DUTCH RIVER SWING BRIDGE

GOOLE

An Historical Audit

September 2003

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1 SUMMARY

An historical audit of the swing bridge over the Dutch River at Goole was carried out to assess its historical importance in local, regional and national terms. Historical documentary sources were inspected and several industrial and technical history experts were consulted regarding similar swing bridges. The report presents a general introduction to swing bridges, with reference to other surviving examples, particularly in Yorkshire. The history of the Dutch River Swing Bridge in Goole is considered, together with the technical aspects of the bridge and mechanism. In conclusion its importance is discussed.

2 INTRODUCTION

2.1 *Background*

The first bridge over the Dutch River at Goole was a fixed bridge and probably built around 1633 when the Dutch River itself was built by Cornelius Vermuyden. Opening spans were authorised under the 1727 Dun Navigation Act for the three fixed bridges below Fishlake, at Middle (Newbridge), Rawcliffe and Goole. However, these works may not have been carried out until the 1760s when James Brindley's advice was sought. The wooden swing bridge at Goole which was built then was replaced by the present bridge which opened in 1890.

The bridge was originally the responsibility of the Dun Navigation undertakers, and this responsibility passed to the Manchester, Sheffield & Lincolnshire Railway when it took over the river navigation in 1874. Ownership passed to Goole Local Board in 1888 during the construction of the present bridge.

This historical audit looks at the history of swing bridges in general, and the Dutch River Swing Bridge at Goole in particular. Other similar swing bridges are identified. The problems of conserving and interpreting the bridge are considered, and recommendations made for future action with regard to them. The audit was undertaken by Mike Clarke.

The audit was commissioned by Carl Bro Group, on behalf of the East Riding of Yorkshire Council, following a recommendation in the Stage 1 Cultural Heritage Appraisal of the Dutch River Crossing.

2.2 *Organisation of the Report*

The report first considers the design, development and use of the various types of swing bridges. The history of Goole's Dutch River Swing Bridge is then considered both chronologically and technically. The report closes with a discussion and appraisal of the significance of the swing bridge with recommendations for conservation and interpretation.

3 SWING BRIDGES

3.1 *Draw bridges and bascule bridges*

The earliest opening bridges were draw bridges. For these, one end of the bridge is hinged to allow the other end to be raised, the power needed to raise the bridge sometimes being reduced by a counter balance. The simplest design is the traditional Dutch type of bridge where the counter balance is carried on an overhead beam, and the first proposal for an opening bridge over the Dutch River at Goole suggested this system. Recent examples can be found on the New Junction Canal, near Goole. This design developed into the bascule bridge where the counter balance is under the tail of the bridge. A pit is sometimes required to accommodate the counter balance when the bridge is raised. There were several such bridges in Goole Docks which have subsequently been replaced by swing bridges. Scott Street Bridge, Hull, is an example of a counter balanced bascule bridge, and there are also two Scherzer bascule bridges, a development of previous types, over the River Hull. This latter type of bridge has a curved rolling path which allows it to open upwards.

3.2 *Swing bridges*

Swing bridges became popular in the eighteenth century, particularly for canals and docks. The weight of the bridge is either taken by a central bearing, or by a circular rim bearing on which rollers run. On some centre bearing bridges, a rim bearing is provided with light loading to stabilise the bridge when in motion. The old wooden bridge over the Dutch River had such a bearing. The benefits of swing bridges are their low power requirements, minimal bearing wear, absence of deep pits for counter weights and small variation in road level. Their disadvantages are that they are longer than bascule bridges and, in docks, side recesses are needed when the bridge is open to water traffic. On river crossings, expensive foundations need to be built, either in the river or alongside it, for the support of the swinging section. Swing bridges also require more maintenance, but their operation is less affected by wind.

The earliest swing bridges were built from wood, usually with iron stays and bearings. They probably had rim bearings in an effort to reduce point loading. It must have been difficult to keep the bearing track free from stones and dirt on these early bridges. The Leeds & Liverpool Canal Company was replacing some swing bridges with stone bridges by 1784, just ten years after the canal had opened, to increase the weight which they could carry. In the same year they sent one of their engineers to look at the swing bridges on the Sankey Navigation, ordering him to build a similar one on their canal. Could this design have incorporated a centre bearing? Certainly more recent small canal swing bridges all have such bearings. These are much easier to keep free from dust and stones, thereby reducing wear and increasing ease of operation.

Cast iron swing bridges were first used in London Docks in 1805. Aydon & Elwell, of Shelf Ironworks, Bradford, supplied the iron work for the first phase of the docks in 1801-5, and this included a double leaf cast iron swing bridge to John Rennie's design over the Wapping entrance. Over the next three years, the same firm erected a cast iron swing bridge in Hull Docks, followed by one in Liverpool in 1809. The span of such bridges was around 40 feet for a double leaf bridge.

During the first half of the nineteenth century, cast iron was used for the main bridge structure of most dock bridges; those at Albert Dock, Liverpool, dating from 1843, are an example of this type. The Humber and Railway Dock swing bridges in Hull are built to the same design. One interesting feature of this design is that the two outer ends of the moving spans dovetail together to form a single arch. When a load is applied, the bearings can move slightly and the weight is transferred to the abutments through a shroud which covers part of the bearing path. In effect, the bridge tends to become a solid arch.

However, cast iron is not the ideal material for bridge construction as it is poor in tension. Wrought

iron, which became much cheaper in the mid-nineteenth century, was preferred for dock and navigation bridges as the increasing size of vessels demanded greater bridge spans. This problem increased with the introduction of steam power in the 1830s and '40s. Paddle steamers required a very wide, though shallow, navigable channel; screw steamers, which were introduced shortly after, required a much deeper one, though it need not be as wide. Consequently, there were continual changes in design standards for bridges at this period, particularly within docks.

Materials were also improving. The tubular railway bridges over the Menai Straits and at Conway, built in the 1840s, mark a definite change from cast to wrought iron for bridge construction. The collapse of the cast iron railway bridge at Chester in 1847 also added to the speed of the change. Wrought iron is much better in tension than cast iron and, rolled or fabricated into a suitable section, can resist bending. This enabled the construction of much wider bridge spans. Until the construction of the Menai bridge, the maximum span for a girder bridge had been 60 feet; afterwards spans of over 400 feet were possible using wrought iron. This gives some indication of the restrictions which cast iron imposed.

From 1850, I-section beams could be rolled from wrought iron, but technological problems restricted the size which could be rolled, resulting in the need to fabricate complex bridge girders from simple plates and angle sections by riveting. Many mid to late-nineteenth century bridges have fabricated plate girder construction, though open lattice girders were used increasingly as technology improved. The bridge over the Dutch River exhibits both systems, as well as plates curved to increase their strength. With the introduction of steel and the improvement of rolling technology around 1900, bridge girder design concentrated on the open lattice type. This allowed spans to be increased while restricting the overall weight of the bridge and consequently reducing loading on the bridge bearing.

With regard to the means of opening swing bridges, manual power was sufficient for many, with hydraulic power being used for those in docks where such power was available. From the 1890s, hydraulic power was available more widely, often with internal combustion engines driving hydraulic pumps to operate the bridge. The swing bridges on the Manchester Ship Canal, dating from around 1890, are good examples of this. Electric power was introduced around 1900, the first use for swing bridges being at Northwich on the River Weaver. It soon became the standard power source, either directly via electric motor driven gears, or by electrically driven hydraulic systems. The latter were originally water-hydraulic, but today oil has replaced water in most hydraulic systems.

4 METHODOLOGY AND SOURCES

4.1 *The range of evidence*

For a report on South Dock Swing Bridge (Clarke, 1999), a variety of information related to the development and conservation of historic bridges in Britain was collected, and this has been added to for this report. It has allowed a national overview to be developed, along with a regional survey of surviving swing bridges. From this, the historical importance of the Dutch River Swing Bridge at Goole has been evaluated.

Because of the strong links between the Aire & Calder Navigation and the development of Goole, a series of drawings of the current bridge, mainly dating from its design and construction period, are still held by Associated British Ports at Goole. There is no archive material with the local authority relating to the bridge's construction as the papers for Goole Local Board were destroyed by fire at the end of the nineteenth century. There is also little material, other than that contained in the Acts of Parliament, in the archive material concerning the River Dun Navigation.

Opening bridges have always been a specialist subject within the wider scope of bridge building. Consequently there are few technical books which cover the subject. Histories of bridge building have tended to concentrate on fixed bridges, with opening bridges being covered by just the odd page or two of text. Amongst the publications of engineering history societies, there are several papers which look at the development of nineteenth century docks and at bridge construction.

4.2 *Technical sources consulted*

The Library of the Institution of Civil Engineers was consulted, particularly for information regarding opening bridges from the Heritage Engineering Panel's work on the history of bridges. Several papers in the Minutes of the Proceedings of the Institution contain general information about opening bridges, perhaps the most important being that of Price (1879), in which the various types of bridge are discussed, and some of the most important listed. The Transactions also contain an article about Hull's Docks, published in 1836, which includes much detail about the earliest cast iron dock bridges (Timperley, 1836).

4.3 *Contemporary sources consulted*

The drawings held by ABP Goole were copied and several examples are included in this report. The various Acts of Parliament relating to the bridge were identified and the relevant clauses extracted. A contemporary account of travelling down the River Dun to Goole was found in Sir George Head's, A Home Tour through the Manufacturing Districts of England in the Summer of 1835. John Tomlinson's, The Level of Hatfield Chace, published in 1882, also gave brief details of the bridge's history. The microfilm copies of the Goole Times for around 1890 held in Goole Library were also consulted.

4.4 *Secondary sources consulted*

Various local history books produced a little information on the bridge. The history of the Dun Navigation came mainly from Charles Hadfield's, The Canals of Yorkshire and North East England (1973). Information related to the development of cast iron bridges was also found in publications relating to Liverpool Docks and in articles in the Transactions of the Newcomen Society.

5 THE HISTORY OF THE DUTCH RIVER SWING BRIDGE AT GOOLE

5.1 *The Dutch River*

Prior to the draining of Hatfield Chase, the River Dun had two outlets; at Adlingfleet into the Trent, and into the Aire near Rawcliffe. The river was certainly navigable to Doncaster by the mid-fourteenth century and probably had been earlier. It was the agreement between Cornelius Vermuyden and Charles I, dated 24 May 1626, which began the drainage of Hatfield Chase, when the channel of the Dun to Adlingfleet was closed and all waters turned northwards to the Aire. This created flooding around Fishlake, Sykehouse and Snaith whose occupants complained. A judgement in 1633 compelled Vermuyden to cut a new channel, subsequently called the Dutch River, from Newbridge to the Ouse at Goole to overcome the problem.

Originally there were tidal sluices at Goole, and these would almost certainly have included a bridge over the Dutch River. Similar structures survive near Swinefleet, about half a mile downstream of the Dutch River at Goole, and at the entrance to the Market Weighton Canal near Broomfleet. The Goole sluices were carried away by floods around 1688 and do not seem to have been replaced. However, a bridge was probably rebuilt here before the 1720s. With the sluices removed, the tide scoured out the river and this allowed navigational access via the Dutch River to Fishlake and Wilsick House, near Thorne.

5.2 *The River Dun Navigation*

The early eighteenth century saw several successful proposals for river navigations in Yorkshire. The first one for the River Dun dates from 1691 and a Bill was presented to Parliament in 1698 by Sir Godfrey Copley, the same year as the Aire & Calder Navigation. It failed, as did a second attempt by Doncaster Corporation in 1704. The scheme was revived in the 1720s, though when it finally succeeded the river was divided into two sections.

The first Act of 1726 (12 Geo I Cap 38) was for '*Making the River Dun navigable from Holmstile to Tinsley*', from below Doncaster to above Rotherham. The second Act was promoted by Doncaster Corporation. It dates from 1727 (13 Geo I Cap 20) and was '*For improving Navigation from Holmes-stile to Wilsick House*', the section of the navigation below Doncaster. It was this Act which authorised the conversion of the three fixed bridges over the Dutch River below Doncaster to opening ones, including the one at Goole, as well as those at Newbridge and Rawcliffe. It also authorised the charging of tolls for opening the bridges.

The new bridges were to be of the Dutch lifting type, but no construction work was undertaken on the bridges for some years. Perhaps the fixed bridges had narrow opening slits which allowed boats with masts to pass, though with difficulty. A Bill to amalgamate the two sections of the river was presented in 1731, and this also included a clause for the removal of two of the bridges. It failed, but a subsequent Bill for just the amalgamation became an Act in 1733, (6 Geo II Cap 9) '*To explain and amend previous Acts and uniting several Proprietors thereof*'.

Further Bills followed. In 1736 for improving the river down to Sykehouse, and in 1737 for both improving the river and for removing Rawcliffe Bridge and making the other two bridges easier for boats to pass. Both failed, but an Act was obtained in 1740, (13 Geo II Cap 11) '*For improving from Wilsick House to Fishlock Ferry*', though there is no mention of the bridges in it.

The Navigation continued to be improved over the following century, and in 1847, (10 & 11 Vict cap 291) it amalgamated with the South Yorkshire, Doncaster & Goole Railway. A clause in the Act forbids the company from making a fixed bridge below Doncaster. A subsequent Act of 1850, (13 & 14 Vict cap. 57) '*The South Yorkshire Railway and River Dun Act*', included clauses confirming that the bridges across the river below Doncaster had to be maintained as opening bridges. The South Yorkshire Railway and River Dun was leased by the Manchester, Sheffield & Lincolnshire Railway

(MS&LR) in 1864 and ten years later, in 1874, all the Navigation's powers were vested with the Manchester, Sheffield & Lincolnshire Railway. This included those relating to the opening bridge over the Dutch River at Goole.

Finally, under the MS&LR Act of 1886, (50 Vict cap 49), it was recognised that the need for opening bridges had declined, particularly as the North Eastern Railway's 1863 Act had authorised a fixed bridge over the Dutch River above Goole. A new bridge over the Dutch River at Goole was authorised and it was agreed that this should be passed to the Goole Local Board, ending all association with the Dun Navigation. Boats continued to use the Dutch River, the lock into the Navigation at Stainforth only closing in 1939. However, vessels continued to pass through the bridge on their way to serve the wharf at Thorne Riverside for some time afterwards.

5.3 *The First Swing Bridge at Goole*

No work on building a swing bridge at Goole seems to have been undertaken until 1762, thirty-five years after the original authorisation. James Brindley had been asked to comment on alterations to the navigation near Rotherham, and at the same time to produce estimates for altering the three bridges over the Dutch River so that boats with fixed masts could pass them. He made a model and this was used as the design by John Needham, who was deputy to John Smith, the Navigation's Engineer. Surviving drawings and photos of the bridge show a simple structure with a clear passage of about 30 feet. The swinging span was fitted onto a wooden framework on the northern side of the channel in a similar location to the current bridge, with a fixed section on the southern side.

The tidal river would have been difficult to navigate and only possible around high tide. The number of boats passing through the bridge at Goole probably declined after the opening of the Stainforth & Keadby Canal in 1802 offered an easier access to the Dun Navigation. The nineteenth century also saw the introduction of steam towage on the Humber, so there was a decline in the number of boats with masts which would have needed to have the bridge opened.

The old swing bridge must have been quite fragile as there were constant complaints about it in the mid-nineteenth century. It was certainly a structure not fit for the growing volume of road traffic as warping of Marshland to the south of the Dutch River brought about increased agricultural use. The growing size of boats would also have caused problems. Prior to railways, there were regular paddle steamer services from Thorne to Hull and these must have found great difficulty in passing the bridge. Sir George Head, writing about '***A Home Tour through the Manufacturing Districts of England in the Summer of 1835***' described the passage down the river by horse-drawn boat thus:

'It was before seven o' clock in the morning, after passing the night at Doncaster, that I found myself among a crowd of persons anxiously waiting the arrival of the tide-coaches, which had departed Sheffield at five o' clock, in order to reach Thorne at half-past eight, in time for the Hull steamer. The distance is not more than thirty miles, and three hours and a half sufficient time for the journey; nevertheless, from one cause of delay or another, it is not performed without much furious driving…
…The usual place of embarkation is Thorne Quay, a small village about a mile beyond the town of Thorne; but the tide on our arrival there, was so low, that the coaches proceeded a mile farther down the River Don, to a place called 'Hangman's Hill', celebrated for the summary vengeance taken in former days, on the part of Cornelius Van Muden, on certain caitiffs who maliciously damaged his dikes. At Hangman's Hill, we found in readiness for the voyage to Goole a flat-bottomed punt, in shape like a Sunderland keel, but furnished with a good cabin under a raised bulkhead, sufficient effectively to protect the passengers from the weather. We were towed the whole way, by a couple of horses, to Goole, where, on our arrival, the Hull steamer lay at the quay ready to proceed on her way.
The last seven miles of the voyage were performed through the 'Dutch River', a singular and magnificent work of art; a straight cut, whereby the ancient circuitous course of the River Don was effectively changed, in the reign of Charles II, by the aforesaid Van Muden. At the present day its deep shelving banks, its ample breadth, and the ebbing and flowing of the tide within its channel, give it all theappearances of a

natural river. I paced one of the old-fashioned wooden bridges, with a draw-bridge in the centre, thrown across it at Goole, and found the length to be eighty-three yards.'

By the 1860s it is probable that masted boats were a rarity on the Dutch River. The North Eastern Railway Act of 1863 would not have passed with its clause allowing the construction of a fixed bridge if there had been regular passage of boats with mast up and down the river. ***The Goole & Marshland Gazette*** of the 1 October1863 suggests that a fixed bridge was planned to replace the swing bridge at Goole. It reported:

'Tenders are to be delivered today for the execution of a brick and stone bridge in the place of the present dangerous communication. We regret to hear that it is proposed to make the New Bridge only the width of the present one, which is totally inadequate to the traffic, and we think it behoves the authorities and parties interested, when there is a prospect of a permanent erection to see that it not only accommodates the present, but is adequate to the large increase of trade which there is every probability.'

The reason why the bridge was not built is not known, but possibly the river was already being used as an extension to the docks, with wharfs on its banks. A further 25 years were to pass before the present bridge was built. There was considerable local concern over the condition of the old bridge. When the keel ***Jane*** struck the bridge in 1871, the captain's wife and two children were drowned. The coroner said:

'…it is also the opinion of the jury that the bridge, as at present, is dangerous from the narrowness of its opening, and that a new bridge is required to be constructed.'

The roadway was also in poor condition and, at fifteen feet in width, far too narrow for the increasing traffic.

5.4 *The Present Swing Bridge at Goole*

From the evidence of the drawings held by Associated British Ports at Goole, planning for the replacement of the bridge goes back to 1877. This design was for a c.40 foot clearance opening span. It was somewhat less strong than the final design, with a much smaller swinging girder cross section. There were also two intermediate supports for the fixed portion of the bridge on the southern bank as opposed to the single support in the other drawings.

The bridge was redesigned by January 1886, probably as part of the work on obtaining the necessary Act in that year. The clear span varied in the drawings from 36 feet to 45 feet, with the final design being for 40 feet. A design may have been chosen as a detail of the turntable and the supporting cylinders survives dated October 1886. Mr Bartholomew also commented on the drawings in November 1886, giving details of suggested improvements, but following this no further drawings seem to have been made until January 1888, and these were of boreholes for the foundations.

Over the intervening fourteen months there must have been considerable discussion as to the bridge's design and to its financing. The finalisation of the design of the swinging bridge must have been taking place early in 1888, as there is a drawing of details of the swing leaf dated May 1888. In August 1888, the ***Goole Times*** reported that Mr Stubbs, Engineer for the MS&LR, William McGregor, the contractor from Old Trafford, Manchester, and Mr Tudor, Engineer for the Local Board, were about to set out the lines for the bridge. A temporary fixed bridge was built downstream of the old bridge for use by the public during construction, and it was agreed that river traffic could be stopped for fourteen days during the installation of the swing leaf. The ironwork for the bridge was supplied by John Butler & Co of Stanningley, Leeds.

The bridge opened on 17 January 1890 after costing £9,752. It had been designed by the MS&LR and they contributed £500 to the overall cost, but the main financial burden fell on the Goole Local Board. They took over responsibility for the bridge under a clause in the MS&LR Act of 1886.

Increasing traffic from Marshland may have led to a strengthening of the southern approaches. The first plan for this appears in 1924, then further ones in 1926, and a final plan in 1927. The south eastern approach to the bridge was widened at this time, with the roadway being carried partially on new piling.

5.5 *New Bridge Proposals*

In 1899 it was suggested that the bridge be handed over to the Aire & Calder Navigation (A&CN). The Navigation's Bill in that year included the suggestion for a lock into the Dutch River above the bridge to reduce congestion in the docks. This would have drastically increased boat traffic through the bridge, and the A&CN were to be required to provide hydraulic power to speed up the bridge's operation. They were also to repair and maintain the bridge in perpetuity. Goole UDC could then charge a toll of 6d per 10 tons on boats using the Don Navigation, and a reduced toll of 6d per boat was to be introduced for those using the new lock. This section of the Bill was removed before the 1899 A&CN Act was passed.

A new bridge was proposed in 1960 by the West Riding County Council. The bridge had been inspected in October 1959, and it was considered that proposals to widen the footpaths could not be carried out and that traffic lights providing single-line working was out of the question. Fisons, who used the wharf upstream of the bridge, were to be asked for their minimum dimensions for a fixed bridge. These must have been impossible to achieve using a fixed bridge, so the traffic light scheme was resurrected.

5.6 *Operation*

The bridge was originally manually operated with crabs and winches. The present electrically-powered oil-hydraulic system was probably installed at the same time as the traffic lights, possibly during the 1960s. This was to speed up the operation of the bridge; the time taken by manual operation had always caused problems with traffic delays.

6 OTHER LOCAL BRIDGES

6.1 *Goole Docks and inland navigations*

There were several swing bridges in Goole Docks. South Dock Bridge was built in 1898, as a plate girder bridge, to replace an earlier bascule bridge. It has recently been replaced, in 2000, by a modern welded steel plate swing bridge. West Dock and Lowther bridges are lattice girder bridges and were built just before the First World War. The Aire & Calder Navigation, owner of Goole Docks, also built several small swing bridges across the Knottingley & Goole Canal around 1880, one of which still survives. This was around the time when the Manchester Ship Canal was being promoted, and schemes for ship canals to both Leeds and Sheffield were suggested. When the Hunslet Railway crossed the Aire & Calder Navigation just below Thwaite Lock, Leeds, in the 1880s, a swing bridge of a size suitable for a ship canal was built. Later, in 1912, when the Hull & Barnsley Railway bridge below Pollington Lock was built, it was a Scherzer rolling lift bridge. Neither had operating machinery installed and neither were ever opened.

6.2 *Other swing bridges in East Yorkshire and Lincolnshire*

The first swing bridge over the River Ouse was the road bridge at Selby, built in 1792. It was followed, in 1840, by the Hull & Selby Railway bridge, a cast iron bascule bridge which was replaced by a swing bridge in 1891. An important swing bridge in the area is the railway bridge across the River Ouse at Goole. Built in 1869, it is a plate girder bridge and was the second largest double-track railway bridge at the time. It was followed shortly after by the railway swing bridge over the Ouse at Naburn. A road swing bridge was built at Cawood in 1872 of the lattice girder type, the third road crossing of the Ouse being the Boothferry Bridge, near Goole, a lattice girder swing bridge which opened in 1929.

To the south of the Humber, a swing bridge was also built in Grimsby Docks in 1877, across the New Cut which linked the Royal Dock to the new Alexandra Dock system. There is also a plate girder railway swing bridge at Boston which is similar to the original, 1853, Wilmington railway swing bridge in Hull.

In Kingston-on-Hull, the River Hull formed a barrier to the eastward development of the town, though at the same time forming a useful harbour. Because of its importance for shipping, bridges over the river needed to have an opening span until a bridge with sufficient headroom could be built.

The earliest bridge was North Bridge, originally opened in 1541 and rebuilt in each of the following centuries. After Hull's first dock was opened in 1779, the increase in traffic it created, both road and water-borne, probably led to the reconstruction of the bridge in 1785. It was built from stone with a lifting section. The bridge was enlarged in 1832, but this did not solve the problems of traffic to and from the growing residential and industrial areas to the east of the river. North Bridge was rebuilt in 1869-70 as a hydraulically powered lattice girder draw bridge.

Historically, the next bridge over the river, Wilmington Railway Swing Bridge, was built for the Victoria Dock Railway and opened in 1853. The original bridge was single track, and also used by the Hull & Holderness Railway from the following year and the Hull & Hornsea Railway from 1864. The bridge was replaced in 1905 by the present one which could accommodate a double track.

In 1885 the Hull & Barnsley Railway opened, including the swing bridge over the River Hull above Wilmington. This has an open lattice girder construction, as is found on other girder bridges on this railway in Hull. The lattice girder bridge at Newcastle, opened in 1876, was one of the earliest of this type. Open lattice girder bridges are lighter than plate girder bridges, enabling either much greater spans to be built, or lighter foundations to be required.

Victoria Dock, Hull, and its associated railway encouraged the development of residential areas

around Sculcoates and Wilmington, both of which had stations, and this in turn led to the need for a new road bridges across the river. The first was South Bridge, which was built by a private company and which received its Act of Parliament in1862, opening in 1867. Originally manually powered, it was subsequently converted to water hydraulic power. It had a clear span of 100 feet. It closed in 1933 and was demolished around 1944.

Sculcoates Swing Bridge was the next to be built and opened in 1875. Then, in 1889, Drypool Sliding Bridge opened. It was rebuilt around 1960. Scott Street Bascule Bridge was added in 1902, quickly followed by swing bridges at Stoneferry in 1905, with Sutton Road opening in 1939. Next, Myton Bridge was built between 1977-79, and finally Ennerdale Bridge opened in 1997.

7 TECHNICAL DESCRIPTION

Dutch River Swing Bridge is a typical river navigation-type plate-girder swing bridge. It has a swing leaf span of length 114 feet, and two fixed girder sections of 46 feet each on the southern side of the river. The bridge parapets are formed from lattice girder ironwork. The swinging leaf is an elongated lozenge-shaped iron plate girder, and is supported on 26 rollers running on a 25 feet diameter track. In the original design, the height of the roller track would have meant that it was under water during the highest tides. The track was raised and this led to a raising of the centre of the swing leaf. Because of this, the approach slope of 1:30 is slightly more than originally envisaged. The width of the carriageway is 26 feet.

The bridge was originally manually powered, with crabs and winches turning the bridge through gearing. Rams and locking gear were also manually operated by levers. Electrically-driven hydraulics now operate all these fittings, though there is still much of the original system surviving.

Iron gates, probably manually-operated, were originally fitted to the fixed bridge at either end of the swing leaf, and the fittings can still be seen, though the gates have been removed. They have been superseded by the present traffic lights and barriers. Today the bridge is operated from a cabin on the north west corner, and this was the site of an earlier bridge house. A bridge house and blacksmith shop were also originally located on the south west corner of the bridge.

A draft specification for the present bridge, with the drawings kept by Associated British Ports at Goole, have been photographed digitally and are on a CD with this report. A few examples have been printed.

8 DISCUSSION AND APPRAISAL OF THE DUTCH RIVER SWING BRIDGE IN GOOLE

The bridge over the Dutch River at Goole has a long history of creating problems for local people travelling between Goole and the Marshlands. The current bridge, probably the third on the site, still causes problems because of its single carriageway and traffic light control. The bridge is rarely swung open for river traffic, though boats do occasionally visit the wharf just upstream of it in order to load cargo.

Wrought iron plate-girder swing bridges are not uncommon today, and the design has continued to be used for steel bridges, such as the recent South Dock Bridge in Goole. Other plate girder bridges around Goole include the Skelton Railway Bridge over the Ouse, built in 1869 (the railway bridge at Naburn was from a similar date), and the railway bridge at Selby which dates from 1891. Another plate girder railway bridge survives at Boston, in Lincolnshire. Road bridges of this type can be found in Hull; the Sculcoates bridge of 1873, and Whitby Harbour bridge, which dates from 1909. Of these, and including Dutch River Bridge, the Skelton Railway Bridge is probably the most historic because of its size, it was one of the largest in the world when built, and its early use of hydraulics.

Dutch River Swing Bridge is typical of its type, with an interesting use of curved plates for strengthening the deck. Much of the original equipment survives, though there has been some destruction or alteration of the turning, locking and wedging mechanisms during electrification.

Alongside the bridge, there were bridge houses on both sides to the west of the bridge. The approximate location and style of these buildings is known from existing drawings and photographs, but further information may become available during any site excavation works. Most remains of the house on the northern bank were probably destroyed when the present bridge control cabin was built, but there may be remains on the southern side where a smithy was included in the building.

The previous bridge was on the same line as the current one. It is unlikely that any foundation work will have survived as the current bridge foundations are probably more extensivethan those for the previous one.

The detailed chronological history of the bridge is difficult to ascertain as many records have disappeared, especially early Goole Local Board records which were destroyed by fire. There are probably some further details within the River Dun Navigation and the MS&LR papers at the Public Record Office at Kew, though little of great significance could be expected. A complete survey of the local papers would also provide details, and the Goole Library does have an index which includes Dutch River Bridge. The most interesting dates were consulted for this audit, but not all the papers were inspected.

It should also be noted that the Dutch River Swing Bridge is not statutorily protected.

9 RECOMMENDATIONS

From a technical viewpoint, the Dutch River Swing Bridge is fairly typical in design. Its loss would not be of major importance, particularly as there is a reasonable selection of original working drawings. These are currently held by Associated British Ports at Goole. It would be better if these could be copied and/or deposited with either the appropriate County Record Office or the Waterways Museum in Goole. Other, more recent, drawings could be held by the East Riding's Bridge Engineer, and copies of these should be added to the collection of original drawings.

A full photographic survey should be carried out before any replacement or alteration to the bridge is carried out. Particular attention should be given to the design of the main girders and to the turning and locking mechanisms, including any alterations which have been made during installation of electro-hydraulic operation.

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APPENDICIES

1. Acts of Parliament relating to Dutch River Swing Bridge
2. A list of some swing bridges in Britain.
3. Plans held by Associated British Ports at Goole.

1727 Act, 13 Geo II Cap XX
Improving navigation from Holmes-stile, Doncaster, to Wilsick House, Barmby Dunn.

Clause XX.
And whereas since the stopping up of the old Course and Navigation of the River Dun Lighters and other Vessels have commonly passed from Doncaster, Fishlake, and other Places upon the said River Dun down the new River (commonly called the Dutch River, in the said County of York) unto the River Owze, and back again from the said River Owze to Fishlake and Doncaster, and other Places upon the said new River, which said new River was made by the Participants and Land Owners of several Lands lying within the Level of Hatfield Chase, and Parts thereto adjacent, in the Counties of York, Lincoln, and Nottingham, for the more convenient draining of their Lands, and such other Lands of the Country adjoining to the said Level which the said Participants are now obliged to drain, which is also a Convenience to the said Navigation: And whereas there are Three Wood Bridges over the said new River or CutLhich were made by the said Participants, which said Three Bridges, and the Banks of the said River, they the said Participants and Land Owners are, at a great yearly Expence, obliged to repair and maintain: And whereas by the Increase of the Navigation up and down the said River Dun between Doncaster and the River Owze, through the said new River, the Bridges and Banks of the same River will more frequently be broken and damaged by Boats, Lighters, and Vessels passing through and mooring in the same: And whereas it will be convenient for the said Navigation to alter the said Bridges, and to make Leaves to draw up or Drawbridges therein, for the more easy Passage for Boats, Lighters, and other Vessels through the same, without taking down or lowering their Masts in such a Passage: To that End therefore, and that the said Boats and Vessels may have no Obstruction in passing the said new River, the said Mayor, Aldermen, and Burgesses of Doncaster aforesaid have agreed with the said Participants and Land Owners to take upon them the Charge of maintaining and repairing the said Three Wood Bridges, and Fifteen Yards of the Banks of the said new River on both Sides thereof next above and below each of the said Three Bridges, and to rebuild the said Three Bridges when and so often as Occasion shall require, for ever after the Twenty-fifth Day of March in the Year of our Lord One thousand seven hundred and twenty-seven; be it therefore enacted by the Authority aforesaid, That the said Three Bridges over the said new River and Fifteen Yards of the Banks of the said new River on each Side of the said new River next above and below each of the said Three Bridges, (except so much of such Part of the Bank near One of the said Three Bridges called Rocliffe Bridge whereon there is a Cottage erected and built, and the Yard of the said Cottage) shall, from the Twenty-fifth Day of March in the Year of our Lord One thousand seven hundred and twenty-seven, be vested and are hereby declared from thenceforth to be vested in the Mayor, Aldermen, and Burgesses of the Borough of Doncaster aforesaid, and their Successors; and the said Corporation of Doncaster, and their Successors, are hereby obliged from thenceforth for ever thereafter to repair, maintain, and rebuild the same when and so often as there shall be Occasion; and the said Corporation of Doncaster, for the more easy Passage of Boats and Vessels through the said new River, is hereby authorised, empowered, and obliged to make Leaves to draw up or Drawbridges, and such other Alterations of and in the said Three Bridges as shall be convenient and necessary for the more easy Passage of Boats, Lighters, and other Vessels through the same, without taking down or lowering their Masts in such their Passage; and the said Corporation is hereby obliged to make such Leaves or Drawbridges within the Space of Two Years next ensuing the said Twenty-fifth Day of March, and from thenceforth for ever after to keep and maintain such Leaves or Drawbridges in the said Three Bridges for the Uses and Purposes aforesaid; and the said Corporation and their Successors, for and in respect of the Charge which they shall be put to in altering the said Three Bridges, and making such convenient Passage for Boats, Lighters, and other Vessels through the same as aforesaid, and for repairing and maintaining the said Three Bridges and Fifteen Yards of the Banks (except before excepted) above and below each of the said Bridges, and building new Bridges in lieu of them so often as there shall be Occasion, are hereby empowered and authorised to ask, demand,

receive, and take, for the Passage of each Boat, Lighter, or other Vessel which shall pass through the said Three Bridges or any of them, (for the passing of which Boat, Lighter, or other Vessel such Drawbridges or any of them shall be opened) of the Owner or Master of every such Boat, Lighter, or other Vessel, the several Duties following; (that is to say) any such Sum of Money as they shall think fit, not exceeding Sixpence for every Vessel of Ten Tons Burthen, and not exceeding Twelve-pence for every Vessel of the Burthen of Twenty Tons, and not exceeding the same Proportion for all Boats and Vessels of larger Burthen; and that the said Boats and Vessels paying the said Duty shall have the Benefit of opening the said Drawbridges, and have free Passage through the said Bridges and new River, without any Obstruction by the said Mayor, Aldermen, and Burgesses of the said Corporation of Doncaster, their Successors, or by the said Participants or Land Owners, their Heirs or Assigns, or by any Person or Persons having or claiming any Interest in the said River from, by, or under them or any of them; and also that all other Keels, Boats, and Vessels, for which the said Drawbridges shall not be opened, shall have free Passage through the Arches of the said Bridges, as they have usually had, without any Disturbance by the said Mayor, Aldermen, and Burgesses of the Corporation of Doncaster, or their Successors, or by the said Participants or Land Owners, their Heirs or Assigns, without paying any Duty for the same; and that no Obstruction whatsoever shall be made in the Arches or Passages under the said Bridges by lessening or straitening of the same, but the Arches or Passages of and under the said Bridges now erected, or any new Bridges which may hereafter be erected, shall not be of less Height or Breadth or less Dimensions than the Arches of or Passages under the Bridges already erected upon the said new Cut or River.

Clause XXI

And be it further enacted by the Authority aforesaid, That the said Participants and Land Owners, for and in respect of their Lands now liable to the Charge of repairing and maintaining of the said Three Bridges over the said new River, and Fifteen Yards of the Banks thereof (except before excepted) above and below each of the said Three Bridges as aforesaid, shall pay to the said Corporation of Doncaster and their Successors for the Time being, in consideration of their repairing, maintaining, and rebuilding of the said Three Bridges, and Fifteen Yards of the said Banks (except before excepted) above and below each of the said Three Bridges, when and so often as Occasion shall be or require, from and after the said Twenty-fifth Day of March in the Year of our Lord One thousand seven hundred and twenty-seven, yearly and every Year for ever, the yearly Sum of Twenty Pounds Sterling, upon the Twenty-ninth Day of September and the Twenty-fifth Day of March in every Year by equal Portions, the first of which said Payments shall be made on the Twenty-ninth Day of September in the Year of our Lord One thousand seven hundred and twenty-seven; and that the said Mayor, Aldermen, and Burgesses of the Corporation of Doncaster, and their Successors, shall have full Power to dig and get Sods and Earth in the most convenient Places in the Lands of the said Participants adjacent to the Banks they are hereby obliged to repair and maintain, for the repairing and maintaining of the same, doing as little Damage as may be thereby, and not injuring any of the other Banks or the Staiths of the said River by such digging or taking such Earth or Soda, without paying any Consideration for the Earth they shall so dig or use.

Clause XXII

And for the better Security to the Country that the said Bridges and the said Parts of the said Bridges shall be duly repaired, supported, and maintained, and new Bridges built in lieu of them when and so often as Occasion shall be or require, the said Participants and Land Owners for the Time being, for and in respect of their Lands now liable to the Repairs of the said Three Bridges and Banks, shall stand and continue, with respect to the Country, liable to the Repairs of the said Three Bridges and the Banks of the said new River within Fifteen Yards above and below each End of each of the said Three Bridges, in default of the due repairing, maintaining, or rebuilding of the same by the said Corporation of Doncaster, as they would have been in case this Act had not been made; and in case of such Default the Lands of the said Participants and Land Owners shall

stand and be liable to be assessed by the Commissioners of Sewers for or towards the repairing and maintaining of the said Bridges and Banks in such Manner as they might have been in case this Act had not been made; and all Persons aggrieved or damnified by any Omission or Neglect in the repairing the said Bridges or Banks shall in such Case have the same Remedy for the repairing of such Damages against the said Participants and Land Owners and the Lands liable to the Repairs of the said Bridges and Banks, as they might have had in case this Act had not been made; and in case the said Corporation of Doncaster or their Successors shall, after Notice given them in Writing by the said Participants, or any Five or more of them, having each of them Lands of the yearly Value of Five Pounds Sterling or upwards chargeable towards the Drainage and public Works of the said Level of Hatfield Chase, of any Want or Default of repairing of the Bridges or Banks so to be repaired or rebuilt by them the said Corporation or their Successors, make any Default in repairing, supporting, or rebuilding the said Bridges or Banks hereby appointed to be repaired or rebuilt by the said Corporation of Doncaster and their Successors aforesaid, when and so often as it shall be necessary or Occasion shall require, it shall and maybe lawful to and for the said Participants and Land Owners to repair and amend the said Bridges or any of them, and the said Fifteen Yards of the said Banks above and below each of the said Three Bridges, so wanting to be repaired and amended, and to rebuild the said Bridge or Bridges, or any of them so wanting to be rebuilt; and in such Case the said Participants and Land Owners shall and may not only take and receive to their own Use, by the Hands of their Expenditor or Surveyor, or by such other Person or Persons as shall be appointed for that Purpose by the Majority of an Assembly of any Five or more of the said Participants having each of them Lands of the yearly Value of Five Pounds Sterling or upwards chargeable towards the Drainage and public Work of the said Level of Hatfield Chase, assembled together at a public Meeting appointed for that Purpose by affixing Notice thereof in Writing in the public Market Places of Doncaster and Thorne at least Ten Days before such Meeting, all the Tolls and Duties whatsoever due and payable to the Corporation of Doncaster aforesaid for the Time being, and their Successors, by virtue of this Act, for and in respect of any Boats, Lighters, or other Vessels, or of any Goods and Merchandizes carried in such Boats, Lighters, or other Vessels, till such Time as they shall be fully satisfied and paid all such Monies and Expences as they shall reasonably expend and be put unto for or in respect of such Repairs, Amendments, and new Buildings as aforesaid, and all Damages which they shall sustain or be put unto on that Occasion by the Perception or Receipt of the said Tolls and Profits, or otherwise, and the said Tolls, Dues, and Duties shall for that Purpose only be in such Case vested in the said Participants till they shall be fully reimbursed and satisfied of all such Expences, Costs, and Charges; or the said Participants may, at their Election, bring their Action at Law or Bill in Equity in the Names of any Four or more of the said Participants, either so qualified as aforesaid, on the Behalf of themselves and all the rest of the said Participants, either to compel the said Corporation of Doncaster for the Time being, and their Successors, to repair, maintain, support, and build the said Bridges and Fifteen Yards of the said Banks (except before excepted) above and below each of the said Three Bridges, or to compel them to make Satisfaction to the said Participants and Land Owners for the Expences, Charges, and Damages that they have so expended, sustained, or been put unto for and in respect of such Repairs, Amendments, and Buildings; and it is hereby declared, that the said new River and the Banks and Bridges thereof, as well as the said River Dun from Wilsick downwards, shall be and continue under and subject to the Commissioners of Sewers for the Time to come, in such Manner as they have usually been before the making of this Act.

Clause XXIII

Provided always nevertheless, That in case the said Participants and Land Owners shall at any Time hereafter refuse or neglect to pay unto the said Mayor, Aldermen, and Burgesses of the Borough of Doncaster, and their Successors, the said yearly Sum of Twenty Pounds Sterling, or any Part thereof, by the Space of Two Months next after any of the Days or Times herebybefore limited or appointed for the Payment thereof, that then and in such Case it shall and may be lawful to and

for the said Corporation of Doncaster, and their Successors, by their Agent or Agents, to enter into any Lands and Tenements lying in the Level of Hatfield Chase belonging to the said Participants or any of their Tenant or Tenants, and subject to the Drainage thereof, and to distrain for all Arrears of the said annual Sum of Twenty Pounds Sterling then due and unpaid, the Distress or Distresses there found to take, lead, drive, and carry away, detain and keep, until the said yearly Sum of Twenty Pounds Sterling, and all Arrearages thereof, together with the Expences of such Distress, shall be fully satisfied and paid; and in case the same shall not be paid from Time to Time within the Space of Ten Days next after such Distress or Distresses shall be made, then and in such Case, and so often as it shall so happen, it shall and may be lawful to and for the said Corporation of Doncaster, and their Successors, by their Agent or Agents, to cause the same to be appraised by the Oaths of Two Men, to be sworn by the Constable of the Parish or Place, or his lawful Deputy, where such Distress shall be made, to appraise the same truly to the best of their Understanding, which Oath he is hereby empowered to administer, and after the same shall be so L appraised to sell the same for the best Price they can conveniently get for the same; and by and out of the Monies which shall be raised by such Sale the said Corporation shall pay and satisfy themselves all such Arrears of the said annual Sum of Twenty Pounds Sterling as shall then due, together with the Costs and Charges of such Distress; and if any Surplus shall remain the same shall be paid to the Owner or Owners of the Goods so distrained and sold; and the Person or Persons so distrained on shall be reimbursed all such Expences as he or they shall be put unto by such Distress by and out of the Scotts raised for the Drainage of the said Level and Repairs of the Banks and Bridges belonging to the same.

1732 Act, 6 Geo II, Cap 9
Maintains the rights and responsibilities set out above after the Undertakers for the River Dun above and below Holmstile were united.

1820, 1 Geo IV, Cap XXXIX, A&CN
(Clauses from the 1820 Aire & Calder Navigation Act which regulates the maintenance of the north bank of the Dutch River. This was confirmed and extended in later acts for improving the navigation.)

Clause 107: And be it further Enacted, That in case the said Undertakers shall be desirous of making and carrying the Cut or Canal hereby authorized to be made, within the distance of Fifty yards from the foot of the North Bank of the Dutch River, then and in that case it shall be lawful for the Undertakers of the Aire and Calder Navigation, and the Participants of the Level of Hatfield Chase, respectively, and they are hereby required, to choose two competent and disinterested Engineers, one to be chosen by each of the said Parties; which said Engineers shall view and examined the Foreshore and North Bank of the said Dutch River between New Bridge and Goole, and shall ascertain and value the future annual expence of Maintaining supporting and keeping in repair the said Foreshore by itself, and shall also in like manner ascertain and value the future annual expence of maintaining supporting and keeping in repair the said North Bank by itself; and in case the said Two Engineers shall disagree in their Valuation, then it shall be lawful for them, and they are hereby required, to call in a third competent and disinterested Engineer, whose decision upon the Premises shall be final; Provided always, that such Valuation shall be made by such Engineers, and delivered or communicated to the said Undertakers and the said Participants respectively, before the making or cutting any part of the said Cut or Canal parallel to the said North Bank within the said distance therefrom; and that the expence of such View Examination and Valuation shall be borne and paid by the said Undertakers, and that when such Valuation shall be communicated to the said Undertakers and Participants respectively, the said Participants shall be and they are hereby empowered and required, within Two calendar months from the time of such communication as aforesaid, to elect and choose whether they will pay to the said Undertakers the

annual expence so ascertained as aforesaid, of maintaining the Foreshore; in which case the said Undertakers shall from thenceforth be liable to maintain and keep in repair both the said Foreshore and the said North Bank respectively, as fully and effectually to all intents and purposes as the said Participants are liable to repair and maintain the same; (for which purpose it shall be lawful for the said Undertakers to dig and take Earth from the Lands adjoining to the said Bank, or any part thereof, in the same manner as the said Participants may or might have done) or whether they the said Participants will accept from the said Undertakers the amount of the annual expence of repairing the said North Bank so ascertained as aforesaid, in which case the said Participants shall from thenceforth be liable to maintain and keep in repair both the said Foreshore and the said North Bank accordingly.

Clause 108
Provided always, and it is hereby Enacted and Declared, That nothing in this Act contained (save as after mentioned) shall extend, or be construed to extend, to lessen, prejudice, alter or affect the Jurisdiction, or any of the Rights, Priviledges, Powers and Authorities, of or belonging to the Commissioners of Sewers for the Level of Hatfield Chase and Parts adjacent, in the Counties of York, Lincoln and Nottingham; but that the same and every of them (save as aforesaid) shall remain and continue in the said Commissioners of Sewers, as fully and amply, to all intents and purposes, as if this Act had not been passed.

1847, 10 & 11 Vict, Cap CCXCI
An Act for making several lines of railway …; and for authorizing the purchase of part of the Sheffield, Rotherham, Barnsley, Wakefield, Huddersfield and Goole Railway, and of the Dun Navigation and Dearne & Dove Canal. (see photocopy)

1850, 13 & 14 Vict Cap LVII
The South Yorkshire Railway and River Dun Act. (see photocopy)

1886, 50 Vict Cap XLIX
An Act to authorize the MS&LR Company, the S&MR and the CLC respectively to construct new railways and other works and to confer powers upon that company and those committees in connection with their respective undertakings and for other purposes. (see photocopy)

Name (Bold: existing; Italic: listed)	*Date*	*Type*	*Span*	*Opening*
London Docks, Wapping entrance, eng. Rennie	1803/5	cast iron		
Hull, Humber Dock (possibly as per London)	1809	cast iron		
Liverpool, Queen's Dock (as above)	1809	cast iron		
Gravesend, road/canal	1824	timber/CI, stayed		
London, St Katherine's Dock	1828	cast iron?		
Royal William Victualling Yard, Plymouth	**1833**	**cast iron**		
Devonport Dockyard, South Yard	1838	cast iron		
Liverpool Albert Dock; builders Haigh Foundry; double leaf, road	***1843***	***cast iron***	***44.75 feet***	
Norwich, Trowse Bridge, railway, replaced 1905	1845	cast iron		
Humber Dock, Hull, double lea***f***	***1846***	***cast iron***		
Railway Dock, Hull, double leaf	***1846***	***cast iron***		
Princes Dock, Hull, double leaf	1846?	cast iron		
Victoria Dock, Hull, Humber half tide basin	***1849***	***cast iron***		
Bristol Cumberland Basin, road, (Sir Wm. Arrol & Co 1965)	**1849**	**WI plate**	**121 feet**	
Leith Docks, road, double leaf	1850c	cast iron		34 feet
Hull, Victoria Dock, double leaf, River Hull lock, road, manual, replaced 1880c	1852			45 feet
Hull, Wilmington, railwa***y***	***1853***	***WI plate girder***		
Sankey Bridge, rail, replaced by fixed concrete bridge	1854			
London, Surrey Docks; designer Samuel Walker	1855			
Wisbech, River Nene, road, manual/hydraulic, never used, removed 1930s	1856			85 feet
Birkenhead, West Float, railway, hydraulic, replaced by Scherzer type	1860		180 feet	100 feet
Birkenhead, Alfred Dock, railway, hydraulic	1860			30/50 feet
Liverpool, Waterloo Dock (three bridges), hydraulic	1860	WI girder		60 feet
Newhaven, eng Prof Husband, builder Phoenix Iron Wks, road	1866	WI		
Hull, South Bridge, closed 1934, demolished c1944, manual/hydraulic	1867		170 feet (120/50)	100 feet
Hull, Albert Dock, removed	1869?			
Goole (Skelton), River Ouse, railway, manual/hydraulic	***1869***	***plate girder***		***100 feet***
Naburn, railway	**1870c**	**WI plate girder**		
Cawood; eng. Robt. Hodgson, builder John Butler & T B Nelson, road	***1872***	***WI lattice***		***53.5 feet***
Hull, Sculcoates, road, manual	***1873***	***plate girder***	***135 feet (75/40)***	***56.5 feet***
Rochester, River Medway	1873		109 feet	48.5 feet
Birkenhead, Morpeth Dock, hydraulic, replaced by Scherzer type	1874		140 feet	70 feet
Leith Docks, Victoria Bridge, road/rail	1874	WI lattice	214 feet	120 feet

Name (Bold: existing; Italic: listed)	*Date*	*Type*	*Span*	*Opening*
Newcastle-upon-Tyne, eng John Ure, road, manual/hydraulic	1876	lattice girder	281 feet	110 feet
Glasgow, Queen's Dock	1877		181 feet	100 feet
Grimsby, New Cut, hydraulic	1877			52 feet
Hull, Albert Dock, hydraulic	1879		140 feet	80 feet
Liverpool, Canada Dock, hydraulic	1879			80 feet
London, Blackwall Basin, railway, hydraulic, skew	1879		125 feet	38 feet
London, Milwall Dock, hydraulic	1879		150 feet	80 feet
London, SW India Dock, hydraulic	1879		110 feet	55 feet
London, South Dock, railway, hydraulic	1879		119 feet	55 feet
London, Import Dock, railway, hydraulic, skew	1879		106 feet	37 feet
Penarth Dock, road, manual/hydraulic	1879	plate girder	98 feet	
60.5 feet				
Severn Bridge, rail, Windsor Iron Co., Garston	1879	lattice girder	197 feet	
Oxford Railway SB over canal; ancient monument, railway	***1880?***			
Hull, Victoria Dock River Hull Lock, John Abbot & Co, removed	1880			
Aire & Calder Navigation, swing bridges Nos. 1-5, No.3 survives	**1880c**	**open lattice**		
Hunslet, railway, removed	1880c	WI/steel? Truss		
Alloa, railway, removed	1883	WI/steel? Truss		
Hull, St Andrew's Dock, Stockton Forge Co.	1883			
Boston Haven	***1884***			
Hull, Alexandra Dock	1885			
Goole, Dutch River; builders Samuel Butler; MSLR road bridge	**1886**	**WI plate girder under roadway**		
Hull, Drypool, closed 1958, Scherzer bascule from 1961	1888			
Hawarden, rail	**1889**	**steel truss**	**287 feet**	**140/87 feet**
Liverpool, Brunswick/Toxteth Docks, Chester Hydraulic Eng. Co	1889			
Cardiff, Clarence Bridge	1890		191 feet	72 feet
Weaver Navigation, Vale Royal Lock swing bridge	***1890c***			
Glasgow, Bowling?, F&CC, railway	**1890c**	**plate girder**		
Selby Railway Bridge, eng Harrison & Copperthwaite, built Nelson & Co.	**1891**	**WI plate girder**	**130 feet**	**85/45 feet**
Liverpool, Stanley Dock, rail/road, removed	1891			57 feet
Ramsey, IOM, Cleveland Bridge & Eng Co, road	1892	truss	210 feet	36 feet?
Manchester Ship Canal, Barton Road	**1894**	**bowspring lattice**	**200/250 feet**	**75-120 feet**
Manchester Ship Canal, Chester Road, road, (Sir Wm. Arrol & Co .1933)	**1894**	**bowspring lattice**	**200/250 feet**	**75-120 feet**

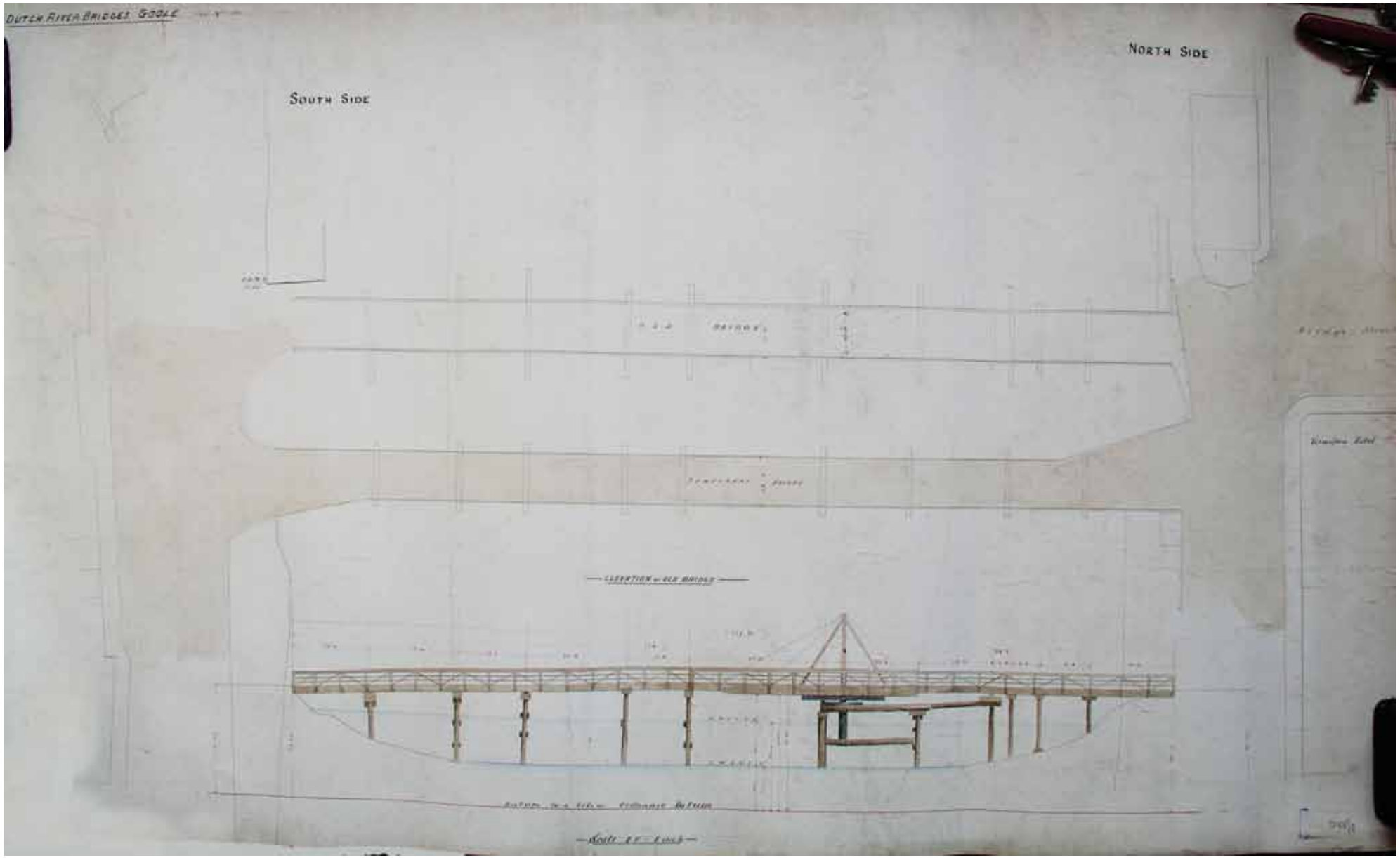
Name (Bold: existing; Italic: listed)	*Date*	*Type*	*Span*	*Opening*
Manchester Ship Canal, Knutsford Road, road, (Sir Wm. Arrol & Co 1909)	**1894**	**bowspring lattice**	**200/250 feet**	**75-120 feet**
Manchester Ship Canal, Manchester Docks, rail	**1894**	**bowspring lattice**	**200/250 feet**	**75-120 feet**
Manchester Ship Canal, Moore Lane	**1894**	**bowspring lattice**	**200/250 feet**	**75-120 feet**
Manchester Ship Canal, Northwich Road	**1894**	**bowspring lattice**	**200/250 feet**	**75-120 feet**
Manchester Ship Canal, Old Quay	**1894**	**bowspring lattice**	**200/250 feet**	**75-120 feet**
Manchester Ship Canal, Trafford Road	**1894**	**bowspring lattice**	**200/250 feet**	**75-120 feet**
Neath; on curve and skew (unique?), rail	1894	steel truss	170 feet	
Sutton, River Nene, road/rail	1897	steel truss	178 feet	99/69 feet
Goole, South Dock Bridge	1898	plate girder		
Weaver Navigation, Hayhurst, road	***1899***	***bowspring lattice***		
Weaver Navigation, Town, road	***1899***	***bowspring lattice***		
Bristol, Vauxhall, footbridge	1900			
Liverpool, Coburg/Brunswick Dock, Francis Morton & Co	1900			
Banavie, Caledonian Canal, rail	**1901**			
Castletown Harbour, IOM, builder A Handyside & Co Ltd, manual, foot	1903	WI lattice	30 feet	
Crowle Swing Bridge, River Axholme, removed	1903			
Breydon, railway, removed	1903	truss	170 feet	60 feet
Regent Swing Bridge, Aberdeen, hydraulic	1904			
Hull, Stoneferry, road	**1905**	**open lattice**		
Norwich, Trowse Bridge, railway, replaced 1987	1905	steel plate/truss?		45 feet
Reedham, railway	1905	WI plate?	139 feet	55 feet
Somerleyton, railway	1905	plate/truss?	139 feet	55 feet
Bristol, Ashton, road/rail	**1906**	**truss**	**202 feet**	
Avonmouth	1906			
Oulton Broad, railway	1907			
Winnington, River Weaver, road	**1908**	**open lattice**		
Whitby, road	**1909**	**plate girder under roadway**		
Clachnaharry, Caledonian Canal, rail	**1909**			
Swansea, King's Dock, road, Sir Wm. Arrol & Co	1909			
Hull, William Wright Dock link	1910			
Fossdyke	1911			
Goole, West Dock Bridge, road	**1913**	**bowspring lattice**		
Goole, Lowther Bridge, road	**1914c**	**bowspring lattice**		

Name (Bold: existing; Italic: listed)	*Date*	*Type*	*Span*	*Opening*
London, Royal Albert Dock, road, Sir Wm. Arrol & Co	1919			
Weaver Navigation, Sutton Weaver, road	**1923**	**bowspring lattice**		
Bristol, Cumberland Swing Bridge, hydraulic	**1924**			
River Yar, IOW	1926	steel		30 feet
Milwall Dock, London, hydraulic	1928			
Castlecary, Forth & Clyde Canal, road, Sir Wm. Arrol & Co	1928			
Goole, Boothferry	**1929**	**truss**		**127 feet**
Polmont, Union Canal, road, Sir Wm. Arrol & Co	1930			
Kilbowie, Forth & Clyde Canal, road, Sir Wm. Arrol & Co	1930			
Kirkintilloch, Forth & Clyde Canal, road, Sir Wm. Arrol & Co	1932			
Dalgrain, Forth & Clyde Canal, road, Sir Wm. Arrol & Co	1932			
Fort Augustus, Caledonian Canal, road, Sir Wm. Arrol & Co	**1932**	**plate girder**		
Laggan, Caledonian Canal, road, Sir Wm. Arrol & Co	**1932**	**plate girder**		
Aberchalder, Caledonian Canal, road, Sir Wm. Arrol & Co	**1932**	**plate girde?**		
Weaver Navigation, Acton, road	**1932**	**bowspring lattice**		
Dalgrain, Forth & Clyde Canal, road, Sir Wm. Arrol & Co	**1933**			
Banavie, Caledonian Canal, road, Sir Wm. Arrol & Co	**1935**	**plate girder**		
Kincardine Railway Bridge, now road	1936			
Tomnahurich Bridge, Caledonian Canal, road, Crouch & Hogg	**1937**	**plate girder**		
Muirtown Bridge, Caledonian Canal, road, Sir Wm. Arrol & Co	**1938**			
Lowestoft, Mutford Road, road, Sir Wm. Arrol & Co	1939			
Camelon, Forth & Clyde Canal, road, Sir Wm. Arrol & Co	1956			
Liverpool, Wapping Dock	1962			
Liverpool, Salthouse/Canning Docks (demolished 1983)	1962			
Liverpool, Canada-Huskisson Docks, road, Sir Wm. Arrol & Co	1966			
Selby, road	**1970**	**steel stayed**		
Grangemouth Docks, road, Sir Wm. Arrol & Co	1971			
Western Docks, Dover	**1977**			
Hull, Myton	**1980**			

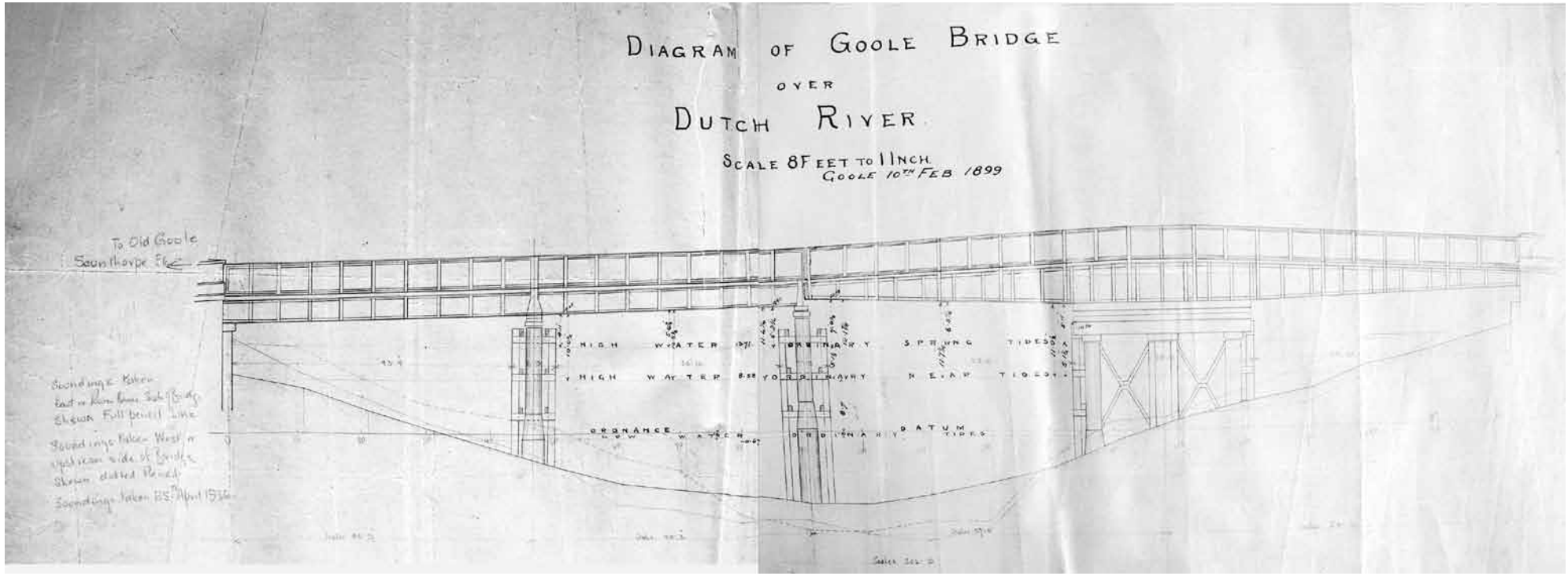
Name (Bold: existing; Italic: listed)	*Date*	*Type*	*Span*	*Opening*
Swilgate Bridge, Tewkesbury				
Swansea Docks				
Cardiff Docks				
Cardiff, James Street				
Fleetwood	pre 1879		70/35 feet	
Sharpness, low level		***steel plate***		
Sharpness, high level		***steel bowspring***		
Gloucester, Victoria Bridge, rail		***iron braced girder***		
Keadby, road	**?**	**plate girder**		
Falkirk, F&CC, rail		**plate girder**		
Dundee Docks, footbridge		**cast iron**		
Widnes, Spike Island, rail	?	plate girder		
Warrington, Sankey Bridges, road	?	plate girder		
Glasson Dock	**?**			
Glasgow, Forth & Clyde, road, Sir Wm. Arrol & Co				
Bonnybridge, Forth & Clyde Canal, road, Sir Wm. Arrol & Co				
Grangemouth, South Bridge St, F&CC, road, Sir Wm. Arrol & Co				
Liverpool, Herculaneum/Harrington Docks				
Newbridge, R Weaver				

Drawings held by Associated British Ports at Goole

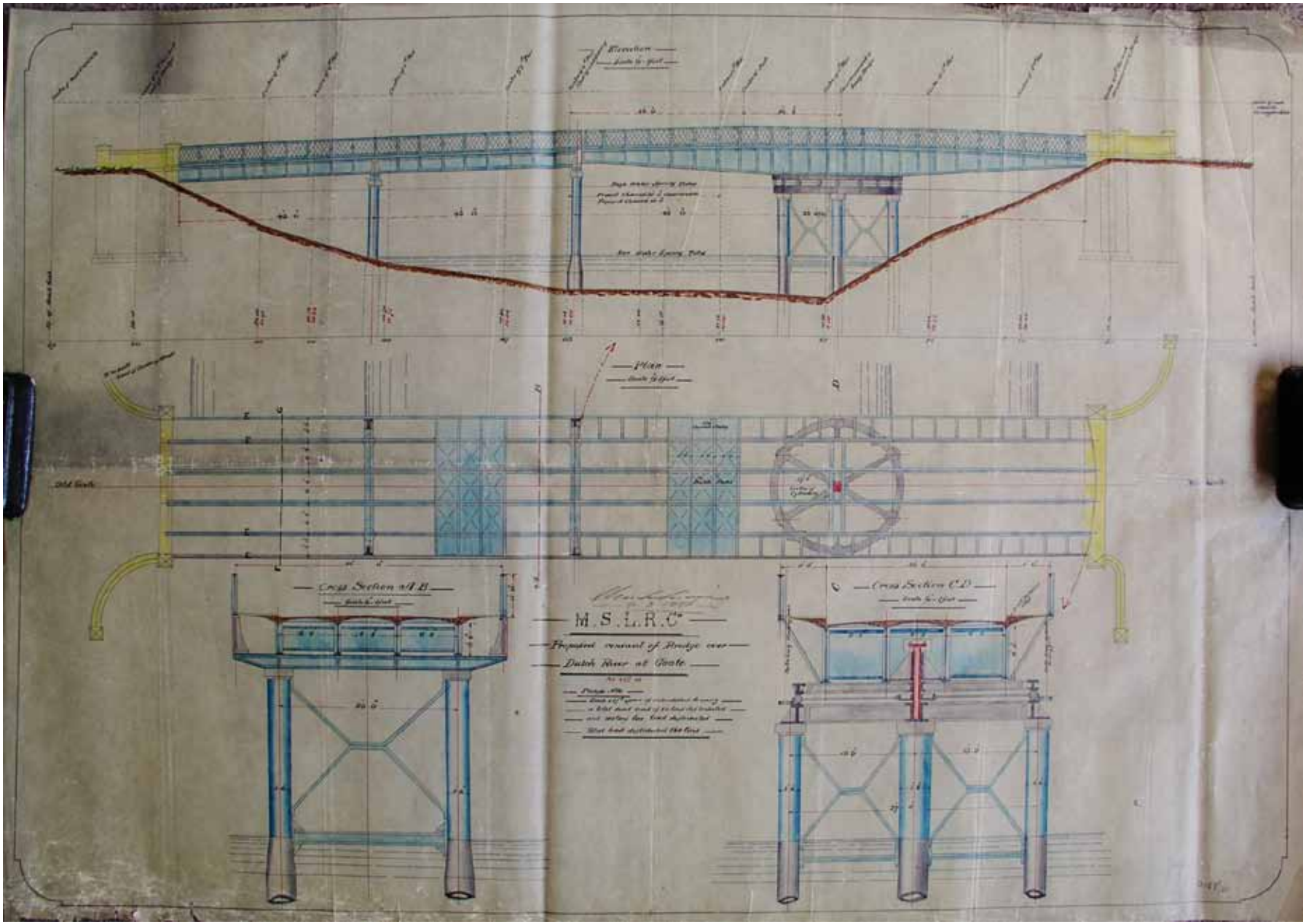
1. D158/19; Bridge over Dutch River at Goole, Details of Centre Pin, 1.5 in: 1 foot, John Butler & Co, Stanningley Iron Works, Leeds, 24/8/93
2. D158/1; Diagram of Goole Bridge over Dutch River, 1 in : 8 feet, Goole, 10 Feb 1899
3. MS&L Railway, Proposed Renewal of Bridge over Dutch River at Goole, 0.125 in: 1 foot, Details of abutments (superseded 19 July 1888), 3 copies
4. Design No. 1, 36 foot opening
5. D158/2, MS&LR, Proposed Renewal of Bridge over Dutch River, 8 feet: 1 in, 22 July 1890, note: copy to Goole UDC 3 July 1905
6. D158/9, Dutch River Bridges Goole, 8 feet : 1 in, 20 Jan 1886, (plan and elevation of old bridge) 2 copies
7. MS&LR, Proposed renewal of Bridge over the Dutch River at Goole, 4 feet: 1 in & 0.75 in: 1 foot, 5 April 1886, (elevation & details of swing girder) 2 off
8. D158/12, Drawing No.3 Details of Fixed Spans, 0.375 in : 1 foot & 1.5 in 1 Foot, no date
9. MS&LR, Proposed renewal of Bridge over the Dutch River at Goole, 0.375 in: 1 foot, Details of Swing Leaf, 9 May 1888
10. A&CN, Dutch River Bridge, South Approach, 8 feet : 1 in, no date, plan, 2 copies, (10 March 1914)
11. Proposed Bridge over Dutch River, Goole, Sept 1877, (plan, elevation & sections)
12. MS&LR, Proposed renewal of Bridge over the Dutch River at Goole, 0.125 in: 1 foot & 0.25 in: 1 foot, (plan, elevation & sections)
13. D158/8, MS&LR, Drawing No.6, 1.5 in: 1 foot, (details of grab, rollers & locking gear)
14. Goole Bridge, Plan of North Approach, 0.125 in : 1 foot, 28 Sept 1889
15. D158/18, Goole Bridge, Plan of South Approach, 0.125 in : 1 foot, 28 Sept 1889
16. D158/6, Goole UDC, Proposed widening of Dutch River Bridge, 8 feet : 1 in, 11 Nov 1924, plan
17. D158/4, Goole UDC, Proposed widening of Dutch River Bridge, 8 feet: 1 in, 9 August 1924, plan, elevation and details
18. D158/5, Goole UDC, Proposed widening of Dutch River Bridge, 1.5 in: 1 foot, 10 Dec 1926, (detail sections)
19. D158/4, Goole UDC, Proposed widening of Dutch River Bridge, 1 ft: 0.125 & 1 ft: 0.375 in, 10 Dec 1926, plan, section, elevation
20. D158/3, Goole UDC, Proposed widening of Dutch River Bridge, 1 foot: 0.375 in, 10 Aug 1927, (plus similar plan dated 10 Dec 1926) pile positions amended
21. D158/14, Drawing No.4, (plan, elevation and details of swinging span), 0.375 in: 1 foot and 1.5 in: 1 foot
22. Pencil site plan for non-opening bridge
23. D158/7, MS&LR, Proposed renewal of Bridge at Goole, Drawing No.5, Details of Turntable and Cylinders, 0.5 in: 1 foot and 1 in : 1 foot and 1.5 in : 1 foot, 25/10/1886
24. D158/10, MS&LR, Proposed renewal of Bridge over Dutch River at Goole, 0.125: 1 foot and 0.25 in: 1 foot, 4/3/1886, plan, elevation and sections
25. (Proposed new of bridge over Dutch River at Goole), (0.125: 1 foot and 0.25 in: 1 foot), plan, elevation and sections for 40 foot clear opening
26. Proposed Bridge across the Dutch River at Goole, 28 Jan 1886, 8 feet : 1 in, (outline plan and elevation)
27. D158/16, MS&LR, Proposed renewal of Bridge over Dutch River at Goole, Plan shewing position of bridge and timber dolphins, 5 April 1886, 2 copies
28. D158/11, A&CN, Particulars of boreholes at Goole, 19.1.1888
29. Details of bearing, Mar 5, 1886 (MS&LR)



D158/9, Dutch River Bridges Goole, 8 feet : 1 in, 20 Jan 1886, (plan and elevation of old bridge



D158/1; Diagram of Goole Bridge over Dutch River, 1 in : 8 feet, Goole, 10 Feb 1899



D158/10,MS&LR,ProposedrenewalofBridgeoverDutchRiveratGoole,0.125:1footand0.25in:1foot,4/3/1886,plan,elevationandsections