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SUMMARY

Examination of the three study bridges indicated utilitarian sandstone piers and abutments that maintained an iron super-structure for the bridge decking. The bridges dating from the early 1860s displayed little architectural merit and apart from occasional masonry marks there were no embellishments or decoration.

Erosion of the river bank illustrated that the embankment and railway line was formed from upcast clay consolidated by a clay membrane and then widened with furnace waste and gravel.

The earlier timber bridges dating from 1847 were indicated by a series of driven timber piles respecting the extant piers.

Flood damage in 2005 and particularly 2009 had seriously compromised these structures with three bridge abutments and one pier completely lost and two other piers severely damaged.

1. INTRODUCTION

1.1 Project origins

Cumbria County Council Historic Environment Service (Development Control) was consulted by West Cumbrian Rivers Trust regarding the demolition of a series of former bridge abutments and piers associated with the former Cockermouth and Workington Railway near Camerton, Cumbria (figure 1).

The study buildings are located at three locations; NY 039 307, NY 046 306 and NY 049 303.

Although there is a preference for preservation *in situ* voiced by the curatorial authority, the scheme has the potential to remove structures of special architectural and historic interest. The development proposal will remove extant bridge abutments and piers and as a result, a building survey has been requested by the curatorial authority requiring a programme of archaeological building recording to be undertaken prior to the demolition taking place.

The curatorial authority has requested a programme of building recording equivalent to Level 2 as described by English Heritage *Understanding Historic Buildings, A Guide to Good Recording Practice, 2006*.

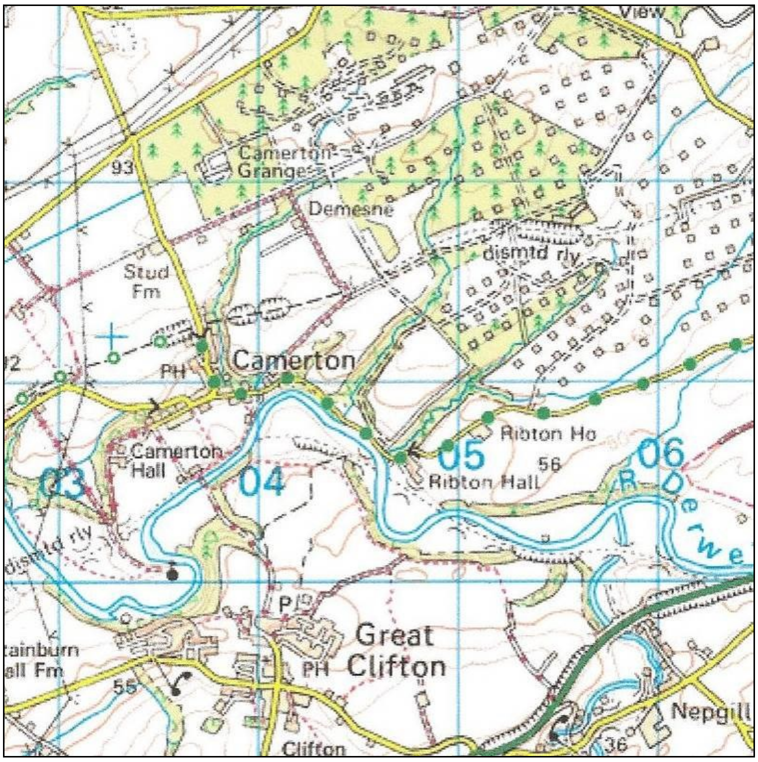

Figure 1. Location of survey. (OS copyright licence no. 100044205).

Subject to safe working conditions, the programme of archaeological building recording required documentation of three partially surviving bridges. These study buildings are located below (figure 2).

A Working Scheme of Investigation was submitted to the curatorial authority for their approval prior to the field survey being undertaken. Upon approval the fieldwork was undertaken on February 13th-14th 2012 and from this evidence the following report collated.

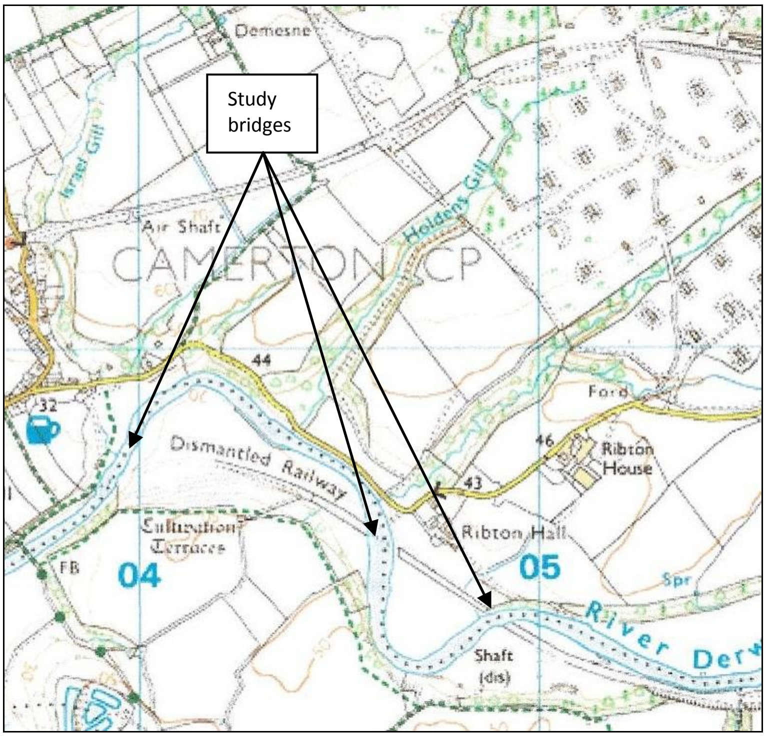

Figure 2. Location of bridges. (OS copyright licence no. 100044205).

2 HISTORICAL CONTEXT

2.1 Historical background; Cockermouth and Workington Railway

The Cockermouth and Workington Railway (CWR) was founded by an Act of Parliament on July 23rd 1845 and was opened on April 28th 1847 (Joy 1968, 26).

The Earl of Lonsdale commissioned George Stephenson in 1844 to survey the 8 ¾ mile line (Bairstow 1995, 24).

The requirement for a railway was to supply the existing collieries with the burgeoning iron smelting industry of Workington, an industry that rapidly expanded with the introduction of the Bessemer Converter during the 1850s and subsequent construction of blast furnaces from 1857.

This method produced high grade steel, stronger than wrought or cast iron due to its lower carbon content, but required coke rather than coal as a fuel. This encouraged the importation of substantial quantities of coke from Durham requiring extension of the railway to Penrith from Cockermouth, plans established in 1860 (Gradon 1948, 1) and thereby utilising the Stainmoor cross-Pennine rail link approaching from Appleby (Western 2001, 7-9).

A trade emerged whereby coke trains from Durham returned with steel to the east coast ports and onwards to Europe (Joy 1968, 51).

The early coal mining industry usually comprised drift mines burrowing into the hillside. Clifton Old Pit was opened in 1827, followed by Crossbarrow and then Lowther Colliery in 1852 (Bowtell 1989, 22).

The Railway dispatched on 2nd June 1847 its first coal train of 21 wagons from Greengill Colliery, Camerton to Workington. This colliery belonged to William Thorburn of Papcastle who with the

Fletcher family who acquired Lowther Colliery in 1856, owned most of the local mines (Ibid 17 and 22).

2.2 Historical background; the bridges

The Cockermouth and Workington Railway, originally a single tracked railway, comprised eleven timber bridges measuring between 50 and 300 feet in length (15.24m to 91.44m) that had to cross a major river (the Derwent) six times. These bridges were supported on numerous timber piles, on piled foundations in the riverbed, the spans being comparatively short.

The course of the railway was surveyed in 1844 (TBR 1/3/7A) by the Consulting Engineer John Dixon (1796-1865) who served under George Stephenson (1781-1848) the Directing Engineer. The proposed line sought the simplest route across the valley floor of the River Derwent (figure 3). The line generally avoided steep gradient and tunnels but required eleven substantive bridges in order to traverse the Derwent (figure 4). The railway was subsequently built in 15 months between February 1846 and April 1847.

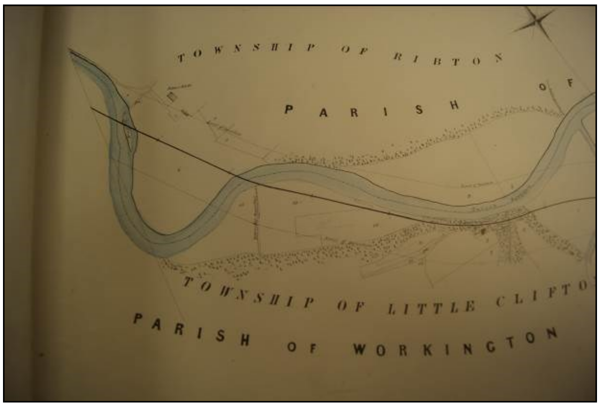

Figure 3. The original railway survey (TBR 1/3/7A)

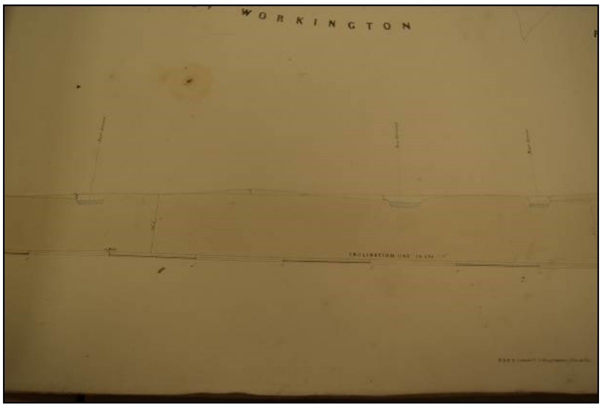

Figure 4. Profile across River Derwent (TBR 1/3/7A)

The CWR was built on the cheap, both bridges and stations constructed from timber. Despite Dixon describing the material as "the best timber… of large dimensions" in a progress report of 1846, within ten years the vibration of passing trains had compromised the integrity of all the bridges.

In April 1856 William Brown and J.W.Fletcher examined the bridges and reported back to the company that the CWR's river bridges required only minor attention, such as realignment of approaching tracks, relaying or re-ballasting of track on the bridge and the application of a protective finish to the timbers. The cost for these *ad hoc* repairs varied between £11 and £113.

However, Ribton High Bridge (the easterly bridge in this study) was found unsafe, requiring replacement of washed-away piles and other work. In June 1856 tenders for tension rods for this bridge were considered of which the G.D.Richardson proposal was accepted. Bowling or Low Moor iron was to be used and by August 12th 1856 the ironwork had been forged in Carlisle and delivery to the site was imminent.

On January 31st 1857 the half-yearly report to the proprietors stated that the various timber bridges remained solid and in many instances strengthened and improved. Yet this review and a derailment in March 1857 invoked a severe speed limit over the bridges from April 7th 1857; 10mph for passenger traffic and 8mph for coal trains (Bowtell 1989, 124).

Between 1857 and 1858 further trussing was undertaken on various bridges but with the gradually increasing mineral traffic and the advent of nearby brick production in 1859 (Ibid, 18), the bridges built between 1846 and 1847 had reached the end of their useful lives. The railway commissioned its Engineer Thomas Drane to review the situation. He reported on 3rd December 1859 rebuilding and replacement of all eleven bridges, using wrought iron girders for the superstructure with spans of typically 50-60 feet (15.24m-18.29m) in order to minimise the number of piers obstructing the river. The girders were to be supported by masonry abutments, supplemented by masonry piers erected in water conditions described as "low summer".

Ribton Hall Bridge (see section 3.2 below) required iron piling for the piers due to the depth of the channel with the abutments and piers capable of conveying double track although single track was installed during this phase of work (figure 5).

The timetable for this work was to be completed over several summers at a cost of £6,500, the scheme endorsed in 1860 and the bridges over the Derwent completed by autumn 1862.

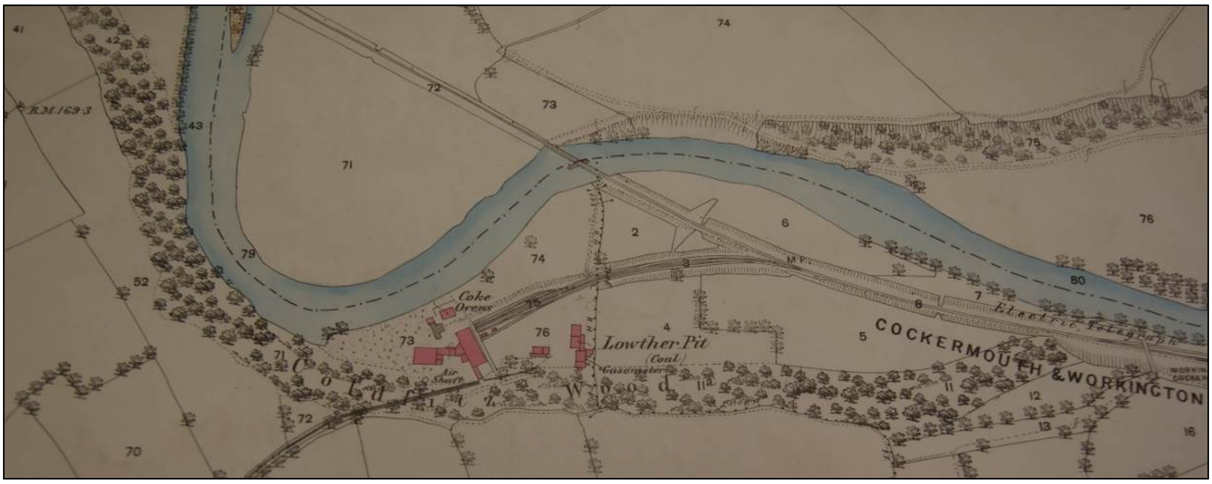

Figure 5. First edition Ordnance Survey map of 1864 illustrating Ribton High Bridge

Figure 6. First edition Ordnance Survey map of 1864 illustrating Ribton and Camerton bridges

1859 Title	**LMS Title**	**Drane's Quoted Bridge Length**	**Rebuilding progress report (from minutes of 1860-1863)**
Ribton Hall	Ribton High (two spans)	180ft (54.86m)	At January 22 1862: both abutments built, a pier still to be constructed. July 29 1862: traffic was passing over new bridge
Ribton Hall No. 2	Ribton (six spans)	300 ft (91.44m)	At 1859: "recently strengthened with iron trussing rods". January 31 1861: rebuilding authorised. At April 9 1861: tenders accepted – W.Hodgson for masonry, Gilkes, Wilson & Co. for iron girders. At June 11 1861: stone piers in hand. At January 22 1862: rails to be laid this week. At July 29 1862: No. 2 coffer dam commenced.
Camerton	Camerton (three spans)	270ft (82.30m)	At 1859: "recently strengthened with iron trussing rods". At January 22 1862: one abutment complete, one abutment and three piers to build. At July 29 1862: track being laid.

Table 1. Synopsis of bridge repairs between 1860 and 1863

Harrison Hodgson of Durham undertook the contracts providing masonry for Marron, Ribton Hall, Ribton Hall No. 2, Camerton, Table Top, Salmon Hall No. 1 and Salmon Hall No.2 bridges between April and July 1861.

The wrought iron girders for all the bridges were manufactured by Gilkes Wilson & Company of Middlesbrough under orders made in April and June 1861.

From the minutes of the progress report 1860-1863, Table 1 describes action undertaken on the three study bridges (Bowtell 1989, 124-127).

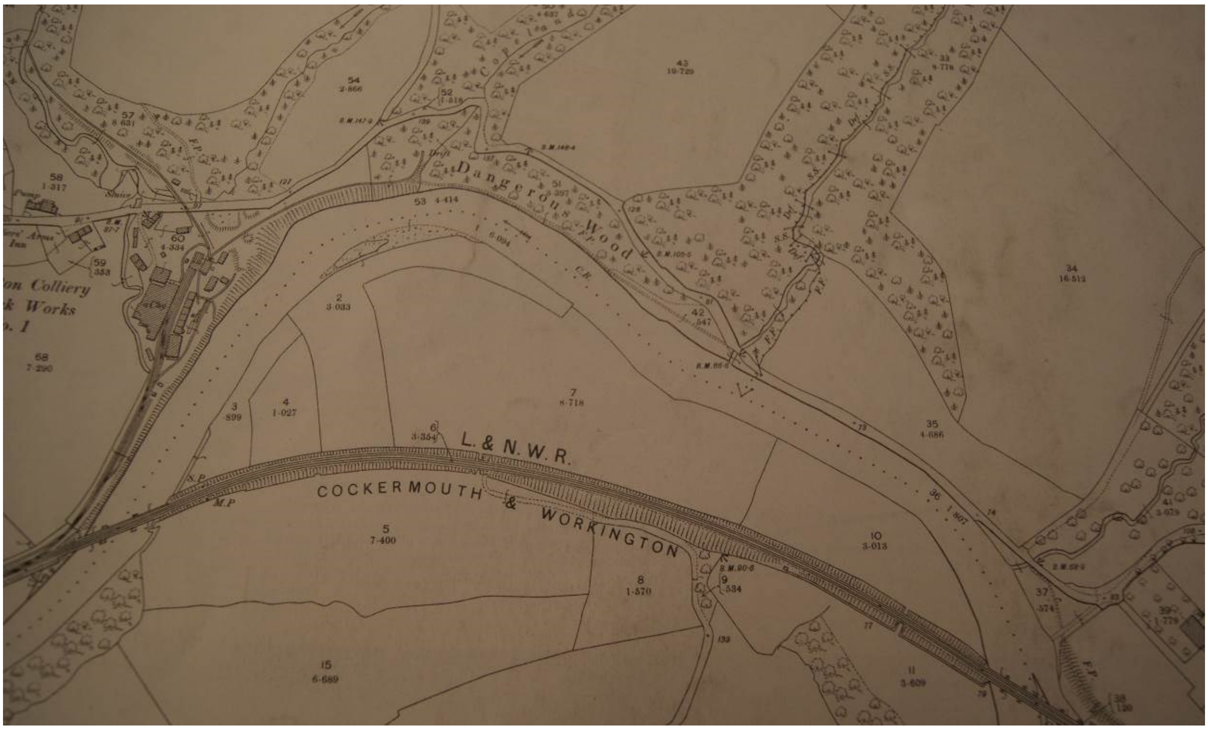

Figure 7. Ordnance survey map second edition map of 1900

The relationship between colliery owners and the railway was largely a fractious one. The railway in effect held a transport monopoly, the only method of moving a bulk commodity was by rail. Enjoying the benefits of this lucrative trade, rail companies such as the nearby Whitehaven Junction Railway (WJR) could pay dividends as high as 18% in 1864. Complaints about high tariffs and service were fairly frequent, leading to instability and duplication within the independent rail network.

Following a Parliamentary Bill of November 1862 (Byers 1998, 211), the Cockermouth and Workington Railway was absorbed by the London North Western Railway (LNWR) on 16th July 1866, but complaints regarding the service continued.

Subsequently, the line was double-tracked from 1868 (Bairstow 1995, 65) as illustrated on the second edition Ordnance Survey map of 1900 (figure 7).

On 1st October 1873 agreement with the LNWR and I.W.Fletcher a mine owner was attained to install a two-way connection with Ribton Hall Colliery, open to traffic from April 1874 (figure 8).

However, by 1880, the local coal mining industry allied to depletion of local iron ore meant iron masters in Workington were dependent on imported ore from Spain. Consequently, heavy industry in West Cumberland had by now passed its peak.

Allerdale Coal Co. took over Lowther Colliery in 1887 but was closed by January 1893 (Bowtell, 1989, 23) and by November 1888 the sidings had been lifted (Ibid, 20).

Despite a slight revival in economic fortunes during the Great War (1914-18) the importance of the railway began to wane.

In 1922, Camerton Bridge was bolstered by a concrete retaining wall (DHAM/7/2) on the Cockermouth side (figure 9).

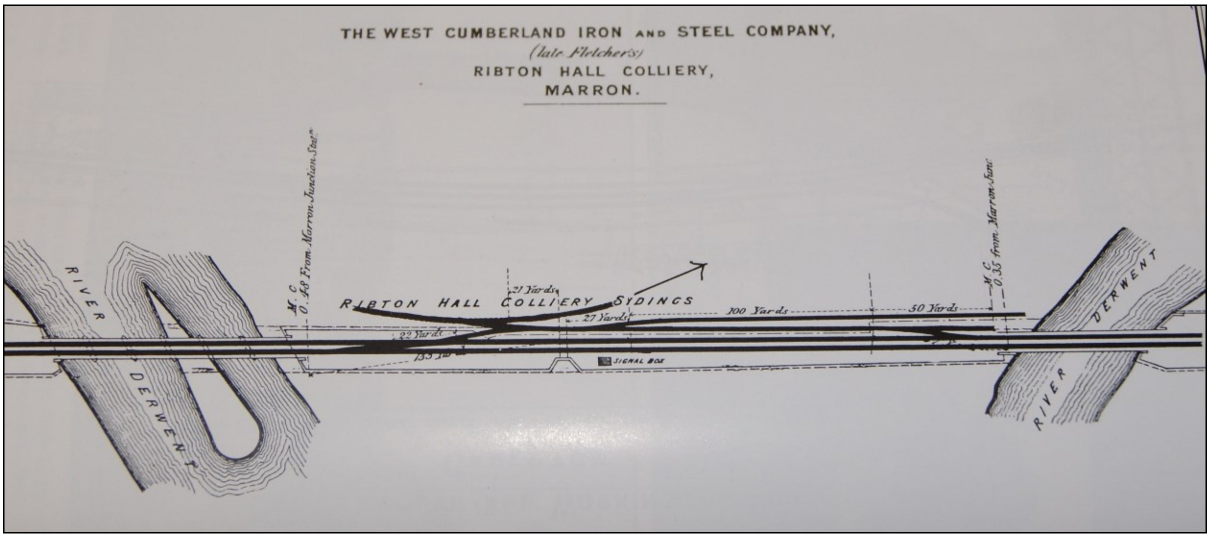

Figure 8. The sidings between Ribton High and Ribton bridges

After 1923, the railway was maintained by the London, Midland Scottish Railway (LMS). Their engineers considered the Derwent railway bridges as being unduly light in superstructure, the wrought iron cross girders under the double track deflecting significantly under the load of a train, causing the longitudinal wrought iron girders to lift at their ends, where supported by abutments or piers at the end of each span (Bowtell 1989, 127).

By 1961, the line from Workington was losing £50,000 per annum (Joy 1968, 89) and with the high cost replacement of the bridge fabric, the Beeching report advocated closure of the line in 1963

(Bairstow 1995, 70). The last goods train ran in June 1964 and the line closed to passenger traffic on April 18th 1966 (Byers 1998, 211).

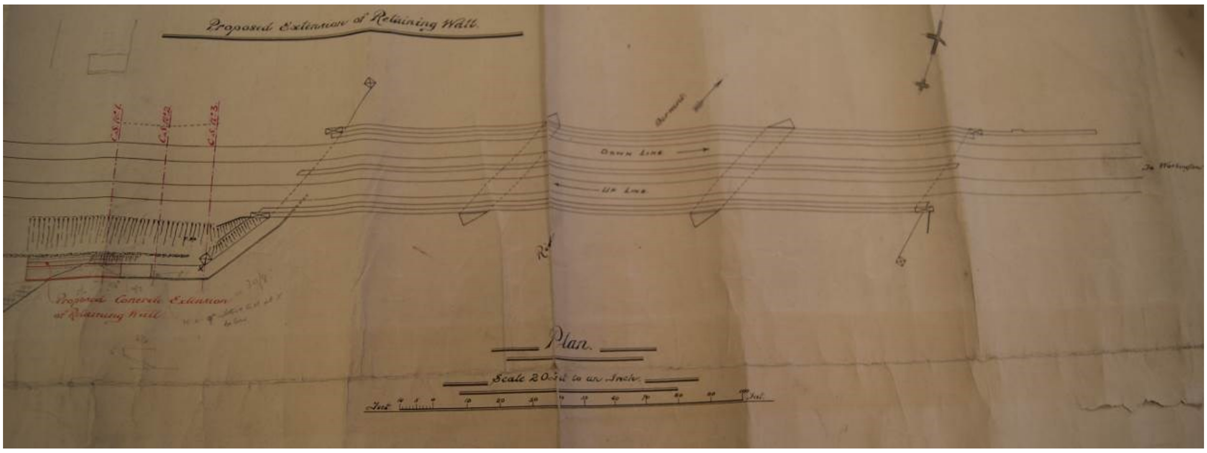

Figure 9. Concrete retaining wall, Camerton Bridge (DHAM/7/2)

Road improvements to the A66 trunk road absorbed part of the track bed of the former railway during the 1970s whilst the rail bridges were stripped of their superstructure shortly after closure.

3 RESULTS

3.1 Methodology

The structures in the study area were surveyed on February 13-14th 2012 by Gerry Martin using tapes, a Disto measuring device, hand-held GPS equipment and photography.

The survey comprised of the following elements:

- Ribton High Bridge (Bridge No. 20)
- Ribton (Bridge No. 22)
- Camerton (Bridge No. 25)

The nomenclature adopted is that used by the London Midland Scottish Railway (LMS) in their register compiled during the 1940s.

Access to the piers was inhibited by the fast flowing river derwent which was unfortunately at a high water level when the survey was conducted.

The survey comprised of scaled photographic recording of the elevations of the principal bridges, their abutments and piers and where possible, detailed photography of any worthy railway features.

The corpus of the following report is formed from these notes and photographs.

3.2 Survey results; Ribton High Bridge (No. 20)

Between its bridge abutments located between mileposts 4 ¼ and 4 ½, Ribton High formerly possessed two spans. Progressing from east to west these skewed spans measured 72 ft 4 in (22.05m) and 73ft (22.25m) and comprised wrought iron main and cross girders with wooden planking. All the spans were removed.

At this location, the head water from the River Marron joined the Derwent producing a deep but relatively narrow channel. This denied close access to both the eastern abutment and Pier 1.

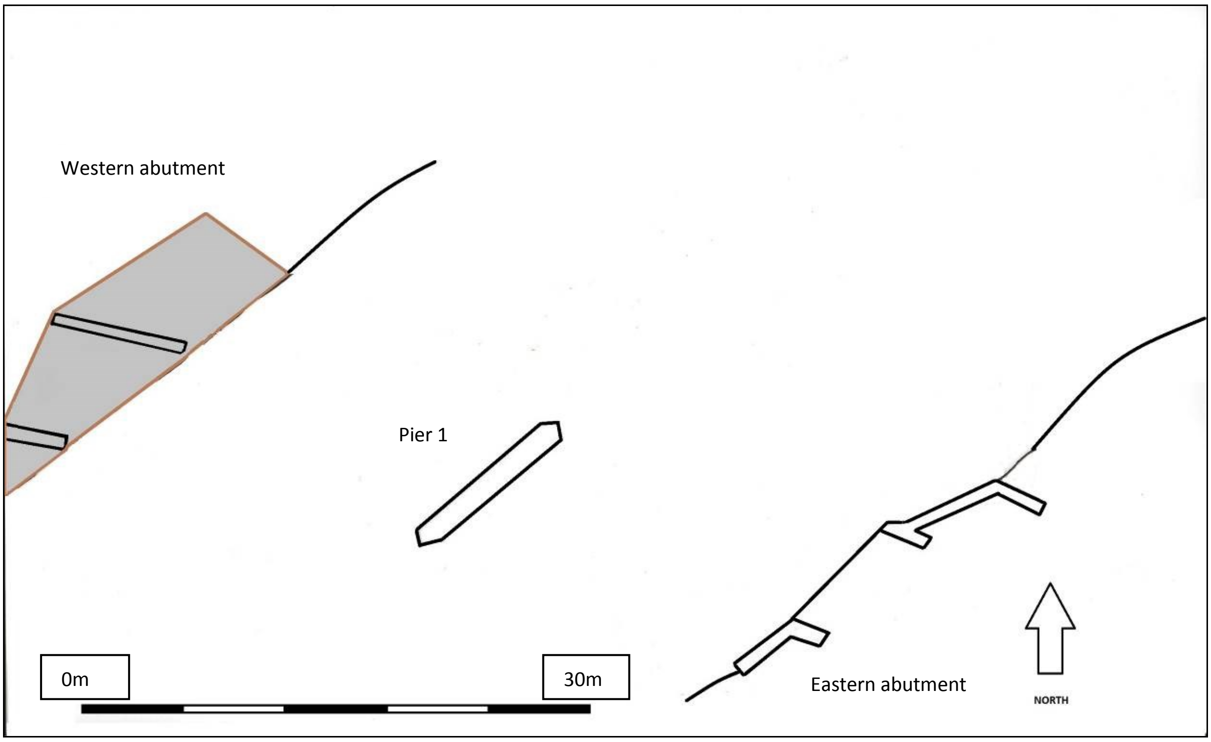

Figure 10. Plan of Ribton High Bridge (No. 20). Grey outline denotes area lost to river erosion.

Ribton High Bridge (No. 20) displayed three extant structural elements, namely the eastern abutment, Pier 1 and the western abutment (figure 10). The condition of these elements is discussed below.

<u>Eastern bridge abutment</u>

The eastern bridge abutment appeared to be in good condition and fully extant (figure 11) located at NY 04882 30399.

It comprised of a low red sandstone retaining wall approximately 1.00m in height that protected the abutment from river flow advancing from the east. The roughly hewn rectangular blocks of varying sizes, were generally smaller than those used in the actual bridge abutment

The portion of the abutment sustaining the bridge decking was approximately 2.50m in height and was also constructed from rough-hewn, red sandstone blocks formed into eleven courses with the final course bearing the largest blocks. There was no architectural embellishment within the elevation although the elevation had been rebated in order to form a uniform frame.

A stretch of vitrified brick illustrated to the left of the elevation, may represent a filled recess that could have borne a structural girder or brace for the bridge platform.

A further low red sandstone wall approximately 1.50m in height deflected the river away from the bridge abutment immediately to the south.

Silt had accumulated in front of the bridge abutment suggesting that the southern side of the river had developed into slow moving water.

Figure 11. Elevation of the eastern abutment, Ribton High Bridge

Figure 12. Pier 1, north-western facing elevation

Pier 1

Pier 1 was not accessible. The structure comprised a skin of roughly hewn, red sandstone blocks of varying sizes but forming concordant courses at least seven courses in height. The structure measured approximately 10.00m in length, 2.50m in width and stood over 2.50m in height.

Each end of the pier was pointed in order to deflect the impact of the headwater. The sandstone pier possessed a rubble core possibly consolidated by poured concrete.

Surmounting the pier were three stone plinths raising the track bed and bridge platform above the pier by approximately 0.40m in height.

On the south side of the pier, some of the stone blocks had become dislodged due to impact with a passing tree during floodwater.

Western bridge abutment

The western bridge abutment (NY 04940 30375) had been totally removed by river erosion (figure 13). Forming obstructions within the river, bonded blocks were littered in close proximity, some resting on the western bank of the river.

Figure 13. Remnant masonry blocks that had formed the western bridge abutment

Erosion by the river had produced a steep section partly illustrating the embankment formation that conjoined the lost bridge abutment (figure 14). This comprised of a band of gravel approximately 0.40m in thickness overlying a thick deposit of homogenous light brown clay measuring 1.50m in depth that rested above gravel. It was not entirely certain whether this material was natural drift geology or re-deposited clay, dumped to form an embankment.

Figure 14. Eroded bank, location for the former western bridge abutment

Figure 15. Buried wood in ground make-up

Figure 16. Stanchion base for telegraph pole

Further north, traces of wood was found embedded in gravel (figure 15), suggesting that some of the overlying clay was indeed ground make-up.

A timber stanchion base for a former telegraph pole (figure 16) indicated the northern limit of the course of the railway line.

The destructive force of the river appears to have been a significant issue in the past. A neatly dressed and incised stone block was (figure 17) was found embedded in the side of the bank, a structural element assumed to have emanated from the bridge abutment.

Figure 17. Neatly dressed stone block

3.3 Survey results; Ribton Bridge (No. 22)

Located between mileposts 4 ½ and 4 ¾, Ribton formerly possessed six spans between its abutments. Progressing from east to west these skewed spans measured 46 ft (14.02m) on land, 42 ft (12.80m) in the river, 44 ft 6 in (13.56m) on an island, 44ft 3 in (13.49m) in the river, 40ft 3 in (12.27m) in the river and 42ft 6 in (12.95m) in the river and had comprised wrought iron mains and cross girders with wooden decking. All the spans were removed in 1966.

At this location, the river becomes abraded, an observation that dates to at least 1844 (figure 3) where an eyot is spanned on the original Railway Survey.

Currently, the river flows as two divergent branches, impacting upon both banks and in the case of the western bank eroding that margin.

On the eastern side, the river is fordable up to Pier 4, thereafter the river channel is too deep for detailed recording.

Ribton Bridge (No. 22) consists of an eastern abutment, five stone piers measuring approximately 12.00m in length, 2.00m in width and 3.50m in height and a western abutment described below (figure 18). These stone blocks varied in size, the largest being 1.20m x 0.60m and 0.36m in height (Pier 5).

<u>Eastern bridge abutment</u>

A low former railway embankment lead to the eastern bridge abutment (NY 04653 30490) that comprised of a low, rough-hewn, red sandstone wall, flush with the river, that stood to a maximum height of 1.75m (figure 19).

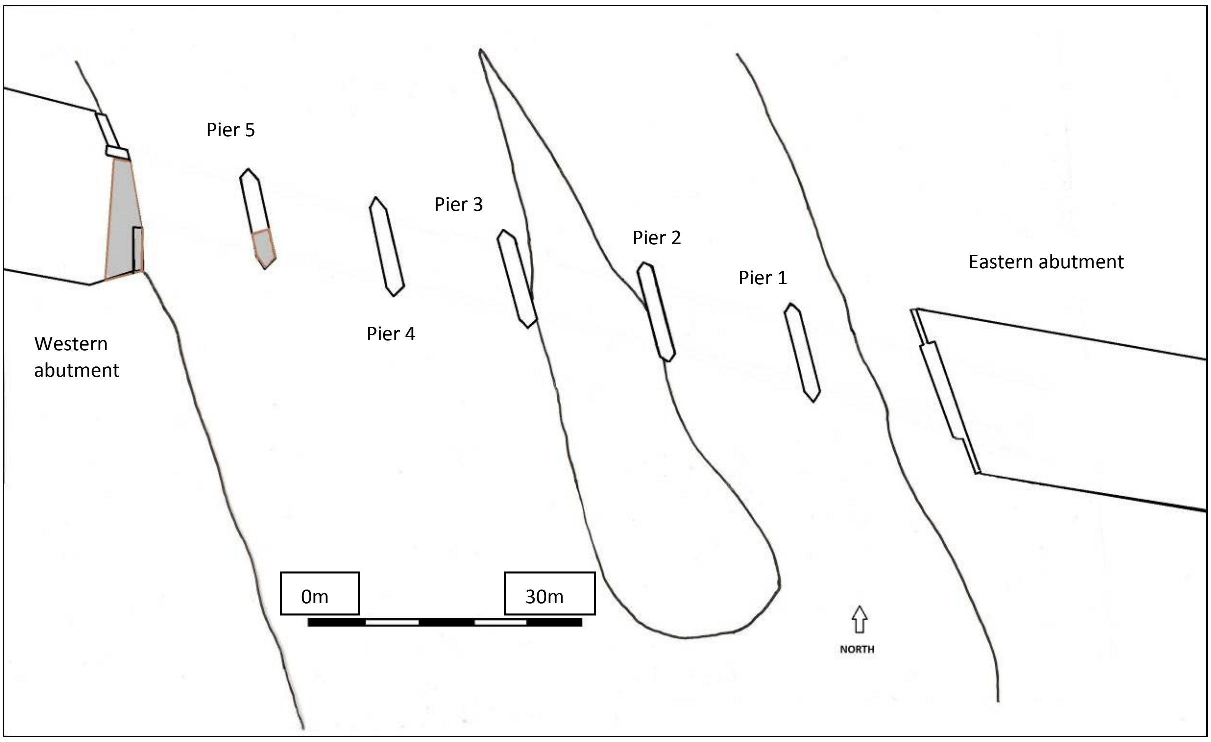

Figure 18. Plan of Ribton Bridge (No. 22). Grey outline denotes area lost to river erosion

The wall was surmounted by a stone coping with two small rectangular piers at each end. Both piers were four courses high, surmounted by low pyramid-shaped copings (figure 20) with raked-back sandstone buttresses. The area was heavily overgrown with brambles and largely inaccessible.

Figure 19. Eastern abutment Ribton Bridge

Figure 20. Pier at southern end of east abutment

<u>Pier 1</u>

Pier 1 was partially situated on the river bank, the western elevation being within the river channel. The pier was constructed from concordant, rough-hewn, red sandstone blocks and was complete, measuring approximately eleven courses in height (figure 21).

The following observations were noted:

- The northern end possessed a blunt face.
- The southern end possesses a chisel-face, deflecting water into the channel between Piers 1 and 2.
- There was no architectural embellishment present, nor any evidence for masonry marks.

- The top course comprised of dressed stone blocks.

Figure 21. Western elevation illustrating Pier 1

Figure 22. Pier 2 showing the eastern elevation

Pier 2

Pier 2 was located on gravel that formerly represented the river bed, the eastern elevation in contact with water (figure 22), the western elevation colonised by scrub.

The pier was constructed from concordant, rough-hewn, red sandstone blocks and was complete, measuring approximately eleven courses in height.

The following observations were noted:

- Both northern and southern ends possessed pointed faces facilitating the efficient flow of the river.
- The top course comprised of dressed stone blocks.
- There was no architectural embellishment present.
- The stonework had been repointed (Figure 23)
- A masonry mark comprising two upright incisions was visible on the western elevation (Figure 23).
- Below the water line was an offset stone plinth upon which the pier had been constructed

Midway between Piers 2 and 3 were four timber piles that formed a linear alignment parallel to the stone piers (figure 25). These piers stood to a height of approximately 0.50m and were heavily denuded above the water-line.

These square plan timber piles (0.30m x 0.30m) were tipped with a wrought iron sheath (figure 24) held in place by a large nail or bolt, that had assisted the pile through the gravel. It appears highly plausible that these four piles represented a trestle for the earlier timber bridge built in 1847 and replaced by the stone piers currently in place.

Alternatively, these piles could represent a repair undertaken c 1857-1858 prior to construction of the stone piers.

As the stone piers were built within coffer dams, it appears unlikely that the timber piles are associated with the surviving pier.

Figure 23. Masonry mark, Pier 2

Figure 24. Timber pile

Figure 25. Alignment of four timber piles representing the earlier bridge

Figure 26. Western elevation of Pier 3

Pier 3

Pier 3 was located on a gravel bar that formerly represented the river bed, the eastern elevation just in contact with water (figure 26), the western elevation free of scrub.

The pier was constructed from concordant, rough-hewn, red sandstone blocks and was complete, measuring approximately eleven courses in height.

The following observations were noted:

- Both northern and southern ends possessed pointed faces facilitating the efficient flow of the river (figure 27).
- The top course comprised of dressed stone blocks.
- There was no architectural embellishment present.
- The stonework had been repointed (figure 28).
- A masonry mark comprising three horizontal incisions was visible on the western elevation (Figure 28).

Figure 27. South face of pier

Figure 28. Masonry marks on western elevation on Pier 3

Pier 4

Pier 4 was located on a gravel bar that formerly represented the river bed, the eastern elevation and the western elevation free of scrub (figure 29).

The pier was constructed from concordant, rough-hewn, red sandstone blocks and was complete, measuring approximately eleven courses in height.

The following observations were noted:

- Both northern and southern ends possessed pointed faces facilitating the efficient flow of the river albeit the pointed northern face was slightly offset.
- The top course consisted of dressed stone blocks.
- There was no architectural embellishment present.
- The stonework had been repointed.

Masonry marks comprising an inverted "open four" and a capital L was visible on the western elevation (Figure 30). This graffiti appeared to be set within a symmetrical stone arrangement comprising a central stone flanked by pairs of square stones (figure 30).

Figure 29. Western elevation of Pier 4, the masonry marks are dead centre

Figure 30. Mason's marks showing an inverted "open four" and a capital L

Pier 5

Pier 5 was located within the river channel and had been severely damaged on its southern flank by an errant tree (figure 31).


Figure 31. Pier 5 showing eastern elevation

The pier was constructed from a skin of eleven courses of concordant, rough-hewn, red sandstone blocks with a rubble core that had been consolidated with poured concrete (figure 32).

The following observations were noted:

- Both northern and southern ends possessed pointed faces facilitating the efficient flow of the river albeit the pointed southern face now destroyed by flood damage.
- The top course consisted of dressed stone blocks.
- There was no architectural embellishment present.
- The southern end had been bolstered by later concrete and stone on the western side.
- At the top of the pier were bolted iron plates.

Western bridge abutment

The western bridge abutment (NY 04570 00508) had largely been swept away, a small portion of the bridge abutment surviving to the north-west. This stone wall possessed a stone coping that has become dislodged (figure33).

Elsewhere, large lumps of bonded masonry were strewn along the bank (figure 34) and in the river channel causing an obstruction.

Bank erosion had been an earlier problem with temporary measures attempted.

Just to the south of the former bridge abutment, concrete filled “sand bags” were lain in courses.


Figure 32. Southern elevation, Pier 5


Figure 33. Surviving flank of western abutment


Figure 34. Debris from the former western bridge abutment

In cross-section, the retaining wall for the bridge abutment appeared to be crudely constructed. The base of the wall appeared to comprise red sandstone blocks forming a wide plinth. The overlying wall was poorly grouted onto this plinth consisting of an outer red sandstone skin and an inner rubble-stone wall. Within this void, rubble core had been deposited (figure 35).

Figure 35. Western bridge abutment showing a cross-section through the former stone wall skin

The erosive power of the river revealed a section across the western railway embankment thereby illustrating the following sequence that formed its construction.

A linear upcast of light brown clay standing to a height of approximately 2.50m sealed to the north by a membrane of grey clay 0.40m in thickness that conjoined a bed of dark brown compacted gravel, possibly a former track bed, forming a level plane approximately 6.00m in width. The embankment possessed a 45 angle of repose, approximately 12.00m in width at its base (figure 36).

The embankment comprised a soft clay core, consolidated by a harder clay membrane that allowed the shock of the passing train to be absorbed within the earthwork. This action represented the original single course track bed opened in 1847.

Clinker and gravel probably derived from the blast furnaces in Workington, accumulated on the north side of the embankment indicating widening of the track bed for two-way traffic from the 1860s onward.

Leading to the bridge abutment, the embankment was approximately 2.50m above the surrounding pasture.

On the north side of the embankment was a stanchion formerly supporting a telegraph pole and a series of four low iron posts probably forming a fence established when the railway was in use (figure 37).

Figure 36. Section through the embankment showing the original embankment to the left

Figure 37. Telegraph stanchion and iron fence posts

3.4 Survey results; Camerton Bridge (No. 25)

Located between mileposts 5 and 5 ¼, Camerton formerly possessed three spans between its abutments. Progressing from east to west these skewed spans measured 62 ft 8 in (19.10m), 70ft 2 in (21.39m) and 63ft 4 in (19.30m) had comprised wrought iron main and cross girders with wooden planking. The west abutment had been partly rebuilt in 1948 in concrete. All the spans were removed since 1966.

At this location and the channel is relatively wide, the water is over 1.00m in depth creating inaccessibility for the surveyor.

The river has been particularly destructive on its northern side, robbing the western bank that stands approximately 4.00m in height for a stretch of approximately 150m. This section revealed a deep accumulation of waste rock and chippings from Camerton Colliery and a horizon of salmon coloured waste brick from the later brickworks.

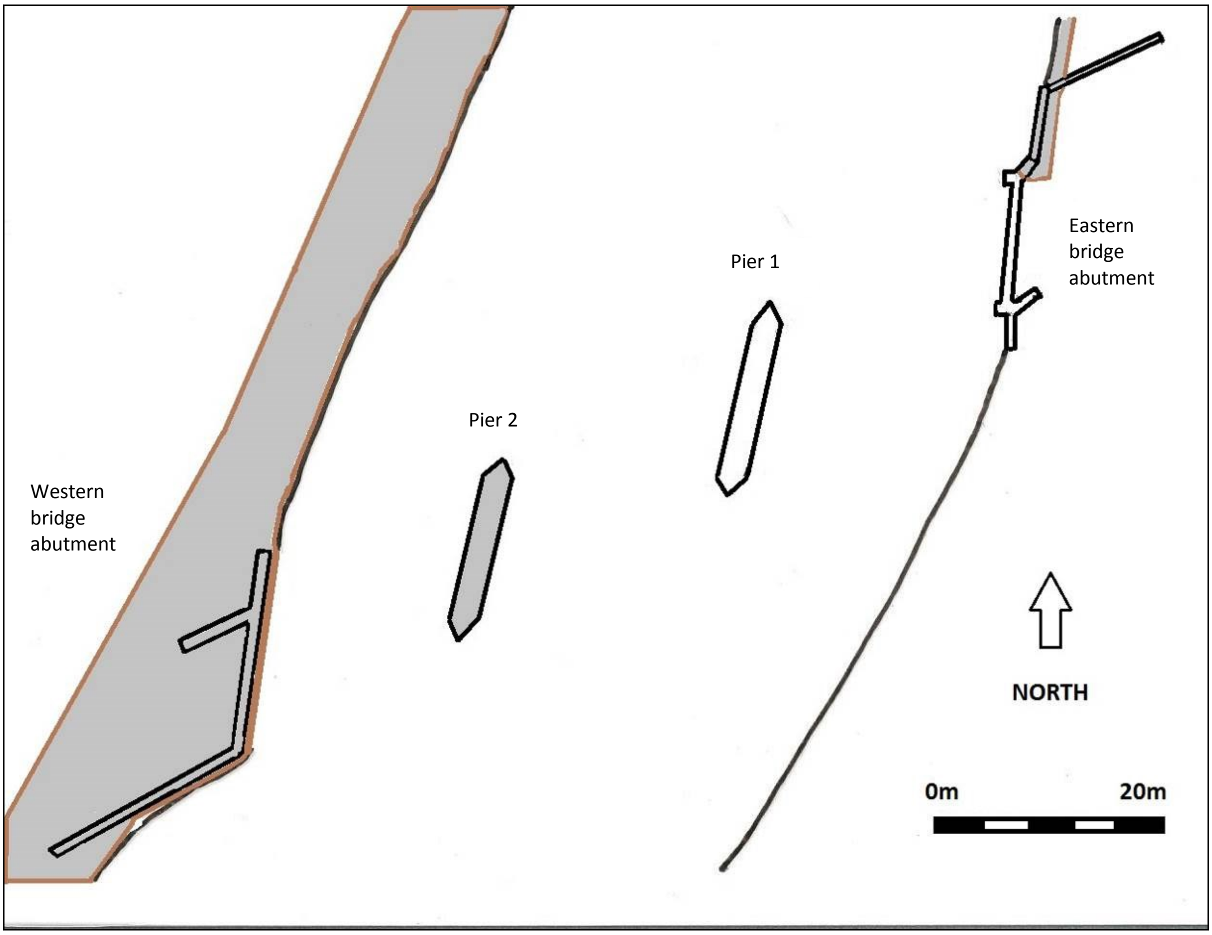

Figure 38. Plan of Camerton Bridge (No. 25). Grey outline denotes lost features and land.

<u>Eastern bridge abutment</u>

The approach to the eastern bridge abutment (NY 03956 30670) was via a raised embankment approximately 2.00m in height.

The abutment had been formalised by a red, rough-hewn sandstone retaining wall partly dressed, standing to a height of 3.00m and formed from blocks measuring approximately 0.75m x 0.36m and 0.50m in thickness

The abutment was outlined by a thin rebate, possessing flanking stone wings defined by terminals of stone pillars with a low pyramidal coping stone (figure 39). Copings surmounted the flanking wall up to the track bed.

Figure 39. Western elevation forming the eastern bridge abutment.

Figure 40. Cross-section through bridge abutment fabric

On the north side of the bridge abutment, the river has removed part of the building fabric thereby illustrating an outer skin of red sandstone and a coarse inner yellow rubble sandstone wall filled with rubble core consolidated by poured concrete (figure 40). This configuration was 2.00m in thickness.

Following the retaining wall eastwards, this area was liable to flood damage. In 1922 the embankment was bolstered by a concrete retaining wall measuring 9.60m in length, 2.00m in height and 0.80m in thickness that only partly survives (figure 41), the masonry wall now lost.

This flank has been undermined where it meets the embankment, revealing a horizon of coarse sand or gravel overlain by a linear bank of light brown clay surmounted by a thick spread of cinders (figure 42).

Figure 41. Extant concrete wall built in 1922

Figure 42. Partly robbed embankment

Figure 43. Timber posts and cross member indicating probable earlier timber bridge abutment

Exposed by the scouring of the river just to the south of the abutment were a series of upright timber posts or piles with at least one retaining plank (figure 43). These timbers probably indicate the earlier timber bridge of 1847 suggesting that the course of this railway may have been slightly to the south of the current abutment.

Where the bridge met the abutment two features were observed that probably related to accommodation of the iron girders, forming and also securing the deck.

A small rectangular plan reception pit measuring 2.00m x 0.93m and 0.50m in depth was outlined in vitrified brick (figure 44).

On the extreme north side bolted to the top of the abutment was an iron plate (figure 45).

Both features possessed sufficient margin that would allow the iron bridge to expand in hot weather and contract when cold, thereby avoiding structural stress in the bridge fabric.


Figure 44. Reception pit or recess


Figure 45. Iron plate on bridge abutment


Figure 46. Southern elevation of Pier 1, Camerton Bridge

Pier 1

The pier was constructed from a skin of at least eight courses of concordant, rough-hewn, red sandstone blocks with a rubble core that probably had been consolidated with poured concrete. The tail of the abutment had been severely damaged by flood damage (figure 46).

The following observations were noted:

- The western end possessed a pointed face facilitating the efficient flow of the river whilst the pointed eastern face was destroyed by flood damage.
- The top course consisted of dressed stone blocks.
- There was no architectural embellishment present.

Pier 2

Pier 2 had been completely destroyed by flood damage with just some of the toppled superstructure still visible (figure 47).

Western bridge abutment

The western bridge abutment (NY 03885 30610) had been washed away by flood action leaving only some fallen masonry and a section in the bank showing natural sand and waste from the former Camerton Colliery (figure 48).

Figure 47. Location of fallen Pier 2

Figure 48. Location of former western abutment

3.5 Survey results; Discussion

All the bridge crossings had suffered major damage with an abutment lost at all three bridges, one pier totally lost and two further piers severely compromised. This action had occurred relatively recently.

In early 2005, the height of the floodwater reached the top of the piers for the first time. During the flood of 2009 the floodwater surpassed this level and remained well above the bridges inflicting severe robbery of the banks. Without vegetation to consolidate the river bank, the River Derwent has increasingly undermined these banks, hastening deterioration in the remaining bridge fabric and creating further obstructions within the river.

The damage inflicted by the river offered an opportunity to examine relatively fresh sections which revealed the probable presence of an earlier timber bridge at Camerton Bridge and Ribton Bridge.

Both putative timber structures appeared to lie just to the south of the masonry bridges, suggesting that construction of the later bridges occurred whilst the railway line was carrying traffic. Once the masonry bridges were completed the timber piers were abandoned.

The Level II Building Survey confirmed uniformity in design for each of the study bridges comprising outward, rough-hewn, red sandstone finish for the abutments and pointed red sandstone piers carrying the deck for the bridge.

Only Ribton Bridge displayed mason's marks, probably because only at that particular location could the piers be closely examined. These marks appeared to correspond with the number for the pier but this may be coincidental.

The consensus within the railway world that this line was poorly constructed appears to be confirmed with the mediocre material used in the embankment at Ribton Bridge, the poor quality rubble core fill within all the piers and frequent *ad hoc* repairs, notably in 1922 and 1948.

Although the railway was built during the first half of the nineteenth century under the tutelage of the eminent railway engineer George Stephenson, there were no outstanding architectural features of historical or artistic merit. This action confirmed that the line possessed a utilitarian function where the priority was the efficient, rapid and cheap movement of coal and coke for the blast furnaces in Workington. Consequently, the need for impressive and monumental extravagance was not a requisite, but the relative lack of capital investment probably in the long term condemned the line to extinction, an event that finally occurred in 1966.

4 ARCHIVE

The archive has been compiled in accordance within a generic project design and the guidelines set out by English Heritage (1991) and the Institute of Field Archaeologists (1994, 2007 and 2008).

The archive for this project will be deposited with the appropriate archaeological curator. This archive has been assembled in accordance within the protocols of Management of Archaeological Projects (MAP2).

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