AN ARCHAEOLOGICAL EXCAVATION AT THE FORMER GOODYEAR DUNLOP TYRE FACTORY SITE, WEAR INDUSTRIAL ESTATE, BIRTLEY ROAD, WASHINGTON, TYNE AND WEAR

Assessment Report

PCA

PRE-CONSTRUCT ARCHAEOLOGY

An Archaeological Excavation at the Former Goodyear Dunlop Tyre Factory Site, Wear Industrial Estate, Birtley Road, Washington, Tyne and Wear

Central National Grid Reference: NZ 2925 5452

Site Code: DFW 09

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PART A: PROJECT SUMMARY

1. NON-TECHNICAL SUMMARY

1.1 An archaeological excavation was undertaken April-June 2009 by Pre-Construct Archaeology Limited on the site of a former Goodyear Dunlop tyre factory, Wear Industrial Estate, Washington, Tyne and Wear. The work was commissioned by Cundall on behalf of Highbridge Washington Limited ahead of re-development of the tyre factory site. The excavation was a condition of planning permission from Sunderland City Council and was undertaken on the recommendation of the Tyne and Wear Specialist Conservation Team as part of a programme of archaeological work required in association with the re-development proposal.

1.2 The Wear Industrial Estate lies in the south-western part of the 'new town' of Washington. An important manufacturing element of the original new town, the tyre factory site dates from the late 1960s when it was originally operated by Dunlop, with Goodyear Dunlop Tyres UK Limited taking over in 2004. The site covers approximately 18 hectares and has a central National Grid Reference of NZ 2925 5452. It is bounded to the north by the west-east A195 Western Highway, to the west by the curving route of Vigo Lane, to the east by operational premises within the industrial estate and to the south by a section of what is now the Consett and Sunderland Railway Path, this being a footpath and cycleway running along the former route of what was originally part of the Stanhope and Tyne Railway. The archaeological excavation was undertaken in the largely undeveloped southern part of the site, the northern part of which was occupied by the abandoned factory at the time of the work.

1.3 The site lies within the central eastern portion of the Durham Coalfield and it is for the post-medieval industrial era that the site is of archaeological importance, as first established by an archaeological desk-based assessment undertaken in 2008. Harraton Colliery, which was potentially in operation as early as *c*. 1590, lay to the south of the site, with the site itself located in an area generally known, from the post-medieval period onwards, as 'Harraton Outside'. The Ordnance Survey 1st edition map from 1856 shows part of a branching network of colliery waggonways crossing the site and serving numerous coal pits to the north and west, all part of the operational area of Harraton Outside. An archaeological evaluation undertaken in 2008 revealed the presence of significant archaeological remains associated with the construction and use of these waggonways. The routes were probably in use between the mid-late 18th century and the mid-late 19th century.

1.4 Two open areas were investigated during the excavation. Area A was the larger, covering c. 715 m^2, and was located in the south-eastern corner of the site on an area of scrubland and bounded to the north by a belt of woodland. Area B was smaller, covering *c.* 135 m^2, and was located roughly centrally in the overall site, at the northern edge of the same woodland.

1.5 Natural Boulder Clay was exposed to a limited extent in both areas of excavation. Broadly the work recorded the height of the natural sub-stratum falling in elevation by *c.* 2.30m over a distance of *c*. 150m between Area B in the north-west and Area A in the south-east, this reflecting the natural topography of the area with the ground falling away to the south-east towards the River Wear.

1.6 At the northern extent of Area A, Boulder Clay was overlain by the remnants of a palaeosol that had accumulated upon the natural sub-stratum. Its date of origin is uncertain.

1.7 The earliest late post-medieval/industrial era remains recorded at the site represent the earliest attempts to transport coal using timber tracked waggonways from the outlying workings of Harraton Colliery to staithes at Fatfield on the River Wear to the south-east. The location and alignment of two closely associated Phase 3a waggonways recorded in the south-western corner of Area A indicate a route created to serve Hall Pit of Harraton Outside. This activity likely dates to the mid to late 18th century, possibly earlier.

1.8 The sub-structure of the first Phase 3a waggonway, [480], comprised a WNW-ESE aligned embankment built using dumped clay probably quarried from the natural sub-stratum. The upper part of the embankment, along which the waggonway track was set out, was *c.* 4m wide. The track of waggonway [480] had been constructed within a shallow trackbed up to *c.* 1.80m wide. Only two timbers – both sleepers, one identified as oak - survived from the track, with the remainder represented simply by the impressions of timber sleepers and rails. The remains indicate a gauge of *c.* 5 feet, with a slight gradient recorded along the exposed portion of the track, with the fall to the south-east. A possible trackside gully was recorded along the eastern side of the embankment.

1.9 The remains of the second Phase 3a waggonway, [760], were recorded on the eastern side of the first, with the two routes evidently merging within the excavation area and thus potentially in use contemporaneously. The track of waggonway [760], constructed upon a crushed coal trackbed, survived as a group of sleeper impressions, along with five surviving sleeper timbers, all crudely worked branches. The recorded evidence again suggests a slight gradient along the exposed portion of the track, with the fall to the south-east. The surviving evidence of the Phase 3a tracks suggests that they were constructed to take fully laden wagons from the pit head.

1.10 Phase 3b represents two subsequent, closely associated and probably contemporary timber tracked waggonways in Area A, these running on a NW-SE orientation and likely serving Anna Bella Pit of Harraton Outside. This activity potentially dates to the late 18th century. The tracks of the two waggonways, [130] and, on its western side, [360], merged in the central part of Area A, to continue northwards as the single track of waggonway [130]. To the north, a substantial embankment had been constructed for waggonway [130], again using redeposited natural clay more than 1.0m thick, to carry the track. To the south, there was less of a requirement to construct an embankment, with that of the Phase 3a routes already in place. However, the upper part of the existing embankment was widened on its eastern side to accommodate waggonway [130]. Distinct trackbeds were recorded for the Phase 3b waggonways, using crushed coal or stony clay, to form a firm foundation for the tracks. The recorded evidence again indicates a slight track gradient, down to the south-east, along this portion of the track of waggonway [130].

1.11 The track of waggonway [130] comprised a combination of sleeper and rail impressions, along with more than 20 surviving timber sleepers and one surviving rail. Again, oak trees supplied the timber used for sleepers. The earliest timber waggonway recorded in Area B potentially corresponds with waggonway [130]; this ran along a clay embankment *c.* 4.50m wide and *c.* 0.75m high. The level of survival of waggonway tracks in Area B was very poor, with only timber impressions recorded on a stony trackbed

1.12 In Area A, the track of waggonway [360] lay to the west of waggonway [130]. Forty timber sleepers survived from this track, along with numerous sleeper impressions. The sleepers were closely set, with a gauge of *c.* 5 feet indicated by traces of rails. Ballast deposits associated with the track were of variable composition. The remains of trackside ditches were recorded along both sides of the Phase 3b waggonway embankment.

1.13 Phase 3c represents the latest timber waggonways at the site, this activity probably of late 18th or early 19th century date. Two waggonways, [180] and [97], were identified, the first broadly followed the same NW-SE alignment as the Phase 3b routes to serve Anna Bella Pit, while to the east, waggonway [97] ran on a NNE-SSW direction, probably branching to serve Noel and Judith Pits of Harraton Outside. The two routes appeared to merge in the southern part of Area A, suggesting that they were in use contemporaneously. Drainage was evidently an issue along the eastern side of the broad waggonway corridor as development of the routes at the site continued, with the remains of a well-constructed brick-lined culvert recorded in the south-eastern part of Area A. A series of ground-raising deposits, associated with construction of the culvert, infilled the Phase 3b waggonway ditch. A mostly robbed-out sinuous brick-lined drain, had evidently been cut across the line of waggonway [97], and it is possible that this was associated with the culvert. For the most part, the Phase 3c waggonways had been constructed over the earlier routes and while no unique embankments were identified, ground raising deposits associated with their construction were recorded.

1.14 The track of waggonway [97] largely survived as sleeper impressions, with some rail impressions also recorded. Waggonway [180], built within a trackbed in some areas, was represented by a combination of timbers and timber impressions, with more than twenty timber sleepers and eight timber rails surviving, the latter all from the western side of the track. Many of the sleepers had peg holes at their ends, indicating fixing points for rails. Rails from both Phase 3c waggonways were from pine trees. The rails from the track of waggonway [180], although of variable lengths, displayed evidence of having been worked into regular forms. The tracks of both Phase 3c waggonways had estimated gauges of *c.* 5 feet and the recorded evidence again indicates a slight track gradient, down to south-east. A substantial trackside ditch was recorded along the western side of waggonway [97] in the northern part of Area A.

1.15 Relatively little survived of the latest phase of waggonway, [470], in Area A. This likely saw the introduction of iron rails, probably in the first half of the 19th century. Towards the southern limit of excavation, two stone blocks represent sleepers for iron rails, each with two fixing holes in its upper surface. Further traces of this iron-railed waggonway were recorded at the northern end of Area A and also what was probably the same route was recorded to the north-west in Area B, as waggonway [332]. Linear features represent the former locations of rails, these likely having been removed on disuse. Together these elements evidently represent development of the NW-SE aligned route, which continued to serve Anna Bella Pit. The *in situ stone* sleepers indicate a gauge of *c.* 5 feet.

1.16 This Assessment Report is divided into three parts. Part A, the Project Summary, includes an introduction to the site, its location, geology and topography, planning and archaeological background, and a full description of the archaeological methodology employed during the investigations. It concludes with an illustrated summary description of the archaeological remains representing each of the main phases of activity.

1.17 Part B, the Data Assessment, quantifies the written, graphic and photographic elements of the Site Archive and contains specialist assessments of the artefactual and bioarchaeological evidence, with recommendations for any further work in each case. This part then contains a summary discussion of the archaeological remains, before summarising the potential for further analysis of all elements of the collected project data.

1.18 Part C of the report contains acknowledgements and references. There are three appendices to the report, the first being the index of archaeological contexts, the second being a selection of photographs from the fieldwork and the fourth being the project Specification as prepared by the Tyne and Wear Specialist Conservation Team. The stratigraphic matrix, not included within the Assessment Report due to its large size, can be consulted as part of the Site Archive.

2. INTRODUCTION

2.1 General Background

2.1.1 This report describes the methodology and results of an archaeological excavation undertaken between 14th April and the 2nd of June 2009 by Pre-Construct Archaeology Limited (PCA) on the site of a former factory of Goodyear Dunlop Tyres UK Limited, Wear Industrial Estate, Washington, Tyne and Wear. The central National Grid Reference for the overall site is NZ 2925 5452 (Figure 1).

2.1.2 The archaeological work was commissioned by Cundall, on behalf of Highbridge Washington Limited, and was undertaken in advance of a proposed scheme to re-develop the tyre factory site.

2.1.3 The work was undertaken as a condition of planning permission for the re-development scheme, on the recommendation of the Tyne and Wear Specialist Conservation Team. The archaeological potential of the site had been initially established in 2008 by a desk-based assessment (DBA).[1] The DBA concluded that the site had high potential for archaeological remains of the late post-medieval and early modern industrial eras, particularly for evidence of the late 18th and 19th century transport system associated with Harraton Colliery. This important working, which lay to the south of the site, was in operation potentially as early as *c*. 1590, with the site itself located in an area generally known as 'Harraton Outside' from the post-medieval period onwards. This area was dotted with outlying coal workings and criss-crossed by numerous waggonways transporting coal to staithes on the River Wear.

2.1.4 An archaeological evaluation in December 2008 recorded significant archaeological remains at the site.[2] Specifically features and deposits associated with the construction and use of colliery waggonways, these probably in use between the late 18th century and the mid-late 19th century, were recorded. Accordingly, further investigation of archaeological remains threatened by the re-development scheme was required. The excavation was undertaken according to a Specification prepared by the Tyne and Wear Specialist Conservation Team in advance of the fieldwork.[3]

2.1.5 The archaeological project herein described was designed according to the guidelines set out in *Management of Research Projects in the Historic Environment* (MoRPHE).[4] In line with MoRPHE guidelines, this Assessment Report sets out a formal review of the data collected during the fieldwork.

2.1.6 At the time of writing, the Site Archive, comprising written, drawn, and photographic records and all artefactual and biological material recovered during the investigations, is housed at the Northern Office of PCA, Unit N19a Tursdale Business Park, Durham, DH6 5PG. When complete, the Site Archive will be deposited with Tyne and Wear Museums and Archives, Arbeia, South Shields, Tyne and Wear, under the site code DFW 09.

2.1.7 The Online Access to the Index of Archaeological Investigations (OASIS) reference number for the archaeological excavation is: preconst1-79967.

[1] Pre-Construct Archaeology 2008.
[2] Pre-Construct Archaeology 2009.
[3] Newcastle City Council 2009.
[4] English Heritage 2006.

2.2 Site Location and Description

2.2.1 Washington, designated a new town in 1964, is based around the former colliery villages of Columbia, Fatfield, Harraton, Usworth and Washington. The modern town comprises 18 self-sufficient 'villages' (originally it was series of numbered 'districts') and, in administrative terms, lies within the City of Sunderland, Tyne and Wear. Sunderland itself lies to the north-east, while the town of Chester-le-Street, in County Durham, lies to the south-west, and immediately to the west, beyond the north-south route of the A1(M), is the town of Birtley, in the Metropolitan Borough of Gateshead.

2.2.2 The former Goodyear Dunlop tyre factory site forms the central portion of an east-west corridor of land occupied by the Wear Industrial Estate, in the south-western part of Washington. The industrial estate – which dates from the late 1960s - occupies *c.* 46 hectares and is delimited on three sides by main roads: to the north by the west-east A195 Western Highway, to the west by the north-south A1(M) (Junction 64) and to the east by the SE-NW aligned A182. To the south, the industrial estate is entirely bounded by a section of what is now the Consett and Sunderland Railway Path, this being a footpath and cycleway running along the former route of what was originally (at the time of its opening in 1834) part of the Stanhope and Tyne Railway. The land beyond the former railway line is occupied by a sprawl of housing forming the northern extent of the villages of Harraton and Rickleton.

2.2.3 The overall tyre factory site is roughly triangular in shape and *c.* 18 hectares in size, centred at NZ 2925 5452 (Figures 1 and 2). It is bounded to the west by the curving route of Vigo Lane, to the east by operational premises within the industrial estate, with the A195 and the former railway line to the north and south, respectively, as described above. At the time of the excavation the site had a steel security fence around its entire perimeter and was accessed at its western end, from Vigo Lane, where there were security gates/barriers at the entrance.

2.2.4 The derelict factory building dominated the northern half of the site at the time of the excavation. Orientated roughly east-west, it was an extensive structure - more than 450m in length - occupying a landscaped terrace. An access road skirted the majority of the building, with a branch running off to the south-eastern corner of the site to serve various utility sub-station. There were various areas of hardstanding, mostly surfaced with concrete, in the immediate vicinity of the building, as well as a large car park in the south-western portion of the site.

2.2.5 Most of the remainder of the site comprised scrubland, some of which was evidently tended as grassed lawns during the operational life of the factory. There were also areas covered by thick ground level vegetation and others with tree cover, particularly in the eastern half of the site and skirting much of the site perimeter fence. A distinct belt of woodland in the south-eastern portion of the site was of particular note, since this area, which had evidently escaped development in the modern era, is known to have been crossed by colliery waggonways in the late 18th-mid 19th century.

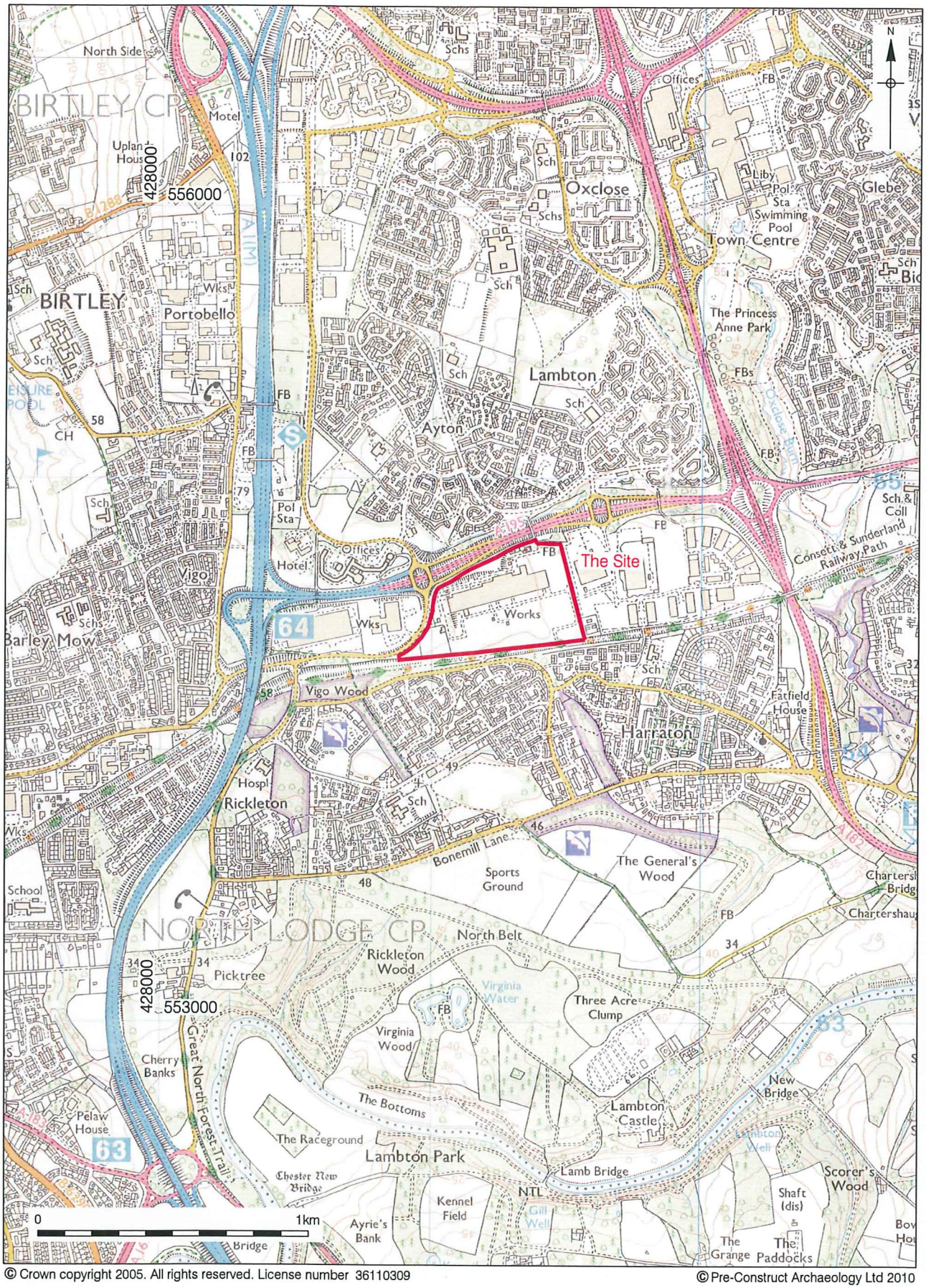


Figure 1
Site Location
1:20,000 at A4

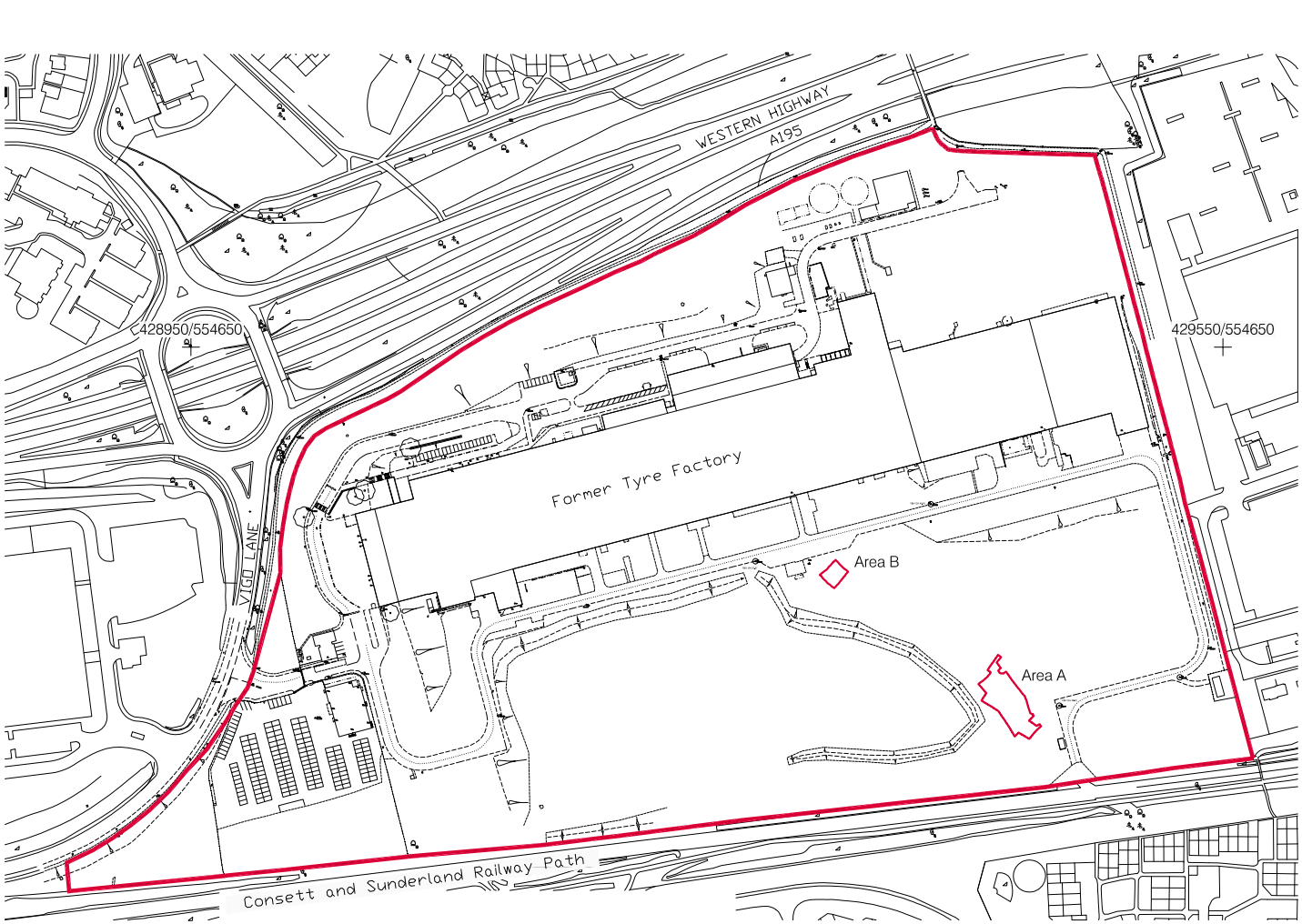


Figure 2
Areas of Investigation
1:4,000 at A4

2.3 Geology and Topography

2.3.1 The site lies within the eastern central portion of the Durham Coalfield, west of the late Permian age Magnesian Limestone escarpment that runs north-south through Sunderland. The solid geology of this lower lying ground below the Limestone outcrop comprises the Carboniferous Upper and Middle Coal Measures, consisting of a succession of mudstones, siltstones, sandstones and coals.[5]

2.3.2 Across much of the wider area, Coal Measures rocks are concealed beneath a mantle of superficial or drift deposits of Quaternary age. These largely comprise Boulder Clay, known locally in the Washington area as 'Pelaw Clay'. Boulder Clays are typically extensive, with an average thickness of 10m in most places. Relatively thick deposits of laminated clay can occur locally in buried valley locations, such as Birtley to the west of the site, where such deposits were extensively exploited for brick-making in the late post-medieval and early modern industrial eras.

2.3.3 The area of the site lies at *c.* 50m OD, with localised variations on the site itself, as described below. The main geographical feature in the wider area is the River Wear, which flows *c.* 2km to the south and 1.5km to the south-east of the site, carving a meandering path through Carboniferous rock and then, further east, through the Permian Magnesian Limestone towards its outlet at Sunderland.

2.3.4 At the time of the excavation, ground level across the site was variable, with significant landscaping evidently having been undertaken at the time of the construction of the industrial estate. The former factory building occupied an extensive terrace, at *c.* 51.0m OD, running roughly east-west across the northern central portion of the site. To the north and west, the ground rose, steeply at first, from this terrace, before almost levelling out towards the site boundaries. Ground level stood at *c.* 56.0m OD at both the northern and south-western boundaries of the site, while the north-western corner, at *c.* 58.0m OD, represented the highest area within the site.

2.3.5 The southern central portion of the site comprised an expanse of fairly level ground, with a slight fall away from west to east, from *c.* 51.0m OD to *c.* 50.0m OD. This area, then scrubland but probably tended grassland during the life of the factory, was surrounded by a low bund. This area was probably landscaped at the time of the construction of the factory. The lowest lying part of the site was the south-eastern portion, where ground level fell locally to *c.* 47m OD. This part of the site contained a defined belt of heavy woodland extending north-westwards toward the factory building and other areas of scrubland and heavier ground level vegetation. Within the overgrown areas, particularly the woodland, there were localised surface variations, in the form of depressions and raised mounds, some linear. The woodland belt was, as previously described, the part of the site of greatest archaeological interest.

[5] Geological Survey of Great Britain 1978.

2.4 Planning Background

2.4.1 In 2008 an outline planning application (reference 08/03879/OUT) was submitted to the Local Planning Authority (LPA), Sunderland City Council, for a re-development proposal for the Goodyear Dunlop tyre factory site. The proposal was to demolish the existing factory unit and ancillary buildings and re-develop the site for a mix of business and industrial uses, together with a hotel and associated catering outlets, car parking and landscaping.

2.4.2 Planning permission for the scheme was granted by the LPA in January 2009. A condition (No. 18) of planning permission was that an archaeological excavation must be undertaken at the site in accordance with a Specification provided by the Tyne and Wear Specialist Conservation Team, part of the Historic Environment Section of Newcastle City Council, the body which undertakes archaeological development control in the City of Sunderland. This condition was imposed as a result of the findings of two previous elements of archaeological work, as described below.

2.4.3 In 2008 an archaeological desk-based assessment (DBA) was compiled on the recommendation of the Tyne and Wear Specialist Conservation Team, in order to form a baseline consideration of the archaeological potential of the proposed re-development site. The requirement for this assessment was in line with *Planning Policy Guidance Note 16: 'Archaeology and Planning'* (PPG16)[6] which, at the time, provided advice concerning the safeguarding of archaeological remains within the planning process. In addition, the 1998 Unitary Development Plan[7] of Sunderland City Council contains the following policies related to archaeological remains:

> ***B11. THE CITY COUNCIL WILL PROMOTE MEASURES TO PROTECT THE ARCHAEOLOGICAL HERITAGE OF SUNDERLAND AND ENSURE THAT ANY REMAINS DISCOVERED WILL BE EITHER PHYSICALLY PRESERVED OR RECORDED.***
>
> ***B13. THE CITY COUNCIL WILL SEEK TO SAFEGUARD SITES OF LOCAL ARCHAEOLOGICAL SIGNIFICANCE. WHEN DEVELOPMENT AFFECTING SUCH IS ACCEPTABLE IN PRINCIPLE, THE COUNCIL WILL SEEK TO ENSURE MITIGATION OF DAMAGE THROUGH PRESERVATION OF THE REMAINS IN SITU AS A PREFERRED SOLUTION. WHERE THE PHYSICAL PRESERVATION OF REMAINS IN THE ORIGINAL SITUATION IS NOT FEASIBLE, EXCAVATION FOR THE PURPOSE OF RECORDING WILL BE REQUIRED.***
>
> ***B14. WHERE DEVELOPMENT PROPOSALS AFFECT SITES OF KNOWN OR POTENTIAL ARCHAEOLOGICAL IMPORTANCE, THE CITY COUNCIL WILL REQUIRE AN ARCHAEOLOGICAL ASSESSMENT/EVALUATION TO BE SUBMITTED AS PART OF THE PLANNING APPLICATION. PLANNING PERMISSION WILL NOT BE GRANTED WITHOUT ADEQUATE ASSESSMENT OF THE NATURE, EXTENT AND SIGNIFICANCE OF THE REMAINS PRESENT AND THE DEGREE TO WHICH THE PROPOSED DEVELOPMENT IS LIKELY TO AFFECT THEM.***
>
> ***B15. WHERE MAJOR DEVELOPMENTS INVOLVE LARGE SCALE GROUND DISTURBANCE IN CURRENTLY UNDEVELOPED AREAS, THE CITY COUNCIL WILL DETERMINE WHETHER, AND TO WHAT EXTENT, AN ARCHAEOLOGICAL ASSESSMENT IS REQUIRED.***
>
> ***B16. WHERE ANY HISTORIC SITES AND MONUMENTS ARE DISCOVERED PROVISION WILL BE MADE FOR AN APPROPRIATE LEVEL OF ASSESSMENT, RECORDING AND PRESERVATION (IN ADVANCE OF OR IF NECESSARY DURING CONSTRUCTION) COMMENSURATE WITH THE IMPORTANCE OF THE FIND.***

[6] Department of the Environment 1990.
[7] *The Planning Portal* website.

2.4.4 The DBA established that the site does not lie within one of the 14 conservation areas in the City of Sunderland (the nearest being Washington Village Conservation Area), and there are no scheduled monuments, listed buildings or historic parks and gardens within its boundaries or within its immediate vicinity. However, the DBA concluded that the site did have high potential for significant archaeological remains of the post-medieval and early modern industrial eras, particularly for the remains of late 18th-mid 19th century transport systems associate with outlying coal workings of Harraton Colliery.

2.4.5 As a result of this potential, an initial phase of archaeological fieldwork, an evaluation of the site by trail trenching, was conducted in December 2008. This work revealed the presence of significant archaeological remains at the site, including features associated with the construction and use of colliery waggonways. These routes were probably in use between the late 18th century and the mid-late 19th century, and were associated with coal workings of Harraton Outside, north of Harraton Colliery.

2.4.6 Therefore, in accordance with PPG16 and UDP Policies B11 and B16, as set out above, a second phase of archaeological fieldwork, namely the archaeological excavation herein described, was deemed necessary and a condition requiring this work was attached to outline planning permission for the re-development proposal, as previously described. The condition also required a report on the archaeological excavation to be submitted to and approved in writing by the LPA.

2.4.7 Planning permission also contained another condition (Number 17) requiring archaeological monitoring of construction groundworks to record items of archaeological interest and finds in the area of two former coal pits to the west of the excavation areas herein described.

2.4.8 Subsequent to the archaeological excavation herein described, a reserved matters application (reference no. 09/02281/REM) was submitted to the LPA for a proposal to construct a BAE Systems facility at the site and approval was granted for this application in August 2009.

2.5 Archaeological and Historical Background

The archaeological DBA of the re-development site undertaken in 2008 is the source of much of the following information and should be consulted for full details including documentary references and Tyne and Wear Historic Environment Record (HER) numbers. The research and writing of those responsible is gratefully acknowledged.

Prehistoric

2.5.1 There are no Tyne HER entries relating to any of the prehistoric eras for the site or within c. 1.5km. However, the discovery of prehistoric artefactual material in the surrounding areas, for example, in Birtley, broadly suggests some human occupation and exploitation of the wider area throughout prehistory.

Roman

2.5.2 There are no HER entries of the Roman period for the site and only one entry within *c.* 1.5km. This is a Romano-British brooch found *c.* 1km south-east of the site on a housing estate in Harraton in the mid 1960s.

Anglo-Saxon

2.5.3 No entries relating to Anglo-Saxon or early medieval activity are recorded in the HER within *c.* 1.5km of the site. Neither is there any documentary evidence to suggest settlement or exploitation of the land in the vicinity of the site during this era.

Medieval

2.5.4 There are no records in the HER for the medieval period at the site or within *c.* 1.5km. The name Washington may date to the Norman Conquest, potentially being of Norse origin. The earliest documentary reference to Washington village comes from the 'Boldon Buke' (*c*. 1183) when the 'vill', but not the church or its lands, was held by William de Hertburne. The church today is almost entirely 19th-20th century, although a potentially 12th century font survives within it. Bishop Hatfield's survey of 1382 indicates William of Washington held the manor, before it passed into the hands of the Blaykestons in the 15th century.

2.5.5 The Boldon Book gives brief mention to nearby settlements at Birtley and Penshaw and there is some documentary evidence to suggest that Birtley may have been producing coal since the mid 14th century. The village of Harraton – as part of the ancient manor of 'Harvertune' – was originally in the ownership of the Bishops of Durham, although Bishop Ranulf Flambard purportedly gave the estate to a family member sometime before his death in 1128 and eventually it came by marriage came into the possession of the Hedworth family. In 1599 the estate is recorded as being owned by Sir John Hedworth.

Post-medieval and Early Modern/Industrial

2.5.6 With regard to general settlement and agricultural activity, the HER contains no entries for the post-medieval period at the site or within *c.* 1.5km. The majority of the post-medieval HER entries within *c.* 1.5km are directly or closely related to early modern industrial era development in the south-western portion of what is now Washington. Two of these entries lie within the site, both being former waggonways branching from Fatfield Waggonway as described in detail below.

Harraton Colliery

2.5.7 Although the coal trade on the Wear did not begin to flourish until the middle of the 17th century, there were certainly workings in the Washington area before that. In fact, a colliery at Harraton may have been amongst the first to operate in the area, with a shaft possibly being sunk as early as *c.* 1590. Harraton Colliery lay to the south of the site, while the area in which the site itself was located was known as Harraton Outside Colliery or simply Harraton Outside and, on occasion, possibly Harraton Moor.

2.5.8 In 1603, a London merchant, Robert Bromley, leased Harraton Colliery for £300 per annum and that same year it reportedly had 6,000 chaldrons of coal available. The year 1605 saw Sir John Bourchier lease the colliery for £500 per annum on behalf of a group of London businessmen and by the 1630s it was reportedly contributing 6,000 tons of the total of 10,000 shipped annually from Wearside. An account of 1635 mentions Harraton Colliery as having '*divers Ingines, trammes, shouells'*.

2.5.9 Successive consortia of primarily local adventurers undoubtedly provided the driving force behind the pre-Civil War success of Harraton Colliery. After the Civil War, Harraton estate was divided into thirds, two being retained by another former army officer, Colonel John Jackson, who became the lessee of Harraton under Cromwell, the third comprising the dower of Dame Dorothy Hedworth, widow of John Hedworth, who then married the same Colonel Jackson in 1655. In 1696, the Harraton estate entered the ownership of the Lambton family through marriage.

2.5.10 The early post-medieval coal trade on the Wear was well-known for being patronised by both land-owning gentry and industrialists from Sunderland itself. By 1700, the port was very much renowned for its coal trade, much of it derived from workings in the Chester-le-Street/Washington area and brought down river to the port by shallow-draught keels. By 1728 there were eight collieries active along the Wear and Lambton was the furthest point up-river accessible by keel, even using the shallow-draught variety in use on the river.

2.5.11 There are other documentary records of Harraton Outside from the 18th century. Of particular note are two leases, one dated 1778, the other undated but probably also from the 1770s, containing details regarding coal workings and waggonways at Harraton Outside. This documentary evidence paints a vivid picture of the landscape in which the site was set in the late 18th century, an essentially rural landscape having elements of increasing industrialisation forced upon it. It also establishes definitively that waggonways were in use serving the coal workings at Harraton Outside by the 1770s.

2.5.12 The 1st Earl of Durham, John George Lambton had a lengthy tenure as owner of the Harraton estate from 1797 until his death in 1840. Throughout the 19th century, much of the land, including the collieries, was leased out by the Earls of Durham, the Lambton family. By the 1820s, Harraton Colliery was evidently operated by Messrs. Lamb and Co. and by the 1850s it was in the hands of Stobart, Bell and Co. As detailed further below, the Tithe map of 1847 records that all of the land within the boundary of the site, located in the area known as Harraton Outside, was owned by the Earl of Durham and under assorted occupancy. In 1896, Lord Lambton, who had gained control of the estate, sold many of its elements to Sir James Joicey. Harraton Colliery thus became part of The Lambton Collieries Limited, before becoming part of The Lambton and Hetton Collieries Limited in 1911, and then, in 1924, in its last private incarnation before nationalisation in 1947, it became part of The Lambton, Hetton and Joicey Collieries Limited, the largest colliery company in County Durham. Harraton Colliery was closed by 1964.

Colliery waggonways on Wearside and beyond

2.5.13 The existence of waggonways serving Harraton Outside in the 1770s has been discussed above and by the 1780s an extensive network was in place on Wearside. In the case of Harraton, the waggonways fed staithes at Fatfield on the Wear, which in turn provided a direct route to the Sunderland dock facilities, where colliers were loaded.

2.5.14 Colliery waggonways had their origin in the simple horse and cart, with wooden rails being laid down in the early 17th century to facilitate the movement of wheeled vehicles in overground colliery transport systems. In the North-East, the vehicles were initially known as 'wains', this word eventually being replaced by 'waggons'. The early systems were usually designed so that full waggons would travel under their own weight, on a gradual downhill incline, with horses pulling the empty vehicles uphill to the coal workings for reloading.

2.5.15 By 1797 the self-acting inclined plane was in operation at Benwell in Newcastle, this using the principle that the weight of a loaded waggon going downhill could be utilised to pull an empty waggon back uphill. Early rails were typically of oak, ash or birch, with sleepers between, with a variety of gauges in use. Early lines were single track, with a buffer zone to either side where lines passed through private property. The aforementioned 1778 lease for Harraton Outside provides precise instructions regarding maximum dimensions of this waggonway, *'14 yards in breadth only, including the gutters except where mounts, bridges or cuts are to be built wider as occasion requires'.* That document also details the importance of issues such as, for example: not allowing cattle to trespass on land through which the waggonways ran, although tenants were allowed to use the routes on foot, in carts, on horseback, and with cattle or sheep, and specifies that adjacent ground should not be damaged during waggonway construction.

2.5.16 Double-tracked lines were certainly in existence in the 18th century, although many remained single track, facilitating vehicular movement with a series of sidings and passing places. The waggons were also initially made entirely of wood, with a brake to regulate the downhill descent, while wooden axles were replaced by iron ones and from around the 1730s manufacturers started adding iron tyres, then iron spokes to wheels, before all cast-iron flanged wheels were eventually introduced.

2.5.17 Upgrade of waggonway rails was inevitable in the 18th century with metal strips or bars being fitted at first before all metal rails came into use. The precise date at which all metal rails were introduced is much argued, as is the location of this technological improvement. Usage of crude iron rails by Richard Reynolds in 1762 is much quoted, although some authors claim that iron rails were in use as early as 1716. The earliest form was almost certainly the 'L-section' rail since casting iron wheels or tyres with a flange initially proved difficult. William Jessop has been generally accepted as the inventor of the ancestor of the modern rail in 1789, although this too is disputed, this being the flat-topped 'edge' rail along which ran a flanged iron wheel. Jessop's rails were cast in three foot to six foot lengths with the centre of the rail of deeper section than the ends – the so-called 'fish-bellied' type of rail. Initially these were made with side plates cast onto the rail through which bolts secured the rail to wooden or stone sleepers. From the 1790s the rails were cast with no built-in feet or fixing holes, rather they were mounted in cast iron brackets called 'chairs' and, again, wooden sleepers remained in widespread use. Cast-iron fish-bellied rails were widely used on light waggonways throughout the country from the late 18th century and in fact remained in use in some remote locations up to the 1940s, mainly carrying horse-drawn or manually pushed light mineral waggons.

2.5.18 In the North-East specifically, it is documented that two-foot long malleable iron rails were first used at Walbottle Colliery, Newcastle in 1794. A survey of 1810 noted that although 'traditional' wooden waggonways remained in extensive use in the Tyneside area, replacement of wooden rails with metal ones was taking place on most routes.

2.5.19 To date there has been only a handful of examples of detailed archaeological investigation of former colliery waggonways, two of which in Tyne and Wear - both of likely late 18th century date - have led to published papers, underlining the significance of these structures in terms of post-medieval and early modern industrial archaeology. The first reported on an excavation at Lambton D Pit in 1995, which uncovered the substantial and well preserved remains of a timber waggonway, dating from *c.* 1780-90.[8] The second reported the findings of an excavation in 2002 at Rainton Bridge, near Houghton le Spring, which revealed a waggonway that could pre-date the example at Lambton D Pit.[9] Although timber preservation was poor in this case, the excavation was able to determine the rail gauge, and identify a series of re-cut ditches and fencelines that would have demarcated the surrounding wayleave.

2.5.20 These previous pieces of archaeological work have largely confirmed theories regarding general construction of late 18th century waggonways, in that initial groundworks involved laying down linear banks of ballast, often small-coal and ash, upon which wooden sleepers were placed and to provide gradients as required. Wooden rails were then laid down and pegged into place, before a further layer of fine ballast was deposited on and around the sleepers as protection. Further ballast could be added to raise or effectively conceal the rails, with provision sometimes made for a path and, more usually, drainage gutters either side.

Summary of historic map evidence for Harraton

2.5.21 Gibson's map of 1788 shows the main colliery elements of the Washington/Harraton area sometime ahead of the introduction of the railways proper. The waggonways are depicted as terminating at staithes at Fatfield on the Wear and run in from various workings to the north-west and west. One of the lines, skirting the village of Pelaw in the west and running roughly west-east into Fatfield is certainly 'Beamish Old Waggon Way' becoming 'Harraton Waggon Way' to the east, as these appear on the Ordnance Survey 1st edition map, whilst other lines are less easy to identify.

2.5.22 A map of 1839 by Hobson shows the line of the Stanhope and Tyne Railway running through the general area, as well as Fatfield Staith, with various waggonway branches running into the staithes from the north-west and west. A waggonway north of Nova Scotia and on the line of the aforementioned railway could represent abandoned waggonways shown on the Ordnance Survey 1st edition map.

[8] Ayris *et al.* 1998.
[9] Glover 2005.

2.5.23 Bell's coalfield map of 1843 shows the Stanhope and Tyne Railway with Harraton Colliery to the south, along with various pits associated with Harraton Outside. South-east of the former factory site, Fatfield Waggonway branches from Harraton Waggonway and, running to the north-west, enters the site close to its south-eastern corner before branching into two. The first branch runs north-west, passing Hall Pit. before terminating, south of Portobello, at an unnamed pit. The second branch runs NNW before dividing again just inside the boundary of the site, one branch continuing to the north-east to Judith Pit, the other dividing again, to the north of the site, this time into three branches, to feed Noel Pit, Boundary Pit and Ayton Pit. Anna Bella Pit and Engine Pit are not shown, despite documentary evidence suggesting that both were sunk before this date.

2.5.24 At the time of the drawing up of the Tithe maps in the mid 19th century, the site lay within Harraton township in the parish of Chester-le-Street in County Durham. None of the pits or waggonways within or in the immediate vicinity of the study site is named on either the 1847 Tithe map of Harraton or the accompanying apportionment. On the Tithe map, Fatfield Waggonway enters the site towards its the south-eastern corner and then immediately divides into three branches, the first two of which correlate with those shown on Bell's map. The first branch runs to the north-west, past Hall Pit and onto the aforementioned unnamed pit south of 'Porto Bello'. The second branch is the waggonway running in a NNW direction and which itself sub-divides to send a branch to feed Engine Pit and Judith Pit, a branch to feed Noel Pit and a third branch to feed Ayton Pit, this route continuing to the north-west, to Boundary Pit.

2.5.25 The third waggonway branch lies midway between the two branches and effectively continues the line of Fatfield Waggonway. It serves Anna Bella Pit, terminating in three short branches towards the pit head. The HER shows this route turning to the north-east and running to Ayton Pit, probably based on detail shown on the Ordnance Survey 1st edition map, which is supported to some degree by a dotted line on the Tithe map. Anna Bella Pit was possibly named after Annabella Milbanke, as detailed in the DBA. Since this person was born in 1792 – and assuming that the working was not renamed at any stage – it can be presumed that this pit was sunk on or after that year.

2.5.26 On the 1847 Tithe map, the remainder of the site is arable land, with a small plantation towards the north-eastern corner. The smallest land parcel at the site – this being a triangular plantation adjacent to the northern site boundary – survived, presumably unchanged, until the creation of the Wear Industrial Estate in the late 1960s, as evidenced by its presence on the Ordnance Survey map series until 1967. Just beyond the site, the land parcel in which Engine Pit is situated is described as 'waggonway and waste' in the apportionment. The Stanhope and Tyne Railway is annotated on the Tithe map simply as 'Stanhope Railway', although it had been renamed before 1847.

2.5.27 Oliver's map of 1851 is of note in that it shows two other pits, 'Milbank' and 'Thorold', south-east of Hall Pit and north of the railway and thus, potentially, within the southern central portion of the site. Rush Pit, which lay to the east of the site, is annotated as '10th' and another working, 'Melburn', is depicted just to the north. It is possible that this map reflects an earlier account of operational pits since none of Melburn, Milbank or Thorold pits evidently survived into the mid 19th century, even to appear as 'old' shafts on the Ordnance Survey 1st edition map. Thus the precise locations of these former workings are uncertain.

2.5.28 The Ordnance Survey 1st edition map shows the site and the wider area in detail. The waggonways serving Judith, Anna Bella and Ayton Pits are each annotated as 'Old Wagon Way', probably indicating that they were out of use. In the southern central portion of the site, an area of woodland shown between two of the branch waggonways is probably the area of woodland that survives on site, although the existing woodland is much expanded due to planting in the modern era.

2.5.29 Fatfield Waggonway itself, to the south of what was by then the Pontop and South Shields branch of the North Eastern Railway (NER), is shown with the symbol for railway, indicating that this route had been upgraded. The branch waggonway serving Noel Pit and the waggonway serving Hall Pit were both probably out of use by then. South of the NER, the 1st edition map shows the main complex of Harraton Colliery, with a number of associated pits in the immediate vicinity, but all beyond the site. Ancillary industries are indicated by other features on the 1st edition, such as brick fields, ponds and ovens at the Harraton Colliery complex, along with a forge adjacent to Hall Pit.

2.5.30 By the time of the Ordnance Survey 2nd edition map of 1896, the majority of the outlying workings of Harraton Colliery were disused, including those of relevance to the site, namely Hall Pit, Engine Pit, Rash (formerly Rush) Pit, Anna Bella Pit, Ayton Pit, Noel Pit and Judith Pit. The waggonways serving these workings, along with the portion of Fatfield Waggonway entering the site, were also clearly abandoned. The south-easternmost portion of the waggonway branch that served Hall Pit had evidently been obliterated entirely from the landscape, while the other former waggonway routes are depicted as simple roads, tracks or pathways, some with embanked sections.

2.5.31 The Ordnance Survey 3rd edition map of 1921 showed little change within the site from the previous edition. The area of woodland between the trackways marking the former waggonway routes has the annotation 'Rises'. To the south, Harraton Colliery still dominates the landscape, although the associated brick field was evidently no longer operational. The branch railway linking Harraton Colliery into the NER at the southern boundary of the site remains annotated as a 'wagonway'.

2.5.32 Therefore, documentary, and particularly cartographic, evidence indicated that three former colliery waggonways – all running broadly from SE-NW – crossed the overall re-development site. The belt of thick woodland in the southern central portion of the site at the time of the excavation probably had its origins in the 19th century and this area, having avoided subsequent development of the site. The woodland was thought to contain - as sub-surface remains - sections of a waggonway that fed Anna Bella Pit to the north-west and a branching waggonway that fed Ayton, Noel, Judith and Engine Pits to the north. The line of a third former waggonway crossed an area of scrubland to the south of the tyre factory building; running on a WNW alignment, it served Hall Pit. All the waggonways at the site probably originated in the late 18th century and all were probably out of use by the mid-late 19th century.

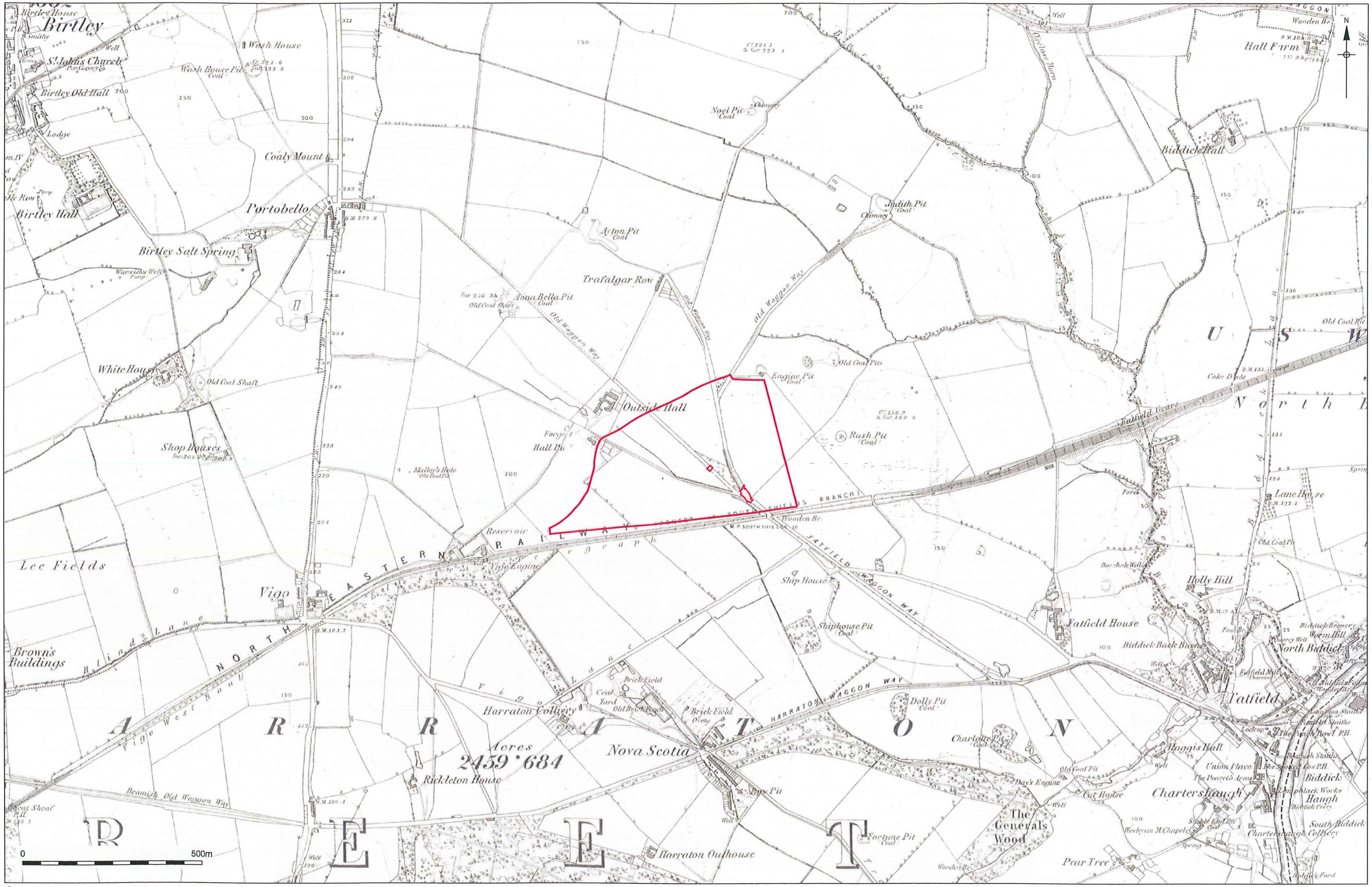


Figure 3
Areas of Investigation on Ordnance Survey 1st edition basemap
1:10,000 at A3

3. AIMS AND OBJECTIVES

3.1 Project Aims

3.1.1 The archaeological project was 'threat-led' with the re-development scheme having potential to disturb or destroy important sub-surface archaeological remains of the late post-medieval and early modern industrial eras, specifically evidence of Fatfield Waggonway and various branch routes which served workings in the area known as Harraton Outside, to the north of Harraton Colliery. These waggonway routes were suspected as being operational between the late 18th century and the mid 19th century. The broad aim of the excavation was thus to preserve archaeological remains by record, specifically those associated with the former colliery waggonways known to have crossed the site.

3.1.2 Open area excavations were undertaken at two locations (Areas A and B), based on the results of the earlier evaluation (Figure 2), Area A was the larger of the two areas, *c.* 715 m^2, in size, and was sited at the southern end of a belt of woodland to further investigate archaeological remains found in evaluation Trench 4. Its purpose was to expose a portion of the route of Fatfield Waggonway to the north of the point at which the waggonway entered the site along its southern boundary, running to the north-west, and taking in the area where the route was suspected as having divided into three branch routes to serve workings of Harraton Outside. Area B, *c.* 100m to the north-west and at the northern edge of the belt of woodland, was less extensive, *c.* 135 m^2 in size, and was sited to further investigate remains found in evaluation Trench 2. Its purpose was to expose a portion of the central of the three branch routes, which effectively continued the north-westwards line of Fatfield Waggonway serving Anna Bella Pit.

3.1.3 Additional aims of the project were:

- to prepare an Assessment Report which sets out an assessment of the nature and significance of all categories of collected data (stratigraphic, artefactual, biological, *etc.*) and, as appropriate, to compile a final publication report on the findings;
- to prepare and submit a suitable Site Archive, consisting of all site and project documentary and photographic records, as well as all artefactual and biological material recovered during the work and retained as part of the archive, to an appropriate repository.

3.2 Research Objectives

3.2.1 *Shared Visions: The North-East Regional Research Framework for the Historic Environment* (NERRF)[10] is a document that highlights the importance of research as a vital element of development-led archaeological work. In setting out key research priorities for all periods of the past, NERRF allows archaeological projects to be related to wider regional and national priorities for the study of archaeology and the historic environment.

[10] Petts and Gerrard 2006.

3.2.2 The relevant key research themes of NERRF for the archaeological project herein described are:

PM1. **Early coal industry and coal use:**

To ensure improved targeting of archaeological evaluation there should be a survey of documentary evidence and cartographical evidence for early mining in order to identify precise locations.

Development controlled commissioned fieldwork should also be aware of the potential for the buried remains of colliery buildings on later sites.

Sub-surface mine workings may survive. These may be revealed by modern deep ground disturbances in advance of other surface developments. It is essential that appropriate archaeological monitoring processes be put in place to record such remains.

PM2. Early railways:

Ongoing research needs to recognise the role of the North East in the development of the early railways, with several key areas of investigation having been identified.

Investigations should focus on the early waggonways and pre-locomotive hauled lines, whilst also recognising the potential archaeological importance of terminal, and specifically the development of coal staithes. Existing landscape features along the course of known early waggonways require survey, which if possible, should include railway formations, track beds and gradients.

The routes of early railways should be plotted on the HERs of the region, through archival research on early documentary and cartographic sources.

3.2.3 Therefore, given the findings of the earlier archaeological DBA and evaluation, the specific research objectives for the project were:

- to examine in detail through archaeological excavation and survey the waggonway and pre-locomotive routes at the site, with particular emphasis on technological and constructional aspects of the routes, including railway formations, track beds and gradients;
- to elucidate, where possible, the sequence of construction and development of the waggonway and pre-locomotive routes at the site through time.

4. ARCHAEOLOGICAL METHODOLOGY

4.1 Fieldwork

4.1.1 The archaeological excavation was undertaken in accordance with the aforementioned Specification provided by the Tyne and Wear Specialist Conservation Team (Appendix 3 to this report) and the relevant standard and guidance document[11] of the Institute for Archaeologists (IfA). PCA is an IfA-Registered Organisation. The methodologies employed during the fieldwork element of the project are summarised below.

4.1.2 Open area archaeological excavation was undertaken at two locations (Areas A and B) (Figure 2). Area A, the larger of the two areas, was broadly rectangular, measuring (in its final, extended, form) up to *c.* 43m NW-SE x up to *c.* 22m NE-SW (*c.* 715 m^2 in area); it was sited towards the south-eastern corner of the site to further investigate archaeological remains found in evaluation Trench 4. Area B, *c.* 100m to the north-west, was less extensive, sub-square in shape and measuring *c.* 10.5m NW-SE x *c.* 12.5m NE-SW (*c.* 135 m^2 in area); it was sited to further investigate remains found in evaluation Trench 2.

4.1.3 The open areas were initially located using a Leica TC407R Total Station. Overburden and archaeologically insignificant material was gradually removed across each area by machine, in spits of approximately 100mm thickness, down to the first archaeologically significant horizon. The machine used was a *c.* 13-tonne tracked 360^o excavator utilising a wide-blade, ditching bucket. Spoil was removed from the working area using a *c.* 6-tonne wheeled 'dumper' truck and mounded away from the open areas at designated 'spoil heaps'. All machine excavation was undertaken under the direct supervision of the supervising archaeologist.

4.1.4 After initial cleaning and recording of the archaeological remains in Area A, this area was subsequently extended to the south. This was a contingency arrangement, undertaken with the agreement of the Tyne and Wear Specialist Conservation Team, with the purpose of further exposing the well-preserved archaeological remains of the late post-medieval waggonway extending south-eastwards from the original extent of Area A. The extension to Area A measured *c.* 9m NE-SW x *c.* 7m NW-SE.

4.1.5 Archaeological excavation and recording was undertaken in accordance with recognised archaeological practice and following the methodologies set out in PCA's *Field Recording Manual*.[12] Following machine clearance of overburden, the sections and the base of each open area were cleaned using appropriate hand tools.

4.1.6 The remains exposed across each open area were planned at scales of 1:50 or 1:20, as appropriate. The 'single context planning' system was used, as appropriate. A series of 'investigative slots' (Slot 1-5*)* were excavated by hand at right angles to and across the line of the main waggonway routes to investigate the stratigraphy in detail. The slots were sited at locations designed to provide the most archaeological information and all ran on or close to an SW-NE alignment (Figure 2).

[11] IfA 2008.
[12] PCA 1999.

4.1.7 Slot 1, at the southern limit of the excavation of the extended Area A was *c.* 7m in length and *c.* 1.0m wide. Approximately 8.50m to the north was Slot 2, *c.* 15.50m in length and *c.* 1.0m wide. Approximately 6.50m to the north was Slot 3, *c.* 16m in length and up to *c.* 2.25m wide, this taking in part of evaluation Trench 4. Approximately 11m to the north was Slot 4, *c.* 8m in length and *c.* 1.0m wide. Approximately 8.50m to the north, at the northern limit of excavation of Area A, was Slot 5, *c.* 10.75m in length and *c.* 1.0m wide. Each slot was extended to the maximum depth permissible under Health and Safety guidelines.

4.1.8 In general throughout the fieldwork, archaeological features and deposits were recorded on the PCA *pro forma* 'Context Recording Sheet', timbers were recorded on the *pro forma* 'Timber Recording Sheet' and surviving masonry was recorded on the *pro forma* 'Masonry Recording Sheet'. Sections were drawn at scales of 1:20 or 1:10. All drawings were located relative to a site grid, installed using a Total Station.

4.1.9 A photographic record of the investigations was compiled using SLR and digital cameras illustrating in both detail and general context the principal features and finds discovered. SLR photography comprised black and white prints and colour transparencies (on 35mm film). The photographic record also included 'working shots' to illustrate more generally the nature of the archaeological operation mounted. All photographs included a graduated metric scale. The photographic record forms part of the Site Archive.

4.1.10 Two Temporary Bench Marks (TBMs) were installed using existing survey data. TBM 1, used for Area A, had a value of 48.52m OD. TBM 2, used for Area B, had a value of 50.57m OD. The height of all principal strata and features were calculated relative to Ordnance Datum and indicated on the appropriate plans and sections.

4.2 Post-excavation

4.2.1 The stratigraphic data generated by the project is represented by the written, drawn and photographic records. A total of 788 archaeological contexts were defined during the excavation (Appendix A). Post-excavation work involved checking and collating site records, grouping contexts and phasing the stratigraphic data. A written summary of the archaeological sequence was then compiled, as described below in Section 5.

4.2.2 Artefactual material recovered from the excavation comprised assemblages of pottery, ceramic building material, clay tobacco pipe, glass and stone. Where appropriate, preliminary conservation and stabilisation was undertaken on completion of the fieldwork in accordance with guidelines set out in *First Aid for Finds*[13] and *Guidelines No. 2. Packaging and storage of freshly excavated artefacts from archaeological sites.*[14]

[13] Watkinson and Neal 2001.
[14] UKIC, Archaeology Section 1983.

4.2.3 Biological material recovered from the excavation comprised a group of twenty timbers, all collected from the waggonway remains in Area A and representing four rails, fifteen sleepers and one other timber. Preliminary conservation and stabilisation was undertaken on completion of the fieldwork in accordance with guidelines set out in *Waterlogged wood. Guidelines on the recording, sampling, conservation and curation of waterlogged wood.*[15] Off-site, all the timbers were cleaned, drawn to scale, photographed and assessed. Samples of nine of the timbers were selected for specialist identification of species and assessment of their potential for dendrochronological dating.

4.2.4 The palaeoenvironmental sampling strategy of the project was to recover bulk soil samples where appropriate, from well-dated (where possible), stratified deposits covering the main periods or phases of occupation and the range of feature types represented, with specific reference to the objectives of the excavation. To this end, no appropriate deposits were encountered and therefore no bulk soil samples were recovered.

4.2.5 The complete Site Archive will be packaged for long term curation. It will include all written, drawn and photographic records, including all material generated electronically during post-excavation. Artefactual and biological material will be retained as appropriate, following specialist recommendations.

4.2.6 In preparing the Site Archive for deposition, all relevant standards and guidelines documents referenced in the Archaeological Archives Forum guidelines document[16] will be adhered to, in particular two well-established United Kingdom Institute for Conservation (UKIC), Archaeology Section documents[17] and a forthcoming IfA publication.[18] The depositional requirements of the receiving body, in this case Tyne and Wear Museums and Archives Arbeia, South Shields, will be met in full. The depositional requirements of Tyne and Wear Museums and Archives will be met in full.

[15] English Heritage 1996.
[16] Brown 2007.
[17] UKIC, Archaeology Section 1984 and 1990.
[18] IfA forthcoming.

5. RESULTS: THE ARCHAEOLOGICAL SEQUENCE

During the excavation, separate stratigraphic entities were assigned unique and individual 'context' numbers, which are indicated in the following text as, for example [123]. The archaeological sequence in each open area is described separately, although all contexts have been assigned to broad phases on a site-wide basis. Interpretation has been added to the data, where possible, and the phases have been correlated with recognised historical and geological periods, again where possible. All features recorded in plan in Area A are shown collectively on Figure 4.

Precise alignments of waggonways and where appropriate other linear features are discussed within this section. For the most part, however, directions and alignments of waggonways and where appropriate other linear features in Areas A and B are generally simplified, to just the four cardinal points.

5.1 Area A: Phase 1 - Natural Sub-stratum

5.1.1 A layer, [103], of firm, light to mid yellowish orange silty clay with occasional flecks of degraded sandstone, was exposed in plan for a distance of *c*. 4.50m adjacent to the northernmost limit of excavation in Area A. This material was considered to be undisturbed natural Boulder Clay, representing the drift geology of the area. At this location the deposit was recorded at a maximum height of 48.20m OD (Figure 10, Section 1). The same material was recorded to the south as the basal deposit in Slot 5 (Figure 10, Section 1).

5.1.2 To the south, in Slot 4, an identical clayey deposit, [606], was exposed for a distance of *c.* 5.0m as the basal deposit (Figure 11, Section 5). It was at least 0.40m thick and was recorded at a maximum height of 47.90m OD.

5.1.3 The only other locations in Area A where natural Boulder Clay was encountered were in the eastern portions of Slots 3 and 2. In Slot 3b, the material, again recorded as layer [103], was recorded at a maximum height of 47.72m OD (Figure 12, Section 7). In Slot 2, an identical deposit, layer [625], was recorded at a maximum height of 47.22m OD (Figure 13, Section 9).

5.1.4 Overall, therefore, the maximum recorded heights on natural Boulder Clay in Area A represent a fall in height of *c.* 1m over a distance of *c.* 37.50m from north to south. This likely partly reflects the natural slope of the ground, but may also reflect some degree of horizontal truncation in the southern part of the site, below later stratigraphy.

5.2 Area A: Phase 2 - Undated Palaeosol

5.2.1 Two very similar, light yellowish brown silty sand deposits, [116] and [649], were recorded in at the northern extent of Area A, overlying the natural Boulder Clay, (Figure 10, Sections 1 and 3). Deposit [116], recorded for a maximum distance of *c.* 1.50m, was up to 0.27m thick and was recorded at a maximum height of 48.38m OD. A small area of this deposit was exposed further to the south, where it reached a maximum height of 48.12m OD. (Figure 12, Section 6).

5.2.2 Deposit [649] was recorded for a maximum distance of *c.* 2.0m in Slot 5, likely truncated by later activity to the west. It had a maximum thickness of 0.23m and was recorded at a maximum height of 48.26m OD.

5.2.3 These very similar sterile deposits have been interpreted as the remains of a palaeosol, which developed above the natural Boulder Clay. The material is of uncertain period of origin but almost certainly pre-dates all late post-medieval activity recorded on the site, as described below.

5.3 Area A: Phase 3 - Late Post-Medieval Waggonway Construction and Use

5.3.1 In Area A, Phase 3 has been subdivided into four sub-phases comprising:

- Phase 3a, the two earliest closely associated timber waggonways, [480] and [760];
- Phase 3b, two subsequent, differently aligned, and again closely associated timber waggonways, [130] and [360];
- Phase 3c, two final timber waggonways, [180] and [97], which likely merged;
- Phase 3d, a waggonway, [470], which likely saw the introduction of iron rails.

5.4 Area A: Phase 3a – the Earliest Timber Waggonways (Figure 5)

5.4.1 The remains of probably the earliest timber waggonway, [480], to be encountered at the site were recorded in the southernmost part of Area A, with the route running on a WNW-ESE alignment (Figure 5). The earliest elements of the waggonway comprised a series of clay dumps – evidently redeposited natural Boulder Clay - mounded to create a substantial raised embankment.

5.4.2 The most extensive section of this embankment was recorded in Slot 2, towards the southern end of Area A (Figure 13, Section 9). Three clay dump layers were recorded, the earliest of which, layer [633], comprised compact, mid orange brown clay. This extended *c*. 6m in section, continuing beyond the limit of excavation to the west, and had a maximum thickness of *c*. 0.55m, continuing below the basal limit of excavation. It was overlain by layer, [632], of firm, mid grey clay, from which five sherds of pottery, all dating to the late medieval period, were recovered. This layer was up to 0.45m thick and extended *c.* 6.80m in section, continuing beyond the limit of excavation to the west. A further dump layer, [631], comprising firm, mid brownish orange clay containing a lens of crushed coal, formed the uppermost element of the embankment deposit at this location. This layer extended *c.* 6.50m in section, continuing beyond the limit of excavation to the west, and was up to 0.85m thick.

5.4.3 Therefore, the embankment of waggonway [480], as recorded in Slot 2, was at least *c*. 6.80m wide in total, continuing to the west beyond the limit of excavation. Its upper part was *c.* 4.0m wide, probably truncated to the west. Its maximum recorded thickness was *c*. 1.40m, but it was not possible to ascertain the full thickness of the embankment deposits as excavation at the western end of Slot 2 had to be curtailed due to Health and Safety considerations.

5.4.4 Elements of the embankment for waggonway [480] were also recorded in Slots 1 and 3a. In Slot 1, two dumped clay deposits, [564] and [563], formed part of the embankment, these extending in section for *c*. 5.0m, continuing beyond the limits of excavation to the east and west (Figure 14, Section 11). The combined maximum recorded thickness of the deposits was *c*. 0.85m, but again the full embankment thickness could not be ascertained due to Health and Safety considerations. Two clay tobacco pipe stems of probable 17th century origin were recovered from dump deposit [564]. Deposit [563] was also recorded in section at the southern limit of excavation in Area A, prior to the extension to that area (Figure 14, Section 10).

5.4.5 In Slot 3a, only the easternmost portion of the embankment of waggonway [480] was exposed towards the western limit of excavation (Figure 13, Section 8). The mounded redeposited Boulder Clay deposits, [584] and [583], extended *c*. 2.70m in section, continuing beyond the limit of excavation to the west. Their combined maximum recorded thickness of *c.* 1.20m was again not the full thickness of the embankment, as further excavation could not be undertaken due to Health and Safety considerations.

5.4.6 From the recorded evidence in Slots 1, 2 and 3a, it appears that the upper surface of the embankment for waggonway [480] sloped down from 48.45m OD in the north to 48.00m OD in the south, this fall achieved over a distance of *c.* 17m, giving a *c.* 2.6% gradient.

5.4.7 A single trackbed for waggonway [480] had been cut into the clay embankment as described. This feature was recorded as trackbed [561] in Slot 1 (Figure 14, Section 11), trackbed [644] in Slot 2 (Figure 13, Section 9) and, at the initial southern limit of excavation of Area A, as trackbed [63] (Figure 14, Section 10). The trackbed was not revealed in Slot 3 as it lay beyond the western limit of excavation. In general the trackbed was up to *c.* 1.80m wide. Its base and edges were very uneven due to the impressions of timbers from the overlying tracks and, overall, the trackbed had an average depth of *c.* 0.15m. In Slot 1 the trackbed was filled with compact, mid brownish grey clayey sand, [560], with fragmented sandstone throughout.

5.4.8 In total, therefore, a length of *c.* 17m of waggonway [480] was exposed, aligned NW-SE and continuing beyond the limits of excavation in both directions (Plate 1). Only two timbers from the waggonway track survived, timbers [472] (Figure 5) and [559] (Figure 14, Section 11), both exposed close to or at the southernmost limit of excavation in Area A. In addition, however, the impressions of 27 sleepers, [473]-[479], [481]-[490], [558], [763]-[767], [785]-[786] and [791]-[792], were recorded along the trackbed. These impressions ranged in size and shape from 0.65m to 2.10m long, from 0.10m to 0.40m wide and from 80mm to 0.28m deep. The distance between sleeper impressions varied between 0.10m to 1.60m. The general irregularity of the impressions and the compaction of the overlying material made it unclear as to whether the sleeper timbers had been removed on disuse or left to rot *in situ*. The northernmost sleeper impression, [767], was recorded at a maximum height of 48.37m OD while timber [472], *c.* 15m to the south, was recorded at a maximum height of 47.98m OD, confirming a *c.* 2.6% gradient along this portion of the waggonway, as indicated by the embankment material.

5.4.9 The aforementioned two surviving sleepers were both in a poor state of preservation. Of the two, timber [472], this *c.* 1.30m long, survived in better condition. A very knotty branch had been used for this sleeper, identified as from an oak tree (see Section 8). No tool marks or fixing holes were evident on the timber and it had evidently been utilised in its crudest, unworked form as part of the waggonway track. Sleeper [559] was recorded in section but not recovered, due to its extremely poor state of preservation.

5.4.10 Accompanying the sleeper impressions were the impressions of the waggonway rails, with no timber surviving at any point in these impressions. On the western side of the track, the rail impressions were features [648] (south of Slot 2) and [768] (between Slots 2 and 3a), while the eastern rail impression was feature [769] (between Slots 2 and 3a). At the north-western extent of waggonway [480], rail impressions [768] and [769] lay *c.* 1.50m apart, giving the waggonway a gauge of *c.* 5 feet. These impressions were 0.10m-0.15m wide. To the south, rail impression, [648], was 0.10m wide.

5.4.11 In the southern extension to Area A, another section of waggonway - group [760] – was recorded (Figure 5). This was located on the eastern side of waggonway [480], with the two routes evidently merging and thus likely in use contemporaneously. Waggonway [760] was exposed for a length of *c.* 6m running WNW-ESE and with all of its elements seemingly having been removed by later activity by the southern limit of excavation. Its trackbed, [702], comprised compact silt and crushed coal, with frequent patches of silty clay. This petered out close to the southern limit of excavation, likely removed by later waggonway development.

5.4.12 The track of waggonway [760] was represented by five timber sleepers, [676], [679], [681], [689] and [692], all badly degraded and fragmented, twelve sleeper impressions, [677], [678], [680], [682], [684], [690], [691], [693], [695], [697], [698] and [762]. The sleepers were on average *c.* 0.50m apart and the surviving straight lengths of timber were up to *c.* 1.25m long and up to *c.* 0.17m wide. The sleeper impressions varied in depth form from 40mm to 0.10m. Most of the impressions appeared as voids, with fills recorded in just three, the dark grey silt and crushed coal deposits, [683], [694] and [696], likely derived from overlying material. The situation of the three north-westernmost sleeper impressions, [695], [697], [698], was crucial to the interpretation that the two waggonways merged at this location.

5.4.13 No evidence for the rails of waggonway [760] was recorded. The northernmost sleeper impression, [698], was recorded at a maximum height of 48.18m OD, while the maximum height recorded on sleeper [676], *c.* 5.80m to the south and close to the southern limit of excavation, was 48.08m OD. Again this indicates a fall in height to the south along this portion of the waggonway, with a *c.* 1.70% gradient estimated.

5.4.14 Due to later development of the waggonway routes, very little evidence survived of trackside ditches/gullies associated with the Phase 3a waggonways. A possible trackside gully, [582], was recorded on the eastern side of the embankment for waggonway [480] in Slot 3a (Figure 13, Section 8). This was a U-shaped feature in profile, *c.* 0.25m wide by 0.12m deep, and was filled by firm, blackish brown silty clay, [581]. To the east was a 0.13m thick deposit, [580], comprising dark bluish grey silty clay, this likely representing a silting deposit that had accumulated on the eastern side of the embankment.

5.4.15 Deposit [580] and the possible trackside gully were overlain by a c. 0.15m thick deposit, [579], comprising crushed coal and clay, which continued down the sloping side of the embankment. This probably represents material derived from the trackbed or colliery traffic whilst waggonway [480] was in use. Similar deposits, [630], in Slot 2 (Figure 13 Section 9) and [562] in Slot 1 (Figure 14, Section 11), correspond to deposit [579].

5.4.16 Very tentative evidence for part of another possible early waggonway was recorded at the north-eastern limit of Area A (Figure 5 and Figure 10, Section 1). Cutting into the natural sub-stratum was a 0.20m wide and 0.10m deep feature, [119], aligned NW-SE and recorded at a maximum height of 45.21m OD. Recorded in plan for a distance of 0.50m, this was potentially the remains of a boundary delineation for the wayleave corridor of a waggonway, although on the basis of such limited evidence this is far from certain.

5.4.17 Feature [119] was filled by an overlying layer, [118], consisting of firm, brown sandy silt. This extended *c.* 2.35m in section, continuing beyond the limit of excavation to the east, and was at least 0.20m thick. In turn, it was overlain by a thin layer, [117], comprising firm, grey silt with frequent fragments of coal throughout. This extended 2.30m in section, continuing to the east, and was 30mm thick, recorded at a maximum height of 48.39m OD. Due to the limited extent to which these remains were exposed, any interpretation remains inconclusive.

5.5 Area A: Phase 3b - the Second Timber Waggonways (Figure 6)

5.5.1 Two timber waggonways, [130] and [360], comprise the main elements of Phase 3b, with the excavated evidence indicating that these post-dated the Phase 3a waggonways. Waggonway [130] was traced across the full extent of Area A on a slightly more northerly orientation (NW-SE) than the Phase 3a routes (Plates 2-4). On the western side of waggonway [130] was waggonway [360] (Plates 5 and 6), with the two routes merging in the northern part of Area A and thus likely in use contemporaneously.

5.5.2 The most extensive segment of embankment for waggonway [130] was recorded in the northern part of Area A, in Slot 4 (Figure 11, Section 5). A series deposits, [605], [607], [604], [600], [599], [597], [609] and [608], formed the embankment for the merged waggonways at this location, the feature having an overall width of 7.70m, continuing to the west beyond the limit of excavation. To the east, the embankment deposits overlay natural Boulder Clay, while, to the west, it was not possible to fully excavate the deposits due to Health and Safety considerations. The maximum recorded thickness of the embankment material was 1.10m. All these deposits, with the exception of layer [600], essentially comprised re-deposited natural clay, with varying quantities of coal fragments throughout. Layer [600] comprised dark grey clayey silt. Deposit [597] produced a single sherd of pottery, this probably dating to the 18th century.

5.5.3 In Slot 5, at the northern limit of excavation, the embankment for waggonway [130] comprised a series of deposits, [102], [616], [615] and [96] (Figure 10, Section 3). These deposits, which overlay natural Boulder Clay, had a combined thickness of 0.70m, forming the easternmost portion of the embankment at this location. The deposits extended *c.* 2.50m in section, continuing beyond the limit of excavation to the west. Dump [96] corresponded with deposit [608], as recorded in plan and section to the south.

5.5.4 With the embankment for the Phase 3a waggonways in place in the southernmost extent of Area A, there was clearly less of a requirement for embankment construction, certainly for waggonway [360], as described in due course. However, to take into account the diverging course of waggonway [130], additional embankment material was clearly required. In Slot 1, at the southern limit of excavation, deposits were recorded which have been interpreted as representing the embankment for waggonway [130].

5.5.5 These deposits – the earliest being re-deposited natural clay dump [557] - overlay the eastern edge of the Phase 3a embankment, reflecting the requirement to widen the waggonway sub-structure as the routes of waggonways [130] and [360] diverged to the south (Figure 14, Section 11). The embankment sub-structure was represented in plan as deposit [743] in the southern extension of Area A.

5.5.6 Further north, in Slot 2, additional evidence of the widening of the sub-structure of the merging waggonways in Phase 3b was recorded in the form of re-deposited natural clay deposits [629] and [628], these overlying the eastern side of the Phase 3a embankment (Figure 13, Section 9). The addition of this material, *c.* 1.10m in thickness, widened the upper part of the overall embankment by *c.* 3.30m. Similar evidence was recorded In Slot 3a, where the Phase 3b embankment was represented by deposits [798], [576], [577], [578], [575] and [574], this material overlying the eastern side of the Phase 3a embankment (Figure 13, Section 8 and Plate 14). The addition of this material widened the upper part of the overall embankment by *c.* 4.80m. Collectively the deposits were at least *c.* 1.25m thick, although again it was not possible to fully excavate the deposits due to Health and Safety considerations.

5.5.7 From the recorded evidence in Slots 1 and 5, it appears that the upper surface of the embankment for waggonway [130], joined to the south by waggonway [360], sloped down from 48.71m OD in the north to 47.97m OD in the south, this fall achieved over a distance of *c.* 41m, thereby creating a *c.* 1.8% gradient.

5.5.8 Waggonway [130] was traced for a distance of *c.* 41m, crossing Area A on an NW-SE orientation, merging with waggonway [360], and continuing beyond the limits of excavation in either direction. The trackbed of waggonway [130] was recorded in section in Slot 1 at the southern extent of Area A (Figure 14, Section 11). At this location, the feature, [641], may also have formed the trackbed of the closely related waggonway [360]. The easternmost portion of feature [641], exposed for *c.* 0.70m in section, sloped down to the east, and this is likely to have been the portion of the overall feature that formed the trackbed of waggonway [130]. It was filled with compact sand and crushed coal fill, [556], up to 0.12m thick.

5.5.9 The trackbed of waggonway [130] was also recorded as a cut feature, [627], in Slot 2 (Figure 13, Section 9). Truncated to the east and extending *c.* 1.30m in section, the trackbed had a generally flat base, with a deeper element along its western edge. Two deposits, [801] and [802], both comprising silt and crushed coal, filled the feature, thus forming the trackbed at this location. The trackbed infill was recorded in plan in the extension to Area A as deposit [805].

5.5.10 No trackbed material of waggonway [130] survived in section in Slot 3a. Between Slots 3 and 4, the infill, [168], of the trackbed of waggonway [130] comprised firm redeposited clay and pebbles, this material also recorded in plan to the north beyond Slot 4. In Slot 4, the full width of the trackbed cut survived, recorded as feature [603] (Figure 11, Section 5). It was 2.95m wide and up to *c.* 0.25m deep. Its base was generally flat, with a deeper linear element along its eastern side and a similar linear element forming an upper part along its western side. To the east, the basal deposit, [797], comprised compact black silty pea grit. This was overlain by a more extensive mixed deposit, [602], comprising compact crushed coal and re-deposited clay.

5.5.11 At the northern extent of Area A, in Slot 5, the easternmost portion of the same trackbed, [617], was recorded for a distance of 0.70m, continuing to the west beyond the limit of excavation (Figure 10, Section 3). Its infill, [614], comprised compact black silty pea grit.

5.5.12 The track of waggonway [130] was represented by a total of nearly 60 sleeper impressions, of which 25 contained timbers, [127]-[129], [131]-[163], [167], [425]-[457] (timber [449]=[645] and their impressions [450]=[793]), [462]-[468], [523]-[524], [647], [711], [722], [737], [748]-[749] and [758], along with 10 rail impressions, [164]-[166], [458]-[461], [757], [761] and [779], and two possible rail impressions, [752] and [774], containing timbers, [753] and [773], respectively. The maximum recorded heights of sleepers or their impressions in waggonway [130] varied from 48.62m OD in the north to 48.00m OD in the south, indicating a track gradient of *c.* 1.5%, along the exposed portion of the route.

5.5.13 There was a wide variation in the dimensions of the sleepers of waggonway [130], as indicated by surviving timbers and sleeper impressions. Lengths ranged from 1.20m to 2.10m, widths ranged from 0.14m to 0.24m and depths ranged from 70mm and 0.12m. The interval between sleepers varied between 0.10m and 0.70m. In general, the impressions and surviving timbers demonstrated that relatively straight pieces of timber had been used, although a few were clearly crooked sections of branch. Timber [433] was submitted for specialist species identification and was identified as oak (Section 8).

5.5.14 The size and profile of the rail impressions recorded at the southern end of Area A indicated that straight, uniform timbers had been used for the rails of waggonway [130]. The impressions were up to 0.14m wide and, at the southern end of Area A, the central points of parallel rail impressions were *c.* 1.30m apart, indicating a gauge of *c.* 4 feet 3 inches. Just south of Slot 3, timber [773] and its associated impression, [774], were located in the correct position to represent a rail, although the timber was probably crude to have been utilised for this purpose; and these remains perhaps more likely represent debris from the track once it had fallen into disuse.

5.5.15 Many of the sleeper and rail impressions recorded within the poorly preserved sections of waggonway [130] were filled by loose silty sand deposits, *e.g.* [652]. This material is likely to have accumulated in the voids left by disintegrated or removed timbers from overlaying strata. A single sherd of probable 18th century pottery was recovered from deposit [652]. The fill, [420], of sleeper impression [160] comprised a blackish brown organic material, likely the result of part of the associated sleeper, [161], having degraded.

5.5.16 Recorded in section in Slot 2, timber sleeper [645] of waggonway [130] was overlain by a deposit, [626], comprising crushed coal and fragments of stone overlying (Figure 13, Section 9). This has been interpreted as track ballast, probably laid down during the use of the waggonway. The material was recorded in plan to the south of Slot 2 and was up to *c.* 0.10m thick. To the north, in Slot 4, the corresponding deposit, [601], was very different in composition, there comprising firm yellowish brown silty clay (Figure 11, Section 5). In Slot 5, at the northern extent of Area A, the corresponding deposit, [613], comprised compact fine and medium pebbles, pea grit and sandy silt, up to *c.* 0.15m thick (Figure 10, Section 3).

5.5.17 Waggonway [360] was located on the western side of waggonway [130], with the tracks of the two routes merging between Slots 3 and 4 in the northern part of Area A. Waggonway [360] may have been constructed at a slightly later date than waggonway [130], as a few of its structural components appeared to overlie those of waggonway [130]. However, the two tracks are considered likely to have been in use contemporaneously, with separate tracks in the southern part of Area A, these evidently sharing a common trackbed at the southernmost limit of excavation. Within the excavation area the tracks merged, continuing to the north as the single track of waggonway [130]. The distinct track of waggonway [360] was recorded for a distance of *c.* 25.50 NW-SE, continuing beyond the limit of excavation to the south.

5.5.18 As with waggonway [130], the trackbed of waggonway [360] was recorded as a cut feature in the uppermost element of its embankment sub-structure. In Slot 1 at the southern extent of Area A, the westernmost part of the aforementioned feature, [641], has been interpreted as the trackbed of waggonway [360] (Figure 14, Section 11). That the two waggonways appeared to share a trackbed gives a clear indication that the two routes were contemporary. A linear U-shaped element of this trackbed was located directly below timber rail [554], which is described further in due course. The rail, however, did not occupy this feature, which contained the previously described trackbed infill, [556]. The corresponding trackbed feature did not survive in section in Slot 2, to the north, although material possibly related to the construction of the trackbed of the waggonway was recorded, as described in due course.

5.5.19 In Slot 3a, the trackbed cut, [640], of waggonway [360] was 1.60m wide, up to 0.18m deep and had an uneven, though generally concave, base (Figure 13, Section 8) Its fill, [567], comprised crushed coal and silt with moderate fine and medium stones, this up to 80mm thick and forming the trackbed itself.

5.5.20 Material possibly related to the construction of the trackbed of waggonway [360] was recorded in the southernmost part of Area A, where the Phase 3a waggonway remains were overlain by a deposit, [62], comprising compact silt and crushed coal with frequent fine and medium stones (Figure 14, Sections 10 and 11). This material, up to *c.* 0.35m thick, may have been an infill and general levelling spread laid down after the Phase 3a waggonway had fallen into disuse and possibly ahead of the construction of the trackbed of waggonway [360]. A possibly equivalent deposit, [643], was recorded in Slot 2, infilling the Phase 3a trackbed (Figure 13, Section 9).

5.5.21 Other deposits to the west of the track of waggonway [360], but potentially related to it, were recorded at the original limit of excavation of Area A (Figure 14, Section 10). The earliest of these may have been dumped to elevate the ground along the western side of the track. Overlying infill [62] was a raft of a compact crushed coal, [53], which extended 3.60m in section and was up to *c.* 0.35m thick. To the west, this was overlain by a similar deposit, [795], also c. 0.35m thick, which extended 0.80m in section, truncated to the west. A thin compact crushed coal and silt layer, [60], overlay dump layer [53]. In turn this was overlain by a thin spread of loose crushed coal, [59], up to 90mm thick.

5.5.22 The surviving elements of waggonway [360], comprised 44 sleeper impressions, 40 of which contained associated timbers, [280]-[283], [352]-[359], [365]-[371], [388]-[419], [654]-[666], [669]-[675], [685]-[688], [715], [718]-[719], [724]-[727], [730]-[733] and [735]. These ranged from 0.61m to 1.74m in length and from 0.16m to 0.27m in thickness. The timbers that survived appeared to be largely unworked, with no tool marks other than an occasional peg hole or sawn-off end. The timber comprising sleeper [408] was identified as oak (Section 8). The distance between the sleepers or their impressions ranged from 0.10m to 0.60m.

5.5.23 The sleepers recorded at the northernmost and southernmost extents of waggonway [360], timbers [353] and [656], respectively, were recorded at maximum heights of 48.57m OD and 47.94m OD, respectively, with a distance between of 24.20m separating them, indicating a track gradient of *c.* 2.60%, along the exposed portion of the route.

5.5.24 Rail impressions from waggonway [360] were recorded in the southern part of Area A. The distance between the rails was *c.* 1.55m, giving a gauge of *c.* 5 feet. From the traces that were left, the rails appeared to be *c.* 0.11m wide. Rail impressions [668] and [742] contained fills of splintered timber, [667] and [741], respectively, whilst impression [717] contained a very poorly preserved timber, [716]. Further rail impressions, [723] and [775], were also observed along the route of the track. The only definite rail to be recorded, the aforementioned timber [554], was partially exposed in Slot 1 (Figure 14, Section 11).

5.5.25 At the same location, a silty crushed coal deposit, [555], up to 0.15m thick, was recorded. This has been interpreted as trackbed ballast, possibly associated with both waggonways [360] and [130]. The possible remnants of a stone ballast layer, [638], were recorded in Slot 2, but waggonway [360] had been largely truncated in this area by later activity (Figure 13, Section 9). Another likely trackbed ballast deposit, [361], comprising stone, crushed coal and silt, was recorded in plan m to the north of Slot 3a, the area where waggonway [360] merged with waggonway [130].

5.5.26 Evidence for a substantial eastern trackside ditch associated with Phase 3b waggonway [130] was recorded in Slot 2 (Figure 13, Section 9). The surviving portion of the steep-sided feature, [623], was 2.40m wide and *c.* 0.70m deep, with its sloping base lying *c.* 1.70m below the level of the track of waggonway [130]. Along the eastern edge of the ditch was a fill, [709], comprising grey sandy clay, this 0.15m thick and probably representing natural silting. The main fill, [621], comprised crushed coal with ash, fragmented stone and wood inclusions, this possibly representing debris from the waggonway used to backfill the ditch following disuse.

5.5.27 A further portion of the eastern trackside ditch was recorded further north between Slots 3 and 4. The feature, [345], was 0.80m deep and at least *c.* 1.50m wide, meeting an unexcavated later intrusion to the east (Figure 12, Section 6). Beyond the intrusion was the eastern side of a ditch, [348], the base of which was *c.* 0.35m deeper than that of ditch [345], suggesting that these were probably not contemporary features. Ditch [345] had evidently been re-cut by a shallower, U-shaped ditch, recorded as ditches [341] and [343] either side of the aforementioned intrusion, with the feature collectively *c.* 1.90m wide and 0.60m deep.

5.5.28 The eastern trackside ditch to waggonway [130] was also recorded in Slot 4 (Figure 11, Section 5). At this location, the ditch, [612], was as least 0.70m deep and 2.40m wide, meeting a limit of excavation to the east created by an unexcavated intrusion. In Slot 5, at the northern extent of Area A, the eastern trackside ditch, [15], had a maximum recorded width of 1.60m, again meeting a limit of excavation to the east created by the same unexcavated intrusion (Figure 10, Section 3). The surviving portion of the ditch was *c.* 0.35m deep, its flattish base of the feature lying *c.* 1.0m below the level of the track of waggonway [130]. The ditch had a primary fill, [13], of sticky, mottled mid greyish green clay, this representing natural silting. The main fill, [14], comprised dark grey gritty clayey silt. The same ditch was also recorded in plan further south, as feature [612].

5.5.29 A western trackside ditch for waggonway [130] was recorded in Slot 4 (Figure 11, Section 5). The ditch, [803], was at least 2.45m wide and *c.* 1.0m deep, although it was not possible to ascertain the full width or depth as the feature continued beyond the western and basal limits of excavation, the latter imposed due to Health and Safety considerations. The ditch contained four fills, [596], [595], [592] and [591], with fill [591] consisting of a dump of timbers. The other fills comprised varying quantities of crushed coal with clay and silt and occasional sandstone fragments; they varied in thickness between 0.33m and 0.53m. The dump of timbers comprised nine timbers in total, [491]-[499], these likely former waggonway sleepers. One timber form this group, timber [493], was identified as oak (Section 8). The ditch had evidently been deliberately backfilled with debris from the waggonway.

5.5.30 Following infilling of the western trackside ditch, a smaller trackside gully, [594], was evidently instated, this recorded cutting into the top of the infilled ditch. This gully was *c.* 0.90m wide and *c.* 0.60m deep and had a narrow, concave base. Its single fill, [593], comprised grey sandy silt and crushed coal. What may have been the same feature was recorded in Slot 3a - at this location the feature skirted waggonway [360] - as ditch [573] (Figure 13, Section 8). The surviving portion of this feature was *c.* 1.80m wide and *c.* 0.35m deep, with its narrow concave base lying *c.* 0.60m below the level of the track of waggonway [360].

5.5.31 What may have been a further portion of the western trackside gully of waggonway [360], was recorded in section, as gully [61], at the original southern limit of excavation (Figure 14, Section 10). With steep sides it was 0.65m wide and at least 0.36m deep, although its base was not exposed. Its single fill, [57], mostly comprised crushed coal.

5.6 Area A: Phase 3c – the Final Timber Waggonways (Figure 7)

5.6.1 Two timber waggonways, [180] and [97], comprised the main elements of Phase 3c, with the excavated evidence indicating that these post-dated the Phase 3b waggonways and likely formed the final timber waggonways to be constructed at the site. Waggonway [180] included the best-preserved timbers encountered during the excavation (Plates 9-12). It followed a very similar NW-SE alignment as Phase 3b waggonway [130], while waggonway [97] ran on a more northerly, NNW-SSE, alignment (Plates 7 and 8) The two routes likely merged in the southern part of Area A, although the excavated evidence indicates that waggonway [180] likely post-dated waggonway [97].

5.6.2 As well as the aforementioned two waggonways, which are described in detail in due course, Phase 3c evidently witnessed the construction of brick drainage features on the eastern side of waggonway [97]. The earliest of these features, recorded in the south-eastern end of Area A, was a brick culvert, [333], aligned NW-SE. It had been built within a construction cut, [707], the western edge of which was recorded in Slot 2, cutting into the eastern edge of the Phase 3b waggonway ditch [623] (Figure 13, Section 9). The construction cut had near vertical sides and a flat base with the culvert walls trench-built; only a small area of backfill, [706], of the construction cut was recorded in section.

5.6.3 The culvert itself, [333], had brick sides and arched roof, with no structural base evident and the base seemingly formed by the underlying natural Boulder Clay. The structure was examined in detail where it survived to its full height as it ran into the limit of excavation to the south of Slot 2 (Plate 13). The sides of the structure were two bricks thick, with an outer skin formed by bricks laid in stretcher courses and an inner skin by bricks laid in header courses. Each side wall was eight courses high, this *c.* 0.55m, and the arched roof above was formed by 14 brick courses. Red hand-moulded bricks with no apparent frogs had been used, although heavy lime mortar adhered to most faces. The bricks date from the late 18th century to the first half of the 19th century (see Section 7 of this report). In total the structure was 1.35m wide with an internal width of 0.60m and a length of *c.* 7m was exposed. It continued beyond the limit of excavation to the south-east and to the north-west had been replaced by a later element of brickwork [78], as described in due course. Three deposits had accumulated within the culvert, the earliest of which, fill [705], comprised pea grit. This was overlain by a black silt deposit, [704], and an upper fill, [703], which comprised sandy silt with frequent coal fragments.

5.6.4 A series of dump deposits recorded in Slot 2, overlying the Phase 3b embankment and trackside ditch [623], have been interpreted as representing ground-raising and consolidation material associated with the Phase 3c waggonways (Figure 13, Section 9). These deposits evidently post-dated construction of culvert [333], having been dumped against its western wall. The earliest of these, deposit [708], was a very mixed clayey material, overlain by a dump of compact clay, [619], in turn overlain by a dump of crushed coal, [620]. The overlying material, dump [618], comprised crushed coal and stones, in turn overlain by a *c.* 0.40m thick sandy silt and sandy clay dump, [28], which was traced in plan to the south of Slot 2 and thus also recorded in section at the original limit of excavation (Figure 14, Section 10).

5.6.5 Underlying dump [28] in section at the original southern limit of excavation were additional dump deposits, [29], [30], and [531]-[533] (Figure 14, Section 10). Of these, deposit [30], comprising crushed coal up to 0.24m thick, correlates to a layer, [502], recorded in plan. Deposit [532] comprised crushed coal and silt, while deposit [533] comprised grey clay with a high organic content. Both deposits [532] and [533] were overlain by silty clay layer [29] which was covered in part by clay deposit [531]. Deposit [29] was also overlain by the aforementioned dump layer [28], as described above.

5.6.6 Various other dumped deposits recorded overlying layer [28] in section at the original southern limit of excavation have been interpreted as originating from this episode of ground-raising activity (Figure 14, Section 10). To the east, a silty clay deposit, [25] was overlain by a clayey silt deposit, [24]. Deposit [25] was truncated to the west by a substantial later feature, described in due course. To the west of this intrusion, layer [28] was overlain by a clayey silt deposit, [35], with frequent small coal fragments, and a crushed coal deposit, [36]. These deposits were truncated to the west by a later feature, [41]. To the west of that feature, deposit [28] was overlain by Phase 3c trackbed deposit [42], described below, this relationship crucial in demonstrating that construction of brick culvert [333] pre-dated construction of the Phase 3c waggonway.

5.6.7 A feature, [50], interpreted as the trackbed cut for waggonway [97], was recorded in section at the original southern limit of excavation of Area A (Figure 14, Section 10). The western side of the feature had a near vertical side, a flat base and the exposed portion was 0.16m deep. Its fill, [48] comprised crushed coal with stone fragments throughout. To the north, in Slot 2, what was evidently the same trackbed was recorded as feature [120] (Figure 13, Section 9). This extended 1.90m in section, truncated to the west. In this area the trackbed was *c.* 0.15m deep, with a steep eastern side and a relatively flat base. A crushed coal and ash deposit, [636], filled the trackbed.

5.6.8 Remains of the Phase 3c waggonways were recorded in section in the northern part of Area A. At the northernmost limit of excavation, what was evidently the trackbed cut, [120], for waggonway [97] truncated the Phase 2 soil horizon (Figure 10, Section 1). Its primary fill, [115], comprised compact brown and dark reddish orange clayey silt, this confined along the eastern edge of the feature. To the west, a series of dump deposits likely represent ground-raising and levelling deposits for Phase 3c waggonway [97]. The earliest deposit, [113], comprised clay and sand, this exposed in plan in the northern part of Area A, extending *c.* 16m north-south. To the west, what was evidently the same deposit was recorded in Slot 2 as deposit [75]. Two deposits, [112] and [111], overlay deposit [113], while deposit [650] overlay dump [75]. A fragment of clay tobacco pipe of 18th century or late 17th century date was recovered from deposit [650]. Further south, in Slot 3, another silty clay levelling deposit, [290], extended *c.* 6.0m east-west in section overlying natural boulder clay, [103], and this also likely represents ground-raising in Phase 3c associated with the construction of waggonway [97] (Figure 12, Section 7). Its maximum recorded thickness was 0.40m, overlying natural Boulder Clay.

5.6.9 Trackbed ballast for waggonway [97] generally comprised compact crushed coal with occasional inclusions of brick and sandstone fragments and fine and medium pebbles. Towards the southern extent of Area A, in the area where waggonways [97] and [180] merged, this material was recorded in section as deposit [46] (Figure 14, Section 10). It was recorded in plan between Slots 2 and 3a as deposits [286] and [776] and in section, as deposit [566], where it overlay the remains of Phase 3b waggonway [130] (Figure 13, Section 8). North of Slot 3a, trackbed ballast for waggonway [97] was recorded in plan as deposit [287]. Further north, trackbed ballast was recorded in plan and in section in Slot 5 as deposit [74] (Figure 10, Sections 2 and 3) and at the northernmost limit of excavation of Area A as deposit [110] (Figure 10, Section 1). The maximum recorded height of this ballast was recorded as 48.75m OD in the north. Two sherds of pottery of probable 18th century date were recovered from deposit [74].

5.6.10 One further layer, [114], likely contemporary with trackbed [74], but different in composition, was also recorded at the northernmost limit of excavation of Area A (Figure 10, Section 1). This was a firm silty deposit with pockets of clay and sandy silt and occasional fragments of coal and fine pebbles. In section it extended 1.50m and was up to 0.23m deep.

5.6.11 Eleven sleeper impressions from waggonway [97] were recorded upon trackbed ballast material [74] and [287]. In the northern part of Area A, these impressions, [221]-[225], had minimal depth, up to only 10mm deep, upon the surface of trackbed ballast [74]. Further south, the group, [227-237] (odd numbers), were more substantial, with some surviving up to a depth of 0.10m. Their fills, [226]-[236] (even numbers), comprised silty crushed coal with occasional inclusions of small brick and sandstone fragments and pebbles. The impressions ranged from 0.40m to 1.50m in length and they were situated between 0.20m and 0.70m apart.

5.6.12 Three rail impressions, [284], [721] and [729], the first of these containing a poorly preserved timber rail, [285], were recorded in the southern part of Area A, overlying the remains of the tracks of waggonways [130] and [360]. Timber [285] was submitted for analysis and identified as pine (see Section 8 of this report). Rail impression [721], which formed part of the eastern side of the track of waggonway [97], was the longest surviving section, a length of *c.* 5m being exposed. It was recorded in Slot 2 as rail impression [635] (Figure 13, Section 9).

5.6.13 Both rails of waggonway [97] evidently survived as timbers in the original southern limit of excavation of Area A (Figure 14, Section 10). The eastern rail, timber [98], was 100m in diameter, while the western rail, [49], was square in profile, 90mm wide and 110mm high. The rails were *c.* 1.25m apart giving an estimated gauge of just over 4 feet, with such a narrow width perhaps suggesting that one or both of the rails had been displaced at that location. Two short rail impressions, [238] and [240], were recorded along with the group of sleeper impressions north of Slot 3. Impression [238], which was *c.* 1m long and 0.15m wide, survived only as a stain, while impression [240] measured 0.38m in length by 90mm wide and 20mm deep. Rail impressions [729] and [284] were *c.* 1.45m apart giving an estimated gauge of *c.* 4 feet 9 inches.

5.6.14 A shallow rail impression, [109], was recorded in section in trackbed ballast [110] at the northernmost limit of excavation of Area A (Figure 10, Section 1). It was *c.* 0.25m wide by 0.12m deep. Its fill, [108], comprised pea grit, crushed coal and degraded stone. Directly to the west, a 20mm thick layer, [107], of compact crushed brick and degraded stone, extended 0.50m in section, truncated to the west. This was recorded at a maximum height of 48.65m OD and is interpreted as the remnants of the trackbed.

5.6.15 Rail impression [109], recorded in the northernmost limit of excavation of Area A was recorded at a maximum height of 48.75m OD, while timber [98], *c.* 38.25m to the south-east, in the original southern limit of excavation of Area A, was recorded at a maximum height of 48.46m OD, suggesting a barely perceptible *c.* 0.75% gradient along this portion of waggonway [97].

5.6.16 A deposit [289], interpreted as ballast having likely overlain the tracks of waggonway [97] was recorded in plan to the north between Slots 4 and 5. It covered part of trackbed deposit [74] and comprised compact crushed coal with patches of sandy clay and occasional inclusions pebbles and brick fragments.

5.6.17 The construction cut, [4], for the surviving portion of what was evidently - in its full form - a sinuous brick drain, [104], truncated ballast [289] in the northern part of Area A. The feature was up to *c.* 0.80m wide and *c.* 0.40m deep. It had sloping concave sides and flat base, which was stepped where it contained the surviving portion of the drain. The backfill, [3], of the construction cut, comprised clayey silt. A stone ball was recovered from this fill and this is believed to be an item used by pitmen in the game of 'booling' (see Section 7 of this report). The disturbed walls of drain [104] comprised two rows of dark red hand moulded bricks, surviving up to three courses in height, with a silty clay bonding. In total, the drain was *c.* 0.75m wide, with the interior *c.* 0.25m wide, and a length of *c.* 3.50m survived, running roughly NE-SW.

5.6.18 To the west, drain [104] was truncated in Phase 4 by the insertion of a substantial drainpipe, [16], and did not appear on the western side of that feature. The majority of the structure had been robbed-out (in Phase 4), with the robber cut, [351], following the course of the original construction cut closely. To the south, drain [104] possibly ran into culvert [333]. What may have been a short surviving section of drain [104] was recorded further south, in Slot 3b, running under the aforementioned Phase 4 drain pipe, [16], and linking with its supporting brickwork, [78], as described in due course. The curvilinear form of culvert [104] is notable, as is its apparent close association with waggonway [97]; the surviving portion appeared to have been built below and across the line of the waggonway [97]. It presumably served to aid drainage of the track of that waggonway.

5.6.19 In the central eastern part of Area A, deposits recorded to the east of waggonway [97] have been interpreted as possible dump deposits contemporary with the use of the waggonway. North of Slot 3, clayey silt deposit [84], up to 0.15m thick, partly overlay the trackbed ballast. It was traced in plan to the south of Slot 3, as deposit [504], therefore extending *c.* 18m in plan, continuing beyond the limit of excavation to the south. Between Slots 2 and 3 it was overlain to the east by clayey deposit [503], which yielded fragment of pipe stem probably dating from the 18th century.

5.6.20 A western trackside ditch, [70], associated with waggonway [97], was recorded in Slot 5 in the northern part of Area A (Figure 10, Section 3). This was at least 1.80m wide, truncated to the west, and 0.75m deep and was steep-sided with a flat base. Its fill, [69], was a mixed, generally clayey deposit. To the south this feature presumably extended from the existing eastern trackside ditch for the Phase 3b waggonways, although this was not proven. Another gully, [73], was recorded running along the western side of waggonway [97], this positioned between ditch [70] and the waggonway tracks (Figure 10, Section 3). Measuring *c.* 1.05m wide and 0.40m deep, its eastern side was stepped and it had a concave base. The surviving portion of its original fill, [72], was gritty clayey sand, up to 50mm thick; the upper part of the feature appeared to have been backfilled later, described in Phase 4.

5.6.21 A much smaller linear feature, gully [126], was recorded running along the eastern side of waggonway [97] (Figure 10, Section 1). This had a shallow U-shaped profile and was 0.60m wide and 0.20m deep. It was traced in plan for *c.* 29m, continuing beyond the limit of excavation to the north and truncated to the south by later activity. Its single fill, [125], comprised compact crushed coal and silt. The gully was recorded at a maximum height of 48.47m OD, this at its northern end. In the original southern limit of excavation of Area A what was probably the same feature was recorded as a more substantial ditch, [530], cutting through Phase 3c levelling deposits (Figure 14, Section 10). It had a steep eastern side and a narrow base, but was truncated to the west by a re-cut, assigned to Phase 3d. The original ditch contained three fills. The primary fill, [529], comprised sandy clay up to 90mm thick, this was overlain by a 0.30m thick fill, [528], comprising sandy silt with frequent pockets of clay and small fragments of coal, and the upper fill, [527], comprised clayey silt. The ditch survived for a maximum width of 1.50m and was *c.* 0.85m deep.

5.6.22 Another gully, [339], of similar profile and proportions, was recorded to the south, this associated with the eastern side of the waggonway (Figure 12, Section 6). Although this area was much truncated by later intrusions, it appears that this feature was situated between the waggonway tracks and gully [126]. Gully [339] survived for a maximum width of *c.* 0.90m, slightly truncated to the east, and was *c.* 0.50m deep. Its western edge was stepped and it had concave sides and base. This feature, as with gully [73], cut into the surviving part of trackbed [74] at this location and the surviving portion of its original fill, [338], comprised brownish orange clay, up to 0.19m thick; again the upper part of the feature appeared to have been backfilled later, described in Phase 4.

5.6.23 The track of the other Phase 3c waggonway, [180], was generally far better preserved than that of waggonway [97]. This route ran on a NW-SE orientation similar to that taken by the Phase 3b routes. The trackbed cut, [590], was recorded in Slot 4 (Figure 11, Section 5). It a steep western edge, a slightly concave base, and a less well-defined eastern edge. The trackbed was *c.* 1.80m wide and up to c. 0.25m deep. Its lowermost fill, [653], which was up to 0.21m thick, comprised compact crushed coal and sandy silt. The trackbed was traced southwards in plan, as silty crushed coal infill deposit [565], for more than 20m beyond Slot 3 (Figure 13, Section 8). A single fragment of pottery, of probable late 18th century date, was recovered from deposit [565].

5.6.24 In the southern part of Area A – where waggonways [180] and [97] merged - no trackbed cut for waggonway [180] could be determined, but various crushed coal layers were recorded which have been interpreted as representing trackbed material. These were recorded as deposit [637] in Slot 2, (Figure 13, Section 9), as deposits [42] and [44] in section at the original southern limit of excavation (Figure 14, Section 10), and as deposit [552] in Slot 1 (Figure 14, Section 11). The same trackbed material for waggonway [180] was also recorded in plan, as deposit [701], across the southern extension of Area A, this comprising compact silty crushed coal and silty clay. Deposit [552] produced three sherds of pottery all broadly dating to the 18th to 19th century. A clay pipe bowl recovered from trackbed [701] is of probable late 19th or early 20th century date and may have been introduced intrusively.

5.6.25 The aforementioned trackbed layers provided a platform for 23 sleeper impressions, with twenty-one associated timbers, [177]-[179], [181]-[213], [424], [699]-[700], [713], [746]-[747] and [772], which were in turn covered by two ballast deposits, [589] and [598]. These were overlain by ten portions of rail impression, containing eight associated timbers, [43], [214]-[220], [334], [639], [710], [712], [744]-[745], [777], [780] and [782]. Rails [216], [217] and [218] and their relationships with underlying sleepers, are shown on Plates 11 and 12.

5.6.26 Twelve complete lengths of sleeper survived, these 1.10m to 2.10m in length, along with eight 'half' sleepers ranging from 0.53m to 1.30m in length. None was heavily worked, simply sawn from source, although many did have peg holes at their extremities, these on average 35mm in diameter. Four sleepers, [185], [187], [203] and [424], had multiple peg holes suggesting re-use or repair. The fixing holes at each end of sleepers [187] and [203] were 1.36m apart. The remaining timbers were less complete and could not provide any further information. Timbers [185], [187] and [203] were submitted for species identification and all were identified as oak (see Section 8 of this report).

5.6.27 One further timber and timber impression, [770] and [771], respectively, may have also been part of waggonway [180], although it was located to the west of the track and may have been a disturbed or dumped timber.

5.6.28 All the rails of waggonway [180] to survive were from the western side of the track. Most provided evidence of fixing pegs, and one portion of rail, [217], appeared to be largely complete. This rail was submitted for species identification and identified as pine (see Section 8 of this report). In general, the rails displayed more evidence of having been worked, being fairly regular in form, than the sleepers, with an average width of 0.11m and depth of 80mm. Their bases were flat, while all edges were slightly concave. The upper surfaces of each rail also appeared to have been cut flat. Although only one rail evidently remained intact, it was clear that the rails had not been not cut in regular lengths; rail [217] was 1.05m long, compared to the remains of rail [219], which was more than 4.30m long. Rail impressions from the eastern side of the waggonway, [639], [782], [780], [220], [756] and [745], from south to north, were also recorded. One further timber, [751], and an associated impression, [750], were recorded towards the northern extent of this trackbed. The timber was fairly well preserved but it did not lie horizontally and it may have been a disturbed rail.

5.6.29 The distance between the rails of waggonway [180] in the northern part of Area A was *c*. 1.40m, giving an estimated gauge of just over 4½ feet. The northernmost sleeper impression, [177], was recorded at a maximum height of 48.53m OD, while sleeper impression [772], this *c.* 19.5m to the south, was recorded at a maximum height of 48.40m OD, indicating a barely perceptible gradient of *c.* 0.66% along this portion of the track.

5.6.30 Ballast layers associated with the laid track of waggonway [180] were recorded in Slot 4, (Figure 11, Section 5). Layer [589], up to 0.25m thick, was located along the western side of the waggonway and comprised firm clayey silt with occasional coal fragments. To the east, layer [598], up to 0.22m thick, comprised compact crushed coal with occasional brick fragments. Deposit [587], a compact crushed coal layer, had evidently been compacted beneath rail [215], within rail impression [214], which was also recorded as impression [588].

5.6.31 The fill, [714], of rail impression [712], comprised compact crushed coal and splinters of wood, just 20mm deep. The remains of another ballast deposit, [634], associated with this phase, was recorded in Slot 2 (Figure 13, Section 9). This comprised compact crushed coal with stone inclusions. It likely accumulated while the track was in use.

5.6.32 Deposits recorded in section at the original southern limit of excavation of Area A have also been interpreted as being associated with use of waggonway [180] (Figure 14, Section 10). To the east of rail [43] was a deposit, [39], comprising very compact ash and clinker, overlying trackbed deposits [42], [44] and [46] and itself overlain by deposit [40]. Possibly contemporary with deposit [39], but further to the west, was a compact crushed coal layer, [52]. This layer, along with deposit [39], was covered by an extensive, but thin layer of compact crushed coal, [38]. The latest deposit in this sequence, [37], comprised compact ash and clinker.

5.7 Area A: Phase 3d – An Iron-Railed Waggonway (Figure 8)

5.7.1 Phase 3d comprises the limited evidence of what was probably the final phase of colliery waggonway – this likely using iron rails – at the site. Although this sub-phase has been placed within the broad late post-medieval phase of activity, it is likely that this final waggonway – group [470] - was established in the early modern period, when iron rails largely replaced wooden rails. This route ran on the same NW-SE alignment as Phase 3c waggonway [180] and can perhaps be seen as a direct replacement of that route.

5.7.2 In Slot 1, an extensive levelling deposit, [550], up to *c.* 0.20m thick, was recorded in section (Figure 14, Section 11). It extended more than 6m in section, continuing beyond the limits of excavation, and comprised compact crushed coal. It has been interpreted as having been deposited to consolidate and level the ground following disuse of the Phase 3c timber waggonways. It was overlain to the west by another consolidation deposit, [549], comprising sand, crushed coal and stone fragments. At the northern limit of excavation, a similar crushed coal layer, [380], has been interpreted as a probably contemporary ground consolidation deposit (Figure 11, Section 4).

5.7.3 A stone fixing block/sleeper, [546], had been set into layer [550] (Figure 14, Section 11). This was a squared sandstone block (560mm x 390mm x 200mm) with two fixing holes drilled into its upper surface, these set *c.* 0.15m apart and both *c.* 30mm in diameter. A similar block, [740], was recorded *c.* 9m to the north and a square impression, [739], was recorded 1.40m to the north, this probably indicating the former position of another stone block. Together these remains formed the surviving elements of the western side of a waggonway that to the south ran on the same alignment and in approximately the same location as Phase 3b waggonway [130], and to the north ran on the same alignment and in approximately the same location as Phase 3c waggonway [180]. The use of stone blocks strongly indicates that this would have been an iron-railed waggonway. To the east of stone block impression [739] was a similar impression, [738]; the distance between the midpoints of these was 1.50m, giving a gauge of *c.* 5 feet for the waggonway track. The relative positions of block [546] and impression [739], indicates that the sleepers lay at intervals of *c.* 1.50m along the track.

5.7.4 Further evidence for the iron-railed waggonway was recorded in the form of a series of 'robber cuts', consisting of eight lengths of linear features and six associated fills, [169]-[176], [379], [383], [585]-[586], [778] and [781]. These features likely represent the removal of elements of the track of iron-railed waggonway [470]. Evidence for this was recorded in section at the northern limit of excavation of Area A, where robber cut [383] cut into consolidation layer [380] (Figure 11, Section 4). The feature was *c.* 4.80m wide and had a maximum depth of 0.40m, with a deeper portion where a rail had presumably been removed. Its fill, [379], comprised crushed slate and fragmented stone. The deeper linear portions of this feature were visible intermittently in plan, recorded as features [169], [171], [173], [175], [781] and [778]. The first of these was recorded in section in Slot 4 as feature [586] (Figure 11, Section 5). All the fills associated with these cuts had the same composition as fill [379]. The distance between the robbed-out rails of waggonway [470] in the northern part of Area A was *c.* 1.35m, giving an estimated gauge of *c.* 4½ feet.

5.7.5 In the southern part of Area A, blocks [546] and [740] were recorded at the same height, 48.52m OD. No corresponding blocks survived in the northern part of Area A, therefore it is difficult to accurately establish the gradient along this portion of the track. The maximum height of robber cut [389] was 48.90m OD, this *c.* 36m to the north of block [546], which indicates a slight gradient of *c.* 1%, downwards from north to south along the recorded portion of waggonway [470].

5.7.6 A wooden stake, [754], and associated stakehole, [755], were recorded in plan at the northern extent of Area A, in close proximity to robber cut [169]. The stake was square in shape and 80mm wide and had been vertically driven through the remains of underlying waggonway [180]. Its proximity to the robber cuts implies that it was associated with waggonway [470].

5.7.7 A group of ditches and gullies recorded in the southern part of Area A have been interpreted as being associated with the Phase 3d waggonway. Ditch [27] - a re-cut of Phase 3c ditch/gully [530], had a steep straight western side, with a more moderately sloping eastern side, and a narrow concave base (Figure 14, Section 10). The ditch was 2m wide and 0.70m deep, recorded at a highest level of 48.34m OD. A primary silting fill, [526], up to 0.20m thick, was overlain by a secondary silting deposit, [525]. The upper fill, [26], was the most substantial, up to 0.53m thick, comprising crushed coal and silt, this presumably debris from the waggonway and possibly representing a deliberate infilling of the feature. This ditch and its re-cut have been interpreted as a trackside ditch running along the eastern side of the Phase 3d waggonway.

5.7.8 Infilled ditch [27] was capped by a 0.12m thick layer, [31], of compact sandy silt and fragmented coal. This may represent ground consolidation ahead of the excavation of a gully, recorded as features [41] and [101], which truncated the layer to the west and was located a short distance to the west of the trackside ditch, and slightly closer to the assumed line of the Phase 3d track. The gully had sloping sides that were slightly undercut to the west and was *c.* 0.80m wide and *c.* 0.45m deep. The primary fill, [34], comprising silt and crushed coal, was overlain by a fill, [33], of crushed coal with occasional fragments of brick. The upper fill, [32], also comprised crushed coal.

5.7.9 Evidence for a substantial trackside ditch running along the western side of waggonway [470] was recorded within the south-western part of Area A. The eastern edge of a NW-SE aligned ditch, [2], was recorded in plan and in section (Figure 13, Section 9 and Figure 14, Section 10). The side of the ditch was slightly moderately steep and slightly uneven and the base was a relatively flat. Its maximum recorded width was *c.* 2.60m, although its full width was not ascertained, and it was *c.* 0.90m deep. The ditch was recorded at a maximum height of 48.62m OD. Its primary fill, [1], comprised silty sandy crushed coal, which infilled the majority of the feature and was up to *c.* 0.90m thick. It was also recorded in section as deposit [642]. Fill [1] was overlain by a crushed coal deposit, [67], up to 0.24m thick.

5.8 Area A: Phase 4 - Early Modern (Figure 9)

5.8.1 Changes to the drainage arrangements in Area A form the main elements of Phase 4. As previously described, most of brick drain [104] was robbed-out, represented by feature [351]. A possible earlier phase of robbing was also recorded, as feature [293]. The same broad episode of activity probably saw culvert [333] dismantled at its northern end, ahead of the construction of a length of linear brick structure, [78], probably built to support a large bore ceramic drain [16], described in due course, installed to feed into the remaining part of culvert [333]. Where excavated in plan to the south of Slot 3, the construction cut for structure [78] was up to *c.* 1.80m wide at its widest point and up to 0.65m deep.

5.8.2 The southernmost part of structure [78] comprised parallel walls, just one brick thick laid in stretcher course. A lower foundation course was also recorded. The walls, laid 0.70m apart, were constructed with red handmade bricks of the same broad date range as those in culvert [333], *i.e.* late 18th century to the first half of the 19th century. The overall structure ran on a slightly more northerly alignment than that of culvert [333] and was 0.90m wide. A silty infill, [85], included brick and wood fragments.

5.8.3 The aforementioned drain, [16], was housed in a substantial construction cut, [12], recorded in the northern part of Area A. The construction cut, up to *c.* 8.30m wide and c. 2.05m deep, ran on a broadly NW-SE direction and was exposed for a length of 25m from its connection to brick culvert [333], via brickwork, [78], where it was recorded as cut [77]. The drain itself comprised sections of large-bore salt-glazed ceramic pipe. Each flanged section was 0.90m (3 feet) long with an internal diameter of 0.47m (18½ inches). Some sections bore the stamp '*Lambton Sanitary Tile & Brickworks Fencehouses*'.[19]

5.8.4 Drain [12] continued beyond the northern limit of Area A. Eight backfills of the vast construction cut were recorded, [11], [86], [10], (which equates to fill [76], recorded further to the south), [9], [8], [7], [6] and [88]. A few sherds of pottery of 19th century date and a 20th century glass bottle were recovered from fill [6] and a few sherds of pottery dated to the late 19th to early 20th century were recovered from deposit [7].

5.8.5 Deposits post-dating abandonment of the Phase 3d waggonway were recorded in section at the southernmost extent of Area A. Stone sleeper block [546] was overlain by a 0.20m thick layer, [545], comprising crushed coal (Figure 14, Section 11). A similar deposit, [23], was recorded to the north, this extending for more than 9.75m in section continuing to the east (Figure 14, Section 10). A series of overlying dump deposits, [537]-[539], [541]-[544] and [547]-[548], was recorded (Figure 14, Section 11). These mostly comprised crushed coal, with many including ash and cinder, along with fragmented stone and brick rubble. The combined maximum thickness of these deposits was *c.* 0.80m. To the east a small feature, [790], was recorded in section, as well as a further levelling dump, [536], comprising similar material as described. Layer [544] was the only one of these dumps to produce any dating evidence, this being a single sherd of pottery of 18th to 9th century date. Deposition of this material raised the ground level to a maximum height of 49.09m OD, following disuse of the final phase of waggonway.

5.8.6 Three similar dump layers, [21], [22] and [51], up to 0.80m thick, were recorded to the north (Figure 14, Section 11). Layer [21] was cut by a small feature, [100], which was in turn cut by a second, smaller feature, [56]. Their fills reflected the dumped material that they truncated, again mostly comprising crushed coal.

5.8.7 Recorded in section at the northern limit of excavation of Area A were numerous deposits interpreted as having been deposited during Phase 4 (Figure 11, Section 4). The earliest, layer [378], comprised crushed coal with stones, ash and clinker, and this covered much of robbed-out trackway deposit [379]. A small feature, [381], cut into this layer to the west. Further deposits, [377], [376] and [375], of crushed coal, with various inclusions, had a combined maximum thickness, along with deposit [378], of *c.* 0.95m. A substantial feature, [387], truncated these dump layers (Figure 11, Section 4 and Figure 10, Section 2). Its loose fills contained varying proportions of coal, ash and cinders.

[19] The date of origin of the works is uncertain but the manufactory is listed in *Kelly's Directory of Durham* for 1914.

5.8.8 Various dump deposits assigned to this phase were recorded in section in the next portion of the northern limit of excavation of Area A (Figure 10, Section 2). To the west, the earliest deposit, [17], produced a single fragment of 19th century pottery. The overlying deposit, [92], comprised clayey silt with fragments of brick, concrete and sandstone, along with various ceramic, iron and leather objects. This produced pottery of 20th century date. Further dumps were recorded to the east in the same section. These comprised: a crushed coal deposit, [71], which infilled the upper part of Phase 3c gully [339]; a crushed brick and coal deposit, [123]; crushed coal deposits, [122] and [121]. Three more substantial layers, [124], [95] and [106], were recorded either within this section or within the section of the northernmost portion of the limit of excavation of Area A (Figure 10, Section 1).

5.9 Area A: Phase 5 - Modern

5.9.1 At the original southern limit of excavation of Area A, a substantial cut, [794], was recorded in section (Figure 14, Section 10). Its fills contained varying quantities of debris, such as crushed coal and fragments of concrete and brick. A concrete layer, [19], [45] and [534], and associated hardcore bedding deposits, [20], [535] and [804], capped cut [794] (Figure 14, Sections 10 and 11). This concrete, recorded at a maximum height of *c.* 49.40m OD, probably represents a former roadway of modern origin.

5.9.2 The principal modern feature recorded within the northernmost portion of Area A comprised a shallow but extensive intrusion, [94], recorded in section (Figure 10, Sections 1 and 2). Its main fill, [93], comprised silty clay likely re-deposited natural Boulder Clay. This feature extended for a distance of at least 13m, continuing beyond the limit of excavation to the east, and was 0.55m deep. It has been interpreted as representing an episode of landscaping associated with the construction of the tyre factory in the second half of the 20th century.

5.9.3 A soft, dark grey clayey silt topsoil, recorded as deposits [18], [87] and [374], covered Area A. It varied in thickness from 0.10m to 0.75m. The existing ground surface created by this deposit ranged from *c.* 49.05m OD in the south rising to *c*. 50.10m OD in the north.

Waggonway to Noel Pit & Judith Pit

Waggonway to Anna Bella Pit

Waggonway to Hall Pit

N

Area A

FATFIELD WAGGONWAY

Phase 3a

Phase 3b

Phase 3c

Phase 3d

1856 OS Map Detail

0 10m

Figure 4
Area A, all sub-phases of Phase 3
1:200 at A3

N

cut [119]

S1

Area A

Slot 3a

Waggonway to Hall Pit

S8

Slot 2

Waggonway [480]

S9

S10

trackbed [560]

embankment [563]

Waggonway [760]

trackbed [702]

[692]

[689]

[681]

[679]

[676]

Slot 1

S11

[472]

Waggonway [480]

Waggonway [760]

Trackbed

Embankment

Conjectured Trackbed

Surviving timbers

0 5m

Figure 5
Area A, Phase 3a
1:125 at A3

N

S1

S3

Slot 5

trackside ditch[15]

Area A

trackbed
[168]

embankment
[608]

Waggonway to Anna Bella Pit

fill [610]

trackside ditch [612]

S6

trackbed
[361]

[749]

[753]

fill [610]

trackside ditch [345]

[143]

embankment
[608]

Slot 4

S5

fill [610]

[711]

cut [803]

[353]

[355]

[157]

[159]

[161]

[358]

[163]

[735]

[730]

[731]

[732]

[733]

[426]

[427]

[773]

[429]

[431]

[433]

[388]

[435]

[437]

[737]

Waggonway [130]

[390]

[392]

[462]

[465]

Slot 3a

[394]

[439]

[466]

[396]

[441]

trackbed
[626]

[398]

[446]

embankment
[628]

S8

[283]

[281]

[448]

[400]

[443]

[449]

[404]

[406]

[408]

embankment
[574]

[410]

[412]

Waggonway [360]

[414]

[718]

[416]

trackbed
[805]

[418]

[724]

[687]

Slot 2

[726]

S9

[685]

[699]

[674]

[672]

[715]

S10

[662]

[669]

[665]

[654]

[663]

[660]

[658]

[656]

Slot 1

S11

Waggonway [130]

Waggonway [360]

Trackbed

Embankment

Conjectured Trackbed

Conjectured Embankment

Re-used Trackbed from Phase 3a

Surviving timbers

Trackside Ditch

0 5m

Figure 6
Area A, Phase 3b plan
1:125 at A3

N

Waggonway to Noel Pit & Judith Pit

S1

S2

S3

Slot 5

trackside gully [73]

trackside ditch [70]

Waggonway [97]

trackside gully [126]

Area A

[289]

[74]

drain [104]

Waggonway to Anna Bella Pit

S5

Slot 4

S6

[74]

robbed out drain [104]

[750]

[183]

[181]

[185]

Waggonway [180]

[187]

[189]

[191]

[216]

[197]

[217]

[199]

[193]

[201]

[202]

[219]

[207]

[565]

Waggonway [97]

[74]

S7

Slot 3b

?drain [104]

[287]

robbed out culvert [333]

culvert [333]

S8

[286]

[770]

[565]

Slot 3a

S10

trackside ditch [530]

[776]

Slot 2

S9

[701]

Slot 1

S11

Waggonway [97]

Waggonway [180]

Trackbed

Conjectured Trackbed

Re-used Trackbed and Embankment from Phase 3b

Surviving Timbers

Trackside Gully/Drain

Culverts and Drains

Dumped Deposits

0 5m

Figure 7
Area A, Phase 3c
1:125 at A3

N

S1

Area A

S4

S5

Slot 4

Waggonway to Anna Bella Pit

Waggonway [470]

Slot 2

trackside ditch [27]
(only seen in section 10)

S9

stone block [740]

S10

block impression [738]

block impression [739]

trackside ditch [2]

stone block [546]

Slot 1

S11

Waggonway [470]

Conjectured Trackbed

Trackside Ditch

Conjectured Trackside Ditch

0 5m

Figure 8
Area A, Phase 3d
1:125 at A3

N

S2

S3

Slot 5

drain [16]

construction cut [12]

Area A

S6

robber cut [351]

S5

Slot 4

Slot 3b

brickwork [78]

Slot 3a

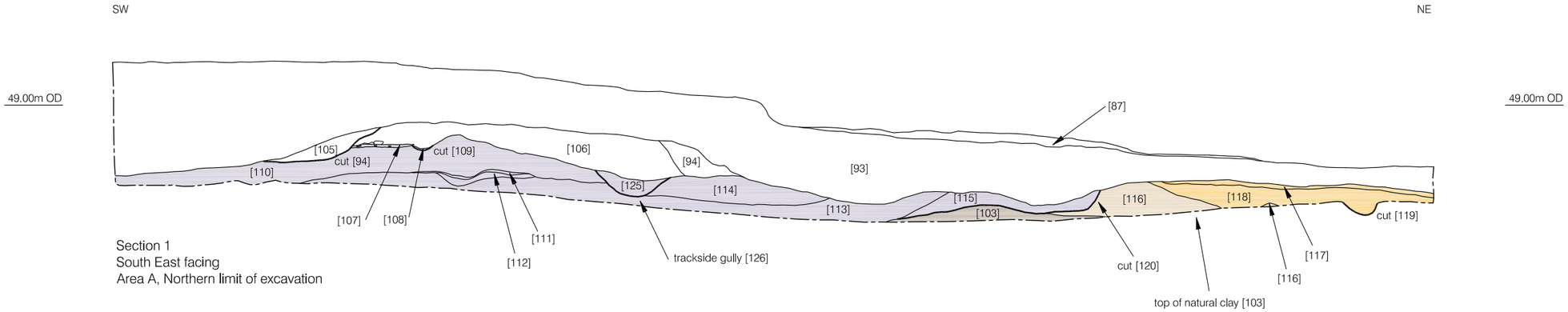
S8

Drains and Culverts

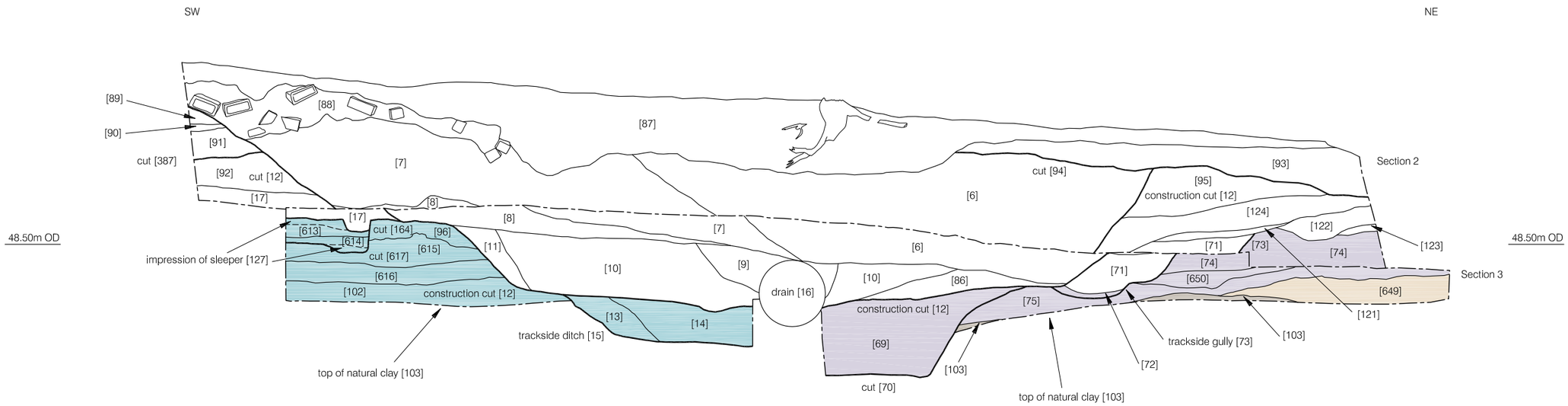
Robber Cut

0 5m

Figure 9
Area A, Phase 4
1:125 at A3



Section 1
South East facing
Area A, Northern limit of excavation

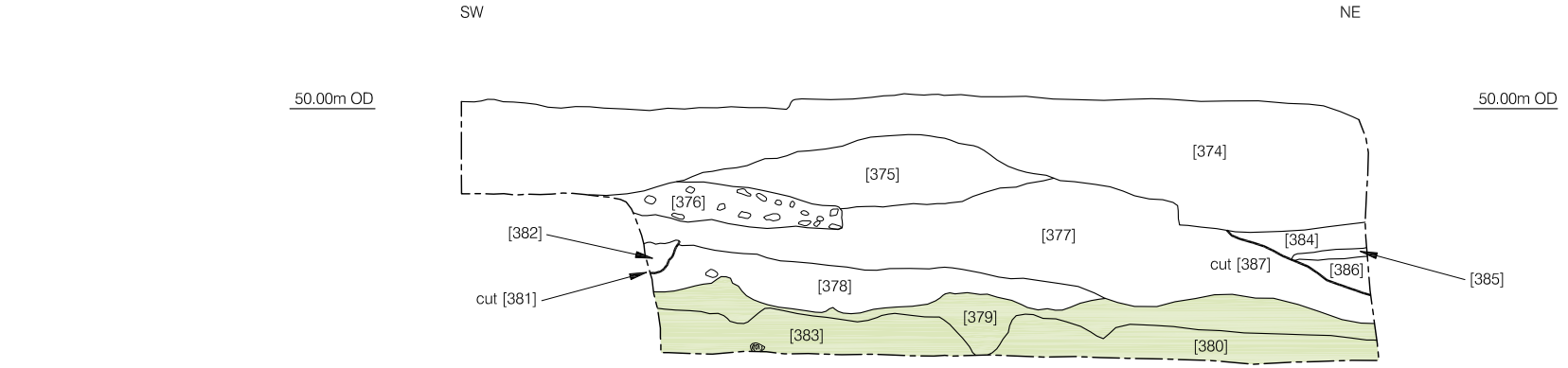


Sections 2 (upper) & 3 (lower)
South East facing
Area A, Northern limit of excavation and Slot 5

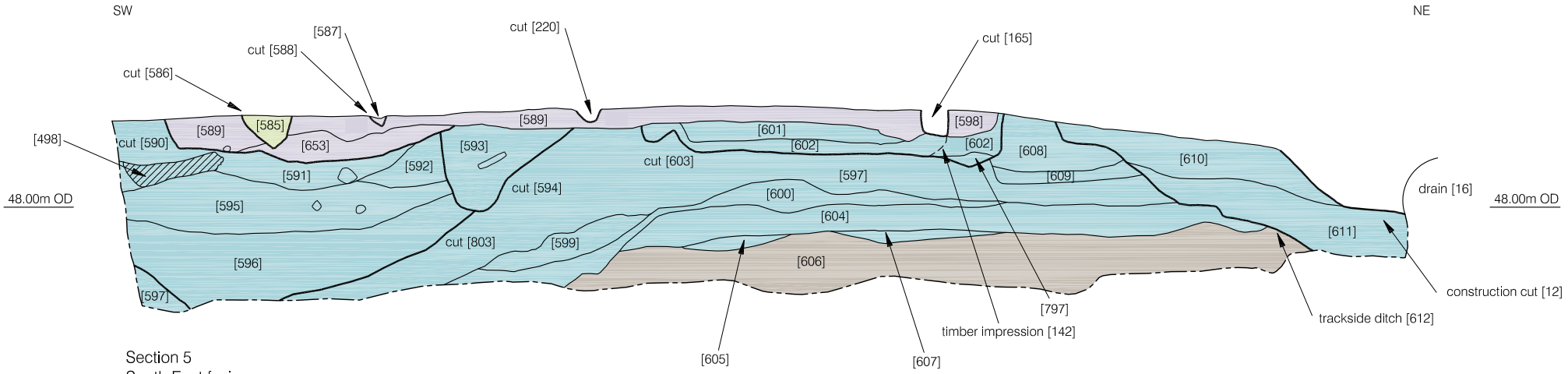
Phase 3a
Phase 3b
Phase 3c
Developed Soil
Natural sub-stratum

0 2m

Figure 10
Area A, Sections 1-3
1:40 at A3



Section 4
South East facing
Area A, Northern limit of excavation

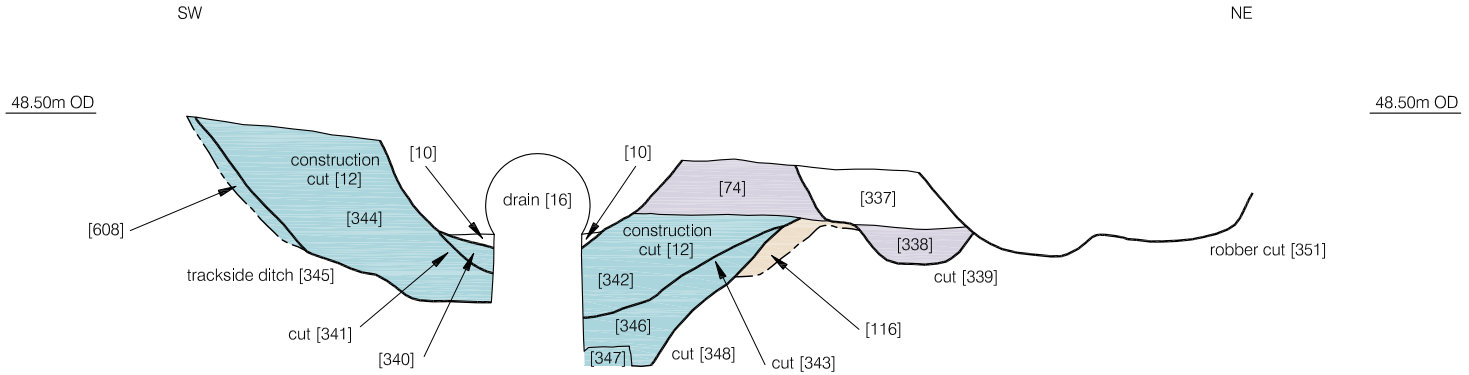


Section 5
South East facing
Area A, Slot 5

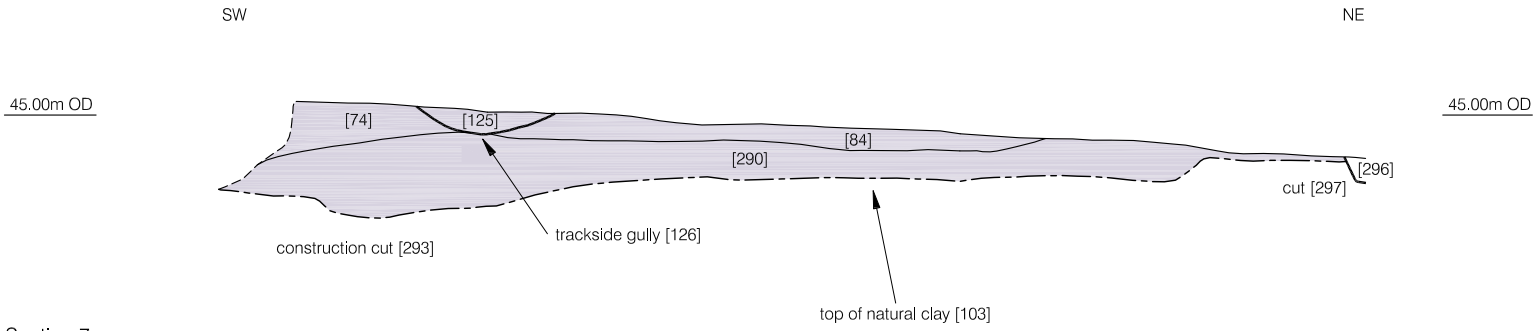
Phase 3b
Phase 3c
Phase 3d
Natural sub-stratum
Surviving Timber

0 2m

Figure 11
Area A, Sections 4 & 5
1:40 at A4



Section 6
South East facing
Area A, section through features [345] & [348]



Section 7
South East facing
Area A, Slot 3b

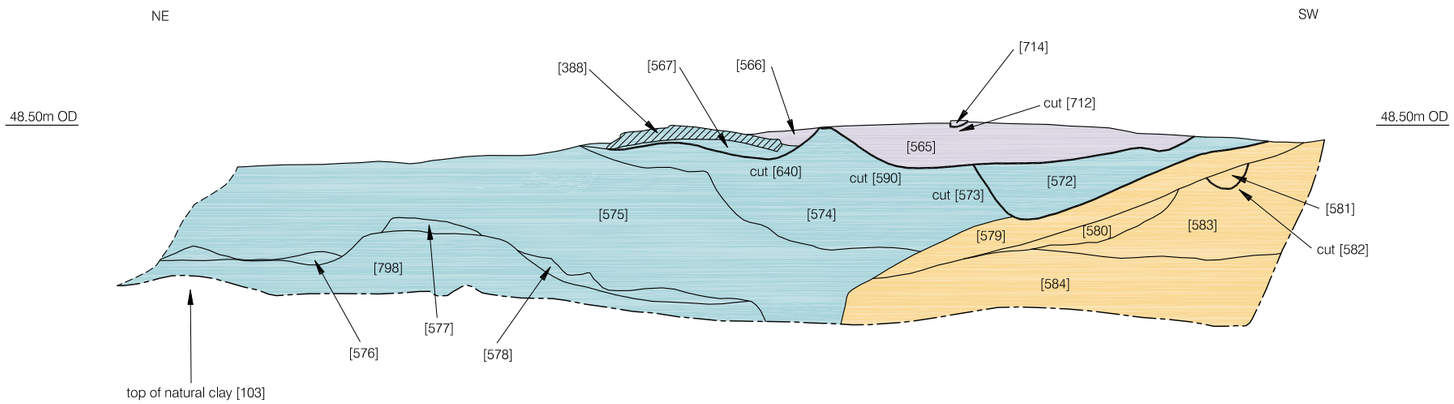
Phase 3b

Phase 3c

Developed Soil

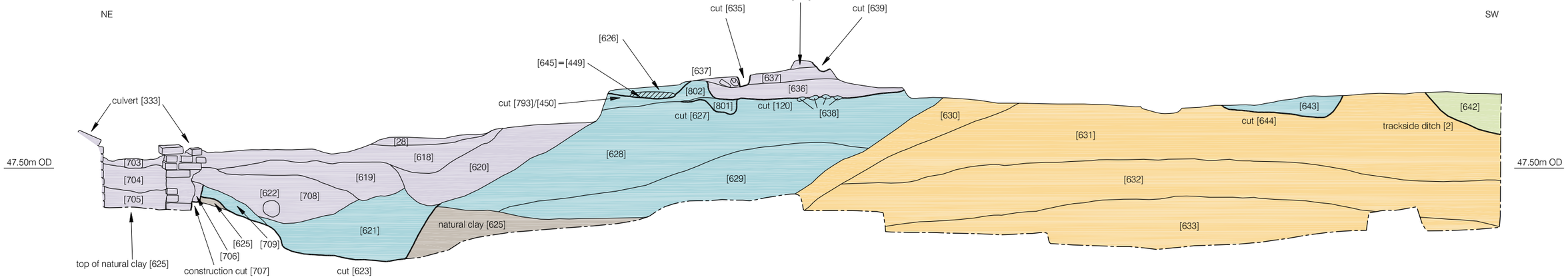
0 2m

Figure 12
Area A, Sections 6 & 7
1:40 at A4



Section 8
North West facing
Area A, Slot 3a

[634]

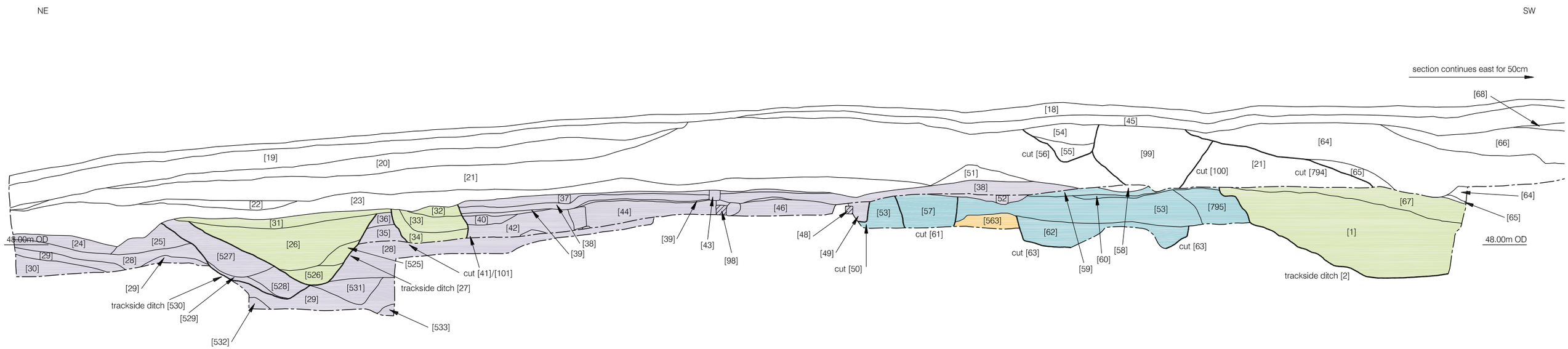


Section 9
North West facing
Area A, Slot 2

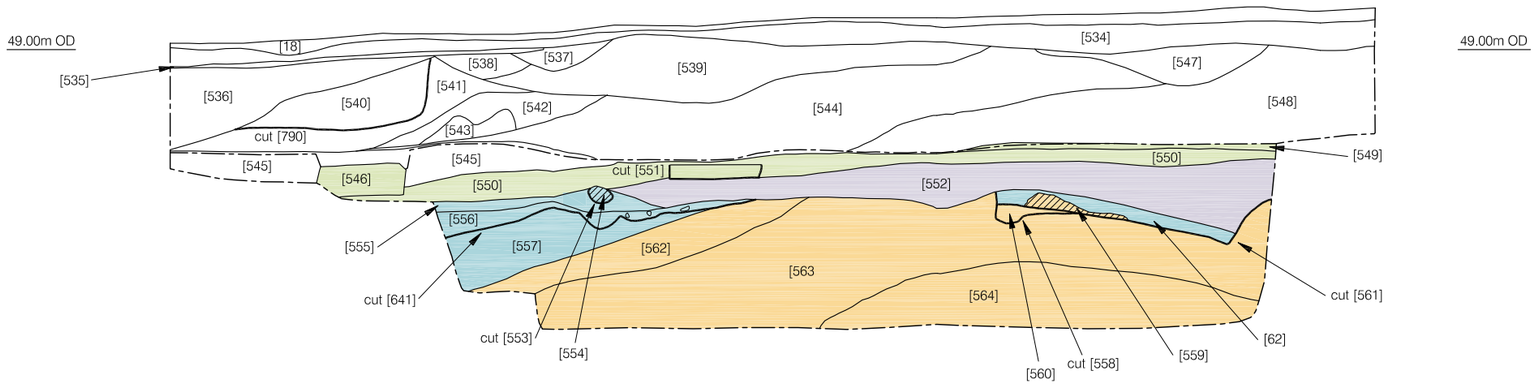
Phase 3a
Phase 3b
Phase 3c
Phase 3d
Natural sub-stratum
Surviving Timber

0 2m

Figure 13
Area A, Sections 8 & 9
1:40 at A3



Section 10
North West facing
Area A, Southern limit of excavation (before extension of Area A)



Section 11
North West facing
Area A, Southern limit of excavation

Phase 3a
Phase 3b
Phase 3c
Phase 3d
Surviving Timbers

0 2m

Figure 14
Area A, Sections 10 & 11
1:40 at A3

5.10 Area B: Phase 1 - Natural sub-stratum

5.10.1 Natural boulder clay, [248], comprising firm, light to mid brownish yellow clay with occasional small fragments of sandstone, was exposed at the northern limit of excavation of Area B (Figure 18, Section 12). The same deposit was recorded at the southern limit of excavation as deposit [520] (Figure 18, Section 13). The maximum height recorded on the natural sub-stratum in Area B was 49.52m OD, this at the north-eastern end of the northern limit of excavation (Figure 18, Section 12).

5.10.2 No deposits were recorded in Area B which can be correlated with the Phase 2 deposits in Area A.

5.11 Area B: Phase 3b/3c - Timber Waggonway (Figure 15)

5.11.1 In Area B, Phase 3 has been subdivided into two sub-phases comprising:

- Phase 3b/3c, the earliest timber waggonway, [279], which correlates with either Phase 3b waggonway [130] or Phase 3c waggonway [180] in Area A.
- Phase 3d, a waggonway, [332], which likely saw the introduction of iron rails and thus potentially correlates with Phase 3d waggonway [470] in Area A.

5.11.2 Again the embankment for the earliest waggonway - group [279] - in Area B was constructed with dumped re-deposited natural clay. What remained of the embankment was exposed in section at the northern limit of excavation (Figure 18, Section 12). Its earliest and principal element, overlying the natural clay sub-stratum, comprised firm, brownish yellow sandy silty clay, [264]. This extended *c.* 7.0m in section, with its main part *c.* 4.50m wide and up to *c.* 0.75m thick. A very similar layer, [247], this up to 0.18m thick, lying beyond a modern intrusion potentially represents the western side of material related to construction of the embankment petering out. Another similar clay dump, [799], may have been related to the eastern edge of the waggonway embankment, but this is not certain. The main dump, [264], was traced intermittently in plan across the full north-south extent of excavation area.

5.11.3 The maximum recorded height on Phase 3b/c waggonway embankment deposits in Area B was 50.16m OD, although it is of note that, at that location, the embankment material was seemingly elevated above the trackbed (Figure 18, Section 12). Below the trackbed, embankment material at the northern limit of excavation was recorded at a maximum height of 49.95m OD, falling away to 49.88m OD at the southern limit of excavation, *c.* 10m to the south.

5.11.4 Trackbed material of Phase 3b/3c waggonway [279] was recorded in section at the northern limit of excavation as a very compact deposit, [331], comprising fine and medium cobbles and sandstone fragments in a matrix of silt and crushed coal (Figure 18, Section 12). This extended *c.* 1.0m in section, was up to *c.* 0.15m thick and was recorded at a maximum height of 49.95m OD. A similar deposit, [318], was recorded in plan at a maximum height of 49.91m OD adjacent to the southern limit of excavation (Plate 18).

5.11.5 Evidence for elements of the track of waggonway [279], in the form of two groups, [319] and [335], of sleeper and rail impressions, was recorded adjacent to the southern limit of excavation. Group [335] likely represents the easternmost portion of the waggonway track; it comprised two sleeper impressions, [323] and [327], and two possible rail impressions, [321] and [325]. All fills of these impressions, [322], [326], [320] and [324], respectively, comprised silty pea grit and crushed coal. To the west, group [319] comprised five possible sleeper impressions, [301], [303], [305], [307] and [311], along with a rail impression, [299]. The sleeper impressions were generally *c.* 0.15m wide, ranged in length from *c.* 0.90m to *c.* 1.30m and in depth from 40mm to 120mm. Rail impression [299], a distinct representation of the western rail, was 0.24m wide and 0.19m deep and was traced in plan for *c.* 2m, continuing beyond the southern limit of excavation (Figure 16, Section 13). The various impressions related to the track were recorded at height of *c.* 49.85m OD. Four other short possible timber impressions, [309], [313], [315] and [317], recorded in this area may have been related to the track. To the west of, and running parallel with, the track was a shallow linear feature, [349], 0.75m in long by 0.10m wide and just 40mm deep. This may also have been related to the track, although this was not clear.

5.11.6 With the rails of waggonway [279] potentially represented by features [299] and [321], these *c.* 1.40m apart, a gauge of just over 4½ feet is indicated for the Phase 3b/3c waggonway in Area B. This corresponds to the likely gauge of Phase 3c waggonway [180] in Area A; notably these two routes also correspond closely in terms of their NW-SE alignment.

5.11.7 Evidence was recorded to indicate that material accumulated upon the lower-lying elements of embankment of waggonway [279], presumably during usage of the route. Recorded in section at the northern limit of excavation in Area B was a thin deposit, [262], comprising fragments of sandstone in a silt and crushed coal matrix, this overlying the low-lying western edge of embankment material [264] (Figure 18, Section 12). It was overlain by a deposit, [261], comprising silt, ash and crushed coal, up to 0.20m thick, in turn overlain by another deposit, [260], comprising greenish grey clayey silt, this up to *c.* 0.40m thick. West of an intrusive feature, an almost identical material as deposit [260] was recorded as a layer, [246]. At the southern limit of excavation, a deposit, [517], comprising loose crushed coal and ash, up to *c.* 0.55m thick, overlay the low-lying western edge of embankment material [264] (Figure 18, Section 13). It was a substantial deposit extending *c.* 3.0m in section, with another deposit, [516] overlying it.

5.11.8 On the eastern side of the embankment, there was evidence to indicate that a trackside ditch had been defined, rather than material simply accumulating on the lower-lying portion of the embankment; it may have been that delineation of such features was undertaken unsystematically.

5.11.9 Part of this probable eastern trackside ditch for waggonway [279] was recorded in section at the southern limit of excavation in Area B. The concave western edge of the putative feature, [508], was recorded; it was at least 1.50m wide, with its base at least 1.10m below the level of the waggonway track. The fill, [509], of the feature comprised black silty sand, at least 0.30m thick and continuing below the basal limit of excavation. Full excavation of these remains could not be undertaken due to Health and Safety considerations, therefore a definite interpretation is not possible. At the northern limit of excavation no evidence for the trackside ditch was recorded, due to later activity associated with development of the waggonway.

5.12 Area B: Phase 3d – An Iron-railed Waggonway (Figure 16)

5.12.1 Phase 3d comprises evidence of what was probably the final phase of colliery waggonway in Area B, this likely constructed with iron-rails. Placed within the broad late post-medieval phase of activity, again it is likely that this final waggonway – group [332] - was established in the early modern period, when iron rails largely replaced wooden rails. The Phase 3d waggonways recorded in Areas A and B are considered likely to have formed parts of the same route, running on the same NW-SE alignment as Phase 3c routes.

5.12.2 The majority of the evidence for waggonway [332] comes in the form of deposits representing development of the existing, Phase 3b/3c, waggonway embankment. At the southern limit of excavation in Area B, what may have been close to the full extent of this development was recorded (Figure 18, Section 13). A dump [515], comprising yellowish orange redeposited natural clay, up to 0.50m thick and extending *c*. 2.0m in section, seemingly represented initial raising and widening the western side of the overall embankment.

5.12.3 On the eastern side a similar deposit, [510], comprising brownish yellow redeposited natural clay, up to 0.20m thick, likely served the same purpose. This was overlain by an extensive dump, [800], comprising compact crushed coal and silt. This extended for more than 3.0m in section, continuing to the east beyond the limit of excavation, and had a maximum thickness of 0.55m. Just overlying this material and extending across the upper part of the embankment was a compact sandy stony layer, [512]. Extending *c*. 2.70m in section, this had a maximum thickness of 0.45m. Overlying all of these deposits was a deposit, [511], comprising sandy ash and crushed coal, this extending for 4.80m in section and up to 0.55m thick. It was recorded at a maximum height of 50.45m OD. In its developed form, the upper part of the embankment thus measured *c.* 5.40m in width, compared to the *c.* 3.70m width seen at this location for the earlier route.

5.12.4 Similar evidence for the raising and widening of the waggonway embankment in Phase 3d was recorded in section at the northern limit of excavation. The uppermost Phase 3b/3c remains were overlain by a deposit, [330], comprising compact sandy silt with frequent coal fragments (Figure 18, Section 12). This was up to 0.15m thick and extended 3.50m in section in plan. It was also exposed, intermittently, across Area B for a total distance of *c.* 8.50m NW-SE and has been interpreted as a trackbed consolidation deposit, laid down ahead of the new track.

5.12.5 In section, deposit [330] was overlain by a deposit, [266], comprising fragmented stone in a clayey silt matrix and up to 0.38m thick. This material likely formed the actual trackbed. A patch of similar material, [362], was recorded in plan, overlying deposit [330], in the central part of Area B. Deposit [273], overlying deposit [266] to the east, comprised dark grey silt and crushed coal and was up to 0.35m thick. It was recorded at a maximum height of 50.41m OD.

5.12.6 Probably contemporary with these deposits was a series of dumps recorded along the eastern side of the earlier waggonway, these evidently serving to widen the feature. The earliest of these, dump [278], was a mixed clayey silt and silty clay deposit, with occasional coal fragments. It was overlain by a clayey silt deposit, [277], also with occasional coal fragments throughout. The final deposit, [276], comprised crushed and fragmented coal and silt with frequent stone fragments; to the west this also overlay the previously described deposit [273].

5.12.7 Evidence for the track of waggonway [332] was restricted to the linear impressions - group [336] - of the 'robbed out' iron rails, these likely removed when the waggonway fell into disuse. In plan these were recorded 'cutting' the trackbed consolidation deposits previously described. For example, a linear feature, [783], was traced intermittently for a total distance of more than 5.50m, running NW-SE along the western side of the embankment. Its main element was 3.70m long and it was up to 0.25m wide.

5.12.8 A similar feature, [784], was located to the east, this traced for 3.80m in plan and up to 0.30m wide. Both features contained silty crushed coal fills, [363] and [364], respectively, and were recorded maximum heights of *c.* 50.12m OD. The distance between the midpoints of these features was *c.* 1.30m, giving an estimated gauge of *c.* 4½ feet, this broadly corresponding to the estimated gauge of the Phase 3d waggonway in Area A.

5.12.9 Further probable evidence of the 'robbed-out' rails of the Phase 3d waggonway was recorded in section upon trackbed deposit [266] (Figure 18, Section 12). To the west lay feature [269], 0.40m wide and 0.23m deep. Its primary fill, [268], comprised crushed coal whilst an upper fill, [267], comprised crushed brick and clinker. To the east, feature [272] was *c.* 1.20m wide and up to 0.28m deep, this in a deeper eastern element likely representing the position of the rail. It had a single fill, [271], comprising crushed coal and silt. These features were recorded at a maximum height of 50.45m OD. The gauge implied by these features in section was again *c.* 4½ feet (*c.* 1.30m).

5.13 Area B: Phase 4 - Early Modern (Figure 17)

5.13.1 A linear field drain was recorded running across the western side of Area B in a NW-SE direction. It would have been positioned deliberately along the lower lying western side of the abandoned waggonway embankment. The route likely remained in use for pedestrians and probably farm traffic into the early modern era. The drain trench was recorded in section as features [253] and [519], at the northern and southern limits of excavation, respectively (Figure 18, Sections 12 and 13). The feature was up to 1.60m wide and *c.* 0.45m deep. Along the base, visible only to the south, ran a red ceramic drain, [806], this overlain by a sandy silt backfill, [518], in turn covered by a sandy fill, [651]. Five backfills [288], [252], [251], [250], and [249], were recorded in section at the northern limit of excavation.

5.13.2 Numerous dump deposits and levelling layers recorded in section in Area B have been assigned to the early modern era, post-dating abandonment of the waggonway route recorded there. At the northern limit of excavation, the earliest of these, deposit [245], comprised ash and burnt stone, overlain by a silt and crushed coal deposit, [259], in turn overlain by sandy silt deposit, [265], containing fragments of coal, brick and stone. This layer appeared to be contemporary with similar material to the east, deposit [270]. The combined maximum thickness of these deposits to the south-west was *c.* 0.80m.

5.13.3 To the east, a substantial ditch, [506], truncated the eastern side of the existing waggonway embankment. This was at least 2.50m wide by 1.30m deep, although its full width and depth were not revealed within the limits of excavation. Its main fill, [275], comprised silt and crushed coal. The upper part of the feature was infilled by an ash and crushed coal deposit, [274], this traced across the excavation area, as deposit [505], and recorded in section at the southern limit of excavation (Figure 18, Section 13). The feature was likely dug for drainage along the eastern side of the abandoned waggonway embankment, as this route remained in use for pedestrians and other traffic into the early modern era, as postulated above.

5.14 Area B: Phase 5 - Modern

5.14.1 A substantial feature, [258], was recorded in section at the northern limit of excavation (Figure 18, Section 12). It was *c.* 6m wide and 0.92m deep with a concave base and sloping sides. Several fills, [257], [256], [263] and [255], were recorded in its lower part. These appeared to be make-up deposits for a concrete raft, [254], probably a former NW-SE aligned roadway, which extended 6.05m in section and occupied construction cut [258].

5.14.2 The concrete raft may have been a continuation of the roadway recorded at the southern limit of excavation in Area A. The concrete had a maximum thickness of 0.58m, bringing the ground level up to 50.70m OD. This material, although less substantial and without a construction cut, was also recorded in section at the southern limit of excavation, as layer [507].

5.14.3 At the northern limit of excavation concrete road [254] was truncated to the west by an intrusion, [244], which extended 3.10m in section, continuing beyond the limit of excavation to the west.

5.14.4 A substantial ground levelling dump, [514], was recorded in section at the southern limit of excavation, this mostly comprising clay with inclusions of concrete, plastic and other industrial waste. It measured at least 4.90m wide, continuing beyond the western limit of excavation, and was up to 0.70m thick.

5.14.5 As with Area A, the latest deposit recorded comprised topsoil, [241]. This did not cover the entire area and varied in depth, being on average *c.* 0.15m deep, bringing existing ground level up to a maximum height of 50.70m OD.

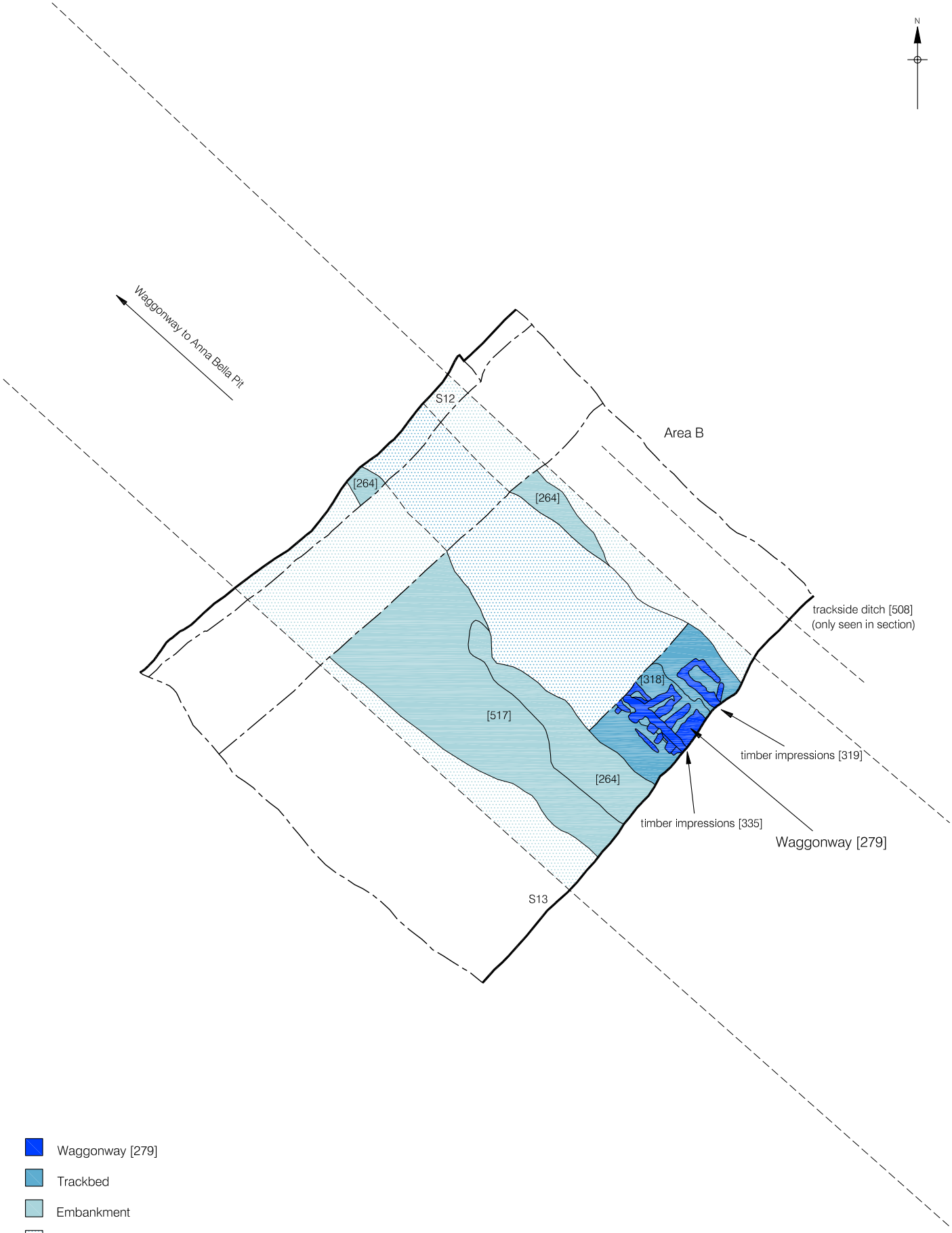


Figure 15
Area B, Phase 3b/3c plan
1:125 at A4

Waggonway [332]

Trackbed

Embankment

Conjectured Trackbed

Conjectured Embankment

Re-used Embankment from Phase 3b/3c

0 5m

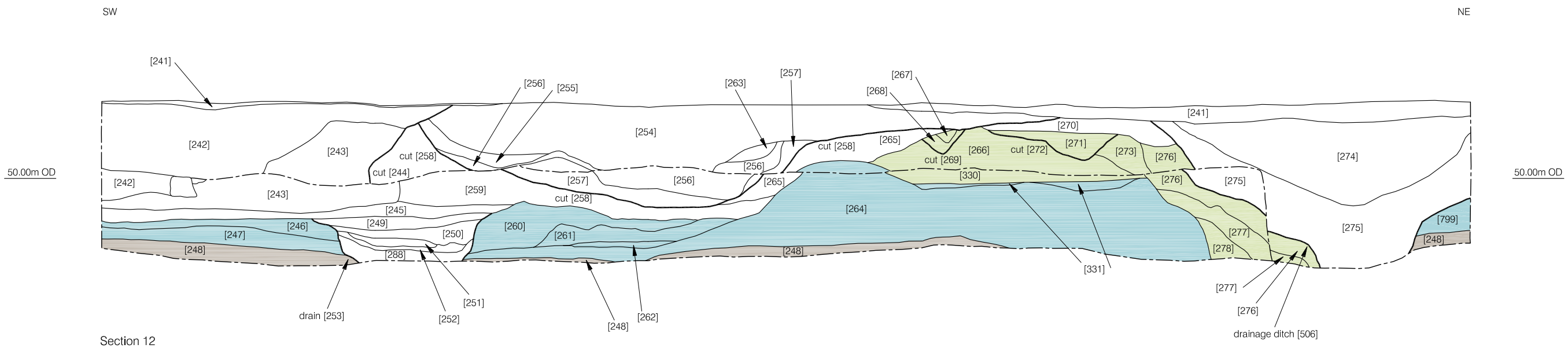
Figure 16
Area B, Phase 3d plan
1:125 at A4

Drains and Drainage Ditches

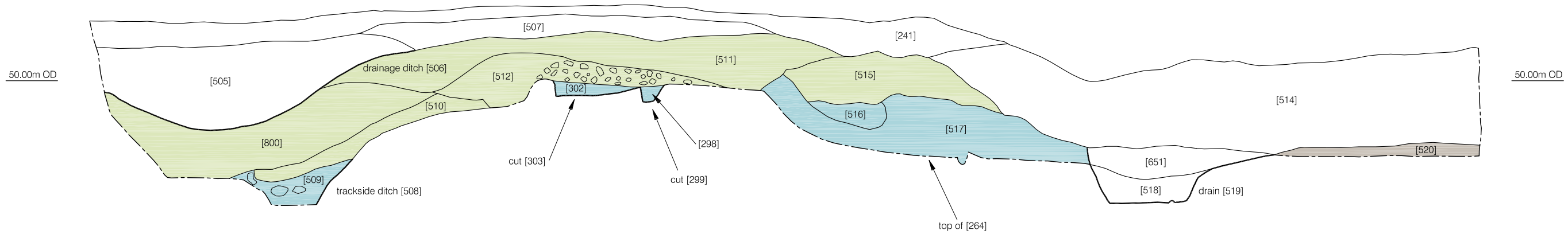
Conjectured Drain

0 5m

Figure 17
Area B, Phase 4 plan
1:125 at A4



Section 12
South East facing
Area A, Northern limit of excavation



Section 13
North West facing
Area A, Southern limit of excavation

Phase 3b/3c

Phase 3d

Natural sub-stratum

0 2m

Figure 18
Area B, Sections 12 & 13
1:40 at A3

PART B: DATA ASSESSMENT

6. STRATIGRAPHIC DATA

6.1 Paper Records

6.1.1 The contents of the paper archive are set out in Table 6.1, as follows:

Item	*No.*	*Sheets*
Contexts register	1	11
Context sheets	788	788
Sections register	1	1
Section drawings	31	56
Plans	24	56
Small finds register	1	1
Timber drawings register	1	1
Timber drawings	12	12

Table 6.1: Paper archive contents

6.2 Photographic Records

6.2.1 The contents of the photographic archive are set out in Table 6.2, as follows:

Item	*No.*	*Sheets*
Colour slide register	5	7
Colour slides	162	10
Monochrome print registers	6	7
Monochrome prints	138	18
Monochrome negatives	138	8
Digital photographs register	1	8
Digital photographs	295	N/A

Table 6.2: Photographic archive contents

6.3 Site Archive

6.3.1 The Site Archive, including the paper and photographic records, is currently housed at the Northern Office of Pre-Construct Archaeology Limited. The timber samples are currently housed in the Environmental Laboratory at Archaeological Services Durham University. The Site Archive will eventually be deposited with Tyne and Wear Museums Archive at Arbeia, South Shields for permanent storage and the detailed requirements of the repository will be met prior to deposition.

7. ARTEFACTS

By: ***Jenny Vaughan (NCAS)***

7.1 Introduction

7.1.1 An assemblage of 37 sherds of pottery weighing 4,212g was recovered during the excavation. Seven fragments of stoneware present accounted for over 75% of the weight. There were a few fragments of medieval pottery – these from embankment material of a Phase 3a waggonway in Area A - but the rest of the group ranged in date from the 18th century to the early 20th century.

7.1.2 A small assemblage of clay tobacco pipe, comprising four stem fragments and a complete bowl, was recovered.

7.1.3 The glass assemblage comprised eight fragments of glass from bottles and tubes along with glass waste indicative of industrial processing.

7.1.4 A small stone ball was also recovered from the excavations. This curious object possibly originated from a game known to have been played by pitmen.

7.1.5 Nine brick samples were taken from structural features at the site.

7.2 Pottery

7.2.1 The pottery assemblage is summarised in Table 7.1.

7.2.2 The late medieval pottery – recovered as residual material within Phase 3a waggonway embankment deposit [632] - was reduced green glazed ware. The five fragments joined.

7.2.3 Three main types of post-medieval pottery were present: red earthenware (some with internal white slip); refined whiteware; utilitarian stoneware. There were three complete stoneware vessels: a plain stoneware bottle and two jam jars. Some of the red earthenware, particularly the plain brown glazed sherds, could be of 18th century origin.

7.2.4 A small fragment of painted white salt glazed stoneware from a context ([652]) associated with Phase 3b waggonway in Area A would be consistent with a mid 18th century date.

7.2.5 The refined whiteware included three interesting fragments. The first, from Phase 3c waggonway deposit [565], has the partial inscription '*THE SIRI…'.* Part of a painted scene above the letters is too small to identify without a complete example for comparison. This may well refer to HMS Sirius, the flagship of the Royal navy First Fleet that sailed to New South Wales in 1787. She was wrecked off Norfolk Island in 1790, an event described as a catastrophe for the colonists. The fragment is slightly moulded and the colour a pale cream. It is entirely possible that the piece is of late 18th century origin. The second HMS Sirius was launched in 1797, this being a 36-gun Royal Navy frigate that served in the Napoleonic Wars and was sunk in the Battle of Grand Port in Mauritius in 1810. Commemorative pieces may well have been produced marking the fates of either of these ships, but need not be contemporary with the events.

7.2.6 The Sirius name was used again for three Royal Navy ships in the 19th century and there was also a British & American Company paddle steamer Sirius, launched in 1835 and the first such vessel to cross the Atlantic non-stop in 1838. However, given its likely date, the item from the excavation perhaps most likely refers to the first or second HMS Sirius.

7.2.7 The second refined whiteware fragment of note was from Phase 4 deposit [7], this a piece of a large oval dish is marked '*Silksworth 1897 Industrial & Prov*...' The complete inscription would probably have read '*Silksworth 1897 Industrial & Provident Building Society'*. There are fatal accidents recorded at Silksworth Colliery in 1897 but this plate is perhaps more likely to be a commemorative item for the Diamond Jubilee of Queen Victoria.

7.2.8 The third whiteware fragment of note, from Phase 4 dump layer [92], is another royal memento, this a fragment, probably from a mug, showing the year '*1902'* with '*…E 26th'* above. The 26th June 1902 was the date planned for the coronation of Edward VII. It actually took place on 9th August after the sovereign to be developed appendicitis a few days before the coronation; no doubt many souvenirs had already been produced before the change of plan.

7.2.9 A small yellow glazed bowl with applied dark brown decoration from Phase 4 context [92] appeared from stamps *'…A FEU*' and '…EGUEMINES' on its base to be is a type of oven to table ware from the Sarreguemines potteries in the Lorraine region of France, one of the largest potteries in Europe by the end of the 19th century. By that date the works featured an expanded product line including all manner of tableware and other items.

Context	***Phase***	***Sherds***	***Weight (g)***	***Spot date***
Unstratified	N/A	2	1413	N/A
6	4	5	172	19th c. (?first half)
7	4	7	1484	Late 19th/early 20th c. (dated vessel 1897)
17	4	1	6	19th c.
74	3c	2	8	18th c.?
92	4	8	1062	Early 20th c. (dated vessel 1902)
544	4	1	6	18th/19th c.
552	3c	3	23	18th/19th c.
565	3c	1	10	?Late 18th c.
597	3b	1	6	18th c.?
632	3a	5	18	Late medieval
652	3b	1	4	18th c.?

Table 7.1. Pottery assemblage

7.3 Clay Tobacco Pipe

7.3.1 Four stems and a complete bowl were recovered. Two stems from context [564], a Phase 3a waggonway embankment deposit, had bores of 7/64" and are probably 17th century in date. One stem from context [503], a Phase 3c deposit, had a bore of slightly less than 6/64". It is possibly 18th century. A small fragment of stem from deposit [650], another Phase 3c deposit, with a bore slightly larger than 6/64" may also be 18th century or late 17th. The bowl, from Phase 3c context [701], is a large spurless type; a type referred to as a briar copy. It is likely to be late 19th or early 20th century date and may have been introduced intrusively into this context.

7.4 Glass

7.4.1 A small assemblage of mainly bottle glass was recovered. The material is broadly late 19th/early 20th century date. This material is detailed in Table 7.2.

7.4.2 The Ayres Quay Bottle Company operated throughout the 19th century and up to the Second World War. The Codd bottle survived the introduction of the internal screw stopper and continued to be used up to about 1930, so this item could be as late as this date. It was recovered from a Phase 4 dumped deposit. The other names were not immediately traceable.

7.4.3 A fragment of vitrified grey ceramic material was recovered from context [361], a Phase 3b trackbed ballast layer. This had green glaze on two flat surfaces, one of them grooved. Similar material has been noted from other sites and thought to be related to some sort of industrial process, possibly glass making. The glass waste is from a similar ballast deposit [286], this from Phase 3c.

Context	*Phase*	*Type*	*Sherds*	*Weight (g)*	*Form*	*Comments*
6	4	White glass	1	214	Bottle	Complete sauce type bottle - square sided. 20th c.
7	4	Blue glass	1	163	Bottle	Complete. Light blue flat bottle embossed KOMP (REGISTERED).
26	3d	Green glass	2	217	Bottle	Kick up from base of bottle.
71	4	Green glass	1	43	Tube	Thick walled dark green glass tube.
92	4	Green glass	1	560	Bottle	Codd bottle minus top. Embossed marks - bottle maker is Ayres Quay Bottle Co. Sunderland, mineral water supplier is J. W. Pratt, South Shields.
92	4	Green glass	1	328	Bottle	Base/body of dark green bottle with embossed marks of Aerated Water Co. Newcastle and Thos. War…? maker (presumably of the bottle), Dunston.
286	3c	Green glass	1	1		Very small fragment.
286	3c	Glass	11	203		Fragments of glass waste

Table 7.2. Glass assemblage

7.5 Stone Object

7.5.1 A stone ball weighing 203g and *c.* 52mm diameter was recovered from context [3], the backfill of Phase 3c construction cut [4]. There is a similar object in the Cocks Collection (Society of Antiquaries of Newcastle-upon-Tyne) with a manuscript note by W. A. Cocks describing it as a bowl or 'boole' formerly used by pitmen in the game of 'booling'.

7.6 Bricks

7.6.1 Eight brick samples were taken from various structures at the site and a single fragment of brick was recovered from a fill deposit. All but one fell within the date range of late 18th century to first half of the 19th century. The exception, from context [88], the uppermost infill of the construction cut of Phase 4 drain [12], was a press moulded 20th century brick. Measurements are given in Table 7.3.

7.6.2 The bricks from Phase 4 brickwork [78], from, were handmade, dark red with shallow combed frogs and occasional pale inclusions. <78.1> was somewhat coarser than the other three with possible trace of mortar on one side. <78.2> had some white mortar traces on upper and lower faces and on the header ends.

7.6.3 The sample from Phase 4 infill deposit [88] was a mid red wire-cut press-moulded brick, heavy and smooth with frogs on both faces. There is some cracking and one end has the remains of cream coloured paint, *i.e.* it was a visible header in the structure.

7.6.4 The samples from Phase 3c drain [104] were dark red and hand moulded with some small dark inclusions and shallow combed fragments.

7.6.5 The samples from Phase 3c culvert [333] were mid red and hand moulded with no frogs visible but heavy lime mortar adhered to all but one header end of each brick.

Context <Sample No.>	***Phase***	***Length (mm)***	***Width (mm)***	***Thickness (mm)***
78 <78.1>	3c	253	113	62
78 <78.2>	3c	230	107	60
78 <78.3>	3c	230	107	60
78 <78.4>	3c	225	111	65
88 <88.1>	4	227	102	80
104 <104.1>	3c	240	110	60
104 <104.1>	3c	245	115	63
333 <333.1>	3c	229	106	60
333 <333.2>	3c	235	111	60

Table 7.3. Brick samples

7.7 Potential for Further Analysis

7.7.1 Although there are some interesting later pieces in the post-medieval pottery assemblage, it is too small to have any potential for further analysis and thus further research is probably not justified.

7.7.2 The glass assemblage contained marked items, which are always of some interest. However, this group of material is too small to merit further work.

7.7.3 The bricks were retained only as dating evidence for various structures and features associated with the waggonways and further analysis is not necessary.

7.7.4 In sum, although there were some interesting items, the artefactual assemblage was too small to have potential for further analysis or for additional research to be justified.

7.7.5 A short description of the material should be included in a publication report of the site and the stone ball should be drawn for inclusion with the publication.

8. TIMBER

By: ***Dr Charlotte O'Brien (ASDU)***

8.1 Introduction

8.1.1 Nine samples of timbers from the waggonways were submitted in order to undertake species identification and assess whether they would be suitable for dendrochronological dating.

8.1.2 The timber identification, assessment and report preparation was undertaken by Dr. Charlotte O'Brien.

8.2 Methods

8.2.1 Transverse, radial and tangential sections of the timbers were examined at up to x600 magnifications using a Leica DM/LM microscope. Identifications were assisted by the descriptions of Schweingruber (1978) and Hather (2000), and modern reference material held in the Environmental Laboratory at Archaeological Services Durham University.

8.3 Results

8.3.1 The timbers from contexts [185], [187], [203], [408], [433], [472] and [493] are oak. These timbers were all used as sleepers. Those from contexts [217] and [285], which were both samples from rails, are pine. Preservation is good in those from contexts [185] and [203], but is moderate to poor in the other samples. The oak timber from context [203] comprised the largest sequence of annual rings (50). Bark is absent from all of the samples. Details of the identified timbers are listed in Table 8.1.

Context	***Phase***	***Species***	***No. of annual rings***	***Pith present***	***Sapwood present***	***Suitable for dendro dating***	***Notes***
185	3c	Oak	23	Yes	Yes	No	Good condition. Entire cross-section of branch/stem present.
187	3c	Oak	*c.* 8	No	?	No	Fixing peg. Difficult to count rings.
203	3c	Oak	50	Yes	Yes	Unlikely	Good condition. Entire cross-section of branch/stem present.
217	3c	Pine	*c.* 8-10	No	?	No	Very poor condition. Difficult to count rings.
285	3c	Pine	*c.* 3-7	No	Yes	No	Small piece.
408	3b	Oak	24	No	Yes	No	Not entire cross-section of branch/stem.
433	3b	Oak	*c.*. 26	Yes	Yes	No	Not entire cross-section of branch/stem.
472	3a	Oak	*c.* 21	No	Yes	No	Compressed branch/stem.
493	3b	Oak	>16	Yes	Yes	No	Very poor condition. Entire cross-section of branch/stem present.

Table 8.1. Details of the identified timbers

8.4 Discussion

8.4.1 The samples of pine had dentate ray tracheid walls, indicating that they are probably Scots pine (*Pinus sylvestris*), which is a native species of Britain and northern Europe. This species cannot be differentiated on the basis of its wood anatomy from mountain pine (*Pinus mugo*), but it is unlikely that this species is represented as it is a small tree, which is largely restricted to high altitude regions of central Europe.[20] Oak wood cannot be identified beyond genus,[21] with the species native to Britain being pedunculate oak (*Quercus robur*) and sessile oak (*Quercus petraea*). The timber may have been locally sourced, however large amounts of timber were imported to Britain during the late medieval, post-medieval and early modern industrial eras, particularly from the Baltic region.[22]

8.4.2 Annual ring sequences of >100 years are generally required to successfully date timbers using dendrochronology, and those with fewer than 50 rings are usually rejected.[23] Therefore all of the timbers are unlikely to be suitable for dendrochronological dating, although the 50 year old oak timber in context [203] may warrant assessment by a dendrochronology specialist.

8.5 Potential for Further Analysis

8.5.1 No further research or analysis is necessary for the timber samples. A short report detailing the material should be included in any publication report on the site.

8.5.2 The timbers are currently in the Environmental Laboratory at Archaeological Services Durham University.

[20] Hather 2000; Stace 1997.
[21] *ibid*.
[22] Crone and Fawcett 1998.
[23] Hillam 1998.

9. SUMMARY DISCUSSION

9.1 Phase 1, Natural Sub-stratum and Phase 2, Undated Palaeosol

9.1.1 Natural Boulder Clay was exposed to a limited extent in both areas of excavation. The maximum recorded height on the natural sub-stratum was *c.* 49.50m OD, this in the northern part of Area B, where the deposit may have been horizontally truncated by development of the waggonway routes in the later post-medieval period. In the northernmost part of Area A, probably untruncated natural clay was recorded at a maximum height of *c.* 48.20m. Towards the southern limit of Area A, natural clay was recorded at a maximum height of *c.* 47.20m OD although again it may have suffered horizontal truncation at this location. Broadly though the work recorded the height of the natural sub-stratum falling in elevation by *c.* 2.30m over a distance of *c.* 150m between Area B in the north-west and Area A in the south-east, this reflecting the natural topography of the area with the ground falling away to the south-east towards the River Wear.

9.1.2 At the northern extent of Area A, the natural Boulder Clay was overlain by a layer of clayey silty sand, up to *c.* 0.30m thick. This has been interpreted as the remnants of a palaeosol which accumulated upon the natural sub-stratum.

9.2 Phase 3a, the Earliest Timber Waggonways

9.2.1 Two Phase 3a waggonways represent the earliest evidence of attempts to carry coal from the outlying workings of Harraton Colliery to staithes at Fatfield on the River Wear to the south-east. The location and alignment of Phase 3a waggonway [480], when overlaid on the 1st edition Ordnance Survey map (Figure 19), strongly suggest that this route was created to serve Hall Pit of Harraton Outside. The Phase 3a remains likely date to the mid to late 18th century, possibly earlier.

9.2.2 The earliest waggonway, [480], recorded within the excavated areas was located within the south-western corner of Area A. The sub-structure of this waggonway comprised a WNW-ESE aligned embankment built up using dumped clay, certainly quarried from the natural clay sub-stratum of the area. The embankment was at least *c.* 6.80m wide and *c.* 1.40m high, although it was not possible to ascertain either its full width or height within the limits of excavation. The upper part of the embankment, along which the waggonway track was set out, narrowed to a width of *c.* 4m.

9.2.3 The remains of the track of waggonway [480] were recorded for a distance of *c.* 17m, running along the top of the embankment and constructed within a shallow trackbed cut up to *c.* 1.80m wide. A stony deposit lined the base of the trackbed to form a solid foundation layer for the track. Only two timbers – both sleepers - survived from the track of waggonway [480], with the rest of the track evident simply as the impressions of timber sleepers and rails; whether these had rotted *in situ* or had been removed following disuse of the route is uncertain.

9.2.4 Rail impressions in waggonway [480] were between 0.10m to 0.15m wide and their midpoints lay *c.* 1.50m apart, indicating a gauge of *c.* 5 feet. The distance between sleeper impressions of waggonway [480] was variable, between 0.10m and 1.60m apart, but on average they were *c.* 0.30m apart. The two surviving timber sleepers were in a poor state of preservation, but one was identified as oak, with a knotty fragment of branch having been used. It was *c.* 1.30m long.

9.2.5 The recorded evidence of waggonway [480] suggests that there was a gradient of *c.* 2.6% along the exposed portion of the track, with the fall to the south-east, thus reflecting the underlying natural topography. A possible trackside gully was recorded in section along the eastern side of the embankment at the northernmost point that the waggonway was exposed.

9.2.6 The remains of the second Phase 3a waggonway, [760], also aligned WNW-ESE, were recorded on the eastern side of waggonway [480], with the two routes evidently merging within the excavation area and thus potentially in use contemporaneously. Waggonway [760] was exposed for a length of *c.* 6m although all of its elements had seemingly been removed by later activity as it ran up to the southern limit of excavation. The track, constructed upon a compact silty crushed coal trackbed, survived as a group of sleeper impressions along with five surviving sleeper timbers. These sleepers were on average *c.* 0.50m apart and the surviving straight lengths of timber were up to *c.* 1.25m long (although some impressions were up to *c.* 2.10m long) and up to *c.* 0.17m wide. The recorded evidence suggests that there was a gradient of *c.* 1.7% along the exposed portion of the track, with the fall to the south-east, in similar fashion to the closely related waggonway [480].

9.2.7 As described, the waggonway tracks ran along a substantial man-made embankment with the required track gradient thus created. Excavation of cuttings and building of embankments were typical features of early waggonways, with steady, and where possible, very slight gradients along the tracks being crucial due to the basic methods of propulsion and low technology braking systems. The very earliest lines tended to be single tracks with passing loops, and there is no certain evidence for double tracks, main ways to take loaded wagons and bye ways to return empty wagons to the pit head, until the 1720s.[24] The earliest waggonways tended to be single tracks, with the loaded wagons having a predominantly downhill route.[25] This was certainly the case on the Phase 3a waggonways recorded here. By 1750, a gradient of *c.* 10% was considered to be the maximum for a main way.[26] Some waggonways had their bye ways at some distance from the main way, with the main way track having the most direct alignment and regular gradient, particularly when the bye way was a later addition to a single track. Many waggonways remained as single track, especially if they did not carry heavy traffic.

[24] Lewis 1970, 144.
[25] Warn 1976, 4.
[26] Lewis 1970, 145.

9.2.8 The estimated 5 feet gauge for waggonway [480] is at the upper end of the 4 to 5 feet range of known gauges used for waggonways in the North East coalfields. The highest dimension is based on the optimum axle-length for a wagon pulled by one horse.[27] Surviving timber sleepers from other waggonways in the region, such as Lambton D Pit,[28] are made from oak and documentary evidence from 1765 describing waggonway construction describes how oak was used for track sleepers.[29]

9.2.9 In general, the impressions and surving timbers from the Phase 3a waggonway tracks at this site indicate that for the most part fairly straight timbers had been used as sleepers. One of the Phase 3a sleepers was made from a knotty branch of oak. At Lambton D Pit and another excavated example of a timber waggonway from the region, Rainton Bridge South,[30] generally crooked lengths of roughly-trimmed oak branches were utilised for most sleepers. The aforementioned 1765 account described how timbers for sleepers were often simply squared at the ends, leaving the centres untrimmed. It also stated that sleepers ranged from 4 to 8 inches (*c.* 0.10m to 0.20m) square, were on average 6 inches (*c.* 0.15m) square and on average 6 feet (*c.* 1.80m) long. In terms of their estimated dimensions, the sleepers from the Phase 3 tracks at this site therefore lie within those ranges. The account also described how sleepers were laid 2 to 3 feet (*c.* 0.60m to *c.* 0.90m) apart, while the sleepers in both sections of Phase 3a track evidently lay closer, on average *c.* 0.50m apart. As discussed above, this is likely because only a single track was present, rather than a main way and a bye way. It has been noted that sleepers in early main ways were generally set 1 foot 6 inches (*c.* 0.45m) apart, although they could on some occasions be set 1 foot (*c.* 0.30m) apart.[31] In sum, therefore, the surviving evidence of the Phase 3a tracks suggests that they were constructed to take full loads from the pit head.

9.2.10 Dating evidence from the Phase 3a waggonway remains was limited, as one might expect in an essentially rural industrial context. Two fragments of clay tobacco pipe of possible 17th century date were recovered from embankment deposits, but these could have been residual in context, given that the embankments were created from bulk excavation of the underlying sub-stratum. Documentary evidence certainly has a waggonway in existence at Harraton by the 1770s, but the workings may have been amongst the first to operate in the area, with a shaft possibly being sunk as early as *c.* 1590. Therefore, while it is possible that the tobacco pipe fragments were contemporary with the construction of the Phase 3a waggonway, on the basis of such limited artefactual evidence this is far from certain.

[27] Lewis 1970, 183.
[28] Ayris *et al* 1998.
[29] Jars 1765, in Lewis 1970.
[30] Glover 2005.
[31] Lewis 1970.

9.3 Phase 3b, the Second Timber Waggonways

9.3.1 Two closely associated Phase 3b waggonways recorded in Area A represent the development of the outlying workings of Harraton Colliery. The location and alignment of this overall route, when overlaid on the 1st edition Ordnance Survey map (Figure 19), strongly suggest that it was created to serve Anna Bella Pit of Harraton Outside. A single sherd of probable mid 18th century pottery was recovered from a Phase 3b trackbed in Area A. Such limited dating evidence is certainly not conclusive but the sherd does broadly fit in with the probable date of these waggonways. Anna Bella Pit was possibly named after Annabella Milbanke (as described in the 2008 desk-based assessment) and since this person was born in 1792 – and assuming that the working was not renamed at any stage – it can be presumed that this pit was sunk on or after that year. The Phase 3b waggonways therefore potentially date to the late 18th century.

9.3.2 The Phase 3b waggonways ran on a slightly more northerly, NNW-SSW, orientation, than the earlier routes. The tracks of the two waggonways, [130] and, on its western side, [360], slightly diverged at the southern limit of excavation, but merged in the central part of Area A, to continue the single track of waggonway [130] beyond the northern limit of excavation. That the two routes merged strongly suggests that they were in use contemporaneously.

9.3.3 To the north, a substantial embankment had been constructed for waggonway [130], again using bulk redeposited natural clay, to carry the track. This had a maximum recorded width of *c.* 7.70m and a maximum recorded thickness of *c.* 1.10m, although, as with Phase 3 a embankment, the full width and thickness was not determined. To the south, there was less of a requirement to construct an embankment, with that of the Phase 3a routes already in place. However, there was evidence to show that the upper part of the existing embankment was widened on its eastern side, by up to *c.* 3.30m, accommodate the route of waggonway [130].

9.3.4 Distinct trackbeds were recorded for the Phase 3b waggonways, these up *c.* 2.95m wide and *c.* 0.22m deep. Crushed coal and, in the northern part of Area A, stony clay, formed a firm foundation for the tracks. The track of waggonway [130] was traced for *c.* 41m running NW-SE, extending beyond the limits of excavation in Area A. The recorded evidence indicates a track gradient of *c.* 1.5-1.8% along the exposed portion of the route.

9.3.5 The track of waggonway [130] comprised a combination of sleeper and rail impressions, along with 26 surviving timber sleepers and one surviving rail, with sleepers generally only surviving in the central part of Area A. The timber sleepers were 0.14m to 0.24m wide (*c.* 5½ to 9½ inches) and were of variable lengths, but on average were *c.* 1.60m (*c.* 5 feet) in length, with the largest almost 2m (*c.* 6½ feet) in length. The spacing between the sleepers was variable, ranging from 0.10m to 0.70m, but on average was *c.* 0.30m (just under 1 foot). Again, this suggests that the track was designed to transport full wagons from the pit head.

9.3.6 The surviving timbers and impressions of waggonway [130] suggest that a variety of crooked and straight branches had been used. The mostly crooked sleepers recorded at Lambton D Pit ranged from *c.* 1.80m to *c.* 2m in length,[32] which correlates closely with the Phase 3b of waggonway sleepers at this site. Again, oak trees supplied the timber used for sleepers here. Rail impressions were up to *c.* 0.15m (*c.* 5½ inches) wide and at the northern end of Area A, the central points of associated rails were *c.* 1.50m apart, suggesting a gauge of *c.* 5 feet.

9.3.7 Trackbed ballast recorded in association with Phase 3b tracks varied considerably in composition from fragmented stone to crushed coal to pea grit to sandy silt and silty clay. Ballast was deposited over and between sleepers and served several purposes; it carried the weight of the traffic, drained water away from the track timbers, bound the elements of the track together and protected the timbers from the elements and from the hooves of horses pulling the wagons.[33] Ballast deposits recorded on the Rainton Bridge South waggonway largely comprised crushed coal, but in one area, redeposited natural boulder clay had been utilised.[34]

9.3.8 The track of waggonway [360] lay to the west of the track of waggonway [130] in the southern half of Area A. Forty timber sleepers survived from this track, along with numerous sleeper impressions. The elements were generally the same as those used for the track of waggonway [130], with a combination of crooked and straighter oak branches recorded. The timbers appeared to be largely unworked with no tool marks other than occasional peg holes or sawn off ends. Again, the sleepers were closely set and the gauge appeared to be *c.* 5 feet. Ballast deposits were again of variable composition.

9.3.9 A substantial trackside ditch, up to *c.* 2.40m wide and *c.* 0.70m deep, was recorded along the eastern side of the Phase 3b waggonway embankment, and there was evidence that in one location this may have been re-cut. A western trackside ditch was also recorded at two locations, this was at least 2.45m wide and *c.* 1.0m 0. deep, although it was not possible to ascertain the full width or depth as the feature continued beyond the limits of excavation. The ditch had evidently been deliberately backfilled with colliery and waggonway debris, ahead of the excavation of a smaller trackside gully, cut into the top of the infilled ditch.

9.3.10 Waggonway [130] continued beyond the northern limit of Area A, running north-westwards towards Area B. The earliest waggonway route recorded in Area AB was timber waggonway [279] and although this potentially corresponds with waggonway [130], it has been designated to a broad Phase 3b/3c. The main upper part of the clay embankment for waggonway [279] was *c.* 4.50m wide and *c.* 0.75m high. The level of survival of Phase 3b/3c waggonway tracks in Area B was very poor, with only timber impressions recorded. The track evidently had the same gauge, *c.* 1.50m (*c.* 5 feet), as Phase 3b waggonway [130] in Area A.

[32] Ayris *et al* 1998, 11.
[33] Lewis 1970, 163-164.
[34] Glover 2005, 243.

9.4 Phase 3c, the Final Timber Waggonways

9.4.1 The Phase 3c waggonways represent continued development of the outlying workings of Harraton Colliery. The location and alignment of the two waggonways assigned to this sub-phase, [180] and [97], strongly suggest that the routes served Anna Bella Pit and a branch to Noel and Judith Pits of Harraton Outside, respectively (Figure 19). This activity most likely dates to the late 18th or early 19th century.

9.4.2 Drainage evidently became an issue along the eastern side of the broad waggonway corridor at the site as development of the routes continued in Phase 3c. The remains of a well constructed brick-lined culvert were recorded in the south-eastern part of Area A, this built with red hand-moulded made bricks dating from the late 18th century to the first half of the 19th century. Associated with the culvert was a series of consolidation and ground-raising deposit that infilled the Phase 3b waggonway ditch. The culvert may have originally been associated with a mostly robbed-out sinuous brick-lined drain, which, in its northernmost portion, had evidently been cut across the line of Phase 3c waggonway [97].

9.4.3 Waggonway [97] was one of two timber waggonways assigned to Phase 3c in Area A. For the most part these had evidently been constructed over the earlier routes and while no unique embankments were identified, levelling and ground raising deposits associated with their construction were certainly attributable to this sub-phase. The other track, waggonway [180], broadly followed the same NW-SE alignment as the Phase 3b routes, while to the east, waggonway [97] ran on a more northerly a NNE-SSW direction. The two routes appeared to merge in the southern part of Area A, suggesting that they were in use contemporaneously.

9.4.4 The level of survival of waggonway [97] was generally poor, while in contrast, the northern part of waggonway [180] had the best-preserved timbers encountered during the excavation.

9.4.5 The track of waggonway [97] largely survived as sleeper impressions, these between 0.20m and 0.70m apart, with some rail impressions also recorded. Waggonway [180] was built within a trackbed in some areas, this up to *c.* 1.80m wide and *c.* 0.25m deep and filled with crushed coal and sandy silt. Elsewhere, there was no trackbed as such, with the track seemingly built upon crushed coal ballast. This section of waggonway comprised a combination of timbers and impressions, with 21 timber sleepers and eight rail timbers surviving. The tracks of both Phase 3c waggonways had rails set *c.* 1.50m apart, again giving an estimated gauge of *c.* 5 feet. A very slight *c.* 0.75% gradient has been estimated along the exposed portion of the track of waggonway [97], with an even lesser gradient of *c.* 0.66% estimated for the recorded part of the track of waggonway [180].

9.4.6 Twelve complete sleepers survived from waggonway [180], ranging from 1.10m to 2.10m in length and mostly comprising crooked oak branches. None of the sleepers displayed much evidence of having been worked, mostly having been simply sawn from branches, although many did have peg holes at their ends, these indicating where rails would have been fixed. Some sleepers had multiple peg holes, perhaps suggesting re-use or repair.

9.4.7 The surviving rails of waggonway [180] were all from the western side of the track and most provided evidence of fixing pegs. One rail, along with another rail from waggonway [97], have been identified as pine. The type of wood used for the rails would have been dependant on what was available and what the track was to be used for. Oak was the preferred wood for early single track lines due to its strength, but ash and occasionally birch were also used with fir, beech, alder and maple also used in later waggonways.[35] It was common for the main way rails to be oak whilst the bye way rails were constructed with fir or ash. When double ways were introduced, these comprising a second layer of rails pinned over a lower set to increase durability, the bottom rail was usually fir and the top tended to be beech as this wood became smoothly glossed which was ideal for reducing friction.[36] The rails at Lambton D Pit were mainly oak, although fir, ash and elm were also identified.[37]

9.4.8 The rails as a whole from the track of waggonway [180] displayed more evidence of having been worked into regular forms than the sleepers, with an average width of 110mm and thickness of 80mm. The bases of most timbers were flat while the sides were slightly concave. The upper surfaces also appeared to have been levelled. Some rails had timber pegs surviving *in situ,* these pinning the rails to the sleepers. Although only one portion remained intact, it was clear that the rails had not been cut to regular lengths; one complete rail was 1.05m long, while another was more than 4.30m long.

9.4.9 It has been noted that *c.* 6 feet (*c.* 1.80m) was the norm for rails of the era, although the Seaton waggonway had uncommonly long ones 12 to 15 feet (*c.* 3.65m to *c.* 4.60m) in 1749.[38] The Lambton D Pit rails were also of variable length, *c.* 1.25m to *c.* 3.30m and, like examples seen at this site, had a flat upper surface. The Lambton D Pit rails also had been drilled and pinned into the sleepers with round or square wooden dowels. Areas of ballast, again of variable composition, were recorded along the two Phase 3c waggonway tracks.

9.4.10 A substantial trackside ditch, at least 1.80m wide and 0.75m deep, was recorded along the western side of waggonway [97] in the northern part of Area A. Between the ditch and the tracks was a small possible drainage gully. Another possible drainage gully was recorded along most of the exposed eastern side of the same waggonway, this recorded as a more substantial ditch at the southern limit of excavation.

9.5 Phase 3d, an Iron-railed Waggonway

9.5.1 Relatively little survived of the latest waggonway, [470], recorded in Area A. Towards the southern limit of excavation, two stone blocks, along with two impressions where other blocks had been removed, were recorded. These blocks likely represent sleepers for iron rails and each had two fixing holes cut into its upper surface, these *c.* 30mm in diameter and *c.* 0.15m apart, into which pins would have been inserted to fix the rails to the blocks.

[35] Lewis 1970, 170.
[36] *ibid*.
[37] Ayris *et al* 1988, 11.
[38] Lewis 1970, 165.

9.5.2 Further traces of this iron-railed waggonway were recorded at the northern end of Area A and also what was probably the same route was recorded to the north-west in Area B, as waggonway [332]. Lengths of robber cuts represent the former locations of rails, these likely having been removed on disuse. Together these elements evidently represent development of the NW-SE aligned route, which continued to serve Anna Bella Pit. With the stone sleepers situated *c.* 1.50m apart, the gauge is again estimated at *c.* 5 feet.

9.5.3 The upgrade of timber-railed waggonways to iron rails began with the addition of iron strips to the timber rails and by the end of the 18th century full iron rails were in use. In the North-East specifically, it is documented that two-foot long malleable iron rails were first used at Walbottle Colliery, Newcastle in 1794.[39] These early rails were usually just under 1m in length and were often cast in a 'fish-belly' shape to give extra strength between the joints. They were initially fastened into wooden sleepers and then later into stone blocks, the first recorded incidence for these blocks in this region being at Walker in 1797.[40] A survey of 1810 noted that although 'traditional' wooden waggonways remained in extensive use in the Tyneside area, replacement of wooden rails with metal ones was taking place on most routes.[41]

9.5.4 By the time of 1st edition Ordnance Survey map in 1856 all the waggonways at the site were probably disused (Figure 19). The Phase 3d waggonway therefore probably dates to the period *c.* 1800 to *c.* 1856.

[39] Warn 1976.
[40] *ibid*.
[41] Atkinson 1968.

N

Noel Pit

Judith Pit

Ayton Pit

Anna Bella Pit

Hall Pit

see Inset

Area B

Area A

NORTH EASTERN RAILWAY

FATFIELD WAGGONWAY

1856 OS Map

0 250m

Phase 3a

Phase 3b

Phase 3c

Phase 3d

Inset
1:1,000 at A3

Figure 19
Overall Interpretation Plan
1:5,000 at A3

10. SUMMARY OF POTENTIAL FOR FURTHER ANALYSIS

10.1 Introduction

10.1.1 This assessment of the archaeological data-set from the excavation at the site of the former Dunlop Tyre Factory in Washington has demonstrated that the work recorded significant archaeological remains of the later post-medieval and early modern industrial era.

10.1.2 **In sum, therefore, the industrial era archaeological remains from the site, specifically the Phase 3 waggonways and associated elements, are considered to be of sufficient interest at a local and regional level for the results of the project to warrant full publication.**

10.1.3 Justification for this conclusion is contained within the post-medieval section of the aforementioned NERRF. As discussed in Section 3 of this report, NERRF stipulates that investigation of early waggonways, including railway formations, track beds and gradients, is a key priority.

10.2 Summary of Potential for Further Work

10.2.1 The stratigraphic data from the site requires further analysis to allow closer correlation of contexts and facilitate enhancement of phasing.

10.2.2 Due to the small size of the assemblages, no further analytical work is warranted on the artefactual material or timber. A short description of the material should, however, be included in the publication report.

10.2.3 Further analysis of cartographic and documentary sources may provide a closer date range for usage of the various phases of waggonway recorded at the site.

10.3 Publication Proposal

10.3.1 It is considered that the industrial archaeology recorded at the site merits publication in the form of a detailed synthesised report synthesising the results of the desk-based assessment, archaeological evaluation and excavation herein described. It is proposed that the final publication report is published in a suitable archaeological journal, such as the *Industrial Archaeological Review*.

10.3.2 The synthesised final publication report will be supported by illustrative material including a site location plan, location plan of the excavation areas, plans and sections of the waggonway remains, along with interpretative plans, photographs and historic maps, as appropriate.

PART C: ACKNOWLEDGEMENTS AND REFERENCES

11. ACKNOWLEDGEMENTS AND CREDITS

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APPENDIX A

CONTEXT INDEX

DFW 09: CONTEXT INDEX

Context	*Area*	*Phase*	*Section*	*Type 1*	*Type 2*	*Interpretation*	*Waggonway Reference*
1	A	3d	10	Deposit	Fill	Fill of ditch [2]	Waggonway [470]
2	A	3d	10	Cut	Linear	Trackside ditch; filled by [1]	Waggonway [470]
3	A	3c	31	Deposit	Fill	Fill of construction cut [4]	N/A
4	A	3c	31	Cut	Linear	Construction cut for drain [104]	N/A
5	VOID						
6	A	4	2 & 3	Deposit	Fill	Fill of drain cut [12]	N/A
7	A	4	2 & 3	Deposit	Fill	Fill of drain cut [12]	N/A
8	A	4	2 & 3	Deposit	Fill	Fill of drain cut [12]	N/A
9	A	4	2 & 3	Deposit	Fill	Fill of drain cut [12]	N/A
10	A	4	2 & 3	Deposit	Fill	Fill of drain cut [12]	N/A
11	A	4	2 & 3	Deposit	Fill	Fill of drain cut [12]	N/A
12	A	4	2, 3 & 6	Cut	Linear	Construction cut for drain [16] - same as [77] & [568]; filled by [6], [7], [8], [9], [10], [11], [76], [86] & [88]	N/A
13	A	3b	3	Deposit	Fill	Fill of ditch [15]	Waggonway [130]
14	A	3b	3	Deposit	Fill	Fill of ditch [15]	Waggonway [130]
15	A	3b	3	Cut	Linear	Trackside ditch; filled by [13] & [14]	Waggonway [130]
16	A	4	3, 6 & 7	Masonry	Structure	Ceramic drain within construction cut [12]	N/A
17	A	4	2 & 3	Deposit	Layer	Dump layer	N/A
18	A	5	10 & 11	Deposit	Layer	Topsoil	N/A
19	A	5	10	Deposit	Surface	Concrete surface	N/A
20	A	5	10	Deposit	Layer	Levelling spread	N/A
21	A	4	10	Deposit	Layer	Dump layer	N/A
22	A	4	10	Deposit	Layer	Dump layer	N/A
23	A	4	10	Deposit	Layer	Dump layer	N/A
24	A	3c	10	Deposit	Layer	Dump layer	N/A
25	A	3c	10	Deposit	Layer	Dump layer	N/A
26	A	3d	10	Deposit	Fill	Fill of ditch [27]	Waggonway [470]
27	A	3d	10	Cut	Linear	Trackside ditch; filled by [26], [525] & [526]	Waggonway [470]
28	A	3c	10	Deposit	Layer	Dump layer	N/A
29	A	3c	10	Deposit	Layer	Dump layer	N/A
30	A	3c	10	Deposit	Layer	Dump layer	N/A
31	A	3d	10	Deposit	Layer	Levelling spread	Waggonway [470]
32	A	3d	10	Deposit	Fill	Fill of feature [101]	Waggonway [470]
33	A	3d	10	Deposit	Fill	Fill of feature [101]	Waggonway [470]
34	A	3d	10	Deposit	Fill	Fill of feature [101]	Waggonway [470]
35	A	3c	10	Deposit	Layer	Dump layer	N/A
36	A	3c	10	Deposit	Layer	Dump layer	N/A
37	A	3c	10	Deposit	Layer	Trackbed ballast	Waggonway [180]
38	A	3c	10	Deposit	Layer	Trackbed ballast	Waggonway [180]
39	A	3c	10	Deposit	Layer	Trackbed ballast	Waggonway [180]
40	A	3c	10	Deposit	Layer	Trackbed ballast	Waggonway [180]
41	A	3d	10	Cut	Unknown	Feature - same as [101]	Waggonway [470]
42	A	3c	10	Deposit	Layer	Trackbed ballast	Waggonway [180]
43	A	3c	10	Timber	Horizontal	Rail	Waggonway [180]
44	A	3c	10	Deposit	Layer	Trackbed ballast	Waggonway [180]
45	A	5	10	Deposit	Surface	Concrete surface	N/A
46	A	3c	10	Deposit	Layer	Trackbed ballast	Waggonway [97]
47	VOID						
48	A	3c	10	Deposit	Fill	Fill of trackbed [50]	Waggonway [97]
49	A	3c	10	Timber	Horizontal	Rail	Waggonway [97]
50	A	3c	10	Cut	Linear	Trackbed; filled by [48]	Waggonway [97]
51	A	4	10	Deposit	Layer	Dump layer	N/A
52	A	3c	10	Deposit	Layer	Trackbed ballast	Waggonway [180]
53	A	3b	10	Deposit	Layer	Ground-raising dump/ballast	Waggonway [360]
54	A	4	10	Deposit	Fill	Fill of feature [56]	N/A
55	A	4	10	Deposit	Fill	Fill of feature [56]	N/A
56	A	4	10	Cut	Unknown	Feature; filled by [54] & [55]	N/A
57	A	3b	10	Deposit	Fill	Fill of gully [61]	Waggonway [360]
58	A	4	10	Deposit	Layer	Levelling dump	N/A
59	A	3b	10	Deposit	Layer	Ballast?	Waggonway [360]
60	A	3b	10	Deposit	Layer	Ballast?	Waggonway [360]
61	A	3b	10	Cut	Linear	Trackside gully; filled by [57]	Waggonway [360]
62	A	3b	10	Deposit	Fill	Infill of trackbed [63]	Waggonway [360]
63	A	3a	10	Cut	Linear	Cut for trackbed; same as [561] & [644]	Waggonway [480]
64	A	5	10	Deposit	Fill	Fill of feature [794]	N/A
65	A	5	10	Deposit	Fill	Fill of feature [794]	N/A
66	A	5	10	Deposit	Fill	Fill of feature [794]	N/A
67	A	3d	10	Deposit	Fill	Fill of feature [2]	Waggonway [470]
68	A	5	10	Deposit	Layer	Dump layer	N/A
69	A	3c	3	Deposit	Fill	Fill of trackside ditch [70]	Waggonway [97]
70	A	3c	3	Cut	Linear	Trackside ditch; filled by [69]	Waggonway [97]
71	A	4	2 & 3	Deposit	Fill	Fill of gully [73]	N/A
72	A	3c	3	Deposit	Fill	Fill of gully [73]	Waggonway [97]
73	A	3c	2 & 3	Cut	Linear	Trackside gully; filled by [71] & [72]	Waggonway [97]
74	A	3c	2, 3, 6 & 7	Deposit	Layer	Trackbed ballast	Waggonway [97]
75	A	3c	3	Deposit	Layer	Dump layer	Waggonway [97]

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Context	*Area*	*Phase*	*Section*	*Type 1*	*Type 2*	*Interpretation*	*Waggonway Reference*
76	A	4	7	Deposit	Fill	Fill of construction cut [77]=[12]	N/A
77	A	4	7	Cut	Linear	Cut for drain [16] - same as [12] & [568]	N/A
78	A	4	N/A	Masonry	Structure	Brick structure	N/A
79	A	4	7	Deposit	Fill	?Fill of feature [293]	N/A
80	A	4	N/A	Timber	Horizontal	Timber within fill [79]	N/A
81	VOID						
82	A	4	7	Deposit	Fill	Fill of feature [83]	N/A
83	A	4	7 & 8	Cut	Linear	?Southern part of construction cut for structure [104]; filled by [82] (Sn 7) & [570] (Sn 8)	N/A
84	A	3c	7	Deposit	Layer	Dump layer - same as [504]	N/A
85	A	4	N/A	Deposit	Fill	Infill of brick structure [78]	N/A
86	A	4	3	Deposit	Fill	Fill of construction cut [12]	N/A
87	A	5	1 & 2	Deposit	Layer	Topsoil	N/A
88	A	4	2	Deposit	Fill	Fill of construction cut [12]	N/A
89	A	4	2	Deposit	Layer	Dump layer	N/A
90	A	4	2	Deposit	Layer	Dump layer	N/A
91	A	4	2	Deposit	Layer	Dump layer	N/A
92	A	4	2	Deposit	Layer	Dump layer	N/A
93	A	5	1 & 2	Deposit	Fill	Fill of feature [94]	N/A
94	A	5	1 & 2	Cut	Unknown	Feature; filled by [93] [105]	N/A
95	A	4	2	Deposit	Layer	Dump layer	N/A
96	A	3b	3	Deposit	Layer	Dump forming waggonway embankment	Waggonway [130]
97	A	3c	N/A	Group No.	Structure	Waggonway	Waggonway [97]
98	A	3c	10	Timber	Horizontal	Rail	Waggonway [97]
99	A	4	10	Deposit	Fill	Fill of feature [100]	N/A
100	A	4	10	Cut	Unknown	Feature; filled by [99]	N/A
101	A	3d	10	Cut	Linear	Feature - same as [41]; filled by [32], [33] & [34]	Waggonway [470]
102	A	3b	3	Deposit	Layer	Dump forming waggonway embankment	Waggonway [130]
103	A	1	1,3	Deposit	Layer	Natural boulder clay	N/A
104	A	3c	N/A	Masonry	Structure	Brick drain	N/A
105	A	5	1	Deposit	Fill	Fill of feature [94]	N/A
106	A	4	1	Deposit	Layer	Dump layer	N/A
107	A	3c	1	Deposit	Layer	Trackbed	Waggonway [97]
108	A	3c	1	Deposit	Fill	Fill of impression [109]	Waggonway [97]
109	A	3c	1	Cut	Linear	Rail impression	Waggonway [97]
110	A	3c	1	Deposit	Layer	Trackbed ballast	Waggonway [97]
111	A	3c	1	Deposit	Layer	Dump layer	Waggonway [97]
112	A	3c	1	Deposit	Layer	Dump layer	Waggonway [97]
113	A	3c	1	Deposit	Layer	Dump layer	Waggonway [97]
114	A	3c	1	Deposit	Layer	Dump layer	Waggonway [97]
115	A	3c	1	Deposit	Layer	Infill of trackbed [120]	Waggonway [97]
116	A	2	1 & 6	Deposit	Layer	Palaeosol	N/A
117	A	3a	1	Deposit	Layer	Dump layer	N/A
118	A	3a	1	Deposit	Layer	Dump layer	N/A
119	A	3a	1	Cut	Linear	Boundary feature?; filled by overlying layer [118]	N/A
120	A	3c	1 & 9	Cut	Linear	Trackbed; filled by [115] (Sn 1) & [636] (Sn 9)	Waggonway [97]
121	A	4	2	Deposit	Layer	Dump layer	N/A
122	A	4	2	Deposit	Layer	Dump layer	N/A
123	A	4	2	Deposit	Layer	Dump layer	N/A
124	A	4	2	Deposit	Layer	Dump layer	N/A
125	A	3c	1 & 7	Deposit	Fill	Fill of gully [126]	Waggonway [97]
126	A	3c	1 & 7	Cut	Linear	Trackside gully; filled by [125]	Waggonway [97]
127	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [130]
128	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [130]
129	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [130]
130	A	3b	N/A	Group No.	Structure	Waggonway	Waggonway [130]
131	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [130]
132	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [130]
133	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [130]
134	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [130]
135	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [130]
136	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [130]
137	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [130]
138	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [130]
139	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [130]
140	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [130]
141	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [130]
142	A	3b	14	Cut	Discrete	Sleeper impression	Waggonway [130]
143	A	3b	14	Cut	Discrete	Sleeper impression containing timber [144]	Waggonway [130]
144	A	3b	N/A	Timber	Horizontal	Sleeper	Waggonway [130]
145	A	3b	14	Cut	Discrete	Sleeper impression	Waggonway [130]
146	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [130]
147	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [130]
148	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [130]
149	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [130]
150	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [130]

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Context	Area	Phase	Section	Type 1	Type 2	Interpretation	Waggonway Reference
151	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [130]
152	A	3b	N/A	Cut	Discrete	Sleeper impression; filled by [422]	Waggonway [130]
153	A	3b	N/A	Cut	Discrete	Sleeper impression; filled by [423]	Waggonway [130]
154	A	3b	24	Cut	Discrete	Sleeper impression	Waggonway [130]
155	A	3b	24	Cut	Discrete	Sleeper impression; filled by [421]	Waggonway [130]
156	A	3b	24	Cut	Discrete	Sleeper impression	Waggonway [130]
157	A	3b	N/A	Timber	Horizontal	Sleeper	Waggonway [130]
158	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [130]
159	A	3b	N/A	Timber	Horizontal	Sleeper	Waggonway [130]
160	A	3b	N/A	Cut	Discrete	Sleeper impression; filled by [420]	Waggonway [130]
161	A	3b	N/A	Timber	Horizontal	Sleeper	Waggonway [130]
162	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [130]
163	A	3b	N/A	Timber	Horizontal	Sleeper	Waggonway [130]
164	A	3b	3	Cut	Linear	Rail impression	Waggonway [130]
165	A	3b	29	Cut	Linear	Rail impression	Waggonway [130]
166	A	3b	N/A	Cut	Linear	Rail impression	Waggonway [130]
167	A	3b	28	Cut	Discrete	Sleeper impression containing timber [711]	Waggonway [130]
168	A	3b	N/A	Deposit	Layer	Trackbed	Waggonway [130]
169	A	3d	N/A	Cut	Linear	Rail impression; filled by [170]	Waggonway [470]
170	A	3d	N/A	Deposit	Fill	Fill of impression [169]	Waggonway [470]
171	A	3d	N/A	Cut	Linear	Rail impression; filled by [172]	Waggonway [470]
172	A	3d	N/A	Deposit	Fill	Fill of impression [171]	Waggonway [470]
173	A	3d	N/A	Cut	Linear	Rail impression; filled by [174]	Waggonway [470]
174	A	3d	N/A	Deposit	Fill	Fill of impression [173]	Waggonway [470]
175	A	3d	N/A	Cut	Linear	Rail impression; filled by [176]	Waggonway [470]
176	A	3d	N/A	Deposit	Fill	Fill of impression [175]	Waggonway [470]
177	A	3c	N/A	Cut	Discrete	Sleeper impression	Waggonway [180]
178	A	3c	N/A	Cut	Discrete	Sleeper impression	Waggonway [180]
179	A	3c	N/A	Cut	Discrete	Sleeper impression containing timber [181]	Waggonway [180]
180	A	3c	N/A	Group No.	Structure	Waggonway	Waggonway [180]
181	A	3c	N/A	Timber	Horizontal	Sleeper within impression [179]	Waggonway [180]
182	A	3c	N/A	Cut	Discrete	Sleeper impression containing timber [183]	Waggonway [180]
183	A	3c	N/A	Timber	Horizontal	Sleeper within impression [182]	Waggonway [180]
184	A	3c	N/A	Cut	Discrete	Sleeper impression containing timber [185]	Waggonway [180]
185	A	3c	N/A	Timber	Horizontal	Sleeper within impression [184]	Waggonway [180]
186	A	3c	N/A	Cut	Discrete	Sleeper impression containing timber [187]	Waggonway [180]
187	A	3c	N/A	Timber	Horizontal	Sleeper within impression [186]	Waggonway [180]
188	A	3c	N/A	Cut	Discrete	Sleeper impression containing timber [189]	Waggonway [180]
189	A	3c	N/A	Timber	Horizontal	Sleeper within impression [188]	Waggonway [180]
190	A	3c	N/A	Cut	Discrete	Sleeper impression containing timber [191]	Waggonway [180]
191	A	3c	N/A	Timber	Horizontal	Sleeper within impression [190]	Waggonway [180]
192	A	3c	N/A	Cut	Discrete	Sleeper impression containing timber [193]	Waggonway [180]
193	A	3c	N/A	Timber	Horizontal	Sleeper within impression [192]	Waggonway [180]
194	A	3c	N/A	Cut	Discrete	Sleeper impression containing timber [195]	Waggonway [180]
195	A	3c	N/A	Timber	Horizontal	Sleeper within impression [194]	Waggonway [180]
196	A	3c	N/A	Cut	Discrete	Sleeper impression containing timber [197]	Waggonway [180]
197	A	3c	N/A	Timber	Horizontal	Sleeper within impression [196]	Waggonway [180]
198	A	3c	N/A	Cut	Discrete	Sleeper impression containing timber [199]	Waggonway [180]
199	A	3c	N/A	Timber	Horizontal	Sleeper within impression [198]	Waggonway [180]
200	A	3c	N/A	Cut	Discrete	Sleeper impression containing timber [201]	Waggonway [180]
201	A	3c	N/A	Timber	Horizontal	Sleeper within impression [200]	Waggonway [180]
202	A	3c	26	Cut	Discrete	Sleeper impression containing timber [203]	Waggonway [180]
203	A	3c	N/A	Timber	Horizontal	Sleeper within impression [202]	Waggonway [180]
204	A	3c	N/A	Cut	Discrete	Sleeper impression containing timber [205]	Waggonway [180]
205	A	3c	N/A	Timber	Horizontal	Sleeper within impression [204]	Waggonway [180]
206	A	3c	N/A	Cut	Discrete	Sleeper impression containing timber [207]	Waggonway [180]
207	A	3c	N/A	Timber	Horizontal	Sleeper within impression [206]	Waggonway [180]
208	A	3c	N/A	Cut	Discrete	Sleeper impression containing timber [209]	Waggonway [180]
209	A	3c	N/A	Timber	Horizontal	Sleeper within impression [208]	Waggonway [180]
210	A	3c	N/A	Cut	Discrete	Sleeper impression containing timber [211]	Waggonway [180]
211	A	3c	N/A	Timber	Horizontal	Sleeper within impression [210]	Waggonway [180]
212	A	3c	N/A	Cut	Discrete	Sleeper impression containing timber [213]	Waggonway [180]
213	A	3c	N/A	Timber	Horizontal	Sleeper within impression [212]	Waggonway [180]
214	A	3c	N/A	Cut	Linear	Rail impression - same as [588]	Waggonway [180]
215	A	3c	N/A	Timber	Horizontal	Rail within impression [588]	Waggonway [180]
216	A	3c	N/A	Timber	Horizontal	Rail	Waggonway [180]
217	A	3c	N/A	Timber	Horizontal	Rail within impression [744]	Waggonway [180]
218	A	3c	N/A	Timber	Horizontal	Rail	Waggonway [180]
219	A	3c	N/A	Timber	Horizontal	Rail within impression [710]	Waggonway [180]
220	A	3c	N/A	Cut	Linear	Rail impression	Waggonway [180]
221	A	3c	N/A	Cut	Discrete	Sleeper impression	Waggonway [97]
222	A	3c	N/A	Cut	Discrete	Sleeper impression	Waggonway [97]
223	A	3c	N/A	Cut	Discrete	Sleeper impression	Waggonway [97]
224	A	3c	N/A	Cut	Discrete	Sleeper impression	Waggonway [97]
225	A	3c	N/A	Cut	Discrete	Sleeper impression	Waggonway [97]
226	A	3c	N/A	Deposit	Fill	Fill of sleeper impression [227]	Waggonway [97]

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Context	*Area*	*Phase*	*Section*	*Type 1*	*Type 2*	*Interpretation*	*Waggonway Reference*
227	A	3c	N/A	Cut	Discrete	Sleeper impression; filled by [226]	Waggonway [97]
228	A	3c	N/A	Deposit	Fill	Fill of sleeper impression [229]	Waggonway [97]
229	A	3c	N/A	Cut	Discrete	Sleeper impression; filled by [228]	Waggonway [97]
230	A	3c	N/A	Deposit	Fill	Fill of sleeper impression [231]	Waggonway [97]
231	A	3c	N/A	Cut	Discrete	Sleeper impression; filled by [230]	Waggonway [97]
232	A	3c	N/A	Deposit	Fill	Fill of sleeper impression [233]	Waggonway [97]
233	A	3c	N/A	Cut	Discrete	Sleeper impression; filled by [232]	Waggonway [97]
234	A	3c	N/A	Deposit	Fill	Fill of sleeper impression [235]	Waggonway [97]
235	A	3c	N/A	Cut	Discrete	Sleeper impression; filled by [234]	Waggonway [97]
236	A	3c	N/A	Deposit	Fill	Fill of sleeper impression [237]	Waggonway [97]
237	A	3c	N/A	Cut	Discrete	Sleeper impression; filled by [236]	Waggonway [97]
238	A	3c	N/A	Cut	Linear	Rail impression	Waggonway [97]
239	A	3c	N/A	Deposit	Fill	Fill of rail impression [240]	Waggonway [97]
240	A	3c	N/A	Cut	Linear	Rail impression; filled by [239]	Waggonway [97]
241	B	5	12 & 13	Deposit	Layer	Topsoil	N/A
242	B	5	12	Deposit	Fill	Fill of cut [244]	N/A
243	B	5	12	Deposit	Fill	Fill of cut [244]	N/A
244	B	5	12	Cut	Unknown	Intrusion; filled by [242] & [243]	N/A
245	B	4	12	Deposit	Layer	Dump deposit	N/A
246	B	3b/3c	12	Deposit	Layer	Dump deposit	Waggonway [279]
247	B	3b/3c	12	Deposit	Layer	Dump forming waggonway embankment?	Waggonway [279]
248	B	1	12	Deposit	Layer	Natural boulder clay	N/A
249	B	4	12	Deposit	Fill	Fill of ditch [253]	N/A
250	B	4	12	Deposit	Fill	Fill of ditch [253]	N/A
251	B	4	12	Deposit	Fill	Fill of ditch [253]	N/A
252	B	4	12	Deposit	Fill	Fill of ditch [253]	N/A
253	B	4	12	Cut	Linear	Drain trench - same as [519]; filled by [249], [250], [251], [252] & [288]	N/A
254	B	5	12	Deposit	Surface	Concrete slab, forming roadway	N/A
255	B	5	12	Deposit	Fill	Fill of construction cut [258]	N/A
256	B	5	12	Deposit	Fill	Fill of construction cut [258]	N/A
257	B	5	12	Deposit	Fill	Fill of construction cut [258]	N/A
258	B	5	12	Cut	Linear	Construction cut; filled by [255], [256], [257] & [263]	N/A
259	B	4	12	Deposit	Layer	Dump deposit	N/A
260	B	3b/3c	12	Deposit	Layer	Dump deposit	Waggonway [279]
261	B	3b/3c	12	Deposit	Layer	Dump deposit	Waggonway [279]
262	B	3b/3c	12	Deposit	Layer	Dump deposit	Waggonway [279]
263	B	5	12	Deposit	Fill	Fill of construction cut [258]	N/A
264	B	3b/3c	12	Deposit	Layer	Dump forming waggonway embankment	Waggonway [279]
265	B	4	12	Deposit	Layer	Dump deposit	N/A
266	B	3d	12	Deposit	Layer	Trackbed	Waggonway [332]
267	B	3d	12	Deposit	Fill	Fill of feature [269]	Waggonway [332]
268	B	3d	12	Deposit	Fill	Fill of feature [269]	Waggonway [332]
269	B	3d	12	Cut	Linear	Robber cut; filled by [267] & [268]	Waggonway [332]
270	B	4	12	Deposit	Layer	Dump deposit	N/A
271	B	3d	12	Deposit	Fill	Fill of feature [272]	Waggonway [332]
272	B	3d	12	Cut	Linear	Robber cut; filled by [271]	Waggonway [332]
273	B	3d	12	Deposit	Layer	Dump forming waggonway embankment	Waggonway [332]
274	B	4	12	Deposit	Fill	Fill of ditch [506]	N/A
275	B	4	12	Deposit	Fill	Fill of feature [506]	N/A
276	B	3d	12	Deposit	Layer	Dump forming waggonway embankment	Waggonway [332]
277	B	3d	12	Deposit	Layer	Dump forming waggonway embankment	Waggonway [332]
278	B	3d	12	Deposit	Layer	Dump forming waggonway embankment	Waggonway [332]
279	B	3b/3c	N/A	Group No.	Structure	Waggonway	Waggonway [279]
280	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [281]	Waggonway [360]
281	A	3b	N/A	Timber	Horizontal	Sleeper within impression [280]	Waggonway [360]
282	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [283]	Waggonway [360]
283	A	3b	N/A	Timber	Horizontal	Sleeper within impression [282]	Waggonway [360]
284	A	3c	16	Cut	Linear	Rail impression; containing timber [285]	Waggonway [97]
285	A	3c	N/A	Timber	Horizontal	Rail within impression [284]	Waggonway [97]
286	A	3c	N/A	Deposit	Layer	Trackbed ballast	Waggonway [97]
287	A	3c	N/A	Deposit	Layer	Trackbed ballast	Waggonway [97]
288	B	4	12	Deposit	Fill	Fill of drain trench [253]	N/A
289	A	3c	N/A	Deposit	Layer	Trackbed ballast	Waggonway [97]
290	A	3c	7	Deposit	Layer	Dump layer	Waggonway [97]
291	A	4	7	Deposit	Fill	?Fill of feature [293]	N/A
292	A	4	7	Deposit	Fill	Fill of feature [293]	N/A
293	A	4	7	Cut	Linear	?Partial robber cut (?for drain [104]) - ?same as [571]; filled by [292]	N/A
294	A	4	N/A	Deposit	Fill	Fill of construction cut [83]	N/A
295	VOID						
296	A	5	7	Deposit	Fill	Fill of feature [297]	N/A
297	A	5	7	Cut	Unknown	Feature; filled by [295] & [296]	N/A
298	B	3b/3c	N/A	Deposit	Fill	Fill of rail impression [299]	Waggonway [279]
299	B	3b/3c	N/A	Cut	Linear	Rail impression - part of group [319]; filled by [298]	Waggonway [279]
300	B	3b/3c	N/A	Deposit	Fill	Fill of sleeper impression [301]	Waggonway [279]

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Context	Area	Phase	Section	Type 1	Type 2	Interpretation	Waggonway Reference
301	B	3b/3c	N/A	Cut	Discrete	Sleeper impression - part of group [319]; filled by [300]	Waggonway [279]
302	B	3b/3c	N/A	Deposit	Fill	Fill of sleeper impression [303]	Waggonway [279]
303	B	3b/3c	N/A	Cut	Discrete	Sleeper impression - part of group [319]; filled by [302]	Waggonway [279]
304	B	3b/3c	N/A	Deposit	Fill	Fill of sleeper impression [305]	Waggonway [279]
305	B	3b/3c	N/A	Cut	Discrete	Sleeper impression - part of group [319]; filled by [304]	Waggonway [279]
306	B	3b/3c	N/A	Deposit	Fill	Fill of sleeper impression [307]	Waggonway [279]
307	B	3b/3c	N/A	Cut	Discrete	Sleeper impression - part of group [319]; filled by [306]	Waggonway [279]
308	B	3b/3c	N/A	Deposit	Fill	Fill of rail impression [309]	Waggonway [279]
309	B	3b/3c	N/A	Cut	Linear	Timber impression - ?part of group [319]; filled by [308]	Waggonway [279]
310	B	3b/3c	N/A	Deposit	Fill	Fill of sleeper impression [311]	Waggonway [279]
311	B	3b/3c	N/A	Cut	Discrete	Sleeper impression - part of group [319]; filled by [310]	Waggonway [279]
312	B	3b/3c	N/A	Deposit	Fill	Fill of timber impression [313]	Waggonway [279]
313	B	3b/3c	N/A	Cut	Linear	Timber impression - ?part of group [319]; filled by [312]	Waggonway [279]
314	B	3b/3c	N/A	Deposit	Fill	Fill of sleeper impression [315]	Waggonway [279]
315	B	3b/3c	N/A	Cut	Discrete	Sleeper impression - ?part of group [319]; filled by [314]	Waggonway [279]
316	B	3b/3c	N/A	Deposit	Fill	Fill of rail impression [317]	Waggonway [279]
317	B	3b/3c	N/A	Cut	Linear	Rail impression - ?part of group [319]; filled by [316]	Waggonway [279]
318	B	3b/3c	N/A	Deposit	Layer	Trackbed	Waggonway [279]
319	B	3b/3c	N/A	Group No.	Structure	Rail and sleeper impressions	Waggonway [279]
320	B	3b/3c	N/A	Deposit	Fill	Fill of rail impression [321]	Waggonway [279]
321	B	3b/3c	N/A	Cut	Linear	Rail impression - part of group [335]; filled by [320]	Waggonway [279]
322	B	3b/3c	N/A	Deposit	Fill	Fill of sleeper impression [323]	Waggonway [279]
323	B	3b/3c	N/A	Cut	Discrete	Sleeper impression - part of group [335]; filled by [322]	Waggonway [279]
324	B	3b/3c	N/A	Deposit	Fill	Fill of rail impression [325]	Waggonway [279]
325	B	3b/3c	N/A	Cut	Linear	Rail impression - part of group [335]; filled by [324]	Waggonway [279]
326	B	3b/3c	N/A	Deposit	Fill	Fill of sleeper impression [327]	Waggonway [279]
327	B	3b/3c	N/A	Cut	Discrete	Sleeper impression - part of group [335]; filled by [326]	Waggonway [279]
328	VOID						
329	VOID						
330	B	3d	12	Deposit	Layer	Dump forming waggonway embankment	Waggonway [332]
331	B	3b/3c	12	Deposit	Layer	Trackbed	Waggonway [279]
332	B	3d	N/A	Group No.	Structure	Waggonway	Waggonway [332]
333	A	3c	9	Masonry	Structure	Brick culvert; filled by [703], [704] & [705]	N/A
334	A	3c	N/A	Timber	Horizontal	Rail	Waggonway [180]
335	B	3b/3c	N/A	Group No.	Structure	Rail and sleeper impressions	Waggonway [279]
336	B	3d	N/A	Group No.	Structure	Rail impressions	Waggonway [332]
337	A	4	6	Deposit	Fill	Fill of gully [339]	N/A
338	A	3c	6	Deposit	Fill	Fill of gully [339]	Waggonway [97]
339	A	3c	6	Cut	Linear	Gully; filled by [337] & [338]	Waggonway [97]
340	A	3b	6	Deposit	Fill	Fill of ditch [341]	Waggonway [360]
341	A	3b	6	Cut	Linear	Ditch; filled by [340]	Waggonway [360]
342	A	3b	6	Deposit	Fill	Fill of ditch [343]	Waggonway [360]
343	A	3b	6	Cut	Linear	Ditch; filled by [342]	Waggonway [360]
344	A	3b	6	Deposit	Fill	Fill of ditch [345]	Waggonway [360]
345	A	3b	6	Cut	Linear	Trackside ditch; filled by [344]	Waggonway [360]
346	A	3b	6	Deposit	Fill	Fill of ditch [348]	Waggonway [360]
347	A	3b	6	Timber	Horizontal	Timber within ditch [348]	Waggonway [360]
348	A	3b	6	Cut	Linear	Ditch; filled by [346]	Waggonway [360]
349	B	3b/3c	N/A	Cut	Linear	Timber impression; filled by [350]	Waggonway [279]
350	B	3b/3c	N/A	Deposit	Fill	Fill of timber impression [349]	Waggonway [279]
351	A	4	6, 7 & 31	Cut	Linear	Main robber cut (of drain [104]); filled by [4] & [796] (Sn 7)	N/A
352	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [353]	Waggonway [360]
353	A	3b	N/A	Timber	Horizontal	Sleeper within impression [352]	Waggonway [360]
354	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [355]	Waggonway [360]
355	A	3b	N/A	Timber	Horizontal	Sleeper within impression [354]	Waggonway [360]
356	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [360]
357	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [358]	Waggonway [360]
358	A	3b	N/A	Timber	Horizontal	Sleeper within impression [357]	Waggonway [360]
359	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [360]
360	A	3b	N/A	Group No.	Structure	Waggonway	Waggonway [360]
361	A	3b	N/A	Deposit	Layer	Trackbed ballast	Waggonway [360]
362	B	3d	N/A	Deposit	Layer	Dump forming waggonway embankment	Waggonway [332]
363	B	3d	N/A	Deposit	Fill	Fill of rail impression [783]	Waggonway [332]
364	B	3d	N/A	Deposit	Fill	Fill of rail impression [784]	Waggonway [332]
365	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [360]
366	A	3b	22	Cut	Discrete	Sleeper impression containing timber [735]	Waggonway [360]
367	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [730]	Waggonway [360]
368	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [731]	Waggonway [360]
369	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [360]
370	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [733]	Waggonway [360]
371	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [732]	Waggonway [360]
372	VOID						
373	VOID						
374	A	5	4	Deposit	Layer	Topsoil	N/A
375	A	4	4	Deposit	Layer	Dump layer	N/A
376	A	4	4	Deposit	Layer	Dump layer	N/A

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Context	Area	Phase	Section	Type 1	Type 2	Interpretation	Waggonway Reference
377	A	4	4	Deposit	Layer	Dump layer	N/A
378	A	4	4	Deposit	Layer	Dump layer	N/A
379	A	3d	4	Deposit	Layer	Fill of trackbed [383]	Waggonway [470]
380	A	3d	4	Deposit	Layer	Trackbed ballast	Waggonway [470]
381	A	4	4	Cut	Linear	Feature, filled by [381]	N/A
382	A	4	4	Deposit	Fill	Fill of feature [381]	N/A
383	A	3d	4	Cut	Linear	Trackbed; filled by [379]	Waggonway [470]
384	A	4	4	Deposit	Fill	Fill of feature [387]	N/A
385	A	4	4	Deposit	Fill	Fill of feature [387]	N/A
386	A	4	4	Deposit	Fill	Fill of feature [387]	N/A
387	A	4	4	Cut	Unknown	Feature; filled by [384], [385] & [386]	N/A
388	A	3b	N/A	Timber	Horizontal	Sleeper within impression [389]	Waggonway [360]
389	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [388]	Waggonway [360]
390	A	3b	N/A	Timber	Horizontal	Sleeper within impression [391]	Waggonway [360]
391	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [390]	Waggonway [360]
392	A	3b	N/A	Timber	Horizontal	Sleeper within impression [393]	Waggonway [360]
393	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [392]	Waggonway [360]
394	A	3b	N/A	Timber	Horizontal	Sleeper within impression [395]	Waggonway [360]
395	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [394]	Waggonway [360]
396	A	3b	N/A	Timber	Horizontal	Sleeper within impression [397]	Waggonway [360]
397	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [396]	Waggonway [360]
398	A	3b	N/A	Timber	Horizontal	Sleeper within impression [399]	Waggonway [360]
399	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [398]	Waggonway [360]
400	A	3b	N/A	Timber	Horizontal	Sleeper within impression [401]	Waggonway [360]
401	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [400]	Waggonway [360]
402	A	3b	N/A	Timber	Horizontal	Sleeper within impression [403]	Waggonway [360]
403	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [402]	Waggonway [360]
404	A	3b	N/A	Timber	Horizontal	Sleeper within impression [405]	Waggonway [360]
405	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [404]	Waggonway [360]
406	A	3b	N/A	Timber	Horizontal	Sleeper within impression impression[407]	Waggonway [360]
407	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [406]	Waggonway [360]
408	A	3b	N/A	Timber	Horizontal	Sleeper within impression [409]	Waggonway [360]
409	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [408]	Waggonway [360]
410	A	3b	N/A	Timber	Horizontal	Sleeper within impression [411]	Waggonway [360]
411	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [410]	Waggonway [360]
412	A	3b	N/A	Timber	Horizontal	Sleeper within impression [413]	Waggonway [360]
413	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [412]	Waggonway [360]
414	A	3b	N/A	Timber	Horizontal	Sleeper within impression [415]	Waggonway [360]
415	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [414]	Waggonway [360]
416	A	3b	N/A	Timber	Horizontal	Sleeper within impression [417]	Waggonway [360]
417	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [416]	Waggonway [360]
418	A	3b	N/A	Timber	Horizontal	Sleeper within impression [419]	Waggonway [360]
419	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [418]	Waggonway [360]
420	A	3b	N/A	Deposit	Fill	Fill of sleeper impression [160]	Waggonway [130]
421	A	3b	N/A	Deposit	Fill	Fill of sleeper impression [155]	Waggonway [130]
422	A	3b	N/A	Deposit	Fill	Fill of sleeper impression [152]	Waggonway [130]
423	A	3b	N/A	Deposit	Fill	Fill of sleeper impression [153]	Waggonway [130]
424	A	3c	N/A	Timber	Horizontal	Sleeper	Waggonway [180]
425	A	3b	N/A	Timber	Horizontal	Sleeper within impression [426]	Waggonway [130]
426	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [425]	Waggonway [130]
427	A	3b	N/A	Timber	Horizontal	Sleeper within impression [428]	Waggonway [130]
428	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [427]	Waggonway [130]
429	A	3b	N/A	Timber	Horizontal	Sleeper within impression [430]	Waggonway [130]
430	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [429]	Waggonway [130]
431	A	3b	N/A	Timber	Horizontal	Sleeper within impression [432]	Waggonway [130]
432	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [431]	Waggonway [130]
433	A	3b	N/A	Timber	Horizontal	Sleeper within impression [434]	Waggonway [130]
434	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [433]	Waggonway [130]
435	A	3b	N/A	Timber	Horizontal	Sleeper within impression [436]	Waggonway [130]
436	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [435]	Waggonway [130]
437	A	3b	N/A	Timber	Horizontal	Sleeper within impression [438]	Waggonway [130]
438	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [437]	Waggonway [130]
439	A	3b	20	Timber	Horizontal	Sleeper within impression [440]	Waggonway [130]
440	A	3b	20	Cut	Discrete	Sleeper impression containing timber [439]	Waggonway [130]
441	A	3b	N/A	Timber	Horizontal	Sleeper within impression [442]	Waggonway [130]
442	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [441]	Waggonway [130]
443	A	3b	N/A	Timber	Horizontal	Sleeper within impression [444]	Waggonway [130]
444	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [443]	Waggonway [130]
445	A	3b	27	Timber	Horizontal	Sleeper within impression [446]	Waggonway [130]
446	A	3b	27	Cut	Discrete	Sleeper impression containing timber [445]	Waggonway [130]
447	A	3b	N/A	Timber	Horizontal	Sleeper within impression [448]	Waggonway [130]
448	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [447]	Waggonway [130]
449	A	3b	N/A	Timber	Horizontal	Sleeper - same as [645] - within impression [450]	Waggonway [130]
450	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [449]	Waggonway [130]
451	A	3b	N/A	Cut	Discrete	Sleeper impression; filled by [652]	Waggonway [130]
452	A	3b	N/A	Cut	Discrete	Sleeper impression; filled by [652]	Waggonway [130]

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Context	Area	Phase	Section	Type 1	Type 2	Interpretation	Waggonway Reference
453	A	3b	15	Cut	Discrete	Sleeper impression; filled by [652]	Waggonway [130]
454	A	3b	23	Cut	Discrete	Sleeper impression; filled by [652]	Waggonway [130]
455	A	3b	23	Cut	Discrete	Sleeper impression; filled by [652]	Waggonway [130]
456	A	3b	23	Cut	Discrete	Sleeper impression; filled by [652]	Waggonway [130]
457	A	3b	23	Cut	Discrete	Sleeper impression; filled by [652]	Waggonway [130]
458	A	3b	N/A	Cut	Linear	Rail impression; filled by [652]	Waggonway [130]
459	A	3b	N/A	Cut	Linear	Rail impression; filled by [652]	Waggonway [130]
460	A	3b	N/A	Cut	Linear	Rail impression	Waggonway [130]
461	A	3b	N/A	Cut	Linear	Rail impression	Waggonway [130]
462	A	3b	N/A	Timber	Horizontal	Sleeper within impression [463]	Waggonway [130]
463	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [462]	Waggonway [130]
464	A	3b	N/A	Timber	Horizontal	Sleeper within impression [465]	Waggonway [130]
465	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [464]	Waggonway [130]
466	A	3b	N/A	Timber	Horizontal	Sleeper within impression [467]	Waggonway [130]
467	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [466]	Waggonway [130]
468	A	3b	30	Cut	Discrete	Sleeper impression; filled by [736] & containing timber [737]	Waggonway [130]
469	VOID						
470	A	3d	N/A	Group No.	Structure	Waggonway	Waggonway [470]
471	VOID						
472	A	3a	N/A	Timber	Horizontal	Sleeper within impression [473]	Waggonway [480]
473	A	3a	N/A	Cut	Discrete	Sleeper impression containing timber [472]	Waggonway [480]
474	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [480]
475	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [480]
476	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [480]
477	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [480]
478	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [480]
479	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [480]
480	A	3a	N/A	Group No.	Structure	Waggonway	Waggonway [480]
481	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [480]
482	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [480]
483	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [480]
484	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [480]
485	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [480]
486	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [480]
487	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [480]
488	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [480]
489	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [480]
490	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [480]
491	A	3b	N/A	Timber	Horizontal	Timber within fill [591]	Waggonway [130]
492	A	3b	N/A	Timber	Horizontal	Timber within fill [591]	Waggonway [130]
493	A	3b	N/A	Timber	Horizontal	Timber within fill [591]	Waggonway [130]
494	A	3b	N/A	Timber	Horizontal	Timber within fill [591]	Waggonway [130]
495	A	3b	N/A	Timber	Horizontal	Timber within fill [591]	Waggonway [130]
496	A	3b	N/A	Timber	Horizontal	Timber within fill [591]	Waggonway [130]
497	A	3b	N/A	Timber	Horizontal	Timber within fill [591]	Waggonway [130]
498	A	3b	N/A	Timber	Horizontal	Timber within fill [591]	Waggonway [130]
499	A	3b	N/A	Timber	Horizontal	Timber within fill [591]	Waggonway [130]
500	A	3c	N/A	Deposit	Fill	Fill of construction cut [501]	N/A
501	A	3c		Cut	Linear	Construction cut of culvert [333]; filled by [500]	N/A
502	A	3c	N/A	Deposit	Layer	Dump layer	N/A
503	A	3c	N/A	Deposit	Layer	Dump layer	N/A
504	A	3c	N/A	Deposit	Layer	Dump layer - same as [84]	N/A
505	B	4	12	Deposit	Fill	Fill of feature [506]	N/A
506	B	4	12	Cut	Linear	Feature; filled by [505] & [274]	N/A
507	B	5	13	Deposit	Surface	Concrete roadway	N/A
508	B	3b/3c	13	Cut	Linear	Trackside ditch; filled by [509]	Waggonway [279]
509	B	3b/3c	13	Deposit	Fill	Fill of ditch [508]	Waggonway [279]
510	B	3d	13	Deposit	Layer	Dump forming waggonway embankment	Waggonway [332]
511	B	3d	13	Deposit	Layer	Dump forming waggonway embankment	Waggonway [332]
512	B	3d	13	Deposit	Layer	Dump forming waggonway embankment	Waggonway [332]
513	VOID						
514	B	5	13	Deposit	Layer	Dump layer	N/A
515	B	3d	13	Deposit	Layer	Dump forming waggonway embankment	Waggonway [332]
516	B	3b/3c	13	Deposit	Layer	Dump deposit	Waggonway [279]
517	B	3b/3c	13	Deposit	Layer	Dump deposit	Waggonway [279]
518	B	4	13	Deposit	Fill	Fill of drain trench [519]	N/A
519	B	4	13	Cut	Linear	Drain trench - same as [253]; filled by [518] [651]	N/A
520	B	1	13	Deposit	Layer	Natural boulder clay	N/A
521	VOID						
522	VOID						
523	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [524]	Waggonway [130]
524	A	3b	N/A	Timber	Horizontal	Sleeper within impression [523]	Waggonway [130]
525	A	3d	10	Deposit	Fill	Fill of ditch [27]	Waggonway [470]
526	A	3d	10	Deposit	Fill	Fill of ditch [27]	Waggonway [470]
527	A	3c	10	Deposit	Fill	Fill of ditch [530]	Waggonway [97]
528	A	3c	10	Deposit	Fill	Fill of ditch [530]	Waggonway [97]

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Context	Area	Phase	Section	Type 1	Type 2	Interpretation	Waggonway Reference
529	A	3c	10	Deposit	Fill	Fill of ditch [530]	Waggonway [97]
530	A	3c	10	Cut	Linear	Trackside ditch; filled by [527], [528] & [529]	Waggonway [97]
531	A	3c	10	Deposit	Layer	Dump layer	N/A
532	A	3c	10	Deposit	Layer	Dump layer	N/A
533	A	3c	10	Deposit	Layer	?Dump layer	N/A
534	A	5	11	Deposit	Surface	Concrete surface	N/A
535	A	5	11	Deposit	Layer	Levelling spread	N/A
536	A	4	11	Deposit	Layer	Dump layer	N/A
537	A	4	11	Deposit	Layer	Dump layer	N/A
538	A	4	11	Deposit	Layer	Dump layer	N/A
539	A	4	11	Deposit	Layer	Dump layer	N/A
540	A	4	11	Deposit	Fill	Fill of feature [790]	N/A
541	A	4	11	Deposit	Layer	Dump layer	N/A
542	A	4	11	Deposit	Layer	Dump layer	N/A
543	A	4	11	Deposit	Layer	Dump layer	N/A
544	A	4	11	Deposit	Layer	Dump layer	N/A
545	A	4	11	Deposit	Layer	Dump layer	N/A
546	A	3d	11	Masonry	Discrete	Fixing block/sleeper	Waggonway [470]
547	A	4	11	Deposit	Layer	Dump layer	N/A
548	A	4	11	Deposit	Layer	Dump layer	N/A
549	A	3d	11	Deposit	Layer	Trackbed ballast	Waggonway [470]
550	A	3d	11	Deposit	Layer	Trackbed ballast	Waggonway [470]
551	A	3d	11	Cut	Discrete	Sleeper impression; filled by [550]	Waggonway [470]
552	A	3c	11	Deposit	Layer	Trackbed ballast - same as [701]	Waggonway [180]
553	A	3b	11	Cut	Discrete	Rail impression; filled by timber [554]	Waggonway [130]
554	A	3b	11	Timber	Horizontal	Timber within impression [553]	Waggonway [130]
555	A	3b	11	Deposit	Layer	Trackbed ballast	Waggonways [130] & [560}
556	A	3b	11	Deposit	Layer	Dump forming waggonway embankment	Waggonway [130]
557	A	3b	11	Deposit	Layer	Dump forming waggonway embankment	Waggonway [130]
558	A	3a	11	Cut	Discrete	Sleeper impression containing timber [559]	Waggonway [480]
559	A	3a	11	Timber	Horizontal	Sleeper within impression [558]	Waggonway [480]
560	A	3a	11	Deposit	Fill	Fill of trackbed [561]	Waggonway [480]
561	A	3a	11	Cut	Discrete	Cut for trackbed; filled by [560]	Waggonway [480]
562	A	3a	11	Deposit	Layer	Dump forming waggonway embankment	Waggonway [480]
563	A	3a	11	Deposit	Layer	Dump forming waggonway embankment	Waggonway [480]
564	A	3a	11	Deposit	Layer	Dump forming waggonway embankment	Waggonway [480]
565	A	3c	8	Deposit	Layer	Fill of trackbed [590]	Waggonway [180]
566	A	3c	8	Deposit	Layer	Trackbed ballast	Waggonway [97]
567	A	3b	8	Deposit	Fill	Fill of trackbed [640]	Waggonway [360]
568	A	4	8	Cut	Linear	Cut for drain [16] in Sn 8 - same as [12] & [77]	N/A
569	A	4	8	Deposit	Fill	Fill of feature [571]	N/A
570	A	4	8	Deposit	Fill	Fill of construction cut [83] (in Sn 8)	N/A
571	A	4	8	Cut	Linear	?Robber cut (?for drain [104]) - ?same as [293]; filled by [569]	N/A
572	A	3b	8	Deposit	Fill	Fill of gully [573]	Waggonway [130]
573	A	3b	8	Cut	Linear	Trackside gully; filled by [572]	Waggonway [130]
574	A	3b	8	Deposit	Layer	Dump forming waggonway embankment	Waggonway [130]
575	A	3b	8	Deposit	Layer	Dump forming waggonway embankment	Waggonway [130]
576	A	3b	8	Deposit	Layer	Dump forming waggonway embankment	Waggonway [130]
577	A	3b	8	Deposit	Layer	Dump forming waggonway embankment	Waggonway [130]
578	A	3b	8	Deposit	Layer	Dump forming waggonway embankment	Waggonway [130]
579	A	3a	8	Deposit	Layer	Dump deposit on waggonway embankment	Waggonway [480]
580	A	3a	8	Deposit	Layer	Dump deposit on waggonway embankment	Waggonway [480]
581	A	3a	8	Deposit	Fill	Fill of gully [582]	Waggonway [480]
582	A	3a	8	Cut	Linear	Gully; filled by [581]	Waggonway [480]
583	A	3a	8	Deposit	Layer	Dump forming waggonway embankment	Waggonway [480]
584	A	3a	8	Deposit	Layer	Dump forming waggonway embankment	Waggonway [480]
585	A	3d	5	Deposit	Fill	Fill of impression [586]	Waggonway [470]
586	A	3d	5	Cut	Linear	Rail impression; filled by [585]	Waggonway [470]
587	A	3c	5	Deposit	Fill	Fill of impression [588]	Waggonway [180]
588	A	3c	5	Cut	Linear	Rail impression- same as [214]; filled by [587] & containing timber [215]	Waggonway [180]
589	A	3c	5	Deposit	Fill	Trackbed ballast	Waggonway [180]
590	A	3c	5 & 8	Cut	Linear	Trackbed; filled by [653] (Sn 5) & [565] (Sn 8)	Waggonway [180]
591	A	3b	5	Deposit	Layer	Fill of ditch [803]; includes timbers [491-[499]	Waggonway [130]
592	A	3b	5	Deposit	Layer	Fill of ditch [803]	Waggonway [130]
593	A	3b	5	Deposit	Fill	Fill of gully [594]	Waggonway [130]
594	A	3b	5	Cut	Linear	Trackside gully; filled by [593]	Waggonway [130]
595	A	3b	5	Deposit	Fill	Fill of ditch [803]	Waggonway [130]
596	A	3b	5	Deposit	Fill	Fill of ditch [803]	Waggonway [130]
597	A	3b	5	Deposit	Layer	Dump forming waggonway embankment	Waggonway [130]
598	A	3c	5	Deposit	Layer	Trackbed ballast	Waggonway [180]
599	A	3b	5	Deposit	Layer	Dump forming waggonway embankment	Waggonway [130]
600	A	3b	5	Deposit	Layer	Dump forming waggonway embankment	Waggonway [130]
601	A	3b	5	Deposit	Layer	Trackbed ballast	Waggonway [130]
602	A	3b	5	Deposit	Layer	Trackbed ballast	Waggonway [130]

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Context	Area	Phase	Section	Type 1	Type 2	Interpretation	Waggonway Reference
603	A	3b	5	Cut	Linear	Cut for trackbed; filled by [797], [602]	Waggonway [130]
604	A	3b	5	Deposit	Layer	Dump forming waggonway embankment	Waggonway [130]
605	A	3b	5	Deposit	Layer	Dump forming waggonway embankment	Waggonway [130]
606	A	1	5	Deposit	Layer	Natural boulder clay	N/A
607	A	3b	5	Deposit	Layer	Dump forming waggonway embankment	Waggonway [130]
608	A	3b	5	Deposit	Layer	Dump forming waggonway embankment	Waggonway [130]
609	A	3b	5	Deposit	Layer	Dump forming waggonway embankment	Waggonway [130]
610	A	3b	5	Deposit	Fill	Fill of ditch [612]	Waggonway [130]
611	A	3b	5	Deposit	Fill	Fill of ditch [612]	Waggonway [130]
612	A	3b	5	Cut	Linear	Trackside ditch; filled by [610] & [611]	Waggonway [130]
613	A	3b	3	Deposit	Layer	Trackbed ballast	Waggonway [130]
614	A	3b	3	Deposit	Fill	Fill of trackbed [617]	Waggonway [130]
615	A	3b	3	Deposit	Layer	Dump forming waggonway embankment	Waggonway [130]
616	A	3b	3	Deposit	Layer	Dump forming waggonway embankment	Waggonway [130]
617	A	3b	3	Cut	Discrete	Cut for trackbed; filled by [614]	Waggonway [130]
618	A	3c	9	Deposit	Layer	Dump layer	N/A
619	A	3c	9	Deposit	Layer	Dump layer	N/A
620	A	3c	9	Deposit	Layer	Dump layer	N/A
621	A	3b	9	Deposit	Fill	Fill of ditch [623]	Waggonway [130]
622	A	3c	9	Timber	Horizontal	Timber within dump [708]	N/A
623	A	3b	9	Cut	Linear	Trackside ditch; filled by [621], [709]	Waggonway [130]
624	VOID						
625	A	1	9	Deposit	Layer	Natural boulder clay	N/A
626	A	3b	9	Deposit	Layer	Trackbed ballast	Waggonway [130]
627	A	3b	9	Cut	Discrete	Cut for trackbed; filled by [801], [802]	Waggonway [130]
628	A	3b	9	Deposit	Layer	Dump forming waggonway embankment	Waggonway [130]
629	A	3b	9	Deposit	Layer	Dump forming waggonway embankment	Waggonway [130]
630	A	3a	9	Deposit	Layer	Dump deposit on waggonway embankment	Waggonway [480]
631	A	3a	9	Deposit	Layer	Dump forming waggonway embankment	Waggonway [480]
632	A	3a	9	Deposit	Layer	Dump forming waggonway embankment	Waggonway [480]
633	A	3a	9	Deposit	Layer	Dump forming waggonway embankment	Waggonway [480]
634	A	3c	9	Deposit	Layer	Trackbed ballast	Waggonway [180]
635	A	3c	9	Cut	Discrete	Rail impression - same as [721]	Waggonway [97]
636	A	3c	9	Deposit	Fill	Infill of trackbed [120]	Waggonway [97]
637	A	3c	9	Deposit	Layer	Trackbed ballast	Waggonway [180]
638	A	3b	9	Deposit	Layer	Trackbed ballast	Waggonway [360]
639	A	3c	9	Cut	Discrete	Rail impression	Waggonway [180]
640	A	3b	8	Cut	Linear	Cut for trackbed; filled by [567]	Waggonway [360]
641	A	3b	11	Cut	Linear	Trackbed	Waggonways [360] & [130]
642	A	3d	9	Deposit	Fill	Fill of ditch [2]	Waggonway [470]
643	A	3b	9	Deposit	Fill	Infill of trackbed [644]	Waggonway [360]
644	A	3a	9	Cut	Discrete	Cut for trackbed; same as [63] and [561]	Waggonway [480]
645	A	3b	9	Timber	Horizontal	Sleeper - same as [449] - within impression [793]	Waggonway [130]
646	A	3b	19	Deposit	Fill	Fill of sleeper impression [647]	Waggonway [130]
647	A	3b	19	Cut	Discrete	Sleeper impression; filled by [646]	Waggonway [130]
648	A	3a	N/A	Cut	Linear	Rail impression	Waggonway [480]
649	A	2	6	Deposit	Layer	Palaeosol	N/A
650	A	3c	3	Deposit	Layer	Dump layer	Waggonway [97]
651	B	4	13	Deposit	Fill	Fill of drainage trench [519]	N/A
652	A	3b	15	Deposit	Layer	Trackbed ballast	Waggonway [130]
653	A	3c	5	Deposit	Fill	Infill of trackbed [590]	Waggonway [180]
654	A	3b	N/A	Timber	Horizontal	Timber within impression [655]	Waggonway [360]
655	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [654]	Waggonway [360]
656	A	3b	N/A	Timber	Horizontal	Sleeper within impression [657]	Waggonway [360]
657	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [656]	Waggonway [360]
658	A	3b	N/A	Timber	Horizontal	Sleeper within impression [659]	Waggonway [360]
659	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [658]	Waggonway [360]
660	A	3b	N/A	Timber	Horizontal	Sleeper within impression [661]	Waggonway [360]
661	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [660]	Waggonway [360]
662	A	3b	N/A	Timber	Horizontal	Sleeper within impression [664]	Waggonway [360]
663	A	3b	N/A	Timber	Horizontal	Sleeper within impression [664]	Waggonway [360]
664	A	3b	N/A	Cut	Discrete	Sleeper impression containing timbers [662] & [663]	Waggonway [360]
665	A	3b	N/A	Timber	Horizontal	Sleeper within impression [666]	Waggonway [360]
666	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [665]	Waggonway [360]
667	A	3b	N/A	Timber	Horizontal	Splintered timber filling impression [668]	Waggonway [360]
668	A	3b	N/A	Cut	Discrete	Rail impression; filled by [667]	Waggonway [360]
669	A	3b	N/A	Timber	Horizontal	Sleeper within impression [670]	Waggonway [360]
670	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [669]	Waggonway [360]
671	A	3b	17	Cut	Discrete	Sleeper impression containing timber [715]	Waggonway [360]
672	A	3b	N/A	Timber	Horizontal	Sleeper within impression [673]	Waggonway [360]
673	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [672]	Waggonway [360]
674	A	3b	18	Timber	Horizontal	Sleeper within impression [675]	Waggonway [360]
675	A	3b	18	Cut	Discrete	Sleeper impression containing timber [674]	Waggonway [360]
676	A	3a	N/A	Timber	Horizontal	Sleeper within impression [677]	Waggonway [760]
677	A	3a	N/A	Cut	Discrete	Sleeper impression containing timber [676]	Waggonway [760]

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Context	Area	Phase	Section	Type 1	Type 2	Interpretation	Waggonway Reference
678	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [760]
679	A	3a	N/A	Timber	Horizontal	Sleeper within impression [680]	Waggonway [760]
680	A	3a	N/A	Cut	Discrete	Sleeper impression containing timber [679]	Waggonway [760]
681	A	3a	N/A	Timber	Horizontal	Sleeper within impression [682]	Waggonway [760]
682	A	3a	N/A	Cut	Discrete	Sleeper impression containing timber [681]	Waggonway [760]
683	A	3a	N/A	Deposit	Fill	Fill of impression [684]	Waggonway [760]
684	A	3a	N/A	Cut	Discrete	Sleeper impression; filled by [683]	Waggonway [760]
685	A	3b	N/A	Timber	Horizontal	Sleeper within impression [686]	Waggonway [360]
686	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [685]	Waggonway [360]
687	A	3b	N/A	Timber	Horizontal	Sleeper within impression [688]	Waggonway [360]
688	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [687]	Waggonway [360]
689	A	3a	N/A	Timber	Horizontal	Sleeper within impression [690]	Waggonway [760]
690	A	3a	N/A	Cut	Discrete	Sleeper impression containing timber [689]	Waggonway [760]
691	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [760]
692	A	3a	N/A	Timber	Horizontal	Sleeper within impression [693]	Waggonway [760]
693	A	3a	N/A	Cut	Discrete	Sleeper impression containing timber [692]	Waggonway [760]
694	A	3a	N/A	Deposit	Fill	Fill of impression [695]	Waggonway [760]
695	A	3a	N/A	Cut	Discrete	Sleeper impression; filled by [694]	Waggonway [760]
696	A	3a	N/A	Deposit	Fill	Fill of impression [697]	Waggonway [760]
697	A	3a	N/A	Cut	Discrete	Sleeper impression; filled by [696]	Waggonway [760]
698	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [760]
699	A	3c	N/A	Timber	Horizontal	Sleeper within impression [700]	Waggonway [180]
700	A	3c	N/A	Cut	Discrete	Sleeper impression containing timber [699]	Waggonway [180]
701	A	3c	N/A	Deposit	Layer	Trackbed ballast - same as [552]	Waggonway [180]
702	A	3a	N/A	Deposit	Layer	Trackbed ballast	Waggonway [760]
703	A	3c	9	Deposit	Fill	Fill of culvert [333]	N/A
704	A	3c	9	Deposit	Fill	Fill of culvert [333]	N/A
705	A	3c	9	Deposit	Fill	Fill of culvert [333]	N/A
706	A	3c	9	Deposit	Fill	Fill of construction cut [707]	N/A
707	A	3c	9	Cut	Linear	Construction cut for culvert [333]; filled by [706]	N/A
708	A	3c	9	Deposit	Layer	Dump layer	N/A
709	A	3b	9	Deposit	Fill	Fill of ditch [623]	Waggonway [130]
710	A	3c	N/A	Cut	Linear	Rail impression containing timber [219]	Waggonway [180]
711	A	3b	N/A	Timber	Horizontal	Sleeper within impression [167]	Waggonway [130]
712	A	3c	N/A	Cut	Discrete	Rail impression	Waggonway [180]
713	A	3c	N/A	Cut	Discrete	Sleeper impression	Waggonway [180]
714	A	3c	N/A	Deposit	Fill	Fill of impressions [712] & [713]	Waggonway [180]
715	A	3b	17	Timber	Horizontal	Sleeper within impression [671]	Waggonway [360]
716	A	3b	18	Timber	Horizontal	Rail within impression [717]	Waggonway [360]
717	A	3b	18	Cut	Discrete	Rail impression containing timber [716]	Waggonway [360]
718	A	3b	N/A	Timber	Horizontal	Sleeper within impression [719]	Waggonway [360]
719	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [718]	Waggonway [360]
720	A	3c	N/A	Deposit	Fill	Fill of impression [721]	Waggonway [97]
721	A	3c	N/A	Cut	Linear	Rail impression - same as [635]; filled by [720]	Waggonway [97]
722	A	3b	24	Cut	Discrete	Sleeper impression	Waggonway [130]
723	A	3b	N/A	Cut	Discrete	Rail impression	Waggonway [360]
724	A	3b	N/A	Timber	Horizontal	Sleeper within impression [725]	Waggonway [360]
725	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [724]	Waggonway [360]
726	A	3b	N/A	Timber	Horizontal	Sleeper within impression [727]	Waggonway [360]
727	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [726]	Waggonway [360]
728	A	3c	21	Timber	Horizontal	Rail within impression [729]	Waggonway [97]
729	A	3c	21	Cut	Discrete	Rail impression; filled by [734] & containing timber [728]	Waggonway [97]
730	A	3b	N/A	Timber	Horizontal	Sleeper within impression [367]	Waggonway [360]
731	A	3b	N/A	Timber	Horizontal	Sleeper within impression [368]	Waggonway [360]
732	A	3b	N/A	Timber	Horizontal	Sleeper within impression [371]	Waggonway [360]
733	A	3b	N/A	Timber	Horizontal	Sleeper within impression [370]	Waggonway [360]
734	A	3c	21	Deposit	Fill	Fill of impression [729]	Waggonway [97]
735	A	3b	22	Deposit	Fill	Fill of impression [366]	Waggonway [360]
736	A	3b	30	Deposit	Fill	Fill of impression [468]	Waggonway [130]
737	A	3b	30	Timber	Horizontal	Sleeper within impression [468]	Waggonway [130]
738	A	3d	N/A	Cut	Discrete	Masonry impression	Waggonway [470]
739	A	3d	N/A	Cut	Discrete	Masonry impression	Waggonway [470]
740	A	3d	N/A	Masonry	Discrete	Fixing block/sleeper	Waggonway [470]
741	A	3b	N/A	Timber	Horizontal	Splintered timber filling impression [742]	Waggonway [360]
742	A	3b	N/A	Cut	Linear	Rail impression; filled by [741]	Waggonway [360]
743	A	3b	N/A	Deposit	Layer	Dump forming waggonway embankment	Waggonway [130]
744	A	3c	25	Cut	Linear	Rail impression containing timber [217]	Waggonway [180]
745	A	3c	N/A	Cut	Discrete	Rail impression	Waggonway [180]
746	A	3c	N/A	Cut	Discrete	Sleeper impression containing timber [747]	Waggonway [180]
747	A	3c	N/A	Timber	Horizontal	Sleeper within impression [746]	Waggonway [180]
748	A	3b	N/A	Cut	Discrete	Sleeper impression containing timber [749]	Waggonway [130]
749	A	3b	N/A	Timber	Horizontal	Sleeper within impression [748]	Waggonway [130]
750	A	3c	N/A	Cut	Discrete	Timber impression containing timber [751]	Waggonway [180]
751	A	3c	N/A	Timber	Horizontal	Timber within impression [750]	Waggonway [180]
752	A	3b	N/A	Cut	Discrete	?Rail impression containing timber [753]	Waggonway [130]
753	A	3b	N/A	Timber	Horizontal	Timber within impression [752]	Waggonway [130]

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Context	*Area*	*Phase*	*Section*	*Type 1*	*Type 2*	*Interpretation*	*Waggonway Reference*
754	A	3d	N/A	Timber	Vertical	Stake within [755]	Waggonway [470]
755	A	3d	N/A	Cut	Discrete	Stakehole; containing [754]	Waggonway [470]
756	A	3c	N/A	Cut	Linear	Rail impression	Waggonway [180]
757	A	3b	N/A	Cut	Linear	Rail impression	Waggonway [130]
758	A	3b	N/A	Cut	Discrete	Sleeper impression	Waggonway [130]
759	A	5	N/A	Cut	Discrete	Geotechnical borehole	N/A
760	A	3a	N/A	Group No.	Structure	Waggonway	Waggonway [760]
761	A	3b	N/A	Cut	Linear	Rail impression	Waggonway [130]
762	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [760]
763	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [480]
764	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [480]
765	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [480]
766	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [480]
767	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [480]
768	A	3a	N/A	Cut	Linear	Sleeper impression	Waggonway [480]
769	A	3a	N/A	Cut	Linear	Sleeper impression	Waggonway [480]
770	A	3c	N/A	Timber	Horizontal	Timber within impression [771]	Waggonway [180]
771	A	3c	N/A	Cut	Discrete	Timber impression containing timber [770]	Waggonway [180]
772	A	3c	N/A	Cut	Discrete	Sleeper impression	Waggonway [180]
773	A	3b	N/A	Timber	Horizontal	Timber within impression [774]	Waggonway [130]
774	A	3b	N/A	Cut	Discrete	?Rail impression containing timber [773]	Waggonway [130]
775	A	3b	N/A	Cut	Discrete	Rail impression	Waggonway [360]
776	A	3c	N/A	Deposit	Layer	Trackbed ballast	Waggonway [97]
777	A	3c	N/A	Cut	Linear	Rail impression containing timber [218]	Waggonway [180]
778	A	3d	N/A	Cut	Linear	Rail impression	Waggonway [470]
779	A	3b	N/A	Cut	Linear	Rail impression	Waggonway [130]
780	A	3c	N/A	Cut	Linear	Rail impression	Waggonway [180]
781	A	3d	N/A	Cut	Linear	Rail impression	Waggonway [470]
782	A	3c	N/A	Cut	Linear	Rail impression	Waggonway [180]
783	B	3d	N/A	Cut	Linear	Rail impression; filled by [363]	Waggonway [332]
784	B	3d	N/A	Cut	Linear	Rail impression; filled by [364]	Waggonway [332]
785	A	3a	N/A	Cut	Linear	Sleeper impression	Waggonway [480]
786	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [480]
787	VOID						
788	VOID						
789	VOID						
790	A	4	11	Cut	Unknown	Feature; filled by [540]	N/A
791	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [480]
792	A	3a	N/A	Cut	Discrete	Sleeper impression	Waggonway [480]
793	A	3b	9	Cut	Discrete	Sleeper impression containing timber [645]	Waggonway [130]
794	A	5	10	Cut	Unknown	Feature; filled by [64], [65] & [66]	
795	A	3b	10	Deposit	Layer	Ground-raising dump	Waggonway [360]
796	A	4	7	Deposit	Fill	Fill of robber cut [351]	N/A
797	A	3b	5	Deposit	Fill	Fill of trackbed [603]	Waggonway [130]
798	A	3b	8	Deposit	Layer	Dump forming waggonway embankment	Waggonway [130]
799	B	3b/3c	12	Deposit	Layer	Dump forming waggonway embankment?	Waggonway [279]
800	B	3d	13	Deposit	Layer	Dump forming waggonway embankment	Waggonway [332]
801	A	3b	9	Deposit	Fill	Fill of trackbed [627]	Waggonway [130]
802	A	3b	9	Deposit	Layer	Fill of trackbed [627]	Waggonway [130]
803	A	3b	5	Cut	Linear	Trackside ditch	Waggonway [130]
804	VOID						
805	A	3b	N/A	Deposit	Layer	Trackbed	Waggonway [130]
806	B	4	N/A	Masonry	Structure	Ceramic drain within cut [253]=[519]	N/A

APPENDIX B

PLATES

Plate 1. Area A: Waggonway [480], looking north *(1m scale).*

Plate 2. Area A: Northern end of waggonway [130], looking south *(1m scale).*

Plate 3. Area A: Northern end of waggonway [130], looking north *(1m scale).*

Plate 4. Area A: Southern end of waggonway [130], looking north *(1m scale).*

Plate 5. Area A: Southern end of waggonway [360], looking north *(1m scale).*

Plate 6. Area A: Northern end of waggonway [360], looking north *(1m scale).*

Plate 7. Area A: Northern extent of waggonway [97], looking south *(1m scale).*

Plate 8. Area A: Southern extent of waggonway [97], looking north *(1m scale).*

Plate 9. Area A: Waggonway [180], looking south *(1m scale).*

Plate 10. Area A: Waggonway [180], looking north *(1m scale).*

Plate 11. Area A: Rails [217] and [218] on sleeper [193] in waggonway [180] *(20cm scale).*

Plate 12. Area A: Rails [216] and [217] on sleeper [191] in waggonway [180] *(20cm scale).*

Plate 13. Area A: Culvert [333], looking south-east *(2m scale).*

Plate 14. Area A: Section 8 in Slot 3a (*1m and 2m scales).*

Plate 15. Area A: Overview during excavation, looking north.

Plate 16. Area A: Overview during excavation, looking south-east.

Plate 17. Area B, Overview looking north-west *(2m scale)*

Plate 18. Area B: Trackbed [318] of waggonway [279], looking north *(1m scale)*

APPENDIX C

PROJECT SPECIFICATION

SPECIFICATION FOR EXCAVATION WORK TO RECORD ARCHAEOLOGICAL DEPOSITS AT THE FORMER DUNLOP TYRE FACTORY, WEAR INDUSTRIAL ESTATE, WASHINGTON, SUNDERLAND

Introduction

An outline planning application has been granted for a mixed use development on the above site following the demolition of the existing factory.

An archaeological desk based assessment has been completed (Pre-Construct Archaeology Ltd 2008).

The assessment concludes that a colliery at Harraton had a shaft possibly sunk as early as c. 1590. Harraton Colliery lay to the south of the development site and the general area was known as Harraton Outside Colliery.

Harraton Outside is mentioned in a volume of minutes dated 1727-1730 of the Grand Allies Partnership and in two leases, one dated 1778. These describe the coal workings and waggonways.

Gibson's map of 1788 shows two waggonways running through the area of the development site. Hobson's map of 1839 shows two waggonways and two pits. Bell's plan of 1843 shows three branches of the waggonway.

The Tithe map of 1847 shows Fatfield Waggonway dividing into three branches within the development site. Hall Pit and Engine Pit lie just outside the site boundary. The Stanhope Railway (later Pontop and South Shields branch of the North Eastern Railway) forms the southern boundary of the development site.

Oliver's map of 1851 shows two pits within the site, Milbank and Thorald. The name Milbank comes from Ralph Milbanke, who was associated with coal workings in Harraton Outside in the eighteenth century. Sir John Thorold of Lincolnshire acquired land in Harraton in 1730 on his marriage to Elizabeth Ayton of West Herrington (Ayton Pit lay north of the development site).

Ordnance Survey first edition of 1856 shows woodland in-between two of the branches of the waggonway. This survives today in expanded form. By the second edition of 1896 the outlying workings of Harraton Colliery were disused and the waggonways long abandoned.

A preliminary programme of archaeological trial trenching has been completed (Pre-Construct Archaeology Ltd, January 2009).

The evaluation comprised four trenches, which were targeted on the waggonway.

Trench 1 did not encounter significant archaeological remains. Natural boulder clay was encountered 0.40m below present ground level, overlain by a thin spread of coal waste.

Trench 2 recorded the central waggonway branch. A clay embankment was recorded with a deposit of clay in the centre – probably a bedding layer for the waggonway rails. No rails survived in situ, but parallel linear features showed their former position. North-east of the embankment was a trackside drainage ditch. The embankment was covered by numerous dumped deposits. Natural subsoil was 1.20m below present ground level.

Trench 3 failed to reveal any conclusive remains of the northern waggonway branch. Evidence for narrow ridge and furrow agriculture was recorded. A dumped deposit of crushed coal may have originated from the waggonway and was deposited after the route was dismantled.
The route of the waggonway is visible as a linear earthwork through the woodland between trenches 3 and 4.

Trench 4 was the southernmost trench. It was positioned across the Fatfield Waggonway just south of the point where it splits into three routes. Several horizontal timbers, crudely fashioned tree branches arranged parallel to each other, are interpreted as sleepers of a waggonway track. They were laid directly upon boulder clay, 1.30m below present ground level. A deposit of crushed coal, probably ballast from the waggonway trackbed overlay the timbers. There was a broad drainage ditch parallel and south-west of the waggonway. No similar feature could be seen on the north-east side due to modern disturbance. Natural boulder clay was up to 2m below present ground level.

A section of iron rail and two coins were found during the evaluation. It is advised that a specialist assesses these objects along with those recovered from the forthcoming excavation, to see if further analysis or stabilisation is warranted.

The five crude timbers need to be assessed by a specialist to identify species and to see if dendrochronology is possible. Further analysis may be recommended. The timbers also need to be photographed and drawn.

The colliery waggonways were probably in use from the late 18th century.

In accordance with the recommendations of the evaluation report, *PPG16* and Sunderland UDP 'Policy B14', a final phase of archaeological excavation is required to record more of the waggonways.

A proposed plan of the excavation areas is shown on Figure 9 of the evaluation report.

The appointed archaeologist **must** familiarise themselves with the results of previous archaeological work on the site before starting work.

A watching brief will be needed on the sites of Milbank and Thorald pits but this will be subject to a separate specification.

Research Aims and Objectives

The excavation report should make reference to Regional and Thematic Research Frameworks.

The North-East Regional Research Framework for the Historic Environment (NERRF) (2006) notes the importance of research as a vital element of development-led archaeological work. It sets out key research priorities for all periods of the past allowing commercial contractors to demonstrate how their fieldwork relates to wider regional and national priorities for the study of archaeology and the historic environment. The aim of NERRF is to ensure that all fieldwork is carried out in a secure research context and that commercial contractors ensure that their investigations ask the right questions. The relevant key research themes for this excavation are PM1. Early coal industry and coal use and PM2. Early railways. See http://www.algao.org.uk/Association/England/Regions/ResFwks.htm

Ideally and where possible the evaluation should cross-reference its aims and objectives to national priorities, defined in SHAPE (Strategic Frameworks for Historic Environment Activities and Programmes in English Heritage), and the English Heritage Research Agenda 2005-2010.

Where appropriate note any similar nationwide projects using ADS, internet search engines, ALSF website, HEEP website, OASIS, NMR excavation index.

All staff on site must understand the project aims and methodologies.

Methods Statement

The proposed excavation areas are shown in purple and green on figure 9 in the evaluation report of January 2009.

1. An area south-east of evaluation Trench 2, extending 10m along the waggonway line of the Anna Bella Pit branch. The excavation area will be 15m wide. The aim is to further expose the waggonway and its embankment, to ascertain its date and form of construction, variation in form through time and its date of abandonment.

2. An area south-east of evaluation Trench 4, extending 10m along the Fatfield Waggonway. The excavation area will be 20m wide to take into account the convergence of Fatfield Waggonway and the branch to the north-north-west. The aim is to further expose the waggonway and its embankment, to ascertain its date and form of construction, variation in form through time and its date of abandonment.

3. An area north-west of evaluation Trench 4, extending 30m along the waggonways. 20m at its southern end and 25m at its northern end. The aim is to further expose the waggonway and its embankment, to ascertain its date and form of construction, variation in form through time and its date of abandonment.

4. Subject to the results of area 3, a further area of up to 25m along the waggonway and 15m wide will be excavated north of area 3 to expose more of the north-north-west branch. Shown in green on Figure 9 of the evaluation report.

The work will record and environmentally sample any archaeological deposits of importance found on the plot. The purpose of this brief is to obtain tenders for this work. The report must be the definitive record for deposition in the Tyne and Wear HER, and it must contain recommendations for any further work needed on this site before development destroys any archaeological remains.

All staff employed by the Archaeological Contractor shall be professional field archaeologists with appropriate skills and experience to undertake work to the highest professional standards.

The work will be undertaken according to English Heritage guidelines: *Managing Archaeological Projects 2nd Edition* ('MAP2') (1991) (www.english-h.gov.uk/guidance/map2/index.htm) and *Management of Research Projects in the Historic Environment* (MoRPHE) (2006), also *MoRPHE Project Managers' Guide*, and *MoRPHE Project Planning Notes* (PPN) and *MoRPHE Technical Guides* (www.english-heritage.org.uk/publications).

The work will be undertaken according to MoRPHE 'PPN3 – Archaeological Excavation' and 'PPN6 – Development of procedural standards and guidelines for the historic environment'.

All work must be carried out in compliance with the codes of practice of the Institute for Archaeologists and must follow the IfA *Standard and guidance for archaeological excavation* (2008) (www.archaeologists.net).

Notification

The County Archaeologist needs to know when archaeological fieldwork is taking place in Tyne and Wear so that he can inform the local planning authority and can visit the site to monitor the work in progress. The Archaeological Contractor must therefore inform the County Archaeologist of the start and end dates of the Excavation. He must also keep the County Archaeologist informed as to progress on the site. The CA must be informed of the degree of archaeological survival and of any significant finds. The Client will give the County Archaeologist reasonable access to the development to undertake monitoring.

PROJECT INITIATION

PROJECT DESIGN

Because this is a detailed specification, the County Archaeologist does not require a Project Design from the appointed archaeologist. However a health and safety statement and risk assessment, identifying potential risks in a risk log (see template in Appendix 2 of *MoRPHE Project Manager's Guide*) and specifying suitable countermeasures and contingencies, is required to be submitted to the commissioning client.

MoRPHE Project Managers' Guide contains general guidance on Risk management (section 2.3.2, Appendix 2).

Risk assessments must be produced in line with legislative requirements (for example *The Health and Safety at Work Act 1974*, *The Management of Health and Safety at Work Regulations 1999*, *The Control of Substances Hazardous to Health (COSHH) Regulations 2002* and *The Personal Protective Equipment at Work Regulations 2002*) and best practice *e.g.* as set out in the SCAUM (Standing Conference on Archaeological Unit Managers) Health and Safety Manual http://www.scaum.org/uk

Detailed information on hazards and how to carry out a risk assessment can be obtained from the Health and Safety Executive (www.hse.gov.uk) and the local authority health and safety department.
Specific guidance for land contamination and archaeology can be obtained from the Institute for Archaeologists (www.archaeologists.net), the Construction Industry Research and Information Association (www.contaminated-land.org) and the Association of Geotechnical and Geoenvironmental Specialists (www.ags.org.uk).

See also Environment Agency's *Guidance on Assessing the Risk Posed by Land Contamination and its Remediation on Archaeological Resource Management* (2005).

The archaeological contractor must be able to provide written proof that the necessary levels of Insurance Cover are in place.

The archaeological contractor must detail measures taken to ensure the safe conduct of excavations, and must consult with the client's structural engineers concerning working in close proximity to the foundations of the surrounding buildings. The Client may wish to see copies of the archaeological contractor's Health and Safety Policy.

The archaeological contractor must maintain a site diary for the benefit of the Client, detailing the nature of work undertaken on a day by day basis, with full details of site staff present, duration of time on site, *etc.* and contact with third parties.

PROJECT EXECUTION

1) Archaeological excavation

Excavation areas are shown on Figure 9 of Pre-Construct Archaeology Ltd's evaluation report of January 2009.

Trench locations can be slightly adjusted to avoid services or for practical or safety purposes.

Trenches can be widened in order to step the sides to reach depths over 1.2m where necessary.

Trenches must avoid known services.

Trenches must stay a safe distance away from any pylons and overhead power lines.

The commissioning Client will advise of any ecological or biodiversity issues which need to be taken into consideration.

The commissioning Client will advise of any protected trees which must be avoided by the excavation. Damage to trees covered by a Tree Protection Order carries a substantial fine.

Trees will need to be removed to allow the excavation to take place. However Natural England (Frances Falconer) wants further surveys of the trees in the spring/early summer to ascertain whether or not there are bats roosting in them. The archaeological work can thus only be undertaken after the go-ahead has been given by Natural England and Sunderland City Council's ecologist (Claire Dewson). A site meeting may be needed before the tree felling can commence.

Trench positions should be accurately surveyed prior to excavation and tied in to the national grid.

The trenches should be excavated to the depth of natural subsoil.

Tasks

Hand excavation, recording and environmental sampling (as stipulated below) of deposits down to the depth specified above.

Any modern overburden or levelling material can be machined-off using a wide toothless ditching bucket under strict archaeological supervision and the remaining deposits are to be excavated by hand.

Excavation is to be carried out with a view to avoid damage to any archaeological features which appear to worthy of preservation in-situ.

Excavation is to be carried out by single context planning and recorded on *pro forma* context sheets.

Environmental sampling (and where relevant scientific dating) are compulsory parts of the evaluation exercise. All tenders will give a price for the assessment, full analysis, report production and publication per environmental and scientific dating sample as a contingency.

Scientific investigations should be undertaken in a manner consistent with 'MAP2' (English Heritage 1991) and with *Archaeological Science at PPG16 Interventions: Best Practice for Curators and Commissioning Archaeologists* (English Heritage 2003). Advice on the sampling strategy for environmental samples and samples for scientific dating etc. must be sought from Jacqui Huntley, English Heritage Regional Advisor for Archaeological Science (jacqui.huntley@english-heritage.org.uk or 07713 400387) **before** the excavation begins. See Appendix 1 for more information.

See Appendix 2 for guidance on procedures relating to human remains.

See Appendix 4 for guidance on Treasure Act procedures.

The spoil can be kept close-by and rapidly backfilled into the trenches at the conclusion of this work.

Recording

A full written, drawn (accurate scale plans, elevations and section drawings) and photographic record (of all contexts in black and white print and colour transparency with clearly visible graduated metric scale) will be made.

The finished report must include a plan and section of each trench plus plans and sections through excavated archaeological features.

There will be elevation drawings of any standing structures such as walls.

Pro-forma context sheets will be used.

All deposits and the base of the trench will be levelled. Levels will be expressed as metres above Ordnance Datum.

Stratigraphy shall be recorded even when no archaeological features have been recognised.

A 'Harris' matrix will be compiled where stratified deposits are recorded.

2) Post-excavation and report production

Finds Processing and Storage

The archaeological contractor will process and catalogue the finds in accordance with Museum and Galleries Commissions guidelines (1992) and the UKIC Conservation guidelines, and arrange for the long term disposal of the objects on behalf of the Client. A catalogue of finds and a record of discard policies, will be lodged with the finds for ease of curation.

Finds shall be recorded and processed in accordance with the IfA *Guidelines for Finds Work*.

Finds will be assessed by an experienced finds specialist.

Human and animal bone assemblages should be assessed by a recognised specialist (see Appendices 2 and 3 for more information).

Industrial slag and metal working debris will be assessed by a specialist.

Assessment should include x-radiography of all iron objects (after initial screening to exclude recent debris) and a selection of non-ferrous artefacts (including all coins). Refer to *Guidelines on the x-radiography of archaeological metalwork (*English Heritage 2006).

If necessary, pottery sherds and bricks should be recommended for thermo-luminescence dating.

Finds processing, storage and conservation methods must be broadly in line with current practice, as exemplified by the IFA *Standard and guidance for the collection, documentation, conservation and research of archaeological materials* (2001). Finds should be appropriately packaged and stored under optimum conditions, as detailed in the RESCUE/UKIC publication *First Aid for Finds* (Watkinson and Neal 1998). Proposals for ultimate storage of finds should follow the UKIC publication *Guidelines for the Preparation of Excavation Archives for Long-term Storage* (Walker 1990). Details of methodologies may be requested from the archaeological contractor.

Other useful guidance – *A Strategy for the Care and Investigation of Finds* (English Heritage 2003) and *Finds and Conservation Training Package* (English Heritage 2003).

All objects must be stored in appropriate materials and conditions to ensure minimal deterioration. Advice can be sought from Jacqui Huntley of English Heritage (0191 334 1137 or 07713 400 387) where necessary.

PRODUCTS

The report

1. The archaeological contractor must produce an interim report of 200 words minimum, **two weeks after the completion of the field-work**, for the Client and the Planning Authority, with a copy for information to the County Archaeologist. This will contain the recommendations for any further work needed on site.

2. The production of a Site Archive and finds analysis will be undertaken according to English Heritage Guidelines - 'MAP2' (1991) and *Management of Research Projects in the Historic Environment* (MoRPHE) (2006).

3. A full archive report or post-excavation assessment, with the following features should be produced **within six months of the completion of the field-work**. All drawn work should be to publication standard. The report must include:

* Location plans of trenches and grid reference of site
* Site narrative – interpretative, structural and stratigraphic history of the site
* Plans showing major features and deposit spreads, by phase, and section locations
* Sections of the two main trench axes and through excavated features with levels
* Elevation drawings of any walls etc. revealed during the excavation
* Artefact reports – full text, descriptions and illustrations of finds
* Tables and matrices summarising feature and artefact sequences.
* Archive descriptions of contexts, grouped by phase (not for publication)
* Deposit sequence summary (for publication/deposition)
* Colour photographs of trenches and of archaeological features and finds
* Laboratory reports and summaries of dating and environmental data, with collection methodology.
* A consideration of the results of the field-work within the wider research context (ref. NERRF).
* Recommendations for further work on site, or further analysis of finds or environmental samples
* Copy of this specification

4. Three bound and collated copies of the report need to be submitted:

- one for the commissioning client
- one for the planning authority (Sunderland City Council) plus a copy on CD – this must be formally submitted by the developer to the planning department with the appropriate fee.
- one for deposition in the County HER at the address below. A digital copy of the report on CD is also required by the HER in a plastic case. Please do not attach this to the report.

The report and CD for the HER must be sent by the archaeological consultant or their client directly to the address below. If the report is sent via the planning department, every page of the report will be stamped with the planning application number which ruins the illustrations. The HER is also often sent a photocopy instead of a bound colour original which is unacceptable.

Publication

It is expected that the results of the excavation will warrant publication in a suitable archaeological journal. The tender should therefore include an estimated figure for the production of a short paper of, for example 20 pages, in *Industrial Archaeology Review*. This is merely to give the commissioning Client an indication of potential costs.

Before preparing a paper for publication, the archaeological contractor must discuss the scope, length and suitable journal with the County Archaeologist.

Archive Preparation and Dissemination

The archive should be a record of every aspect of an archaeological project – the aims and methods, information and objects collected, results of analysis, research, interpretation and publication. It must be as complete as possible, including all relevant documents, records, data and objects (Brown, 2007, 1).

The Site Archive (records and materials recovered) should be prepared in accordance with 'MAP2' (1991), section 5.4 and Appendix 3, MoRPHE (2006) 'Project Planning Notes: PPN3 – Archaeological Excavation', *Archaeological documentary archives* (IFA Paper No. 1)*, Guidelines for the Preparation of Excavation Archives for Long Term Storage* (UKIC 1990) and *Archaeological Archives – A guide to best practice in creation, compilation, transfer and curation* (Brown, Archaeological Archives Forum, 2007).

Documentary Archive

The documentary archive comprises all records made during the archaeological project, including those in hard copy and digital form.

This should include written records, indexing, ordering, quantification and checking for consistency of all original context sheets, object records, bulk find records, sample records, skeleton records, photographic records (including negatives, prints, transparencies and x-radiographs), drawing records, drawings, level books, site note-books, spot-dating records and conservation records, publication drafts, published work, publication drawings and photographs etc.

A summary account of the context record, prepared by the supervising archaeologist, should be included.

All paper-based material must at all times be stored in conditions that minimise the risk of damage, deterioration, loss or theft.

Do not fold documents.

Do not use self-adhesive labels or adhesive or tape of any kind.

High quality paper (low-acid) and permanent writing materials must be used.

Original drawings on film must be made with a hard pencil, at least 4H.

Do not ink over original pencil drawings.

Use polyester based film for drawings (lasts longer than plastic).

Store documents in acid-free, dust-proof cardboard boxes.

Store documents flat.

All documents must be marked with the project identifier (e.g. site code) and/or the museum accession number.

All types of record must use a consistent terminology and format.

Use non-metal fastenings, and packaging and binding materials that ensure the longevity of documents.

Copies of reports and appropriate drafts, with associated illustrative material, must be submitted for inclusion with the archive.

Material Archive

The material archive comprises all objects (artefacts, building materials or environmental remains) and associated samples of contextual materials or objects.

All artefacts and ecofacts retained from the site must be packed in appropriate materials.

All finds must be cleaned as appropriate to ensure their long-term survival

All metal objects retained with the archive must be recorded by x-radiograph (except gold or lead alloys or lead alloys with a high lead content and objects too thick to be x-rayed effectively, *etc.*)

All finds must be marked or labelled with the project and context identifiers and where relevant the small-finds number.

Use tie-on rot-proof labels where necessary.

Bulk finds of the same material type, from the same context, may be packed together in stable paper or polythene bags.

Mark all bags on the outside with site and context identifiers and the material type and include a polyethylene label marked with the same information.

Use permanent ink on bags and labels.

Sensitive finds must be supported, where appropriate, on inert plastic foam or acid-free tissue paper. It is not advisable to wrap objects in tissue as the unwrapping could cause damage.

The archive will be placed in a suitable form in the appropriate museum (typically Museum of Antiquities for Newcastle and Tyne and Wear Museums for the rest of Tyne and Wear (check with these institutions) with the landowner's permission.

A letter will be sent to the County Archaeology Officer within six months of the report having been submitted, confirming where the archive has been deposited.

Digital Archive

See MoRPHE 'Technical Guide 1 – Digital Archiving & Digital Dissemination' (2006).

SIGNPOSTING

OASIS

The Tyne and Wear County Archaeologist supports the Online Access to the Index of Archaeological Investigations (OASIS) project. This project aims to provide an online index/access to the large and growing body of archaeological grey literature, created as a result of developer-funded fieldwork.

The archaeological contractor is therefore required to register with OASIS and to complete the online OASIS form for their evaluation at http://www.oasis.ac.uk/. Please ensure that tenders for this work takes into account the time needed to complete the form.

Once the OASIS record has been completed and signed off by the HER and NMR the information will be incorporated into the English Heritage Excavation Index, hosted online by the Archaeology Data Service.

The ultimate aim of OASIS is for an online virtual library of grey literature to be built up, linked to the index. The unit therefore has the option of uploading their grey literature report as part of their OASIS record, as a Microsoft Word document, rich text format, pdf or html format. The grey literature report will only be mounted by the ADS if both the unit and the HER give their agreement. The grey literature report will be made available through a library catalogue facility.

Please ensure that you and your client understand this procedure. If you choose to upload your grey literature report please ensure that your client agrees to this in writing to the HER at the address below.

For general enquiries about the OASIS project aims and the use of the form please contact: Mark Barratt at the National Monuments Record (tel. 01793 414600 or oasis@english-heritage.org.uk). For enquiries of a technical nature please contact: Catherine Hardman at the Archaeology Data Service (tel. 01904 433954 or oasis@ads.ahds.ac.uk). Or contact the Tyne and Wear Archaeology Officer at the address below.

The tender

Tenders for the work should contain the following:-

1. Brief details of the staff employed and their relevant experience
2. Details of any sub-contractors employed
3. A quotation of cost, broken down into the following categories:-
    - Costs for the excavation, incl. sub-headings of staff costs on a person-day basis, transport, materials, and plant, *etc*.
    - Post-excavation costs, incl. storage materials.
    - Cost of Environmental analysis and scientific dating per sample.
    - Estimated cost for full publication of results in an archaeological journal.
    - Overheads.
4. An indication of the required notification period (from agreement to start date) for the field-work; the duration of fieldwork and the expected date for completion of the post-excavation work (a maximum of 6 months after completion of the fieldwork)

Monitoring

The Archaeological Contractor will inform the County Archaeologist of the start and end dates of the excavation to enable the CA to monitor the work in progress.

Should important archaeological deposits be encountered, the County Archaeologist must be informed. If further archaeological evaluation is required on this site, then the archaeological contractor must submit a written scheme of investigation for approval by the CA before extending the size of the trenches.

APPENDICES

1. Environmental Sampling, Scientific Analysis and Scientific Dating

This is a compulsory part of the evaluation exercise.

Scientific investigations should be undertaken in a manner consistent with 'MAP2' and with *Archaeological Science at PPG16 Interventions: Best Practice for Curators and Commissioning Archaeologists* (English Heritage 2003).

Aims of environmental sampling – to determine the abundance/concentration of the material within the features and how well the material is preserved, to characterise the resource (the site) and each phase, to determine the significance of the material and its group value, what crop processing activities took place on the site? What does this tell us about the nature of the site? Is there any evidence for changes in the farming practice through time? How did people use this landscape? Can we place certain activities at certain locations within the site? Function and date of individual features such as pits, hearths etc. Are the charred assemblages the result of ritual deposition or rubbish? Is the charcoal the result of domestic or industrial fuel?

Advice on the sampling strategy for environmental samples and samples for scientific dating etc. must be sought from Jacqui Huntley, English Heritage Regional Advisor for Archaeological Science (07713 400 387) **before** the evaluation begins. The sampling strategy should include a reasoned justification for selection of deposits for sampling.

Deposits should be sampled for retrieval and assessment of the preservation conditions and potential for analysis of biological remains (English Heritage 2002). Flotation samples and samples taken for coarse-mesh sieving from dry deposits should be processed at the time of fieldwork wherever possible. Sieving recovers fish, amphibian, small bird and mammal bone, small parts of adult mammals and young infused bones which may be under-represented otherwise. However it is noted that clay soils in this region make sieving difficult. Discuss the potential for sieving with Regional Advisor for Archaeological Science.

Environmental samples (bulk soil samples of 30-40 litres volume) will be collected by the excavator from suitable (*i.e.* uncontaminated) deposits. It is suggested that a large number of samples be collected during evaluation from which a selection of the most suitable (uncontaminated) can be processed. All tenders will give a price for the assessment, full analysis, report production and publication per sample.

The full 30-40 litre sample must be assessed by the laboratory, not just a small sub-sample.

Deposits will be assessed for their potential for radiocarbon, archaeomagnetic (guidance is available in the Centre for Archaeology *Guideline on Archaeometallurgy*, 2001) and Optically Stimulated Luminescence dating. Timbers will be assessed for their potential for dendrochronology dating. Sampling should follow procedures in *Dendrochronology: guidelines on producing and interpreting dendrochronological dates* (Hillam 1998). All tenders will quote the price of these techniques per sample.

The following information should be provided with the environmental samples to be processed – brief account of nature and history of the site, aims and objectives of the project, summary of archaeological results, context types and stratigraphic relationships, phase and dating information, sampling and processing methods, sample locations, preservation conditions, residuality/contamination etc.

Laboratory processing of samples shall only be undertaken if deposits are found to be reasonably well dated, or linked to recognisable features and from contexts the derivation of which can be understood with a degree of confidence.

A range of features, and all phases of activity, need to be sampled for charred plant remains and charcoal. Aceramic features should not be avoided as the plant remains from these features may help to date them. Deep features should be sampled in spits to pick up changes over time. Part, or all of each of the contexts should be processed. In general samples should be processed in their entirety. All flots should be scanned, and some of the residues.

Pollen
Pollen samples can be taken from features such as lakes, ponds, palaeochannels, estuaries, saltmarshes, mires, alluvium and colluvium, and from waterlogged layers in wells, ditches and latrines etc. Substances such as honey, beer or food residues can be detected in vessels. Activities such as threshing, crop processing and the retting of flax can be identified. When taken on site, pollen samples should overlap. Your regional science advisor can advise on the type of corer or auger which would be most appropriate for your site. Samples need to be wrapped in clingfilm and kept dark and cool. Make a description of the sediments in which the pollen was found, and send this with the sample to be assessed.

Forams and diatoms
Coastal or estuary sites (even those which are now well drained) are suitable for sampling for foraminifera. Diatoms can also be found on marine sites, but also in urban settings (sewers, wells, drains, ditches etc). They only survive in waterlogged conditions. These aquatic microfossils are used as proxy indicators of the former aquatic ecological conditions on site, changes in sea levels and temperature, salinity, PH and pollution. Forams are taken from cores, monolith tins or bulk samples. Diatoms are cut from monolith tins or cores or taken as spot samples.

Insects
Insects, which are useful as palaeoenvironmental indicators, survive best in waterlogged deposits such as palaeochannels and wells. They can provide information on climate change and landscape reconstruction as some species are adapted to particular temperatures, habitats or even particular trees. Certain insects can indicate the function of a feature or building (*e.g.* Weevils, which were introduced by the Romans, often indicate granary sites, parasites will indicate the presence of particular animals such as sheep or horse, latrine flies survive in the mineral deposits in latrines, or in the daub of medieval buildings, *etc*.). Samples need to be sealed (*e.g.* in a plastic box).

Industrial Activity
Where there is evidence for industrial activity, macroscopic technological residues should be collected by hand. Separate samples should be collected for micro-slags (hammer-scale and spherical droplets). Guidance should be sought from the English Heritage Regional Science Adviser on the sampling strategy for metalworking features and advice on cleaning and packaging. Specialist on-site advice must be sought on identification of metalworking features. Slag and metal working debris must be assessed by a specialist. Scientific analysis (such as x-ray fluorescence, chemical analysis, metallography or scanning electron microscope) of slag can provide information on the melting temperature, chemical composition (is it iron, zinc, copper etc), microstructure (the type and shape of the crystals), physical properties (the hardness or viscosity), isotopic composition (strontium_87 or strontium_88 etc) and mineralogical composition. Guidance is available in the English Heritage's guidelines on archaeometallurgy (2001), archaeomagnetic dating (2006) and X-radiography of archaeological metalwork (2006).

See also *Metals and metalworking: a research framework for archaeometallurgy* (Historical Metallurgy Society 2008).

Buried soils and sediments
Buried soils and sediment sequences should be inspected and recorded on site by a recognised geoarchaeologist. Procedures and techniques in the English Heritage documents *Environmental Archaeology* (2002) and *Geoarchaeology* (2004) should be followed.

Wood
Sampling strategies for wooden structures should follow the methodologies presented in *Waterlogged wood. Guidelines on the recording, sampling, conservation and curation of waterlogged wood* (Brunning 1996). If timbers are likely to be present on your site, contact a wood specialist beforehand. Pre-excavation planning – determine questions to ask, agree on a sampling strategy, allocate reasonable time and budget. Soil samples should be taken of the sediments surrounding the timber. Keep the timbers wet! Record them asap on-site – plan, photograph, record the size and orientation of the wood (radial, tangential,transverse), any toolmarks, joints, presence of bark, insect damage, recent breaks, and if another piece of wood was on top of or below the piece sampled. Both vertical and horizontal positioning of wattling must be recorded. Wood samples can provide information on woodland management such as medieval coppicing, type of taxa (native or foreign), conversion technology (how the wood was turned into planks), building techniques and type of tools used.

Suitable samples should be submitted for dendrochronological dating. See the English Heritage guideline document, *Dendrochronology* (2004).

Leather and organic materials
Waterlogged organic materials should be dealt with following recommendations in *Guidelines for the care of waterlogged archaeological leather* (English Heritage and Archaeological Leather Group 1995).

2. Animal Bone

Animal bone can explore themes such as hunting and fowling, fishing, plant use, trade network, seasonality, diet, butchery, animal husbandry, food procurement, age structures, farrowing areas, species ratios, local environment.

Domestic animal bone was used in prehistoric and Roman cremation rituals.

Post medieval cattle bones – small cow bones invariably represent animals which produced high quality buttermilk for cheese. Big 'improved' cattle with large bones were produced for large quantities of meat and poorer quality milk. Large and small cattle bones are often found together on post medieval sites, usually with less of the small bones.

Animal bone assemblages should be assessed by a recognised specialist.

The specialist will need to know a brief account of the nature and history of the site, an account of the purpose, methods (details of sampling) for recovery of animal bones, and the main aims and results of the excavation, details of any specific questions that the excavator wants the animal bone specialist to consider, information about other relevant finds from the excavation (e.g. bone tools, fishing equipment, weaving equipment), specific information about each context that has produced significant quantities of animal bone (recovery method, phase, context type, position in relation to major structures, contamination by more recent material, some indication of the amount of bone (by weight or by container size). See the Ancient Monuments Laboratory advisory note, *Assessment of animal bone collections from excavations* (Payne 1991) and *The Assessment of a collection of animal bones* (Davis, n.d., Ancient Monuments Laboratory).

Fish bone – there was some herring exploitation in the early medieval period. Christian fasting from around 970 allowed fish to be eaten on Fridays which led to a huge demand for fish. There was an increase in marine fishing, fish trade and fish consumption (cod, haddock, ling, herring etc) around 1000 AD. Middens provide evidence of commercial fishing. There was a decline in freshwater fish (cyprinid or carp, salmon, smelt, eel, pike) from the eleventh century.

Smoking fish is a recent practice. They were previously air dried and salted.

Newcastle was a major port. Samples should be sieved to retrieve fish and bird bones along with small parts of other animal skeletons and young infused bones.

A crane bone was recovered from excavations at Tuthill Stairs, Newcastle – a rare find.

Herring bones are so small that they can only be retrieved by 2mm sieving.

Clay soils are difficult to sieve, hot water can help.

Acidic soils mean poor preservation of bone.

See *Environmental Archaeology – a guide to the theory and practice of methods from sampling and recovery to post excavation* (Centre of Archaeology Guideline 1, English Heritage 2002).

Isotope analysis can determine where the fish were coming from – North Sea, Scandinavia, Newfoundland, Iceland etc.

There is an excellent reference collection of fish bone at York.

Fish bones should be archived to museums for future dating and isotope analysis where this is not undertaken as part of the post-excavation process.

www.fishlab.org

3. Human Remains

Human remains must be treated with care, dignity and respect.

Excavators must comply with the relevant legislation (essentially *The Burial Act 1857*) and local environmental health concerns. If found, human remains must be left in-situ, covered and protected. The archaeological contractor will be responsible for informing the police, coroner, local Environmental Health department and the County Archaeologist. If it is agreed that removal of the remains is essential, the archaeological contractor will apply for a licence from the Home Office and their regulations must be complied with.

Site inspection by a recognised osteologist is desirable for isolated burials and essential for cemeteries. The remains will be recorded in-situ and subsequently lifted, washed in water (without additives). They will be marked and packed to standards compatible with *Excavation and post-excavation treatment of cremated and inhumed human remains*, (McKinley and Roberts 1993). After excavation, the remains will be subject to specialist assessment.

Analysis of the osteological material should take place according to published guidelines *Human Remains from Archaeological Sites, Guidelines for producing assessment documents and analytical reports* (English Heritage 2002).

Some of the potential benefits from the study of human skeletons – demography, growth profiles, patterns of disease, genetic relationships, activity patterns, diet, burial practices, human evolution. New scientific techniques available include DNA and stable isotope analyses.

Diseases which yield ancient DNA – leprosy, syphilis, tuberculosis, mycobacterium bovis (animal form of TB passed to humans when they shared a living space from Neolithic period onwards).

Cremation destroys the crown of the tooth so it cannot be dated (the closure of the cranium vault can be used in adults for dating instead). Cremation also fragments bone, distorts it due to lack of water, shrinks the bone, causes microstructural alteration and destroys organic components (so DNA analysis not possible).

The final placing of the remains after scientific study and analysis will be agreed beforehand.

Further guidance is available in:

Guidance for best practice for treatment of human remains excavated from Christian burial grounds in England (The Church of England and English Heritage 2005)
(www.english-heritage.org.uk/upload/pdf/16602_HumanRemains1.pdf)

Church Archaeology: its care and management (Council for the Care of Churches 1999).

The Advisory Panel on the Archaeology of Christian burials in England can provide free well-informed advice with consideration of relevant religious, ethical, legal, archaeological and scientific issues.
http://www.britarch.ac.uk/churches/humanremains/index.html
or email the secretary simon.mays@english-heritage.org.uk

4. Treasure

Defined as:

- Any metallic object, other than a coin, provided that at least 10% by weight of metal is precious metal and that is at least 300 years old when found
- Any group of two or more metallic objects of any composition of prehistoric date that come from the same find
- All coins from the same find provided that they are at least 300 years old when found, but if the coins contain less than 10% gold or silver there must be at least ten
- Any object, whatever it is made of, that is found in the same place as, or had previously been together with, another object that is Treasure
- Any object that would previously have been treasure trove, but does not fall within the specific categories given above. Only objects that are less than 300 years old, that are made substantially of gold or silver, that have been deliberately hidden with the intention of recovery and whose owners or heirs are unknown will come into this category

If anything is found which could be Treasure, under *The Treasure Act 1996*, it is a legal requirement to report it to the local coroner within 14 days of discovery. The Archaeological Contractor must comply with the procedures set out in The Treasure Act 1996. Any treasure must be reported to the coroner and to The Portable Antiquities Scheme Finds Liaison Officer, Rob Collins (0191 2225076 or Robert.Collins@newcastle.ac.uk) who can provide guidance on the Treasure Act procedures.

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