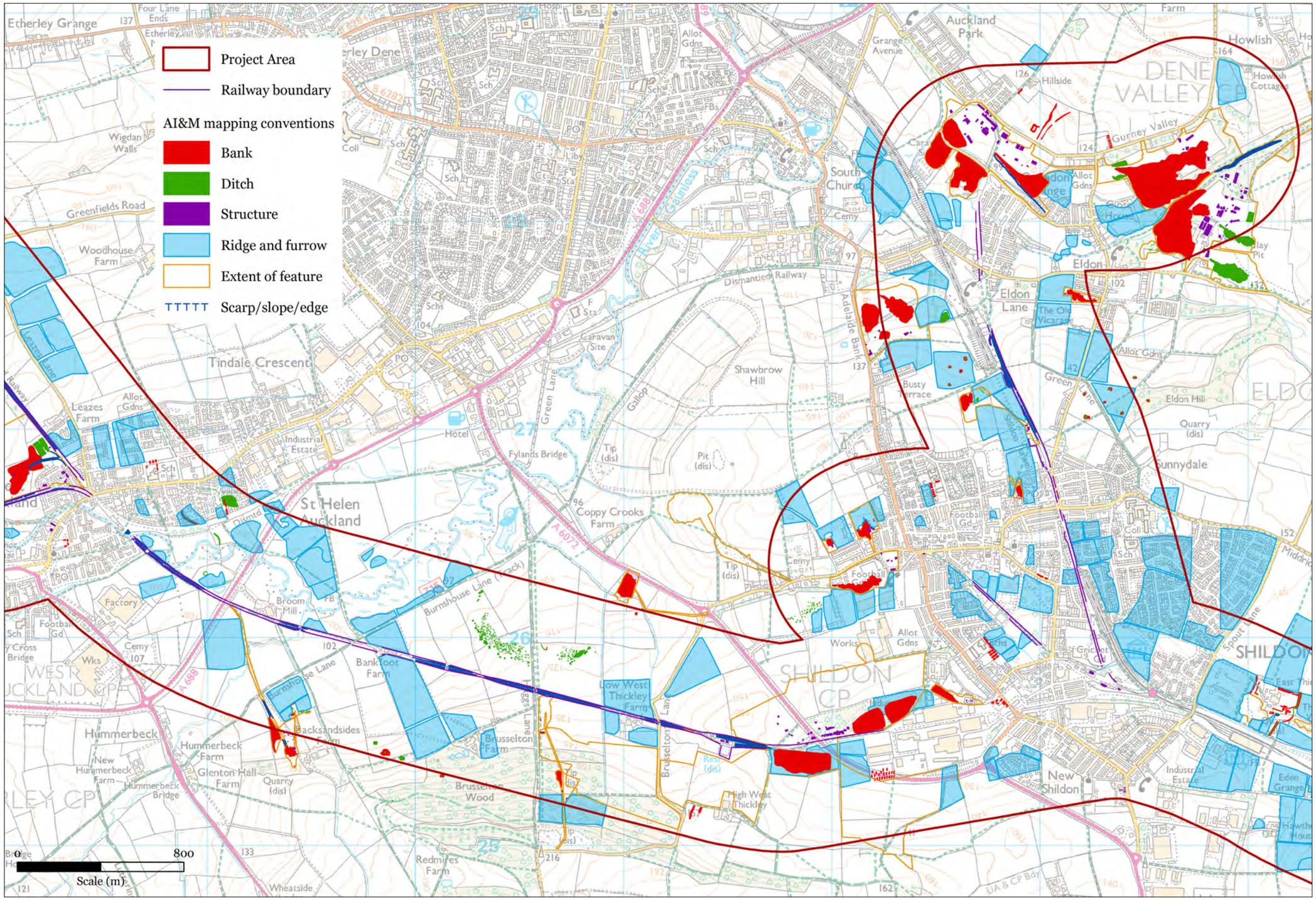


Fig 85: Archaeological and railway features visible on historic aerial photographs between Gaunless Bridge and Shildon, including the Black Boy Branch Line and Surtees Railway. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2019.

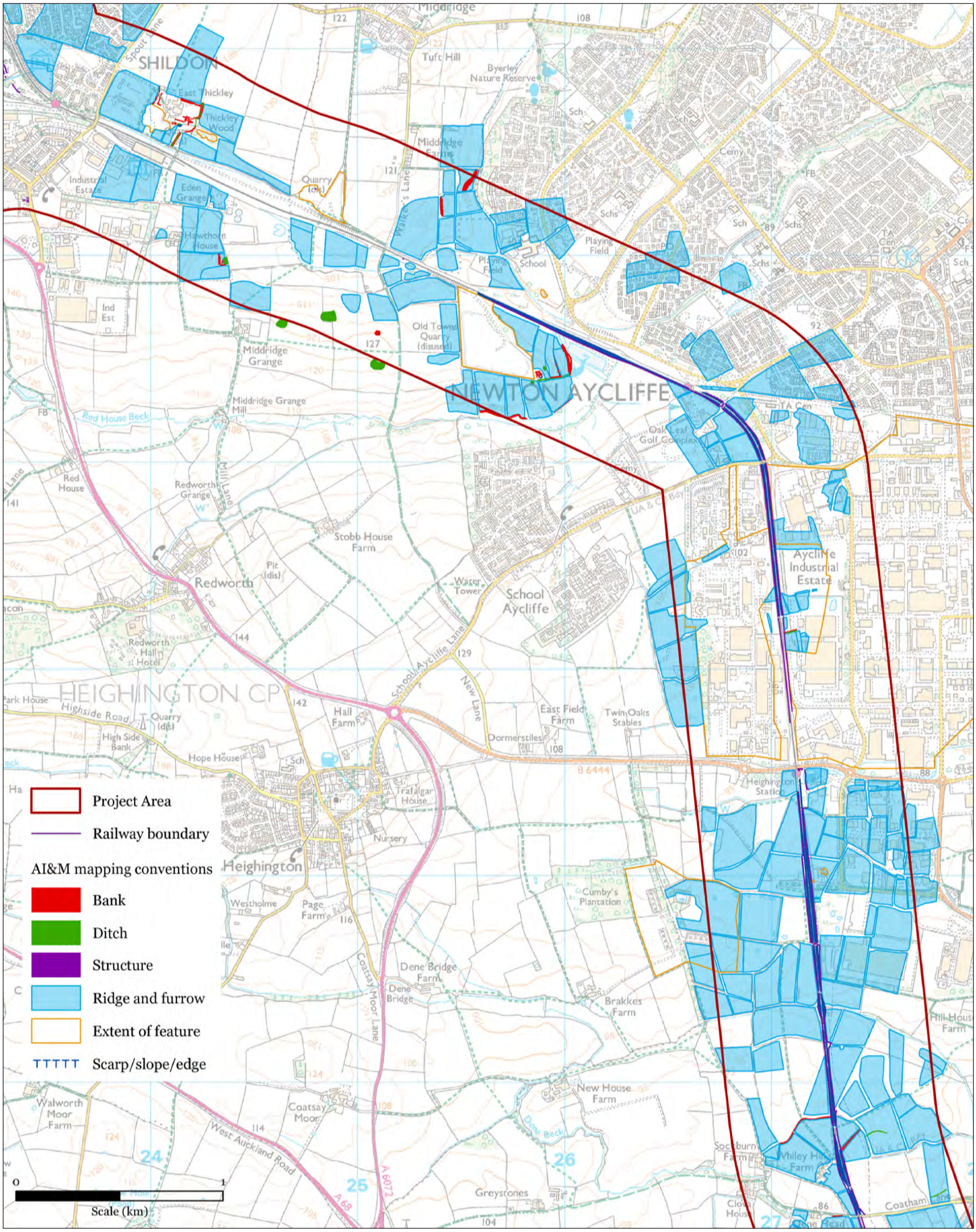


Fig 86: Archaeological and railway features visible on historic aerial photographs between Shildon and Coatham Lane. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2019.

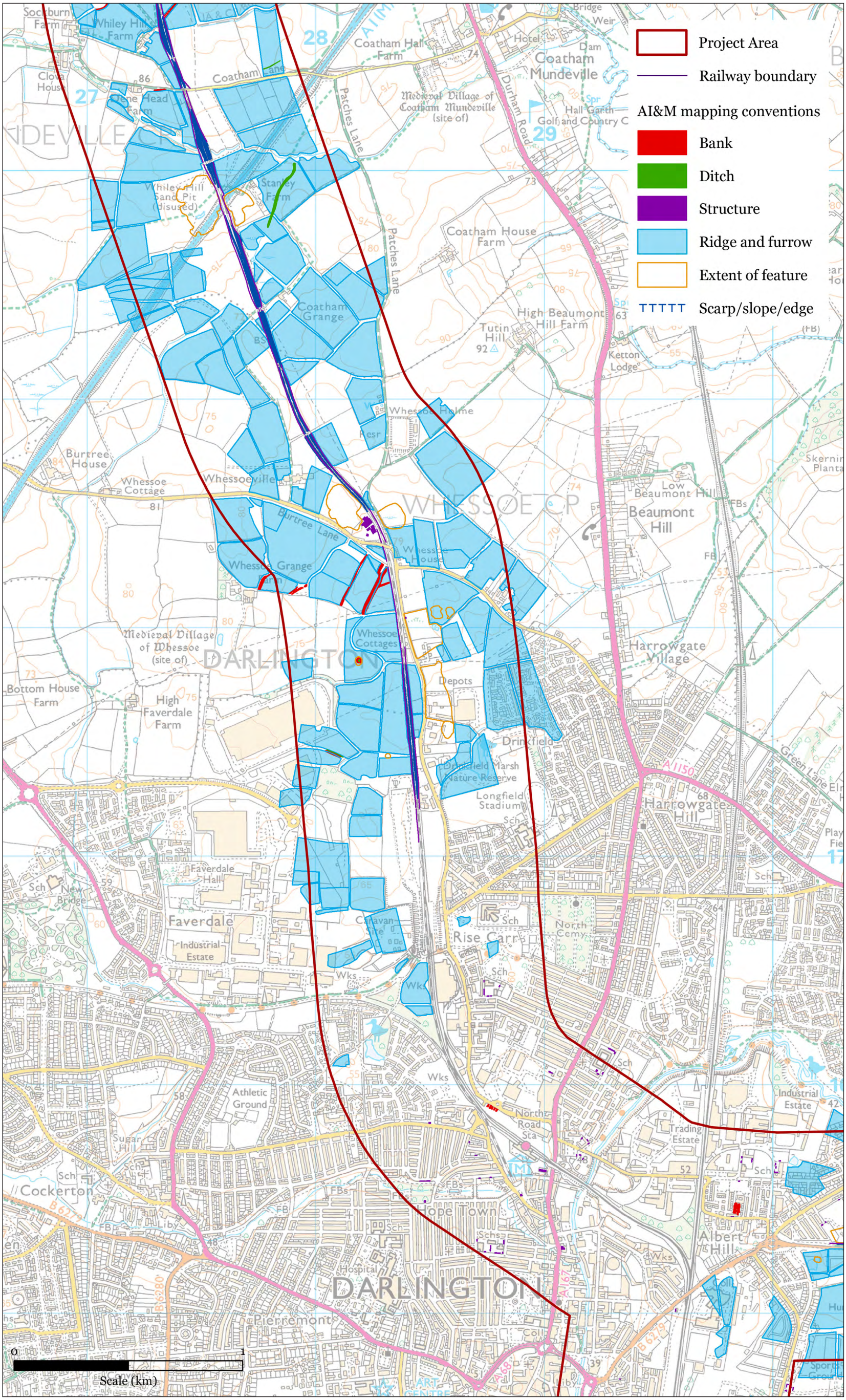


Fig 87: Archaeological and railway features visible on historic aerial photographs between Coatham Lane and Darlington. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2019.

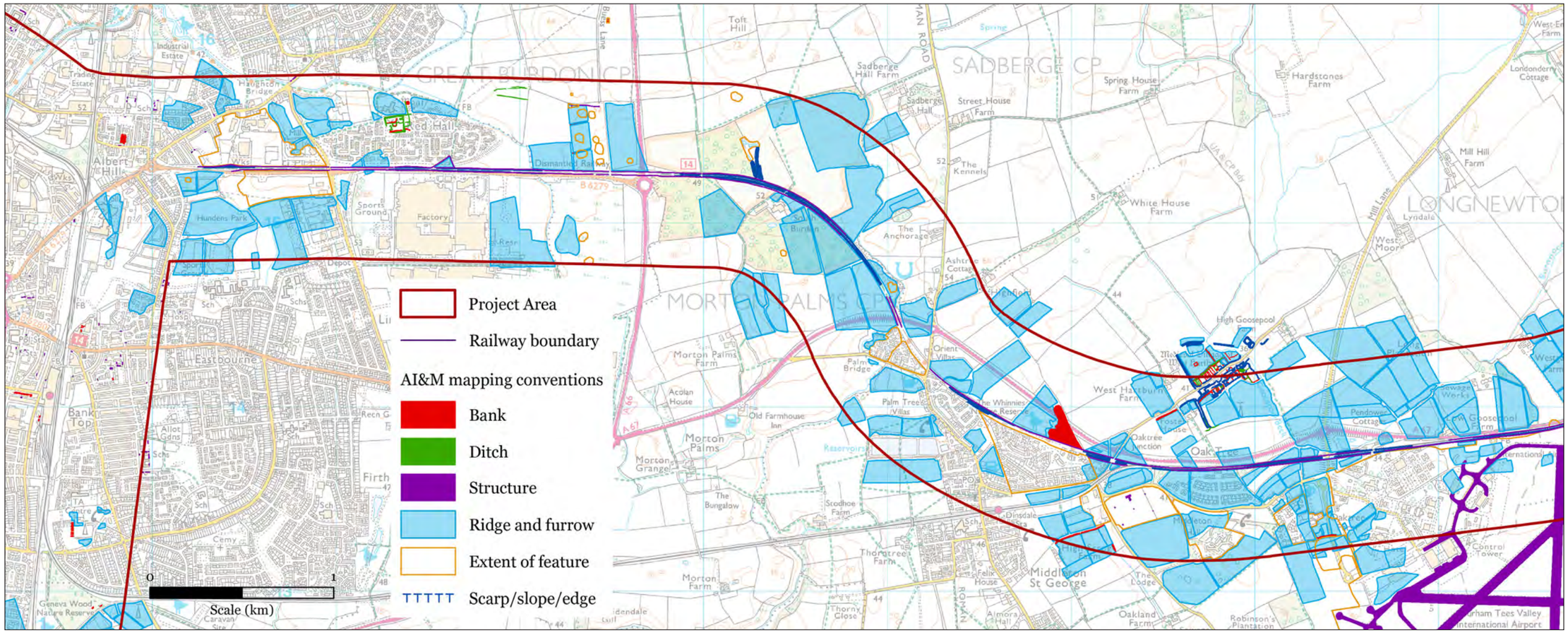


Fig 88: Archaeological and railway features visible on historic aerial photographs between Darlington and Low Goosepool Farm. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2019.

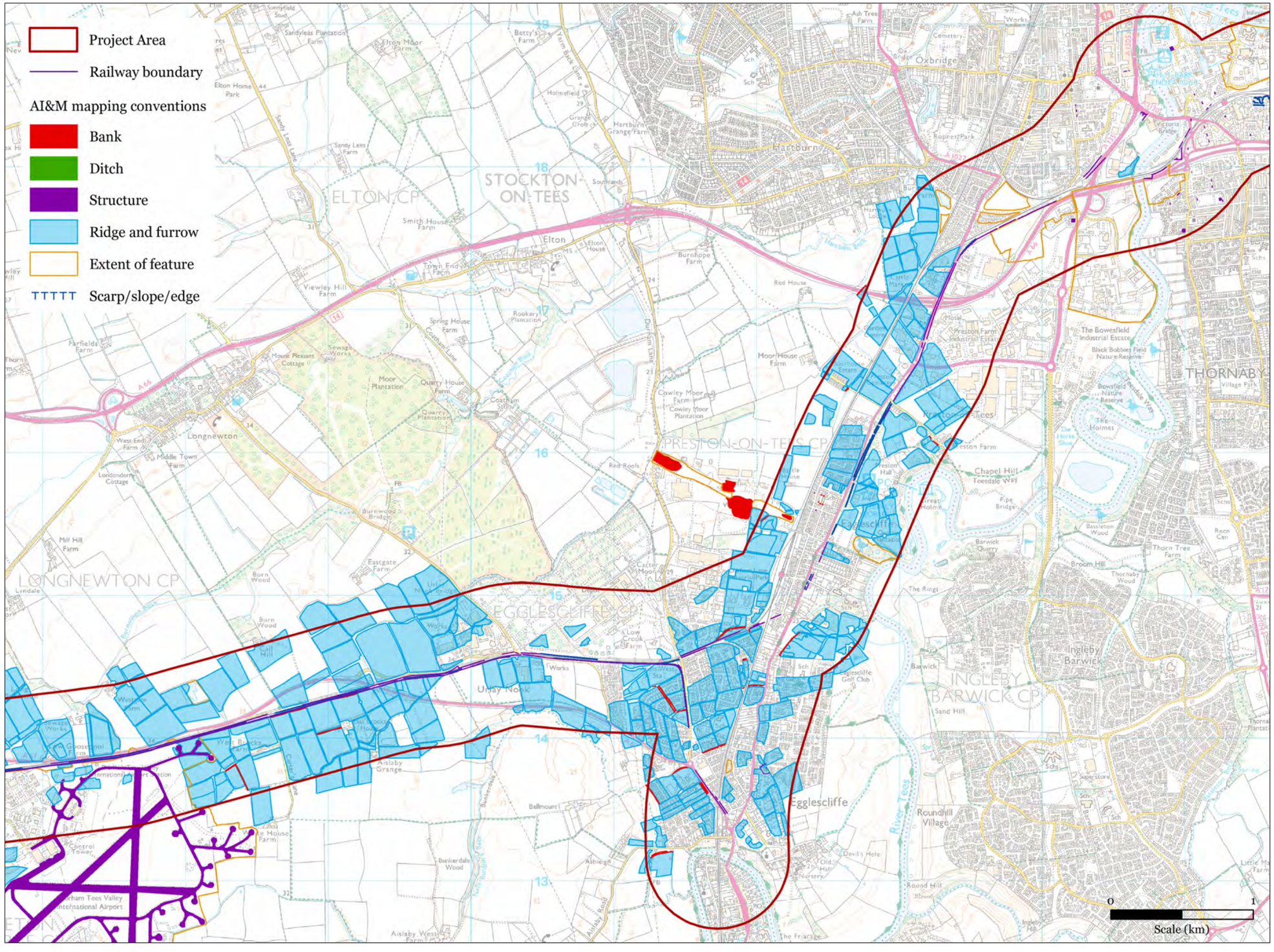


Fig 89: Archaeological and railway features visible on historic aerial photographs between Low Goosepool Farm and Stockton-on-Tees, including the Yarm Branch Line. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2019.

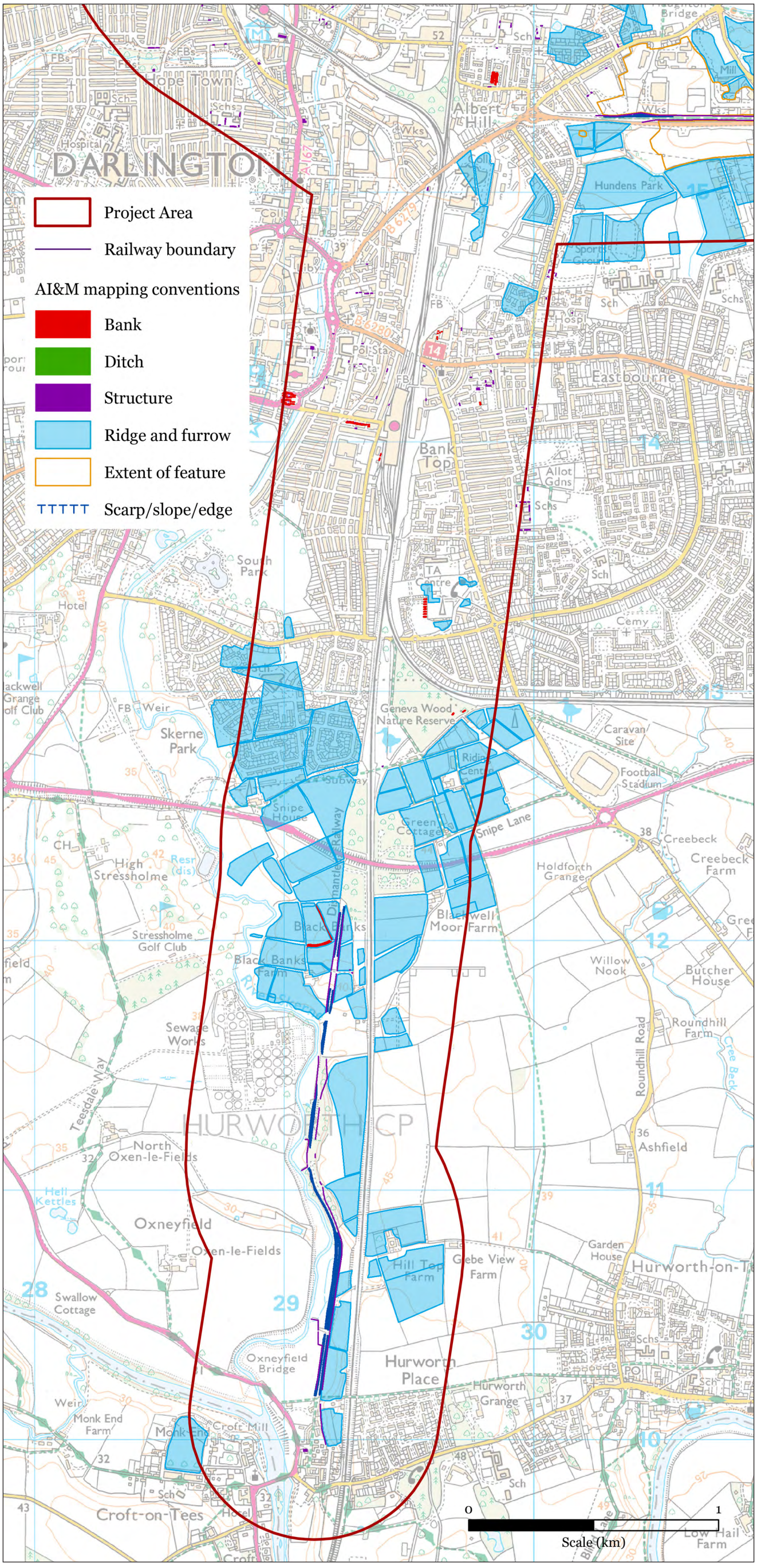


Fig 90: Archaeological and railway features visible on historic aerial photographs along the Croft Branch Line. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2019.

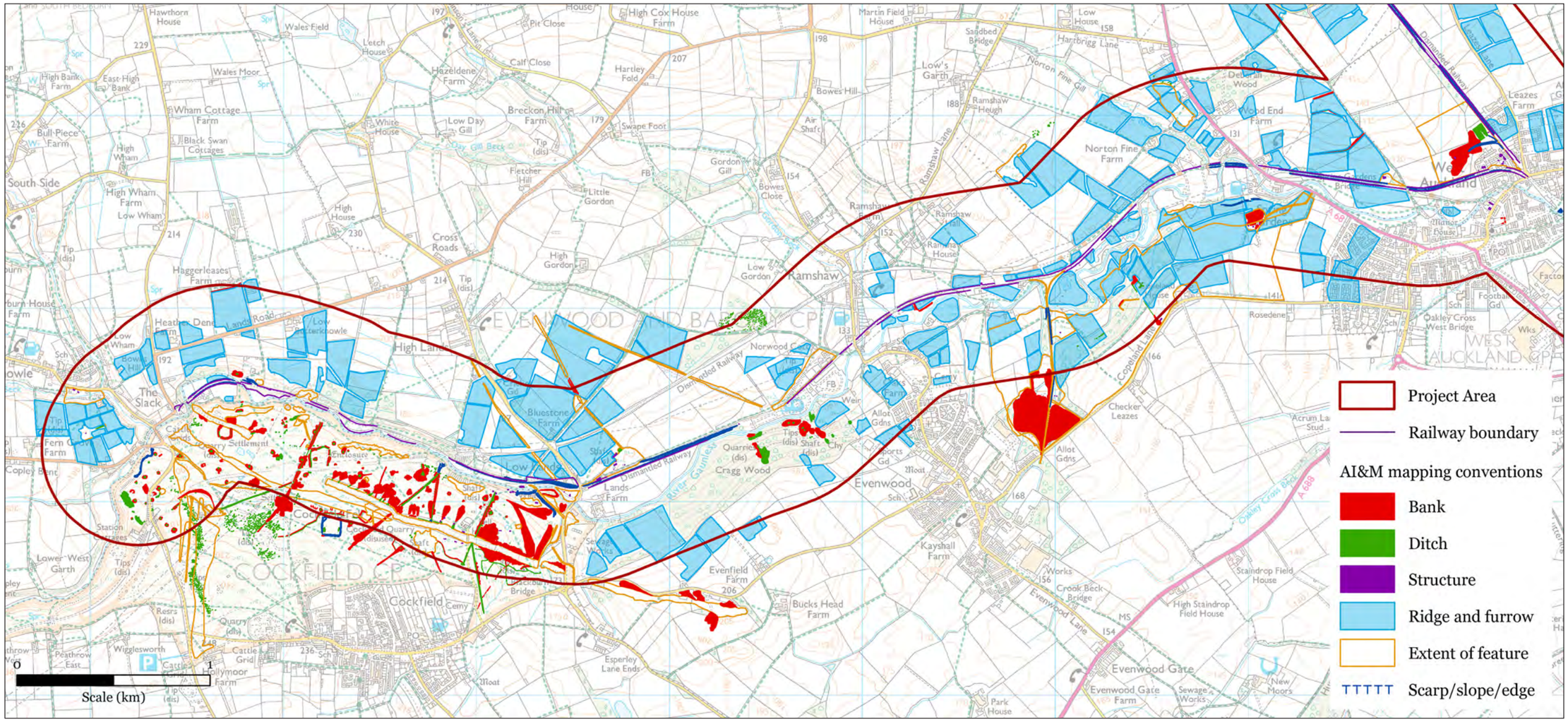


Fig 91: Archaeological and railway features visible on historic aerial photographs along the Haggerleases Branch Line and Surtees Railway. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2019.

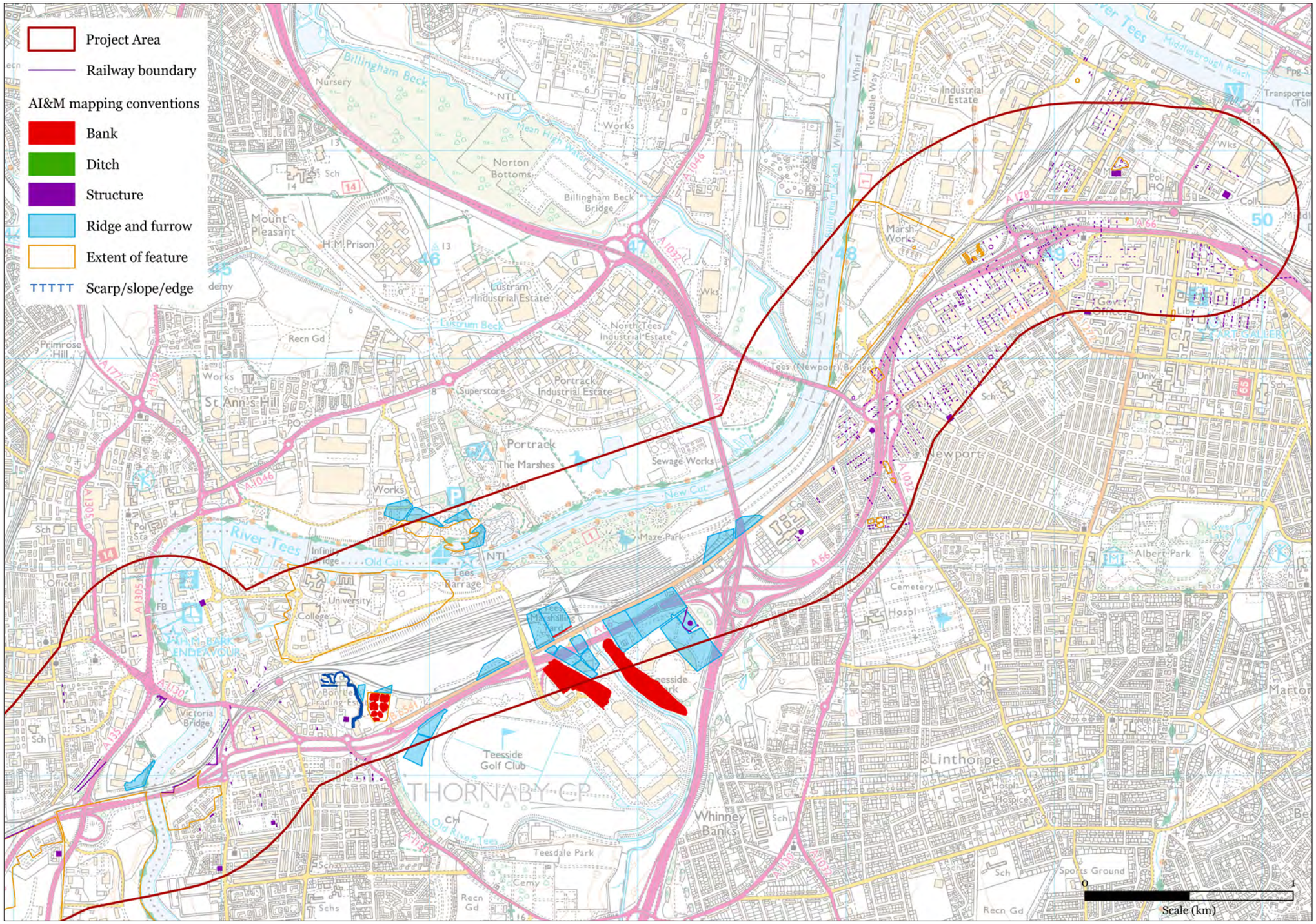


Fig 92: Archaeological and railway features visible on historic aerial photographs along the Middlesbrough Extension. Archaeological mapping © Historic England; Base map © Crown Copyright and database right 2019.

GLOSSARY

Accommodation bridge	A pre-existing right of access allowing traffic to cross a railway via an underbridge or overbridge.
DSM	Digital Surface Model – is the first return data captured using lidar and includes tree canopies, rooftops, walls and vegetation.
DTM	Digital Terrain Model – is the last return data captured using lidar which shows the terrain after the removal of surface objects such as trees and buildings.
Incline	A uniform slope, too steep for steam locomotives to traverse, whereby railway wagons were hauled by rope.
Level crossing	The intersection of a road with the railway, where traffic could cross the railway on a level plain. The original level crossings to the S&DR were not gated.
Lidar	Light detection and ranging – a survey method using light from a laser to measure the distance to a target whereby a 3D point cloud is created.
Lineside	The area adjacent to a railway track, within the railway boundaries.
Mineral railway	A privately operated railway serving an industrial complex which linked directly to a mainline railway.
Occupation crossing	A pre-existing right of access allowing traffic to cross a railway via a level plane. This differs from a level crossing in that it acted as an accommodation crossing and was usually gated.
Orthophotograph	An aerial photograph (or mosaic of photographs) that has been rectified to give uniform scale.
Overbridge	A bridge that passes over a railway.
Platelayers' hut	Small buildings constructed on the lineside at regular intervals for storage of equipment or as shelter for workers.
Permanent way	A railway track or railroad comprising rails, fasteners, ties and ballast.
Staithe	A waterside depot for loading vessels for the shipment of goods.
Structure from Motion	A digital photogrammetric method of created 3D models from 2D images.
Underbridge	A bridge which carries a railway over another railway, road or river, ie another route passes *under* the railway.

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