

GeoArch

Report 2016/01

Metalwork from Ffos y fran

(revised version; replaces Report 2014/20)
Dr Tim Young
6th January 2014

Metalwork from Ffos y fran

Dr T.P. Young

Abstract

The project produced a total of over 1500 metallic artefacts from eleven surface sites plus underground workings. Approximately 500 of these items were fastenings, including bolts, nails, spikes and related items. The abundance of these materials reflects both the debris from the demolition of the various structures and the routine replacement of fastenings on plateways and railways.

Plateway components, and those of the drams running on them, were important elements of the assemblages from most sites, including the recovery of twenty drams from underground. The drams provide evidence for their development, probably from c.1800 to c.1850. Horse harness fittings indicate the importance of horse-haulage both under- and over-ground in the early years.

Tools reflecting the mining of coal and ironstone were found in most areas. A rich and representative assemblage of tools from the Settlement area suggests that miners of the early nineteenth century took their tools home when not in the mine. Assemblages from Pit No. 1 and the Settlement area also included blacksmiths' tools, suggesting the location of smithies in these areas.

Railway components dominated the assemblage for the area around the brickworks, which formed an important transport corridor from the 1840s onwards.

Structural metalwork was recovered in various places, but most notably from the No 1 Pit, which retained in situ the support plate for the bearings of the balance bob. Although the pits showed structural evidence for steam engines, no components of these were recognised, apart from boiler plates. Although the ironstone pits of the Gwaun nant y bwch area (Pit Nos 1 to 6) are commonly described as having been water balance pits, the structural and documentary evidence indicates that Pit No. 1 had a steam winding capability.

Steam winding was also employed at the poorly documented 'Soap Vein pit', which also featured an interesting re-use of boiler plates as part of the mounting for the winding drum. The pit was not listed as having a steam engine in 1848, and with the documented proposal to sink a shaft here to exploit the Rhas Las coal at depth after 1849, there is the intriguing possibility that the engine might be that removed from Pit No. 1 in 1848, and even that the re-used boiler plates might be from the same source.

The Settlement area and the post-mining occupation of Pit No. 1 provide a small assemblage of more personal and domestic metalwork.

At Pit No 1, numerous finds of horse harness and fittings may date, at least in part, from the late domestic occupation of the site, when the occupants of the cottage are known to have kept horses.

Appendices to the report present the mining history and transport history contexts within which the metalwork assemblage may be interpreted.

Revision note: *this report represents an updated version of GeoArch report 2014-20 to reflect the evidence provided by the recovery of an additional eight drams from underground between December 2012 and December 2015.*

Contents

Abstract	1		
Summary	4		
The Catalogue			
1. Stock/unmodified materials	5		
1.a Cast Iron			
Bars	5		
Beams	5		
Plates	5		
1.b Wrought iron			
Half-round	5		
Round	5		
Square	5		
Flat	5		
2. Fastenings			
2.a Threaded bolts and related items			
Carriage bolts	5		
Square-headed carriage bolts	5		
Other round-headed bolts	5		
Transverse-headed bolts	6		
Square-headed bolts	6		
Hexagonal-headed bolts	6		
Loop-headed bolts	6		
Wood bolt 6	6		
Bolt fragments	6		
Square nuts	6		
Hexagonal nuts	6		
Bracing nut	6		
Washers	6		
Double-washers	6		
Securing bands	6		
2.b Nails			
Zinc clout nails.....	6		
Horseshoe nails	6		
Triangular wedge nails	6		
Rectangular/square-sectioned nails	6		
Round-sectioned nails	6		
Nail fragments	6		
Joiners dogs and staples	6		
2.c Spikes			
Disc-headed spikes	7		
Round-headed, chisel-tipped spikes	7		
Fold-headed spikes	7		
Square-headed, chisel-tipped spikes	7		
Other spikes	7		
2.d Cotter bolts			
Cotter bolts	7		
Threaded cotter bars	7		
Axle-like cotter bars	7		
3. Transport			
3.a Plateway drams	8		
Drams of 72cm gauge	9		
Type 1	8		
Drams of 82cm gauge			
Type 2	10		
Type 3	10		
Type 4	10		
Type 5	11		
Type 6	11		
Type 7	11		
Type 8	11		
3.b Plateway dram components			
Dram spines	12		
Other dram strapping	12		
Dram cotters	12		
Dram wheels	12		
Dram axles	12		
Dram washers	12		
3.c Dram couplings	13		
3.d Plateway plates			
Lapped plateway plates	13		
Outram-type plateway plates	13		
Plain dual-purpose plateway plates	13		
Crenulated dual-purpose plateway plates	14		
Plain plateway plates for iron sills	14		
Crenulated plateway plates for iron sills ..	14		
Plateway plate fragments	14		
Plateway special plates	14		
Wrought iron plateway plates	14		
3.e Plateway sills and chairs			
Plateway sill – Type 1	15		
Plateway sill – Type 2	15		
Plateway sill – Type 3	15		
Other plateway sills	15		
Plateway chairs	15		
3.f Railway components			
Railway chairs	16		
Fishplates	16		
Spring wedge	16		
3.g Other vehicle components	16		
4. Chains and hooks			
4.a Chains	16		
4.b Hooks	17		
4.c Shackles	17		
5. Horse and harness			
5.a Horse shoes	17		
5.b Harness fittings	17		
5.c Other haulage equipment	18		
6. Wire and wire rope (cable)			
6.a Wire	18		
6.b Wire rope	18		
7. Tools			
7.a Mining tools			
Shovels	18		
Gad bars	18		
Chisels and prise bars	18		
Wedges	19		
Hammers	19		
Rock drill	19		
Mandrels	19		
Other tools	19		
Illumination	20		
7.b Blacksmiths' tools	20		
7.c Other tools	20		
8. Sheet metalwork			
8.a Boiler plate	20		
8.b Small plates with central hole	20		
8.c Other iron plate	21		
8.d Iron sheet and strip	21		
8.e Copper alloy strip.....	21		
9. Pipes and related items			
9.a Cast iron pipes	21		
9.b Lead gaskets	21		
9.c Wrought iron pipes	21		
9.d Copper pipes	21		
9.e Pipe unions?	21		
10. Structural ironwork			
10.a Window bars?	21		
10.b Structural tie bars			
Plain bars	21		
Threaded bars	22		
Eyed bars	22		
10.c Iron bindings	22		
10.d Frames and hatch covers	22		
10.e Structural casting	22		
10.f Door fittings			
Handles	22		

Strap hinges	22
Pintles	22
10.g Structural cotter bars	23
11. Domestic and personal items	
11.a Cast iron vessels	23
11.b Galvanised iron vessels	23
11.c Cutlery	23
11.d Footwear	23
11.e Clothing and related items	23
11.f Furniture	24
12. Mechanical Components	24
13. Miscellaneous	
13.a Miscellaneous iron objects	24
13.b Worked iron	24
13.c Miscellaneous ferrous castings	25
13.d Miscellaneous non-ferrous artefacts	25
13.e Concretions	25
Discussion of assemblages by site	
Underground evidence	26
No. 1 Pit Pithead	26
No. 2 Pit Pithead	27
No. 4 Pit Pithead	27
The Soap Vein Pit Pithead	27
Bargoed-Taf northern culvert	28
Bargoed-Taf tramroad trenches	28
The Brickworks and tramroad area	28
The Penydarren platform area	28
The southern dumping area	28
The Longtown area	28
The Settlement area	28
Discussion of major artefact groups	
Plateways	29
Railways	32
Tools	32
Appendix A. Mining history	34
Appendix B. Transport history	37
References	40
Figure Captions	41
Table1	42
Table1	43
Table1	44
Table1	45
Table1	46
Figures	47
Catalogue Listing	77

SUMMARY

The project produced a total of over 1500 metallic artefacts from eleven surface sites plus underground workings. Most of these are finds from the initial surface excavations, with just a few items recovered from underground workings during the subsequent open-cast mining itself. The objects are described and discussed under the broad headings of stock/unmodified materials, fastenings, transport, chains & hooks, horse & harness, wire & wire rope, tools, sheet ironwork,

The metalwork was in only moderate to poor condition. Many items required the removal of concretion to permit identification, which means that quoted dimensions are only approximate.

Approximately 500 of these items were fastenings, including bolts, nails, spikes and related items. Although most of these fastenings were not attributable to a particular use, the abundance of these materials reflects both the debris from the demolition of the various structures and the routine replacement of fastenings on plateways and railways. Apart from within the Settlement area, nails were rare, compared with larger spikes.

The plateways were a significant element of activity on many of the sites. Twenty drams were recovered in varying states of completeness, buried in the underground galleries. These are mainly interpreted to be coal drams and associated with Penydarren Ironworks. They mostly correspond to a gauge between the inner wheel faces of approximately 825mm (i.e. the Dowlais two foot eight inch gauge that may also have been employed by the Penydarren Ironworks in the mid-nineteenth century). The plateways mainly employed iron sills; both Outram-type plates (requiring stone sleeper blocks) and dovetail plates/sills were employed; iron chairs were rare. Those employed underground in the coal workings and in some associated above ground contexts, may have been particularly lightweight versions of those employed on the surface. Surface finds show a wide variety of types of plate and sills, reflecting the long history of the workings and influences of both Dowlais and Penydarren Ironworks in this area at different times.

The pit head areas show an only very limited survival of structural ironwork. At Pit 1, the earliest of the investigated pits, the support plate for the bearings of the balance bob was found preserved in-situ, as were various cast iron beams supporting the fire-grates of the later boilers across their ash pits (PT120/126) as well as plates supporting the roofs of some culverts (e.g. PT226). The geometry of the remains and the location of these features provide significant evidence to help interpret the nature of engines and boilers employed on the site, although the low level of preservation of the mountings preclude precise interpretation. The early phase was a compact system with a single boiler, probably egg-ended, an engine described in contemporary accounts as having an 18 inch diameter cylinder, with a 5 foot stroke and providing 25 hp, apparently both providing drive for pumping, via a short flat rod system, and winding. It is unclear if the winding by steam was in addition to the use of the water balance. Winding appears to have employed flat chains.

The Soap Vein Pit pithead produced a considerable number of smaller tools. The mounting for the winder included reused boiler plates from an egg-ended

boiler. Scraps of wire suggest that wire rope was used for winding. Although the style of engine mounting was similar to that at Pit 1, the round stack base and lack of an ash pit for the boiler suggest that an enclosed tube boiler was used, with the boiler house having a more 'Cornish' appearance. Together with use of wire rope, a date significantly later than Pit 1 is suggested.

CATALOGUE

1. Stock/unmodified materials

This category includes all items of unmodified, simple, stock form. In some cases these may actually be fragments of larger objects.

1.a Cast iron (1 – 47)

Bars (1-4)

Four fragments of cast iron bar were found. These were all rectangular-sectioned bars with no features to indicate their purpose.

One bar (Cat. No. 1) measured 1210mm by 60mm by 70mm, with a small protrusion (casting mark/sprue) just off centre.

A second bar (Cat. No. 2) measured 200mm by 80mm by 30mm, with fractured ends.

A third fragment of cast bar (Cat. No. 3) measured 130mm in length with a 55mm by 45mm section.

The fourth, smaller, bar fragment (Cat. No. 4) was 130mm long with a 30mm by 14mm section.

Beams (5-8)

These four items are pig-like cast beams. They have a trapezoidal section (30-40mm wide at the base, 100-110mm wide at the top and 100-115mm tall) with a fractured distal tip leading to almost cuboidal end section of 90mm wide at the base, 105mm wide at the top and 200-205mm long (Cat. Nos 5, 7) or 310mm long (Cat. No. 6, 8).

The surviving length of each was 1030mm, 960mm, 850mm and c. 800mm respectively.

Two of the bars (Cat. Nos 5, 7) were weighed and were 57.5kg and 53.5kg respectively.

It remains unclear whether these are ingot-like objects with a single cuboidal 'head', or whether they are (more likely) fragments of beams, perhaps originally with a cuboidal head at either end.

Plates (9-47)

Cast iron plates occurred in a wide range of sizes. Long narrow plates, with a width of 23cm (9 inches) variously had lengths of 104 or 213cm, one plate had width of 30cm (1 foot) and a length of 181cm (6 feet), at least eight of the plates were 60cm (2 feet) wide and many were 121cm long (4 feet), with at least one 181cm (6 feet) long. Plate thickness varied from just 15mm in some of the smaller plates up to 50mm in one narrow plate, but with most plates being in the range of 20-30mm. The plates in this category were all simple slabs, probably all originally rectangular (although some showed evidence for subsequent cutting) and were probably all cast in open moulds.

1.b Wrought Iron (48 – 231)

Half-round (48-52)

Only five fragments of bar of probable half-round profile were noted; three were unstratified finds from area 6006 and may be related. They had measured diameters ranging from 20-27mm

Round (53-81)

Round bar fragments varied from 5-40mm in diameter, with a preponderance of material recorded in the 20-25mm range (i.e. material probable originally $\frac{3}{4}$ - 1 inch in diameter). Much of the material in the size range was recovered from the area around Pit 1, where there were also significant numbers of round sectioned chisel bars (see below).

Square (82-128)

Forty seven square-sectioned bars were found, with twenty nine of those from the area of Pit 1. As with the round sectioned bars described above, it seems likely that many of these pieces are either broken tools (chisel bars or gad bars), or pieces of raw bar for the manufacture of such tools. Some of these bars might also be associated with structural ironwork (such as tie-bars). Thirty-one bar fragments lie in the measured range of 14-20mm square (the size range including 20 out of the 25 square-sectioned chisel bars).

Flat (129-231)

Fragments of flat bar were abundant, with over one hundred recorded pieces. The profiles (see Figure 2) were mainly between 2:1 (width to thickness) and 4:1. There is a spread of measured dimensions, caused in part by corrosion, but a cluster of measurements occurs at approximately 24mm x 9mm, suggesting that a 1" by $\frac{3}{8}$ " was a common stock material. Clusters also occur at 30mm x 9mm and 35mm x 10mm, suggesting that widths of 1 $\frac{3}{16}$ " and 1 $\frac{3}{8}$ " may also have been stock items. For bars of greater than 55mm width thicknesses seem to have been either close to 10mm or close to 20mm; similar dimensions have been observed on the component bars used in dram construction.

2. Fastenings

This category embraces a wide range of fasteners (nails, bolts etc.) isolated from any items to which they may have been originally attached.

2.a Threaded bolts and related items (232 – 448)

Carriage bolts (232-254)

Carriage bolts were typically 80mm – 120mm in overall length, with shafts of 8mm to 18mm diameter and heads of 25-32mm diameter. One large bolt was 190mm long with a 30mm diameter shaft. One group of bolts from c6010/6011 were associated with 30-35mm square nuts. These examples were probably associated with railway track.

Square-headed carriage bolts (255-264)

These bolts have similar form to those in the category above, but with square heads. One group of three similar bolts 115mm in length occurred with the round-headed varieties in c6010 (and are also likely to be from railway track). The examples from other contexts were more variable, with lengths of between 75mm and 175mm.

Other round-headed bolts (265-283)

Round headed bolts without evidence for a square sectioned length below the head were almost all from contexts c6010 and c6011. As with the categories above, there was a strong group of bolts with an overall length of 100mm-115mm (probably associated with railway track) and a variety of other sizes from 90mm to 215mm in length. One example with an

overall length of 430mm, a very small round head and a shaft of 10mm diameter, may be more closely related to the transverse-headed bolts described below.

Transverse-headed bolts (284-308; Figure 2a)

These bolts are long (up to 720mm), with a square sectioned shaft, mostly 15mm square, with a relatively short rounded and threaded distal section (typically approximately 50mm long) and a transverse head 25mm to 35mm wide of triangular longitudinal profile.

Square-headed bolts (309-366)

A wide variety of simple square-headed bolts was recovered from many sites in the project. They ranged from 65mm to 290mm in length, with outliers of long square headed bolts with lengths of 480 and 640mm

Hexagonal-headed bolts (367-372)

Just five hexagonal headed bolts were recovered, three of which came from the same area (c6011) as yielded a large number of round- and square- headed bolts probably associated with the railway track. These bolts were of similar overall dimensions to the other varieties from the same context. The head sizes were very variable, from 18-41mm across flats.

Loop-headed bolt (373)

A single example was recovered of a bolt with a head forged into a square loop of internal dimension 25mm.

Wood bolt (374)

This was a single example of a very coarsely-threaded (pitch of c. 6mm) bolt (or carriage screw), 175mm long and with a shaft 17mm in diameter, similar to a modern wood bolt.

Bolt fragments (375-398)

These 24 bolt fragments were not referable to any of the above classes with certainty.

Square nuts (399-411)

A variety of loose nuts were recovered ranging from examples 30mm square with 14mm diameter holes, through examples 45mm square with 25mm holes, up to examples 90 and 98mm square, 50mm thick, with 40mm diameter holes.

Hexagonal nuts (412-415)

Only four hexagonal nuts were recovered. They measured 36, 37, 40 and 44mm across flats. The smaller nuts had 20mm, the larger ones 30mm holes.

Bracing nut (416)

A single example of a nut with an approximately 9mm thread, with a total width of 77mm. Each tip of the wings was flattened over an area of 8mm x 6mm apparently to brace the fastened material.

Washers (417-436)

Eighteen round and two rectangular large washers were present. The commonest sizes for the circular washers were 46mm outside diameter / 24mm inside diameter and 65mm outside diameter / 28mm inside diameter, although other sizes were also present.

Double-washers (437-443)

Five large, slightly waisted, double washers ranged from 195mm x 75mm with 22mm diameter holes, up to 280mm x 100mm with 35mm diameter holes. Most elongate example (Cat. No. 442) is 250mm x 45mm with 25mm holes. The sixth example (Cat. No. 443) is rectangular.

Securing bands (444-447)

Three examples of semicircular bands with out-turned, holed tips were recovered (two being possibly parts of the same original object). A small example approximately 120mm long, was held by two carriage bolts, one with a hexagonal nut, the other with a square nut and round washer. A larger, probably broken, example was originally over 600mm across and formed from 50mm x 16mm bar.

Two further examples were less convex, both 270mm long, formed from 90x15mm and 80x9mm bar, and rising 40mm and 47mm off the plane of the base respectively.

2.b Nails (449 – 656)

Zinc clout nails (449-466)

Eighteen zinc nails were recovered, mainly from the settlement area. They varied in size from 35mm to 60mm in length, with thin heads up to 12mm in diameter. The nails are square in section, with slight facets visible on opposing sides below the head, and narrow to a point.

Horseshoe nails (467-468)

Two iron nails with a shape suggestive of horseshoe nails were found, both from the Settlement area.

Triangular wedge nails (469-477; Figure 2b)

These nails vary from 80mm to 120mm in length, 22mm to 30mm wide at the head (where they are up to 10mm in thickness) and 4mm to 7mm wide at the point. The purpose of these nails is unknown, although one possibility is that they were used to fasten plateway rails into wooden pegs.

Rectangular/square sectioned nails (478-534)

60mm to 140mm long rectangular sectioned nails were widely recorded. Poor preservation hindered detailed observation, but these are almost all apparently cut nails. One very large nail (Cat. No. 531; 150mm long and 8mm square shank with a 16mm square faceted head) may possibly have been hand-made.

Round-sectioned nails (535-547)

Thirteen nails were identifiable as being round-sectioned wire nails. As well the morphology, these nails differed from other ferrous nails in apparently being formed of steel rather than wrought iron. Sizes varied from about 35mm in length (1.5 inches) and a diameter of 6mm, up to a length of 125mm (5 inches) with a 7mm diameter.

Nail fragments (548-648)

The majority of nails retrieved from the project were too poorly preserved for detailed description. The fragments include the one possible hobnail (Cat. No. 608).

Joiners dogs and staples (649-656)

Two large joiners dogs were both forged from 15mm square bar. The larger (Cat. No. 650) was 265mm wide, with 40 mm spikes. The tips of the spikes were forged into chisel ends perpendicular to each other. The second dog was 170mm wide and 170mm deep (Cat. No. 649). Lighter dogs were formed from round bar: an 8mm bar was forged into a dog 430mm wide by 70mm tall (Cat. No. 650), a 10mm bar formed a dog over 410mm wide and 55mm tall (Cat. No. 653) and a second example in 10mm bar was also over 300mm wide (Cat. No. 654).

Narrower staples included examples at 50mm wide and 120mm tall, formed from 10mm square section bar

(Cat. No. 651) and one at 100mm wide and 160mm long, formed from 10mm round bar (Cat. No. 655).

Also included here is a staple-like object forged from flat bar. The 'points' of the staple have been forged down to round section and threaded at their ends. In conjunction with a double washer, or holed bar, this would form a binding or mounting point (Cat. No. 656).

2.c Spikes (657 – 718)

This category includes several types of large nail-like objects, probably mostly hand-forged. The round- and square-headed spikes may have been employed in the fastening of plateway rail to wooden pegs in stone sleepers, or the fastening of chairs to wooden sleepers, but the same artefacts could have been used for a variety of constructional roles. The fold-headed spikes could have been employed in similar ways, but somewhat similar spikes have also been used to attach flat-based edge rail directly to wooden sleepers.

Disc-headed spikes (657-661; Figure 2 c,d)

These spikes are formed either of square bar (11mm and 14mm in Cat. No. 657 and 661) or tapering rectangular bar (up to 18mm wide and 10mm thick). The heads have been forged down into thin discs, 25mm to 40mm in diameter, with a central hole 4-6mm in diameter. In some instances there is a suggestion of plating on this spikes, which suggests that the securing of plated sheets to timber frames might be one possible use of such spikes.

Round-headed, chisel-tipped spikes (662-684; Figure 2d)

These spikes are 120-140mm in length, with a large domed head 30-35mm in diameter and 8-12mm high, and a shank 12-16mm in diameter, narrowing to a chisel-like tip. Such spikes might have a variety of uses, but the similarity with some reconstructions of spikes used on early plateways is noteworthy, for instance that of 'Homfray's Old Dram Roads' (Van Laun & Bick 2000, Figure 2). These spikes were mainly found in the Brickworks/Tramway and Settlement areas.

Fold-headed spikes (685-693; Figure 2e)

This group of spikes all had a short section bent through right angles at the top. They varied in scale from the smallest at 90mm long, forged from 10mm square bar, to one 320mm long, forged from 20mm square bar.

Square-headed, chisel-tipped spikes (694-699; Figure 2f)

These spikes were also a very heterogeneous group, with examples with both round and square shanks and a variation in length from 115mm to 250mm.

Other spikes (700-718)

This group includes a variety of spikes not included in the above categories.

Cat. No. 700 is a poorly preserved spike formed from a 16mm diameter round bar, preserved passing through a hole in 175mm x 25mm x 7mm flat bar.

Cat. Nos 701 & 702 share the property of having a second short branch extending from the head of the spike for a short distance. The spikes are formed from a 255mm long, 20mm square section bar and a 520mm long 16mm round bar respectively. In each case the downturned branch is 80mm long.

Cat. Nos 703 to 713 are a variety of pointed or chisel-tipped spike fragments. They show no surviving head, so may be fragments of the spike varieties described above or may possibly be tool fragments.

Cat. Nos 714 & 715 both show somewhat burred heads, neither with a preserved point.

Cat. No. 716 is a tapering round rod, with a 10mm maximum section. This may be a form of spike, or just possibly might be a fork tine.

Cat. No. 717 is a highly corroded bolt or spike with a round, domed head.

Cat. No. 718 is a sturdy spike 160mm in length, with a shaft of 30mm diameter and a large head 55mm in diameter.

2.d Cotter bolts (719 – 728)

(note: small cotters have been described below under 'Transport'; large cotters under 'Structural ironwork'.)

Cotter bolts (719-722; Figure 2g)

These cotter bolts are between 115 and 150mm in length. They are all dissimilar. One (Cat. No. 719) has a 30mm diameter shaft and a 46mm diameter head, one (Cat. No. 720) a 35mm x 18mm rectangular shaft with a 50mm x 30mm faceted head, one (Cat. No. 721) a 30mm x 22mm rectangular shaft with a 45mm diameter head and the last (Cat. No. 722) a 20mm diameter shaft and 34mm diameter head. The slots for the cotters were only measurable in two of the examples and were 12mm x 5mm (Cat. No. 721) and 21mm x 6mm (Cat. No. 722).

Threaded cotter bars (723-726; Figure 2h)

These four objects are bars, with one end of square section and with a slot for a cotter, the other end is of round section and threaded. Two of the bars (Cat. No. 723-4) are similar, with an overall length of 410mm, 30mm across, with the square section 275mm long and the threaded section of the round end 105mm long. Somewhat similarly sized cotter bars formed the stub axles for early wooden drams, with the cotter acting to secure the axle into the wooden frame, but there is no evidence for those axles being threaded on their outer ends.

The other two examples are poorly preserved but smaller. One (Cat. No. 727) has a wedge-like cotter still in place.

Axle-like Cotter bars (727-8)

The first of these (Cat. No. 727) is somewhat similar to the bars above but has ring 65mm in diameter and 10mm thick separating the ends of round and square section. The square sectioned end is 25mm across, 110mm long and has a cotter slot 30mm long. The round end is 390mm long and 35mm diameter.

The second (Cat. No. 728) is a round bar, 410mm long and 40mm in diameter, with 120mm threaded and cotter slot 60mm x 8mm 35mm from the end.

In neither case is it entirely certain that the object is complete. These two objects share features in common with the axles of the drams recovered from the site, but differ in significant aspects.

3. Transport

Many of the metal finds from the project are associated with transport. These include the major plateway and railway components listed in this section, but also many of the bolts and spikes listed in the *Fastenings* section above as well as the various items in the *Equestrian* section and many of the items listed in the *Chains and Hooks* section.

3.a Plateway drams (729–740, 1514–1521)

Twenty drams, either essentially complete or surviving in large part, have been recovered from the underground workings. Eighteen of the twenty are entirely constructed of iron (Types 2- 7) whereas two (Type 1) had wooden bodies.

All of the drams have suffered some degree of deformation and some are badly disintegrated. Reconstruction of the gauge of the drams is therefore somewhat tentative, but the two wooden drams (Cat. Nos 729-730; Type 1) appear to be of narrower gauge (approximately 720mm, 28.3 inches, between the inner faces of wheels) than the eighteen iron drams (with a gauge of approximately 835mm, between the inner faces of the wheels). Although wooden drams were an important component of the stock from the 1790s through to the 1870s, these particular drams have both this narrow gauge and a type of wheel (Type (a); see below) considered typologically early. These are therefore interpreted as the earliest of the drams present in the assemblage. The typologically earliest iron drams showed basal frames that were approximately 750mm wide, incompatible with the earlier narrower gauge.

The key features of the morphology of the iron drams include:

- the wheels
- the bush type (types i-iv described below)
- a flared or straight-sided section
- a frame with either 3 or 4 lateral ribs/strapping
- the nature of the side bars/plates
- the overall length (typically around 1.4m or 1.6m)
- the type of basal longitudinal member (sill)
- the use of iron rail for the top bar of the dram

While no two drams are exactly the same, they have been divided here into eight types (Types 1-8; **note: these types have been revised since the first draft of this report in 2014**). Reconstructions of the drams are presented in Figure 2 and explanations of the construction of the three main types in Figure 3.

Structural members of the dram frames comprise three types of materials: simple rolled bar (with modifications in the case of the sills of Type 2 drams), angle iron of 85-95mm o/d (the material forming the sills of drams from Type 3 onwards, and as the upright frame components in Type 5 drams), and a rolled iron 'rail' a form of angle iron with one leg 80mm (o/d), the other 30mm (o/d) and 10mm thick (sometimes with the short leg of rounded profile). Some of the later drams appear to employ a slightly heavier version of this rail, with one leg 85mm and 9mm thick, the other 25mm long and 20mm thick. Some versions of the 'rail' show a slightly rounded profile to the short leg. The angle iron employed in the sills was referred to by Overton (1825) as 'gunnel' iron. The contemporary name for the asymmetric 'rail' is not known.

The dram wheels are typically 480-500mm in diameter, although some are as small as 455mm diameter, probably because of wear to the rim. The wheels are all variants of design with six straight spokes, a narrow (20mm wide or less) running rim and an axle tube of 105 to 120mm length and 70-95mm external diameter. In different forms there may be 12-25mm of axle tube protruding inwards from the inner face of the wheel. Wheels occur in both matched and unmatched sets on the drams, indicating the forms were interchangeable, and replaced with new or recycled wheels as wear or breakage demanded. The wheels were all designed to rotate on the axles, and were secured solely by a cotter pin in the end of the axle. The axles might have had a degree of movement, but there was facility for lubrication of the bushes.

The wheels show an evolution from forms with a thin planar wheel, with narrow low ribs, oval perforations and a cylindrical axle tube extending 75mm outside the ribs, to forms in which the wheel is biconvex in section, with a curved inner face, and outer ribs rising to the tip of the axle tube, enable the plane of the wheel rim to be closer to mid-length of the axle tube. Four broad types of wheel are present on the intact dram remains:

Type (a): The wheel has narrow angular ribs of almost constant profile, which stand above wide flat webs with oval holes. There is clear rounded rim that is much thicker than the web. The axle tube is only slightly tapering and forms a marked cylinder. Approximately 70-80mm of the axle tube rises above the ribs and 25mm protrudes from the inner face of the wheel. The inner face of the wheel is otherwise almost planar, so that the wheel is approximately parallel-side in section, with the gentle thickening of the ribs towards the axle reaching a maximum of 45mm thick, with the axle tube having a total length of 150mm. Type (a) wheels were observed fitted to drams types 1, 2 and 3.

Type (b): The spokes widen and rise inwards towards the axle tube to 30-50% of distance from the web to the end of the tube, leaving 45-60mm of the axle tube proud of the ribs. The web is perforated by tear-drop shaped holes. These wheels were observed on drams of types 2, 4, 5, and 6. There are three variants of this type:

(b1) has a wide 'rim', thinner web, teardrop-shaped holes almost abutting the rim, almost as planar as Type (a).

(b2) has a narrow rim (approximately 20mm), thinner web, teardrop-shaped holes with a clear space between hole and rim, gently rising ribs. Total length of axle tube 130mm, with 60mm above ribs and 17mm inside inner face of flange.

(b3): has no differentiation between web and rim, oval- to teardrop-shaped holes, broad rounded ribs

Type (c): The spokes widen and rise markedly inwards to the axle tube, extending almost to its tip, making the wheel flange 110mm thick close to the axle tube. The axle tube is 90mm in diameter at the outside face and also extends 15-20mm inwards of the inner face of the wheel (so is 125-130mm in total length). The web is 22mm thick, and perforated by slightly tear-drop shaped holes, through the deeply-set web. In section the inner face of the wheel is strongly convex, mirroring the rising spokes, so that the rim is 25mm outside the line of the join between rear face and axle tube..

Type (c) wheels were observed on drams of Types 6, 7 and 8, with complete sets only on drams of Type 7.

Type (d): There is no web and thick rounded spokes are separated by triangular spaces 110mm wide and long. The rim is 40mm wide and slightly narrower than the main disc, with the spokes descending to the rim 30mm outside the perforations. The external face rises modestly up the axle tube (30%?), leaving 45mm of the 120mm long axle tube above the external face of the wheel (with 15mm inside the inner face of the wheel flange). Type (d) is less closely-linked to the evolutionary nature of the other varieties. Type (d) occurred on drams of Types 4, 5 and 6. A complete set was only found on a Type 6 dram

Types (a) to (c) appear to form a potential developmental series. Type (d) is distinct in design.

Detailed measurements of all the wheels has not been undertaken because of the concretion attached to many, but it appears likely that not all members of each type are precisely identical, notwithstanding the variable degree of wear present on the various examples.

It is clear that dram wheels were often replaced by examples of different types. Three of the fourteen drams still possessing four wheels showed sets of wheels containing different types. However, despite this evidence for replacement, a typological series has been developed (Table 1), in which the simpler, lighter weight, wheels were preferentially present on the drams interpreted as earlier in the series, and which were constructed using the typologically earlier bushes (see below).

The axles of the drams show some evolution, becoming thicker through the series. The central parts of the axles on some drams from early in the sequence (Types 1-4) are square in section, whereas later ones are round. For the axles employed on drams with a cylindrical bush, there is a raised ring on the axle in-board of the bush. For the bushes with axle boxes (Type (vi) bushes), the corresponding axles have raised rings out-board of the bush.

The axles are attached to the body of the drams by cast iron bushes, of which six basic designs are identified (Types i-vi). Types (i) to (iv) are bushes designed for locations where there was no rising strapping (i.e. on the three-rib drams: Types 1 (presumably), 2, 3, 4 and 5). Types (v) and (vi) are designed to overlie the inner strapping on four-rib drams (Types 6, 7 and 8). All types of bush carry the axle in a tube, except for Type (v), which has an open box, with closing pin:

Type (i): the axle bush proper flares upwards to provide a moderately long supporting inner surface for the basal timber of the dram frame, while the outer part of the bush is continued upwards in a semicircular plate with central upper extension, bearing three square holes for horizontal bolts to attach the bush to the frame (i.e. of somewhat similar form to a Type (iii) bush). The bush itself is approximately 85mm thick, the side plate 20mm thick, and the whole casting approximately 250mm tall. Type (i) bushes occur on wooden Type 1 drams.

Type (ii): these bushes have no supporting surface for the sill (which in Type 2 drams is a simple bar); instead a 20mm thick vertical plate arises from the centre of the 50mm long axle tube and swells into a sub-rectangular section, 85mm high and 200mm wide, which bears two 25mm square holes for riveting to the basal bar of the frame. The bush is attached to the inside

of the basal bar. Type (ii) bushes were employed on Type 2 drams.

Type (iii): these bushes are similar to Type (i), but have longer upward extension of the external mounting plate, carrying the third hole higher to take a rivet through the lower of the side bars.

Type (iii) bushes are found on Type 3 and Type 4 drams, which have angle iron sills. Measured examples were 300mm tall, 200mm wide and with three 17mm square holes. The axle tube was 60mm long. The axis of the axle tube lies at approximately 100mm below the base of the sill, when the bush is attached.

Type (iv): these bushes are found on the only example of a Type 5 dram. They are simple bushes riveted horizontally to the angle iron sill. The nature of any vertical attachment is unknown. They have a small rectangular side plates (to carry the horizontal rivets) 190mm wide and apparently rather light-weight tubular bushes below.

Type (v): these bushes are stepped to allow placement over the wrought iron strapping as it passes around the angle iron sill. They have rectangular side and base plates, each of which has two holes to carry the vertical and horizontal rivets through the longitudinal angle iron member of the frame. The mounting is 260mm wide, 100mm deep and 90mm tall, with the bush proper descending a maximum of 90mm below. The axle is with its axis only approximately 50mm below the base of the sill. Type (v) bushes occur on Type 6 drams.

Type (vi): Type (vi) bushes are essentially identical to Type (v) bushes, except that the axle passes through an axle-box formed by two vertical plates 140-165mm long and 110mm wide (o/d), instead of a cylindrical bore. The upper mount is similar to Type (v), but may include six rivet holes, so that the bush and strap are riveted together to the sill, rather than the bush simply overlying the riveted join of sill and strap. It is 260-280mm wide, and 115-135mm tall (o/d). The base of the box is closed by a 20mm diameter pin passing through holes in each vertical plate. The tips of the plate are angled at 45 degrees, forming an irregular half-octagonal termination. The pin is bent to secure it in place, typically with a leg of 90mm length on one side and much less on the other. Type (vi) bushes are found on Types 7 and 8 drams.

Drams with a gauge of approximately 720mm measured between the inner wheel faces (729-730)

Dram Type 1 (729, 730)

The Type 1 drams were of wooden construction, but unfortunately only the axles, wheels and bushes are preserved, together with a small quantity of the wood to which the bush was bolted. For dram 729 just one axle (with its wheels) was recovered, whereas from dram 730 both axles were retrieved.

The surviving wheels are all of the slender Type (a) (see below). The axles have a central 45mm square bar, divided by a 20mm wide collar from each of the outer round-section parts. On dram 729 the wheels have one washer inside and one washer outside; for dram 730, one axle shows two external washers and the other none. The wheels are secured by cotters passing through the axle. The cotters are formed from short lengths of iron strip of 160-240mm in length, folded double, to form a split-pin like fastening.

The bushes are of Type (i), but mostly poorly-preserved. The gap between plate and nut on the bolts is approximately appropriate for the 2-inch thick lower elm board described by Overton (1825).

The upper parts of these drams are unknown. It is assumed they comprised timber boards secured by iron straps.

Drams with a gauge of approximately 820mm measured between the inner wheel faces (732-740)

Dram Type 2 (732, 733)

Type 2 is represented by two examples (Cat. Nos 732, 733). Dram 732 is largely complete, although badly compressed longitudinally. Dram 733 is deformed and broken apart, although most of the components (with the exception of one wheel) are present.

The drams are 1.4m in overall length (5' 6") long, with a 0.60m, 2', wheelbase.

The characteristic features of Type 2 drams are a bar-iron side member (sill) of 75mm x 13mm section, which has a vertical rising sections (95mm tall and 50-65mm wide) just inside each end, to secure the two end lateral straps, and simple cast iron axle bushes (Type (ii) bushes), which are secured to the inside of the sills.

The base of the dram is 760mm wide (outside dimension). The sides of the dram show a flaring above the level of the wheels, with three longitudinal bars, all of simple rectangular section (typically 50x10mm for the lower bars and 60x10mm for the top one). The drams appear to be 920mm wide (outside dimension) at top of the upper bar (but might have been spread by compression during burial).

The base of the tram comprises simple longitudinal bars (50x10mm section, 1350mm long) positioned midway between the spine and the sill on either side. These are riveted to the transverse end members of the frame, but not to the central rib..

Dram 732 shows no end bars and dram 733 shows just an upper end bar, again of simple rectangular sectioned bar iron. The spine is rather slight, 1520mm long, with narrow coupling rings, and is not riveted to the central transverse strapping. It extends only a little beyond the protruding ends of the sills.

The wheels of Type 2 drams are mainly of Type (b1), but dram 733 had one wheel of Type (a). The axles show a central section of 45mm square section, 550-580mm long, then 22mm thick, 75mm o/d rings, before the circular-sectioned ends 245mm long.

Dram Type 3 (1515)

The single Type 3 dram (Cat. No. 1515) is moderately well-preserved and is very similar to the Type 4 drams described below. It differs in possessing a simple rectangular-sectioned bar as the top bar of the sides (rather than iron rail) and in having the upper end of the dram closed by a moveable round iron bar.

The end of the dram was closed by an upper hooked 35mm diameter round bar, fastened after passing through a hole in the end of the side bar, by a pin in a terminal loop. The hook was 125mm long. The bars were fastened at the right side (in plan) of each end.

The lower part of the ends was closed by a rectangular bar

The dram possessed a longitudinal side member (sill) to the frame of angle iron (as did subsequent varieties), with an approximately 90mm x 90mm section. The dram was 1560mm in length, with a 565mm wheelbase and was 700mm wide at the base (O/D). The floor sheet was 480mm wide.

The sides have a 40mm gap above the angle iron, below a 50-55mm wide and 8mm thick lower bar of rectangular section, with its top 35mm before the outward flexure, then 35mm to the middle side bar (50mm x 8mm), with a further 60mm gap to the top bar (50mm x 8mm).

The three lateral strapping/ribs were 65x12mm in section.

The bushes were of Type (iii) and carried three 17mm square holes. The axles were round centrally, 50mm in diameter, with 20mm wide collars, 517mm apart, and extending 280mm beyond each collar. The bearings were 50mm thick. Two wheels survived, both of Type (a).

Dram Type 4 (731, 734-736, 1518)

These drams are slightly larger than the Type 3 dram, at 1.65m overall length (6' 6"), but of rather similar construction. The base of the body is approximately 685mm wide (o/d).

There are three well-preserved examples of this type (Cat Nos 1518, 734 and 736; the latter accessioned as NMW j/6d) and a two fragmentary examples (Cat. No. 731 and 735).

The characteristic features of Type 4 drams are a cast iron Type (iii) bush attached via two rivets to the angle iron sill and by a third rivet through an elongate vertical extension, to the first horizontal side-bar (thus showing some similarity with Type 1 drams as well as Type 3).

The strapping comprises three transverse bands, of 75mm x 10mm section, passing from top to base, under the floor and passing back up the opposing side.

The top bars on both sides and ends are formed of iron 'rail' with a narrow 'L'-shaped section, 80mm tall, 10mm thick and with a 30mm wide out-turned flange. The expanded flange on the gunnel iron faces the outside of the dram on both sides and ends (on the three examples with the top bar preserved). The body has a flared profile, with an out-turn at approximately mid-height. The width at the top was 935mm, with the body 455mm high (o/d).

One major difference with Type 6 drams in the body is the presence of two lower side bars of equal widths (65mm x 10mm profile), one just above and one just below the flexure of the vertical bars, instead of the wide plate present on the Type 6, 7 and 8 drams. This is similar to the side bars of Types 2 and 3 drams, but those typically have lighter weight (50mm wide) bars.

The spine has a section of 80mm x 17mm, broadening at the coupling, so is slightly stouter than those of Type 3 drams. Where sufficient detail is visible, the spine is usually only riveted to the transverse end members and not in the centre (but is riveted centrally in Dram 731). The spine typically overlies the 480-490mm wide sheet iron floor. In one instance (Dram 1518) the floor overlies the spine, possibly indicating a replacement

floor. The spine has an overall length of 1720mm. It is formed of 75x13mm bar, which flares markedly around the 55mm i/d coupling holes.

An example in the National Museum collections (Cat. No. 736; NMW j/6d) shows extensive evidence for repair, with two of the main body straps having been strengthened by an additional bar up to the level of the second side rivet. In the case of the central strap, this has been undertaken with a length of angled bar as used for the top rail. The alterations to the strapping have meant that the lower end bars have also been replaced, with narrower bars that are attached by folding around the end strapping, rather than by riveting.

The wheels of the Type 4 drams are of Type (b2), with one exception; one wheel on Dram cat. No. 1518 was of Type (d). The axle is 50mm in diameter.

Dram Type 5 (740)

A dram of fundamentally different design to all the other trams was designated Type 5 (Cat. No. 740). It is 1.65m long. It possesses angle-iron sills to the frame (as in Types 2, 4 and 5). Three lateral vertical supports are present, with the corner supports being of angle iron, the central of 80x10mm bar, carrying sides and ends of thin (c. 4mm?) sheet iron. Unlike the other drams, the lateral supports are not part of a continuous strapping, but are secured by cotters to the basal frame. The sides have a simple base to top expanding profile rather than the flare of the other varieties. The details of the base are unknown, because the sole example is still full of coal.

The body is 660mm wide at the base, 800mm wide at the top, with the top poorly preserved but approximately 960mm above ground level.

The axle bushes are rather simple, somewhat similar to those of Type 2 drams, but small – and designated as Type (v). They have a simple rectangular side plate with two mounting holes. The wheels are a mixture of Types (b) and (d).

Dram Type 6 (737, 739, 1514, 1517, 1520)

There are five examples of Type 6 drams, all complete, or almost so, but several still contain their cargo and so are not possible to observe any of their internal features. Type 6 drams are of similar overall size to the Type 4 drams, but have a frame constructed with 4 transverse ribs/strapping.

The presence of four ribs required the use of a different type of bush, the Type (v), which is attached over the strapping.

The body has a flared profile, with an out-turn at approximately mid-height. It is 660mm wide at the base and 970mm wide at the top (all o/d).

The sides of the drams have a 150mm wide sheet placed symmetrically over the angle of the out-turn, in place of the lower two bars of the earlier dram types. The upper bar is formed by outward-facing iron rail attached to the inner faces of the ribs in three cases (737, 1514, 1520), but of inward-facing gunnel iron attached to the outside of the ribs in one (1517) as in most of the Type 7 drams.

The dram ends are closed by a lower plain bar (typically attached to the lower of the two rivets holding the side sheet), and an upper arching bar of iron 'rail',

wrapped around the outside of the ends of the 'rail' on the dram sides. In one instance, the lower end is apparently closed by a further 150mm sheet (dram 1514; which also employed 150mm sheet for the floor).

The nature of the floor is uncertain, because of the fill in most of the drams. In one clear example (dram 1514), the floor appears to be formed of three separate 150mm wide sheets, rather than one single sheet, each riveted to the end transverse members. Other examples appear to show a single floor sheet.

The wheels observed on the Type 6 drams were a mixture of types (b2), (b3), (c) and (d) – with 4, 4, 7 and 3 respectively (detailed observation could not be made of two of the wheels). The only complete set of similar wheels were the four type (d) wheels on dram 1514.

The axles on the Type 6 drams were not able to be closely observed in most cases, but on dram 1514 the axle was 52mm in diameter with no collars.

Dram Type 7 (738, 1519, 1521)

Type 7 drams have an overall length of 1.65m (6' 6").

This type is represented by three largely complete, but damaged, examples (Cat. No. 738, 1519, 1521) This type is characterised by having four transverse strapping bands, with a Type (vi) axle bush lying over the intersection of the strapping and the angle-iron side member.

The strapping comprises four bands of 75-80x10-15mm bar iron, passing from top to base, under the floor and passing back up the opposing side.

The top bars on both sides and ends are formed of iron rail, as on the Type 6 drams, but with the 'rail' on the sides attached to the outer sides of the ribs and facing inwards (the opposite orientation to that in most of the Type 6 drams).

The lower sides of the dram are closed by a 210mm wide sheet, closely abutting the top of the angle iron sill. The end of the body is closed by a 'rail' top bar and a lower simple bar attached via the lower of the two rivets for the wide side panel.

The sides of the dram are almost planar, with a gentle outwards slight curve with apparently little, if any, localised flexure.

The floor is formed by an iron sheet lying between the inner edges of the angle iron frames. The tram spine lies above this sheet and is riveted to all four cross-members. The sheet is also riveted to the cross members by two rivets either side of the spine. In one example (dram 1521) the spine was doubled at the coupling links (with both layers on top of the floor sheet), but the fill of the dram precluded further examination. It may be significant that the closely related Type 8 dram had strengthening to the ends of the spine

The preserved wheels of the Type 7 drams were all of Type (c). The axles were thick, being 55mm diameter, and possessed collars to lie outside the axle boxes, with 175mm of axle extending beyond the collar.

Dram Type 8 (1516)

The single Type 8 dram is of identical construction to the Type 7 drams, but is of much smaller size; the

dram has an overall length of 1.31m. The spine is 1500mm long and 85mm wide little widening around the eye. The outer 400mm of the spine (including the loops) are replicated in a lower strengthening of identical section riveted below the main section and floor.

The sides of the dram are lower than in Type 7 drams, with the 200mm side plate occupying the entire gap between the top of the angle iron and the base of the inward-facing iron 'rail' top bar. The ends are closed by an outward-facing iron 'rail' top bar and a plain lower bar.

The base of the dram was 690mm wide (o/d) and it was approximately 900mm wide at the top. The sides of the dram are almost planar, with a gentle outwards slight curve (although the extent of deformation is uncertain), with apparently little discrete flexure.

The dram possessed a single surviving Type (c) wheel. The axle was similar to that on the Type 7 dram, with a 15mm wide collar outside the axle box and 185mm of axle outside the collar.

3.b Plateway dram components (741 – 779)

Dram spines (741-746)

The only complete isolated dram spine (Cat. No. 741) was wrought iron with a forged circular-sectioned loop at both ends. The ends has raised areas inwards of the loops, suggesting that the loops were probably separate forgings welded to the straight bar. The spine is 1450mm long overall, 75mm wide and 10mm thick. The main bar has two holes and the raised welded pads each have a hole (one with a rivet still *in situ*); the four holes suggest that this bar came from a dram with four strapping bands (similar to dram types 6-8), but it has an overall length similar to that of the smaller Type 8 drams. The only intact Type 8 dram did not have identical forged loops, but showed strengthening of the spine through a replicated lower plate at each end.

A substantial fragment of a spine (Cat. No. 742) possesses only one surviving end, with an integral forged loop (rather than the separate component welded to the bar as in Cat. No. 741). Both the loop and the hole for rivet to attach the end strapping and very clean and crisp-edged, suggesting that, despite the damage to the other end, this spine may never have been used for its intended purpose. The surviving length is 1260mm long, with the main section 75mm x 10mm thick. The coupling ring is 45mm internal diameter, 90mm external diameter; the rivet hole is 25mm square, 150mm from tip of bar, suggesting that the minimum original length of the spine was greater than 1435mm. Between 450mm and 1180mm from tip there are 34 round indentations along the centre of the bar, up to 10mm diameter and deepest in the middle of the run. These are presumably a defect introduced during rolling. The lack of a rivet hole for a central transverse strap suggests that this may have been intended for a Type 6 or 7 dram.

The further substantial fragments of spines (Cat. Nos 743, 744) are rather slighter than the above example, with a section of just 60-62mm by 10mm. The length of spine/coupling loop protruding beyond the end strapping would have been substantially greater for spine 743 than for 742 (280mm compared to 150mm), longer than the equivalent distance observed on any of the more intact drams.

Two fragments (Cat. Nos 745, 746) comprise coupling loops fractured from the end of spines. Both of these are of similar dimensions to no. 743.

Other dram strapping (747-758)

A variety of wrought iron bars with rivet holes (Cat. Nos 747-758) are compatible with the strapping on drams as seen on the intact drams, although other uses would be possible for such strapping.

Dram cotters (759-764)

The cotters on the intact dram axles were formed from folded iron strips and six similar cotters were recorded in isolation (Cat. Nos 759-764). They range between 80mm and 140mm long when folded, formed from strip approximately 12-20mm by 3-5mm in section. The folded end is typically in the form of a loop of up to 15mm inside diameter.

Dram wheels (765-768)

Four wheels were present in the collection as isolated items, only one of which is similar to those present on the intact drams (Cat. No. 768). Two are of quite different form to those on the intact drams (Cat. No. 765 & 766) and one (Cat. No. 767) is an indeterminate fragment.

One small wheel (Cat. No. 765), 280mm diameter, has 6 tear-drop holes and central axle hole of 40mm diameter. The wheel has a simple lenticular profile to its body, 11mm on the edge and 27mm at centre, with no spokes. The axle tube is cylindrical and rises 60mm off the face of the wheel and has a 60mm outside diameter. The tube bears a possible notch in one side of its outer face, in radial alignment with a small raised boss on the outer part of the face of the wheel (possibly a small casting mark). The perforations are tear-drop shaped, 60mm x 30mm.

A small tram wheel fragment (Cat. No. 766), appears to be from the rim of a wheel of similar size to the wheels present on the drams (approximately 500mm diameter), but shows the end of narrow curving ('spiral') spoke. Such spokes have been associated with wheels from Dowlais and such wheels appear on the dram illustrated on the furnace top level at Dowlais in a watercolour by Childs (1840).

A possible wheel fragment (Cat. No. 767), featuring a smooth curved surface, 50mm x 30mm x 14mm, is probably a chip from a dram wheel rim.

A type (b) dram wheel (Cat. No. 768), 500mm diameter, with six tear-drop shaped holes, 20mm thick on the rim, with a cylindrical axle tube (90mm o/d, 60mm i/d) extending 90mm from wheel face, and with the spokes rising 30mm against face of cylinder, is present in the display material of the Education Centre.

Dram axles (769-770)

A dram axle (Cat. No. 769), 1080mm, end to ring 200mm, ring 15mm thick, 45mm diameter, ring o/d 80mm, centre section possibly 48mm diameter, slot 30mm x 12mm, 10mm from end (distance between rings larger than on preserved trams).

A possible axle fragment (Cat. No. 7709) was a square bar with collar then threaded, 190mm long, circular end is 55mm long and 25mm square section 100mm long, between is rounded and wide 35mm long and up to 40mm diameter

Dram washers (771-779)

This group of objects includes a series of wrought iron washers of similar size to those observed *in situ* on the

drams. They may not all necessarily be for that purpose.

They vary from 52 to 60mm internal diameter, 85 to 145mm external diameter and 8 to 17mm in thickness.

3.c Dram couplings (780 – 794)

The simplest dram coupling bar (Cat. No. 780) was a 19mm diameter bar with simple hooked ends, with an overall length of 340mm.

Three coupling bars (Cat. Nos 781-783) are 30mm diameter bars forged into slightly recurved, 'bull's horn' hooks, with an overall length of 380-400mm.

Two coupling bars are similar to the above items, but have an overall length of 530-540mm (Cat. Nos 784, 785).

Two bars are again similar, but with an overall length of 620mm (Cat Nos. 786, 787).

One bar has a similar shape, but is forged from 40mm diameter bar and has an overall length of 1080mm (Cat. No. 788).

There are six fragments of coupling bars (Cat. Nos 789-794) of which one is forged from a 40mm diameter bar and has 840mm surviving (Cat. No. 794).

3.d Plateway plates (795 – 837)

The collection includes a large numbers (43 items) of plateway plates. They form a very heterogeneous collection of plates of variable details. With a very few exceptions, there are no plates of precisely the same style in the collection. A few of the Outram-pattern plates must have been used spiked to stone sleeper blocks. The majority of the plates however were either specifically for use with iron sills or were dual purpose. These plates typically show a very slightly developed integral chair, with a barely marked basal pad in most cases and with an elongate raised lug at the inner end of the inside of chair and sometimes a smaller lug on the outside of the plate too. These plates would have been compatible with the light slightly dovetailed sills described below. The weighed examples of complete plates all are equivalent to a weight of about 38lbs/yard.

Lapped plateway plates (795)

A single, very poorly preserved, fragment of a cast iron plate (Cat. No. 795) apparently bears a semi-circular lapped end with central hole 20mm in diameter. The plate has a 70mm wide flat upper face and a flange 60mm high from the base of the rail. Despite only being a small fragment (220mm long), this plate is significant for its similarity to descriptions of 'Homfray's Old Dramroad' (e.g. Van Laun and Bick 2000, Figure 2). However, another interpretation is also possible, for Van Laun recovered fragments of similar plates (e.g. Van Laun 1999, Figure 88) from early plateways to the Twynau Gwynion quarries and suggested that these were from Robert Thompson's Dowlais limestone road laid in c. 1792 (Van Laun 1999 p. 280-281 quoting GRO Dowlais Letter Book, 27 July 1792). This piece may possibly be a fragment, therefore, from a 1790s plateway, from the period before the changes to the Dowlais plateway system introduced by George Overton.

Outram-type plateway plates (796-7)

The collections included two Outram type plates (Cat. Nos. 796-797). The first is a complete plate 900mm (3 feet) long, 75mm tall, 25mm thick on outer edge (with no outer lip), the upper surface of the plate has 60mm flat on the outside, then a groove 20mm wide and 8mm deep. The flange has a slight, approximately 5mm wide, outer ledge 45mm below its top, and 10mm above the groove. The lugs form almost semi-circular extension from the pad (sill) extending out 40mm. The mounting hole is 50mm from low edge and 20mm diameter. There is a slight bar on the underside, 30mm wide, 6mm high, along the outer edge. The plate weighs 17kg (38lb).

The second example is a substantial fragment, 740mm long. The plate is typically 110mm wide, expanding to 140mm because of the semi-circular lug on inner side. The pad (sill) is 75mm long. There is a reinforcing bar along low outer edge, 30mm wide. The plate is 22mm thick on the outer edge, with a slightly dished top, planar for 60mm then curving into a groove 18mm wide and 10mm deep. The flange is 75mm tall, with a slight step 40mm from top of flange on the outer side.

Early examples of Outram plates in the Merthyr Tydfil area described by Van Laun (1999) are not grooved. Outram plates continued to be used even after Overton (amongst others) promoted the use of iron sills in the first decade of the 19th century. Plateways typically employed Outram-style plating around turn-outs and other more complex parts of the road, even if iron sills were employed on the simple runs. A parallel, if not an exact one, can be found for these two plates in the material from the Brinore Tramroad (constructed by George Overton in c. 1813, later than his work for the Dowlais Company), from which Van Laun (1999, Figure 80) illustrated Outram plates with an external bar and also described dual-purpose plates with grooves.

Plain dual-purpose plateway plates (798-802)

Only one of the non-Outram style plates was certainly an approximately 3 feet plate (measuring 920mm in length; all other complete examples are longer, most being 4 feet /1200mm). This complete dual-purpose plate (Cat. No. 798) was 920mm long, 110mm wide in the centre, 120mm at ends, sill base 80mm long, one end has surviving nail in a 17mm diameter hole 50mm in from low side (which has no lip). The basal pad of the sill extends wedge-like up flange; there is no separate lug. The base of the plate shows slight transverse markings at 300mm intervals. The plate weighs 18kg (38lbs). A second fragment (Cat. No. 799) is badly damaged at both ends, but shows similar transverse marks at 300mm intervals on the base of the casting.

A third dual-purpose plain plate (Cat. No. 800) was complete, 1200mm long and 100mm wide (110 mm wide at the integral chair). The flange was 80mm tall. The terminal half-hole was 45mm from the outer edge and 20mm in diameter. The lugs were situated 40-70mm from the end on the outer margin and protruded an extra 5mm beyond the plate margin. There was no basal pad to the chair, nor any longitudinal bar.

Another complete plate (Cat. No. 801) 1200mm long, 105mm wide and 110mm at ends is very similar to plate 800, but has a slightly raised outer lip. The maximum flange height is 80mm from the base (55mm internally); the outer lip rises to 30mm off the base (15mm internally). There is no pad to the integral chair. The mounting half-hole is 17mm in diameter and lies 50mm from the outer edge. A lug protrudes up to

15mm on the outer face, between 45 and 60mm from the end of the plate. At one end another protrusion, just slightly inwards of the lug, is probably a casting relic. The plate weighs 22.5kg (49lbs).

An uncrenulated plate fragment (Cat. No. 802) is 330mm long and 110mm wide. The integral chair has a basal pad 140mm wide at end including lug on high side, 80mm long, with a spike-hole 50mm from the outer side is 20mm diameter. The plate is 23mm thick in middle, has no lip, but does have a slight groove. The plate fragment is infilled with concretion.

Crenulated dual-purpose plateway plates (803-806)

Four dual-purpose crenulated plates are present in the assemblage: two complete plates 1200mm (4 feet) long and two fragments.

One complete plate (Cat. No 803), 1200mm long, 110mm wide, had integral chairs 115mm wide and 70mm long. The flange had a maximum height of 75mm. The plate was slightly channelled with an external lip up to 30mm above the base. The running surface was 70mm wide. The mounting holes at the ends were 16mm in diameter and 55mm from the outer edge. The pads forming the bases of the chairs were low, but distinct, and the base of the plate was flat.

A second similarly-sized complete plate (Cat. No. 804; NMW e8954/5), has a crenulated flange with a wavelength of about 77mm. The running surface of the plate is angle down from a distinct out lip, towards the base of the flange. The pads below the integral chairs are only very slightly developed and the base is otherwise flat. The chairs project outwards from the line of the outer edge of the plate by 5mm. There are small lugs on the inner face of the plate spanning the inner edge of the chair, 79-90mm from the end of the plate. The terminal half-holes are 15mm in diameter.

A fragment of plate (Cat. No. 805) 330mm long is broadly similar to the two examples above, with a shallow 'channel' profile, but differs in having lugs on both faces: on the inner side the lug lies between 105 and 70mm from the end of the plate and protrudes 15 and on the outer face a lug lies between 90 and 40mm from the end, again protruding 15mm.

A fragment from end of a plateway plate (Cat No. 806) is 280mm long with a width of 105mm, thickening to 115mm at the chair. It differs markedly from the three examples above which are shallow channels, by having no outer lip. The outer 50mm of the upper surface is flat, but the inner part is a 25mm wide groove. The flange is up to 70mm high and has a slight ledge, 40mm below its top. The inner face of the plate bears lugs inwards of the chair, but these are not well seen because of the concretion. The terminal half-hole is 20mm in diameter and 45mm from the outer edge.

Plain plateway plates for use with an iron sill (807-814)

The plates intended solely for use with sills lack the half-holes for spiking in their ends.

One group of four plates (Cat. Nos 807-810) have similar characteristics: the running surface is grooved (the groove is 25mm wide), with a ridge (20-25mm wide and up to 15mm high) on the base below the groove. The ridge butts up onto the margins of the very narrow (30mm) basal pads of the integral chairs. The flange is slightly hogged, rising to 90mm above the base in the centre and to 70mm near the ends. The sole intact plate of this group is 1200mm long (4 feet). The plates are thin (20mm or less). There is one

complete plate of this type (Cat. No. 807) and three fragments (Cat. Nos 808-810; 1000mm, 335mm and 800mm long respectively).

A second pair of plates are also hogged and ridged, but the ridge lies along the base adjacent to the outer edge of the plate, rather than the more usual position below the groove. These plates show well-marked pads up to 10mm tall and lugs on the outer edges of the pads. An intact plate (Cat. No 811) is 1090mm long, with its ridge being 35mm wide and 8mm tall. A broken plate fragment 1040mm long (Cat. No 812) is similar, but the length of the original plate is not known. A badly corroded and slightly deformed rail (Cat. No. 813; NMW e8954/7) has no strengthening bar, but has a slight outer lip and shows a small lug on the outer face of the integral chair.

Crenulated plateway plates for use with an iron sill (814-819)

Six plates show a crenulated flange and no indication of a hole for spiking to a sleeper.

All show a channel profile with a flange up to 70mm high and an outer lip up to 35mm high, with a thickness below the running surface of 20-22mm. The pads of the integral chairs are seen in all examples and are 70-75mm long. All the fragments, except (Cat. No. 817), have a broad lug on the internal face varying from 35 to 60mm in length, 10-30mm in length and starting 50-65mm from the end of the plate.

One fragment (Cat. No. 817) shows a 35mm wide central ridge on the base.

Two fragments (Cat. No. 818, 819) do not have a basal rib, but probably have a grooved running surface.

Plateway plate fragments (820-832)

These small fragments of cast iron plate provide little to add to the description of the larger pieces and intact plates described above. A delicate style of plate is represented by a fragment 800mm long (Cat. No. 820). This has a flat running surface, with a slight ledge on the outer face of the flange. One fragment (Cat. No. 825) seems to be from a rather stout plate, for the flange is apparently 40mm thick at its base.

Two of the fragments (Cat. Nos 831, 832) are from crenulated plates, of the same slightly channelled form as the larger fragments described above.

Plateway special plates (833-835)

A cast iron plateway splay (Cat. No. 833, NMW e8954/8) was 900mm long, 110mm wide at narrow end and 250mm wide at the broad end. On the lower face the pads of the integral chairs are slightly raised and are 80mm wide at the narrow- and 90mm at the broad end. The flange stands 80mm above the base and 50mm above plate surface.

A plateway pointer (Cat. No. 834) was 390mm overall length, with maximum width 60mm, a height 50mm and had a 340mm long flat upper surface. The pivot hole was close to the rounded end.

A cast iron rewheeling plate (Cat. No. 834, NMW e8954/3) was 1.58m x 0.83m overall and 20mm in thickness. The superimposed, rounded V-shaped flange (40mm tall and 20mm thick), extended to 340mm from the two road-side corners.

Wrought iron plateway plates (836-837)

The assemblage includes only two wrought iron plates, both rather poorly preserved.

The first (Cat. No. 836) is a small fragment of lipped wrought iron plate. The flange is missing. The plate is 150mm long and 80mm wide, formed of 11mm thick plate. The outside lip rises 15mm from plate surface lip and is 11mm wide.

The second fragment (Cat. No. 837) is badly corroded, 1030mm long, 100mm wide and with a flange 50mm tall. There is no outer lip.

3.e Plateway sills and chairs (838 – 859)

Most of the plateway sills can be assigned to one of three types: the narrow (Type 1) and wide (Type 2) variants of a tall sill form somewhat similar to Van Laun's 'Bailey' and 'Rhymney' types, or a low-profile, probably non-dovetailed sill (Type 3) similar to a sill Van Laun attributed to an earlier period (pre-1807) at Rhymney.

Plateway sill – Type 1 (838-839)

Two well-preserved sills, one almost complete (Cat. No. 838), one broken (Cat. No. 839), are similar. The intact sill (just missing part of one outer cheek) is 1070mm long. The central bar is 630mm long with a rounded triangular profile, 55mm wide and 55mm tall. The bar swells progressively into the integral chair, with a concavely rounded junction. The faces of the inner cheeks are 720mm apart, with a spacing to the outer cheek of 140mm (which are therefore 1000mm apart). The inner cheek rises 45mm off the base and the outer cheek about 25mm. The head of the sills is just 85-90mm wide, much narrower than the other types of iron sills reported here.

The two Type 1 sills were recovered at Pit 2.

Plateway sill – Type 2 (840-844)

This sill type is represented by one complete example (Cat. No. 840) and four fragments (Cat. Nos 841-844). The complete sill is 1060mm long, of which the central bar is 630mm (the bar is up to 60mm tall and 60mm wide with a rounded triangular shape). The heads are 210mm x 105mm, with a gap of 115mm between cheeks. There is a spacing of 790mm between inner cheeks. One head shows some possible casting excess laterally.

This form is very similar to Type 1, with a generally similar shape of merger of the chair and bar, but with a much wider chair (110-115mm rather than 85-90mm). The fragmentary examples show a degree of variation, with the tie bar in one example (Cat. No. 843) being somewhat taller, reaching 75mm tall in the centre, decreasing to 55mm at the ends. The inner cheeks vary from 35-45mm above the plate and the outer 15-25mm. The thickness of the plate varies from 25-40mm. The inner cheek generally shows a vertical face and the outer cheek overhangs the plate.

This general form of sill could be regarded as having a shape intermediate between forms illustrated by Van Laun (1999) as his 'Rhymney pattern' and his 'Bailey type'. The Rhymney pattern included examples from Darren (east) (Fig59), the Bute Tramroad (Figure 96; dating to a period between 1827 and 1852) as well the Brinore Tramway (Figure 79; built by George Overton in 1814/5). The high inner cheek was designed for use with wooden keys. The Bailey type apparently appeared first at Blaenavon (Van Laun 1999, p. 386) in about 1817, and was developed by the Baileys from 1818 onwards (e.g. at Disgwylfa, Van Laun 1999,

Figure 51). Most of the later Bailey type sills has 'cruciform' or inverted 'T'-shaped sectioned bars, rather than the rounded ones of the Rhymney type. The Blaenavon sills had a curved inner cheek to take a wooden key, but the Bailey version had a smaller gap designed to take an iron key (or wedge). The present Type 1 and Type 2 sills show a high inner cheek, rather like the Rhymney type, but with a slightly more rounded profile to the inner cheek.

Two of the Type 2 sills were recovered from Pit 4 (Cat. Nos 841, 843), with another less certain example (Cat. No. 844) from Pit 1

Plateway sill – Type 3 (845-854)

The third type of sills are quite different from the previous groups. The sills have low cheeks (20-25mm on both sides of the plate) forming part of a chair that is wide (110-115mm) and thin (20-25mm). In plan, the chair is much more rectangular than in the previous two groups and the junction from the bar to the chair is much more abrupt, giving a strongly shouldered appearance.

The collections contain three complete example (Cat. Nos. 845-847), one almost complete (Cat. No. 848; NMW e8954/9) and six fragments. Two of the examples (Cat. Nos. 847, 852) were recovered from underground workings and the other examples were found widely (Pit No. 1, Pit No. 2, Settlement Overbridge, Taff Bargoed tramway trenches, Southern dumping Area).

These sills are somewhat similar to the non-dovetailed sill illustrated by Van Laun (1999, Figure 94) from the Rhymney Line 2 at Twynau Gwynion, possibly dating to c.1804-6. The line had closed before 1813. Van Laun argued (1999, p. 294) that since Overton (in a letter of 1822 stated that Rhymney Ironworks had been using dovetailed sills from at least 1807, then a non-dovetailed sill such as his example must date to before 1807. Such an early date is possible for the present material, but it is very likely that the development of sills for major surface plateways was not paralleled by that of sills for underground use, and that the use of non-dovetailed sills in conjunction with relatively lightweight plates may have continued for a much longer period for underground use.

Other plateway sills (855-857)

Two castings (Cat. Nos. 855 and 856) are suggestive of fragments from larger sills than the types described above. One fragment probably comprises part of the bar and inner cheek of a large sill (Cat. No. 855) and a second (Cat. No. 856) may be interpreted as a length of tie bar with a 'U'-shaped section 70mm wide and 70mm tall. Not only is this piece stouter than the bars of the sills described above, but it is also longer; the tie-bar section is 780mm long, giving a minimum distance between the inner cheeks of about 1020mm (based on the shape of the sill fragment just described). Both of these fragments came from Pit 1.

A third sill fragment (Cat. No. 857) is badly damaged and not attributable to any of the classes describe above.

Plateway chairs (858-860)

Three probable plateway chairs were recovered, all different.

A small chair (Cat. No. 858) was formed on a base plate 240mm by 100mm and 22mm thick. The cheeks are separated by 100mm, they are 20mm high and at

least one is incurved. There are two symmetrically placed mounting holes, 16mm diameter, 185mm apart.

A somewhat larger, but narrower, presumed plateway chair (Cat. No. 859) is 300mm long, 85mm wide and 30mm thick. It bears cheeks 25mm and 45mm high, 100mm apart. There are mounting holes both ends, still bearing corroded nails.

A third probable plateway chair (Cat. No. 860) is 300mm long, 100mm wide and 30mm thick. The cheeks are 20mm tall, slightly overhanging and 150mm apart. There are two 20mm diameter mounting holes, 240mm apart, in the outer section of the plate.

3.f Railway components (861 – 887)

Railway chairs (861 – 864)

The collection includes four railway chairs, all different:

Cat. No. 861: chair 300mm x 100mm wide and 30mm thick; cheeks 80mm high, maximum distance apart is 95mm, has mounting holes either side.

Cat. No. 862: chair 210mm x 80mm and 16mm thick, gap 80mm, cheeks overhanging, heights of cheeks above plate 35mm; mounting holes 14mm diameter, 160mm apart.

Cat. No. 863: probable chair 430mm long x 100mm wide and 45mm thick, ends rounded; only one extremely large cheek is present, 95mm high, 100mm wide and 70mm long, lying 60mm in from the end of the base. The other cheek is missing.

Cat. No. 865: chair 320mm long by 100mm wide, max height 80mm, gap between cheeks 30mm, base plate 120mm, symmetrical, No mounting holes visible. To hold flat based rail

Fishplates (865 – 886)

Some twenty two fishplates are present in the assemblage, with six types:

(i) A small fishplate, with square holes set in in recess on one face, 400mm long, 85mm wide, 20mm thick on edge and 8mm thick in the centre; the 4 holes are each 20mm square (Cat. No. 865).

(ii) A second small plate fishplate, with a bevelled edge and small, circular holes; 390mm long, 65mm wide and 20mm thick (Cat. No. 866).

(iii) Five fishplates are simple bars with square holes; 465mm long, 60mm wide and 14mm thick (Cat. No. 867-871).

(iv) Ten fishplates have bevelled edges and large, circular holes; 460mm long 80-86mm wide and 20mm thick (Cat. No. 872-881).

(v) Three fishplates had bevelled edges and a recessed face with large, circular holes; 470mm long, 85mm x 24mm (Cat. No. 882-884).

(vi) Two fishplates were particularly long, with bevelled edges; 510mm long, 80mm wide and 14mm thick (Cat. No. 885-886).

Spring wedge (887)

A single example of a steel spring wedge for use with a chair (Cat. No. 887) measured 60mm by 75mm.

3.g Other vehicle components (888)

A fragment probably from a leaf spring (Cat. No. 888) survives to a length of 1.14m (approximately 0.15m is missing) and has one of its terminal loops. The section of the bar is 75mm x 10mm and it has 4 perforations with round headed bolts with square nuts. If this item is indeed a spring it might be associated with either a road or rail vehicle, although the stoutness of the bar might suggest the latter.

4. Chains and hooks

There was a considerable number of items of chain recovered (Cat. Nos 889 – 929). Although many of these finds were just single links, several were substantial lengths of chain, with six examples over 1m in length (Cat. Nos 895, 904, 905, 906, 908, 917). One of these long chains (Cat. No. 895) was attached to a hook; one shorter length of chain was also attached to a hook (Cat. No. 896) and there were two isolated similar hooks (Cat. No. 931 and Cat. No. 930, in which the hook was through a loop with a double iron plate, probably for a strap end, with a second iron loop locking the two together). There was a small number of more specific chain and hook types.

4.a Chains (889-929)

Most of the chains were formed of conventional rounded links, but one had flattened links suitable for winding (Cat. No. 915), with links 110mm x 45mm. Conventional chain link sizes varied from 42mm x 20mm, formed of 4mm rod, up to 130mm x 90mm, formed of 22mm rod. The chains with attached hooks (Cat. Nos 895, 896) had relatively small links (60-70mm x 45-50mm) and there were a number of other chains with similarly-sized links (Cat. Nos 895, 897, 898).

One of these long chains (Cat. No. 895) was of 28 links, each 60mm x 50mm and formed of 12mm rod, attached to a hook (via a single elongate link of 110mm x 60mm) at one end of the chain and a sub-circular ring, 140mm x 110mm formed of 16mm rod, at the other. The hook was 230mm by 130mm overall, up to 45mm in thickness, with the return of the hook 120mm long with a slight recurve. The eyelet on the hook has an outside diameter of 60mm, similar to that of the attached elongate link. This chain with its hook and loop was approximately 1.2m long overall and was the only apparently entire chain artefact.

A hook attached to a shorter length of similarly-sized links, just slightly more elongate at approximately 70mm x 45mm, was of a slightly smaller size, 190mm by 110mm overall and 25mm thick (Cat. No. 896). There were a large group of chains (Cat. Nos 902-914) with links in the size range of 90-95mm x 45-60mm, with this group including four of the six chains over 1m long and another only slightly shorter. None of this group was attached to a hook.

A short length (just two links) of chain with small links (50mm by 25mm, formed from 7mm rod) was attached to an iron plate (Cat. No. 890). The plate extended into a broad 'tongue', 160mm by 35mm and 7mm thick, expanding to 50mm wide for a short length just before the narrower chain attachment loop. The end opposite to that with the chain was pierced by a 15mm diameter hole.

Just two finds (Cat. Nos 916, 917) were formed of large links of 130mm x 90mm, with one (Cat. No. 917) being of substantial length (1.5m).

A short length of chain attached to a small lopped screw and with elongate and partially compressed loops, formed of 5mm wire (Cat. No. 918) was probably a door fastening.

A single loop of 6mm was formed into an elongate loop 100mm in length with a 33mm wide sub-circular section, then an compressed section, then an elongate end, also up to 33mm wide out of the plane of the loop on the other end (Cat. No. 919). Such compressed links are commonly used, often in conjunction with a short securing bar, for chains used to tether animals (e.g. cows during milking).

There were numerous fragments of chain links and short lengths of round rod that might be fragments of chain links (Cat. Nos 920-929).

4.b Hooks (930-938)

The large hooks attached to chains described above (Cat. Nos 895 and 896) were large – 230mm by 130mm and 190mm by 100mm overall respectively. A slightly smaller, but morphologically similar, hook (Cat. No. 931) was found unattached to a chain. It was 150mm by 100mm overall and 16mm in thickness, with an eyelet of 18mm internal diameter. These hooks are likely to be associated with dram haulage, but their precise use is unknown.

A similar smaller hook, 130mm by 80mm overall (Cat. No. 930) was found in a corroded mass, attached through a broad loop formed with a double plate, perhaps for a strap end, with a second large loop, with one straight side, also entwined. This mass is suggestive of the attachment of a hooked trace (perhaps originally a chain) onto horse harness. The strap end would be of an appropriate size for mounting on the end of a leather tug.

A hook 115mm by 85mm overall (Cat. No. 932) was fractured from its attachment, but it appears to be a plate perpendicular to the plane of the hook, possibly with mounting holes. This would appear therefore to be a hook attached to an object or structure, perhaps for storage, rather than being sufficiently robust for haulage as in the hooks described above.

There were several bar fragments that might have been pieces of hook (Cat. Nos 933-937), but none was sufficiently well preserved for certainty.

One round bar was forged into a large hook at one end and a smaller one in a perpendicular plane at the other (i.e. resembling a pot-hook; Cat. No. 938).

4.c Shackles (Nos. 939-940)

Two shackles were found. The smaller example (Cat. No. 939) was 90mm by 55mm overall with 13mm holes through the arms. The larger (Cat. No. 940) was approximately 110mm by 70mm, with the arms formed of approximately 20mm square bar, which was forged to a round section around the angle of the shackle.

5. Horse and harness

Many of the items in the previous two sections were associated with horse haulage. This section includes those items most specifically associated with equestrian equipment, including horse shoes, harness fittings and haulage fittings. The harness fittings include buckles, a ring, part of a hame, part of bit, a terret and a chain carrier.

The items suggest that the main harness was employed was a haulage harness involving a collar, chain traces, a back or hip band with chain carrier and a whippetree. Such components would be suitable for the use of either a single horse or multiple horses, either on the surface or underground. It is not certain that all the led haulage harness components come from a single harness design. Somewhat similar harnesses are shown on some photographs of underground haulage (e.g. Thompson 2008, p. 18, 62), but in general later 19th and 20th century underground haulage used a rigid 'gun and shafts' system (which appears in almost all the other photographs of haulage in Thompson 2008) that would prevent the dram running onto the horse and would also allow the horse to back-up a dram. No evidence for a 'gun and shafts' was recovered in this project.

The presence of a shaft-tip ferrule and a terret suggests that a small proportion of the remains was associated with driven, rather than led, harness (although terrets might have been present on the harness of led animals, if the general purpose harness was employed).

5.a Horse shoes (941-948)

Eight horse shoes were recovered. These varied between 120mm and 140mm in width, compatible with a wide range of smaller horses or large ponies, but not large draught horses.

5.b Harness fittings (949-958)

An object (Cat. No. 949) comprising a wooden core, with iron sheathing approximately 230mm in surviving length, comprises the lower part of a hame. At one end the iron terminates in a ring, at the other the object is cut by a staple-like iron fitting, to which is attached a chain link approximately 85mm with one flattened face, to which in turn is attached a small hook that would have been the attachment for the traces.

An object of similar construction (Cat. No. 950), with iron-sheathed wood, apparently forming a four-armed structure, is of uncertain nature. The similarity of construction to that of the hame (Cat. No. 949) raises the possibility it too is associated with harness, just possibly as a pannier saddle component. Alternatively, this piece might derive from furniture.

Smaller components of harness include a brass ring, 70mm by 55mm and 7mm in diameter on a leather strap (Cat. No. 951) and two brass buckles (Cat. Nos 952 and 953), also both still attached to remnants of leather straps. The buckles are 40mm by 30mm and 85mm by 60mm respectively, both are of copper alloy with iron pins (now missing in the case of Cat. No. 953).

An elongate ring with attached bar with a perforation in the perpendicular place is probably a cheek ring from a snaffle bit (Cat. No. 954). The cheek ring is 50mm by

30mm, with the piece having an overall length of 74mm.

A three-part linkage (Cat. No. 955) is a chain carrier. A leather strap would have attached to the flat-ended link 100mm wide and 60mm long with central construction, forged from 8mm rod. The central link, 50mm by 30mm, forged from 6mm rod, attaches the small ring formed by the constriction to a similar ring on leaf-shaped loop with a central prong extending forwards from the rear edge over, and into, the centre of the ring (acting as a hook for securing the chain). Such chain carriers could be used either with a back band or a hip strap.

A non-ferrous loop, 65-70mm across and 10mm in diameter, on a post which swells to a 30mm diameter collar 20mm below the ring, and includes a 35mm long threaded section, approximately 12mm in diameter, is a wire terret (Cat. No. 956).

An oval mount or plaque, 45mm by 65mm, with a polished face shows remnants of what appears to be leather attached to the two rear mounting pins (Cat. No. 957). This item is therefore tentatively interpreted as a decorative item from harness, rather than from furniture.

A copper-alloy link (Cat. No. 958) has a straight sided loop, probably for attachment to a strap, attached to a sub-cylindrical collar. This would have acted as a union between the strap and another material, probably as a swivel; it is possibly a harness component.

5.c Other haulage equipment (959 – 960)

A non-ferrous object with the form of a large thimble, with one planar and perforated side, 50mm long, 24mm in diameter on the open end, is a shaft tip ferrule (Cat. No. 959). This item indicates use of a small horse drawn vehicle with shafts, possibly a trap. A piece (Cat. No. 960) of highly corroded flat iron strapping, folded back on itself via an end section which has been forged down to a round cross section, is probably from the end of a whippetree. The two flat pieces of strapping were separated by wood with a thickness of approximately 40mm and they were held in place by nails passing right through. The preserved section is approximately 100mm long.

6. Wire and wire rope (cable)

6.a Wire (961 – 991)

There were 28 items classified simply as wire and 3 as wire objects. These were mainly as rather small fragments with a diameter of 2 to 4mm. Although most of indeterminate use, two pieces (Cat. Nos 968 and 969) were identified as probably associated with fencing. One piece was noted as probably having been galvanised (Cat. No. 962).

Two items comprised wire fashioned into a skewer-like object (Cat. Nos 989 and 990). These were 240mm long with a 17mm outside diameter loop and 170mm long with a 15mm by 21mm loop respectively.

A third object had a similar looped head, 28mm in diameter, but had a short shaft with a hooked end, the object having an overall length of 90mm.

6.b Wire rope (992 – 1004)

Most of these items were short sections of single strands of wire rope. Seven of the items (Cat. Nos 997-1003) were single strands with a fibre (hemp?) core observed. Where a fibre core was observed the overall diameter of the wire strand was approximately 12mm and was formed from six wires, but for some of the strands apparently without a fibre core, the diameter was about 8mm, formed of seven component wires. One item (Cat. No. 1004) was the highly corroded and accreted end of a multi-strand wire rope, approximately 50mm in diameter. The strands were bound by thin iron wire wrapped around the cable, with some of the wires of the cable folded back over this binding.

7. Tools

A large number of tools were recovered. These were mainly mining tools, including shovels, bars, sledge hammers, mandrels and possibly wedges. A small selection of blacksmith's tools was also found, including a hammer, tongs, files and hearth tools. A small variety of tools of other kinds were also recorded.

7.a Mining tools (1005 – 1132)

Shovels (1005 – 1009)

The shovels were broadly similar in style, 265mm to 295mm in width and 320mm to 335mm in length. The upper part of the shovels shows a divergence of the two sheets of iron used to fabricate the blade, forming iron sheathing extending up to 300mm up the handle shaft, secured by regularly spaced nails. The metal sheets in the upper part of the blade are riveted together on either side of tip of the wooden handle. The shovel handle is not in the same plane as the blade, with a down-curved, slightly ribbed, section to the junction.

Gad bars (1010 – 1015)

The term gad bar has been used here for a number of heavy bars with a pyramidally-pointed, rather than chisel-shaped tip (as seen in the 'chisel and prise bar' category). Four of the gad bars (Cat. Nos 1011, 1012, 1013, 1015) are formed from round bar, ranging from 25mm to 40mm in diameter, one is formed from square bar 25mm across (Cat. no. 1014) and one from rectangular bar 40mm x 25mm (Cat. no. 1010). The lengths of the bars are 0.19m, 1.24m, 1.3m, 0.55m, 1.7m and 0.78m respectively, so they represent a heterogeneous collection of items with different uses. All of the bars, part from the 1.24m long example (Cat. No. 1011) show burred heads, so have been struck. It is possible, however, that the three longest bars (Cat. Nos 1011, 1012 and 1014) were not actually tools. The shorter bars showed well-developed burrs, suggesting they were struck repeatedly and almost certainly functioned as hand tools.

Chisels and prise bars (1016 – 1064)

A large group of bars with chisel tips included two short examples that were hand tools (chisels; Cat. Nos 1016, 1017), 24 examples of long tools that might be termed chisel bars or prise bars (Cat. Nos 1018 – 1041), one unusual example of a chisel tipped bar with a rounded handle area that may have been used in a different way (Cat. No. 1042) and 22 examples of broken prise bars (Cat. Nos 1043 – 1064).

The group shows some overall trends in choice of raw material, with most complete bars with a surviving length of less than 0.8m being of square-sectioned

stock, whereas most complete bars over 0.8m in length are of round stock. The square-sectioned bars are typically of 15-25mm section, whereas the round bars are mainly 25-35mm diameter. Amongst the broken bars, there were a number of short, round sections and all the broken round bars had diameters of 25mm or less. Amongst the longer sections of broken bars, almost all were of square cross-section. This suggests that there are distinct patterns of use, breakage and discard, with narrow bars tending to break before they were discarded for other reasons. Bars intended to be larger were made from round stock of over 1 inch diameter. Lighter bars were forged from square stock of 1 inch or less.

The two small chisels (Cat. Nos 1016, 1017) were similar in shape to the longer bars and were apparently rock chisels for hand use (although re-use of longer broken bars is possible). The main suite of prise bars (Cat. Nos 1018 – 1041) and probably most, if not all, of the broken fragments (Cat. Nos 1043 – 1064), formed the most common type of mining tool. The lengths of the bars are evenly distributed between about 600mm and 1000mm – reflecting their size at time of discard or loss, rather than when freshly made.

A 1.73m long, chisel-tipped, bar (Cat. No. 1042) has an unusual form in being a 16mm square-sectioned bar, up until the top 230mm, which is 40mm diameter. This tool is reminiscent of a Cornish 'boryer' – a chisel-like tool used for boring shot holes in hard rock, struck by a hammer and twisted between hammer blows.

Wedges (1065 – 1100)

Large numbers of rather delicate wedges were recovered. Some of the wedges show slight traces of burring on their thick edges, showing they have been struck, but most are too delicate to have been driven into rock directly. They may be 'feathers', used in the process of 'gad and feathering' in which rock was split by driving a gad or prise bar into the rock between a pair of thin wedges (known as feathers).

The wedges range from 90mm to 290mm in length, 20mm to 50mm in width and 4mm to 25mm in maximum thickness. There are no clear relationships between the dimensions.

Hammers (1101 – 1106)

Six large hammers were recovered. One (Cat. No. 1101) was a square-faced (50x55mm) cross-pein rock hammer, with the chisel edge on with the lower surface of the head. The head was 220mm long and had a substantial section of shaft remaining.

A second was a very large straight-pein sledge hammer, with a rectangular face, 40x75mm, a head 240mm long and 75mm high at the shaft hole (40x30mm), with a rounded wedge-shaped rear (Cat. No. 1102).

A third sledge hammer had a double-faced head with a hexagonal cross section, 50mm wide and 160mm long (Cat. No. 1103). The shaft hole was 40x30mm.

The other three all had somewhat octagonal cross sectioned double-face heads. One had only slightly faceted corners (Cat. No. 1104), 180mm long, 45mm x 50mm in section with a 35mm x 20mm shaft. The other two were more markedly octagonal in cross section: one was 190mm long, with faces 35mm across (Cat. No. 1105), the other 150mm long with faces 55mm across (Cat. No. 1106).

Rock drill (1107 – 1108)

A single two-part manual rock drill was recovered from workings in the Bute Seam. The drill itself was 1.22m in length, with a pyramidal end 50mm long for placing in the brace, a 20mm diameter circular section 455mm long, then an 18mm square section 185mm long, followed by 530mm of bit with an outside diameter of 38mm and a pitch of 40mm.

The corresponding crank-shaped brace is 425mm in overall length and formed from 28mm round bar, welded to a 50mm x 35mm x 40mm block, perforated by a square hole tapering from 17mm across to 14mm across from outer to inner faces. The upper end of the brace terminates in a 170mm long spike

Mandrels (1109 – 1123)

Fifteen examples of wrought iron mandrels were recovered. They ranged in total length from 350mm to 540mm. The tools fall into two groups:

Group 1 (1109 – 1115) – total length of up to 390mm, the head is straight, the lugs are typically up to 40mm, occasionally more, the eye is typically 70mm x 20mm.

Group 2 (1116 – 1123) – total length of 450-540mm, the head is down-curved, the lugs are typically up to 40mm, occasionally more, the eye is 80-95mm x 20-25mm.

One example (cat. No. 1111) of a small straight mandrel had one the tip of one pick and it was burred back. It was unclear whether this had occurred through the use of the mandrel as a hammer, or whether the mandrel head had been struck with another hammer and used as a spike or gad bar.

Other tools (1124 – 1129)

A tool head (Cat. No. 1124) 415mm long comprised a hammer-like tool one side and a flat bladed pick or adze the other. The 260mm-long adze blade widens from 30mm to 50mm at the cutting edge. The hammer is 80mm long with a 30mm diameter face. The eye is 90mm x 25mm, with the lugs having a total depth of 40mm. Whilst this appears to be a purpose-forged object, it is also possible it is derived from a bladed pick, similar to Cat. No. 1125, by conversion of the pick end to a hammer.

A bladed pick (Cat. No. 1125) 495mm long, comprises a 180mm-long parallel-side adze-like blade one side and a 225mm long pointed pick the other. The eye is 100mm by 20mm. The lugs extend downwards to 60mm from the upper edge of the head.

A large spanner (Cat. No. 1126) was forged from a 560mm long round bar. The head had an outside diameter of 100mm, with the jaws 55mm apart.

A possible spanner (Cat. No. 1127) was formed by forging a bifurcated tip into a 60mm by 12mm flat bar, 1270mm long. The slot created was 45mm deep and 25mm wide.

A right angled spatula tip, 35mm by 40mm was forged from the end of a 10mm diameter rod, to leave a 305mm long rod section (Cat. No. 1128). This is tentatively interpreted as a tool for cleaning shot holes.

A probable shot-hole tamper was formed from a 25mm square section bar, by creating a 50mm long, 45mm diameter circular section at one end (Cat. No. 1129).

illumination (1130 – 1132)

The copper alloy base of a safety lamp is represented by Cat. No. 1130, a brass ring with an outside diameter of 70mm. The hole through the centre of the ring is 40mm in diameter and has four small cutout notches equally spaced.

A small cogged wheel of copper alloy may be part of a Speddings Steel Mill (Cat. No. 1131). It is 57mm in diameter and 4mm thick, with teeth 1mm high and 2mm apart, has an internal diameter of 45mm with four 9mm wide spokes and an 8mm diameter central hole. The outer ends of each spoke have a 3mm hole containing an iron pin, apparently to attach a sheet of ferrous metal to the wheel.

A small fragment of perforated copper alloy sheet, with regular 2mm diameter holes, may possibly also be part of a safety lamp (Cat. No. 1132).

7.b Blacksmiths' tools (1133 – 1143)

The assemblage includes a small suite of blacksmith's tools, comprising two hammers, four files, two pokers/rakes and three fragments of tongs.

One of the two hammers was a small ball pein hammer, approximately 100mm long (Cat. No. 1133); the other is an unusual, possibly cast, head, 130mm long, octagonal in section and 23mm wide, apparently with slightly pointed, possibly faceted, faces (Cat. No. 1134). The purpose of the second hammer is uncertain, but it might have been for riveting.

The files included two small triangular files (Cat. Nos 1135, 1136), one of which (1136) appeared to have been reused as a punch, with the tip of the file broken and burred by hammering, the tang apparently acting as the punch.

A round-backed file, 230mm long, with maximum width 20mm, and 5mm thick (Cat. No 1137) and flat file, 350mm long overall, 30mm wide, 7mm thick, and with a tapering tang 50mm long (Cat. No. 1138) were also found.

Two smith's pokers were recovered (Cat. Nos 1139, 1140), both had one pointed end on one end of a round bar, with the other forged down into a perpendicular flat-bladed rake.

Three fragments of blacksmith's tongs were found (Cat. Nos 1141-1143).

7.c Other tools (1144 – 1147)

A bar with an unclosed, looped end is similar to the handles forged onto various types of ironworks tools. This is just the distal end of the handle and tool is unknown (Cat. No. 1144).

A 200mm long tapering socket (Cat. No. 1145) was apparently attached to a tool-head via the bifurcating tip of the socket, each side of which then appears to have been flattened and out-turned. The tool itself is not preserved but would appear likely to have been a brush, rake or hay fork.

A 10mm square-sectioned rod, 210mm long, curved just before a break one end and slightly tapered the other is just possibly a tine from a hayfork (Cat. No. 1146), although the identification is not certain. A small piece of sheet iron, 85mm long, with a maximum width 20mm, now broken into three fragments may possibly be a knife blade, although a

high degree of corrosion prevents certain identification (Cat. No. 1147).

8. Sheet metalwork**8.a Boiler plate (1148 – 1161)**

The collections include wrought ten iron plates with marginal rivet holes that may be boiler plates and four smaller fragments.

Of these, five (Cat. Nos. 1148-1152) are trapezoidal in shape, originally 1.17m in length, 20-25mm thick, tapering from between 520 and 600mm down to 200mm. The shortest edge is slightly concave, the others all very slightly convex. The marginal holes are approximately 25mm in diameter with centres 52-57mm apart and placed 30mm from the sheet edge.

These plates would clearly potentially form part of the termination of a round-ended boiler, but a lack of any preserved rivets and the presently flat nature of the plates suggests that they may be unused. A further feature of these plates is that each has an approximately central hole cut through the plate, with the holes varying from 55mm to 90mm in diameter. These plates were found built in to the walling of structure 072/074 at the Soap Vein Pithead.

Three plates of rectangular shape (Cat. Nos 1153-1155), 1.23 by 0.66m, 1.30 by 0.58m and 1.32 by 0.65m respectively, were also found in this structure; these too were flat and had holes cut through them (a 70mm and a 50mm hole, a 55mm hole and a 70mm hole respectively).

This assemblage of plates is suggestive of a partial suite of components for an egg-ended boiler. The holes cut into the plates and the truncation of one of the trapezoidal plates (Cat. No. 1148) are clearly not original features. It may be significant that these holes lie approximately down the midlines of the walls of structure 072/074 and may thus have had a structural significance during the reuse of the plates.

Two rather similar rectangular plates (Cat. Nos 1156, 1157) were also found, measuring 1.43 by 0.67m and 1.46 by 0.67m respectively) but these were curved and were not perforated by central holes.

Four small fragments of boiler plate were found (Cat. Nos 1158-1161) were also found, but these fragments are undiagnostic. One of these pieces (Cat. No. 1161) represents an intact riveted joint between two thin sheets of plate.

8.b Small iron plates with a central hole (1162 – 1173)

This category includes one piece of thin plate (6mm) measuring 90mm square with a 20mm diameter central hole (Cat. No. 1162), eight pieces of thicker plate (20-24mm) with dimensions of 160 to 190mm by 100 to 115mm, each with an approximately central hole approximately 70mm in diameter (Cat. Nos 1163 – 1170), two slightly larger plates (Cat. Nos 1171, 1172), 290mm x 175mm and 320mm x 150mm respectively, again each with a 70mm approximately central hole and one example of a plate 16mm thick measuring 210mm x 165mm with a central 70mm square hole (Cat. No. 1173).

All these pieces derive from demolition contexts at the Soap Vein Pithead, where the boiler plates pierced with 70mm diameter holes were built into Structure 072/074. A connection between these artefacts types is suspected.

8.c Other iron plate (1174 – 1180)

These items are indeterminate pieces of wrought iron plate. Plate is used here for sheet wrought iron of greater than 5mm thickness, below which the material is much more pliable and described here as sheet.

The two largest pieces of wrought iron plate (Cat. No. 1174, 1175) had been trimmed by cutting multiple holes (in the same manner as one of the trapezoidal boiler plates, No. 1148). The other five fragments (Cat. Nos 1176-1180) were all rather small pieces, of which three were curved and might possibly have been boiler plate fragments.

8.d Iron sheet and strip (1181 – 1256)

The poor preservation of the iron has particularly affected the thin sheet and strip. It is likely that a significant proportion of the items in this category were originally plated, although this is frequently not preserved. Where analysed, the plating has proved to be zinc (the process for galvanising iron was invented in 1837 and became popularised during the 1840s). Most of the items in the section are approximately 2mm in thickness.

The largest pieces of iron sheet are trapezoidal sheets (Cat. Nos 1181, 1182), which have long sides of 1200mm, opposing sides of 1080 and 1050mm respectively and widths of 255 and 310mm respectively.

Large rectangular sheets include one of 620mm x 290mm (Cat. No. 1183) and one of 1480mm x 210mm (Cat. No. 1184) pierced by a handle-like length of round sectioned bar iron and one of 1240mm x 120mm (Cat. No. 1185).

Other sheet fragments (Cat., Nos 1186 – 1218) are smaller, frequently lacking original edges. The assemblage of iron strip (Cat. Nos 1219 – 1256) comprises pieces of less than 80mm width, but most pieces are much narrower (20-30mm). Many pieces show multiple nails or nail holes, where the strips have been used as binding or strapping.

8.e Copper alloy strip (1257 – 1258)

The collection also includes two fragments of copper alloy strip, 170mm x 17mm x 1mm and 80mm x 20mm x 1mm respectively (Cat. Nos 1257, 1258).

9. Pipes and related items

9.a Cast iron pipes (1259 – 1260)

The only significant cast iron pipe was possibly originally a steam pipe, but re-used as a culvert (Cat. No. 1259). The main section of this object was a straight pipe surviving to 1.50m long (one end fractured), with an internal diameter of 0.20m, an outside diameter of 0.24m and a flange to 0.42m diameter on the surviving end. This flange was bolted to a smaller diameter (0.12m outside diameter pipe)

with a right angled bend. The small pipe increased to an intermediate diameter close to the flange by which it was attached to the larger pipe. The casting quality of this object appears poor, with large cavities visible in the wall of the larger pipe.

The only other cast iron pipe was a small fragment of a pipe with a wall thickness of 11mm and a curvature suggesting a diameter of 200mm (Cat. No. 1260).

9.b Lead gaskets (1261 – 1262)

Two deformed lead rings, with original external diameters between 120mm and 150mm and 11mm x 1mm section (Cat. Nos 1261, 1262) are interpreted as gaskets from steam pipes.

9.c Wrought iron pipes (1263 – 1269)

Seven pieces of thin wrought iron pipes were recovered (Cat. Nos 1263-1269), at least one of which had been galvanised (Cat. No. 1269). The fragments ranged from 15mm to 35mm outside diameter.

9.d Copper pipes (1270 – 1273)

Four copper pieces were interpreted as pipe fragments. All were very short (<70mm). One piece was a 70mm length of un-seamed pipe approximately 9mm in diameter (Cat. No. 1270), one a seamed pipe 54mm long and 11mm diameter with threaded sections at both ends (Cat. No. 1271), and the other two (Cat. No. 1272, 1273) were small copper fragments possibly from pipes.

9.e Pipe unions? (1274 – 1275)

Two copper-alloy castings fragments (Cat. Nos 1274, 1275; just possibly fragments of the same object) showed a circular pipe passing into a flange with an irregular hexagon shape, with sides of approximately 45mm. These pieces are interpreted as fragments of a pipe union, but an alternative interpretation of the fragments is that they may be parts of bronze bearings, although the sides are locally very thin.

10. Structural ironwork

10.a Window bars? (1276 – 1278)

Two square sectioned bars (Cat. No. 1276, 1277) of 17-18mm thickness, 540mm and 390mm in overall length, with each end thinned to a section 70mm long, 25mm wide and 5-7mm thick are possibly window bars. A third example (Cat. No. 1278) is similar, but the ends are poorly preserved; it was forged from a 25mm round bar.

10.b Structural tie-bars (1279 – 1299)

Plain bars (1279-1283)

This group of wrought iron bars shows a variety of features. One (Cat. No. 1279) is a 1.25m long square sectioned bar (18mm) with a short pyramidal point; the opposite end is not burred. A second bar (Cat. No. 1283) is 2.46m long, 30mm diameter round bar, with a point one end and a slight burr the other. The other three are all bars forged through one or more right angles; two of the three terminate at one end in a point.

Threaded bars (1284-1289)

Three square-sectioned bars with threaded ends (Cat. Nos. 1284-6) are probably fragments of structural tie bars.

Two flat bars (Cat. Nos 1287, 1288) with one end drawn down to a round, threaded section and with a circular hole through opposite end of the bar, are similar, although of slightly different dimension.

A bar (Cat No. 1289) with a flat bar section for 68mm, then a round section of 15mm diameter, threaded for a short distance at the end of the bar, may also be a tie bar, but might also be related to the transverse-headed bolts described above.

Eyed bars (1290-1299)

The collections contained ten eyed bars. These are variable but are all likely to have had a structural purpose.

Three bars have a square section (Cat. Nos 1290 – 1292; 20mm, 30mm and 20mm respectively) and have one end forged into a loop. – in each case the internal dimension of the loop is similar to that of the bar itself. One of the bars (Cat. No. 1292) has a pyramidal point at the opposite end of the bar to the loop.

One bar fragment (Cat. No. 1293) is an 18mm diameter forged to an eyelet which is perpendicular to the bar, although they may not be an original feature. Five bars are stout round bars (Cat. Nos 1294 – 1298), variously 23mm – 35mm in diameter, with loops forged at one end.

A highly corroded loop (Cat. No. 1299) may belong in this group, but alternatively be a very poorly-preserved spike.

10.c Iron bindings (1300 – 1305)

Six wrought iron timber bindings were recovered (Cat. Nos 1300-1305). Their dimensions varied between 110 to 140mm by 60 to 100mm. The iron was of 20 to 28mm wide and 4mm thick. At least one example (Cat. No. 1305) showed a small hole on one side for a securing nail.

10.d Frames and hatch covers (1306 – 1309)

A small wrought iron frame (Cat. No. 1306), with overall dimensions of 255mm x 260mm, formed from bar with section 40mm x 7mm, had holes 14mm diameter 100mm from the edge on one side and centrally on opposing side. This object was stouter than the items identified as bindings (see above).

A hinged cast iron hatch cover (Cat. No. 1307) has an upper face of 370mm x 480mm, with two hinges, 50mm wide, protruding a further 55mm. The inner face appears to have firebrick cast in, as a 310mm x 370mm inset, each of the two brick faces an open in the cast iron plate of 220mm x 110mm.

A simple cast iron hinged hatch cover (Cat. No. 1308) measured 410mm x 330mm and was 30mm thick. It had protruding corroded hinge fragments supported by slight flanges.

A two-part iron frame (Cat. No. 1309) with each section of overall dimensions 1.31m by 0.56m. The sections are joined with 6 securing bolts with 40mm square heads, passing through 25mm square holes in lugs which are 70mm wide and which protrude 60mm from the ends and centres of the long sides. The frame is

90mm thick overall, formed of two 30mm iron faces, delimiting a gap 30mm in thickness and continuing 30mm into the frame on all sides.

10.e Structural casting (1310)

A very large casting was found (Cat. No. 1310; context PT143) associated with the Pit 1 pithead, lying across the passage (PT137) and bedded onto wooden beams. This cast plinth had overall dimensions of 3.11m by 2.45m. It was a large plate, with two pairs of angled supports (each pair forming a large dovetail), each pair separated by a hole through the plate, towards one side and with a large rectangular extension of the plate extending away from the shaft on either side of the underlying passage.

The orientation of its axis towards the rounded NW end of the shaft suggests it was associated with services descending the shaft at its termination, and the most likely interpretation of this enormous casting was that it supported the bearings for the balance bob of a pump. The underlying channel is (PT137) therefore the balance bob pit, with the counterweight end of the bob able to rock between the extended arms of the plinth. The bearings were supported on either side of the beam by castings which rested between the pairs of inclined supports.

10.f Door fittings (1311-1320)**Handles (1311-1312)**

Two broad, 'U'-shaped, handles with out-turned attachments were recovered. The larger example (Cat. No. 1311) is 145mm wide and 135mm high, forged from 16mm diameter bar. This example is probably too large for use on a domestic door.

The second smaller handle (Cat. No. 1312) is 70mm high and 160mm wide, with a 'U'-shaped bar profile of 12mm by 5mm.

Strap hinges (1313-1314)

An iron bar (Cat. No. 1313) which has been spread, approximately symmetrically, resembles the distal end of a strap hinge. A second, complete, strap hinge (Cat. No. 1314) measures 420mm in length, 20mm in width and is 5mm thick. One end widens to 35mm and has a square section nail (70mm long, square section 5mm, round headed 15mm, chisel point) passing through a central perforation, and there are two other nail holes within the main section of the strap. The end is a simple gudgeon formed by a loop in the bar of 44mm outside diameter and 15mm internal diameter.

Pintles (1315-1320)

Five rather similar pintles were found (Cat. Nos. 1315 – 1319). Each comprises a square sectioned spike (110-175mm in length), perpendicular to the round pintle itself (40-60mm in length and 10-16mm diameter). One pintle (Cat. No. 1315) retained a short length of the folded gudgeon of a strap hinge.

A pintle-like object (Cat. No. 1320) has a short spike (65mm long and 8mm diameter) and a long round section (160mm long and 15mm diameter). These are somewhat unusual dimensions for a pintle and the object may be a fractured staple or joiners dog.

10.g Structural cotter bars (1321-1322)

Two 'L'-shaped cotter bars, 260mm long, 90mm wide and 15mm thick (Cat. Nos 1321-1322) had tapered shafts and a head rounded on the side of the protrusion. These substantial cotters would probably have been employed in securing large pieces of structural ironwork.

11. Domestic and personal items

11.a Cast iron vessels (1323-1330)

Cast iron vessels are presented by the spout from a kettle or teapot (Cat. No. 1323), two cast iron saucepans (Cat. Nos 1324, 1325) and a fragment of a small cast iron pot with heavy internal residue (Cat. No. 1326).

Cast iron saucepan (Cat. No. 1324) is 160mm diameter internally at the base, and 200mm at the rim, which is 140mm high. There is an upwards inclined handle socket stub remaining, just below rim.

The second cast iron saucepan (Cat. No. 1325) is 210mm diameter internally at the base, 270mm at rim which is 155mm high, and has a possible handle socket remaining within a concretion just below rim. The rim is plain; the casting is typically 3-5mm thick.

In addition there were four fragments of cast iron vessels (Cat. Nos 1327-1330).

11.b Galvanised iron vessels (1331-1340)

One badly fragmented vessel (Cat. No. 1331) appears to have been a small two-handled jug or pitcher.

The other pieces of galvanised vessels are very fragmentary, but all appear to derive from buckets. Three fragments represent parts of bucket rims, with the sheet metal folded over an iron rod (Cat. Nos. 1332-1334). Two complete U-sectioned handles were present (Cat. Nos 1335-1336), with a section 11mm by 5mm and with an overall width of 330-340mm. These examples have 'T'-shaped escutcheons.

A third example (Cat. No. 1337) was much stouter, with a 13mm diameter rod handle. These escutcheon on this example consisted of an oval plate, 70mm wide, 60mm high, and 5mm thick, held by two rivets and passing into a 50mm long upper protrusion with an 18mm diameter hole to take the handle. This example is of substantially heavier construction than a typical domestic bucket.

Isolated finds included two further handle fragments and an escutcheon (Cat. No. 1338-1340).

11.c Cutlery (1341-1342)

Cutlery was represented solely by two teaspoons. One example was preserved solely as a copper-alloy core (Cat. No. 1341), but the other (Cat. No. 1342) preserved its electroplate and was stamped 'GLADWIN 6 NS'. This example is of early 20th century date.

11.d Footwear (1343-1365)

Two fragments of leather from footwear bearing ironwork were present in the metalwork collection (Cat. Nos. 1343-1344). One of these showed iron plates, the other solely tacks.

Twenty one items were identifiable as metal plates from toes or heels of foot wear (Cat. Nos. 1345-1365). Many of these were simple heel-irons, sub-semicircular in shape, somewhat resembling a very thin small horseshoe (Cat. Nos 1345-1351). These were typically 55-65mm long, 50-70mm wide and about 3mm in thickness, although one large example was 85mm long and 85mm wide.

Toe-irons were more angular, being externally planar across their axis, often with an upturned front (Cat. Nos 1352-1355). These toe-irons were typically about 45mm in length and 70mm wide

Three examples (1356-1358) were more elongate (up to 100mm long and 70mm wide) with slightly tapering long sub-parallel 'arms'. These may be irons from clogs.

Seven examples were two fragmentary for assignment to the above classes (Cat. Nos 1359-1365).

11.e Clothing and related items (1366-1375)

A small copper alloy buckle, with a swivelling bar bearing two narrow, sharp, pins (Cat. No. 1366) is probably from a belt rather than being equestrian equipment. It has a makers stamp (******) which suggests a 20th century date.

Two buttons were found. One was a shanked button 27mm in diameter (Cat. No. 1367). The button metal is a rather decayed copper alloy, which XRF-analysis suggests is gunmetal. The surface is polished and bright – which XRF indicates is a tin coating. The second button (Cat. No. 1368) is a two-holed sew-through button 17mm in diameter in copper alloy, shown by XRF to be brass.

A purse frame (Cat. No. 1369) was of four sections, each with 'U'-shaped profile, hinged at ends, with the corroded remains of the central clip. This measured 80mm wide by 30mm high. This item is late 19th to 20th century in date.

A small stamped piece of copper alloy (Cat. No. 1370) is of uncertain origin, but is probably a fragment of a decorative item. A small pendent (Cat. No. 1371), 34mm x 20mm, stamped from thin copper alloy (shown by XRF to be brass), has an extended drop shape with small hole at its apex. The central annular mount contains an 11mm x 8mm 'gem' formed from a violet-coloured lead glass, held by a clasp of six prongs. The central clasped mount is apparently soldered to the outer mount on only one side, making this a rather crude piece of jewellery.

A copper alloy spectacles frame (Cat. No. 1372), 110mm wide, had sub-circular lens holders 29x23mm, with sides screwed to grip the now missing glass and arms.

Two identical small copper-alloy discs, 22mm in diameter, with recessed centres bearing 8mm diameter holes (Cat. Nos. 1373, 1374) may be press-studs.

A zinc grommet (Cat. No. 1375) still traces of a thick organic layer between its flanges, probably remnants of tarpaulin.

11.f Furniture (1376-1377)

A bright-metal plated mount is probably a drawer pull (Cat. No. 1376). The mount is 47mm in diameter and 24mm tall with central round boss faceted on opposing sides where a hole passes through (probably to take a now-missing ring to act as a the handle). The rear face has two holes for attachment. XRF investigation of the plating suggests it is a nickel-cobalt plating, which suggests the pull is post-1936.

A copper alloy bolt was collected as associated with the mount. The bolt (Cat. No 1377) has a slotted head 7mm diameter and 7mm long with a central hole, below which is 10mm of thread, then a slight tapering prong 15mm long with slightly bevelled blunt tip. The unthreaded main shank tapers slightly from 4.5 to 4mm. This bolt appears to be an early round-pin electrical plug pin and is therefore not directly associated with the drawer pull.

12. Mechanical components

A slightly incomplete cast iron wheel (Cat. No. 1378; NMW e8954/10) 420mm diameter with four spokes and central tapering stub axles (slightly misaligned) and with a rim 22mm square, is probably from a barrow. An 220mm long arcuate fragment of cast iron (Cat. No. 1379), also with a 20mm square section, forms a fragment of an arc of a circle with an effective diameter of c320mm and with a fragment of the base of a spoke, probably forms a fragment of a similar wheel.

A fragment of a cast iron cogged wheel (Cat. No. 1380), c. 400mm internal diameter, 22mm wide, 14mm thick between the teeth and with 16mm tall teeth, with a pitch of 24mm, is of uncertain purpose. A small, thin cogged wheel (Cat. No. 1381), with maximum outside diameter of 80mm, with a 35mm diameter central hole, and with probably 20 teeth 12.5mm apart, and each 7mm tall. The wheel is badly corroded, but closely resembles a sprocket from a bicycle.

Another cogged wheel was stout with tall rounded teeth (Cat. No. 1382). It was 100mm in diameter, with 14 surviving teeth out of a probable 16 originally.

A bell-shaped casting (Cat. No. 1383) is possibly an engine component. It has an overall height of 230mm, a flange 190mm diameter and 10mm in thickness, which is concentrically grooved on underside, with the opening 125mm in diameter, and had six mounting holes. The approximately tubular section above rises 110mm off the flange and is 150mm outside diameter, then a section 60mm in height is tapering. The fractured top section is tubular, 30mm tall, with outside diameter 60mm and inside diameter 35mm. The inside is filled with concretion, so the internal details are not known. The precise use of this has not been identified, but it somewhat resembles the reservoir of an oiler.

Approximately one quarter of a 170mm radius narrow wheel (Cat. No. 1384) with a triangular cross section 32mm wide and 30mm deep, is of unknown purpose.

A claw-shaped pointed and eyed large wrought iron piece (Cat. No. 1385) is a pawl from a ratchet, most likely from a winch.

A poorly-preserved object (Cat. No. 1386) resembling like small pulley wheel c.35mmx8mm, inside chrome-plated sheathing attached to at least two iron tubes c10mm diameter is of unknown origin.

13. Miscellaneous

13.a Miscellaneous iron objects

A circular casting (Cat. No. 1387) is 175mm outside diameter and 95mm internal diameter and 35mm thick. The is an integral bar 20mm wide and 10mm deep flush with one face, running across the diameter. The face with the flush bar has concretion filled holes on either side in an orientation perpendicular to the bar. The opposite face has poorly preserved lettering adjacent to the ends of the bar. The inscriptions are uncertain, but may say DC on one side (base of lettering to outside) and possible 10 on the other (base of the lettering on the inside).

A possible 2-rung ladder (Cat. No. 1388) is of 305mm overall length, 210mm wide, 220mm between 'rungs'. One end has spikes, hooked straight off each vertical bar, whereas the other end has a perpendicular bar with twin spikes. The spikes would allow direct mounting onto a beam of a structure or vehicle. The main part is forged from a wrought iron bar of 25mm by 4mm section.

A complex structure (Cat. No. 1389), comprising a large central screw, with terminal cross plates, passing through a substantial cast iron beam (one end which bears a wrought iron strap) with curved end-pieces and with two pairs of guide rods. Such a design might be adopted for moving wooden components in several different applications, ranging from applications such as cider presses to more industrial uses. It resembles, but is not identical to, the 'iron work for screw stocks' of p. 30 of the Williams' Perran Foundry Catalogue of the early 1870s. The description of the Perran Foundry item describes it as '*fixed to wood posts, used in Mines for screwing Bolts Nuts, Screws, Staples, &c.*'. In this instance the terminals of the cast iron beam suggest a more complex mounting (and possibly purpose). The extent of the inner (moving) framework suggests that pressure was being applied for more than just a small area and a likely alternative interpretation is that the mechanism might have been for raising and lowering a small sluice gate.

A forging (Cat. No. 1390) providing a mount for a circular cross-sectioned component comprises three separate components welded together: a base plate of 320mm by 90mm and 20mm thick, with two circular holes 15mm in diameter attachment, a vertical support plate 235mm high, narrowing from 80mm by 34mm at the base to 55mm by 20mm at the top, and a tubular mount with outside diameter of 92mm, inside diameter of 62mm and a length of 45mm.

13.b Worked iron

A paddle-shaped wrought iron mounting (Cat. No. 1391), overall 215mm long, has a head 110mm by 84mm by 40mm thick, with semi-circular end, bearing a hole of 35mm diameter, and a shaft 100mm long and 25mm in diameter of which 50mm is threaded.

The other items in this section (Cat. Nos 1392-1445) are mainly of worked wrought iron, with a few steel objects, but without specific indications of function or purpose.

13.c Miscellaneous ferrous castings

A casting providing a circular mount perpendicular to the attachment surface (Cat. No. 1446), has a baseplate of casting 470mm long overall, rectangular base 420x200x30mm with three square mounting holes, 25x30mm; pipe attached to one end 140mm o/d and 95mm i/d, pipe diameter lies on line of end of rectangular block, supporting flange from base plate, 160mm high pipe, fractured off or angled inwards at top - hard to be certain.

A substantial large trapezoidal casting (Cat. No. 1447), 460mm long, 460mm wide at the wider end, 300mm at the narrow end, 210mm thick, 60mm thick casting on all sides is of unknown purpose. The cast iron is oxidising, delaminating and expanding on the inner surface to give internal corrugations, but this all appears secondary.

A large casting (Cat. No. 1448) now broken in two, comprises a large rectangular base (2.14 m long, 61cm wide and 6.5cm thick) with a central raised bar (90mm high and 60mm thick). The baseplate is cut by a narrow slit either side, 700mm from end, midline 150mm from edge, 25mm wide, and 300mm long.

A large casting, or just possibly a number of similar castings, is represented by five fragments (Cat. Nos 1449-1453). The original object(s) appears to have had a rounded, pipe-like form, with a series of attachment points provided, not by a flange but by at least two asymmetric lugs, extending 90mm and 70mm and 40mm thick. The two larger pieces show two adjacent lugs over a chord of approximately 280mm, with the effective diameter of the pipe-like section of 750-800mm (although it is not known whether the artefact was actual circular, or simply arcuate, in section). One smaller piece shows a single lug, the other two are rather simpler fragments probably from the same object(s).

A fragment of a large, probably structural, iron casting (Cat. No. 1454) is 75mm thick, and comprises a section 220mm by 100mm with a rectangular hole 40mm by 100mm passing at one end into two strut-like bars, now broken, one in continuity with one edge of the main section (broken off at its base), the other coming off at approximately 50 degrees (surviving for 200mm).

A cast iron plate (Cat. No. 1455) once fastened to a timber by means of a large bolt, bent in a 'U'-shape and passing through two of the holes in the plate. At least one other conventional bolt was probably also present originally. The protruding 'U' may have once been a mounting point, or perhaps help a pipe or other rounded object.

Other castings and fragments of castings (Cat. Nos 1456-1462) largely lack diagnostic features.

13.d Miscellaneous non-ferrous artefacts

A tiny thin scrap (Cat. No. 1463) of folded Cu-alloy, approximately 10mm by 15, is of uncertain purpose. A cylinder (Cat. No. 1464) of ceramic-like material of 75mm diameter, with maximum height preserved

70mm has a concave hemispherical, iron-coated surface at one end, is tentatively identified as an electrical insulator.

A corroded iron fitting (Cat. No. 1465) bears a looped non-ferrous, probably copper alloy, head.

A cast non-ferrous (copper alloy) fitting (Cat. No. 1466), has an elongate base plate (110mm long, 25mm wide in the centre, but broadening to 32mm wide at each rounded end and 6mm thick) with countersunk mounting holes at either end, and a raised central arm rises and runs parallel to the base and had another countersunk hole in it. Below this hole there is a further hole in the basal casting; the arm rises 15mm above the basal plate, is 60mm long and 6mm thick. An exact parallel to this piece has not been found, but it appears likely to be a type of heavy duty shaft breaching D.

A folded lead sheet (Cat. No. 1467) measured 150mm by 70mm by approximately 2mm thick.

A fragment of clipped lead sheet (Cat. No. 1468) measured 120mm x 60mm.

A small bell-shaped copper alloy object (Cat. No. 1469) with the rim 52mm outside diameter, the base 27mm diameter (pierced by a 7mm diameter hole) and 28 mm tall was formed from approximately 2mm thick metal. The outside has lightly scored line, suggesting the object has been spun.

13.e concretions

Forty four small concretions (Cat. Nos 1470-1513) containing decomposed iron pieces were recovered, but remain indeterminate.

DISCUSSION OF ASSEMBLAGES BY SITE

Underground evidence

The material from underground was largely collected under non-archaeological conditions. The assemblage includes twelve more-or-less complete drams, one complete type-3 sill, one fragment of type-3 sill, a bucket handle, two chisels/prise bars, two gad bars, two mandrels, two hammers, a probable spanner, and a rock-drill with its brace.

Only complete sill is of Type 3, measuring 730mm between inner cheeks. It has been argued above that although the Type 3 sills have a simple morphology, close to that of some very early sills, it would appear likely that a lightweight sill of this form was ideal for underground purposes and they may have been employed for that purpose until late in the 19th century. The dimensions would be compatible with drams with a gauge between inner wheel faces of 780mm (i.e. the Dowlais two foot eight inch gauge).

The drams themselves provide limited evidence for the existence of examples with two different gauges (although the examples of the narrower gauge are not well preserved). The apparently narrower gauge drams are the wooden (Type 1) drams with typologically early wheels. The slightly broader gauge (i.e. equivalent to the Dowlais gauge) drams were of various designs in wrought iron. The assemblage gives the impression of including variants of drams constructed over a significant time period to evolving designs. It is argued below (p. 30) that the underground dram assemblage is of coal drams from Penydarren Ironworks spanning the period from c.1810 (and potentially even a decade or more earlier) to c. 1860 (when the coal mines were largely abandoned).

As far as can be determined from the contents of the drams and their recorded stratigraphic origins (many of the items are recorded as being from 'Bute Seam'), the drams (and indeed possibly the whole underground assemblage) was associated with the mining of coal. The area of Gwaun nant y bwch formed the major component of the rights to mine coal granted by lease by the Dowlais partners to Penydarren Ironworks in 1785 and 1792, and worked from a level at Ffos y fran (later known as the Penydarren Coal Level). The whole operation appears to have been known (1794) as the 'Fforsafrane Colliery'. Penydarren maintained these rights until 1829, when the Bute Estate started to lease the area directly to Penydarren Ironworks as part of the settlement with Dowlais. Further reserves were granted by a new lease of 1844. In 1848 the Dowlais lease expired and all rights to the Gwaun nant y bwch area (i.e. coal and iron ore) were then leased to Penydarren Ironworks by the Bute Estate. Penydarren Ironworks worked the area until they folded in 1859. The inventory of Penydarren Co. drams of 1859 (D/D G/E8/134: *Inventory of Penydarren Coal and Mine Trams taken to by the Dowlais Iron Company on the 1st June 1859*) shows drams (both for coal and ore) still present in the Gwaun nant y bwch area and a document lists the iron ore seams being worked in each pit (DDG/E 8/150; *Abstracts of Mine at Penydarren Mine 22nd July 1859*). The iron ore mining operation in this area is very likely to have ceased by the early 1870s and possibly as early as the mid-1860s. Thus drams present in the coal seams would have belong to Penydarren Ironworks if lost prior to 1859, and if lost in the short period of use after 1859 are likely to represent old Penydarren stock, even if actually owned by Dowlais at that time. Any dram in an

iron ore working might be Dowlais stock if lost before 1848 (at which point Dowlais removed all useful property from the workings), would be Penydarren stock if lost between 1848 and 1859, and if lost after 1859 would be likely to be old Penydarren stock still in use under Dowlais ownership.

The same argument can be applied to the plateway materials; documents (e.g. GRO DGE 8/13) record the stripping out of all moveable assets from the Gwaun nant y bwch iron ore mines before Dowlais had to hand the property over to Penydarren in 1848, including 8651 yards of plate removed from Nos 1, 2, 4, and 5 pits in February to April 1848. The most likely interpretation of the plateway remains is that Type 3 sills were placed in the coal workings by Penydarren Ironworks, with just a small possibility of their being Dowlais sills, laid after 1859. If the sills came from iron ore workings, then they would most likely have been laid by Penydarren post-1848, although some debris might have survived the clear-out by Dowlais and be earlier.

No. 1 Pit Pithead

A very large quantity of metalwork was retrieved from this area, the vast majority of which is recorded as 'unstratified'.

Tools were abundant, including four wedges, a mandrel, three gad bars, twenty five chisels/prise bars, eight blacksmiths tools and two other tools. Transport-related materials were also abundant. These included numerous fragments of drams (including three wheels), eight dram couplings, five crenulated plateway plates, an Outram-type plate, four plain cast plates, a wrought iron plate, a Type 2 sill, two Type 3 sills, a plate from a splay, and a rewheeling plate. There were also eight (possibly nine) pieces of harness fitting and other haulage equipment, together with three horse-shoes.

There was a very large quantity of iron bar fragments, unidentified worked iron and bolts. Chains were abundant (twenty items, together with five hooks) and possibly also largely associated with haulage.

The harness fittings included the ironwork of a hame, two buckles, a ring, a chain carrier, a wire terret, a cheek ring from a snaffle bit (from the stable building) and probable iron strapping from the end of a whippetree. A large swivel may also have come from this area but is less securely attributed.

The plateway components display a wide variety of types, probably reflecting the long history of this pit. The crenulated plates would be appropriate for use in pithead yard area, as would a rewheeling plate. The presence of an Outram-type plate is interesting, for this plate would require use with stone sleeper blocks, which have not been recorded in this area. Two sills fragments were of a much heavier construction than those typically found in the area and may be suggestive of an origin with a major surface routeway.

The dram fragments from Pit 1 were also varied. Only one (Cat No. 768) resembles the wheels associated with drams found underground. One (Cat. No. 765) was a very small variant of a dram wheel, just 280mm in diameter rather than the 500mm diameter seen on other examples. A fragment (Cat. No. 766) of a wheel showed curved spokes.

The in-situ metalwork included an enormous plate (Cat. No. 1310; PT143), suspended over elongate pit-

like passage (PT137) and mounted on a timber, damping, substructure. This would have carried the bearings for the balance bob of the pump. This permits recognition of 'passageway' PT137 as the space within which the counterbalance moved. The pump would have been important, not just in terms of pit-drainage, but in recycling the water employed in the water balance winding gear, which is believed to have been employed here, although the apparent use of the engine for winding also complicates the interpretation. Contemporary documents include a suggestion, in a letter from John Urpeth Rastrick to Josiah John Guest, dated December 13th 1820 (Elsas 1960, p. 181), proposing a 25-30hp winding engine using flat chains. The most likely candidate for such an engine would be 'Fosey frane No 1', which was recorded on 30th May 1848 as being 18 inch diameter, with a 5 foot stroke and providing 25 hp (GRO DG/E 8/13; this engine was apparently stripped out before the pit was yielded to Penydarren in 1849). If this identification is correct, it might suggest that the sinking of Pit No. 1 was just after 1820, rather than earlier and that the engine was indeed employed both for pumping and winding. Amongst the main chain fragments from the area one length (Cat. No. 915) was flat winding chain. Identification of the engine type is difficult from its mountings at the level of preservation. Investigations of the nature of the engine are on-going, with the involvement of Rastrick (who had been a major builder of engines for Trevithick in the first decade of the nineteenth century) raising the possibility of an engine other than a typical beam engine.

Although far from certain, it is possible that the removal of the engine in 1849 meant that Penydarren Ironworks needed to place a replacement engine at Pit 1 when they subsequently took over the site, necessitating the rebuild observed in the archaeological excavations. The revisions appear to have included the blocking of the end of the balance bob pit, so it is likely that pumping was not restored. The rebuilding also included the reconstruction of the boiler/engine area, to provide a location for two new egg-ended boilers. The location of the later engine is uncertain, so there is no evidence at present on the type of engine installed.

After the final closure of the pit, domestic occupation of the buildings continued, and much of the assemblage of horse harness appears to be from contexts of this late date.

No. 2 Pit Pithead

A very small quantity of metalwork was retrieved from this area, all of which was associated with transport. Besides one probable bicycle component, there were two dram couplings and five plateway sills (three of Type 1 and two of Type 3), plus a single dram cotter.

No. 4 Pit Pithead

The assemblage from this site was small. Tools were represented by four chisels/prise bars and one wedge. The plateway components included one crenulated plate, two type-2 sills, two dram couplings and at least five other dram components. Other items included nineteen screw bolts of various forms, two cotter bolts and a small number of bar, sheet and strip iron fragments. An unusual find was a circular iron casting with a transverse bar, bearing lettering, one section of which possibly reads DC (for Dowlais Company?).

The No. 2 Soap Vein Pit Pithead

Various contexts around the pithead were rich in tools – most notably 22 of the 36 wedges from the project were recovered here, together with four chisels/prise bars. There were two horseshoes, but otherwise only very fragmentary remains of transport components except for two chairs. One of the chairs was from a plateway, but the other was a railway chair. This was one of the very few finds of probable railway-related material away from the lines of the known railways and the reason for its deposition here is unknown.

Perhaps the most significant pieces of ironwork were five trapezoidal boiler plates, each pierced by a 50-90mm central hole. The form of the plates indicates that they had originally been employed (or intended to be employed) in the construction of an egg-ended boiler. These plates appear to have been re-employed as settings for the pithead structure. Probably associated with these were ten smaller pieces of wrought iron sheet, each again with a central 70-80mm diameter hole. The precise way in which these holed plates were used in the, presumably timber, pithead structure is not known. They cap recesses in the SE sides of two plinths (072) and (074) and may possibly represent three pairs of anchoring points on each, demarcating a setting 5m long and 4m wide, which is probably the location of the winding drum. The segmented plinth to the SE (073) is therefore probably the substructure for the engine mounting. The gap between (073) and (074) may possibly have held the engine flywheel and/or the gearing for the drive to the winder. If the engine had a pumping function, then flat rods might have also made use this gap.

The boiler location is not well preserved, but shows no apparent sign of a sunken ash-pit. It is therefore possible that an enclosed tube boiler (a Cornish or Lancashire boiler) was employed.

This site yielded a large number of badly degraded fragments of wire rope, probably indicating that haulage was by wire rope rather than the flat chain of Pit No. 1. Wire rope was introduced into mining in the 1830s but was not widely used until around the middle of the century.

The history of this site is unclear. A note on the progress of the decommissioning of Dowlais Company pits prior to the expected non-renewal of the lease in 1848 (GRO DG/E/8/13) states:

'Rosser Vein Pit, Soap Vein, Banwain and Fosey frane fairly all dismantled and the castings and plates melted and a portion only has been retained, all the Slopes (?) and Soap, all the others were given up to the Penydarren'

This may imply that the Soap Vein pit was in operation prior to 1848. However, it does not appear on the list of steam engines in that year. In 1844, the location is simply marked as the *'Dowlais Companys proposed pit to Ras Las & Lower 4ft'* (GRO DX/F C/8/2). It is extremely unlikely any such major shaft would have been started prior to settlement of the lease issues and in 1855 the sole map displaying an actual pit at the site has it labelled the No. 2 Soap Vein pit (GRO DG/P/39).

The name suggests that the Soap Vein was being exploited, but this name might refer to the Soap Vein *sensu stricto*, a thin series of ironstones immediately above the Soap Vein coal (a minor coal equivalent to the Gorllwyn Seam to the east and occurring here at very shallow depth), or to the Soap Vein coal which was often worked together with the ironstones. The

site appears to have been abandoned before the first Edition OS map of 1873.

These dates raise the intriguing possibility that the winding engine might just have been that removed from Pit No 1 in 1848. In which case the recovered boiler plates might also be from Pit 1, with the old egg-ended boilers replaced by a new Cornish boiler. It is not known whether a shaft to the depth of the Rhas Las or Lower 4ft coals was ever sunk here.

Bargoed-Taf northern culvert and tramroad trenches

Two fragment of a crenulated plates and part of a Type-3 sill were recorded.

The Brickworks and tramroad area

Nineteen fishplates, three railway chairs and a large number of small carriage bolts (potentially employed for fixing fishplates) characterised the railway-associated assemblage from this area.

A number of very large round-headed spikes, 150mm long with 32mm diameter heads, may have been used to fasten chairs to sleepers, but it is unclear if this would have been for railway or plateway systems (or indeed both). A single example of fold-headed spike was also present. There were no components from plateways (not including the couplings mentioned below) recovered from this site, reflecting the site's location beyond the end of the early nineteenth century plateway system.

The first significant transport route through the site was the Cwmbargoed Coal Road, constructed c. 1840. This 'Road' was a railway employing edge rail (at least partly bridge rail) and was probably capable of being locomotive hauled. It was of standard (4'8½") gauge and ran through the centre of this site. The actual construction of the permanent way is not known, apart from the drawings showing the construction of the incline (GRO DP/P/1/260) and the track illustrated below a 'carriage' design (GRO DGP/P/1/129). In both cases the rail shown is bridge rail, but fastened to transverse sleepers, not longitudinal sleepers as employed by Brunel on the broad-gauge GWR. The Cwmbargoed Coal Road also passed through the 'tramway' site N of the Penydarren platform and over the overbridge by the western aquaduct.

It is unclear whether the more E-W section of 'tramroad' (6013) is part of the Cwmbargoed Coal Road, but it is likely this lay in the unexcavated ground immediately to the N. The 'tramroad' to the SE (6023) is part of the line connecting the Penydarren Pit to the Cwmbargoed Coal Road, and is therefore likely to date to the reorganisation of the transport network after the Penydarren Ironworks were sold to Dowlais in 1859. Both 'tramroads' are mineral railways and probably of standard gauge.

There were two similar 620mm long dram coupling bars recovered from this area (c6300). These are different from the couplings seen elsewhere in the project and might have three interpretations (context 6300 may require re-examination to determine which is the more likely). These long couplings may have been employed for the connection of larger wagons used on the Cwmbargoed Coal Road in the 1840s, for drawings of wagons for this still show simple rings on the wagons, similar to those employed on the plateway drams (GRO DGP/P/1/129, GRO DGP/P/1/134). Alternatively, but probably less likely, the long links

may have been employed for the large standard gauge wagons on the surface mineral railway to the Penydarren Pit in the post-1859 period. Finally, they may represent links lost during transport to Penydarren or Cwmbargoed pits and intended for underground, horse-drawn, use.

The area also produced several fragments of (possibly) a single large, probably cylindrical, casting, the mountings for which were present as a series of asymmetric lugs of differing sizes, rather than a flange typical of a normal pipe. The purpose of this casting is unknown.

The Penydarren Platform area

This area produced a single component of a mining lamp.

The Southern Dumping Area

A small assemblage from this area included a type-2 sill, a single dram coupling and a horseshoe. These finds appear not to be related to particular features.

The Longtown Area

A small assemblage from Longtown included a few tools: two chisels/prise bars and a mandrel.

Settlement Area

The metalwork assemblage from the settlement area was characterised by a dominance of smaller items not seen elsewhere. These included structural debris, with fastenings including various types of nails, together with pieces of thin sheet iron cladding. There were also many small personal items (sixteen boot irons and six other clothing-related items, fragments of galvanised iron vessels, fragments of cast iron vessels, door furniture). Tools were also fairly abundant, mainly mining tools (including nine mandrels, three hammers, seven chisels/prise bars, four wedges, a shovel), but also including three blacksmiths tools and four other tools (including two unusual mattock-like tools from c409 and a possible fork tine from c463). A small piece of copper alloy gauze was possibly (but not certainly) from a mining lamp.

In addition to the certain nails, the Settlement produced a large number of larger 'spikes', including numerous examples of the round-headed chisel-tipped spikes and less numbers of square headed and fold-headed types. These types of spikes appear to be associated with plateways/railways across most of the project and it is unclear if the examples are similar, or whether the spikes were also used for construction (as large nails).

There were a few transport-related items including one piece of harness, a possible lapped plateway plate, one plain plate for an iron sill, one chair, and a fragment of a dram wheel. The lapped plate, if that is indeed what this poorly preserved item is, is important for such a plate would be unlikely to date from after approximately 1800, when George Overton became involved with reorganising Dowlais' plateways. Plates of this type were found (Van Laun 1999 p. 280-281; Van Laun & Bick 2000, p.321) on two early lines from Twynau Gwynion to Dowlais, possibly connected with the work of Thomas Dadford in the mid-1790s. It is possible Penydarren also used such plates (see also Van Laun & Bick 2000, Fig. 2, based on a drawing of 1800 in the Boulton and Watt Collection of 'Homfray's old dram roads'). There is no cartographic evidence to

suggest early (pre-1820s) plateways in this area, but the proximity to the Dowlais works increases the possibility of the occurrence of early material in this part of the development.

DISCUSSION OF MAJOR ARTEFACT GROUPS BY PURPOSE

The Merthyr Tydfil area played an important role in the development of early railways and the present material is an important addition to the corpus of regional material from plateways and early railways. Most of what has been published about on the subject (Rattenbury 2004; Lewis 2004; Van Laun & Bick 2000; Van Laun 1999, 2001) concerns the major early railways linking the ironworks to their sources of limestone and to the Glamorganshire Canal. The present material, particularly that from plateways, is derived largely from more ephemeral lines, both underground and around the pit heads.

Plateways and Drams

Dram types

Previous descriptions of early drams associated with Dowlais Ironworks have relied on contemporary illustration (particularly Childs watercolour of the Dowlais furnace tops of 1840, which shows a wooden dram, but also R.T. Crawshay's photograph of the abandoned Penydarren ironworks of c. 1870 showing many drams, some still in use) and especially on the account of the Dowlais drams by George Overton (1825, p. 44-5):

'The width of the road from the limestone quarry was confined to two feet and a half, in order to correspond with the roads under ground, all of which I altered and reduced to one description, as well as all the carriages'.

and (1825, p. 48-49):

'I will here observe, that I have tried every species and shape of trams; and among such as are made of wood, designed for both underground and above, I have found none equal to those which are constructed with sides one foot upright, and nine inches upon that, to bevel a little outwards. The sides consist of four elm planks, two on each side, the lower planks two inches thick, the upper ones an inch and a half, with straps of iron under the bottom, which are screwed together with inch elm boards on the bottom. This description of tram I introduced more than twenty-four years ago, and it has since been adopted at most of the works throughout South Wales. I have since adhere to the same shape and form, but have substituted iron instead of wood, using gunnel iron for the sills, (which gives a strength not to be obtained by the use of common bars,) flat iron for the straps, of the same description as those used for the wooden ones, and plate iron one eighth of an inch thick, for the sides and bottom. About ten years ago, the Penydarran Company made me two hundred trams of this sort in one lot; and although somewhat worn, they are still as good for every purpose of practical use as they were at first. The expense of repair is infinitely less with iron than with wood; and the exposure to heat, wind, or wet, does not affect them. I have belonging to my establishment, no carpenters, sawyers or timber-yard. I have only a smith's shop &c.; and the expense of smith's work, in

repairing trams made wholly of iron, is not, I believe, greater than the expense of repairing the iron-work in an equal number of wood trams.'

There are relatively few contemporary illustrations of Dowlais drams – with a painting of c. 1840 (wooden) and drawings of c.1840-5 (iron), 1853 (wood and iron examples) and c.1850-5 (wood), as well as an undated illustration of drams for ash.

There is also a design for the dram cage for Cwmbargoed Pit that incidentally include a coal dram (GRO DG/P/1/134, c. 1840-5), which depicts an iron dram with bars (outward facing gunnel top bars) and bushes (Type (v)) similar to the Type 6 drams of this report. It was argued above that dram Types 6, 7 and 8 are the most evolved of the dram types, suggesting that types 1-5 may therefore predate the 1840s.

A Childs watercolour of the Dowlais furnace tops of 1840 shows a wooden dram, which does not closely resemble any of the forms described here. It bears wheels with curved spokes and ends with horizontal tops.

The Dowlais archive includes a design drawing for iron and wooden drams, with the iron one illustrated for plate rail and the wooden one for edge rail, by J. Selkirk (27th November 1853; GRO, DG/P/1/128). The iron dram in this drawing is broadly similar to a Type 6 dram, but the axle bushes are entirely different from any recorded here, and the floor of dram was formed of bars not sheet iron. The wheels show a dish profile and have triangular perforations, similar in form to a wheel of Type d. The wooden dram has a similar form, with strapping similar to that on the Childs painting, but with raised ends with a central vertical strap, and has joined axle bushes (of different form to that on the iron dram), to carry the axles of its edge rail wheels.

A second illustration (GRO, DG/P/1/133), undated (but attributed to J Truran and of therefore of approximately 1850-55) shows a wooden coal dram for use on edge rail. This design is similar to that illustrated by Childs, and very close to the drawing of 1853 described above (GRO, DG/P/1/128), also showing a bar linking the two axle bushes. It has arched ends, but these are not supported by angle iron and there is a vertical strap above the coupling ring.

In 1852 it was reported that 400 drams were needed to bring Dowlais up to working strength (because of the rundown and scrappage in the period leading up to the 1848 crisis over the renewal of the lease), and this may provide a context for the subsequent design drawings of iron and wooden drams.

The Type 5 dram of this report resembles the drawing of a dram for forge ashes and dust illustrated in a design for a sieve to screen ashes (GRO D/D G/P/1/5; undated, but the depiction of the dram wheels is similar to that on other drawings of c. 1840). The illustrations appear to show bushes of Type (iv) or (v), associated with wheels, possibly of Type c. It may be this entirely different design that is described in the inventories of the 1850s as an iron tub dram (Table 3).

The diversity of drams employed in the works in the mid-19th century is indicated by documents giving the valuation of different dram types (; Table 2: Inventory of 1858/9 for the Penydarren stock, D/D G/E8/127; Table 3: Inventory of Penydarran Coal and Mine Trams taken to by the Dowlais Iron Company on the 1st June 1859, GRO D/D G/E8/134). It is tempting to relate the

large and small categories in these inventories to Types 3-7 and Types 2 and 8 respectively.

Because of the context in which the drams were found, it is likely that they belonged to Penydarren Ironworks. They are similar and broadly equivalent, but not quite identical, to the contemporary illustrations of trams from Dowlais Ironworks. One interesting observation is that the drawings of the drams in the Dowlais archive all appear to have taller bushes, so that the axle is further below the floor of the dram than it is in the measured examples.

The only known illustration of possible Penydarren drams are two photographs by RT Crawshay of the derelict Penydarren works, taken around 1870 (www.alangeorge.co.uk/penydarren_ironworks.htm). It is unclear precisely what the photographs show, but it possibly the demolition and salvaging of building materials. The photographs show standard gauge railway wagons containing what appears to be rubble, at a lower level than a plateway with drams both working on the tracks and to the side in various stages of disrepair. Almost all the drams off the tracks appear to be small, mostly wooden, with flat tops to the ends, whether closed or barred. The drams on the track and behind a horse include a single small 3-strap iron dram (apparently similar to a Type 2 or Type 8 dram; other examples appear on either side of the track) and what may be a tub dram (similar to Type 6).

In the examples from this project there appears to be a typological sequence from the small drams with narrow, fine wheels, to larger drams with thicker wheels with coarser spokes. However, the contemporary evidence indicates that it is likely that all these drams might have been used at the same time, and over a broad span of time, between at least the 1840s and the 1870s. Whether the typological series can be used to infer an early age for the drams with an apparently narrower gauge (Type 1) is discussed further in the following section on plateway development.

In summary, therefore, it is possible to recognise the general styles of dram recovered in this project with those operating on the plateways of both Dowlais and Penydarren ironworks in the mid-19th century. Despite disparate early origins, George Overton appears to have influenced both systems in the years around 1800 and they appear to have shared a similar style of dram and a common gauge (2' 8½" or 823mm), at least by the 1850s.

Indeed, Overton's description of his work, quoted above, suggests that the apparently more advanced aspects in the design of some of the drams (such as the use of gunnel iron top bars in Types 4-8, but not in Types 2 and 3) were features introduced before 1815, which may suggest that the general design of the various styles of dram dates from the first two decades of the 19th century, even though identical drams were still in use in the 1870s. Overton's account also suggests that Penydarren ironworks made drams for him to use in other works – a feature that might mean there would not necessarily be significant differences between the drams employed in the different works and tramroads, particularly those advised by Overton.

Placing dates on the various types of dram is problematic. The Type 1 drams, wooden and apparently of narrower gauge, might be an early Penydarren type; Van Laun recovered sills suggestive of a 2'4" gauge between the flanges at Morlais Quarry, (presumably from the line laid in 1800 to Penydarren

works), and 2'4" has been widely associated with 'Homfray's old dram road' of the 1790s, mentioned by Watt in 1800. Thus two phases of Penydarren tramways may have had a gauge less than that adopted at Dowlais (and apparently eventually by Penydarren too). Type 1 drams employ wheels (Type a) only seen on Types 1,2 and 3 drams (i.e. those not employing angle iron, plus the typologically earliest form with angle iron sills). This might suggest that Type 1 and Type 2 drams date from before the introduction of angle (gunnel) iron (which Overton says happened at some point before 1815) and that Type 3 (with similar wheels) may have been soon afterwards.

The majority of the drams are of Types 4 and 6 (with five examples of each), so these ought to reflect the heyday of mine usage. Type 6 is a morphology that closely resembles the illustration of a dram on the proposed cage for the Cwmbargoed Colliery (GRO DG/P/1/134) of c. 1840. Type 5 is similar to the tub drams illustrated on the drawing of the ash screen (GRO D/D G/P1/5), which is undated, but the depiction of the dram wheels is very similar to that on the Cwmbargoed cage illustration. If Types 7 and 8 are later, then they are not seen in the illustrations from the mid-1850s, when complex castings linking both bushes (which are tubular) are seen in the illustrations for Dowlais drams. Either the open axle boxes came and went before c. 1855, or were later (or perhaps were solely a Penydarren concept and not adopted at Dowlais).

It must be remembered that drams had a long expected lifespan, so the data of the dram design need not reflect the date of the dram loss. Overton (1825, see above) noted they were perfectly serviceable after 10 years. The photographs of Penydarren works in the 1870s show drams very similar to those of Types 3 or 4 still being used.

In summary, the assemblage of drams from underground at Ffos y fran shows subtle design differences from those illustrated in the Dowlais archives, despite an overall similarity. The stock of Penydarren drams in 1859 (Table 3) suggests that most iron drams were for coal, whereas wood appears dominantly used for iron ore. The same may not have been true for Dowlais, although Childs painting of c. 1840 shows a wooden dram in the ore preparation area of the Dowlais furnace tops. The dominance of iron varieties, except for the typologically earliest, the coal cargo present in many of the drams, plus the known provenance of the at least some of the drams within coal seams, all strongly suggest that the assemblage is mainly or entirely of Penydarren origin and for coal. This would accord with the known leasing history of the area from which the drams were recovered.

Use of Overton's comments for dating the drams must be undertaken with caution, but since he specifically refers to using Penydarren to fabricate drams, they may reflect the situation at Penydarren itself. In this interpretation, the drams may provide a record of dram evolution during the first half of the 19th century at Penydarren. Type 1 and Type 2 drams probably date from well before 1815, with Type 1 possibly even belonging to the 1790s. Types 3 to 5 probably span the decades between 1810 and 1840. Type 6 most closely resembles designs of c. 1840, so Types 7 and 8 may represent designs from the 1850s. Such a chronology would fit with usage of the mines from the 1790s to 1859, but probably with a decline in mining as the focus of activity shifted southwards in the 1840s.

Plateway gauge and structure

There has been much discussion of the measurement of plateway gauge in the literature. The study area may involve tramroads constructed by both the Penydarren and Dowlais ironworks. These two concerns were responsible for a railroad built in 1790-1 to link the Glamorgan canal to Penydarren and Dowlais. This early railroad was superseded by the Merthyr Tramroad built by George Overton and completed in 1802 as a plateway with 4'2" (1270mm) between the backs of the plates. Overton himself quoted a 'width' of four feet two inches for the Merthyr Tramroad. Rattenbury (2004, p.21) indicated this was measured to the back of the plates and that the gauge was 4'4" (1320mm) measured over the flanges.

Lewis (2004) suggested that drawings of locomotives intended for the Penydarren Company's internal tramroads indicate a measurement of 3' 1½" (927mm) between the backs of the wheels, equivalent 3' (914mm) on the face of the plates or 2' 10" (864mm) between the backs of the plates. However, Rattenbury (2004, p.21) also quotes field evidence suggesting that the narrow gauge section of the Morlais tramroad, built for use by Penydarren, was as little as 2' 6" (762mm) between the backs of the plates (the Morlais tramroad had three rails to take Plymouth's wide and Penydarren's narrow gauge). Van Laun's work in Morlais quarries recovered three non-dovetailed sills (Van Laun 1999, Fig. 107) which measured 2'4" (711mm) between the flanges. Van Laun also quoted Watt's statement of 1800: *'Penydarren Lime Works are situate at castle Morlais about 2 Mles from the furnace, having a new Railroad 2ft 6 wide'*

Thus, if this measurement was over the flanges, the Penydarren internal narrow gauge appears to have been about two foot four inches (711mm) between, and two feet six inches (762mm) over, the flanges. Van Laun also states that there were sills of a slightly later date similar to those of the Brinore Tramway in the Morlais quarries – presumably of van Laun's 'Rhydney type' (Both the early Penydarren tramway to Morlais and the Brinore Tramway were constructed by George Overton, in c.1800 and 1814/15 respectively). Dowlais' internal and underground system was standardised by Overton and *'was confined to two feet and a half, in order to correspond with the roads underground, all of which I altered and reduced to one description, as well as all the carriages'* (1825, p. 44-5). Overton describes the Merthyr Tramway as being 'four feet two inches wide' (1825, p. 44) and that tramway is accepted as having been four feet four inches over the flanges, so it appears Overton quoted his 'width' as a distance between the flanges. The Dowlais internal narrow gauge is usually quoted therefore as having been two feet eight inches (784mm) over the flanges, allowing one inch for the flange thickness either side; the spacing between the wheels is likely to have been slightly more. The drawing for *'Coal Trams used at the Dowlais works'* (GRO, DG/P/1/128) gives the gauge between the inner faces of the wheels as 2 feet 8½ inches (826mm), with a 2 foot (610mm) wheelbase and internal dimensions of the metal framing of 2 foot 4 inches by 5 foot 11 inches (711mm by 1803mm)

Measurement of the gauge (between the inner faces of the wheels) on the recovered drams is not easy, because of their deformation. However, it is suggested above that one class of dram had a narrower gauge (estimated as c.720mm) than the other classes (estimated as c.835mm in one of the better preserved axles). The latter measurement is very close to the

expected gauge for Dowlais drams. The narrower gauge is similar to that reported (Van Laun 1999, Fig. 107; see above) from the early Penydarren plateway at Morlais quarries. This provides, therefore, some circumstantial support for the idea that the typologically 'early' drams, which have examples for which a narrower gauge is possible (Type 1; Cat. Nos 729-730), may indeed be chronologically earlier and associated with an early style of plateway employed Penydarren Ironworks which was of slightly narrower gauge than contemporary plateways of Dowlais Ironworks and which was probably replaced by the Dowlais gauge very early in the 19th century. The transfer of stock from Penydarren to Dowlais in 1859, demonstrates that by then at least the gauges employed by the two works were similar.

Plateway components

A wide range of plateway components was found, with none actually *in situ*, so the interpretation of the components against the complex backdrop of changing leases and track replacements is problematic.

A fragment of a possible lapped plate (Cat. No. 795) from the Settlement would be a piece from before the reorganisation of the Dowlais plateways by Overton, if from Dowlais Ironworks. However, it is not known for how long 'Homfray's Old Dramroad' might have remained in use in Penydarren Ironworks after the 1790s.

It has been suggested above that the Type 3 sills, the most abundant type found, were placed in the coal workings by Penydarren Ironworks. They are low-profile, relatively lightweight, and may owe much to a design from the early years of the first decade of the 19th century (Van Laun 1999, p. 294). It would seem likely that such a simple design proved useful for underground purposes, even when taller, dovetailed, sills became dominant for surface purposes. In this study, Type 3 sills occurred in the underground workings, as well as the surface, and are tentatively attributed to the Penydarren Ironworks. An example of such a sill was recovered from the plateway leading north from the Penydarren Pit, up the Taff Bargoed valley to the stone quarries. This plateway must post-date the sinking of the Penydarren Pits in around 1848 and the quarries may be associated with the construction of the pits and associated inclines.

Dovetailed sills of Types 1 and 2 are closer to Van Laun's (1999) 'Bailey-type'. Types 1 and 2 differ only significantly in the width of the head. They occur widely across the area (Pits 1, 2 and 4, together with the Southern dumping area). The evidence tying these to Penydarren Ironworks is less strong than for the Type 3, but such an association is possible.

Fragments of broken larger, heavier, sills were found at Pit No. 1. There is a possibility that these may have been part of the surface tramway to Dowlais Ironworks. The use of heavy sills in the tramroads of the ironworks is suggested by the sills shown on an undated drawing for an ash screen (GRO D/D G/P1/5).

The plates associated with the sills are almost all of cast iron. Overton (1825, p.68) commented: *"Before I dismiss this subject, in a subsequent part of the present work, I shall take occasion to point out the superiority of cast iron rails to those made of wrought iron, which have lately been introduced"*. The only significant piece of wrought iron plate was found at Pit 1 and it is possible this was associated with surface

use. In the 1858/9 valuation of materials in Penydarren Ironworks mentioned previously (GRO D/D G/E8/127 folio 1), the following amounts of plates are noted:

Cast Iron Trampplates on the Roads of the Colliery – Yards 10163 at 80 lbs p yard = 338.15.1.16

Wrought Iron Trampplates on the Roads of the Colliery – Yards 370 at 54 lbs p yard = 8.6.2.0

Cast Iron Trampplates on the Roads of the Minery – Yards 14812 at 80 lbs p yard = 493.14.2.20

Wrought Iron Trampplates on the Roads of the Minery – Yards 3018 at 54 lbs p yard = 67.18.0.12

Large Rails on the Roads of the Minery – Yards 994 at 120 lbs p yard = 49.14.0.0

The precise nature of the 'large rails' is unknown, but it is clear that only 17% of the underground plateway in the minery was of wrought iron plates and just 3.5% in the colliery.

The cast iron plates include two examples of plain Outram-style plates, but no sleeper blocks were noted. Many (five plain, four crenulated) of the other styles of plates were dual purpose plates, but may simply have been used with sills. Plates solely for use with sills include plain varieties with a hogged flange (four examples) and crenulated varieties (six examples). The surface tramroad in the Taf Bargoed valley produced two fragments of crenulated plate.

Three examples of chairs for use with wooden sleepers and apparently for plates were recovered. They are all different. One is of unknown origin, one is from the Settlement Area and the other from the Soap Vein pithead; none can be related to a particular tramway.

Railways

Apart from a single chair, apparently from the Soap Vein pithead, two fishplates from Pit 1 and a single fishplate from the Settlement area, all the certain railway components were from the area of the 'tramroad' to the S of the brickworks; these comprised three chairs and nineteen fishplates. Ten round-headed chisel ended spikes, two fold-headed spikes and thirty one small bolts were probably associated.

The earliest edge rail system in the study area was the Cwmbargoed Coal Road, constructed c. 1840. As discussed above, this railway employed edge rail, which may have been bolted or spiked directly to the sleepers. The recovered spikes do not necessarily date from this phase however, since they may alternatively have been used for attaching the chairs to the sleepers in later tracks. Bridge rail does not require fishplates.

As discussed above, it is likely that the excavated section of 'tramway' is actually part of a standard gauge line, possibly including a section of the Cwmbargoed Coal Road, together with a branch to the south, connecting to the Penydarren Pit (and therefore dating to after 1859 when Dowlais took control of the Penydarren Pit). Replacement of track during maintenance of railways commonly leads to disposal of used fishplates, chairs, spikes and bolts along the margins of the railway.

Illustrations of early standard gauge edge rail vehicles at Dowlais show them on a 'T' rail with a broad head

on a thin riser, with a rather small rounded foot (e.g. GRO DG/P/1/132 of August 14th 1841) or with on flat-bottomed (e.g. GRO DG/P/1/133, approximately 1850-55), but both of these rail types may have been restricted to use within the works. It is not known if the Cwmbargoed Coal Road continued with bridge rail throughout its life, but this would seem unlikely.

The Cwmbargoed Coal Road was partially followed in this area by the line of Rhymney Railway and Great Western Railway Joint Taff Bargoed Branch, constructed between 1867 and 1876.

The chairs and fishplates may therefore be associated with any of these edge rail systems (Cwmbargoed Coal Road, Rhymney Railway and Great Western Railway Joint Taff Bargoed Branch, Penydarren Pit mineral line) from 1859 onwards and potentially slightly earlier, if the Cwmbargoed Coal Road was moved away from bridge rail earlier than this, with use of the branch line continuing until the 1980s.

Tools

The assemblage of mining tools from the project provides an interesting insight into tools of the first half of the nineteenth century. The tools, together with the sites of origin for contextualised examples are listed in Table 4.

The chief point of comparison for the assemblage is the inventory of Penydarren Ironworks materials of 1858/9 quoted above (GRO D/D G/E8/127). There are two lists of drams and tools on the page, possibly corresponding to those of the colliery and minery respectively (based on the types of dram present in each list), but this is uncertain:

1449 Mandrels
389 Sledges
933 Wedges
270 Bars
170 Sets of blasting tools
1812 Mandrels
549 Sledges
801 Wedges
491 Bars
487 Sets of blasting tools
71 Boring machines

Thus, with the exception of boring machines, the retrieved assemblage of mining tools corresponds closely to the items listed in the contemporary account. What differs markedly are the proportions of the various items. This reflects the varied life history of each type and the variable taphonomy. Taken as a whole, the assemblage contains proportionately far more bars and rather more wedges than in the 'snapshot' of 1858/9. This may be because such simple items had a shorter lifespan before disuse or discard than the more complex (to fabricate) mandrels and sledges. However, in the case of bars, the data include a very large number from Pit 1 and for wedges a very large proportion is formed of examples from the Soap Vein Pit. This may be due to particular issues: for the bars perhaps associated with fabrication/repair/discard by the blacksmith who appears to have operated in the Pit 1 pithead buildings and for the wedges by the large apparent loss of wedges into a 'culvert' near the Soap Vein pit (a context in which loss and falling through the flooring plates of these small, thin, items might be envisaged). It is also possible that the Soap Vein Pit, as a coal mine, might have entailed the use of more wedges than had Pit No. 1, for which the pithead was primarily for the raising of iron ore.

Interestingly, the match of the assemblage of mining tools from the Settlement site is much closer to the documented 1858/9 assemblage. Indeed twenty five out of the total of one hundred and thirteen mining tools (excluding shovels, whose use appears not to have been exclusively in mining) were recovered from the Settlement site. This suggests that tools were taken home by the miners.

Many of the mandrels show evidence for extensive use and breakage (and in one case even re-use as a different tool), suggesting these valuable tools were not lost casually and were discarded only when beyond repair.

The other tools in the assemblage include some agricultural tools (including two possible hay fork pieces from the settlement), but were mainly tools from blacksmithing. Of these eight were from Pit 1 and three from the Settlement, indicating the likely locations for the smithing.

APPENDICES

Appendix (1): Mining history

Although mining had taken place on the commons of Senghenydd from early times, the story of Dowlais commences with the establishing of the partnership in 'Myrthir Furnace' in 1759. The complex issues and controversies over the lands leased for this business have been detailed by Owen (1968). However, the main lease was for the mineral rights to the free commons of Senghenydd uwch Caiach. in the parishes of Merthyr Tydfil and Gelligaer, which was leased to Thomas Morgan of Ruperra in 1748, who sub-leased the 'free commons of Pantywaun and the reversion of Tilla Dowlais and Toryvan' to Thomas Ree and David John, who in turn sub-leased to Thomas Lewis from 1 November 1757. Thomas Lewis created his partnership 'for joint dealing in the art, mistery, occupation and business of iron manufacturers' on 17th September 1759. In 1763 Lady Windsor leased the partnership 22 acres for their works (which were by then already in existence) and confirmed their mineral rights to the common.

The 1763 map (GRO DG/P 1/1) indicates clearly the extent of mineral workings at that time. There are pits marked in the area of the later Mine Pit No. 2 near Pant y Waun in the east of the mineral field, together with others near the later Dowlais Pit, just above the works, as well as various ponds that may have been associated with scouring. There are no mineral workings indicated within the project area. A second furnace may have been added c. 1781 and a third in 1793 (Owen 1972, 11).

In 1784 Samuel, Jeremiah, and Thomas Homfray, the sons of Francis Homfray (who had leased part of the Cyfarthfa operation between 1782 and 1784), set up the Penyarden Ironworks. The leases they negotiated had mineral rights for sufficient ironstone, but to gain access to better coal resources they sub-leased from the Dowlais partners the rights to extract coal from part of 'Wain Nant y bwch'. The initial lease was for 7 years from 14th October 1785, but this was supplemented by a second lease for 56 years from 29th September 1792. Dowlais only leased out the rights to coal, not to iron ore, in these leases (the contents of these leases are recited in the documents associated with the Transfer of Interest in Penyarden Ironworks by Jeremiah Homfray in 1808; GRO DART/W/139).

The early stage of the development of these leases is shown by two maps of c. 1790-5 (GRO DG/P/1/187; GRO DG/P/1/187) show a level opening near Ffos-y-fran. This is apparently the same level later referred to as the Penyarden Coal Level (e.g. the Morris map of 1825; Lloyd 1906 p. 43). These maps show no mines in the main part of Gwaun Nant-y-bwch. The OS draft 2" map of 1814 also shows this level (as a ridge of spoil), served by a tramway from the NW. A branch of this tramway is shown running uphill to a point close to the later Balance Pit 1.

The importance of the Ffos-y-fran area to Penyarden is emphasised by a letter of 18th July 1794 (GRO DG/B/8/3) in which the Dowlais proprietors threatened to have the lease for the '*Ffosafrane Colliery*' declared void in retaliation for a perceived failure to fulfil bond conditions (probably in relation to tipping of slag and other waste into the Morlais Brook).

In 1813, the Dowlais Company leased a further section of the common to Penyarden for the raising of coal. This lease was recited and regranted by the Bute lease

of 1829 (GRO DG/H/601). It gave Penyarden access to a wide area of coal reserves lying to the east of the Penyarden Engine Pit and to the south of the main Dowlais workings. This area was also exploited by the Penyarden New Pit, which is poorly documented and its date of sinking is unknown (it appears solely on a plan of 1844, see below). The boundaries of the area previously leased by Penyarden were also slightly redefined, to be based on the underground location of the Dowlais Fault (then known as the Pwlllythead Fault) rather than the surface topography. The boundaries of the southern section of the revised lease were marked on the surface by ditches (including that seen adjacent to the cairn in the Southern Dumping Area of the present project).

A document (GRO DG/H/524) which is not itself dated but which is on watermarked paper of 1818, calculated the acreage of mine and coal with respect to the *Brewhouse Level* and *Foesyfrane mine pit*. This appears to indicate that Balance Pit 1 was probably sunk earlier than c.1818. It also confirms the area of interest for Dowlais coal-workings as that north and east of the Penyarden sub-leased area in the pre-1820 period. It is likely that the ore resources of Gwaun Nant-y-bwch were being worked by this time, because of the greatly increased demand for ore following the completion of No 5 furnace in October 1817 and of Nos 6 and 7 in October 1818 (GRO DG/H/547). Another circumstantial line of evidence is a letter from John Urpeth Rastrick to Josiah John Guest, dated December 13th 1820 (Elsas 1960, p. 181) proposing a 25-30hp winding engine using flat chains. The most likely candidate for the location of such an engine would be '*Foseyfrane No 1*' (see below), which was recorded on 30th May 1848 as being 18 inch diameter, 5 foot stroke and 25 hp (GRO DG/E 8/13). If this identification is correct, it might suggest that the sinking of Pit No. 1 was just after 1820, rather than earlier.

After 1820, the growing concern by the Marquess of Bute over both the low revenue he received from Dowlais and their allegedly poor working practices, led to a period of intense survey and investigation of the Dowlais operation. The maps produced during this period include the survey of 1824 showing the encroachments on the Bute property (GRO DXF/C/8/1) and one of 1825 by Thomas Morris (Lloyd 1906, p. 43).

The survey of 1825 by Thomas Morris (Lloyd 1906, p. 43) shows the '*Penyarden coal level*' and '*Penyarden Engine Coal Shaft*', with '*coal road*' to Penyarden and the three iron mine shafts, with their railway to Dowlais. The Engine Pit is served by a tramway with a line probably identical to that shown on the 1814 survey extending only to the area of Pit 1. Balance Pits 1 to 3 are shown, together with their ponds and served by a tramway which passes into the Dowlais Works to the east of Long Row.

The Bute lease of 1829 (GRO DG/H/601) contained a recitation of earlier leases from Dowlais to Penyarden and is accompanied by a map based on the 1824 survey (see above). This map contains no indication of the location of workings.

A map dated to c. 1840 by GRO (GRO DG/P/40) shows underground workings associated with these three Balance Pits, and a level near Pit 3 (this level is sufficiently close to the Dowlais Railway that it may be the 'No. 3 Level top of the Dowlais Branch' referred to in the ironstone yields for 1859; DG E 8/150 and 151). An apparently related map (DG/P/28) shows coal workings E of Dowlais which may aid in dating these

plans more precisely (it shows the Brewhouse Level and the Furnace Bank Level system extending to just north of Rhas Las Pond, which was labelled Twyn-y-wain Pond). A date as late as 1840 may not be appropriate for these maps. They show the Penydarren Engine Pit (of uncertain date but pre-1824), but do not extend as far south as the Penydarren Pits (sunk 1835); the workings extend to the area of the Rhas Las Pit, but this pit, (sunk 1851) is not shown. In showing the ironstone mines these maps most likely date to a period before they passed to Penydarren in 1848. The close bounding of the Penydarren subleased area by the Dowlais coal workings shows that this map post-dates the extended Penydarren sublease by a considerable period.

A plan of the area around the Red Mine incline dated to 1834 shows the course of a proposed change to the tramway to the Gwain Nant-y-bwch area (Foes y fran). This line is in the same place as a line later mapped as running to Balance Pit 4 (e.g. on the 1st Edition OS), so may be evidence that Pit 4 had opened by, or at, this time.

A series of plans by Henderson for Dowlais surveyed during 1836-7 (GRO DG/P/3; DG/P/5) and 1840 (GRO DG/P/8) provide great detail for the Dowlais works itself, but they cover little of the common land, but do confirm the tramways towards the Gwaun Nant-y-bwch area had been altered, as proposed in 1834.

A map of 1844 (GRO DX/F C/8/2), prepared as part of one of the various draft agreements drawn up before the lease expiry, shows Balance Pits 1 to 3, the Penydarren New Pit and various 'proposed' pits. These include the '*Dowlais Companys proposed pit to Ras Las & Lower 4ft*' which corresponds to the location of the No 2 Soap Vein Pit (the excavated pit head) as shown on a map of 1855 (GRO DG/P/39) and '*Proposed Pit No1, 250 yds to Big Coal, 341 yds to Lower 4 feet*' on the approximate site of Penydarren Pits. These circumstances, and the naming of the pits, suggest they were not sunk by Penydarren until after the expansion of their concession following the granting of the new lease in 1848. The archive contains a solicitors' receipt for the counterpart of a lease of a colliery on Wain Nant y bwch dating to 1837 (GRO DG/B/8/6), but this cannot refer to a new lease, since the 1844 map shows the 1813 lease boundaries as confirmed in 1829.

Various documents associated with the crisis of 1848 make reference to the mines of Nant-y-bwch. In particular, the list of engines (GRO DG/E/8/13) from 30th May 1848 lists four winding engines, of which one is at 'Ffoes y frane' (an 18-inch, 25hp engine with a stroke of 5 feet). A progress note on the decommissioning of the works in advance of the expected non-renewal of the lease states:

'Rosser Vein Pit, Soap Vein, Banwain and Fose y frane fairly all dismantled and the castings and plates melted and a portion only has been retained, all the Slopes (?) and Soap, all the others were given up to the Penydarren'

A subsequent list of engines values the '*Fosey frane No 1*' engine at £100, but that it is '*taken down*' (GRO DG/E/8/13 p.34). There is no mention of the engine on an inventory of October 1849 (also in GRO DG/E/8/13). Further details of the salvage of plates is provided by an account of '*Old Tram Plates brought in and used or melted in fncs*' (GRO DG/E/8/13 p. 45) which shows 1438 tons of tramplates melted down in the last three months before the lease expiry date. A

separate account (GRO DG/E/8/13 p. 39) shows the source of those plates, including, amongst others, 4747 yds from No1 Pit Foseyfrane, 1129 yds from No 2 Pit, 887 yds from No. 4 pit, 1895 yds from No 5 pit and 1929 yds from the Soap Vein Pit. It is not explicit that the Nos 2, 4 and 5 pits listed here are at Gwain Nant-y-bwch, although this is most likely. The same account provides for 102 days of day-work for (presumably removal of) the '*Foseyfrane Floorings*'.

Interestingly, the list of winding engines (GRO DG/E/8/13) for October 1849 is greatly expanded from those in May 1848, with the 'new' engines at Gwyrhid Pit, Flue Pit (perhaps one of the ventilation pits on the E boundary of the property), Ras Las New Pit, Lower Four Feet Pit, and New Mine Pit. This shows the expanded level of activity along the corridor provided by the Pant-y-waun Railway as early as 1849, despite many authorities quoting sinking dates of 1850-1 for these pits.

Following the new lease of 1848, the previous sublease of part of the common to Penydarren by Dowlais was replaced by direct leasing, under identical terms, of separate areas to Dowlais and Penydarren (e.g. as shown on map GRO DG/P/39 of 1855). This change is the reason for the Banwain and Foseyfrane being '*given up to the Penydarren*' as described above. The boundary between the two holdings was now a line parallel to the Dowlais Fault, passing approximately SSE from the SW corner of the original 22 acre 'furnace ground' and running just to the west of the Cwmbargoed Pits, in fact precisely the line suggested by Geddes in 1844 (GRO DXFC/8/2) that the Guests had rejected so strongly. Penydarren lost their concession north of Cwmbargoed, facilitating limited Dowlais expansion in this area, but gained a large area to the south of their old sub-leased ground. This was probably fairly quickly exploited with the sinking of the Penydarren Pits close to the proposed site of the 'Dowlais No 1' in 1844, with these pits requiring the development of the infrastructure of the incline system to their north to take the coal down to Penydarren.

During the 1850s, following the introduction of the new leases, most of the investigated areas fall within the area of the Penydarren lease, for which there is much less surviving archival material. The 1851 Health Board Map provides a great deal of useful information on the Dowlais Works itself, but the maps have no great extent onto the common.

A map of 1855 (GRO DG/P/39) provides a useful snapshot of the Dowlais lease, with No 1 and No2 Soap Vein pits, the Cwmbargoed Pits, the developing coal workings to the SE (the Gwyrhid Pit and a trial pit close to the point where the Fochriw Collieries would develop later), as well as a string of workings along the Pant-y-waun Railway (from NW to SE: the Old Tunnel, Cwm Cenol Pit, Blaen Dowlais Pit, Pantywaun Pit, No. 2 Mine Pit, No. 1 Mine Pit, Lower Four Feet Pit, Black Pins Pit, and Rhas Las Pit).

The late 1850s saw an intention to develop the eastern side of the concession still further with the start of sinking the Tunnel Pits and of the first shaft at Fochriw. However, in 1859 the Penydarren Iron Company failed; Dowlais was quick to investigate whether they should purchase its mineral resources. The subsequent report (GRO DG/B/8/39) provides little detail on the Penydarren iron mines, but a detailed analysis demonstrated the great value to Dowlais of acquiring the Penydarren coal mines. Unlike the nearby Cwmbargoed Pits belonging to Dowlais, the

Penydarren Pits were working the coal to the rise, rather than the dip, with great savings on underground haulage. The big new coal mines being developed by Dowlais were all at early stage. The report recommended that sinking work, except for that at Fochriw No 1, should be halted until the cheap coal from the Penydarren Pits had boosted the Dowlais finances, and that development work in the works itself should be concentrated on the New Mill (i.e. the Goat Mill). The report also emphasised the importance of acquiring the Pwlywhead estate, because of its potential use for slag disposal (which led eventually to the formation of the Dowlais Great Tip).

Much useful documentation survives from the valuation of Penydarren Ironworks in 1859 (GRO DG/E/8/125-161). The information includes the yields of iron ore (mine) by horizon and pit for a period up to July 22nd 1859 (GRO DG/E/8/150-151). The total figure (17538 tons), compares with a range of monthly yields from the Dowlais mines documented in the months around the lease renewal of 1848 GRO DG/E/8/13 p. 47), from 20339 tons in August 1847 down to just 3854 tons in April 1848 (at the end of which the original Dowlais lease expired), and is therefore likely to represent a monthly figure. The valuation includes two sets of figures (GRO DG/E/8/150 and 151) with two slightly different values per ton. The first values the mine raised at £6768/15/-, the second at £6424/10/-. The ascribed values range from 6/8d to 10/- per ton, depending on the horizon of ironstone. The lists also assist in the interpretation of the mines by providing information on the horizons and hence the stratigraphic range of each mine (discussed below). The list also apparently has a systematic order of description – working from mines located away from the Penydarren ironworks to the NW, passing eastwards up the valley to the various mines of the Pwlywhead property, the back westwards around the mountainside from Gwaun Fawr, across Gwaun Nant-y-bwch, to the Ffos-y-fran area, thus assisting in the location of mines not recorded on any of the cartographic sources. For the workings in the study area this order is (from NE to SW): No 7 Mine Pit, No 4 Pit, No 2 Mine Pit, No. 3 Level, No 8 Coslett's Pit, No1 Mine Pit and No 6 Mine pit.

A second useful role of the valuation is to provide details of the equipment stock of Penydarren, with lists of trams (GRO DG/E/8/127; and where they ended up on 1st June 1859, after the Penydarren closure - GRO DG/E/8/134) and also of summary lists of tools (GRO DG/E/8/127). These lists are discussed in detail elsewhere, but it is worth mentioning here that the trams located in the immediate area of Gwaun Nant-y-bwch were at Pits 1, 2, 4, 6 and 7 as well as the Ffosyfran Level.

Little is known about the Gwaun Nant-y-bwch mines after their return to operation by Dowlais Ironworks in 1859. In 1864 however it appears that the residual Penydarren Co. were again involved in mineral extraction, both from the Black Ball Level (a major level draining both Penydarren and Dowlais workings on the mountain), passing below the area and from a small level near the 'Pwlywhead Gate', from where they were intending to extract coal from the pillars of the older Penydarren workings (GRO DG/F/1/39).

For the area of the project around Gwaun Nant-y-bwch, Table 5 provides a summary of the dates for which there is evidence for each mine being in use.

Appendix (2): Transport history

Between the passing of the Glamorganshire Canal Act of 1790 and the completion of the canal in 1794 the partnerships of the Dowlais and Penydarren ironworks were both petitioning for a connection to the canal, but it was the Dowlais concern of Taitt and partners that constructed in 1791/2 a railroad (i.e. a waggonway using edge rails) from Dowlais to the canal. This line was engineered by Thomas Dadford (senior) as an addition to his work on the canal. Further use was made of railroads during the early 1790s by both Penydarren (Cyfarthfa Castle Museum displays what may be the oldest surviving iron edge rails in the world, found in a Penydarren pit and Plymouth Ironworks supplied 330 rails for underground use in 1793, Van Laun 1999, p.314-5) and Dowlais ironworks. No railroads of this type are known at Dowlais, but Overton (1825, p. 45) stated

'In the principal colliery, which supplied the Dowlais blast furnaces, there was a railroad, over which each horse worked with one wagon. When I had completed the tramroad which I substituted in lieu of that railway, each horse regularly hauled from the farthest part of the colliery twelve drams, carrying fifteen hundred weight each, and took the empty one back.'

Railroads continued to be laid in the east of the coalfield (under the influence of Thomas Dadford's sons), but as early as 1788 Plymouth had cast 176 'Dram Plates' for James Cockshutt at Cyfarthfa Ironworks. Cockshutt may have introduced this technology because of familiarity of the use of 'L'-shaped rails by John Curr in his home area of Yorkshire (Van Laun & Bick 2000). Several uses of a distinctive early style of lapped plate (which could be spiked to a wooden sleeper; see Van Laun & Bick 2000, Fig. 2, based on a drawing of 1800 in the Boulton and Watt Collection of 'Homfray's old dram roads') are known in Wales. Plates of this type were found (Van Laun 1999 p. 280-281; Van Laun & Bick 2000, p. 321) on two early lines from Twynau Gwynion to Dowlais. Thomas Dadford is known to have been involved with surveying a route here in 1792, possibly to assist with the construction of Dowlais' third furnace (Van Laun 1999 p. 280). A third line from Twynau Gwynion to Dowlais dates to about 1800 and was constructed by George Overton (1775-1827) as part of his reorganisation of Dowlais (as described in the quote above).

Overton was also involved at around the same time in the construction of the Merthyr Tramroad of 1800-1802 (4'2" gauge; 1.27m) from Penydarren End to a canal basin at Abercynon, and for the Morlais tramroad of c. 1799-1800 (providing a dual gauge route for Plymouth and Penydarren Ironworks to access the Morlais quarries). Once the Merthyr Tramroad had been built, the Dowlais Railroad was abandoned and replaced between Dowlais and Penydarren End by the Dowlais Tramroad, also of 4'2" gauge. Thus, under Overton's influence Dowlais and Penydarren were both operating dual gauges of plateway in the opening years of the century, with a 4'2" gauge for the Merthyr Tramroad down to Abercynon and to Morlais, and a 2'6" gauge (0.762m) for work on the other mineral lines (including underground). There is some slight confusion over whether the narrow gauge used by Penydarren and Dowlais was exactly the same; Van Laun (2001, p. 174) suggested that diagrams by James Watt (Jnr) (in Birmingham Central Library Archives) indicate a gauge of 2' 4.5" over the flanges (0.724m).

Overton's account of tramroad construction (1825) shows his careful approach to road construction,

favouring the careful levelling of the route and emplacement of stone sleeper blocks, to which the plates were secured using iron spikes into wooden pegs. This plating technique was heavily influenced by the work of Benjamin Outram. (1764-1805), whose approach was further championed in Wales by John Hodgkinson (1779-1861). Outram-style plates feature widely in the design of the tramroads of the early 1800s. Although Overton favoured the Outram approach early in his career (e.g. on the Morlais and Merthyr tramroads), he also increasingly employed the use of iron sills. The iron sill was a development from wooden dovetailed sleepers used by Curr (Van Laun 1999, Fig. 5). The wooden dovetail was replaced by a shallow iron chair attached to a wooden sleeper and subsequently by a sill – a single casting combining two chairs with a tie-bar. By 1825 Overton was able to write (p.67):

"From long experience in the use of both, I much prefer iron dove-tail sleepers to stone blocks. The former always retain the rails or tram plates of a regular gauge; or, in other words., the road, by the use of iron sleepers, always remains of the same uniform width as when first laid."

Early sills from the 1790s were mainly of the horned type, but by 1797 the idea of non-dovetailed sills (based on a tie-bar linking two non-dovetailed chairs or saddles) has been introduced (Laun 1999, p. 383). By 1807 Rhymney Ironworks was already using dovetailed sills. For many tramroads Outram-style plates spiked to stone sleepers were favoured for complex linework (such as at turnouts), while sills were used for more simple road. Sills were also a great advantage in areas where track needed to be moved (such as in quarries and mines). Underground, where stone sleepers were not practical, iron sills may have largely replaced wooden sleepers.

Some plates, such as the Outram-style plates could only be used spiked to a sleeper, whereas others were designed solely for use with sills. However, for a very large number of tramways, the plates were dual purpose – with both a flange to hold the plate in the sill (usually in conjunction with a wooden key) and terminal notch to accept the common spike holding adjacent plates, when spiked directly to a sleeper.

The evolution of both plates and sills has been described by Van Laun (1999, 2000), but it must be borne in mind that by concentrating on the limestone tramroads his work is not necessarily directly transferable to the use of plateways underground and around the pit heads in the coal and iron ore fields. Cormac (???) has shown that underground plates and sills were typically slightly more light-weight than those for use on the surface, though much work remains to be done.

Van Laun has shown that two styles of sills were particularly important in the coalfield in the early 19th century, his 'Rhymney-type' and 'Bailey-type'. The Rhymney-type has a tall inner cheek with a rather curved outline and a high round tie-bar; the Bailey with a squarer, more shouldered inner cheek and commonly an inverted 'T'-shaped tie-bar.

In the 1820s the advent of rolled wrought iron sills apparently met with a rather poor rate of take-up. Overton (1825, p.68) stated:

"Before I dismiss this subject, in a subsequent part of the present work, I shall take occasion to point out the superiority of cast iron rails to those made of wrought iron, which have lately been introduced"

Where wrought iron plates were adopted, they were often held by substantial chairs mounted on wooden sleepers. These developments gained more momentum in the 1830s and 40s with the progressively increasing use of locomotives, but even then, in the Merthyr Tydfil ironworks there is rather little sign of widespread adoption.

After Penyarden Ironworks' initial association with the Trevithick locomotive of 1804, there is a long period with no locomotive power, but a locomotive, *Eclipse*, was purchased by William Foreman of Penyarden, possibly originally for use elsewhere, but in 1832 converted to the Merthyr Tramway gauge and put to work hauling between the works and the canal. It is not known how long this locomotive survived and Penyarden seem to have purchased no others.

At Dowlais, the locomotive era opened with the commissioning of *Perseverance* from Neath Abbey Ironworks in 1831-2. This 4'4" gauge locomotive worked the Merthyr/Dowlais tramroad and was equipped with a rack system for the high gradient of the Dowlais tramroad. A second locomotive, *Yn Barod Etto*, followed in late 1832, and had dual purpose wheels, designed to run on either 4'4" plateway or standard gauge (4'8½") edge rails. A third locomotive, *Mountaineer* was commissioned from Neath Abbey in 1833 and was fitted with wheels for plateway use only. In 1835, the Dowlais Company purchased the *Etna*, a standard gauge locomotive, second-hand from the Liverpool & Manchester Railway. The next locomotive, *Dowlais*, was another rack locomotive, suitable for the Dowlais-Abercynon journey, and was delivered in 1836. In 1838 the locomotive *Charles Jordan* was purchased from Neath Abbey, and, like *Mountaineer*, was a rackless locomotive with a lowering chimney. Lewis (2004, p. 77), suggests that these two locomotives were employed on the run to Abercynon, but only from Penyarden End, rather than being able to work the steep incline to Dowlais, for which *Perseverance* and *Dowlais* were fitted with rack systems. The final Neath Abbey locomotive was the John Watt of 1838, which was initially supplied with edge rail only wheels, but possibly later modified with dual purpose wheels. The *John Watt*, *Etna* and *Yn Barod Etto* were probably restricted to work in the Dowlais works and the track to the limestone quarries (which since 1825 were at Morlais east, rather than Twynau Gwynion, although a tramway appears not to have been laid until 1833). When the route to Morlais was converted from plateway to edge rail is not certain.

In the background of the changes at Dowlais, and the provision of locomotives with standard gauge capabilities, was John Guest's promotion of the Taff Vale Railway, for which the incorporating act was passed in 1836 with Guest as its first chairman. Brunel was engineer for this line, which was built to standard gauge rather than his preferred wide gauge. The railway reached Merthyr in 1841, and at least some of the changes at Dowlais may be seen as happening in expectation of a standard gauge link to the outside world.

Whilst these events changed enormously the transport practices of the Dowlais Company's other operations, they did not directly impact on the mineral fields south and east of the works until the late 1830s. By this time the coal reserves close to the works were becoming exhausted and it became imperative to develop new reserves down-dip to the south. The first of these developments was the sinking from 1839 of the Cwmbargoed Pits. The water balance pits were situated close to the head of Nant Gwyrad, just inside

the southern boundary of the Dowlais lease, and to the south east of the area sub-leased to Penyarden. In order to move coal from these new pits to works a substantial new railway was constructed in c. 1840, the *Cwmbargoed Coal Road*.

The Cwmbargoed Coal Road ran from the pits to close to the top of the Penyarden incline, then around Tor y fan above the mine balance pits, curving round to the SE of the Dowlais works, from where it descended the 'Cwmbargoed Incline' to a point to the E of the old works, from where there was easy access both to the old works and onwards into the new Ivor Works, which commenced in 1839.

The Cwmbargoed Coal Road made use of a variety of new technologies. Drawings of design details (GRO DP/P/1/129, GRO DP/P/1/260) clearly show that the track employed bridge rail. Bridge rail was used on many projects nationally in the 1840s, but is perhaps particularly associated with Brunel, being used on both his wide gauge and standard gauge projects of the period. Brunel was employed in constructing the Taff Valley Railway (a company whose chairman was John Guest) at the time the coal road was built, and it is likely the coal road shows his influence (directly or indirectly). One interesting aspect of the designs for the coal road is that as well as building conventional wagons for the route, the company also built carriages with a railed 'deck' capable of holding three standard mine drams transversely (GRO DP/P/1/132).

The later 1840s were troubled times for the Dowlais works, with major uncertainty over the renewal of its lease in the context of deep personal antagonism between John Guest and the Marquess of Bute (Davies 1968, 50-59). In part these troubled times were produced by Bute's fear that Guest would deplete the entire coalfield, fuelled by the sinking of the Cwmbargoed pits. When the lease was renewed in 1848 (following the death of Bute on the 18th March, just 44 days before the expiry of the lease) a period of rapid investment followed. These changes were reflected in the development of new pits. The Gwyrdd Pit was sunk from 1848, and was served by an extension to the Cwm Bargoed Coal Road, the *Gwrrhid Railway*. The Pant-y-waun Pit was sunk in 1851, but this (together with the Rhas Las pit, also sunk from 1848 and various other workings) was served by a new railway, the *Pant y Wain Railway*, which mirrors the Cwmbargoed Railway (as the Cwmbargoed Coal Road was then known) on the eastern side of the Dowlais mineral field. It entered the Dowlais works from the east, down the Pant-y-wain incline, which passed under the Cwmbargoed incline.

For the Penyarden Ironworks too, the 1848 lease provided impetus for a new burst of activity. They developed the Penyarden Pits in the south of their new holding and these required construction of a substantial new tramway link to Penyarden Ironworks via the inclines on either side of Sarn Howell Pond. This tramway passed very close to the Dowlais Cwmbargoed Coal Road at Sarn Howell, but there is no evidence the two systems (which were presumably of entirely different gauges) were linked in any way.

The link of Dowlais to the national railway network finally came in 1851, following a long period of argument when the Taff Vale Railway failed to build the branch line to Dowlais that it had been empowered to do. The Dowlais Company had to build the branch itself, which it did between 1849 and 1851 as part of the programme of reinvestment (Note the Dowlais Railway is incorrectly labelled Taff Vale Railway on the

1851 Board of Health maps). The Dowlais Railway entered the Dowlais works from the southwest, having passed immediately to the west of the study area.

John Guest died in November 1852 and the works passed to his widow, Lady Charlotte Guest, who appointed trustees, including the engineer G.T. Clarke. Under Clark's guidance the company was reinvigorated and set about further major reinvestment.

For a long period the Dowlais works had been importing some iron ore, but in the late 1850s and early 1860s technical changes started to change the whole basis of the works. The Bessemer Process for production of bulk steel had been invented in 1856 and Dowlais became an early licensee. However, by 1857 it was clear that the original Bessemer process was a failure in turning Dowlais pig iron into steel. Investment in puddling and rolling accelerated with the construction of the Goat Mill and other developments

The organisation of the Dowlais works was fundamentally changed in 1859 when the adjacent Penydarren works failed. It was bought out and closed by the Dowlais works. For Dowlais, there were several attractions in the acquisition of Penydarren. Perhaps foremost amongst these was the access to the Penydarren mineral field, which had been substantially enlarged from that previously sub-leased from Dowlais before the lease renewal of 1849. Penydarren had pits capable of producing cheap coal from the rise, particularly the Penydarren Pits, just to the south of the study area. The pits were then linked to the Dowlais rail network through creation of a junction with the Cwmbargoed Railway at the top of the incline to the pits. Dowlais also regained control of the Mine Balance Pits at Ffos-y-fran that it had lost in the 1848 lease arrangements. The tramroads to these pits were then reoriented to supply Dowlais, as they had done prior to 1848.

During the later 1850s and early 1860s the network linked to the Cwmbargoed Railway was further extended as coal was sought from sources increasingly farther south. The sinking of the Tunnel Pits had started in 1859, but was suspended after the acquisition of the Penydarren Pits. New mines at Fochriw were started in 1856 and came to production in around 1861. They were served by a further extension of the Gwyrhid Railway, which became known as the *Fochriw Railway*. In the early 1860s Dowlais started to develop the resources of the Bedlinog area, and in about 1865 the Colly Line was built as another extension to the Cwmbargoed Railway (branching south from the Cwmbargoed Pits), to serve the Colly levels, which had commenced in 1863. Thus by this period the Cwmbargoed Railway, despite appearing a rather minor feature in the landscape of the study area, had become a major artery of the Dowlais works. Moreover, the new collieries were capable of producing a surplus of coal beyond the requirements of the ironworks, and Dowlais was set to start to sell coal to the outside world. In 1869 work on the Tunnel Pits was restarted and they were served by an extension of the Pant-y-waun Railway.

In 1865 the problems with the Bessemer process were finally solved, with the rolling of the first of its steel rails in June 1865. One of the solutions was to reduce the amount of phosphorus entering the pig iron, but this required using low-phosphorus iron ores, not the local sedimentary ores. The Dowlais concern imported ores and purchased sources of haematite ores both in Britain and Spain. By 1867, the need to expand the

capacity of the railway system at the works led to the creation of the Rhymney Railway and Great Western Railway joint Taff Bargoed branch, from Nelson to Dowlais. At the time of the survey of the 1st Edition Ordnance Survey in c. 1873, this line was still under construction. The line was finally opened on 10th January 1876 and provided a direct route, if a steep one, between Dowlais and the coast. The course taken by the new railway included in part a line similar to that of the Colly Branch, but north of the Cwmbargoed pits it took a new course, initially closely parallel to the Cwmbargoed Railway as far as the Penydarren Pits incline, but there passed under the Cwmbargoed Railway and swept around the mountain between the Dowlais Railway and the Cwmbargoed Railway, then branching – one branch entering the old works at furnace bank level, the other passing to the south of the works to the foot of the Cwmbargoed incline (and thence connecting to the Ivor Works). The railway was further connected to the Dowlais works via the Zig-zag branch, which had a reversing junction at Ffos-y-fran and which entered the lower part of the works through a junction with the Dowlais Railway.

The cartographic evidence suggests that the local iron ore was of such insignificance at this time that the former tramway to the Mine Balance Pits had its route to the works severed by the joint railway and the mines were probably abandoned at this time.

In the 1870s the output of coal from Cwmbargoed and Fochriw areas could still be moved to the ironworks via the old Cwmbargoed Railway, but the increasing demand for the coal from the mineral field as a market product demanded better access. This was provided by the construction in 1881 of a line linking the old Cwmbargoed Railway to the London and Northwestern Railway near Dowlais top. At this time the Cwmbargoed incline was removed. This line was closed in 1937.

The Taff Bargoed Branch closed to through traffic in the 1980s, with the southern section remaining open for the coal washeries, now associated with the Ffos-y-fran Opencast.

References

Published Sources:

Davies, J. 1968. The Dowlais Lease, 1748-1900, *Morgannwg*, **12**, 37-66.

Elsas, M. 1960. *Iron in the Making. Dowlais Iron Company Letters 1782-1860*. Glamorgan: County Records Committee.

England, J. 1959. The Dowlais Works, 1759-93, *Morgannwg*, **3**, 41-60.

Lewis 2004. Merthyr Tydfil Tramroads. The locomotives. Pp. 45-85 In: P. Reynolds (ed) *Merthyr Tydfil tramroads and their locomotives*, Railway & Canal Historical Society, Oxford.

Lloyd, J. 1906. *The early history of the old South Wales ironworks (1760-1840) [from original documents]*. London.

Overton, G., 1825. *A description of the faults or dykes of the mineral basin of South Wales. Pat 1, Introductory Observations on the Mineral Basin, Tramroads, Railways, etc. etc.* London

Rattenbury, G. 2004. Merthyr Tydfil Tramroads. The history. Pp. 7-44 In: P. Reynolds (ed) *Merthyr Tydfil tramroads and their locomotives*, Railway & Canal Historical Society, Oxford.

Van Laun, J. 1999. Early Limestone Railways of South-East Wales, unpublished PhD thesis, University of Hull

van Laun, J 2001. *Early limestone railways: how railways developed to feed the furnaces of the Industrial Revolution in South East Wales*. Newcomen Society.

van Laun, J. and David Bick, D. 2000. South Wales Plateways 1788-1860. *The Antiquaries Journal*, **80**, 321-331.

Maps and other unpublished sources:

- 1761 – DG/P/1/105 plan showing engine with return pipe
 1763 – DG/P/1/1
 1769 – DG/P/1/190 the original of item below
 1769 - DG/P/1/2 (partial – includes furnace ground)
 1784 – DG/P/1/3 (partial – includes furnace ground)
 1784 – DGP/1/22 (partial – includes furnace ground)
 1784 – DGP/1/137 Penydarran Farm
 1795 – DGP/1/226 shows Gwaun nant y bwch label against portal near Ffos-y-fran. Shows no tramroads or turnpike. Shows Merthyr to Brecon road on lower slopes of common not top.
 1795 – DG/P/1/187 -shows Gwaun nant y bwch label against portal near Ffos-y-fran. Shows Dowlais Rail Road and a 'Rail Road' to Twynau Gwynion, but none to south.
 c1805 – DG/P/1/106 – furnace area detailed map
 1810 – DG/P/1/217 – map of river problems – but shows Pen yr Wheiad patches and scouring ponds (see also DG/P/1/42
 1814 OS draft – marks iron mines on the crest of the hill to the E of the works. Shows debris from Penydarren level and tramways to this and to the Pen coedcae colliery – in corner of enclosed land.
 1819. Lease of Gwaun Varran to PD, with right to raise coal and iron ore for £120
 1824 DXFC/8/1 map of encroachments by Robert Bald
 1825 Map of part of the wastes... by Thomas Morris (Lloyd 1906, p. 43) Shows Penydarren coal level and Penydarren Engine Coal Shaft, with coal road to Penydarren and 3 iron mine shafts, with railway to Dowlais
 1820-25 DG-P-26 Map shows 1,2,3 pts, Engine pit, tramroad to PD level. Shows original PD lease as 332-0 and extension as 127-2. Also shows Cwmbargoed pits and has rough line of coal road pencilled in. Has Penydarren Pit (for PD New Pit)
 1828 Agreement with Bute over lease terms
 Undated – DG/P/1/78 Dowlais Station
 Undated – DGP/1/58 (has 12 furnaces)
 1834 – DG/P/1/93 plan of SW corner of works around BH level, with new road to mines and new roads to mouth of double drift (demonstrates age of revised tramway route).
 1836/7 multi-sheet Henderson plans of works area
 c. 1840 DGP/40 map of workings in Gwaun Nant y bwch area – shows balance pits 1-3, plus a level, together with Penydarren Engine Pit
 1841 – DG/P/1/200 plan and section of the Red Mine incline 17/11/1841 (dual gauge?) and base of Cinder Incline
 1844 – DG/P/1/189 proposed alterations to Brewhouse and Cinder levels because of roof fall
 1844 – DXFC/8/2 Geddes proposed Heads of agreement for new lease
 1848/9 – DG/E/8/13. Inventory of 1848-9. Ffos y fran No 1 engine taken down (p34), list of drams (p36), list of rails and plates (p38), plates raised from mines in march/april 1848 – has list of mines, account of plates melted (p45)
 1855. DG-P-39 Habakkuk plan of seams etc. Shows the two Soap Vein Pits 1/5/55
 1857 – DGP/1/63 Cwmbargoed pits and junction 28 Oct. 1857
 1859 - DG E 8-127 inventory of Penydarren, DG E 8-134 inventory of Penydarren drams and source to Dowlais (e.g. 1,2,4,6,7 pits and FyF level), DG E 8-150 and 151 inventory of mine July 1858 and 1859
 1860 - 27/9/60 Lease Boundary plan

Captions

Figure 1. Cast beam. Cat. No. 5.

Figure 2: Thickness v width for bar iron fragments.

Figure 3. Fastenings. Cat. Nos. 306, 472, 659, 660, 676.

Figure 4. Fastenings. Cat. Nos 685, 688, 695, 698, 721, 724.

Figure 5: Comparison of examples of dram types 1-8.

Figure 6: Construction of dram types 2, 4 and 7.

Figure 7: Comparison of dram wheel types a, b1, b2, b3, c and d.

Figure 8. Dram components. Cat. Nos 759, 765.

Figure 9. Dram couplings. Cat. Nos 782, 784, 786, 788.

Figure 10: Cast iron plates. Cat. Nos 795, 796, 798, 800, 803, 807.

Figure 11: Special plates. Cat. Nos 833, 835.

Figure 12: Iron Sills. Cat. Nos 839, 840, 846, 847.

Figure 13: Chairs. Cat. Nos 858, 859, 861, 862

Figure 14: Fishplates. Cat. Nos 867, 877, 883.

Figure 15: Chains and hooks. Cat. Nos 890, 890, 895, 896, 918, 919, 930, 931.

Figure 16: Horse & harness. Cat. Nos 949, 950, 951, 952, 953, 954, 955, 956, 957, 958.

Figure 17: Tools: Cat. Nos. 1006, 1009, 1022, 1030, 1052, 1017, 1042

Figure 18. Lengths in mm of the prise bars (Cat. Nos. 1016-1042)

Figure 19. Width in mm of the prise bars (Cat. Nos. 1016-1042). Blue colour indicates square-sectioned bars and black indicates round bars.

Figure 20: Tools. Cat. Nos 1068, 1075, 1093.

Figure 21: Tools. Cat. Nos. 1101, 1102, 1103, 1104, 1105, 1106.

Figure 22: Tools. Cat. Nos 1107, 1108.

Figure 23: Tools. Cat. Nos 1110, 1110, 1117, 1122, 1124, 1125.

Figure 24: Tools. Cat. Nos 1130, 1131

Figure 25: Tools. Cat. Nos 1133, 1134, 1135, 1137, 1138, 1142.

Figure 26: Boiler plate. Cat. Nos 1152, 1156, 1167, 1171.

Figure 27: Domestic vessels. Cat. Nos 1324, 1325.

Figure 28: Personal. Cat. Nos 1351, 1356, 1366, 1371.

Figure 29: Miscellaneous. Cat. Nos 1387, 1389, 1449

dram type	cat. no.	bush type	wheel types						length	spine	straps	top side	top end	sill	side bars	floor
			a	b1	b2	d	b3	c								
1	729	i	2							?	?	?	wood	wood?	wood?	
1	730	i	4							?	?	?	wood	wood?	wood?	
2	733	ii	1	3				1360		3	plain bar	plain bar	bar	3 bars	spine + 2 bars	
2	732	ii		4				1400		3	plain bar	?	bar	3 bars	spine + 2 bars	
3	1515	iii	2					1560		3	plain bar	round bar	angle	3 bars	sheet	
4	731	iii			4			1520		3	?	?	angle	3 bars	sheet	
4	734	iii			2					3	-' outwards	-' outwards	angle	3 bars	sheet	
4	735	iii			4			1530	1650	3	?	?	angle	3 bars	sheet	
4	736	iii			4				1650	3	-' outwards	-' outwards	angle	3 bars	sheet	
4	1518	iii			3	1		1530		3	-' outwards	-' outwards	angle	3 bars	sheet	
5	740	iv			2	2			1650	3	?	?	angle	sheet	sheet	
6	1514	v					4	1550		4	-' outwards	-' outwards	angle	150mm sheet	150mm sheets	
6	737	v			3				1650	4	-' outwards	-' outwards	angle	150mm sheet	sheet	
6	1520	v			1			1520		4	-' outwards	-' outwards	angle	150mm sheet	sheet	
6	739	?						1500	1650	4	-' outwards	-' outwards	angle	150mm sheet	sheet	
6	1517	v							1640	4	-' inwards	-' outwards	angle	150mm sheet	sheet	
7	738	vi							1650	4	?	?	angle	210 mm sheet	sheet	
7	1519	vi							1670	4	-' inwards	-' outwards	angle	200 mm sheet	sheet	
7	1521	vi							1680	4	-' inwards	-' outwards	angle	200 mm sheet	sheet	
8	1516	vi						1310		4	-' inwards	?	angle	200mm sheet	sheet	

Table 1: Characteristics of dram examples and types

130	Iron Trams for hauling mine to kilns	40/-	
18	d. for Red Ore		"
11	Wood Trams for d.	35/-	
700	Coal Trams		40/-
84	Rubbish Trams		30/-
14	Small Iron Trams		
75	Limestone Trams	40/-	
328	Large Wood Trams	20/-	
526	Small Wood do.		14/-
29	Iron Trams		40/-
8	Small Iron Trams		

Table 2. Inventory with valuation for Penyardren Ironworks drams, 1858/9; extracted from GRO D/D G/E8/127 folio 1.

	Iron Coal Trams	Iron Tub Trams	Iron Mine Trams	Large Wooden Mine Trams	Small Wooden Mine Trams
In No 1 Bargoed Pit	146	12			
In No 2 Bargoed Pit	115	15			
On top of Nos 1 & 2 Bargoed Pits	83	10			
In & about Rhas Las Pit	94	15			
On top of Penydarren Incline	224	8		30	3
At Cosletts Mine Pit	11				96
At small incline	6				
At No2 Mine Pit	6			56	
" No 1 & 7 Mine Pit	44	5		79	
" No 6 " "					117
" Black Pin Level		2		19	31
" Ffosyfrane Level	6	2			
" No 4 Mine Pit				15	8
" No 7 " "	16	4	31	69	2
<i>Totals</i>	<i>751</i>	<i>73</i>	<i>31</i>	<i>268</i>	<i>257</i>

Table 3: Inventory of Penydarran Coal and Mine Trams taken to by the Dowlais Iron Company on the 1st June 1859 (GRO D/D G/E8/134).

	Underground	Pit 1	Pit 2	Pit 4	Soap Vein Pit	Settlement	Longtown	Brickworks	Total
Mandrel (1)	1					5	1		7
Mandrel (2)	1	1				4			8
Sledges	2					3			6
Wedges		4		1	22	4			36
Bar – prise/chisel	2	25		4	4	8	1		48
Bar - gad	2	3							6
Borer						1			1
Rock drill	1								1
Shovels						2		1	
Blacksmiths'		8				3			11
Other	1	3				4			10

Table 4: Summary of tools in the metalwork assemblage by site.

Pit 1: 1818? 1820, 1825 c.1830, 1848, 1859, working? 1873	(c. 1815/20 – 1873)
Pit 2: 1825 c.1830, 1848 1859 working? 1873	(c. 1820/5 – 1873)
Pit 3: 1825 c. 1830	(c. 1820/5 – c.1834)
Pit 4: rerouted tramway 1834 indicates start? 1848, 1859 working? 1873	(c. 1834 – 1873)
Pit 5: 1848, 1859	(c. 1840 – c.1860)
Pit 6: 1859 working? 1873	(c. 1850 – 1873)
Pit 7: lies on Dowlais side of original lease – so post-1848, 1859 working? 1873	(c. 1850 – 1873)
No 8: Coslett's Pit 1859	(c. 1850 – c.1860)

Table 5: Summary of dates of evidence for operation of the mines of the Nant-y-bwch area

Figure 1



Cat. No. 5

Figure 2

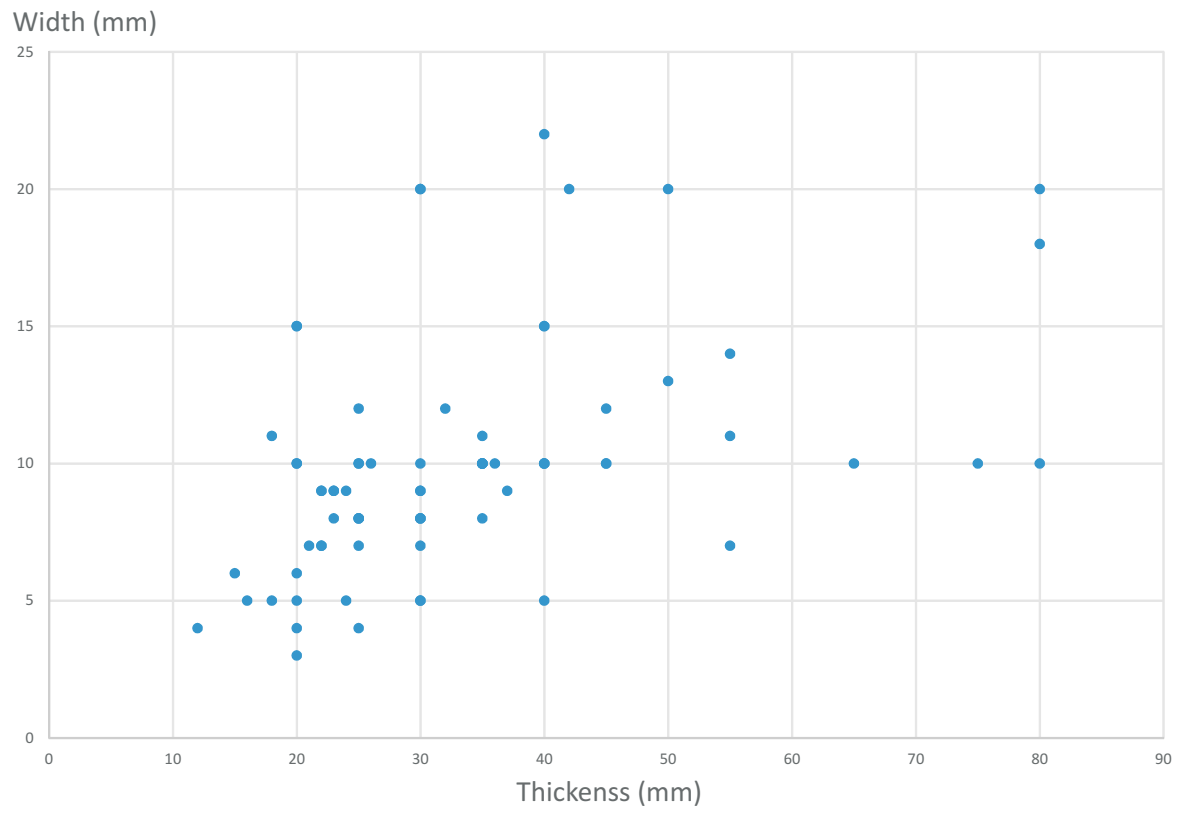


Figure 3

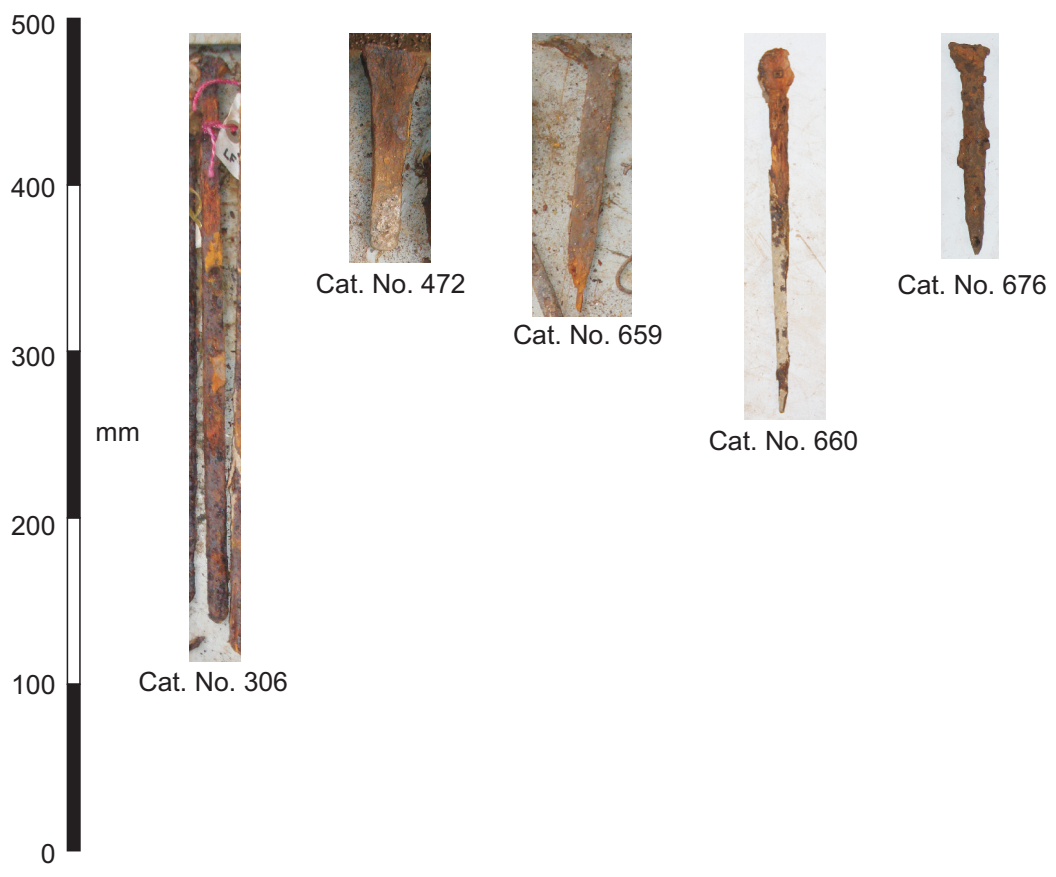


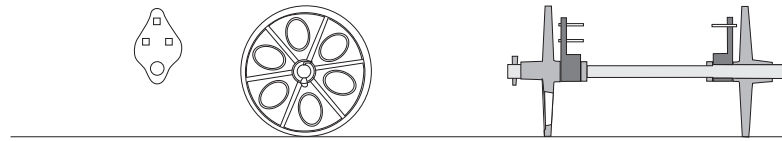
Figure 4



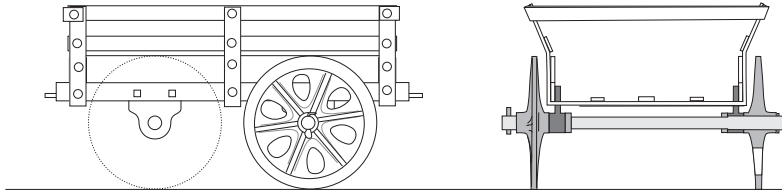
Figure 5



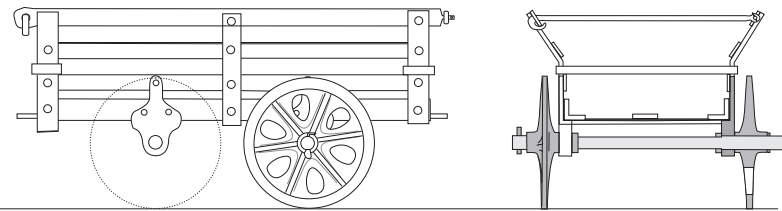
TYPE 1
Cat No. 729



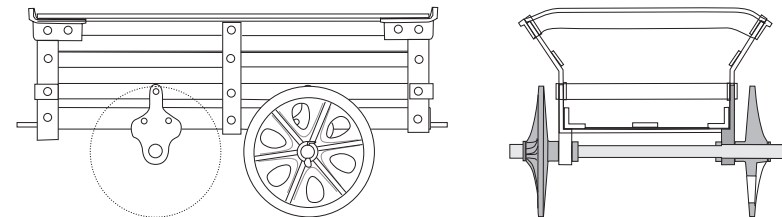
TYPE 2
Cat No. 733



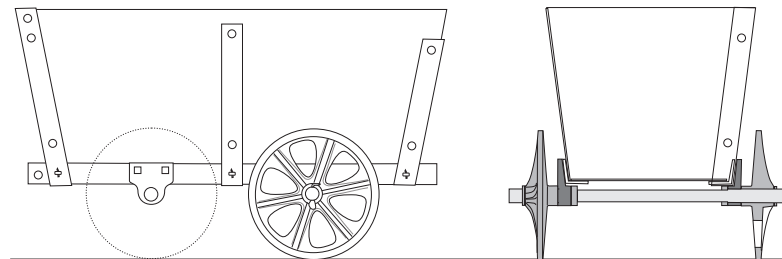
TYPE 3
Cat No. 1515



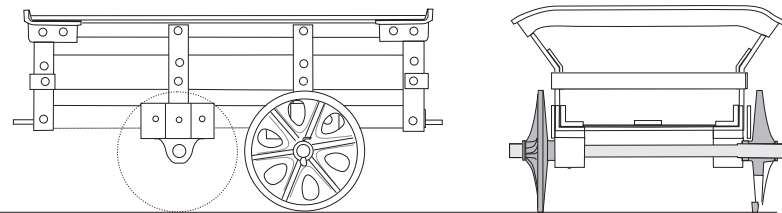
TYPE 4
Cat No. 734



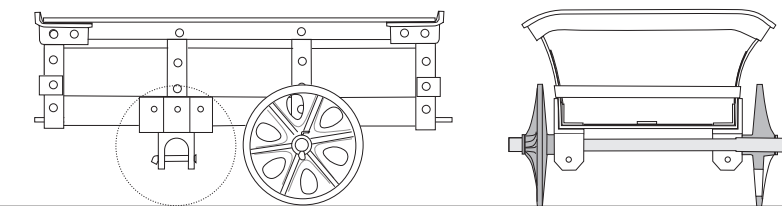
TYPE 5
Cat No. 740



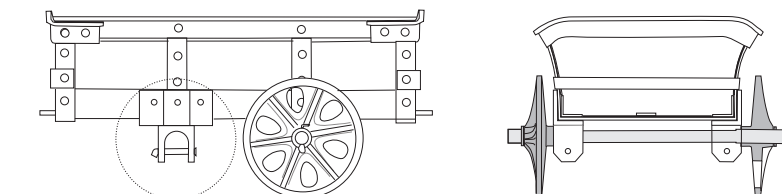
TYPE 6
Cat No. 737



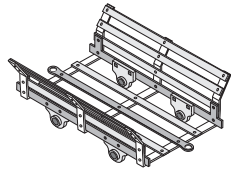
TYPE 7
Cat No. 1521



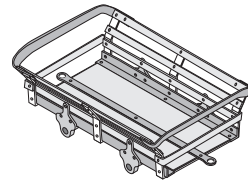
TYPE 8
Cat No. 1516



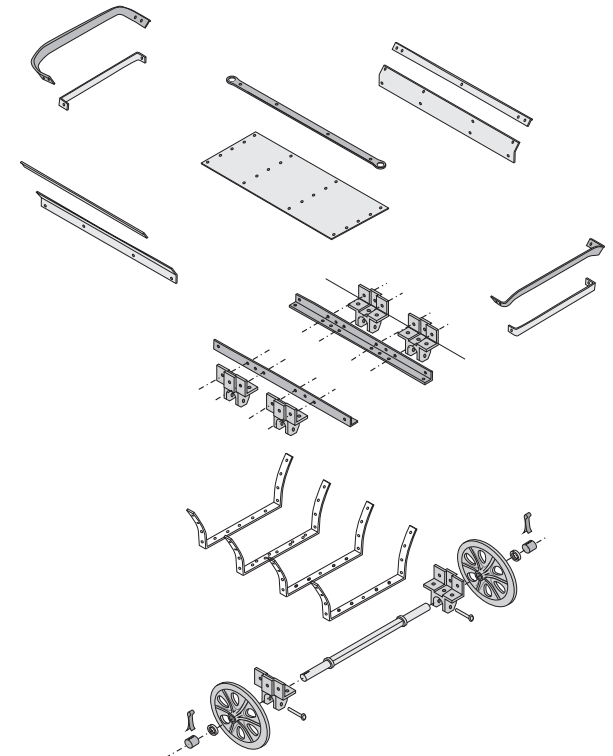
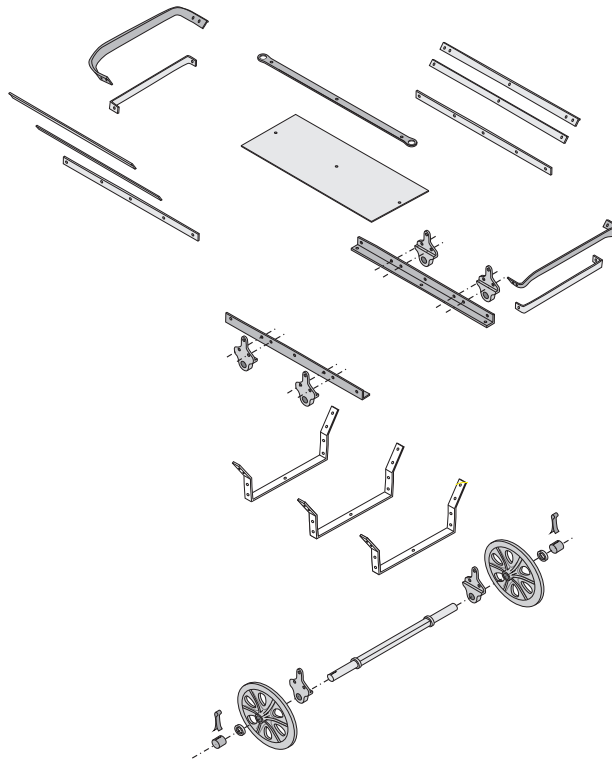
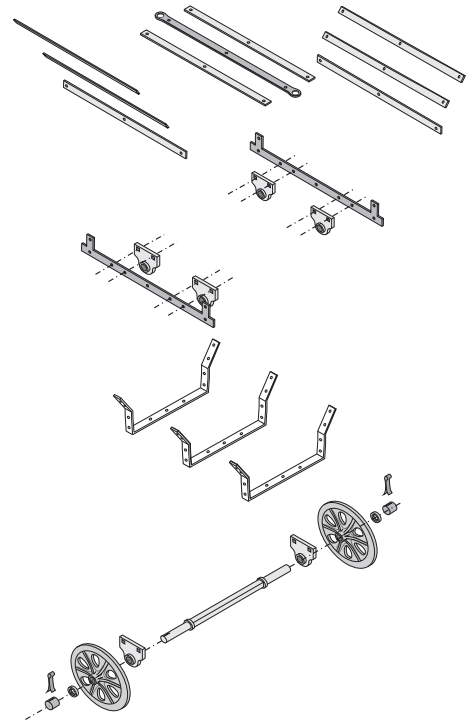
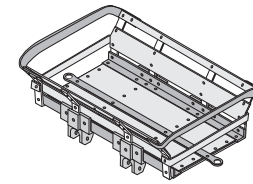
Type 2



Type 4



Type 7



1m

Figure 7



Type a (Cat. No. 729)



Type b1 (Cat. No. 732)



Type b2 (Cat. No. 737)



Type b3 (Cat. No. 1517)

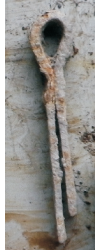


Type c (Cat. No. 738)



Type b2 (right) & Type d (left) (Cat. No. 740)

Figure 8

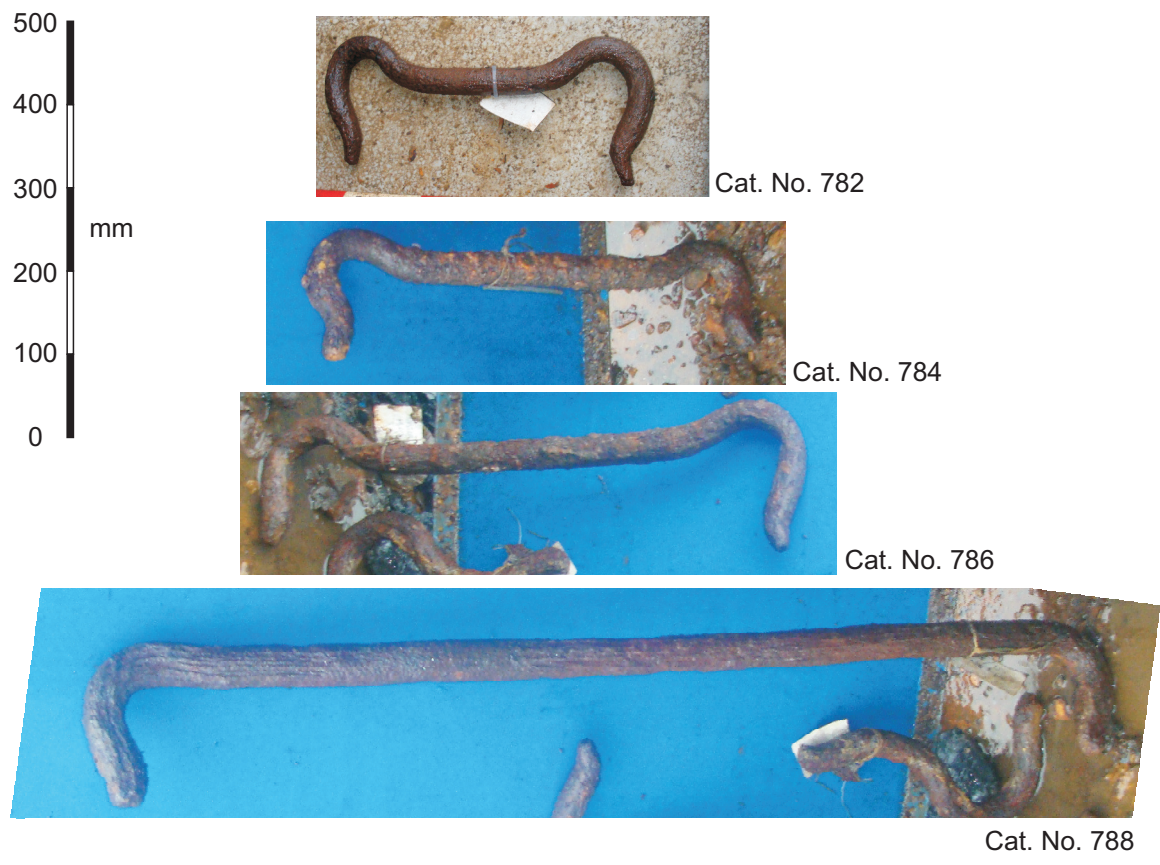


Cat. No. 759



Cat. No. 765

Figure 9



1m



Cat. No. 795



Cat. No. 796



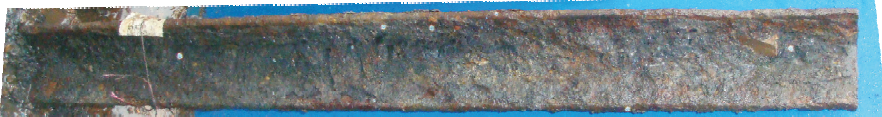
Cat. No. 798



Cat. No. 800



Cat. No. 803



Cat. No. 807

1m



Cat. No. 833



Cat. No. 835

1m



Cat. No. 839



Cat. No. 840



Cat. No. 846



Cat. No. 847

500mm



Cat. No. 858



Cat. No. 859



Cat. No. 861



Cat. No. 862

500mm



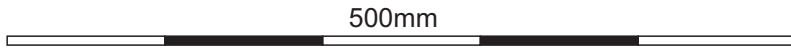
Cat. No. 867



Cat. No. 877



Cat. No. 883



Cat. No. 890



Cat. No. 895



Cat. No. 896



Cat. No. 918



Cat. No. 919



Cat. No. 930



Cat. No. 931

500mm



Cat. No. 949



Cat. No. 950



Cat. No. 951



Cat. No. 952



Cat. No. 953



Cat. No. 954



Cat. No. 955



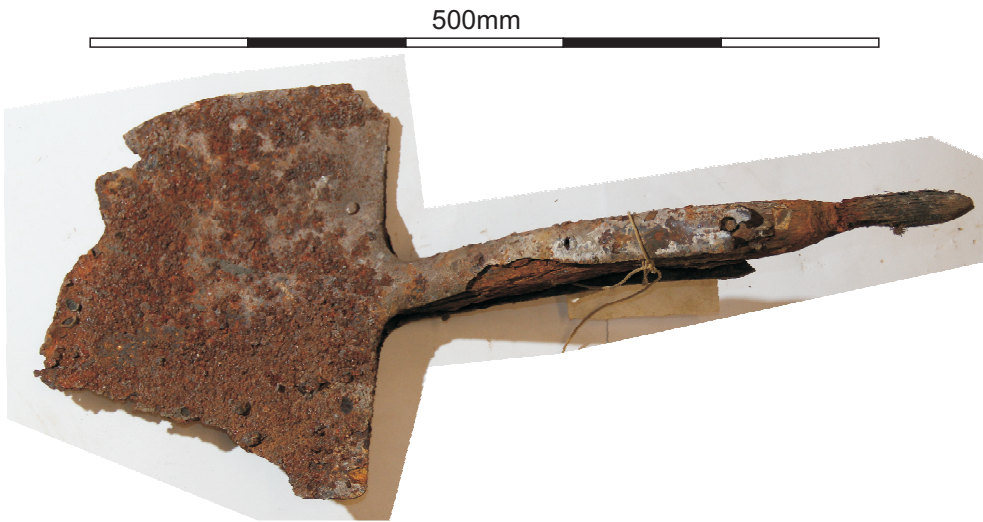
Cat. No. 956



Cat. No. 957



Cat. No. 958



Cat. No.1006



Cat. No.1009



Cat. No.1022



Cat. No.1030



Cat. No.1052



Cat. No.1017



Cat. No.1042 (scale 50% compared to other parts of figure)

Figure 18

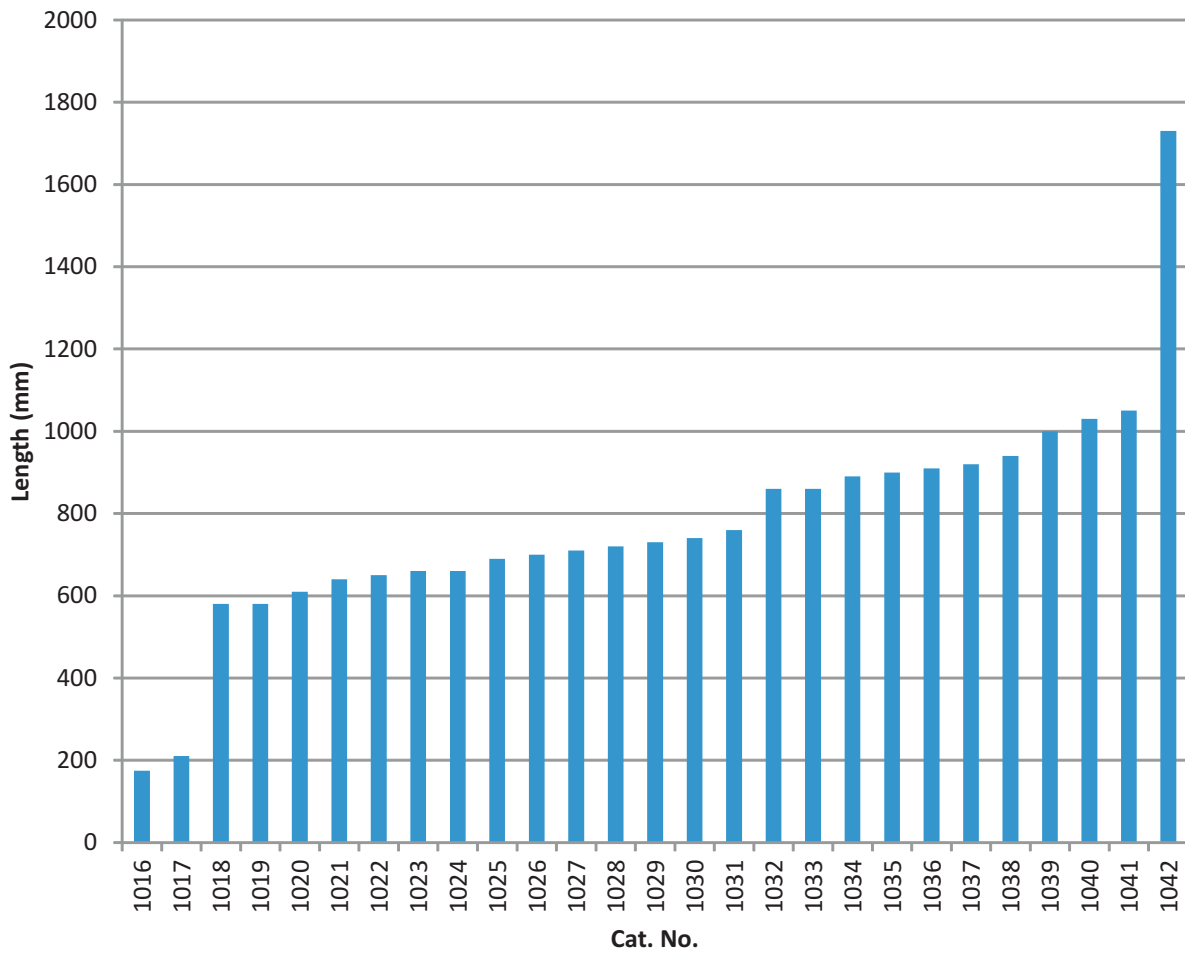
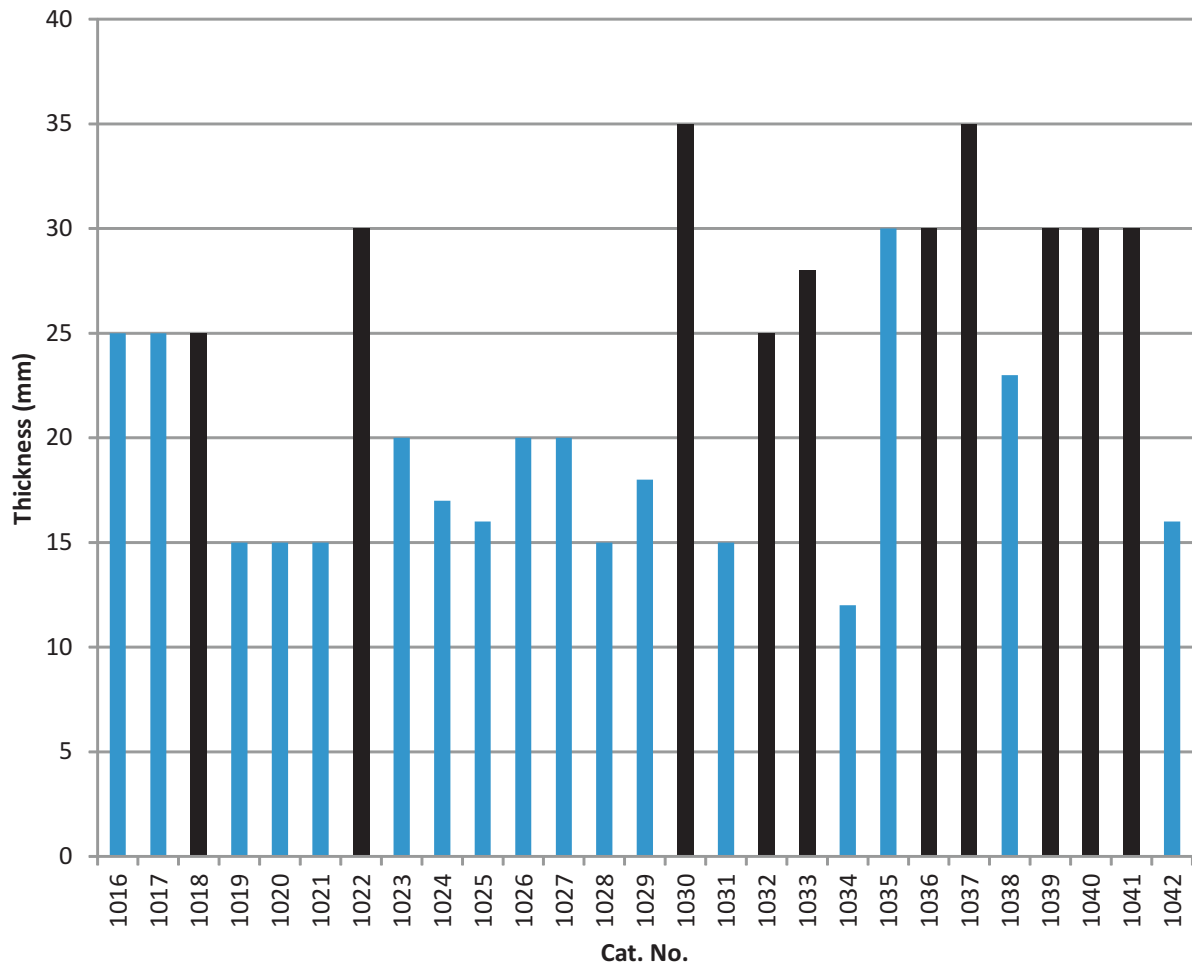
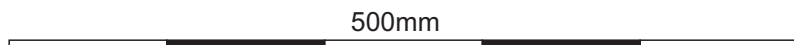


Figure 19





Cat. No.1068



Cat. No.1075



Cat. No.1093

500mm



Cat. No.1101



Cat. No.1102



Cat. No.1103



Cat. No.1104



Cat. No.1105



Cat. No.1106



Figure 22

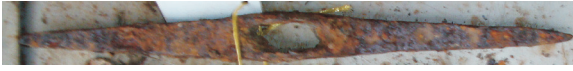
Cat. No.1107



Cat. No.1108



500mm



Cat. No.1110



Cat. No.1111



Cat. No.1117



Cat. No.1122

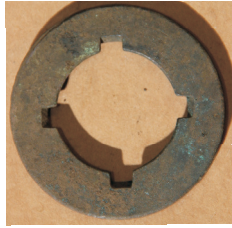


Cat. No.1124



Cat. No.1125

200mm



Cat. No.1130



Cat. No.1131

500mm



Cat. No.1133



Cat. No.1134



Cat. No.1135



Cat. No.1137



Cat. No.1138



Cat. No.1142



Cat. No.1152



Cat. No.1156



Cat. No.1167



Cat. No.1171

100mm



Cat. No.1351



Cat. No.1356



Cat. No.1366



Cat. No.1371

500mm



Cat. No.1387



Cat. No.1389



Cat. No.1449

Cat. No.	description	context	Location	photo	Status	Draw?
----------	-------------	---------	----------	-------	--------	-------

94

Stock materials and related items

Cast

bars

1	cast bar, 121cm x 6cm x 7cm, small casting mark (vent/sprue?) just off centre	no label	FyF	3118		
2	200x80x30mm fractured cast iron bar fragment	u/s	FyF	3150		
3	bar, cast, 130mm long 55x45mm section	6010	FyF	3322		
4	cast iron bar fragment, 130mm x 30mm x 14mm thick	6011	FyF	3332		

pigs/beams

5	large beam fragment, rectangular end piece, tall prism section, 103cm length, 10cm wide, 4cm top of prism, 10cm high, rectangular section 20.5 x 9cm at top 57.5kg	blank label	FyF	3119-20	drawing collection	draw
6	large beam fragment 96cm long, 10cm wide at top of rectangle, 10cm at base 3cm at top, 11cm high, rectangle 31cm long, 10.5cm at base of rectangle	blank label	FyF	3121	retained	
7	large beam fragment 85cm long, 11cm wide, 3cm top, 11.5cm tall, 20cm long rectangular section, 9cm wide at top 10.5cm at base, 53.5kg	blank label	FyF	3122	retained	
8	42kg beam fragment with rectangular end	no label	FyF	3309		

plates

10	cast iron plate - 1 narrow end broken	pit 1	FyF	3074		
39	cast iron plate fragment 49x22x1.5cm no original edges	pit 1 u/s	FyF	3175		
40	cast iron plate fragment, just corner of plate 360x400x15mm	pit 1 u/s	FyF	3176		
43	plate fragment slightly curved, cast iron, deeply pitted surface, curved edge	blank label	FyF	3308		
44	cast iron sheet with very irregular cut margin	blank label	FyF	3308		
45	cast iron plate fragment c. 90mm x 120mm x 20mm	6010	FyF	3322		
46	cast iron plate fragment, triangular, 270x110x37mm thick, one original long straight edge	6036	FyF	3335		
23	185mm x 115mm x 18mm corner broken from cast iron plate	214 settlement	boxes	8,9	boxes	
9	cast iron plate, 320mm x 210mm x 20mm rather irregular plate corner fragment	pit 4 u/s	FyF	3435		
17	cast iron plate - 1.02m x 23cm x 3cm thick - broken not original length	label blank	FyF	3081		
19	cast iron plate - 80cm surviving length, 23cm wide, 30mm thick	no label	FyF	3087		
20	cast iron plate - narrow end broken, 81cm surviving length, 23cm wide, 3cm thick	no label	FyF	3089		
36	cast iron plate - slightly curved, rectangular in plan, 104cm x 23cm wide x 5cm deep,	blank label	FyF	3123		
47	cast iron plate, 1030mm x 230mm x 20mm	175	FyF	550 (28)		
28	cast iron plate - 2.13m x 23cm wide x 3cm thick	blank label	FyF	3098		
25	250mm x 200mm (surviving) x 12mm, end of narrow thin cast iron plate	214 settlement	boxes	8,9	boxes	
41	410mm x 250mm x 7mm, cast iron plate broken across its narrow width	settlement t1 (f37)	FyF	3302		
38	cast iron plate - 181x31x4cm	blank label	FyF	3125		
42	470mm x 380m x 13mm, plate broken across its narrow width	373 f32	FyF	3302		
14	cast iron plate - delaminating, irregular fragment 83cm x 45cm x 1.5cm	label blank	FyF	3078		
15	cast iron plate - irregular plate fragment 77cm x 55cm x 2.5cm	pit	FyF	3079		
12	cast iron plate - 1.07m surviving length, 60cm wide x 20mm thick. Break rounded so probably old	label blank	FyF	3076		
16	cast iron plate - width 60cm, surviving length 55cm, 2cm thick	no label	FyF	3080		
18	cast iron plate - 60cm wide, 56cm surviving length, 2.5cm thick	no label	FyF	3086		
31	cast iron plate - complete, 1.21mx0.60mx2.5cm thick	blank label	FyF	3102		
34	cast iron plate - complete, 121cm long by 60cm wide x 3cm thick	blank label	FyF	3115-6		
35	cast iron plate - complete, 121cm long by 60cm wide x 2.5cm thick	blank label	FyF	3117		
11	cast iron plate - apparently the other half of item 2, overall dimension 181 long x 60cm wide x 20mm thick	label blank	FyF	3075		
32	cast iron plate - 61cm wide, 110cm surviving length, 2cm thickness	blank label	FyF	3113		
37	cast iron plate - complete except for missing corner, 122x62x2.5cm	blank label	FyF	3124		
29	cast iron plate - 1.61m x 0.63 wide and 2.5cm thick	blank label	FyF	3099		
33	cast iron plate - very irregular break, 108cm long 65cm wide 2cm thick, probably true dimensions	no label	FyF	3114		
22	cast iron plate - 1.07 broken length, 68cm broken width, 3cm thick	blank label	FyF	3091		
21	cast iron plate - broken length 71cm, broken width 69cm, thickness 3cm	blank label	FyF	3090		
13	cast iron plate - 70cm wide by 72cm surviving length, 25mm thick	label blank	FyF	3077		
30	cast iron plate - 0.91m broken x 0.7m x 0.03m. possible hole 2cm square, 5cm in from long and 6cm from short edge	blank label	FyF	3100-3101		
24	cast iron plate - 121cm, broken length 91cm x 3cm thick	no label	FyF	3093		
26	cast iron plate - 1.05m x 1.04m broken dimensions x 2.5cm thick	blank label	FyF	3094		
27	cast iron plate - 1.02m broken length, 1.25m width, 2cm thick, 40cm x 21cm surviving cut out starting from corner 41 cm	blank label	FyF	3097		

Wrought

half-round

48	D section bar, 280mm x 27mm x 15mm	6011	FyF	3334		
49	D section bar, as 610, 190mm long	6011	FyF	3334		
50	D section bar, as 610, 220mm long	6011	FyF	3334		
51	770mm long bar, 20mm wide, with concavo-convex section, bent	pit1 u/s	FyF	3299		
52	250mm w/ bar fragment - at least partially appears to be 25mm half round section	6002 kiln	boxes	45	boxes	

round

53	rod, fresh -?steel or galvanised, 90mm 5mm diameter	pt104 pit 1	boxes	72	boxes	
54	280mm length of 6mm rod possibly with nail wound around in concretion	175 t1 settlement	boxes	53	boxes	
55	7mm round rod 70mm long	182	boxes	54	boxes	
56	280mm long, 8mm diameter rod, one end concealed by accretion	u/s 063 (penydarren or pit1)	boxes	102	boxes	
57	round bar c8mm diameter, split on one end	u/s	boxes	46,47	boxes	
58	circular section bar, bent into semicircle, 270mm long, 14mm diameter	pit 4 u/s	FyF	3433		
59	bar 420mm long 15mm diameter	pit 1 u/s	FyF	3198		
60	w/ round bar 15mm diameter	pit1 u/s	FyF	3266		
61	w/ round bar 15mm diameter	pit1 u/s	FyF	3266		
62	round section bar 700mm long, 20mm diameter	6-300	FyF	545 (23)		
63	bar 250mm long 20mm diameter	pit 1 u/s	FyF	3198		
64	w/ round bar/rod 20mm	pit1 u/s	FyF	3265		
65	w/ round bar/rod 20mm	pit1 u/s	FyF	3265		
66	w/ round bar/rod 20mm	pit1 u/s	FyF	3265		
67	w/ round bar/rod 20mm	pit1 u/s	FyF	3266		
68	w/ round bar/rod 20mm	pit1 u/s	FyF	3266		
69	bar 250mm long, 23mm diameter	pit 1 u/s	FyF	3198		
70	round wrought rod - possibly similar to spud bars but no ends, 710mm long 25mm diameter	pit 4 u/s	FyF	3162		
71	round bar, 420mm long, bent, 25mm diameter,	439	FyF	3409		
72	circular sectioned bar fragment, 185mm long, 25mm diameter	pt 101	FyF	3439		
73	w/ round bar/rod 25mm	pit1 u/s	FyF	3265		
74	as above 30mm, possibly slightly burred end	pit1 u/s	FyF	3265		
75	w/ round bar/rod 40mm	pit1 u/s	FyF	3265		
76	very corroded iron rod c220mm long	c037 penydarren pit head	boxes	37,38,39	boxes	
77	iron rod scrap	6011	FyF	3332		
78	iron rod scrap	6011	FyF	3332		
79	highly accreted rod fragment 180mm long	175 t3 settlement u/s	boxes	69	boxes	
80	stout round rod fragment	pit 1 u/s	FyF	3220		
81	thin round rod fragment	pit 1 u/s	FyF	3220		

square

128	thin iron rod twisted	pit 1 u/s	FyF	3220		
82	6mm x 8mm bent bar 220mm long	u/s	boxes	46,47	boxes	
83	bar, 7mm square, 330mm long	u/s	FyF	3407		
84	100mm long 7mm square section rod	u/s	boxes	79	boxes	

Cat. No.	description	context	Location	photo	Status	Draw?
85	rod, square 7mm, length 520mm overall	191	FyF	3306		
86	bent square bar, 120mm long, 9mm section	u/s	boxes	79	boxes	
87	140mm x 10mm square section bar	pit 1 u/s	FyF	3197		
88	bent bar 400mm x 10mm square	pit1 u/s	FyF	3290		
89	iron rod 90mm long, 10mm square	6011	FyF	3327		
90	150x12mm square section	pit 1 u/s	FyF	3197		
91	square-sectioned bar, 295mm x 14mm square	212	FyF	3398		
92	square section bar, 75mm x 14mm section	175	FyF	3402		
93	square bar bent, 200mm long, 15mm square	pit 4 u/s	FyF	3433		
94	15mm square bar fragment	pit1 u/s	FyF	3276		
95	bar 14mm x 15mm x 290mm	u/s	boxes	46,47	boxes	
96	330mm x 15mm square section	pit 1 u/s	FyF	3197		
97	520mmx15mm square	pit 1 u/s	FyF	3197		
98	120x15mm square section	pit 1 u/s	FyF	3197		
99	330mm x 15mm square section	pit 1 u/s	FyF	3197		
100	square sectioned bar 310mm long, 15mm square	pit 4 u/s	FyF	3434		
101	square sectioned bar 330mm x 15mm square	4049	FyF	3436		
102	square sectioned bar 150mm long, 15mm square	pit 1 u/s	FyF	3440		
103	square bar section 350mm long, section 15mm	u/s overbridge	FyF	544 (22)		
105	730mm bar 15mm square	pit1 u/s	FyF	3291		
106	bar 620mm x 15mm square	533	FyF	3304		
119	630mm bar 15mm square	pit1 u/s	FyF	3291		
107	bar fragment, 480x15mm square	248	FyF	3383		
111	15mm square bar fragment	pit1 u/s	FyF	3276		
108	16mm square section	pit1 u/s	FyF	3277		
109	270mm bar, 16mm square	pit1 u/s	FyF	3290		
104	730mm bar 17mm square	pit1 u/s	FyF	3291		
112	18mm square section	pit1 u/s	FyF	3277		
110	700mm bar 20mm square	pit1 u/s	FyF	3291		
113	20mm square section	pit1 u/s	FyF	3276		
114	short square rod section, bent, 395mm, 20mm square	pit1 u/s	FyF	3296		
115	440x20mm square section bar	pit 1 u/s	FyF	3197		
116	260x20mm square section bar	pit 1 u/s	FyF	3197		
117	square sectioned bar 275mm long, 20mm square	pit 1 u/s	FyF	3440		
118	square bar, 390mm x 20mm square	pit1 u/s	FyF	3290		
120	350mm long, 20mm square bar	u/s	FyF	3373		
121	24mm square section	pit1 u/s	FyF	3276		
122	24mm square section	pit1 u/s	FyF	3277		
123	wrought bar 260mm long, 25mm square	6010	FyF	3322		
124	26mm square section	pit1 u/s	FyF	3277		
125	28mm square bar	pit1 u/s	FyF	3276		
126	30mm square section	pit1 u/s	FyF	3277		
127	square sectioned bar, tapering to one end, 820mmx30mm square	175	FyF	3304		
flat bar						
132	iron bar, 250mm x 12mm x 4mm	536	FyF	3395		
141	15mm x 6mm x 110mm corroded bar fragment	6009, u/s kiln 6003	boxes	50,51	boxes	
137	330mm x 16mm x 5mm bar	47	FyF	3410		
140	140mm x 18mm x 5mm corroded bar	pt 092 pit 1	boxes	94,95	boxes	
185	bar 100mm x 18mm x 11mm	45	FyF	3426		
129	275mm and 150mm fragments of iron bar, probably conjoining, 20mm wide, slightly narrower one end, c.3mm thick	T2 f020	boxes	5	boxes	
133	bar fragment, 150mm x 20mm x 4mm	pit 4 u/s	FyF	3432		
139	bar, 100mm x 20mm x 5mm	47	FyF	3412		
142	bar, 310mm x 20mm x 6mm	45	FyF	3423		
176	120mm x 20mm x 10mm bar	6010	FyF	3322		
177	120mm x 20mm x 10mm iron bar	sondage W of building settlement	FyF	3329		
195	tiny bar fragment, 130mm x 20mm x 15mm	6007	FyF	3320		
198	bar 140mm x 20mm x 35mm	pit 1 u/s	FyF	3200		
146	bar, 130mm x 21mm x 7mm	47	FyF	3412		
144	190mm x 22mm x 7mm bar	47	FyF	3410		
145	bar, 220mm x 24mm x 7mm	47	FyF	3412		
160	bar 90x22x9	44 f5	FyF	3427		
161	bar 160x22x9	44 f5	FyF	3427		
154	bar 210x23x8	44 f5	FyF	3427		
162	bar 150x23x9	44 f5	FyF	3427		
163	bar, 195mm x 23mm x 9mm	44	FyF	3428		
138	bar, 170mm x 24mm x 5mm	47	FyF	3412		
157	bar, 355mm x 24mm x 9mm	47	FyF	3412		
131	bar fragment, 125mm x 25mm x 4mm	175 T25 settlement	boxes	43,44	boxes	
148	bar, 160mm x 25mm x 7mm	44	FyF	3428		
150	bar 120mm x 25mm x 8mm	6011	FyF	3332		
151	bar 240mm x 25mm x 8mm	6012	FyF	3336		
155	bar, 130mm x 25mm x 8mm	44	FyF	3428		
168	bar fragment 25x250x10mm	u/s	FyF	3143/4		
178	bar, 400mm x 25mm x 10mm	6011	FyF	3334		
190	bar, 105mm x 25mm x 12mm	47	FyF	3412		
172	bar 630mm x 26mm x 10mm	pit1 u/s	FyF	3293		
134	bar fragment 230x30x5mm	u/s	FyF	3143/4		
136	80mm x 30mm x 5mm bar	sondage W of building settlement	FyF	3329		
143	200mm long, 30mm x 7mm section, bar	pit 1 u/s	FyF	3200		
149	30mm x 140mm x 8mm bar fragment in concretion	211 t1	boxes	88	boxes	
152	70mm x 30mm x 8mm bar iron fragment	214	FyF	3403		
153	bar, 310mm x 30mm x 8mm	45	FyF	3423		
158	bar, 330mm x 30mm x 9mm	47	FyF	3412		
159	bar, 225mm x 30mm x 9mm	45	FyF	3423		
166	iron bar 30x10x105mm	c037 penydarren pit head	boxes	37,38,39	boxes	
197	torn bar 140mm x 30mm x 20mm	181 t2 settlement	boxes	64	boxes	
199	bar 810mm, square section 20mm x 30mm	175	FyF	3303		
188	32mm x 170mm x 12mm bar	u/s	boxes	79	boxes	
156	170mm x 35mm x 8mm bar	44	FyF	3428		
165	bar fragment 23cm x 35mm wide x 10mm thick	u/s	FyF	3143/4		
169	iron bar 230x35x10mm	u/s	FyF	3150		
180	bar, 110mm x 35mm x 10mm	47	FyF	3412		
182	bar 250mm x 35mm x 10mm	45	FyF	3423		
184	80mm x 35mm x 10mm bar	44	FyF	3428		
186	bar, 220mm x 35mm x 11mm	38	FyF	3430		
175	bar 510x36x10mm	6012	FyF	3317/8		
135	bar, 245mm x 40mm x 5mm	pit 1 u/s	FyF	3200		
170	iron bar 110x40x10mm	u/s	FyF	3150		
171	bar, 240mm x 40mm x 10 mm	pit 1 u/s	FyF	3200		
181	wedge, 165mm x 40mm x 10mm	45	FyF	3423		
193	bent bar, 630mm overall length, 40x15mm section	376	FyF	3306		
194	bar, 500mm x 40mm x 15mm	6227	FyF	3317/8		
202	bar 1080mm, 40x22mm section	402	FyF	3306		
130	wrought iron bar formed into semicircle, 164cm diameter, bar 42x20mm	pit 1 u/s	FyF	3247		
167	bar fragment 100x45x10mm	u/s	FyF	3143/4		
173	bar, 480mm x 45mm x 10mm	6226	FyF	3316		
189	iron bar fragment, 200mm x 45mm x 12mm	pit1 u/s	FyF	3292		
191	bar with bent broken ends, 670mm x 50mm x 13mm	424	FyF	3304		
201	445mm x 50mm x 20mm bar	6007	FyF	3320		
204	poorly welded bar splitting down centre, 320mm x 50mm tapering to 35mm, 25mm thick	pit1 u/s	FyF	3294		

Cat. No.	description	context	Location	photo	Status	Draw?
147	110x55x7 plate or bar fragment	47	FyF	3412		
187	wrought bar 240mm x 55mm x 11mm	pit 1 u/s	FyF	3440		
192	125mm x 55mm x 14mm bar	44	FyF	3428		
174	bar 620mmx65x10mm	6012	FyF	3317/8		
183	bar 110mm x 75mm x 10mm	44	FyF	3428		
164	bar fragment, 80mm x 37mm x 9mm	pt020 u/s	FyF	3443		
179	bar 430mm x 80mm x 10mm simple broken one end	536	FyF	3390		
196	bar 470mm x 80mm x 18mm	6007	FyF	3312		
200	bar 550mm x 80mm x 20mm	pit1 u/s	FyF	3293		
203	30x25mm tapering bar	pit1 u/s	FyF	3276		
205	bar fragment	284 settlement T1	boxes	75	boxes	
206	bar fragment	pit 1 u/s	FyF	3206		
207	bar fragment	pit 1 u/s	FyF	3206		
208	bar fragment	pit 1 u/s	FyF	3206		
209	bar fragment	pit 1 u/s	FyF	3206		
210	bar fragment	pit 1 u/s	FyF	3206		
211	narrow bar scrap	175 settlement	boxes	76	boxes	
212	bar fragment	pit 1 u/s	FyF	3207		
213	narrow bar scrap	175 settlement	boxes	76	boxes	
214	bar fragment	pit 1 u/s	FyF	3207		
215	narrow bar scrap	175 settlement	boxes	76	boxes	
216	bar fragment	pit 1 u/s	FyF	3207		
217	rectangular flat wrought iron piece	pit 1 u/s	FyF	3208		
218	bar/rod fragment	pit 1 u/s	FyF	3209		
219	bar/rod fragment	pit 1 u/s	FyF	3209		
220	bar/rod fragment	pit 1 u/s	FyF	3209		
221	bar/rod fragment	pit 1 u/s	FyF	3209		
222	bar/rod fragment	pit 1 u/s	FyF	3209		
223	bar/rod fragment	pit 1 u/s	FyF	3209		
224	bar/rod fragment	pit 1 u/s	FyF	3209		
225	bar fragment with curved back	pit 1 u/s	FyF	3219		
226	small thick wrought iron bar fragment	pit 1 u/s	FyF	3220		
227	530mm x 60mm x 22mm iron bar delaminating along central weld fault	pit1 u/s	FyF	3275		
228	iron bar/rod fragment, 70mm long	175	FyF	3392		
229	iron bar/rod fragment, 70mm long	175	FyF	3392		
230	9 pieces of sheet and bar - all wi	u/s	FyF	3151/52		
231	small curved bar fragment	881 t2	boxes	100	boxes	

FASTENINGS

carriage bolts

232	95mm long carriage bolt, 35mm threaded, 14mm diameter, shank 80mm long in total, of which top 17mm is 15mm square, head 32mm diamter, 12mm high, slightly flared at base	175		boxes	78	boxes
233	110mm long carriage bolt, threading seen over 10mm, 8mm diameter, 9mm square for 12mm below head, head overall 23mm x 18mm low dome	u/s		boxes	79	boxes
234	105mm long carriage bolt - very badly decomposed	u/s 063 (penydarren or pit1)	boxes	102	boxes	
235	carriage bolt, 110mm long, round head, square nuts 35mm approx. square, round head 35mm, square section below head 10mm long, plain circular 30mm	6010	FyF	3322		
236	carriage bolt, 110mm long, round head, square nuts 35mm approx. square, round head 35mm, square section below head 10mm long, plain circular 31mm	6010	FyF	3322		
237	carriage bolt, 110mm long, round head, square nuts 35mm approx. square, round head 35mm, square section below head 10mm long, plain circular 32mm	6010	FyF	3322		
238	round headed bolt with nut, probably carriage bolt, 120mm long, nut 30mm square, head 35mm diameter, 10mm square, shaft 18mm diameter	6011	FyF	3333		
239	round headed bolt with nut, probably carriage bolt, 120mm long, nut 30mm square, head 35mm diameter, 10mm square, shaft 18mm diameter	6011	FyF	3333		
240	round headed bolt with nut, probably carriage bolt, 120mm long, nut 30mm square, head 35mm diameter, 10mm square, shaft 18mm diameter	6011	FyF	3333		
241	carriage bolt as before no nut	6011	FyF	3333		
242	domed bolt head, 37mm diameter head	no label	FyF	3168		
243	round headed domed bolt, 80mm long, 10mm diameter, 40mm threaded, head 25mm round	no 1 pit channel between 70/66/i	FyF	3437		
244	large carriage bolt, overall 190mm long, threaded section 75mm long, circular 45mm, square 40mm, head 25mm, head 75mm x 75mm faceted upper edge, diameter of shaft 30mm, square section 45mm	pt063	FyF	537		
245	circular headed bolt	pit 1 u/s	FyF	3214		
246	circular headed bolt	pit 1 u/s	FyF	3214		
247	circular headed bolt	pit 1 u/s	FyF	3214		
248	circular headed bolt	pit 1 u/s	FyF	3214		
249	circular headed bolt	pit 1 u/s	FyF	3214		
250	circular headed bolt	pit 1 u/s	FyF	3214		
251	circular headed bolt	pit 1 u/s	FyF	3214		
252	circular headed bolt	pit 1 u/s	FyF	3214		
253	circular headed bolt	pit 1 u/s	FyF	3215		
254	fragmentary remains of bolt 100mm long, 25mm long square section of 15mm, then circular section 70mm long and 12mm diameter	pit 1 u/s	FyF	3440		

carriage bolts (square heads)

255	carriage bolt, 25mm square head, square section on upper shaft, some threading preserved, 80mm long, badly corroded	175	FyF	3392		
256	long carriage bolt, 140mm long 80mm square, 6mm round, square head 25mm, threaded part 15mm	175	FyF	3399		
257	square headed carriage bolt, 147mm long, 35mm x 35mm x 7mm head, upper shaft 16mm square, lower 67mm 15mm diameter	570 settlement	boxes	92	boxes	
258	square headed carriage bolt 75mm long, square section 20mm long, round 40mm long, 20mm of that threaded, square head 37mm square, square section 15mm square, round 15mm diameter	pit 4 u/s	FyF	3433		
259	square headed bolt 175mm long, 18mm diameter, 15mm threaded, head 35mm and 10mm thick, carriage bolt, square section 20mm and 20mm long	pit 4 u/s	FyF	3433		
260	square headed bolt, 100mm, 60mm of this circular, 20 square, threaded diameter 22mm, head 45mm square and 15mm thick	pit 4 u/s	FyF	3434		
261	square headed square sectioned spike, 25mm square head, 15mm below, 140mm long, last 20mm before fracture may be rounded - so possibly bolt?	424 settlement	boxes	85/86	boxes	
262	square headed bolt, 115mm long, 30mm head, nut 35mm squarish, 10mm square section below head	6010	FyF	3322		
263	square headed bolt, 115mm long, 30mm head, nut 35mm squarish, 10mm square section below head	6010	FyF	3322		
264	square headed bolt, 115mm long, 30mm head, nut 35mm squarish, 10mm square section below head	6010	FyF	3322		

other round-headed bolts

265	threaded round headed bolt, 90mm long, section 7mm diameter, head diameter 19mm	u/s	FyF	3407		
266	large round headed bolt, 100mm long, head diameter 45mm, corroded,	6010	FyF	3322		
267	large round headed bolt, 110mm long, head diameter 55mm head, not normal carriage bolt - has one single corner of the normal square section	6010	FyF	3322		
268	large round headed bolt, 110mm long, head diameter 45mm head, not carriage bolt	6010	FyF	3322		
269	highly accreted - probably round headed bolt fragment 150mm long	175 t3 settlement u/s	boxes	69	boxes	
270	corroded round headed bolt, 80mm long	ige W of building settlement area	FyF	3329		
271	round headed long bolt fragment	6011	FyF	3332		
272	round headed long bolt fragment	6011	FyF	3332		
273	round headed long bolt fragment	6011	FyF	3332		
274	round headed long bolt fragment	6011	FyF	3332		
275	round headed long bolt fragment	6011	FyF	3332		

Cat. No.	description	context	Location	photo	Status	Draw?
276	round headed long bolt fragment	6011	FyF	3332		
277	rounded head bolt (not carriage)	6011	FyF	3333		
278	rounded head bolt (not carriage)	6011	FyF	3333		
279	rounded head bolt (not carriage)	6011	FyF	3333		
280	Round headed long bolt, fragment 215mm long, 17mm diameter, corroded so head uncertain - maybe round head 30mm diameter	6011	FyF	3333		
281	430mm long, 10mm diameter rod with small 17mm round head on one end	pit1 u/s	FyF	3278		
282	round headed bolt like object, 180mm long, 12mm diameter, head 30mm, no threading seen	175	FyF	3399		
283	square section rod or bolt 100mm surviving length, round flat head, 32mm diameter	u/s	FyF	3372		
transverse-headed bolts						
284	poorly preserved triangular/mushroom headed bolt, 265mm preserved, 12mm diameter	u/s	boxes	79	boxes	
285	long rod-like bolt, but only threaded section preserved, round section 10mm, head 22mm, overall 265mm	175	FyF	3392		
286	square section mushroom/triangular head, 120mm surviving, 15mm square section, 30mm long across base of head	pit 4 u/s	FyF	3432		
287	triangular headed bolt fragment 140mm surviving, very corroded	pit 4 u/s	FyF	3434		
288	triangular/mushroom headed rod fragment, faceted just below head but otherwise circular, 150mm long, 14 diameter, 40mm x20mm head	pit 4 u/s	FyF	3432		
289	square bar, with remains of triangular head, 220mm surviving, 15mm square section, 27mm wide remains of head	pit 4 u/s	FyF	3433		
290	bolt fragment 150mm long, square 15mm square, round 15mm diameter	pit 4 u/s	FyF	3434		
291	triangular headed nail or bolt with length 280mm, 15mm square nut/rove 25x30mmx15mm thick	pit 1 u/s	FyF	3185/6		
292	triangular headed nail or bolt , 210 length, 16mm diameter, head 40mm wide, thickness 15mm, broken before nut	pit 1 u/s	FyF	3185/6		
293	triangular headed nail or bolt , 265mm long, 15mm square, nut 30mm square, 15mm thick	pit 1 u/s	FyF	3185/6		
294	very highly degraded bolt with mushroom/triangular head 210mm long, 17mm diameter on thread	pit 4 u/s	FyF	3432		
295	mushroom/triangular headed bolt/spike 275mm long, 14mm square section 185mm long, turning circular 15mm diameter, threaded seen from 50mm at base, head 35mm wide headx15mm.	175	FyF	3402		
296	long bolt, upper part missing, lower 220mm long, 11mm diameter, square nut 27mm, x 6mm thick	175	FyF	3402		
297	triangular-headed threaded nail	pit 1 u/s	FyF	3216	retained	
298	triangular headed bolt with threaded end, 720mm long, 15mm square section, 30mm square ?nut on end	pit1 u/s	FyF	3269		
299	triangular headed bolt with threaded end, 640mm long, 14mm square section 3cm square nut and 55mm square washer	pit1 u/s	FyF	3269		
300	triangular headed bolt with threaded end, 535mm long, 16cm square section, 31mm square nut, circular washer c35mm below	pit1 u/s	FyF	3269		
301	triangular headed bolt with stout round section, 21mm diameter, 37cm surviving length	pit1 u/s	FyF	3270		
302	triangular headed bolt, 520mm long 15mm square section with distal end missing	pit1 u/s	FyF	3270		
303	triangular headed bolt, 300mm surviving, 15mm square section	pit1 u/s	FyF	3270		
304	triangular headed bolt, 540mm surviving, 15mm square section	pit1 u/s	FyF	3270		
305	triangular headed bolt with threaded end, 530mm, 15mm square section	pit1 u/s	FyF	3270	retained	
306	triangular headed rod, 350mm, square section 10mm, head maximum width 25mm symmetrical	440 f50	FyF	3373	drawing collection	draw
307	square sectioned bolt with flattened nail like head	u/s	FyF	3156/7	retained	
308	square sectioned bolt with flattened nail like head, nut surviving (this example kept)	u/s	FyF	3156/7	retained	
square headed bolts						
309	long bolt 290mm long, 16mm diameter, head square 30mm, 15mm thick	longtown area e 001	FyF	544 (22)		
310	bolt through sheet fragment; 130mm long bolt 11mm diameter, probably square head c. 20mm	pit1 u/s	FyF	3298		
311	square headed bolts	pit 1 u/s	FyF	3210		
312	square headed bolts	pit 1 u/s	FyF	3210		
313	square headed bolts	pit 1 u/s	FyF	3210		
314	square headed bolts	pit 1 u/s	FyF	3210		
315	square headed bolts	pit 1 u/s	FyF	3210		
316	square headed bolts	pit 1 u/s	FyF	3210		
317	square headed bolts	pit 1 u/s	FyF	3210		
318	square headed bolts	pit 1 u/s	FyF	3210		
319	square headed bolts	pit 1 u/s	FyF	3210		
320	square headed bolts	pit 1 u/s	FyF	3211		
321	square headed bolts	pit 1 u/s	FyF	3211		
322	square headed bolts	pit 1 u/s	FyF	3211		
323	square headed bolts	pit 1 u/s	FyF	3211		
324	square headed bolts	pit 1 u/s	FyF	3211		
325	square headed bolts	pit 1 u/s	FyF	3211		
326	square headed bolts	pit 1 u/s	FyF	3212		
327	nut and bolt, square head 27mm x 25mm x 7mm, sides slightly sloped, bolt length c140mm and shaft 16mm diameter, 35mm length threaded; 30mm square nut, 18mm thick, hole appears to be 14mm diameter	u/s 063 (penydarren or pit1)	boxes	102	boxes	
328	slightly domed square head from bolt, head 45mm, shank 22mm	c037 penydarren pit head	boxes	37,38,39	boxes	
329	square headed bolt, 35mm head, 15mm thick, on 20mm shank, threaded to within 30mm of head, 115mm length overall	c037 penydarren pit head	boxes	37,38,39	boxes	
330	square headed bolt, 28mm head, 12mm thick, diameter 17mm, 155mm length overall	175 T25 settlement	boxes	43,44	boxes	
331	large bolt, bent at distal end and fractured, length 180mm preserved, diameter 20mm, head 30mm square, 7mm thick	175	FyF	3392		
332	square headed bolt fragment, 80mm long, threaded part 30mm, square head 40mm square, domed head, circular section 20mm all of shaft	47	FyF	3413	retained	
333	square headed bolt, 140mm, 125mm shaft and 16mm diameter, 36mm threaded, head 35 square x 11mm thick	45	FyF	3423		
334	bolt, 90mm long circular 10mm, square head 20mm, nut square 18x15mm	45	FyF	3426		
335	square headed bolt, 165mm long, shaft 140mm, 20mm diameter, 70mm threaded, head 40mm square and 17mm thick	44	FyF	3428		
336	square headed bolt 80mm long, 40mm head, 17mm diameter	38	FyF	3430		
337	square headed bolt with bevelled head, 60mm long, 35mm square, 20mm diameter	38	FyF	3430		
338	square headed bolt, 65mm long 35mm head, 20mm diameter	38	FyF	3430		
339	square headed bolt 135mm long, 20mm threaded, 30mm square head, 14mm thick	pit 4 u/s	FyF	3432		
340	square headed bolt 100mm long, no surviving thread on broken shaft, 27mm head, 15mm thick, 20mm diameter	pit 4 u/s	FyF	3432		
341	square headed bolt 100 mm long , 35mm threaded, 15mm diameter, 35mm square head 7mm thick	pit 4 u/s	FyF	3432		
342	bolt square headed, 180mm, 21mm diameter, threaded 45mm, head 30mm and 20mm thick	pit 4 u/s	FyF	3433		
343	square headed bolt, distal end badly corroded, 145mm long, 20mm diameter, threaded 40mm, 35mm square head and 11mm thick	pit 4 u/s	FyF	3433		
344	square headed bolt 110mm, threaded 20mm, section 17mm, head 35mm and 10mm thick	pit 4 u/s	FyF	3433		
345	square headed bolt, 90mm long, circular section 20mm, head 30mm square and 8mm thick	pit 101	FyF	3439		
346	bolt, 185mm long, 20mm diameter, square nut 35mm x 16mm thick, head 30mm square x 13mm thick	pit 4 u/s	FyF	3431		
347	log threaded bar, 550mm original length, 12mm diameter, triangular head, possibly - corroded or burred 22x16 surviving, nut 23mm square, end too corroded to see thread	191	FyF	3377		
348	square section rod, become circular at one end, 430mm long, square 15mm , round 35mm long and 15mm diameter	pit 4 u/s	FyF	3431		
349	round rod 460mm threaded with nut 20x30mm hexagonal nut, each side 15mm, threaded section preserved at end near nut, but elsewhere outer layer has flaked off	pit1 u/s	FyF	3297		
350	end of long bolt with nut in place, very heavily corded	175	FyF	3399		
351	bolt 250mm long, 35mm square head, 20 round shaft	u/s	FyF	3143/4		
352	highly corroded ?nut and bolt 230mm long	182	boxes	54	boxes	
353	highly accreted bolt with square head 35mm and round shaft, overall 140mm long	570 settlement	boxes	70	boxes	
354	480mm, 30mm diameter, large square headed bolt, threaded for 60mm, 50mm square head chamfered	6-300	FyF	3272		
355	640mm, 20mm diameter, 40mm square chamfered head, no threading visible	pit1 u/s	FyF	3272		
356	170mm long, bolt, 20mm diameter on threaded section, square 25mm , top 40mm head, 35mm visible thread but maybe up to square section	pit1 u/s	FyF	3272		
357	circular bolt end with large square nut, length 210mm x 22mm diameter, nut 90mm basal section of nut, raising from 55mm square base to 35mm as truncated pyramid	pit1 u/s	FyF	3288		

Cat. No.	description	context	Location	photo	Status	Draw?
358	660mm long, diameter 20mm, with square head 30mm square - long bolt	374	FyF	3306		
359	square headed bolt with nut, 130mm long, 25mm diameter, head 38mm square, nut 40mm square	6001	FyF	3313		
360	square headed bolt, 75mm long, 25mm square head, 20mm diameter section,	6010	FyF	3322		
361	square section bolt, 150mm long, 22mm section, 32 mm square head	6010	FyF	3322		
362	square headed bolt 30mm head	6011	FyF	3332		
363	square headed bolt 30mm head	6011	FyF	3332		
364	square headed bolt 25mm head	6011	FyF	3332		
365	square headed bolt 45mm head, washer 50mm diameter, overall length 120mm	6011	FyF	3332		
366	square headed bolt, 35mm head, 90mm long	6011	FyF	3333		
hexagonal-headed bolts						
367	165mm long hexagonal headed bolt, 20mm af	u/s	boxes	46,47	boxes	
368	hexagonal headed bolt	pit 1 u/s	FyF	3219		
369	hexagonal headed bolt, 225mm long, circular section 13mm diameter, threaded 70mm, hex head 18mm af, 9mm thick	no 1 pit channel between 70/66/i	FyF	3437		
370	hexagonal headed bolt 41 af	6011	FyF	3333		
371	hexagonal headed bolt 32 af	6011	FyF	3333		
372	hexagonal headed bolt 36a/f	6011	FyF	3333		
loop-headed bolts						
373	probable spike forged in to square loop head, 150mm preserved, 45mm square o/d 25mm i/d	175	FyF	3402		
coarse-threaded wood bolt						
374	195mm long wood bolt, square head 25mm, 10 deep, 17mm shank, 105mm threaded with coarse thread of approx. 6mm pitch	214 settlement	boxes	6,7	boxes	
bolt fragments						
375	threaded point passing to square bar with remains of thin washer, no head, 140mm long, 15mm long square, 10mm square, thread seen for 60mm, changes shape at washer	175	FyF	548 (26)		
376	8mm square section 130mm long, last 20mm possibly round and threaded, no head	175	boxes	78	boxes	
377	square headed bolt (or shaft and nut?), one face seem to show shaft passing though asymmetric head, 120mm long, 27mm diameter, head 47x42x17mm thick	c037	FyF	535 (13)		
378	headless bolt with large square washer, 190mm long, bolt 18mm diameter, washer 90mm x 65mm x 10mm, nut square 35mm and 15mm thick	pit 1 u/s	FyF	3440		
379	head of long bolts	u/s	FyF	3156/7	retained	
380	head of long bolts	u/s	FyF	3156/7	retained	
381	bolt fragments	pit 1 u/s	FyF	3215		
382	bolt fragments	pit 1 u/s	FyF	3215		
383	bolt fragments	pit 1 u/s	FyF	3215		
384	bolt fragments	pit 1 u/s	FyF	3215		
385	bolt fragments	pit 1 u/s	FyF	3215		
386	bolt with protrusion at right angles to head	pit 1 u/s	FyF	3218	retained	
387	420mm long rod, 28mm diameter, 45mm square nut, broken bolt	pit1 u/s	FyF	3272		
388	380mm long 30mm diameter, all threaded, 60mm square, 40mm thick nut	pit1 u/s	FyF	3272		
389	340mm long, 20mm diameter, 35mm square nut, no visible thread	pit1 u/s	FyF	3272		
390	bolt	6011	FyF	3327		
391	192mm square headed bolt, 20mm shank, 30mm head, 17mm deep , bottom 55mm threaded	214 settlement	boxes	6,7	boxes	
392	750mm long, 18mm square section. 45mm square head	pit1 u/s	FyF	3279		
393	20mm shaft with 40mm square head, slightly domed, 12mm high. Other end corroded so uncertain if bolt or spike	u/s	boxes	46,47	boxes	
394	36mm square x 10 thick (plus 4mm doming) head on 18mm diameter shaft, no threading visible, probably broken	c063	boxes	105,106	boxes	
395	corroded nail/bolt 70mm	38	FyF	3430		
396	round rod with poor head - could be bolt, 145mm long, 20mm diameter	pit 4 u/s	FyF	3433		
397	very badly corroded probable bolt head, 90mm long, 23mm diameter main section, head area swells but shape and dimensions not known	pt063	FyF	537 (15)		
398	broken bolt, 150mm surviving, 45mm threaded, 18mm diameter, no head	pit 4 u/s	FyF	3431		
square nuts						
399	98mm square nut, 54 mm thick, hole 40mm	44	FyF	3429		
400	40mm square nut on fragment of bolt shaft	6031	boxes	55	boxes	
401	cut off bolt with nut in place. 1 1/4 inch square nut on 14mm bolt	175 settlement	boxes	76	boxes	
402	square nut 40mm approx. square	6010	FyF	3322		
403	nut, corroded, 40mm almost square	6010	FyF	3322		
404	square nut 35mm	175	FyF	3382		
405	square nut, 45mm, 35mm thick, hole 25mm diameter, wrought iron	pt020 u/s	FyF	3443		
406	nut, 90mm square, 50mm thick, 40m diameter hole	47	FyF	3413	retained	
407	large square nuts	pit 1 u/s	FyF	3312		
408	large square nuts	pit 1 u/s	FyF	3312		
409	large square nuts	pit 1 u/s	FyF	3312		
410	square nut 40mm only approximately square	6011	FyF	3333		
411	30mm square nut, 14mm diameter hole, c13mm thick, slightly faceted	c063	boxes	105, 106	boxes	
hexagonal nuts						
412	20mm shaft of bolt with 36mm af hexagonal nut, 170mm long no head	u/s	boxes	46,47	boxes	
413	hexagonal nut 44mm af	6011	FyF	3333		
414	hex nut, 37mm af, one side missing, 20mm thick	u/s	boxes	79	boxes	
415	hexagonal nut 60mm af, 40mm thick, 30mm hole	44	FyF	3428		
bracing nuts						
416	clamping nut with long wings, 77mm long, width at centre 13mm, bar tips 8mm x 6mm, 13mm high in centre, hole 9mm	9337	FyF	540 (18)	retained	
washers						
417	iron washer, highly corroded	c037 penydarren pit head	boxes	37,38,39	boxes	
418	iron washer 65mm o/d, 28mm i/d, 8mm thick, not quite concentric	u/s	boxes	46,47	boxes	
419	iron washer 65mm o/d, 28mm i/d, 8mm thick, not quite concentric	u/s	boxes	46,47	boxes	
420	iron washer 65mm o/d, 28mm i/d, 8mm thick, not quite concentric	u/s	boxes	46,47	boxes	
421	iron washer 65mm o/d, 28mm i/d, 8mm thick, not quite concentric	u/s	boxes	46,47	boxes	
422	iron washer 65mm o/d, 28mm i/d, 8mm thick, not quite concentric	u/s	boxes	46,47	boxes	
423	iron washer 65mm o/d, 28mm i/d, 8mm thick, not quite concentric	u/s	boxes	46,47	boxes	
424	iron washer 46mm o/d, 24mm i/d, 3mm thick	pt020 u/s	boxes	61	boxes	
425	square washer, 55mm square, 5mm thick, 20mm circular hole, w all slightly irregular	175 settlement	boxes	76	boxes	
426	iron washer 45 o/d, 17/d	sondage W of building settlemet	FyF	3329		
427	iron washer 64mm o/d 28mm i/d	6011	FyF	3333		
428	iron washer 80/50/10mm	376	FyF	3381		
429	iron ring or washer, 40mm o/d, 24mm i/d, 4mm thick	175	FyF	3402		
430	iron ring 60mm o/d, 30mm i/d, 5mm thick	no 1 pit channel between 70/66/	FyF	3437		
431	iron ring	pit 1 u/s	FyF	3204		
432	iron ring/washer	pit 1 u/s	FyF	3219		
433	penannular ring	pit 1 u/s	FyF	3219		
434	iron ring 47/38/30mm	175	FyF	3382		
435	square washer 50mm square and 6mm thick, hole 20mm diameter	pt063	FyF	537 (15)		
436	square washer or bar broken with hole, 110mm x 80mm x 5mm with hole 23mm, not in centre 33mm one side	212	FyF	3398		
double washers						
437	double washer with single remaining bolt fragment	pit 1 u/s	FyF	3208		

Cat. No.	description	context	Location	photo	Status	Draw?
438	large possible double washer, slightly figure-of-8 shape, 265mm long, width at one 75mm, in centre 55mm, other end 80mm, 30mm hole at narrow end, 35 mm at wide end, 17mm thick	pit1 u/s	FyF	3289	retained	
439	195mm x 75mm x 15mm w/ plate or double washer with two 22mm holes, at 115mm centres	u/s 063 (penydarren or pit1)	boxes	102	boxes	
440	double washer, 240mm long, 70mm wide in middle 80mm at each end, 23mm thick, holes 35mm diameter, hole centres at 160mm	pit 4 u/s	FyF	3434		
441	iron double washer, slightly bent up on one tip, 280mm x 100mm x 20mm, holes 35mm diameter, 170mm between centres	pit 4 u/s	FyF	3435		
442	bar 250mm surviving, section 34mm x 18mm, 45mm wide near end where there is a central hole 25mm diameter, other end is broken off at a similar hole with similar swelling. Probably an elongate double washer.	pit 4 u/s	FyF	3434		
443	bar fragment with holes, rectangular double washer	pit 1 u/s	FyF	3206		
securing bands						
444	double securing washer with semi-circular loop and two rounded headed carriage bolts	pit 1 u/s	FyF	3218	retained	
445	320mm long, 50mm wide, 15mm thick curved plate with folded end, possibly goes with 883	47	FyF	3413		
446	bar, 50mm x 16mm section bent into crude almost semicircle, but bent inwards and cracked, flattened one end like bracket with square hole 25mm square, 70mm long flange, overall 570mm long	47 f4	FyF	3410		
447	mount 270mm in length, 90mm wide, 15mm thick bar, 40mm arch in centre, one end 80mm other 70mm from raised curved section, holes 25mm square, slightly concave underside to each side of arch	pit1 u/s	FyF	3289	retained	
448	iron mount, 270mm long, ends 80mm wide 9mm thick, 65mm long, central hole on each end, central part of bar rises c.47mm above base, bolt is circular sectioned 100mm long but highly corroded, c20mm diameter, head may be 30mm square	45	FyF	3424		
non-ferrous clout nails						
449	head of square section possible clout nail, 9mm diameter	c037 penydarren pit head	boxes	37, 38, 39	boxes	
450	non ferrous clout nail, 27mm long, 4mm square section, head 11mm diameter, underside of head has ridge across merging into upper faceted stem	367	FyF	538 (16)	retained	
451	clout nail - 47mm with 10mm head	175 settlement	boxes	12	boxes	
452	clout nail - 47mm with 10mm head	579	boxes	13	boxes	
453	clout nail - 55mm with 12mm head	263 settlement	boxes	14	boxes	
454	45mm coated clout nail 12mm head	214 settlement	boxes	6,7	boxes	
455	35mm deeply corroded non-ferrous or plated clout nail, white weathering, 35mm long, 4mm square below, 8x4mm remains of head	424 settlement	boxes	85/86	boxes	
456	plated or non-ferrous clout nail, 50mm long, 3x2mm near head, which is largely missing	pt 092 pit 1	boxes	94,95	boxes	
457	copper alloy clout nail, 40mm long, 8mm round head, shaft bout 3x4 mm where rectangular	u/s 109 pit 1 pit 6 or penydarren	boxes	104	boxes	
458-466	9 clout nails, galvanised, 35-60mm long, heads 11mm diameter	sondage W of building settlement	FyF	3329	retained	
horseshoe nails						
467	possible horse shoe nail	284 settlement T1	boxes	75	boxes	
468	50mm long nail fragment with 10mm square head tapering into shaft over 12mm	175	boxes	78	boxes	
triangular nails						
469	triangular-shaped nail, 80mm tall 30mm wide at head 10 mm thick	6011	FyF	3333		
470	triangular headed nail, 100mm long, 30mm widest, 10mm sharp end, 6mm thick	409	FyF	3388		
471	triangular headed nail, 100mm long, 23mm wide at widest, 12mm at narrow end, thickness 7mm	409	FyF	3388	retained	
472	triangular wedge wood nail, 120mm long, 38 wide at head 18 at base, 15mm thick at head to 4mm at point	pit 4 u/s	FyF	3434	drawing collection	draw
473	triangular wood nail, 90mm long, 22mm across, 5mm at point 10mm thick	pit 1 u/s	FyF	3440		
474	triangular shaped wedge nail, part of head and point missing, 95mm long, probably 35mm wide and 11mm at head if symmetrical	pt020 u/s	FyF	3443		
475	large triangular headed flat wood nail	pit 1 u/s	FyF	3426	retained	
476	large triangular headed flat wood nail	pit 1 u/s	FyF	3426		
477	large triangular nail 105mm x 35 mm wide at head x 10mm thickness	u/s	FyF	3143/4	retained	
478	probably bent nail associated with sheet iron fragment	284 settlement T1	boxes	75	boxes	
479	80mm rectangular shanked nail	181 t2 settlement	boxes	64	boxes	
480	small rectangular section nail	284 settlement T1	boxes	75	boxes	
481	small rectangular section nail	284 settlement T1	boxes	75	boxes	
482	6mm x 5mm section nail, 100mm long, head small but poorly preserved, possibly round	175	boxes	78	boxes	
483	10mm x 6mm nail, 70mm long, chisel tip, head missing	175	boxes	78	boxes	
484	145mm long nail, 9mm x 5mm maximum section, almost no head, tip missing	u/s	boxes	79	boxes	
485	small nail or wedge, wide chisel tip (14mm), 12mm x 7mm mid section swelling to head 13x12mm, swelling all from one wide side, 85mm long overall	424 settlement	boxes	85/86	boxes	
486	120mm nail, 8mm x 4mm rectangular section at top, c.12mm squarish head	212 settlement	boxes	94,95	boxes	
487	6mm x 4mm rectangular nail with 9mm round? head,	212 settlement	boxes	94,95	boxes	
488	nail, rectangular cross section, stout, 65mm long	u/s 109 pit 1 pit 6 or penydarren	boxes	104	boxes	
489	rectangular section nail, 75 mm long, 4mm x 5mm section, head c.10mm x 7mm	c409	boxes	111	boxes	
490	nail 95mm long, 6mm x 4mm section, head 10mm x 6mm to one side, chisel tip	c409	boxes	111	boxes	
491	nail 105mm, 7mm x 4mm maximum section, head to one side but largely missing	c409	boxes	111	boxes	
492	nail (all this group approx. 3 inch rectangular section nail with asymmetric heads)	6001	FyF	3313		
493	nail (all this group approx. 3 inch rectangular section nail with asymmetric heads)	6001	FyF	3313		
494	nail (all this group approx. 3 inch rectangular section nail with asymmetric heads)	6001	FyF	3313		
495	nail (all this group approx. 3 inch rectangular section nail with asymmetric heads)	6001	FyF	3313		
496	nail (all this group approx. 3 inch rectangular section nail with asymmetric heads)	6001	FyF	3313		
497	nail (all this group approx. 3 inch rectangular section nail with asymmetric heads)	6001	FyF	3313		
498	nail (all this group approx. 3 inch rectangular section nail with asymmetric heads)	6001	FyF	3313		
499	spike ended nail, 60mm long, 11mm wide, 5mm thick nature of head uncertain	175	FyF	3402		
500	rectangular sectioned nail, 65mm long, maximum 7mm x 3mm section, head 10mm x 3mm	214	FyF	3403		
501	nail, 75mm long, rectangular section near head 7mm x 3mm head triangular in wide plane, wood nail	pt063	FyF	537 (15)		
502	70mm square sectioned nail	pit1 u/s	boxes	60	boxes	
503	125mm long chisel-shaped nail, 8mm square shank	pt020 u/s	boxes	61	boxes	
504	80mm long square sectioned nail	u/s	boxes	79	boxes	
505	110mm long, 6mm square nail, chisel tip, head corroded	u/s	boxes	79	boxes	
506	square section nail in concretion	u/s	boxes	79	boxes	
507	70mm long square sectioned nail	424 settlement	boxes	85/86	boxes	
508	80mm nails shank, no head, 7mm square at top	212 settlement	boxes	94,95	boxes	
509	corroded square section nail, preserved as mineralised crust	group 406 settlement	boxes	96	boxes	
510	bent square section iron - probably a nail fragment	c042	boxes	99	boxes	
511	nail square section 95mm long	439 s/f 53	FyF	3372		
512	nail square 5mm section 50mm long	175	FyF	3385		
513	nail square 5mm section 50mm long	175	FyF	3385		
514	nail square 5mm section 50mm long	175	FyF	3385		
515	nail square 5mm section 50mm long	175	FyF	3385		
516	nail square 5mm section 50mm long	175	FyF	3385		
517	nail square 5mm section 50mm long	175	FyF	3385		
518	square section nail 80mm long, 5mm section, head poor	409	FyF	3388		
519	nail square 40mm long	187	FyF	3389		
520	nail 25mm long <5mm section	187	FyF	3389		
521	nail, chisel-ended, decomposed, 100mm long, 5mm square section	181	FyF	3397		
522	bent nail 110mm, square 7mm, head largely missing	212	FyF	3398		
523	square headed nail, all these 5 quite stout best preserved, 110mm long, 6mm square shaft, 11mm head	175	FyF	3399		
524	nail, 100mm, 7mm square, round head 16mm diameter	175	FyF	3402		
525	square headed nail, 40mm long, 7mm square section, head 11mm square	175	FyF	3402		
526	square sectioned nail, 100mm long, 6mm section, 10x5mm head	214	FyF	3403		
527	nail fragment 30mm long, 5mm square	214	FyF	3403		
528	square sectioned nail, 80mm long, 7mm square section, 20mm diameter flat round head	214	FyF	3403		
529	110mm long 6mm square section rod, possible nail	214	FyF	3403		
530	pyramidal headed nail 67mm long, 4mm shank	t2 sondage w of building	boxes	65	boxes	
531	150mm nail shank up to 8mm square, head faceted 16mm	u/s	boxes	46,47	boxes	

Cat. No.	description	context	Location	photo	Status	Draw?
532	broken large nail, 80mm long, 10mm round head, 4mm x 5mm shank	470 settlement	boxes	94,95	boxes	
533	possible nail fragment 70mm long, 5mm square	214	FyF	3403		
534	70mm long chisel tipped nail shank	c037 penydarren pit head	boxes	37,38,39	boxes	
535	nail 35mm long, circular section 6mm diameter	214	FyF	3403		35
536	nail fragment 60mm long, round 8mm diameter	181	FyF	3397		60
537	nail, round section, 64mm long, 12mm head, 8mm below head	pit 1 021	boxes	91	boxes	64
538	round section nail with corrugations on shaft below domed head, tip clenched over, 65mm long, 6mm diameter, head 15mm diameter and 3mm high	pt063	FyF	537 (15)		65
539	broken ?nail 85mm long, maximum diameter 10mm	pt 101	FyF	3439		85
540	round headed nail, 90mm, broken off below head	175	FyF	3396		90
541	hooked bent nail, corroded, 95mm long, 7mm diameter	212	FyF	3398		95
542	nail 100 long, 7mm circular, head large but very corroded	424	FyF	3404		100
543	nail? 120mm, pyramidal tip, 6mm diameter, no head	pit 1 u/s	FyF	3440		120
544	round headed nail, 120mm, 10mm diameter head	175	FyF	3396		120
545	c.130mm long round nail, round head, contorted	pit 1 021	boxes	91	boxes	130
546	poorly preserved 5 inch round nail with 10mm head	u/s 063 (penydarren or pit1)	boxes	102	boxes	130
547	nail broken 50mm long, circular section 7mm diameter, 10mm circular head	214	FyF	3403		
548	badly corroded 80mm nail	c092 t1	boxes	56	boxes	
549	probably bent nail associated with sheet iron fragment	284 settlement T1	boxes	75	boxes	
550	large nail 115mm long v corroded	175 T25 settlement	boxes	43,44	boxes	
551	large nail, remains of upper part only	175 T25 settlement	boxes	43,44	boxes	
552	nail fragment	175 t1 settlement	boxes	53	boxes	
553	nail fragment	175 t1 settlement	boxes	53	boxes	
554	nail fragment	175 t1 settlement	boxes	53	boxes	
555	nail fragment	175 t1 settlement	boxes	53	boxes	
556	small nail c50mm, possibly similar to the four above	175 t1 settlement	boxes	53	boxes	
557	nail fragment?	191 settlement	boxes	71	boxes	
558	nail fragment?	192 settlement	boxes	71	boxes	
559	corroded possible nail or rod	pt104 pit 1	boxes	72	boxes	
560	possible nail	285 settlement t1	boxes	73	boxes	
561	large nail, 110mm preserved, stout head, poor preservation	175 settlement 8009/t2	boxes	74	boxes	
562	large nail, 110mm preserved, stout head, poor preservation	175 settlement 8009/t2	boxes	74	boxes	
563	very poor possibly as above	175 settlement 8009/t2	boxes	74	boxes	
564	very poor possibly as above	175 settlement 8009/t2	boxes	74	boxes	
565	nail, corroded c.90mm	175 settlement 8009/t2	boxes	74	boxes	
566	poorly preserved small nail	175 settlement 8009/t2	boxes	74	boxes	
567	poorly preserved small nail	175 settlement 8009/t2	boxes	74	boxes	
568	poorly preserved small nail	175 settlement 8009/t2	boxes	74	boxes	
569	poorly preserved small nail	175 settlement 8009/t2	boxes	74	boxes	
570	nail fragment	284 settlement T1	boxes	75	boxes	
571	nail fragment	284 settlement T1	boxes	75	boxes	
572	nail fragment	284 settlement T1	boxes	75	boxes	
573	badly corroded 90mm nail	284 settlement T1	boxes	75	boxes	
574	badly corroded 90mm nail	284 settlement T1	boxes	75	boxes	
575	badly corroded 90mm nail	284 settlement T1	boxes	75	boxes	
576	bent nail fragment	284 settlement T1	boxes	75	boxes	
577	badly corroded nail	175 settlement	boxes	76	boxes	
578	probable nail fragment	175 settlement	boxes	76	boxes	
579	probable bent nail fragment	175 settlement	boxes	78	boxes	
580	nail fragment?	175 settlement	boxes	78	boxes	
581	nail fragment?	175 settlement	boxes	78	boxes	
582	concretion on 80mm long nail	175 settlement	boxes	78	boxes	
583	nail fragment	424 settlement	boxes	85/86	boxes	
584	nail fragment	424 settlement	boxes	85/86	boxes	
585	nail c.60mm long very corroded	pit 1 021	boxes	91	boxes	
586	probable corroded and accreted nail	181 settlement	boxes	96	boxes	
587	probable corroded and accreted nail	188 settlement	boxes	96	boxes	
588	probable fragment of small nail	612	boxes	99	boxes	
589	highly accreted nail	175 t2	boxes	100	boxes	
590	highly accreted nail	175 t2	boxes	100	boxes	
591	poorly preserved nail fragment	u/s 063 (penydarren or pit1)	boxes	102	boxes	
592	poorly preserved nail fragment	u/s 063 (penydarren or pit1)	boxes	102	boxes	
593	poorly preserved nail fragment	u/s 063 (penydarren or pit1)	boxes	102	boxes	
594	poorly preserved nail fragment	u/s 063 (penydarren or pit1)	boxes	102	boxes	
595	poorly preserved nail fragment	u/s 063 (penydarren or pit1)	boxes	102	boxes	
596	poorly preserved nail fragment	u/s 063 (penydarren or pit1)	boxes	102	boxes	
597	possible nail fragment	u/s/ 045	boxes	104	boxes	
598	100mm long badly corroded nail	18 u/s	boxes	104	boxes	
599	nail fragment	18 u/s	boxes	104	boxes	
600	nail fragment	18 u/s	boxes	104	boxes	
601	nail? 80mm	u/s	FyF	3372		
602	nail 30mm long	212	FyF	3384		
603	nail 30mm broken	212	FyF	3398		
604	nail 65mm long	212	FyF	3398		
605	broken nail 60mm, no head	212	FyF	3398		
606	square headed-nail	175	FyF	3399		
607	square headed-nail	175	FyF	3399		
608	possible nail head - could be hobnail	14 TB valley 5640	boxes	100	boxes	
609	poorly preserved small nail	214 settlement	boxes	6,7	boxes	
610	poorly preserved small nail	214 settlement	boxes	6,7	boxes	
611	poorly preserved small nail	214 settlement	boxes	6,7	boxes	
612	65mm nail with fiddle-key head	214 settlement	boxes	6,7	boxes	
613	110mm nail with rectangular head	214 settlement	boxes	6,7	boxes	
614	130mm bent nail shank?	214 settlement	boxes	6,7	boxes	
615	105mm nail with rectangular head and chisel point	214 settlement	boxes	6,7	boxes	
616	possible nail fragment, 110mm x 7mm x 4mm	45	FyF	3426		
617	large nail	pit 1 u/s	FyF	3426		
618	medium nail	pit 1 u/s	FyF	3426		
619	medium nail	pit 1 u/s	FyF	3426		
620	medium nail	pit 1 u/s	FyF	3426		
621	corroded iron fragment - like nail with swellings both ends	175 t1	boxes	87	boxes	
622	corroded rod/nail? 135mm long narrow	pit 1 u/s	FyF	3440		
623	probable nail, 60mm long	pt063	FyF	537 (15)		
624-642	19 badly corroded iron nails	sondage W of building settlem	FyF	3329		
6431-646	4 iron nails	sondage W of building settlem	FyF	3329		
647	square headed-nail	175	FyF	3399		
648	square headed-nail	175	FyF	3399		
Joiners dogs and staples						
649	170mm x 170mm large staple forged from 15mm square bar	214 settlement	boxes	6,7	boxes	
650	15mm bar forged into staple 265mm wide with spikes 70mm, chisel tips of pikes at right angles	u/s	boxes	46,47	boxes	
651	staple 50mm wide, 120mm high, max thickness of 10mm, square section	pit 1 u/s	FyF	3199		
652	430mm wide large staple, ends 70mm, pointed, rod 8mm diameter	pit1 u/s	FyF	3298		
653	broken similar staple 410mm surviving, 55mm end, rod 10mm	pit1 u/s	FyF	3298		
654	long iron staple fragment, 300mm surviving length, 10 mm diameter	6011	FyF	3332		
655	iron staple, pointed ends very close together, 160mm long, 100mm wide, section 10mm diameter	no 1 pit channel between 70/66/	FyF	3437		
656	large staple like object with threaded ends	pit 1 u/s	FyF	3219		
Disc-headed spikes						
657	11 mm square bar, forged into flat circular tip, 26mm across with 6mm round hole	u/s	boxes	46,47	boxes	

Cat. No.	description	context	Location	photo	Status	Draw?
658	spike with forged flange perpendicular at one end, possibly one with a round disc as before, 230mm long, 18mm wide, 5mm thick.	214	FyF	3403		
659	spike with flattened end folded through right angle with small hole, 150mm long spike, 16mm x 5mm, disc 40x25mm wide with 5mm hole, 2mm thick	no 1 pit channel between 70/66/	FyF	3437	drawing collection	draw
660	w spike with head forged into thin disc with central rectangular hole, 225mm overall, spike 195 x 17-8 x 10-2, disc 25mm, hole 5 wide x 4 tall, rounded shoulder to top of spike onto disc	409	boxes	111	boxes	draw
661	spike with flattened disk with hole, 235mm long, square section 14mm, disc c40mm diameter	424	FyF	3375		
Round-headed, chisel-tipped spikes						
662	round headed chisel ended nail, 150mm long, heads 32mm diameter	6012	FyF	3336		
663	round headed chisel ended nail, 150mm long, heads 32mm diameter	6012	FyF	3336		
664	round headed chisel ended nail, 150mm long, heads 32mm diameter	6012	FyF	3336		
665	large round headed nail with chisel end	6011	FyF	3332		
666	large round headed nail with chisel end	6011	FyF	3332		
667	large round headed nail with chisel end	6011	FyF	3332		
668	large round headed nail with chisel end	6011	FyF	3332		
669	rounded headed spike with chisel tip, 140mm long, head 35mm diameter, circular section 16mm	6010	FyF	3322		
670	spike, as 507, but missing point, 35mm head, 130mm length, spike 17mm diameter	6010	FyF	3322		
671	round headed spike 140mm long, 15mm diameter, head 30mm, spike end	440 f30	FyF	3387		
672	chisel ended spike, round head, 130mm long, 15mm diameter, 35mm round domed head	214	FyF	3403		
673	spike (or nail), round head, 120mm long round section 12mm diameter, 30mm diameter round flat head	214	FyF	3403		
674	dome-headed chisel ended spike, 137mm long, spike hidden in accretion. Head angular, c32mm diameter	175 t1	boxes	87	boxes	
675	130mm long round spike with chisel tip, surviving head poor, shaft 10x12mm	175	boxes	78	boxes	
676	127mm long spike, 14mm diameter, chisel tip, 30mm diameter, 12mm high domed head	175	boxes	78	boxes	draw
677	120mm long spike, 12mm diameter, chisel tip, head irregular 30mm across, flat not domed	193 settlement	boxes	78	boxes	
678	very badly corroded chisel-ended circular spike, 130mm long	u/s	boxes	79	boxes	
679	145mm long round headed nail with chisel tip, 33mm head, 12mm main shank	214 settlement	boxes	6,7	boxes	
680	round headed spike with chisel tip, 150mm 20mm diameter section, head 30mm diameter	6007	FyF	3320		
681	circular section spike 150mm long, 18mm diameter, head 30mm diameter, damaged chisel tip	570	FyF	3375	retained	
682	dome headed spike, point missing, 97mm preserved, head 22mm diameter and 8mm high, shank 10mm square	211 t1	boxes	88	boxes	
683	possible spike, 145mm long, 32mm diameter head, c20mm shaft (but corroded) to 13mm chisel tip	175 T25 settlement	boxes	43,44	boxes	
684	130mm long spike, 30mm diameter domed head, round section(accreted), to chisel tip (broken)	pit 1 021	boxes	91	boxes	
Fold-headed spikes						
685	chisel-ended spike with narrow head folded out of plane of chisel tip - possibly for track? 180mm long, 15mm x 14mm section, 20mm x 5mm head	214 settlement	boxes	40,41,42	boxes	draw
686	spike, c.10mm square section, head formed by right angle bend, 20mm wide, flattened slightly, 90mm long	u/s	boxes	79	boxes	
687	105mm long 'dog' spike, 25mm long top, 11x8mm below head, tip missing - either spike or broken end of staple	424 settlement	boxes	85/86	boxes	
688	spike with hooked top, 135mm long, maximum section 20mm square, hook extends 35mm total width and is 5mm thick, forced out perpendicular to shaft and has down turned tip	6008	FyF	541 (19)	drawing collection	draw
689	broken spike with right angle, 220mm long, 15mm square bar used to fabricate, right angle bit only sticks out 10mm, appears to fatten towards point but poorly preserved	211	FyF	548 (26)		
690	spike with right angle top, 100mm, 12mm section,	175	FyF	3382		
691	more corroded spike as 743 100mm tall, section reduced to 7mm	175	FyF	3382		
692	spike, 180mm long, 15mm square at top, slightly L top	6010	FyF	3322		
693	square section bar with L top 320mm x 20mm square, head 30mm x 20mm	pit 1 u/s	FyF	3298		
Square-headed, chisel-tipped spikes						
694	square headed spike, 30mm x 26mm head of burred appearance, merges into shaft after 7mm, bar 15mm square, 150mm overall of which 55mm is tapering to tip	tp1 longtown area	boxes	112	boxes	
695	square headed spike 180mm long, width of top of shank 35mm, 15mm at base, thickness at top 30mm, base 15mm, head 55square x 15mm thick	212	FyF	3368	drawing collection	draw
696	square headed spike, 115mm long, 15mm x 15mm maximum thickness down to 2mm at base, head 25mm x 20mm (probably originally 25mm)	pt 101	FyF	3439		
697	square headed spike, 250mm long, 25mm square section, 40mm square head 8mm thick	pit 1 u/s	FyF	3440	retained	
698	dome-headed chisel ended spike, 145mm long, spike circular c.15mm. Head rectangular 30mm x 35mm	pt 063	boxes	77	boxes	draw
699	square headed spike, 40x37 head 10mm thick, 175mm long, chisel tip, 22 mm diameter near head	214 t1	boxes	84	boxes	
Other spikes						
700	bar with large spike through it, spike 380mm preserved, bar 175x25x7mm, diameter of rod 16mm	175	FyF	3369		
701	spike, square section 20mm, 80mm long downturned grip to point on one side, 255mm long	175	FyF	3369	retained	
702	circular section 520mm x 16mm diameter, 80mm square down turned branch at one end, 24mm round head, broken other end, possibly slightly flattened	47	FyF	3410		
703	80mm tapering bar, possibly a 'spike' tip	c037 penydarren pit head	boxes	37,38,39	boxes	
704	square section spike, 470mm long, tapers 29mm square at top, down to 10mm square	u/s overbridge	FyF	544 (22)		
705	wrought iron round bar fragment formed into a spike, 105mm long, 20mm diameter at broken end	9337	FyF	540 (18)		
706	spike, circular section, 205mm long, 15mm diameter, burred head, pyramidal point	pt 101	FyF	3439	drawing collection	
707	fragment of wedge shaped spike, 130mm long, 12mmx10mm away from tip	u/s	FyF	551 (29)		
708	100mm long corroded nail, spike or possibly punch, c10mm diameter	175 t1 settlement	boxes	53	boxes	
709	13mm bar forged to chisel tip, 130mm long	6007 u/s kiln 6001	boxes	45	boxes	
710	probable spike, very corroded, 240mm, 30mm x 25mm square,	45	FyF	3426		
711	heavily corroded spike/large nail 110mm long, pyramidal rectangular section, head not seen but concrete asymmetrical	175 T25 settlement	boxes	43,44	boxes	
712	highly corroded and accreted iron spike, 180mm long	286 settlement	boxes	58	boxes	
713	spike circular section 400mm preserved, asymmetric poorly preserved 14mm diameter section	317 f36	FyF	3373		
714	tapering bar, possible spike, 195mm long, 25mm narrowing to 10mm, 7mm thick, possibly slight burring on top but minor hook like protrusions on one side -top one real, bottom one possibly so	244	FyF	3391		
715	square section spike, burred head, no point, 100mm surviving, 17mm square at top	pt020 u/s	FyF	3443		
716	260mm tapering iron rod from 10mm - spike, tine?	175	FyF	3399		
717	highly corroded bolt or spike with round domed head, concreted and broken in two	c063	boxes	105, 106	boxes	
718	possible pointed bolster, 185mm long, spike 160 long, head 55mm diameter, circular section below head is 30mm	settlement no label	FyF	3305	drawing collection	
Cotter bolt			cotter bolts			
719	round headed blunt chisel/spike like object, compare #997/#1041, 150mm long, 30mm diameter main shaft, 46mm diameter head, 8mm thick, blunt end 21mm thick	pit 4 u/s	FyF	3431	drawing collection	
720	rectangular section object similar to blunt chisel/spike like object #992/#1041 above, 130mm long, shaft 35mmx18mm, blunt faceted end head 50x30mm, slightly domed	pit 4 u/s	FyF	3432	drawing collection	
721	rounded head blunt chisel-like securing pin, rectangular section 30mm x 22mm, faceted end, head 45mm diameter and 10mm thick, slot for cotter on wide side 12mmx5mm at 6mm from end, Cf. #992/#997	no 1 pit channel between 70/66/	FyF	3437	drawing collection	draw
722	round headed unthreaded bolt like object 115mm long, 20mm diameter, round head 34 mm diameter, domed, slotted 21x6mm and is at 20mm from lower end, which is rounded	214	FyF	3403	drawing collection	
Threaded cotter bars						
723	square wrought bar with slot in one end, 400mm overall length, 270mm square in section, then circular 30mm then 105mm threaded, square 35mm square, 30mm diameter, slot 40mm from end 55x7mm	u/s	FyF	3148/9	retained	
724	threaded and slotted square bar, 410mm overall; square 275mm, 30mm square, slot 45x5mm; round 135mm of which threaded 100mm	pit 1 u/s	FyF	3319	drawing collection	draw
725	threaded square bar with slotted end	pit 1 u/s	FyF	3218	drawing collection	
726	small round bar with slotted head and iron wedge	pit 1 u/s	FyF	3218	retained	
Axle-like cotter bars						

Cat. No.	description	context	Location	photo	Status	Draw?
727	pin/axle 520mm surviving length; 35mm diameter, separated by ring 65mm diameter 10mm thick from 25mm square section 110mm long with slot 30mm long 6mm wide	pit1 u/s	FyF	3297		
728	round bar with threaded end and a slot for cotter, 410mm long, 40mm diameter, 120mm threaded, slot 35mm from end, 60x8mm	44	FyF	3429		

TRANSPORT

Drams

729	Type 1 dram		FyF		retained	
730	Type 1 dram		FyF		retained	
731	Type 4 dram		FyF		display	
732	Type 2 dram		FyF		accessioned	
733	Type 2 dram		FyF		accessioned	
734	Type 4 dram		FyF		retained	
735	Type 4 dram		FyF		retained	
736	Type 4 dram with floor, 88-91 between outer wheel faces, bases 154 x 64, wheels 46-48 diameter, 6 spoked with teardrop perforations		Nantgarw	3063-70	retained	
737	Type 6 dram missing floor		Nantgarw	3059-3062	retained	
738	Type 7 dram		FyF		retained	
739	Type 6 dram		Education centre		retained	
740	Type 5 dram		FyF		retained	

Dram spines

741	Wrought iron bar with loop both ends, raised areas each end and 4 holes, 145cm long, 75mm wide, 10mm thick, Type 3 dram or similar	pit 1 u/s	FyF	3249	retained	
742	1260mm long, tram spine with one end broken off, 75mm x 10mm thick, ring 45mm i/d, o/d 90mm, square hole 25mm, 150mm from tip of bar, from 450mm to 1180mm from tip has 34 round holes roughly down centre, holes up to 10mm diameter and deepest in the middle of the run. Lack of transverse strap holes suggests type 2?	overbridge u/s	FyF	549 (27)	retained	
743	tram spine, 860mm surviving length, 65mm wide, 10mm thick, forged into ring at end 80mm o/d and hole 40mm x 45mm long, one hole in strap 20mm diameter, 280mm from rounded end (Type 1/2 dram or similar)	pit1 u/s	FyF	3293		
744	970mm x 62mm x 10mm thick. Tram strap with two 22mm diameter holes	pit1 u/s	FyF	3293		
745	possible coupling ring from tram on end of bar fragment, 220mm long, 70mm wide 10mm thick, 55mm diameter hole, snapped off at first rivet hole	pit 4 u/s	FyF	3432		
746	bar strapping, 7dram spine, 260mm surviving length, 50mm wide, 55mm where end hole 22mm wide, second hole on break, 235mm between centres, 6mm thick. Lighter than other spines.	175	FyF	3369		

Other dram strapping

747	bar complete, with two holes, 275mm long, 45mm wide, 5mm thick, holes 15mm, 35mm from one end other 8mm from other, one end broken, tram strap or similar	383 f34	FyF	3375		
748	iron bar/plate 220mm x 70mm x 8mm, one rectangular hole 10x20mm	pit 4 u/s	FyF	3438		
749	bar fragment with part of hole, 150mm x 55mm x 9mm, with remains of hole on one edge	pt020 u/s	FyF	3443		
750	probable dram strap fragment with two and half holes, section 65mm x 15mm and 165mm long, holes 21mm diameter	pt020 u/s	FyF	3443		
751	wi bar with four holes - probably from base of dram with multiple slats (Type 1 or similar) - or a straightened bar from side fractured beyond basal angle	pit 1 u/s	FyF	3222	retained	
752	bar, 480mm x 55mm x 8mm, hole near either end with possible rivets still in each 22mm diameter	38	FyF	3430		
753	iron bar fragment 390mm long, 60mm x 18mm broken off at rivet hole, broken other end too	pit1 u/s	FyF	3292		
754	iron bar 390mm long, 75mm x 15mm two holes one 75mm one 85mm from other centres, each diameter 25mm	pit1 u/s	FyF	3292		
755	bar fragment with hole, 145mm x 65mm x 10mm, hole 20mm	45	FyF	3423		
756	bar fragment with holes	pit 1 u/s	FyF	3206		
757	bar fragment with holes	pit 1 u/s	FyF	3207		
758	bar fragment with holes	pit 1 u/s	FyF	3207		

Dram cotters

759	overall length 140mm, 20mmx4mm section folded double with small loop, cf. cotter from dram axle	u/s pit 2	FyF	541 (19)	drawing collection	draw
760	cotter, similar to #1118, culvert below pit 2, overall 127mm long, metal 17mmx3mm section	8326	FyF	544 (22)	drawing collection	
761	bar folded on itself, cotter? Not welded object 100mm long, 20mm section, 4 mm thick	pit 4 u/s	FyF	3432		
762	cotter bar like #995 but squeezed more tightly shut, 80mm long, section 20mm x 5mm	pit 4 u/s	FyF	3432		
763	probable cotter from dram, bar 230mm x 21mm x 4mm folded slightly unequally with 15mm i/d loop in centre	c424	boxes	109, 110	boxes	
764	folded bar 125mm, 12mm wide, 3mm thick, end folded back on itself	409	FyF	3388		

Dram wheels

765	small wheel, 280mm diameter, 6 tear drop holes, central hole 40mm, central tube 60mm off wheel 60mm o/d 40mm i/d, possible notch in one side with raised boss in line on outer part of wheel, 60mm x30mm tear drop, wheel 11mm on edge, thickness 27mm at centre	pit 1 u/s	FyF	3367	drawing collection	draw
766	tram wheel fragment, has narrow curving ('spiral') spokes	pit 1 u/s	FyF	3240	retained	
767	possible wheel fragment, smooth curved surface 50mm x 30mm x 14mm	277	FyF	3379		
768	wheel, 500mm diameter, 6 tear shaped holes, 20mm on rim, cylindrical hub extends 90mm from wheel face, 90m o/d, 60mm i/d, web raises to 30mm against face of cylinder	pit 1 u/s	Education	3452	display	

Dram axles

769	tram axle, 1080mm, end to ring 200mm, ring 15mm thick, 45mm diameter, ring o/d 80mm, centre section possibly 48mm diameter, slot 30mm x 12mm, 10mm from end (distance between rings larger than on preserved trams)	6-300	FyF	546 (24)		
770	square bar with collar then threaded, 190mm long, circular end is 55mm long and 25mm square section 100mm long, between is rounded and wide 35mm long and up to 40mm diameter	pit 4 u/s	FyF	3433		

Dram washers

771	iron ring, not fully welded closed, 93mm o/d, 52mm i/d, 13mm thick	175	FyF	3392		
772	iron ring, 86mm o/d, 60mm i/d, 10mm thick	175 T25 settlement	boxes	43,44	boxes	
773	iron ring, 90mm o/d, 52mm i/d, 15mm thick	175 T25 settlement	boxes	43,44	boxes	
774	iron ring, 110mm o/d, 67mm i/d, 17mm thick	175 T25 settlement	boxes	43,44	boxes	
775	iron ring, 90mm o/d, 60mm i/d, 8mm thick	175 t14	boxes	83	boxes	
776	iron ring 90mm o/d, 57mm i/d, 12mm thick, no welded join	322	FyF	3408		
777	circular Wi ring, 145mm o/d, 55mm i/d, 17mm thickness	45f10	FyF	3420		
778	iron ring 85mm o/d, 50mm i/d, 10mm thick	no 1 pit channel between 70/66/	FyF	3437		
779	iron ring, WI, 94mm o/d, 56mm i/d, 13mm thick	pt214	FyF	539 (17)		

Dram couplings

780	340mm long probable coupling forged simply from 19mm round	pit 1 u/s	FyF	3349	retained	
781	380mm long, cow horn coupling'	pit 1 u/s	FyF	3349	retained	
782	tram coupling, 'cow horn' style, 400mm	pt021 pit1 u/s	FyF	3337	drawing collection	draw
783	cow horn' coupling fragment, 400mm surviving, 30mm diameter bar	pit 1 u/s	FyF	3441		
784	cow horn type coupling, 530mm long, recurved hooks, 35 mm diameter	8277 trench t40	FyF	3360	drawing collection	draw
785	tram coupling, longer than previous item, 540mm long	pt021 pit1 u/s	FyF	3338	retained	
786	wide cow horn type coupling, 620mm long, recurved hooks, 35mm diameter in middle	6300	FyF	3360	drawing collection	draw
787	wide cow horn type coupling, 620mm long, recurved hooks, 35mm diameter in middle	6300	FyF	3360	retained	
788	simple coupling 108cm long, 40mm diameter, simple hook each end	pit 1us	FyF	3360	drawing collection	draw
789	tram coupling hook broken both ends	pit1 u/s	FyF	3268	retained	
790	broken cow horn type, just fragment of one hook	u/s	FyF	3360		
791	half of a cow horn coupling, 30mm round surviving length 210mm	pit 4 u/s	FyF	3438		

Cat. No.	description	context	Location	photo	Status	Draw?
792	possible coupling 84cm surviving, 40mm diameter, part of one end only surviving	pit 2 u/s	FyF	3360		
793	wrought iron bar with offset, 300mm length, 30mm diameter	pit 1 u/s	FyF	3198		
794	circular section bent bar fragment 200mm and 30mm diameter	pit 4 u/s	FyF	3434		
Plateway plates						
HOMFRAY'S OLD DRAM ROAD style?						
795	cast iron rail end, semi-circular end with central hole, 210mm long, flange height 60mm outside, rail 70mm wide, overall 100mm wide, on end roughly 80mm diameter semicircle, 20mm diameter hole	f39 (??Settlement T3)	FyF	3370	drawing collection	draw
OUTRAM PLATES						
796	complete plateway rail 900 long, 75 tall, other edge 25mm, no lip, flat zone of plate 60mm, then groove 20mm wide 8mm deep, slight ledge 45mm below top of flange, 5mm wide ledge then 10mm into groove, lug almost semi-circular extension from pad extending out 40mm, hole 50mm from low edge and 20mm diameter, slight rib, 30mm wide, 6mm high, on low edge 38lbs (17ka)	overbridge u/s	FyF	3350/2 b	drawing collection	draw
797	plateway fragment 740mm long, 110mm expanding to 140mm because of semi-circular lug on high side, 75mm long pad, reinforced bar along low edge, 30mm wide, 22m thick on low edge, slightly dished top, tread is 60mm then curves into groove 18mm wide, 10mm deep, high side 75mm, not crenulated, slight step 40mm down from top of flange	pit 1 u/s	FyF	3355/56 a	drawing collection	
DUAL PURPOSE PLAIN PLATES						
798	complete plateway rail 920mm long, 110mm wide in centre 120mm at ends, reinforced pad 80mm long, one end has surviving nail in central hole, 50mm in from low side (no lip) hole 17mm diameter, pad extends wedge-like up flange, no separate lug, 18kg 38lbs	us	FyF	3355/56 d	drawing collection	draw
799	plateway rail fragment, 880mm long, 100mm wide, flange 70mm tall, no lip, thickness in plate 17mm, no bars or pads, slight lug on low side near broken end, no surviving ends	us	FyF	3355/56 c		
800	complete plateway rail, 1200mm long, 100mm wide, 110 mm at end, lug to 115mm, high edge 80mm, low edge 35mm, not crenulated, hole in end 45mm from low side, 20mm diameter, lugs 40mm from end on low edge, 30mm long, protrude 5mm, no pad or bar, 24kg, 52 lbs	us	FyF	3355/56 e	drawing collection	draw
801	complete plateway rail, 1200mm long, 105mm in main part, 110mm at ends, max flange height 80mm, low edge 30mm high, 55mm and 15mm internal heights respectively, no pad, but wider end is 110mm long, central mounting hole 50mm in from low side and 17mm diameter, 45mm from end has lug 15mm long and protrudes 15mm at change of width, has small casting lug just inwards of mounting lug at one end, 22.5ka, 49lbs	us	FyF	3350/2e	drawing collection	
802	uncrenulated rail fragment, 330mm long, 110mm wide, pad 140mm wide at end including lug on high side, pad 80mm long, hole 50mm from low side 20mm diameter, 23mm thick in middle, no lip, has groove, but infilled with concrete	pit 1 u/s	FyF	3353/4 e	retained	
DUAL PURPOSE CRENLATED PLATES						
803	complete plateway rail, 120cm long, crenulated, 110mm wide, 115mm at ends, pad 70mm long, 75mm maximum height, 30mm on low lip, width of tread 70mm, 55mm from low edge has hole 16mm diameter, flat base apart from low pads	pit 4 4029	FyF	3353/4 d	drawing collection	draw
804	cast iron plateway rail with slightly cogged flange 7.7 wavelength, rail recessed with inner ridge, rectangular supports barely visible, protruding lug on high side 79-90mm from end, central semi-hole each end 15mm across		Nantgarw	3046-9	accessioned	
805	plateway rail fragment, end appears to have central hole, has lugs both sides, asymmetrically, 330mm long, width 110mm, height on tall edge 60mm, low edge 30mm, tall edge crenulated, face to tall edge 40mm, lug on tall side 70mm from end and 35 wide protrudes 15mm, lug on low edge 90mm from end, 40mm long protrudes 15mm	pit 1 u/s	FyF	3347/8	drawing collection	
806	plateway rail fragment, 280mm long, width 105mm, thickening to 115mm at pad, crenulated 70mm, no other lip, 22mm thick, has groove and step on flange, hole in end, 45mm from low edge and 20mm diameter, pad 50mm long, flat face 50mm wide, then groove 25mm, slight ledge on flange face c. 40mm below top, flat base, small lug on high side but hidden by accretion	u/s	FyF	3353/4 a		
Plain plateway plate for use with iron sill						
807	complete plateway rail, 121 cm long, 105mm wide, flange 85mm tall, no lip, 21mm thick on face, plate face 80mm wide, pad same as overall width, 30mm long, reinforcing rib near flange, 20mm in from edge, 60mm in from opposite, 25mm wide, 10mm tall, just overlaps reinforcing pads by 5-6mm, pads just <5mm tall	pit 1 u/s	FyF	3350/2 c	drawing collection	draw
808	plateway rail fragment, 1000mm 110mm wide continuously, 80mm tall flange, no lip, pad 30mm long, reinforcing bar is 20mm from flange side and 65 from low, and 24mm wide and 12mm tall, laps up onto pad, rounded	pit 1 us	FyF	3355/56 b	drawing collection	
809	trampoline with missing flange 335mm long, internal width c.80mm, basal width 90mm, 15mm thick plate, reinforcing bar 21mm wide, 11mm high below groove on surface, groove 25mm wide	175	FyF	3396		
810	part of plateway rail, somewhat similar to above except has more central strengthening ridge on lower face and has ridge at base of raised flange. Preserved end is straight, top of rail is flat, flange rises from 79mm, preserved 110mm wide, 90mm high in middle, 70mm at end	blank	Nantgarw	3041-45	accessioned	
HOGGED AND BARRED on outer PLAIN PLATE FOR SILLS						
811	plateway rail, 1.09long, width 120mm wide at base. Has rectangular pads both ends and has raised area on lower face opposite, has protruding lugs from inner sides of those rectangles. Edge raises from 75mm off plane of base to 90 mm in middle (where base lies 10mm above base plane), ends straight	pt021	Nantgarw	3038-40	accessioned	
812	plateway rail fragment, 1040mm long, width 105 normally, 120mm on pad, high edge 70mm, 25mm just light lip other side, pad 85mm long, lug is part of pad, reinforcing bar 35mm x 8mm along low edge	u/s	FyF	3350/2 a	drawing collection	
813	badly corroded rail, similar in profile to e8954/5 but top of flange not preserved, no strengthening bar, inner lip, slight lug at inner face of rectangular support area		Nantgarw	3051-2	accessioned	
CRENLATED PLATES FOR SILLS						
814	plateway rail fragment 590mm surviving, 100mm wide 115mm on pad, pad sticks out on low side lug overlaps edge of pad on high side, pad 3-4mm wide and 70mm long, no bar, lug 65-105mm from end extends 10mm out, flange crenulated 70mm tall, low edge 30mm tall, rail 22mm thick in centre	pit 1 u/s	FyF	3353/4 b	retained	
815	crenlated plateway fragment, ci, end of rail with rectangular low pad, 560mm long, 110mm wide, narrowing to 100 inside pad, upper tread filled with concrete, max height 70mm, rectangular pad 55mm long from end, slight overlap with lug, inner edge 35 high, lug protrudes 35mm long and 50mm from end, 10mm long, no lower rib	pit 1 u/s	FyF	3342/3	drawing collection	
816	cast iron plateway rail fragment, crenulated flange, grooved top, 61cm surviving length, 11cm wide, groove 6cm, inner side flange height 4-5cm, 1 cm low side, pad 8cm wide, 6cm to start of lug, then lug 6cm wide and sticks out 3cm, 2cm in middle of rail	no label	FyF	3111-3112	retained	
817	crenlated plateway fragment, ci, end of rail with rectangular low pad and almost central thickening, 460mm long, 130mm wide, upper tread filled with concrete, maximum height 75mm, rectangular pad 70mm long from end, rib 35mm wide	pit 1 u/s	FyF	3340/1		
818	crenlated plateway rail fragment 640mm long, 105mm wide, pad 120mm wide sticks out low side, lug on high side 65mm-105mm, 10mm protrusion, pad 70mm long, low lip 30mm, flat tread 55mm, groove 12mm wide 10mm deep	pit 1 u/s	FyF	3353/4 f	drawing collection	
819	cast iron plate rail length, 1.0m long, 11cm wide, rectangular pads 6cm long with small broad lugs on outer face inwards of pad, grooved top. Top of flange poorly preserved, possibly crenulated	no label	FyF	3106	drawing collection	
PLAIN FRAGMENTS						
820	cast iron plateway rail, rather thin, flat top, slight ledge on side of flange 80cm length, 10 wide,	pt021	FyF	3110	drawing collection	
821	cast iron plateway fragment, flat base 110mm wide, flange 80mm vertical, 20mm base, flat to outer edge, 70mm wide flat,	pit 4 u/s	FyF	3434		
822	possible rail fragment, 100mm x 35mm x 10mm	c037	FyF	535 (13)		
823	cast iron plate way fragment from flange 210mm long, 70 high up to 40 mm thick at base - very stout	pit1 u/s	FyF	3264	retained	
824	cast iron plateway fragment from flat, 510mm long, 80mm wide, maximum 20mm thick	pit1 u/s	FyF	3264	retained	
825	thick cast iron plate flange fragment	47	FyF	3414		
826	thick cast iron plate flange fragment	47	FyF	3414		
827	thick cast iron plate flange fragment	47	FyF	3414		
828	thick cast iron plate flange fragment	47	FyF	3414		

Cat. No.	description	context	Location	photo	Status	Draw?
829	cast iron plateway flange, thick, surviving height 80mm, up to 30mm thick, triangular - broken from corner of rail?	44 f5	FyF	3427		
830	cast iron plateway flange, thick, surviving height 70mm, up to 30mm thick	44 f5	FyF	3427		
CRENULATED FRAGMENTS						
831	small fragment of crenulated plateway, length of fragment 220mm, 110mm wide, external heights 65mm, 40mm above face, 30mm external face, 10mm above face, width of tread 65mm	5504	FyF	3339	retained	
832	plateway fragment, seems very stout, 380mm long, 110mm wide, 70mm high flange, possibly crenulated, low edge 40mm tall, tread 65mm wide 25mm thick, low side slopes in markedly	5605 f75	FyF	3353/4 c		
Plateway special plates						
833	cast plateway rail splay from 'points', 900mm long, 110mm at narrow end, 80mm in raised section on base, 250mm wide at wide end, 90mm in support on base this end, flange stands 80mm above basal plate and 50mm above plate surface	pt021	Nantgarw	3055-57	accessioned	draw
834	tram way pointer, 390mm long, max width 60mm, height 50mm, hole close to rounded end, 340mm long flat upper surface	u/s	Education	3448	display	
835	cast iron plate with rounded V-shaped ridge, 1.52 x 83 overall edge to base V 34 (i.e. 84cm wide - 27.5" to inside of flanges), edge to top V 14, plate 20 V 40 high and 20 thick	pt021	Nantgarw	3036/3037	accessioned	draw
Plateway wrought iron plates						
836	small fragment of lipped wrought iron plateway, flange missing, 150mm long, 80mm wide, 11mm thick plate, lip 15mm from plate surface lip, 11mm wide	424	FyF	3404		
837	wi plateway fragment badly corroded, 1030mm long, 100mm wide, flange 50mm tall, no lip	pit 1 u/s	FyF	3350/2 d		
Plateway sills						
plateway sill - type 1						
838	sill bar, 1070 long, complete except for one broken external cheek, bar 630mm, 50mm wide, height 50mm, head 210mm x 85mm, 140 mm gap, inner cheek 45mm high off rail, 720mm between inner cheeks	u/s pit 2	FyF	3361 f	drawing collection	
839	broken sill, 640mm long, head 220x90mm, gap 145mm, very well preserved, bar 55mm tall and 55mm wide	pit 2 u/s	FyF	3361 a	retained	draw
plateway sill - type 2						
840	complete sill bar 1050 long, bar 630mm, 60mm wide, 70 tall, heads 210x105 with possible casting excess laterally on one, gaps 115mm, 790mm between inner cheeks,	8007	FyF	3361 e	drawing collection	draw
841	broken sill fragment, 330mm long, head 200x115mm, gap 105mm, inner face vertical, outer slight overhanging, height 25mm vertical, inner cheek 45mm, bar 55mm wide and 55mm tall, thickness below face 40mm	pit 4 u/s	FyF	3362	retained	
842	plateway sill end fragment, 420mm surviving, head 175x100mm, thickness below rail 25mm, inner cheek vertical 35mm, outer cheek vertical 15mm, bar 50mm wide max 60mm, tall dropping to 50mm	u/s	FyF	3365	retained	
843	broken sill, just over half, 670mm surviving, head 165mm x 110mm, thickness below rail 30mm, inner cheek vertical 40mm, outer 18mm, max bar profile 50mm wide x 75mm tall dropping to 55mm at head	pit 4 u/s	FyF	3363 c	drawing collection	
844	piq or sill fragment	pit 1 u/s	FyF	3241	retained	
plateway sill - type 3						
845	complete sill, compacted shale in one head suggests mid-bar use, 1060mm long, 190x110mm head, 20mm high up to 25 both cheeks, inner vertical out hooked, 50mm bar, 70mm in middle 50mm on edges	u/s	FyF	3363 b	retained	
846	complete sill 1060mm, head 190x110mm, below rail 24mm, corrosion shows straight plate ends above crushed shale, inner cheek low 15mm, outer face (poss. 20) outer similar v slightly hooked, bar 45mm wide, 60mm tall max 50mm at margin 15kg, 33lb	pit 2 u/s	FyF	3363 a	drawing collection	draw
847	1050mm long, head 210mmx120mm, gap 105mm, vertical inner face, 18mm, outer hook 20mm tall, metal below rail 25mm, max bar profile 45mm wide, 65mm tall, lowers towards end (50mm), distance between vertical faces 730 mm.	u/s workings	FyF	3363 d	drawing collection	draw
848	plateway sill, one end broken, overhanging straight outer ends, tall profile in centre, 91 length preserved, 50mm wide in centre, ends 110mm wide end section 200 long, gap in fast is 120mm and 20mm deep, 75mm, 730mm between inner ends, original 980mm between outer flanges		Nantgarw	3053-4	accessioned	
849	very corroded sill, 1060mm long, 620mm bar, 50mm wide and 70mm tall, 740mm between inner cheeks, heads 210x110 mm	u/s	FyF	3361 d		
850	plateway sill bar fragment, 700mm long, bar 510mm, base 50mm height 60mm, head 200mm long, gap 120mm x 110mm wide, cheeks 25mm tall, simple planar base	pit 1 u/s	FyF	3346	retained	
851	broken sill fragment 350mm long, head 210x110mm, central bar 55mm wide and 60mm high, gap 120mm	5634	FyF	3361 b	retained	
852	sill head, 250mm long, head 200x110, gap 130mm, thickness below rail 20mm, outer cheek strongly hooked 20mm tall, inner vertical 20mm, bar 55 wide, height 55mm (end only seen)	u/s workings	FyF	3366	retained	
853	plateway sill fragment	pit 1 u/s	FyF	3243		
854	broken sill fragment, 440mm long, head 220x115mm, has basal pad raised 7mm, gap 115mm, bar 30mm tall and 40mm wide	u/s overbridge	FyF	3361 c	retained	
other plateway sills						
855	fragment from extremely large plateway sill	pit 1 u/s	FyF	3242	drawing collection	
856	probable centre section of heavy sill, length 780mm both ends broken off, base 70mm wide U-shaped profile 70mm tall	pit 1 u/s	FyF	3246	retained	
857	plateway sill bar, narrow end and rod, end has semi-circular embayment below, 510mm surviving length, bar 280mm surviving 45mm wide at base, 55mm tall, head 200mm long, gap between cheeks 120mm, outer cheek 30mm high, face 60mm wide, base to face 60mm, embayment diameter c.80mm, height 25mm, embayment starts 70mm from outside, inner side 100mm from bar	pit 1 u/s	FyF	3344/45	retained	
Plateway chairs						
858	chair, 240mm x 100mm x 22mm base plate, cast, gap 110mm, plateway?, 1 cheek over curved, other unclear, height of cheeks 20mm off plate, 16mm holes, 185mm apart	45	FyF	3424	drawing collection	draw
859	chair 300mm long, 85 mm wide, space between cheeks c 100mm, 1 cheek 45, other 25 mm high, nails present on mounting holes both sides, basal plate 30mm	175 settlement	FyF	3357	drawing collection	draw
860	plateway chair, 300 long, 100 wide, 30mm thick, 150mm between cheeks, cheeks 25mm tall slight incline in on both, 2 holes on outer plates, 20mm diameter, centres 240mm apart	label blank	FyF	3364	drawing collection	
Railway chairs						
861	chair 300mm, 100mm width, cheeks 80mm high maximum distance apart is 95mm, base plate 30mm, has nail holes either side.	6011 us 6006	FyF	3357	drawing collection	draw
862	chair 210mm x 80mm x 16mm, gap 80mm, cheeks overhanging, heights of cheeks above plate 35mm, mounting holes 14mm diameter, 160mm apart	45	FyF	3423	drawing collection	draw
863	chair, 430mm long, base 100mm wide and 45mm thick, ends rounded, rising section of chair 95mm high, 100mm wide 70mm long, 60mm in from end to outer face	6011	FyF	3223/4		
864	chair to hold flat based rail 320mm long, 100mm wide, max height 80mm, gap between cheeks 30mm, base plate 120mm, symmetrical, no mounting holes visible	6010	FyF	3325/6	drawing collection	
Railway fishplates						
865	fishplate like block, square holes in recess on one face, 400mm long, 85mm wide, 20mm on edge, 8mm in centre, 4 holes each 20mm square	pit1 u/s	FyF	3263	retained	
866	fishplate - bevelled edge - small, circular holes, 390mm long, 65mm x 20mm	6104	FyF	3314/5		
867	fishplate - simple bar - square holes 465x14x60 square hole may be almost circular on other side	6371	FyF	3314/5	drawing collection	draw
868	fishplate - simple bar - square holes	6098	FyF	3314/5		
869	fishplate - simple bar - round holes	6099	FyF	3314/5		
870	fishplate - simple bar - round holes	6369	FyF	3314/5		
871	fishplate - simple bar - round holes	6368	FyF	3314/5		
872	46cm x 7cm x 25mm, four holes equidistant 90mm, 25mm diameter, very slightly concavo-convex bar, fishplate	Settlement T2 f38	FyF	3304	retained	

Cat. No.	description	context	Location	photo	Status	Draw?
873	fishplate - bevelled edge - big, square holes, 460mm long, 80mm x 16mm	6228	FyF	3314/5		
874	fishplate - bevelled edge - big, square holes, 460mm long, 80mm x 16mm	6228	FyF	3314/5		
875	fishplate - bevelled edge - big, circular holes, 460mm long, 86mm x 20mm, slightly c-c	6102	FyF	3314/5		
876	fishplate - bevelled edge - big, circular holes, 460mm long, 86mm x 20mm,	6370	FyF	3314/5		
877	fishplate - bevelled edge - big, circular holes 460mm long, 86mm x 20mm,	6101	FyF	3314/5	drawing collection	draw
878	fishplate - bevelled edge - big, circular holes, 460mm long, 86mm x 20mm,	6105	FyF	3314/5		
879	fishplate with trapezoidal section and round holes, 460mm long, 65mm wide, 20mm thick, holes 20mm diameter	pit1 u/s	FyF	3263	retained	
880	fishplate - bevelled edge 460mm x 80mm x 20mm	6011	FyF	3330		
881	fishplate, bevelled edges 460mm x 32mm x 15mm, square holes	6011	FyF	3334		
882	fishplate - bevelled edge and recessed face - big, circular holes, 470mm long, 85mm x 24mm,	6103	FyF	3314/5		
883	fishplate - bevelled edge and recessed face - big, circular holes, 470mm long, 85mm x 24mm,	6100	FyF	3314/5	drawing collection	draw
884	fishplate - bevelled edge and recessed face - big, circular holes, 450mm long, 76mm x 17mm,	6225	FyF	3314/5		
885	fishplate - bevelled edge 510mm x 80mm x 14mm	6011	FyF	3330		
886	fishplate - bevelled edge 510mm x 80mm x 15mm	6011	FyF	3330		
	railway spring wedge					
887	60mm x 75mm curled steel strip, probably part of a railway fixing spring	u/s	boxes	46,47	boxes	
	other vehicle components					
888	possible leaf spring, 1.14 surviving length, 7.5x1cm section, one scroll end surviving 4 holes with round headed bolts with square nuts	pit1 u/s	FyF	3281	retained	

CHAIN & HOOKS

889	chain length, links 42mm x 20mm, 4mm diameter, c. 10 links in concrete	175	FyF	3399		
890	plate with attachment hole one end, other end has loop with two links of chain attached, plate overall, 160mm long, 35mm wide on main part, 50mm wide just before chain attachment, 7mm thick, hole 15mm, 2 chain links attached to other end links, 50mm x 25mm x 7mm round	214	FyF	3403	drawing collection	
891	chain fragment, 50x25mm, links 5mm section, 5 links possibly attached to a ring at the end	175 T25 settlement	boxes	43,44	boxes	
892	55mm x 40mm by 10mm diameter broken chain link	c063	boxes	105, 106	boxes	
893	probable chain link, eroded, 50mm x 30mm, 5mm diameter section	pt063	FyF	537 (15)		
894	chain, 3 links, each link 60mm x 33mm, with 7mm diameter	pit 4 u/s	FyF	3433		
895	chain with hook and loop, overall length 1110mm, but chain still slightly folded, typical link, 60mmx50mm, 12mm diameter, 28 links of this sort, big loop on one end is 140mm x 110mm x 16mm diameter, top link is 110mm x 60mm x 15mm diameter. Overall length of hook is 230mm, width is 130mm and 45mm thick, return 120mm, eyelet end is 60mm o/d	85558 u/s/ (soap vein?)	FyF	547 (25)	drawing collection	
896	4 links of chain attached to large hook, 70mm x 45mm links, hook 190mm x 110mm x 25mm	pit 1 u/s	FyF	3229	drawing collection	draw
897	short length of chain 75mm x 45mm width	pit 1 u/s	FyF	3226		
898	75mm x 47mm penannular wi piece or broken chain link	u/s 063 (penydarren or pit1)	boxes	102	boxes	
899	chain, 80mm link, 7 links	pit 1 u/s	FyF	3203		
900	80mmx 40mm links - long length of chain corroded into mass	pit 1 u/s	FyF	3225	retained	
901	single chain link, 80mm x 50mm and 10mm diameter	pit 1 u/s	FyF	3440		
902	wrought iron chain, 12 and 2 half links preserved, overall length 760mm, each link 90x60 chain 8mm	4008	FyF	3160/61		
903	chain with spike, 90mm link	pit 1 u/s	FyF	3204	retained	
904	90mm x 60mm links c. 1m of chain	pit 1 u/s	FyF	3228	retained	
905	c. 2m of chain with links 90mm x 45mm, 15mm round	pit 1 u/s	FyF	3231		
906	chain, 1m in length, links 90mm x 60mm x 12mm diameter	4007	FyF	3436	retained	
907	fragment of one chain link, 90mm long, 10mm diameter rod	pit 1 u/s	FyF	3440		
908	chain, links 95mm x 55mm round section 15mm, c 1.5m long	pit 1 u/s	FyF	3238	retained	
909	chain 95mm link	pit 1 u/s	FyF	3203		
910	chain 95mm link	pit 1 u/s	FyF	3203		
911	chain 95mm link	pit 1 u/s	FyF	3203		
912	95mm chain 2 links	pit 1 u/s	FyF	3204		
913	chain, 95mm link	pit 1 u/s	FyF	3204		
914	chain, single link 95mm	pit 1 u/s	FyF	3204		
915	short length of chain with rectangular flattened loops, average 110mm x45mm chain, each link rectangular, flattened on long sides	pit 1 u/s	FyF	3227		
916	1 large chain link, 130mm	pit 1 u/s	FyF	3203		
917	c 1.5 m of heavy chain, links, 130mm x 90mm links of 22mm round	pit 1 u/s	FyF	3230	retained	
918	looped screw 40mm long, loop 15mm diameter 5mm section, attached to 80mm long loop, round where attached then sides together then long open loop, far end extends into section now missing formed by twisting loop into 8	214	FyF	3403	drawing collection	
919	compressed angle chain loop from buckle/chain attachment 100mm long, width on small end 33mm, max width on long end 33mm, 6mm diameter metal link fragment	214	FyF	3403	drawing collection	
920	link fragment	pit 1 u/s	FyF	3204		
921	half oval of 15mm diameter wi - broken chain link?	u/s 063 (penydarren or pit1)	boxes	102	boxes	
922	highly eroded wi, c.7mm diameter, 100mm long, semi-circular, probably link fragment	c424	boxes	109, 110	boxes	
923	broken iron chain link, 55mm surviving, 40mm wide	sondage W of building settler	FyF	3329		
924	chain link fragment 12mm section	197 t3	FyF	3386		
925	chain link fragment 12mm section	197 t3	FyF	3386		
926	concretion containing chain	345	FyF	3400		
927	possible chain link fragment, flattened long sides, 16mm x 18mm, rectangular on short side	pt020 u/s	FyF	3443		
928	chain link or hook, broken, 95mm long, widest part of 'hook' 40mm	175	FyF	3399		
929	bent circular bar, possibly from link, 150mm original length, 15mm diameter	pit 1 u/s	FyF	3440		
930	hook through loop with double plate, apparently secured by iron ring	pit1 u/s	FyF	3258	drawing collection	draw
931	hook - height 150mm, width 100mm, hole 18mm, 16mm thick	pit 1 u/s	FyF	3203	drawing collection	
932	hook, overall 115mm tall by 85mm outwards from plane of attachment, forged from 12mm square bar, hook pointed and outcurve, top forged into flat, c.2mm thick and 37mm diameter semicircle preserved, possibly with two mounting holes - maybe this end was intended to be circular?	263 t1	boxes	81,82	boxes	
933	small corroded probable hook, 50mm across	211	FyF	3328		
934	wi hook fragment or loop	pit 1 u/s	FyF	3203		
935	as above	pit 1 u/s	FyF	3203		
936	wi hook-like object, overall height 160mm, width of bar 25mm and 10mm thick, end with eyelet 20mm diameter with 33mm o/d	pit 4 u/s	FyF	3433		
937	highly corroded iron bar folded into hook, 165mm long, c.6mm diameter	214 settlement	boxes	40,41,42	boxes	
938	pot hook like object round bar forged square into large hook one end and flatted into small perpendicular hook at the other	pit 1 u/s	FyF	3236		
939	90mm x 55mm with 13mm holes small forged shackle	214 settlement	boxes	6,7	boxes	
940	iron shackle	pit 1 u/s	FyF	3219	retained	

HORSE & HARNESS

941	horseshoe	pit 1 u/s	FyF	3202	drawing collection	
942	horseshoe	pit 1 u/s	FyF	3202	drawing collection	
943	horseshoe 150mm long, 130mm wide, widest part 30mm, 10cm thick	6011	FyF	3332	drawing collection	
944	large horseshoe, length 125mm, width 120mm, maximum width 30mm, 9mm thick, back ends folded up, no obvious front lip	8775 tr126	FyF	541 (19)	drawing collection	
945	horseshoe overall 140mmx 130mm wide, 4cm wide at widest narrowing to 2cm at ends, <1cm thick, slight central lip at front,	no label u/s	FyF	3135	drawing collection	
946	135mm x 140mm horseshoe, maximum width 22mm, 10mm thick, very rounded profile at front	c052	boxes	52	boxes	
947	140mm x 155mm large horseshoe, maximum width 28mm, 8mm thick, large downturns on rear	c092 t1	boxes	56	boxes	
948	130mm long and, 50mm half width large horseshoe, very narrow at front where the upturned lip covers most of 17mm width, upto 20mm ide laterally, upturned at rear	c063	boxes	105, 106	boxes	

Cat. No.	description	context	Location	photo	Status	Draw?
949	part of ironwork from horse collar?, iron curved sheathing terminating in a ring; cut at opposite end by staple-like object with chain link with broad, flattened outer face and then small ring with integral hook.	pit 1 u/s	FyF	3441	drawing collection	draw
950	iron strapped wooden object, complex shape, overall 240mm x 300mm, possibly 4 curved arms, metal parts 40mm wide and 3mm thickness	45	FyF	3424	drawing collection	draw
951	brass ring on end of leather strap, ring oval 70mm x 55mm long, brass 7mm diameter, leather poor 60mm long, 20mm wide	no 1 pit channel between 70/66/	FyF	3437	drawing collection	draw
952	brass buckle on leather strap, 40mm long 35mm wide, remains of iron pin	no 1 pit channel between 70/66/	FyF	3437	drawing collection	draw
953	buckle attached to leather, 85 mm in length 60 wide, round section 10mm, iron pin missing, non ferrous	pit 1 u/s	FyF	3180/81	drawing collection	draw
954	double loop from ?bit, large loop oval, 50mm x 30mm, pear-shaped section overlaps this and small ring is in perpendicular plane, 25mm tall by 15mm long, overall length of 74mm	pt063	FyF	537 (15)	drawing collection	draw
955	harness attachment chain 190mm long, forged of 8mm iron on end sections, joined by 50mm x 30mm x 6mm link, end for attachment to harness is 10cm wide by 6cm loop other end has double ring 110mm x 80mm with hook passing back into centre of loop.	no 1 pit channel between 70/66/	FyF	3437	drawing collection	draw
956	loop with threaded attachment 65-70mm diameter, 10mm circular section, thread 35mm length, collar 30mm diameter, 20mm gap to ring, overall 125 mm long	pit 1 u/s	FyF	3180/81	drawing collection	draw
957	oval mount, 45x56mm, polished convex face, rear face shows four ferrous mounting pins, corrosion contains some fibrous organic material that may be leather	548 settlement	boxes	25	boxes	draw
958	non-ferrous, loop with attachment 1/2 inch id, 68 tall, 55 wide, loop 8mm diameter, large harness swivel	u/s 063 (penydarren or pit1)	boxes	102	boxes	draw
959	lead thimble like object 50mm tall, open end c. 24mm diameter, faceted side has nail hole.	u/s	FyF	3372		
960	strapping around wooden beam with nails and looped form on narrow face of wood	pit 1 u/s	FyF	3208		

WIRE & CABLE

961	11 iron wire fragments	c037 penydarren pit head	boxes	37,38,39	boxes	
962	220mm wire folded into crude hook one end, 4mm diameter, possibly galvanised	u/s	FyF	3407		
963	170mm wire, 2mm diameter	pit1 u/s	FyF	3298		
964	iron wire wrapped onto smallish nail	sondage W of building settlem	FyF	3329		
965	1 piece of thicker wire	sondage W of building settlem	FyF	3329		
966	wire, 240mm long, 4mm diameter	214	FyF	3403		
967	8 fragments of iron wire	sondage W of building settlem	FyF	3329		
968	wire from fencing	175	FyF	3392		
969	wire from fencing	175	FyF	3392		
970	180mm 4mm rod	175 settlement 8009/t2	boxes	74	boxes	
971	190mm 3mm wire	175 settlement 8009/t2	boxes	74	boxes	
972	4mm wire, 50mm long	284 settlement T1	boxes	75	boxes	
973	3mm wire fragment 90mm long	pt 063	boxes	77	boxes	
974	coil of 2.5mm iron wire	424 settlement	boxes	85/86	boxes	
975	short length of 2.5mm wire	424 settlement	boxes	85/86	boxes	
976	thin iron wire	pit 1 u/s	FyF	3220		
977	medium iron wire	pit 1 u/s	FyF	3220		
978	4mm wire fragment	424 settlement	boxes	85/86	boxes	
979	4mm iron wire fragment	175 t1	boxes	87	boxes	
980	4mm iron wire fragment	175 t1	boxes	87	boxes	
981	4mm iron wire fragment	175 t1	boxes	87	boxes	
982	4mm iron wire fragment	175 t1	boxes	87	boxes	
983	4mm iron wire fragment	175 t1	boxes	87	boxes	
984	85mm length of 2mm wire	c063	boxes	103,104	boxes	
985	iron wire 200mm x 3mm diameter	175	FyF	3399		
986	iron wire 2mm, various small fragments	no 1 pit channel between 70/66/	FyF	3437		
987	coil of iron wire 4mm	no 1 pit channel between 70/66/	FyF	3437		
988	wire, 200mm long, 3mm diameter	pt214	FyF	539 (17)		
989	skewer-like object, 240mm long, ring 17mm o/d, 12mm i/d, 3-4mm circularish section	214	FyF	3403		
990	skewer-like object, 170mm long, 5mm diameter, folded into oval loop 15mm x 21mm long	214	FyF	3403		
991	wire looped, 90mm long, loop 28mm diameter, wire 4mm diameter, slightly hooked at opposite end	214	FyF	3403		
992	80mm length of steel/iron cable	c063	boxes	105, 106	boxes	
993	iron cable 70mm long fragment, 8mm diameter	u/s 063 (penydarren or pit1)	boxes	102	boxes	
994	iron cable 90mm long fragment, 8mm diameter	u/s 063 (penydarren or pit1)	boxes	102	boxes	
995	iron cable, 7 strand, no fibre, each strand 2mm, cable 8mm	263 t1	boxes	81,82	boxes	
996	6-strand iron cable (galvanised or steel??) 2mm strands 7mm whole	212 settlement	boxes	94,95	boxes	
997	2 pieces of iron cable with rope in core		FyF	3153	retained	
998	wire rope, 5 x 3mm strands wound around thin fibre core, 12mm overall, 500mm long	c037 penydarren pit head	boxes	48,49	boxes	
999	iron cable, 12mm strands each of 6 wires plus central string, partly twisted together to form composite of two, length probably 1.5m altogether but folded	45	FyF	3422		
1000	fibre cored cable fragment 12mm diameter, 6 strands <500mm	45	FyF	3425		
1001	fibre cored cable fragment 12mm diameter, 6 strands <500mm	45	FyF	3425		
1002	fibre cored cable fragment 12mm diameter, 6 strands <500mm	45	FyF	3425		
1003	fibre cored cable fragment 12mm diameter, 6 strands <500mm	45	FyF	3425		
1004	concretion containing wire rope, diameter 50mm, fibre core, multistrands of wire appear to be bound by wire near end and possibly folded back over the top of the binding, each similar to previous wires	47	FyF	3414-3418 (no 17)		

TOOLS

shovels

1005	shovel - 130mm half width, tip and one side missing, 300mm of handle preserved, with regularly spaced nail remnants	548 (f028)	boxes	1,2	boxes	
1006	flatter shovel, 295mm wide, tip missing, two sides of blade riveted to take shaft - each side extending up handle for 270mm	unstrat overbridge	boxes	3,4	boxes	draw
1007	shovel, shield-shaped blade, 290mm wide by 320 mm long, comprises two sheets, probably welded but riveted close to handle base, slightly curvature, covered in a probably 19th century style of coal-bearing mortar, rivets 8mm heads, 120mm apart, 20mm below top of blade	u/s	boxes	113, 114	boxes	
1008	shovel blade, slightly incomplete 325mm long and 270mm wide, apparently double plate almost throughout	6012	FyF	542 (20)	drawing collection	
1009	complete shovel blade with section of handle, metal on shaft, 200mm, shaft out of plane of shovel blade, shaft downcurves with central rib, 335mm long, 265mm wide, metal on shaft 35mm o/d	u/s	Education	3445	display	draw

gad bars

1010	gad, 190mm long, 40mm wide, 25mm thick, burred, narrows to point	u/s underground	FyF	3359	retained	
1011	1.24m long, 4cm diameter round bar pyramidal point, no burr, gad bar	no label u/s	FyF	3136	retained	
1012	bar with long pyramidal point, 1300mm, 30mm diameter, 370mm squared off	pit 1 u/s	FyF	3233	retained	
1013	heavy spike, 550mm long round section burred top 34mm diameter pyramidal point	pit 1 u/s	FyF	3245	retained	
1014	square sectioned bar formed into pyramidal point one end, 170cm long (but folded into hook), 20mm square section	pit 1 u/s	FyF	3251		
1015	gad bar with burred end, circular section, 780mm long, 25mm diameter	u/s Bute Coal Seam	Education	3450	display	

chisels and prise bars

1047	round bar 157mm long and 10mm diameter one end slightly flattened	188	FyF	548 (26)		
1021	small spud bar or spike, square section 15mm, chisel end, burred head 640mm long	197	FyF	3405		
1050	round bar 250mm long, 15mm bar, chisel end, broken off and bent, possible small spud bar tip	244	FyF	3391		
1034	possible poor spud bar 890mm long, slightly burred head and poor chisel, 12mm square section, 20mm wide chisel	277	FyF	3306	retained	
1042	unusual handled spud bar/drill 1730mm, 16mm square section, chisel end 30m, top 230mm circular 40mm diameter	374	FyF	3306	drawing collection	draw

Cat. No.	description	context	Location	photo	Status	Draw?
1057	chisel ended square bar, no top, 20mm square bar, 630mm long	4040	FyF	3163	retained	
1016	chisel, 175mm long, burred top, point fractured, 25mm bar	214 t1	boxes	84	boxes	
1022	split wrought iron spud bar 650mm long, 30mm diameter burred head, poor chisel point	44 f5	FyF	3429	drawing collection	draw
1046	85mm rod c20mm diameter ending in chisel tip	570 settlement	boxes	70	boxes	
1023	bar with wide chisel end 66cm long, 2cm square section, chisel tip 30mm wide	Bute Seam	FyF	3141	retained	
1062	square bar with strongly burred end, 95cm, 20mm square rod, no tip	Bute Seam	FyF	3141	retained	
1037	bent chisel or stake, 920mm long, 35mm diameter, burred end, other end fractured	c045	FyF	549 (27)		
1036	large chisel, 910mm long, 30mm diameter, 40mm wide at chisel end, well burred top	c045	FyF	549 (27)	retained	
1030	large chisel, 740mm long, 35mm diameter, well burred top, chisel 37mm wide	c047 f3	FyF	545 (23)	drawing collection	draw
1038	square section spud bar, 940mm, end not very burred, 23mm square, chisel width 35mm	longtown area F 001	FyF	545 (23)	drawing collection	
1032	round sectioned chisel/spud bar 860mm long, diameter 25mm, slightly burred top, chisel end very poorly preserved	overbridge u/s	FyF	545 (23)		
1018	580mm chisel/bar 25mm diameter, tip 45mm wide, well burred top	pit 1 u/s	FyF	545 (23)	drawing collection	
1019	square section, burred top, chisel point, 580mm, 15mm section	pit 1 u/s	FyF	3245	retained	
1020	square sectioned bar with chisel end, 610mm long, 15mm square section, slightly burred end	pit 1 u/s	FyF	3253	retained	
1024	square sectioned chisel ended bar, 660mm long, 17mm square section	pit 1 u/s	FyF	3234		
1027	square section, burred top, chisel point, 710mm, 20mm section	pit 1 u/s	FyF	3245		
1029	square section 1 burred end chisel point, 730mm, 18mm section	pit 1 u/s	FyF	3245	retained	
1031	square sectioned bar possibly originally with chisel end 760mm, 15mm square	pit 1 u/s	FyF	3253		
1033	as above 860mm x 28mm	pit 1 u/s	FyF	3223		
1039	round sectioned chisel-ended bar 1000mm x 30mm	pit 1 u/s	FyF	3223		
1040	as above 1030mm x 30mm	pit 1 u/s	FyF	3223	retained	
1043	broken chisel tip from small spud bar, 150mm long, 15mm square section	pit 1 u/s	FyF	3440		
1044	burred head of large bar	pit 1 u/s	FyF	3217	retained	
1051	chisel, 260mm long, 25mm diameter, 20mm wide - not burred ?fragment	pit 1 u/s	FyF	3199	retained	
1052	270mm long, round, 20mm diameter, edge 30mm wide, chisel	pit 1 u/s	FyF	3178/79	drawing collection	draw
1053	chisel 275x15mm square, edge 30mm	pit 1 u/s	FyF	3178/79	retained	
1054	burred bar, 290mm long 20mm diameter - broken chisel/spud bar	pit 1 u/s	FyF	3198		
1055	fragment, circular section 15mm diameter, 380mm, chisel end	pit 1 u/s	FyF	3245	retained	
1058	as above but no head, 720mm x 20mm square	pit 1 u/s	FyF	3224		
1059	as above 750mm (no head) x 25mm	pit 1 u/s	FyF	3223		
1061	square section chisel ended bar, 890mm x 20mm square, no tip	pit 1 u/s	FyF	3224		
1035	square sectioned spud bar, 900 long, 30mm square	pit 4 u/s	FyF	3164/5		
1056	end of small spud bar, wide chisel end, 380mm long, 15mm square, chisel end 27mm wide	pit 4 u/s	FyF	3431		
1026	chisel ended square sectioned bar 700 long, 20mm square, chisel 30mm wide	pit 4/s	FyF	3166	retained	
1025	690mm square bar with burred head and chisel tip, 16mm square	pit1 u/s	FyF	3259		
1028	720mm square bar with burred head and chisel tip, 15mm square	pit1 u/s	FyF	3259		
1049	250mm , 16 square fragment with wide chisel tip	pit1 u/s	FyF	3260		
1060	860mm long, square section 16mm head missing ,chisel end	pit1 u/s	FyF	3259		
1064	chisel pointed bar, 165mm long with diameter of 14mm	pt020 u/s	FyF	3443		
1048	18mm bent round bar, appears to tapering and may be spud bar tip, 165mm long	tp1 longtown area	boxes	112	boxes	
1017	210mm long possible chisel 20x25mm max section	u/s	FyF	3143/4	drawing collection	draw
1041	1.05 long 30mm diameter, bar with asymmetrical chisel point	u/s	FyF	3137	retained	
1063	chisel tip from bar 80mm surviving	u/s	FyF	3372		
1045	spud bar tip,		FyF	3156/7	retained	
wedges						
1065	wedge 90mm x 30mm x 8mm, burred end	47	FyF	3413	retained	
1066	wedge 90x40x10	44 f5	FyF	3427		
1067	110x20x12 curved wedge	44	FyF	3428		
1068	wedge, 115mm x 20mm x maximum of 11mm	44	FyF	3428	drawing collection	draw
1069	wedge 120x50x14	44 f5	FyF	3427	retained	
1070	wedge 120x50x14	44 f5	FyF	3427	retained	
1071	wedge, not burred head, 120mm long, 55mm wide, maximum 8mm thick	pt020 u/s	FyF	3443	retained	
1072	125mm x 40mm maximum c.8mm, probable wedge	u/s 063 (penydarren or pit1)	boxes	102	boxes	
1073	wedge 125x38x11	44 f5	FyF	3427	retained	
1074	wedge 130x50x12	44 f5	FyF	3427		
1075	wedge, 135mm x 50mm x maximum of 15mm	44	FyF	3428	drawing collection	draw
1076	140mm x 53mm, maximum thickness 15mm, wedge	c063	boxes	105, 106	boxes	
1077	wedge 140mm x 52mm x 12mm	47	FyF	3413	retained	
1078	150mm x 35mm maximum 8mm thick, probable wedge	u/s 063 (penydarren or pit1)	boxes	102	boxes	
1079	wedge 150mm long, width at top 50mm, bottom 10mm, thickness 22mm top, 7mm bottom, burred top	u/s	FyF	3367	retained	
1080	possible wedge, 160mm long, 30mm wide and maximum 7mm thick, lower part largely corroded away	pt020 u/s	FyF	3443		
1081	wedge, burred head, 165mm long, 25mm wide, 15mm maximum thickness	187	FyF	3389	drawing collection	
1082	wedge 180 x 32 x max thickness of 8mm	c409	boxes	111	boxes	
1083	wedge 180mm long, 22mm wide, 20mm maximum thickness, burred end, more chisel like than the object above	187	FyF	3389	drawing collection	
1084	wedge/chisel 190mm, 28mm wide thins from 24mm to 5mm edge, slightly burred	pit 1us	FyF	3359	retained	
1085	wedge 200mm x 22mm x 9mm , thinning from burred end down to chisel edge	47	FyF	3413	retained	
1086	wedge 200mm long, 25mm wide, 18mm thick,	47	FyF	3413	retained	
1087	wedge 200mm long, 25mm wide, 25mm thick	47	FyF	3413	drawing collection	
1088	wedge 200mm 25mm square	47	FyF	3413	drawing collection	
1089	wedge 200mm, 25mm square	47	FyF	3413	retained	
1090	wedge, 200mm x 25mm x maximum of 9mm	44	FyF	3428	drawing collection	
1091	spike/wedge/chisel 200mm long, 20mm square burred head	47	FyF	3410	retained	
1092	210mm x 45mm maximum 10mm thick, wedge	u/s 063 (penydarren or pit1)	boxes	102	boxes	
1093	wedge or bar, 220mm x 35mm x maximum 8mm	44	FyF	3428	drawing collection	draw
1094	wedge 230x40x14	44 f5	FyF	3427	retained	
1095	230mm long wedge, 30mm wide, 13mm thick at head, burred	214 settlement	boxes	6,7	boxes	
1096	possible wedge 250x22x8	44 f5	FyF	3427		
1097	wedge 270mm, 40mm wide 12mm at thick end to 2mm at thin	pit 1 u/s	FyF	3359		
1098	wedge 280mm x 35x10 slight burring	45	FyF	3423		
1099	wedge shaped bar 280mm x 35mm x maximum of 12mm	44	FyF	3428	retained	
1100	thin bar with chisel like end and burred head 290mm x 26mm x maximum of 4mm - hard to see how this functioned as a chisel or wedge?	pit 4 u/s	FyF	3432		
hammers						
1101	hammer head and part shaft, overall length, 220mm, square end 50x55mm tall square end, burred, chisels on lower face, chisel end 55 end 55mm wide, shaft hole 40x20mm	383 f33	FyF	3358	drawing collection	draw
1102	large wedge shaped hammer, 240mm long 80mm high, 75mm wide across shaft, shaft hole 40x30mm, vertical rounded chisel vertical edge one end, rectangular face 40x70mm	175	FyF	3358	drawing collection	draw
1103	large sledge hammer 160mm long, faces rounded and burred, 50mm hexagonal cross section, shaft hole 40x30mm, part of shaft surviving	u/s	FyF	3358	drawing collection	draw
1104	hammer head, split, square shaft with faceted corners, 180mm long, 45mm tall , 50mm wide, shaft 35x20mm	187	FyF	3358	drawing collection	draw
1105	sledge hammer, octagonal section, 190mm long, faces 35mm across, 200mm of shaft remains attached	underground below Pits 1 and 2	boxes	107, 108	boxes	draw
1106	sledge hammer and part haft, 150mm long, octagonal section away from haft, faces 55mm diameter slightly burred both sides, almost cubic where shaft goes through, shaft hole 50mmx30mm	u/s driver	FyF	541 (19)	drawing collection	draw
rock drill						
1107	1220mm long circular bar, pointed one end for slotting in to handle, circular section below this pyramidal bit, then square section before long bit section, bit rectangular section twisted bar, square section taper 50mm, round section 455mm, square section 185mm, spiral remainder, auger diameter 38mm, 40mm between twists, square section 18mm square, round section 20mm diameter	u/s Bute Coal Seam	Education	3451	display	draw
1108	brace-like object, 425mm long, 280mm central, crank, arm including welded block 190mm, circular section 22mm, block 50mm long, 35 thick and 40 wide, square hole 17mm square outer face, 14mm on inner face, spike section total 170mm	u/s Bute Coal Seam	Education	3444	display	draw

Cat. No.	description	context	Location	photo	Status	Draw?
mandrel 1						
1109	small straight Mandrel, 25cm surviving length, 35cm original length, some shaft surviving, 2.5cm wide x 3cm tall, shaft width 7.5cm x 2cm, 42mm max depth of cheek by shaft	u/s seam	FyF	3133	retained	
1110	straight Mandrel, 350mm long, hole, 75x22mm wide, height of cheek 35mm, 20mm square section near handle	424	FyF	3375	drawing collection	draw
1111	straight Mandrel, with one end burred back, hole c.45mm x 18mm but corroded, cheeks corroded off, 195mm long spike, 355mm overall, section near shaft 22mm tall x 28mm wide, burr 16x20mm	175 T25 settlement	boxes	43,44	boxes	draw
1112	small straight Mandrel, broken one end, 310 remain, originally ?370mm, straight, largest section 20mm square, handle 75mm x 20mm, cheek 40mm	175	FyF	3392	retained	
1113	straight Mandrel, overall length 370mm, largest section 25mm x 20mm, hole 70x20mm, cheek 60mm	536	FyF	3395	drawing collection	
1114	small corroded straight Mandrel, 380mm long, maximum section 25mm square, handle 55mm x 20mm approximately, cheeks missing, very slightly curved (upwards?), probably originally straight	longtown area e 001	FyF	544 (22)		
1115	badly corroded half a straight Mandrel head, 180mm half width	175	FyF	3392		
mandrel 2						
1116	pick, 450mm long, bent hole burst, largest cross section 26x30mm, shaft hole 80x25mm wide, slightly down curved	175	FyF	3369	retained	
1117	down curved pick head, 460mm overall length, largest width is 25mm square, cheek 50mm, hole 90x35mm wide	pit 1 u/s	FyF	3182-3	drawing collection	draw
1118	better preserved down curved Mandrel, 47cm wide, 40mm cheek, 2.5cm tall x2.5cm wide near shaft, shaft hole 8x3cm	u/s/ seam?	FyF	3134	drawing collection	
1119	slightly down-curved Mandrel with 240mm half width, one point missing, shaft hole 95mm x 30mm, metal 6mm either side, cheeks to 40mm, 23mm square close to shaft hole	u/s 063 (penydarren or pit1)	boxes	102	boxes	
1120	curved Mandrel, 480mm long, shaft hole 85x25mm, cheeks 45mm, max section of regular spikes 28mm square	u/s	Education	3446/7	display	
1121	curved pick, length 500mm, max section 22x20mm, hole 85 mm x 23mm wide, cheek 30mm	376	FyF	3305	drawing collection	
1122	large pick, 510mm long, down curved, maximum 30mm square, hole 90mm x 25mm, cheek 45mm	536	FyF	3390	drawing collection	draw
1123	broken curved pick head, original length probably twice the 270mm now present	sondage W of building	FyF	3393,4		
other tools						
1124	hammer headed mattock, 415mm long, square section hammer 80mm beyond hole, mattock 260mm, hole 90x25mm, cheek 40mm, width of chisel end 30-50mm wide, max thickness 14mm, hammer rounded square section 30mm	407	FyF	3373	drawing collection	draw
1125	pickaxe/mattock 495 long, flat tip 180 from hole, point 225 mm from hole, handle 100x20mm, cheek, 60mm, flat edge 35mm wide, 13 thick, point bevelled square section 30mm	407	FyF	3373	drawing collection	draw
1126	round bar with forged spanner end, 560mm long, o/d head 100mm, i/d across flats 55mm	pit 1 u/s	FyF	3237	drawing collection	
1127	wrought iron bar with bifurcated tip, 127 length, 60wide, 12mm thick, slot in end 45mmx 25mm - spanner	Bute Seam	FyF	3142	retained	
1128	round rod with right angled spatula tip, 305 long, 35x40 tip, 10mm rod	no label	FyF	3167	retained	
1129	25mm square section bar with 50mm long 45mm diameter circular section at one end - looks like socket spanner externally, but solid - tamper? (? See also 1018)	pit1 u/s	FyF	3297		
illumination			lamps			
1130	threaded attachment, 70mm o/d, 40mm i/d with four square notches, inner face shows raised ring c4mm	105	boxes	28,29	boxes	draw
1131	geared wheel with four spokes, 57mm o/d, 4mm thick, teeth pitch 2mm, 1mm high, inner diameter 45mm,	pt063	FyF	537 (15)	drawing collection	draw
1132	copper alloy sheet gauze fragment, 2mm diameter holes	181	FyF	3397	retained	
blacksmith's tools						
1133	small ball pein hammer	pit 1 u/s	FyF	3217	drawing collection	draw
1134	cast hammer head with slightly pointed ends 130mm long, faceted bar c23mm wide, hole 20mm diameter, octagonal section	214	FyF	3403	drawing collection	draw
1135	triangular file, apparently reused as a punch, 152mm long, maximum face width 17mm, probable broken end burred, pitch c. 0.8mm, tang slightly curved with possible secondary faceting	pt 021	boxes	97,98	boxes	draw
1136	corroded possible triangular section file 140mm, each face maximum 10mm	214	FyF	3403	drawing collection	
1137	rounded backed file, 230mm long, maximum width 20mm, 5mm thick	no 1 pit channel between 70/66/i	FyF	3437	drawing collection	draw
1138	file, 350mm long, file 300mm, 30mm wide, 7mm thick, slightly triangular tang	pt214	FyF	539 (17)	drawing collection	draw
1139	possible smiths poker, pointed end to round bar, right-angled spatula the other	pit 1 u/s	FyF	3252	retained	
1140	possible smiths poker, spike and right-angled spatula end	214	FyF	3254	retained	
1141	poorly preserved smiths long fragment	pit1 u/s	FyF	3257	drawing collection	
1142	blacksmiths tongs, one handle broken off, 575mm long	pit 1 u/s	FyF	3239	drawing collection	draw
1143	single handle broken from smiths tongs 580mm long, round bar 15mm diameter	pit 1 u/s	FyF	3244	drawing collection	
1144	hooked bar, overall 330mm x diameter of loop c130mm, rod 10mm, ? Shaped	settlement	FyF	3374		
1145	mounting of hoe/broom/hayfork or other tool	pit 1 u/s	FyF	3217	drawing collection	
1146	10mm iron square section rod, 210mm long, curved just before break one end and slightly tapered the other - just possibly a fork tine	463 (f041)	boxes	5	boxes	
1147	85mm long, max width 20mm, possible highly corroded knife blade in three pieces, or just fragment from sheet decomposition?	u/s t2	boxes	106	boxes	
BOILER PLATE						
trapezoidal boiler plate						
1148	trapezoidal boiler plate 60cm, widens to 61cm to 49cm at top, broken 97cm surviving length, narrow end broken off across rivet holes. Holes 2cm diameter, 5.2cm spacing, 2.5cm thick. 6 cm diameter hole in middle	label blank	FyF	3082	retained	
1149	trapezoidal boiler plate, with all sides slightly curved, 54cm wide at bottom, 20 wide at top, 1.17m long, 25mm holes 5.7cm apart, 80x90mm hole in centre, 2cm thick	2 labels one says Penydarren pi	FyF	3103	retained	
1150	trapezoidal boiler plate, 54cm to 20cmx1.17m - as above 50mm central hole	penydarren pit	FyF	3104	retained	
1151	trapezoidal boiler plate, 54cm to 20cmx1.17m - as above 55mm central hole	penydarren pit	FyF	3105	retained	
1152	trapezoidal boiler plate, flat, narrow 120x52x20, all edges slight curved, narrowest one concavely, 25mm holes marginally, 60mm hole in centre, 56mm spacing, 30mm from edge	penydarren pit	Nantgarw	3058	accessioned	draw
rectangular boiler plate						
1153	rectangular boiler plate, flat, 1.23m long, 66cm wide, partially broken on rivet holes, more central hole 70mm, hole nearer edge 50mm, 2cm rivet holes 5.2cm spacing	no label	FyF	3083	retained	
1154	rectangular boiler plate, flat, 1.30m x 58cm wide, holes 2cm at 5cm apart, 55mm hole in centre	no label	FyF	3084	retained	
1155	boiler plate 1.32m long, flat, 65cm wide, 7cm hole in centre. Rivet holes 5.2cm apart	no label	FyF	3085	retained	
1156	curved rectangular boiler plate, 67cm x 131cm as chord, 143cm external curve. 20mm holes at 55mm centres, 35mm from margin, c10mm thick w	pt021	Nantgarw	3058	accessioned	draw
1157	curved rectangular boiler plate, 67cm wide, 130 length as chord, 146 cm around outside, 2-3cm thick, 20mm rivet holes 5.7cm apart	no label	FyF	3088	retained	
fragments of boiler plate						
1158	boiler plate fragment, 200x200mm, 2 rivet holes 20mm diameter surviving, 12mm or more thick, holes at 15mm from plate edge	pt 101	FyF	3439		
1159	boiler plate fragment, possible broken edge, 140mm x 40mm by 10mm thick, two holes 25-20mm broken off	pt 101	FyF	3439		
1160	460mm length of strapping, possibly from boiler, 60mm x 10mm section, 20mm diameter holes, 7 holes and 2 halves, 56mm spacing centres	pit1 u/s	FyF	3280		
1161	fragment from join of thin iron plates with row of large domed rivets, 220mm long, sheet 1mm, 9 rivets visible	u/s	boxes	79	boxes	
WI sheet with central hole						

Cat. No.	description	context	Location	photo	Status	Draw?
1162	plate with central hole, 90mm square, 6mm thick, hole 20mm diameter	45	FyF	3423		
1163	plate with central hole, 160mm x 110mm x 25mm, swollen slightly by hole, hole 65mm, not quite central	45 f6	FyF	534 (12)	retained	
1164	plate with central hole, 170mm x 110-125mm x 22mm, hole 70mm diameter, slightly swollen by hole	45 f7	FyF	3421		
1165	plate with central hole, 180mm x 100mm x 24mm, hole 80mm diameter, slightly swollen by hole	45 f8	FyF	3419		
1166	plate with central hole, 180mm x 100-115mm x 22mm, hole 70mm diameter, slightly swollen by hole	45 f11	FyF	3420		
1167	plate with central hole, 190mm x 100-110mm x 22mm, hole 70mm diameter, slightly swollen by hole	45 f9	FyF	3419	drawing collection	draw
1168	plate with central hole, 190mm x 105-115mm x 20mm, hole 70mm diameter, slightly swollen by hole	45f10	FyF	3420		
1169	plate with central hole, 190mm x 100-110mm x 20mm, hole 65mm diameter, slightly swollen by hole	45 f7	FyF	3421		
1170	plate with central hole, 195mm x 100mm x 25mm, swollen slightly by hole, hole 70mm, not quite central	45 f6	FyF	534 (12)	retained	
1171	plate with central hole, 290mm x 175mm x 24mm, hole 70mm diameter	45 f9	FyF	3419	drawing collection	draw
1172	plate with central hole, 320mm x 150mm x 22mm, hole 70mm diameter	45 f11	FyF	3420		
1173	rectangular plate with square hole. Wrought, 210mm x 165mm with 70mm square hole, 16mm thick	47	FyF	3414		
1174	wrought iron sheet, cut to square with multiple round holes 720x670x10mm	settlement	FyF	3321		
1175	wrought iron sheet cut in trapezoidal shape by multiple ?drill holes, 820mm x 180mm x 14mm thick	pit 1 u/s	FyF	3232		
1176	wrought iron plate fragment, 150mm x 100mm x 5mm	175 settlement	boxes	78	boxes	
1177	curved wi plate fragment, 170mm x 90mm x 8mm	kiln 6002 u/s	boxes	66,67,68	boxes	
1178	plate fragment of wrought iron 180mm x 200mm x 24mm thick	212	FyF	3398		
1179	sheet, 80mm x 100mm x 9mm slightly curved	pit 4 u/s	FyF	3431		
1180	sheet, 110mm x 95mm x 11mm slightly curved	pit 4 u/s	FyF	3431		

SHEET

1181	trapezoidal galvanised sheet. 1200mm long side, 1080mm, shorter side, width 25.5cm. Similar to above which is half on one of these, 4 holes along short length, 4 on long side 11 mm diameter	477 f27	FyF	3301	retained	
1182	as above 1200mm long, 1050mm short, 310mm wide, very corroded with holes	477 f 26	FyF	3301		
1183	possible galvanised/tinned sheet 620x290x2mm, several original holes (4 or 5) near margin, 10mm diameter	settlement	FyF	3300		
1184	1480mm long, 210mm wide, 2-3mm thick, has round section bar through it to make handle-like protrusion, possibly had curved corners on one side	below 490 (f40)	FyF	3301		
1185	corroded iron sheet, 1240x120x2mm	settlement	FyF	3300		
1186	possible galvanised sheet, 350mm x 75mm x 1mm	6007	FyF	3312		
1187	completely corroded sheet of ?wrought iron with much accretion on one surface - iron so degraded accretion is now almost all that is left, approx. size 85x80cm	blank label	FyF	3096		
1188	360x300mm thin wrought iron fragment <2mm with rivet	pit 1 u/s	FyF	3174		
1189	180x150mm as above with rivet	pit 1 u/s	FyF	ditto		
1190	sheet fragment	284 settlement T1	boxes	75	boxes	
1191	twisted sheet fragment	284 settlement T1	boxes	75	boxes	
1192	thin sheet fragment	pit1 u/s	FyF	3283		
1193	thin sheet fragment	pit1 u/s	FyF	3283		
1194	thin sheet fragment	pit1 u/s	FyF	3283		
1195	thin sheet fragment	pit1 u/s	FyF	3283		
1196	thin sheet fragment	pit1 u/s	FyF	3284		
1197	thin sheet fragment	pit1 u/s	FyF	3284		
1198	thin sheet fragment	pit1 u/s	FyF	3284		
1199	sheet fragment with rivet, 180x140x2mm thick, rivet c. 35mm diameter	pit1 u/s	FyF	3299		
1200	corroded sheet, 680x120x2mm	settlement	FyF	3300		
1201	sheet 550mm x 410mm irregular and very corroded 2mm thick	590	FyF	3303		
1202	iron sheet fragment with small possible reinforcing bar, 280mm x 140mm surviving 2mm sheet with riveted strap 23mm wide by 4 mm thick, curved over end of sheet	6007	FyF	3320		
1203	sheet fragment or rust?. Tiny	6011	FyF	3327		
1204	230mm x 80mm x 2-3mm wrought sheet fragment	6012	FyF	3336		
1205	wrought iron sheet fragment, 250x200mm, has square section nail driven through	565	FyF	3371		
1206	420x130x2mm iron sheet fragment	175	FyF	3377		
1207	sheet fragment, 450mm x 250mm x 2mm	175	FyF	3378		
1208	sheet fragment 50mm across	182	FyF	3380		
1209	plate, 110mm x 90mm x 3mm	47	FyF	3412		
1210	sheet maximum 150mm x 80mm, 1mm thick	pt020 u/s	FyF	3443		
1211	sheet with possible 'L'-shaped hole, 105mm x 90mm x 1mm	pt020 u/s	FyF	3443		
1212	sheet iron fragment, 140mm x 80mm	pt 063	boxes	77	boxes	
1213	30mm x 15mm x 1mm sheet fragment	570 settlement	boxes	92	boxes	
1214	small irregular wi sheet fragment	187 settlement	boxes	96	boxes	
1215	tiny thin sheet fragment	group 406 settlement	boxes	96	boxes	
1216	iron sheet fragment, width 170mm, broken length 110mm, 2-3mm thick - no holes	424	FyF	3406		
1217	200mm x 120mm sheet fragment, 1mm thick	45	FyF	3426		
1218	iron sheet, 150mm x 50mm x 5mm	175	FyF	3402		

STRIP

1219	iron plate with multiple nail holes, many still with bent/clenched nails in situ, 335mm x 80mm x 4mm, four nail holes in rough line down centre plus good holes with no nails in each corner	214	FyF	3401		
1220	strapping, with three nails, outer two nails are iron, one planar headed, other conventional, middle nail is plated(?) clout nail 40mm with 13mm diameter head, strap 16x105x2mm	211 t1	boxes	88	boxes	
1221	tapering iron strip 270mm x 28-22mm x 5-2mm with three 10mm holes, one with iron in	pt214 pit 1	boxes	59	boxes	
1222	thin iron strapping with nail holes, bent at one end, 500mm x 32mm x 1mm, holes c80mm apart	214 settlement	boxes	40,41,42	boxes	
1223	iron bar with 5 holes, one near each end, 3 close in middle, 295mm long, 45mm x 3mm thick, well preserved end has regularly truncated corners, holes 11mm diameter	pt063	FyF	537 (15)		
1224	pointed end strip with single nail hole, 340mm long, 25mm wide, 3mm thick, hole 8mm diameter and is 145mm from pointed end	175	FyF	548 (26)		
1225	corroded iron - possibly nail through strapping?	175 T25 settlement	boxes	43,44	boxes	
1226	galvanised or tinned strapping fragment 1 1/4 inch wide, 1mm thick, 200mm long	pt 063	boxes	77	boxes	
1227	strapping as above 150 long	pt 063	boxes	77	boxes	
1228	strapping as above 70mm long	pt 063	boxes	77	boxes	
1229	strapping as above 70mm long	pt 063	boxes	77	boxes	
1230	flat iron strip, 190mm x 35mm x 1mm	45	FyF	3424		
1231	70mm x 30mm x 1mm iron strip	175 t1 settlement	boxes	53	boxes	
1232	narrow thin strapping fragment	pit1 u/s	FyF	3285		
1233	as above with one hole, 16mm hole, 52mm wide sheet	pit1 u/s	FyF	3285		
1234	as above but three holes, 16mm -20mm, strip 60mm, 195mm spacing between centres	pit1 u/s	FyF	3285		
1235	thin strip fragment with rivet	pit1 u/s	FyF	3286		
1236	narrow, slightly thicker strip with small holes, 2 by 7mm holes, 30mm wide strip	pit1 u/s	FyF	3286		
1237	strip with remains of one rivet, 24mm diameter, strip 80 mm wide	pit1 u/s	FyF	3286		
1238	narrow thin strip with one large hole and two small holes near end	pit1 u/s	FyF	3287		
1239	plain strip 100mm wide, 740mm long, thickness, 4mm	pit1 u/s	FyF	3287		
1240	iron strip, 360mm preserved, 30mm x 1mm, broken in two	407	FyF	3375		
1241	strip, 140mm x 15mm x 3mm	570	FyF	3375		
1242	iron strap, 560mmx 40mmx 1mm	214	FyF	3377		
1243	riveted strap (from barrel?) 680mm x 40mm x 1mm	possibly same (214)	FyF	3377		
1244	iron strip 135mm x 50mm x 5mm	181	FyF	3397		
1245	bar 530mm x 20mm x 3mm	439	FyF	3409		
1246	iron strip strapping pierced by a staple and remains of a second staple both oblique to strap, 380mm long x 55mm wide x thickness 2 mm	pit 1 u/s	FyF	3441		
1247	230mm x 23mm x 1mm iron strip	214 settlement	boxes	6,7	boxes	
1248	30mm x 2mm strap, 140mm long, possibly galvanised/tinned	t26 u/s	boxes	104	boxes	
1249	30mm x 2mm strap, 100mm long, possibly galvanised/tinned	t26 u/s	boxes	104	boxes	
1250	30mm x 2mm strap, 50mm long, possibly galvanised/tinned	t26 u/s	boxes	104	boxes	
1251	31mmx 1mm strip 110 mm length	c063	boxes	105, 106	boxes	
1252	31mmx 1mm strip 110 mm length	c063	boxes	105, 106	boxes	
1253	145mm long strip, 20mm x 3mm thick	175	FyF	3392		
1254	iron strip 140mm, 12mm x 4mm, bent	175	FyF	3399		

Cat. No.	description	context	Location	photo	Status	Draw?
1255	130mm long piece of curved and narrow strip (12-7mm) or planar nail, 7-3mm thick	c063	boxes	105, 106	boxes	
1256	bar with ends folded in opposite directions, 450mm x 70mm x 3mm	6007	FyF	3312		
1257	copper alloy strip 170mm x 17mm x 1mm	45	FyF	3426		
1258	copper alloy strip 80mm x 20mm x 1mm	45	FyF	3426		
PIPING						
<i>cast iron pipes</i>						
1259	2 cast iron pipe sections bolted together. Large pipe with casting seam and vents at 90 degrees 1.50m long, i/d 20cm o/d 24cm, flange 42cm. Poor casting with many blowholes. 6 bolts joining sections, smaller pipe has 90 degree bend with expanded and broken collar on distal end. Bolted end has flange with large rectangular slots for bolts, then intermediate diameter sections, swollen flange to 170mm from flange face then narrow pipe, with external collar 21cm o/d 17cm i/d, narrow pipe 120mm o/d, inside not determinable.	no label	FyF	3071-3073		
1260	cast iron pipe fragment, 150mm x 70mm x 11mm thick c. 200mm diameter	9337	FyF	540 (18)		
<i>gaskets</i>						
1261	lead curved strip, folded - possibly a gasket fragment, 14mm wide	c038 penydarren pit	boxes	32	boxes	
1262	lead pipe gasket, 150mm x 120mm external, 11mm x 1mm section	45	FyF	3426	drawing collection	
<i>wrought iron pipes</i>						
1263	concretion on 80mm length of 16mm diameter thin iron pipe	c063	boxes	103,104	boxes	
1264	iron pipe , 17mm diameter	pit1 u/s	FyF	3267		
1265	iron pipe, 800mm long, o/d 35mm i/d 24mm	376	FyF	3303		
1266	arcuate pipe 630mm long, o/d 25mm, 1-2mm thick	440 s/f?51	FyF	3304		
1267	pipe 980mm long, o/d 20mm, metal 1-2mm	374	FyF	3306		
1268	pipe 230mm long 15mm o/d wall 1mm	pit 1 u/s	FyF	3198		
1269	galvanised pipe fragment	pit 1 u/s	FyF	3220		
<i>copper pipes</i>						
1270	copper pipe, 70mm long squashed to 8x10mm on simple broken end, other end shows rolled over margin	188 T3	boxes	17,18	boxes	
1271	rolled copper tube with side seam ,threaded both ends, 54mm long, 11mm diameter, 1mm thick, 10mm threaded each end	pt 101	FyF	3439		
1272	55mm of curled copper - probably unsealed pipe fragment	u/s	boxes	79	boxes	
1273	Cu fragment (from pipe?), small thin fragment, possibly with punched holes on line of one broken end	181 T2	boxes	26	boxes	
<i>unions and fittings</i>						
1274	fragment of hexagonal brass fitting, side 45mm long, 35mmx20mm cross section, blends to circular pipe end?	212	FyF	3384	retained	
1275	brass? collar, circular hole, extended hexagon outside, possibly cut off one side, 70mm x40mm surviving	sondage W of building settleent	FyF	3329	retained	
STRUCTURAL						
<i>window bars?</i>						
1276	square section bar 540mm long, 17mm central section each end flattened on the diagonal 70x25x5mm	pit1 u/s	FyF	3278		
1277	square forged bar 390mm long, 26cm central bar, flattened to end 7 and 5 cm surviving respectively, each 25mm in width, max thickness 7mm, 18mm square section, thinned ends oblique to main bar	410	FyF	3304		
1278	round sectioned rod, flattened each end, 590mm long, 500mm central section diameter 25mm, flattened to 50mm x 32mm x 10mm one end, other end c30mm protrusion but very corroded	6012	FyF	3317/8		
<i>plain bars</i>						
1279	125cm long, 18mm square bar with pyramidal end, no burr - tie bar?	pit1 u/s	FyF	3259		
1280	long round-sectioned bar with pointed end and slightly burred end 246cm long, 30mm diameter	pit1 u/s	FyF	3256		
1281	square sectioned bar cu structural tie bar, object 600mm long, 30mm square, right angle spike 140mm and blunt chisel end, other end probably broken off -structural tie bar	pit1 u/s	FyF	3261	retained	
1282	round bar forged to pyramidal point, folded though two right angles overall 310mm long, 20mm diameter, square for 100mm	pit1 u/s	FyF	3298		
1283	850mm long object, square bar forged into square hook, 30mm bar, o/d hook 140mm, i/d 80, downturn 80mm internally	overbridge u/s	FyF	549 (27)		
<i>threaded bar</i>						
1284	square sectioned bar, broken both ends, 121cm long, square section 25mm, threaded end 90mm long	pit1 u/s	FyF	3262		
1285	as above, 1.14m long bent bar, square section 30mm, 40mm of surviving thread on one end	pit1 u/s	FyF	3262		
1286	210mm surviving, 35 square, 80mm threaded, end of big tie bar like examples seen earlier	pit1 u/s	FyF	3271	retained	
1287	260mm long bar, width of 38mm, 13mm thick, then 65mm rounded 16mm diameter, of which 45mm threaded one end, the other end upturned with hole on bend, 22mmx26mm long	pit1 u/s	FyF	3289	retained	
1288	320mm long, 55mm wide, 12mm thick, hole centre 30mm from one end 20mm diameter, other end narrows to rod 45mm, probably similar to 381	pit1 u/s	FyF	3292	retained	
1289	forging 345mm long, first 68mm is 25mm x 10mm rectangular section, then goes to 280mm of circular section with diameter of 15mm, 50mm is threaded at the far end	376	FyF	551 (29)		
<i>eyed bars</i>						
1290	bar with forged elongate eyelet 40mm x 20mm, 20mm square bar, cf structural tie bar	pit 1 u/s	FyF	3205	retained	
1291	large wrought iron square bar forged into round eyelet on one end, 281cm long, 95mm o/d, 35mm i/d eye, square section 30mm.	pit 1 u/s (between shaft and hole)	FyF	3248		
1292	186cm long, 20mm square bar, eyelet 60mm o/d, 22mm i/d, pyramidal spike the other end - ??structural tie bar	pit1 u/s	FyF	3255		
1293	round bar fragment with forged eyelet at right angles, 105mm long, eyelet 35 o/d, 12mm x 25mm hole, bar 18mm round, curve in bar is out of plane of eyelet, snapped off on curve (cf example in boxed material)	pt 101	FyF	3439		
1294	23mm diameter rod forged into a loop at end 60mm o/d, 22mm i/d, turns through 90 degrees, 170mm from end out of plane of loop	c063	boxes	105, 106	boxes	
1295	round bar with eye in end, 460mm long, 25mm diameter, threaded all way up, 40mm outside diameter head with c. 20mm hole	pit1 u/s	FyF	3273		
1296	round bar with forged rectangular sectioned loop, 200mm long, circular section 26mm diameter, head o/d 66mm, i/d 30mm, head 38mm thick, rectangular section	pt 101	FyF	3439		
1297	260mm long round bar forged into loop, 80mm o/d loop, 35mm hole, bar 34mm diameter, bar curves up away from plane of loop near broken end	6011	FyF	3334		
1298	similar eyed rod as 616, 165mm long, 80mm wide od, 35mm hole, 35mm diameter bar	6010	FyF	3335		
1299	probable spike forged in to square loop head, 150mm preserved, 45mm square o/d 25mm i/d , highly corroded	175	FyF	3402		
<i>iron bindings</i>						
1300	wrought iron binding, rectangular, 130mm x 85mm, section 28mm x3mm	pit 4 u/s	FyF	3432		
1301	iron binding, rectangular 130mm x 60mm, section 20mm x 4mm	pit 4 u/s	FyF	3433		
1302	iron binding, rectangular, 110mm x 60mm with 22mm x 4mm section	pit 1 u/s	FyF	3440		
1303	110mm x 60mm small rectangular strapping	pit 1 u/s	FyF	3208		
1304	100mm x 140mm rectangular strapping	pit 1 u/s	FyF	3208		
1305	100mm x 140mm rectangular strapping with single hole	pit 1 u/s	FyF	3208		
<i>frames and hatch covers</i>						
1306	wrought iron frame 255mm x 260mm, section 40mm x 7mm, holes 100mm from one side and centrally on opposite side, 14mm diameter	374 f32	FyF	3302		

Cat. No.	description	context	Location	photo	Status	Draw?
1307	cast iron hatch cover, upper face 37 x 48cm, hinges stick out further 5.5cm and 5 cm wide over length of hinge and moulding below 22cm long, 27.5 cm gap between. Inner face appears to have firebrick cast in, 31x37cm inset, each brick opening c 22x11cm, 2 openings	blank label	FyF	3126-7	retained	
1308	vent door 410x330 with protruding corroded hinge fragments supported by slight flanges, 30mm thick	6191	FyF	3310/11		
1309	cast iron frame in two pieces with 6 securing bolts. 1.31m long, 0.56m wide with opening 1.20m x 0.48m. gap extends 3cm into frame (possible corroded iron in gap in places) overall 9cm thick - roughly 3 cm of metal either side of frame, lugs extend 60mm out, 70mm wide, bolt hole 2.5cm square, bolt with 40mm square head	no label	FyF	3092		
	structural casting					
1310	Large complex casting, full details recorded on sketch, winged overall shape, paired angled supports either side of two holes in main area, 3.12 long, 2.45 wide overall		FyF	3130-32		
	Doors handles					
1311	wrought iron handle, 135mm high, width 145mm across loop, 16mm diameter of rod, both ends flattened and out turned	settlement	FyF	3374		
1312	handle with rivets left in out turned ends, overall width 160mm, height, 70mm u-shaped section, 12mmx5mm	settlement	FyF	3374		
	strap hinges					
1313	end of wrought bar, variably spread with ornamental appearance cf. door hinge, 450mm surviving length, width 8.5-5.5 cm width, 1-4mm thick	pit 1 u/s	FyF	3282	retained	
1314	hinge plate, from door 420mm in length, 20mm wide 5mm thick, one end widens to 35mm and has square section nail (70mm long, square section 5mm, round headed 15mm, chisel point), loop 44mm o/d, 15mm i/d, 2 other nail holes along length	317 (f35)	FyF	3375		
	pintles					
1315	fragment of hinge and pintle, spike 125mm long, 15mm square section, forged to point, pintle 60mm circular, 15mm diameter, hinge fragment folded bar 25x2mm, just fragment	175	FyF	3385		
1316	pintle, 16mm square to 135mm long overall 70mm upturned giving 53mm, 17mm diameter	424 settlement	boxes	85/86	boxes	
1317	iron spike square sectioned to right angle 15x20mm, 175 long forged to spike, beyond turn 15mm 55mm	214	FvF	3403		
1318	iron spike square sectioned to right angle 10mm, 115 long forged to spike, beyond turn 12mm 40mm long	214	FvF	3403		
1319	iron spike square sectioned to right angle 14mm, 11 long forged to spike, beyond turn 15mm 45mm long	214	FvF	3403		
1320	round sectioned bar, right angled to square-sectioned spike; round 160mm x 15mm diameter, spike 65mm 8mm squarish at top, possibly half a staple	212	FyF	3398		
	structural cotter bar					
1321	L-shaped wrought iron piece, like extremely large cotter bar (as 252)	pit 1 u/s	FyF	3221	retained	
1322	L-shaped wrought iron piece, like extremely large cotter bar (as 251)	pit 1 u/s	FyF	3221	retained	
	VESSELS					
	cast iron vessels					
1323	curved iron tube, probably teapot spout	u/s 063 (penydarren or pit 1)	boxes	103	boxes	
1324	cast iron saucepan, 160mm diameter internally at base, 200mm at rim, upwards inclined handle stub remaining just below rim, 140mm high	408 (f025)	boxes	101	boxes	draw
1325	cast iron saucepan, 210mm diameter internally at base 270mm at rim possible handle stub remaining just below rim in concretion, 155mm high, rim plain, casting 3-5mm	408 (?f24)	boxes	115-7	boxes	draw
1326	90mm x 65mm 2 conjoining fragments of cast iron pot with rolled rim and possible internal slag	175 settlement 8009/t2	boxes	74	boxes	
1327	curved cast sheet - probably from a vessel, 115mm x 80mm x 4mm	284	boxes	62	boxes	
1328	large fragment from cast iron vessel	c063	boxes	105, 106	boxes	
1329	small fragment from cast iron vessel	c063	boxes	105, 106	boxes	
1330	cast iron fragment slightly curved-vessel fragment, 85x65x2mm	175	FyF	3399	retained	
	galvanised iron vessel					
1331	tinned or galvanised jug, probably two strap handles, base, 100mm diameter, several fragments	214 alcove next to fireplace	FyF	543 (21)		
1332	70mm long 4mm wire attached to sheet and probably galvanised - possibly bucket rim	c063	boxes	105, 106	boxes	
1333	180mm long piece of probable rod folded into galvanised sheet edge, possible bucket rim	c063	boxes	105, 106	boxes	
1334	105mm length of possible bucket rim as above	c063	boxes	105, 106	boxes	
1335	bucket handle, with one escutcheon attached, 340mm diameter bucket?, U section 11mmx5mm	settlement	FyF	3374		
1336	bucket handle with riveted T shaped escutcheon, 330mm across, U shaped profile, 11x5mm	no label	FyF	3378		
1337	bucket handle, rod section 13mmdiameter, escutcheons oval plate with ting above 110mm high, 18mm hole for handle, plate oval 70mm wide and 60mm wide, has two rivets and remains of plate to total thickness of 5mm, very substantial handle, not a domestic bucket.	u/s Bute Coal Seam	Education	3449	display	
1338	bucket handle fragment	pit 1 u/s	FvF	3201		
1339	bucket handle fragment	pit 1 u/s	FvF	3201		
1340	80x55mm bucket escutcheon	c063	boxes	105, 106	boxes	
	CUTLERY					
1341	bowl of coffee spoon sized spoon, plating largely worn off exposing copper alloy core	pt032	boxes	21,22	boxes	
1342	tea spoon GLADWIN 6 NS	pt001	FvF	536 (14)	retained	
	CLOTHING					
	footwear					
1343	shoe heel, 2 metal layers with leather between	pt020 u/s	FyF	3443	retained	
1344	leather shoe heel with probable tacks	c063	boxes	105, 106	boxes	
1345	heel protector (or possibly pony shoe, but very thin)	c037 penydarren pit head	boxes	37,38,39	boxes	
1346	65mm long heel (just possibly pony shoe), with square nail visible in one place	u/s	boxes	46,47	boxes	
1347	70mm long probable heel, or pony shoe, rectangular nail holes, approx. 3x1mm	175 t1 settlement	boxes	53	boxes	
1348	heel iron 65mm wide, 50mm long, 1cmx3mm section incomplete	187	FyF	3389		
1349	shoe iron, 60mm long by 70mm wide, metal 14mm x 5mm	175	FyF	3402		
1350	55mm x 60mm heel iron with wide rectangular holes like horseshoe	c063	boxes	105, 106	boxes	
1351	horseshoe 85mm tall, 85mm wide, 12x3mm section	175	FyF	3382	drawing collection	draw
1352	toe iron fragment with upturned lip and angular shape	175 settlement	boxes	78	boxes	
1353	square-ended sole fitting 70x45x3mm	175 t16	boxes	63	boxes	
1354	heel/toe iron with raised upturn on straight end	t8 u/s	boxes	104	boxes	
1355	shoe iron, angular so from toes, small tacks, fragmentary	175	FyF	3399		
1356	shoe iron 100mm long, max 7cm wide, 2-3mm thick	214	FyF	3403	drawing collection	draw
1357	heel iron, expanded 'U' shape, 90mm x 70mm	175 settlement	boxes	78	boxes	
1358	105mm x120mm horseshoe, 19mm max width, 5-7mm thick	c052	boxes	52	boxes	
1359	fragment of pony shoe	sondage W of building settlement	FyF	3329		
1360	fragmented iron shoe piece -heel?	597 settlement	boxes	100	boxes	
1361	small fragment from shoe heel iron	175	FyF	3392		
1362	heel/horseshoe, small fragment	181	FyF	3397		
1363	possible heel iron fragment	175	FyF	3399		
1364	rounded heel iron fragment	175 settlement	boxes	78	boxes	
1365	possible boot iron fragment	175 settlement	boxes	78	boxes	
	clothing and related items					

Cat. No.	description	context	Location	photo	Status	Draw?
1366	non ferrous buckle with central twin spike-like tongues on bar	175	FyF	3399	retained	draw
1367	27mm diameter button, pale grey corroded core with hard polished white metal exterior, suspension loop remnants placed in raised boss on rear	175 settlement	boxes	10,11	boxes	
1368	17mm diameter Cu-alloy button with two holes	175 settlement	boxes	10,11	boxes	
1369	possible purse fitting, Cu-alloy, 4 sections each 'U'-shaped, hinged at ends, remains of clip on top. 80mm x 17mm thick x 10mm width of 4 bars, 30mm tall	pt063	FyF	537 (15)	drawing collection	
1370	small fragment of very thin embossed Cu-alloy	175 settlement	boxes	10,11	boxes	
1371	pendent, 34x20mm thin copper alloy mount, extended drop shape with small hole at approx., central hole contains 11x8mm mount with 6 pronged clasped ring containing purple-pink glass 'gem', central mount probably soldered on one side to outer pendent.	214, recess E of 240)	boxes	23,24	boxes	draw
1372	copper all spectacle frame, 110mm wide, lens voids 29x23mm, sides are secured together to clamp glass and arms (missing)	214	Education	sf021	display	draw
1373	22mm diameter circular fastening, with 8mm central hole. inner recessed section has external screw	175 settlement	boxes	10,11	boxes	
1374	cooper alloy threaded arromet or stud (see also item 24)	175 settlement	boxes	76	boxes	
1375	composite object, comprising a white corroded (Al?) grommet with iron corrosion present in the groove	PT052	boxes	30,31	boxes	

FURNITURE

1376	chromed mount and associated bolt, mount 47mm diameter, 24mm tall with central round boss faceted on opposing sides where hole passes through - like a drawer pull. Rear face has two holes for attachment, worn areas look like Cu-alloy, bolt has slotted head with central hole, 7mm diameter and 7mm long, then 10mm of thread, then slight tapering prong 15mm long with slightly bevelled blunt tip. main shank tapers slightly from 4.5 to 4mm	214 settlement	boxes	15,16	boxes	
1377	bolt in 1373					

MECHANICAL COMPONENTS

1378	cast iron wheel, four spokes and central tapering axles - axles not quite in line, slight, rim 22mm square, 420mm diameter	u/s	Nantgarw	3050	accessioned	
1379	fragment of arc of circle with base of one spoke, 20mm square section, 220mm long, c320mm diameter	pit 1 u/s	FyF	3274		
1380	fragment of cast cogged wheel, c. 400mm internal diameter, 22mm thick, height 14mm between- or 30mm on- teeth, teeth pitch 24mm	pit 1 u/s	FyF	3440	retained	
1381	wheel, spoked for chain drive like bicycle drive, but wrought iron (and found u/g) max o/d 80mm, 35mm, teeth 12.5mm apart, and 7mm tall	8326	FyF	538 (16)	retained	
1382	cogged wheel, 100mm diameter, 14 teeth remaining probably 16 originally	244	FyF	3391	retained	
1383	bell shaped casting (RPJ identified as stationary engine component), overall height 230mm, flange 190mm diameter, flange concentrically grooved on underside, probably six mounting holes, flange 10mm thick, roughly tubular section above rises 110mm off flange and is 150mm diameter, then 60mm height is tapering, fractured top section is tubular, 30mm tall, with o/d 60mm & i/d 35mm. i/d on base 125mm - inside filled with concrete so internal details not known.	pit 1 u/s	FyF	3442	drawing collection	
1384	170mm radius narrow wheel with triangular section, 32mm wide, 30mm deep	6010	FyF	3322		
1385	pointed and eyed large wrought iron machine fragment, claw-shaped	pit 1 u/s	FyF	3221	retained	
1386	object like small pulley wheel c.35mmx8mm, inside iron sheath - some ?chrome plating and at least 2 iron tubes c10mm diameter	pt020 u/s	boxes	61	boxes	

MISC.

Misc. Iron objects

1387	iron ring with smaller central bar, stamped with letters/numbers either side of bar (DC / 10 ?). O/d 175mm i/d 95mm thickness 35mm, internal bar 20x10mm	pit 4	FyF	3169/72	drawing collection	draw
1388	possible 2 rung ladder 305mm overall length, 210mm wide, square part 220mm between 'rungs', one end has spikes, hooked straight off bar, other end has perpendicular bar with twin spikes, 25x4mm bar section	409	FyF	3376	retained	
1389	complex structure with central screw and cast iron cross beam	pit 1 u/s	FyF	3250	drawing collection	draw
1390	base plate with vertical plate to carry circular mount or bearing, wrought iron, base plate 320mm x 90mm x 20mm, holes circular 15mm diameter, 30mm in from ends, central bar height 235mm, 80 wide at base narrowing to 55mm, thickness from 34mm base to 20 mm at top, circular part o/d 92mm, i/d 62mm, thickness 45mm	47	FyF	3411	retained	
Worked iron						
1391	paddle shaped object, screw threaded, 215mm long, head 110mm x 84mm x 40mm, semi-circular end, hole 35mm diameter with its edge 23mm from top not central, 25mm in one side 20mm the other, circular bit 100mm long, 50mm threaded diameter 25mm	44 f5	FyF	3427	retained	
1392	200mm long. Square bar with small collar then round and threaded outside, threaded bar 12mm diameter, 130mm back to collar, nut 35mm square x10mm thick, collar 25mm square x 6mm, bar 70mm beyond collar	175	FyF	3385		
1393	iron bar with an irregular series of circular depressions, welded to cross rod with spike on the end, bar 61x 5.5cm. 42cm long rod, at least 22 holes, first 7cm from rod, 44 cm for 22 holes, holes up to 8mm diameter, rod 18mm square, middle of bar to point 24cm.	Bute Seam	FyF	3139/40	retained	
1394	wrought iron broad bar, tip split, part folded up through right angle, part piece with round hole, 620mm x 150 x 12mm, folded section 90mm up, lug 100 wide with 35mm hole, length of split	4022	FyF	3158/9		
1395	550mm long bar, 45mm x 20mm section, hole close to one end, 55mm wide 2.5mm square hole	pit 1 u/s	FyF	3278		
1396	wrought iron bar with folded end, 1280mm main part, 100mm x 23mm thick, 3 holes 24mm diameter, to top of first 170mm from end, 2nd 540mm, 3rd 870mm, folded section is an additional 150mm, folded at about 45 degrees	u/s overbridge	FyF	550 (28)		
1397	'l'-shaped fragment of w/ plate or wide bar with hole at one end and second piece apparently welded on at angle, main part 240mm x 60mm x 5mm, remnant of side piece extends 45mm, hole 14mm diameter	c409	boxes	111	boxes	
1398	750 mm long, 30mm wide flat end, 5mm thick and 390mm long, then goes to 20mm rod for remainder. Round end has apparently similar bar fragment 80mm long welded to one side converging on tip	pit 1 u/s	FyF	3297	retained	
1399	U shaped forging, 120mm x 100mm, section 18mm square	pit 1 u/s	FyF	3298		
1400	square bar forged in right angle, one end round and threaded, overall 150mm, of which 30mm threaded, 15mm diameter; square bar 20mm square, short end circular 60mm corroded 16mm diameter	409	FyF	3388		
1401	iron bar overall length 760mm, 70mm x 18mm thick, each end has 35-40mm split off leaving 40mm on one edge which has then been twisted through 90 degrees, with the stub on each end twisted in opposite directions. The overall bar is bent and may have been slightly curved in its plane	longtown area e 001	FyF	549 (27)		
1402	sliver of wrought iron, with file-like shape - but almost certainly coincidental	u/s	boxes	46,47	boxes	
1403	bar, 50mm x 16mm section bent into crude almost semicircle, but bent inwards and cracked, flattened one end like bracket with square hole 25mm square, 70mm long flange, overall 570mm long	47 f4	FyF	3410		
1404	bar with loop at right angle to plane of bar 330mm long, 20mm wide, 7mm, D-shaped in section, 30mm head	pit 1 u/s	FyF	3205	retained	
1405	modern stainless steel clip	175 settlement 8009/t2	boxes	74	boxes	
1406	bent round rod attached to thin iron sheet, bent through right angles, 10mm diameter - possible small handle	pit 1 u/s	FyF	3278		
1407	370mm long bar forged into crude hook, c220mm diameter surviving but very heavily corroded	pit 1 u/s	FyF	3299		
1408	substantial thin bar 60mm wide, 30mm diameter hole, 1.0m long	pit 1 u/s	FyF	3287		
1409	bent iron bar 1600mm long, width 40mm thickness 4mm, two holes, one 30mm from one end, 15mm diameter, one 10mm diameter 430mm from other end	175	FyF	3303		
1410	bar, ends bent in opposite directions, central part 370mm with two holes, 14mm diameter, 70mm and 80 mm long folded sections at ends, 70mm x 5mm section	6012	FyF	3316		
1411	bar 280mm. 55mm x 10mm section. slight doalec in centre. with one section having two 15mm diameter	6012	FvF	3316		
1412	170mm bar with right angle 10mm square section	pit 1 u/s	FyF	3197		

Cat. No.	description	context	Location	photo	Status	Draw?
1413	120mm square wrought iron forging into square with rounded corners, 6cm hole, 30mm bar, angled butt join on one corner	pit1 u/s	FyF	3289	retained	
1414	120mm square wrought iron forging into square with rounded corners, 6cm hole, 28mm bar, angled butt join on one corner	pit1 u/s	FyF	3289	retained	
1415	600mm long rod, 20mm diameter, forged into flat plate folded over, 5mm diameter holes (2), 45mm wide flat section x 35mm	376	FyF	3303	retained	
1416	corroded wi piece 190mm long	175	FyF	3399		
1417	irregular cast iron fragment	u/s	FyF	3154/5		
1418	highly corroded thick wire	u/s	FyF	3154/5		
1419	highly corroded thick wire	u/s	FyF	3154/5		
1420	round bar formed to p[oint, slightly curved	u/s	FyF	3154/5		
1421	320mm long flat bar piece	u/s	FyF	3154/5		
1422	highly corroded indeterminate wrought iron piece	u/s	FyF	3154/5		
1423	highly corroded indeterminate wrought iron piece	u/s	FyF	3154/5		
1424	tiny iron scrap	c551	boxes	97	boxes	
1425	small bar slightly burred both ends, 120mm long, 25mm x 20mm section	pt063	FyF	537 (15)		
1426	round bar with flattened ends, 1260mm long, 15mm, flattened ends could suggest this had attachments at end as bracing bar or similar rather than being tool	longtown area e 001	FyF	546 (24)		
1427	iron bar with right angle, 3 holes in each arm, 170mm x 170mm overall, metal section 5mm x 11mm, holes c.4mm	c052	boxes	52	boxes	
1428	bent bar into crude hook shape 190mm original length, 18mm x 10mm section	pit 1 u/s	FyF	3440		
1429	curved wrought iron piece 20mm x 2mm just over quarter of a circle roughly 270mm o/d	settlement	FyF	3374		
1430	bar fragment with rounded end, 130mm long, 45mmx14mm section, rounded one end, corners truncated to semi-octagon	47	FyF	3412	retained	
1431	tapering 270mm long fragment, 1 right angled corner, so possibly a spall	pt020 u/s	boxes	61	boxes	
1432	iron bar 260mm long, 30mm wide, 5mm thick, hole 1mm diameter 20mm from one end (which is rounded)	214	FyF	3403		
1433	bar, 140mm x40mm x30mm, with two circular holes 18mm diameter	pit 1 u/s	FyF	3200		
1434	155mm x 65mm x 9mm thick, truncated corners on one side with small notch in centre	47	FyF	3412	retained	
1435	twisted flat with looped end	pit 1 u/s	FyF	3219		
1436	square bar formed into twisted flat (just possibly auger fragment)	pit 1 u/s	FyF	3219		
1437	tapering bar with twist forged in at one end, flattened section at right angles to main bar, length 125mm, 15mm x 5mm at maximum	175	FyF	3392		
1438	axle like object, 420mm overall: 35mm round section 270mm long, 25mm square 110mm long, then 15mm square section 40mm	pit 1 u/s	FyF	3213	retained	
1439	bent bar with hole, 250mm x 30mm x 5mm, hole i/d 6mm crescent shape	pit 1 u/s	FyF	3205	retained	
1440	bar with hook end and flattened end turned through 60 degrees, 325mm long, main section 17mm x 3mm thick	570	FyF	3373	retained	
1441	790mm long square bar, no point 16mm square section burred end, bent into U	pit 1 u/s	FyF	3235		
1442	corroded square bar, with raised ring in from each end and hole further inside one end. 59cm long, 15mm square bar, 45cm between raised rings, 5mm thick rings, hole 32 mm inside one of rings, hole 6mm diameter. Spindle?	u/s	FyF	3138		
1443	long rod folded into crude loop at end, 1160mm long, 17mm diameter	pit1 u/s	FyF	3295		
1444	round bar formed into circular loop at end, 690mm long, 14mm diameter,	407	FyF	3304		
1445	40mm x 17mm, max 8mm thick, bent wedge shaped bar fragment	220 t3	boxes	90	boxes	

Cast iron

1446	casting 470mm long overall, rectangular base 420x200x30mm with three square mounting holes, 25x30mm; pipe attached to one end 140mm o/d and 95mm i/d, pipe diameter lies on line of end of rectangular block, supporting flange from base plate, 160mm high pipe, fractured off or angled inwards at top - hard to be certain.	u/s shaft pit 1 area (labelled as s	FyF	3307		
1447	large trapezoidal casting, cast iron delaminating on surface to give internal corrugations, but this all appears secondary, 460mm long, 460mm wide end, 300mm narrow end, 210mm thick, 60mm thick casting on all sides	blank label	FyF	3095		
1448	large casting now broken in two, large rectangular base with central raised bar, narrow slit either side 2.14 m long, 61cm wide, 6.5cm thick, raised part 9cm high off plate, 6cm wide, and is central, slot 70cm from end, midline 15cm from edge, 2.5cm wide, 30cm long, slots symmetrical from middle bar	u/s pit1?	FyF	3128-9		
1449	casting, flaring curved surface bonds one side with casting showing two rounded lugs with mounting holes in each, 280mm long, curved plate 65mm wide 6mm thick, lugs extend 90mm and 70 mm, each lug 40mm thick, baseplate extends 15mm below lugs on one side, flush the other, each lug has 20mm hole	6011	FyF	3331	drawing collection	draw
1450	casting, flaring curved surface bonds one side with casting showing two rounded lugs with mounting holes in each, 280mm long, curved plate 65mm wide 6mm thick, lugs extend 90mm and 70 mm, each lug 40mm thick baseplate extends 15mm below lugs on one side, flush the other, each lug has 20mm hole, one lug has bracing strut, now snapped	6011	FyF	3331	drawing collection	
1451	lug, fractured fragment of 569/570, 105mm high, 25mm hole, 40mm thick.	6011	FyF	3333	drawing collection	
1452	cast iron 10x8x25 cm flat face on one side, convex the other curving round to snapped off protruding margin on flat side	6011	FyF	3332	drawing collection	
1453	edge of large casting, 25mm thick, 210mm chord, rounded edge like pipe or cauldron	6011	FyF	3334		
1454	large iron casting, broken fragment loop with bar coming off to one side at an angle, main part 220x100mm, bar preserved length 200mm, hole 40x100mm, all 75mm thick	pit 1 u/s	FyF	3173		
1455	cast iron mount with U shaped bolt to anchor	pit1 u/s	FyF	3288	retained	
1456	210x130x80mm cast iron piece, flange with raised lip on one side		FyF	3150		
1457	c60mm id cast iron, expanding 68mm on other face, suggestion of external curved face one end of slightly larger radius, all other external surfaces are fractures	424 settlement	boxes	85/86	boxes	
1458	190x80x18mm, wedge profiled tapering, bar with 25x40mm raised area at narrow end	6011	FyF	3334		
1459	corroded cast iron fragment 80x180x50mm	u/s	FyF	3143/4		
1460	amorphous cast iron fragment 80x70mm	6011	FyF	3334		
1461	small fragment of cast iron, rounded, 70mm x 50mm x 20mm	175	FyF	3399		
1462	small cast iron fragment	pit 1 u/s	FyF	3219		

Non-ferrous

1463	tiny scrap of folded Cu-alloy, very thin	c 021	boxes	27	boxes	
1464	ceramic like material with 75mm diameter, maximum height preserved 70mm, one end has hemispherical iron lining, < 1mm	244	FyF	3391	retained	
1465	corroded iron filament with looped non-ferrous head	pit 1 u/s	FyF	3218	retained	
1466	non ferrous fitting, elongate base plate bears countersunk mounting holes at either end, central arm rises and runs parallel to the base and had another countersunk hole in it. Below this hoe there is a indent (or hole) in the basal casting: 110mm long, width in centre 25mm, extends to 32mm wide each end, 6mm thick, raised arm rises 15mm above plate, 60mm central arm and 6mm thick, hole below raised part probably goes through, not just indent	214	FyF	3403	drawing collection	
1467	folded lead sheet, 150mm x 70mm x c.2mm, folded in half	pit 1 u/s/ brick floor	boxes	33,34	boxes	
1468	lead alloy fragment, clipped sheet edge 120mm x 60mm, very dense, has hard brownish surface patina.	214 t1 settlement	boxes	35,36	boxes	
1469	bell-shaped copper alloy object, 52mm base o/d, 27mm top o/d, 28mm tall, metal c.2mm thick, top has central hole, 7mm diameter, outside has lightly scored line, suggesting the object has been spun. Bag suggest electric light fitting - but simple bell is also possible	411	boxes	19,20	boxes	

CONCRETIONS

1470	concretion on very small wi fragment	191 T2 (?171)	boxes	45	boxes	
1471	concretion, probably contains ghost of iron object but no visible on surface	197 settlement t3	boxes	no photo	boxes	
1472	concretion, probably contains ghost of iron object but no visible on surface	197 settlement t3	boxes	no photo	boxes	
1473	concretion, probably contains ghost of iron object but no visible on surface	197 settlement t3	boxes	no photo	boxes	
1474	concretion, probably contains ghost of iron object but no visible on surface	197 settlement t3	boxes	no photo	boxes	
1475	concretion, probably contains ghost of iron object but no visible on surface	197 settlement t3	boxes	no photo	boxes	
1476	concretion, probably contains ghost of iron object but no visible on surface	197 settlement t3	boxes	no photo	boxes	
1477	concretion, probably contains ghost of iron object but no visible on surface	197 settlement t3	boxes	no photo	boxes	
1478	concretion, probably contains ghost of iron object but no visible on surface	197 settlement t3	boxes	no photo	boxes	
1479	concretion, probably contains ghost of iron object but no visible on surface	197 settlement t3	boxes	no photo	boxes	
1480	concretion, probably contains ghost of iron object but no visible on surface	197 settlement t3	boxes	no photo	boxes	
1481	concretion, probably contains ghost of iron object but no visible on surface	197 settlement t3	boxes	no photo	boxes	

Cat. No.	description	context	Location	photo	Status	Draw?
1482	concretion, probably contains ghost of iron object but no visible on surface	197 settlement t3	boxes	no photo	boxes	
1483	concretion, probably contains ghost of iron object but no visible on surface	197 settlement t3	boxes	no photo	boxes	
1484	concretion, probably contains ghost of iron object but no visible on surface	197 settlement t3	boxes	no photo	boxes	
1485	concretion containing multiple bent nails	175 settlement	boxes	78	boxes	
1486	concretion with possible sheet iron fragment	175 settlement	boxes	78	boxes	
1487	concretion with curved iron inclusion?	u/s	boxes	79	boxes	
1488	concretion with square section iron ghost - nail fragment?	175 T2	boxes	80	boxes	
1489	concretion with square section iron ghost - nail fragment?	175 T2	boxes	80	boxes	
1490	concretion with square section iron ghost - nail fragment?	175 T2	boxes	80	boxes	
1491	concretion with ghost iron fragment	175 T2	boxes	80	boxes	
1492	concretion with ghost of iron sheet	175 T2	boxes	80	boxes	
1493	concretion with ghost of iron sheet	175 T2	boxes	80	boxes	
1494	concretion with tiny iron fragment	175 t1	boxes	87	boxes	
1495	concretion with two highly fibrous circular-sectioned wrought iron pieces within	211 t1	boxes	88	boxes	
1496	curved concretion - probably contains shoe iron fragment	535 settlement	boxes	89	boxes	
1497	curved concretion	570 settlement	boxes	92	boxes	
1498	irregular concretion	570 settlement	boxes	92	boxes	
1499	concretion with voids after square sectioned objects - probably nails (or one nail bent in U?)	211 settlement	boxes	93	boxes	
1500	concretion - possibly on nail	175 t2	boxes	99	boxes	
1501	concretion - possibly on nail	175 t2	boxes	99	boxes	
1502	concretion - possibly on nail	175 t2	boxes	99	boxes	
1503	concretion - possibly on nail	175 t2	boxes	99	boxes	
1504	elongate concretion probably on iron	channel between 075/090	boxes	99	boxes	
1505	elongate concretion probably on iron	u/s 063 (penydarren or pit1)	boxes	102	boxes	
1506	elongate concretion probably on iron	u/s 063 (penydarren or pit1)	boxes	102	boxes	
1507	elongate concretion probably on iron	u/s 063 (penydarren or pit1)	boxes	102	boxes	
1508	concretion with possible nail fragment	u/s 047 pit 1 or penydarren	boxes	104	boxes	
1509	concretion with possible nail fragment	u/s 047 pit 1 or penydarren	boxes	104	boxes	
1510	concretion with possible nail fragment	u/s 047 pit 1 or penydarren	boxes	104	boxes	
1511	concretion on possible spike point	c063	boxes	105, 106	boxes	
1512	concretion containing mineralised iron object with square section	c424	boxes	109, 110	boxes	
1513	concretion containing small mineralised iron fragment	c424	boxes	109, 110	boxes	
New material 2013-2015						
1514	Type 6 dram	underground	FyF	retained	new dram #2	
1515	Type 3 dram	underground	FyF	retained	new dram #3	
1516	Type 8 dram	underground	FyF	retained	new dram #4	
1517	Type 6 dram	underground	FyF	retained	new dram #5	
1518	Type 4 dram	underground	FyF	retained	new dram #6	
1519	Type 7 dram	underground	FyF	retained	new dram #7	
1520	Type 6 dram	underground	FyF	retained	new dram #8	
1521	Type 7 dram	underground	FyF	retained	new dram #9	

GeoArch



geoarchaeological, archaeometallurgical & geophysical investigations

Unit 6,
Western Industrial Estate,
Caerphilly,
CF83 1BQ

<i>Office:</i>	029 20881431
<i>Mobile:</i>	07802 413704
<i>Fax:</i>	08700 547366
<i>E-Mail:</i>	Tim.Young@GeoArch.co.uk
<i>Web:</i>	www.GeoArch.co.uk