ARCHAEOLOGICAL SERVICES
DURHAM UNIVERSITY

on behalf of
West Cumbria Rivers Trust

Weir Removal Project
Ennerdale Mill
Egremont
Cumbria

archaeological monitoring

report 4826
July 2018

Durham University

Contents

Photographs

Figures

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1. Summary

The project

1.1 This report presents the results of archaeological monitoring conducted during the removal of a weir at Ennerdale Mill, Egremont, Cumbria.

1.2 The works were commissioned by West Cumbria Rivers Trust and conducted by Archaeological Services Durham University.

Results

1.3 The archaeological monitoring has shown that for the most part an established method was used to construct the weir; wooden stakes were piled into the river bed to form a frame into which large stones resting on gravel were inserted.

1.4 The north end of the weir was constructed from large squared rectangular blocks of pink St Bees sandstone. This is likely to be a later repair of the weir, possibly the result of a flood event that also damaged the riverbank; the riverbank had also been reinforced with sandstone. A letter dating to 1899 suggests that the weir was in a state of disrepair and it is likely that the sandstone repair dates to this period. It is possible that the stone came from buildings local to the weir, perhaps part of the mill that had gone out of use.

1.5 At a later date the riverbank was further reinforced with concrete-filled sandbags stacked up to create a wall around the bank, overlying the earlier sandstone.

1.6 In the 20th century the weir was reinforced with concrete; a concrete wall was poured along the front (east side) of the weir and the entire weir was covered in concrete.

2. Project background

Location (Figure 1)

2.1 The site is located at Ennerdale Mill, Egremont, Cumbria (NGR centre: NY 01245 09883). The weir is located just north of the mill buildings, aligned north/south across a bend in the river.

Development

2.2 The West Cumbria Rivers Trust are removing the weir as it is showing signs of failure and has proven to be a barrier to migratory species of fish.

Objective

2.3 The objective of the scheme of works was to record the fabric and methods of construction of the weir as well as any detail of repairs and alterations.

Methods statement

2.4 The works have been undertaken in accordance with guidance from the West Cumbria Rivers Trust and in line with Archaeological Services standard methods and procedures for archaeological monitoring.

Dates

2.5 Fieldwork was undertaken between 10th and 11th July 2018. This report was prepared for July 2018.

Personnel

2.6 Fieldwork was conducted by Natalie Swann. This report was prepared by Natalie Swann, with illustrations by Dr Helen Drinkall. The Project Manager was Daniel Still.

Archive/OASIS

2.7 The site code is **EEM18**, for **E**gremont **E**nnerdale **M**ill 20**18**. The archive is currently held by Archaeological Services Durham University and will be transferred to The Beacon Museum in due course. Archaeological Services Durham University is registered with the **O**nline **A**cces**S** to the **I**ndex of archaeological investigation**S** project (**OASIS**). The OASIS ID number for this project is **archaeol3-322157**.

3. Landuse, topography and geology

3.1 The weir is located south of Egremont in the River Ehen in the eastern area of the West Cumbria Coastal Plain. The source of the River Ehen is at the west end of Ennerdale Water, to the north-west of Egremont. At Egremont the river runs approximately north/south on the east side of the town. South of Egremont the river follows the coast and joins the Irish Sea at Sellafield.

3.2 The weir is located just north of mill buildings on the east bank of the River Ehen that lie at 40m OD.

3.3 The underlying solid geology of the area comprises mudstone and sandstone of the Buttermere formation overlain by river terrace deposits.

4. Historical and archaeological background

4.1 An archaeological desk-based assessment has been conducted for the site (Blyth 2011); details from this assessment pertinent to the weir are summarised below. Prior to the monitoring a photographic survey of the weir was conducted using an Unmanned Aerial Vehicle (Archaeological Services 2017).

4.2 The first paper mill known in Britain was established in Hertford in 1495. Other paper mills were set up in the mid-sixteenth century, but it was not until the end of that century that paper mills began to flourish, and by the end of the seventeenth century there were around one hundred paper mills in England, four of which were in Cumbria. There was a country-wide boom in paper mills in the mid-eighteenth century, which was reflected in Cumbria and included Low and High Mills in Egremont, as well as Ennerdale Paper Mill.

4.3 Early mills used horizontally mounted wheels placed directly in the river, which transferred power through a vertical shaft which would turn stones for grinding corn. In the medieval period mills began to use a vertically mounted undershot wheel placed in the water. However, there were problems with placing a wheel directly in the mainstream as, if the river or stream flooded, the wheel could be destroyed along with the internal machinery of the mill.

4.4 Taking the mill away from the mainstream, via artificial cuts known as mill races or leats, gradually became the most popular way of managing waterflow, which could then be controlled using a weir and sluice gates. Overshot wheels were developed alongside this. Channelling off the water via a mill race allowed its force and quantity to build up. Wheels would sit in a pit so that the water could fall on to it from above and thus turn the wheel. Both undershot and overshot wheels were in use by the sixteenth century.

4.5 A weir is a low dam across a river, used to pool water and control its flow. Weirs probably originated as fishweirs (or kiddles), more to hold up fish than water, and to dam river crossings. Weirs eventually developed into more complex structures, which were used for a variety of reasons, including as at Ennerdale Mill, to divert water to a mill. Weirs varied in their design, with some, such as the one at Ennerdale, linear, and others V-shaped or curved. The design chosen in each particular case was intended to spread the flow of water over the sill (the top of the weir) to the river bed and banks below. Weirs were typically constructed of solid ashlar stones or, if timber was available, by piling wooden stakes into the river bed to form a frame into which large stones resting on gravel were inserted.

4.6 The watercourse pattern used by Ennerdale Mill was that of a wheel at the end of a short head race leading from a weir. Mills using this pattern tended, as with Ennerdale Mill, to be located on a bend. The River Ehen is aligned approximately north/south at this point and a bend takes the river out to the west. The weir is located at the north end of the bend, on a north/south alignment with a mill race at its southern end. The mill race, into which the water is channelled, therefore continues the line of the inner bend of the river. Water entering a mill race was typically controlled by a high-walled narrow entrance. A sluice would also be positioned at the junction of the river with the mill race to control the flow of water.

4.7 Ennerdale Paper Mill is thought to have been in existence by 1755, when it was described as 'lately erected' by the lessor. Read (1999, 89) gives a slightly later date of 1760 to the mill, and states that in February 1760, the Borough Court granted a rood of land known as 'Low Common' to Thomas Pool and John Ponsonby. They were given permission to erect one or more mills, and any other buildings or conveniences required for their paper making business on the land, which included the right to make a weir on the river. Although the exact origins of the mill are not clear, it is on the 1774 map by Hodskinson and Donald. The map depicts two mills in this location, labelled 'Paper Mills'.

4.8 From 1874 onwards the documentary sources refer to the mill as a flax or other textile mill, but the OS mapping names it as a paper mill until the 1924 map when it is labelled 'woollen mill'. It would appear that the mill was known as 'the Paper Mill' despite no longer functioning as such.

4.9 In 1861 TW Chapman and Sons built a new section at Ennerdale Mill and fitted machinery of 1300 spindles so that they could manufacture linen yarn. The two businesses were then run at Ennerdale Mill until 1877.

4.10 In 1881 the mill, then known as Chapman's Mill and described as a Flax and Tow Mill, was up for sale. No mention of the weir is made, although the conditions of sale state that the water-power to work the mill is obtained from Lord Leconfield, the Lord of the Manor. One waterwheel is listed at the mill, described as: '*14 feet wide and 14 feet in diameter, calculated, with full head of water, to drive 50 horse power'.*

4.11 In 1899, the mill and five cottages were sold to John Webster by Richard Grice, following the death of Thomas Grice in 1892. The weir is mentioned in the papers dealing with the sale, with the water power being leased by Lord Leconfield: '*The liberty and privilege of taking and diverting so much water from the River Ehen as shall be necessary for working the Paper Mill and premises of the Lessee situate in or near to a close of land called Millfield in the Parish of Egremont in the County of Cumberland and No 45 on the Ordnance Survey Plan thereof and also of continuing the water weir or dam now erected and set up on the bed and soil of the said River at or near the said premises and as the said water weir or dam is now joined and fixed to the banks or sides of the said River and also of continuing the trench or watercourse thereon for conducting the weir to the said Mill doing as little damage as reasonably may be but so that such water weir or dam shall not at any time hereafter be made of such height as to cause the water to run over the same level with the foot of the tail race of the Mills leased by the lessor to the person or so as to interrupt or prejudice the free working of the lessor's Mills called Egremont Mills.'*

4.12 Correspondence between John Webster and Richard Grice indicates that the weir was in need of repair at the time of the sale. A letter dated 11/9/1899 from John Webster suggests to Richard Grice that it should be his responsibility to repair the weir and banks before Webster took over the property. The tone of the letter indicates that Richard Grice was reluctant to do this.

4.13 By 1923 the mill had been sold to Thomas Goodacre and Sons of the Cumbrian Fibre Company, who manufactured carpets there until 1946. After 1946, the mill stood empty for some time until it was rented by a company named Bradford Gowns. It was later bought by Millers of Great Yarmouth, who also had a factory in

Cockermouth, and manufactured slippers and shoes. Mr L Fischer then occupied the mill and manufactured bed headboards there, after which the mill stood empty. By 1999 some areas of the mill had been partially demolished and others were occupied by various businesses. The site is now referred to as Ennerdale Mill Business Park.

5. The archaeological monitoring

5.1 Due to fast flowing and deep water monitoring was conducted from the north bank of the river. Locations of the photographs taken are shown in Figure 2, the photographs are referenced in the text below.

5.2 The weir had been covered by concrete and a poured concrete wall created at the front (east side) of the weir during the 20th century (photo 1, Unmanned Aerial Vehicle photograph). The concrete was reinforced by metal stakes placed at intervals through the concrete before it set. In places this concrete had started to fail, revealing the original structure of the weir.

5.3 After the removal of some of the concrete a notch was made in the north end of the weir to reduce the water level in front of the weir. This part of the weir was constructed from rectangular, hewn and worked blocks of locally quarried St Bees sandstone, some up to 0.7m wide (photos 2 and 3). Timber planks (photo 4) held in place by large timber stakes (photo 5) had been placed along the front and rear of the weir and the sandstone blocks had been placed on edge between the wooden supports to form the body of the weir (photo 6). To create the slope the west end of the weir was two blocks high tapering down with varying size blocks until it was one block high at the east side.

5.4 The river bank along the north edge of the weir had been reinforced with more upright blocks of sandstone set into the riverbank (photos 7 and 8) forming a wall. The sandstone blocks from the weir were sat against this wall of sandstone (photo 9). The bank had been later reinforced with sandbags filled with concrete and left to harden to form a wall. The same concrete sandbag construction method had been used to reinforce the east bank of the river.

5.5 To the south of the sandstone the construction of the weir was different. Here large timber uprights have been piled into the riverbed at intervals of approximately 1m (photo 10). Wooden planks had been placed upright between the larger timbers and held together by cross-beams. This structure would have created an effective dam to the river to allow the construction of the weir.

5.6 Along the centre of the weir a second line of wooden uprights was recorded, smaller than those at the front of the weir (photo 11). Large wooden planks ran east/west across the weir between the uprights dividing the area into sections. At the rear (west) side of the weir shorter smaller wooden stakes were piled into the river bed with long planks placed on edge between them to form the back of the weir (photo 12).

5.7 This construction method would have created a series of boxes between the upright timbers. These boxes have then been filled in with gravel and small cobbles (photo

13) with large river cobbles filling the top of the structure and forming the surface of the weir (photo 14).

5.8 This is a typical form of construction of weirs, where wooden stakes were piled into the river bed to form a frame into which large stones resting on gravel were inserted (photo 15) (Blythe 2011, Syson 1965, 75; Brown 2011, 36).

5.9 From this it would appear that the sandstone blocks that formed the north part of the weir were a later addition and not part of the original construction. As they sit in the fast flowing part of the river it is likely that a historic flood event had damaged this part of the weir and the riverbank resulting in the need for a repair and the reinforcement of the riverbank.

5.10 A letter dated 11/9/1899 regarding the sale of the mill and weir suggests that the weir is in need of repairs at this date, and it is likely that this sandstone repair dates to this period. Given that the sandstone used is finely worked and squared it is possible that it was reused from buildings in the area, perhaps from the original mill buildings.

6. The archaeological resource

6.1 The archaeological monitoring has shown that for the most part a standard method was used to construct the weir; wooden stakes were piled into the river bed to form a frame into which large stones resting on gravel were inserted.

6.2 The north end of the weir was constructed from large squared rectangular blocks of pink St Bees sandstone. This is likely to be a later repair of the weir, possibly the result of a flood event that also damaged the riverbank which has also been reinforced with sandstone. A letter dating to 1899 suggests that the weir is in a state of disrepair and it is likely that the sandstone repair dates to this period. It is possible that the stone came from buildings local to the weir, perhaps part of the mill that had gone out of use.

6.3 At a later date the riverbank has been further reinforced with concrete filled sandbags stacked up to create a wall around the bank, overlying the earlier sandstone.

6.4 In the 20th century the weir was reinforced with concrete, a concrete wall was poured along the front (east side) of the weir and the entire weir was covered in concrete.

7. Sources

Archaeological Services 2017 *Ennerdale Mill, Egremont, Cumbria; photographic survey.* Unpublished report **4578.** Archaeological Services Durham University

Brown, J, 2011 *Water Power and Watermills. An Historical Guide*, Wiltshire

Blythe, K 2011 *Ennerdale Weir, Egremont, Cumbria: archaeological desk based assessment.* Unpublished report **L10420**. Oxford Archaeology North

Read, EA, 1999 *1000 Years of Egremont*, Egremont

Syson, L, 1965 *British Water-Mills*, London

Photograph 1: The concrete-covered weir, looking north

Photograph 2: Notch cut through the weir, with lower course of sandstone visible under water and upper course visible in section, looking south

Photograph 3: Stone removed from the weir

Photograph 4: *In situ* wooden plank at the north end of the weir, looking south-east

Photograph 5: Wooden stake removed from the weir

Photograph 6: Detail of section through the weir, looking south-east

Photograph 7: Sandstone and concrete bank reinforcement, looking south-west

Photograph 8: Sandstone riverbank reinforcement, looking west

Photograph 9: The remains of the sandstone part of the weir, sat against the bank reinforcement, looking north-east

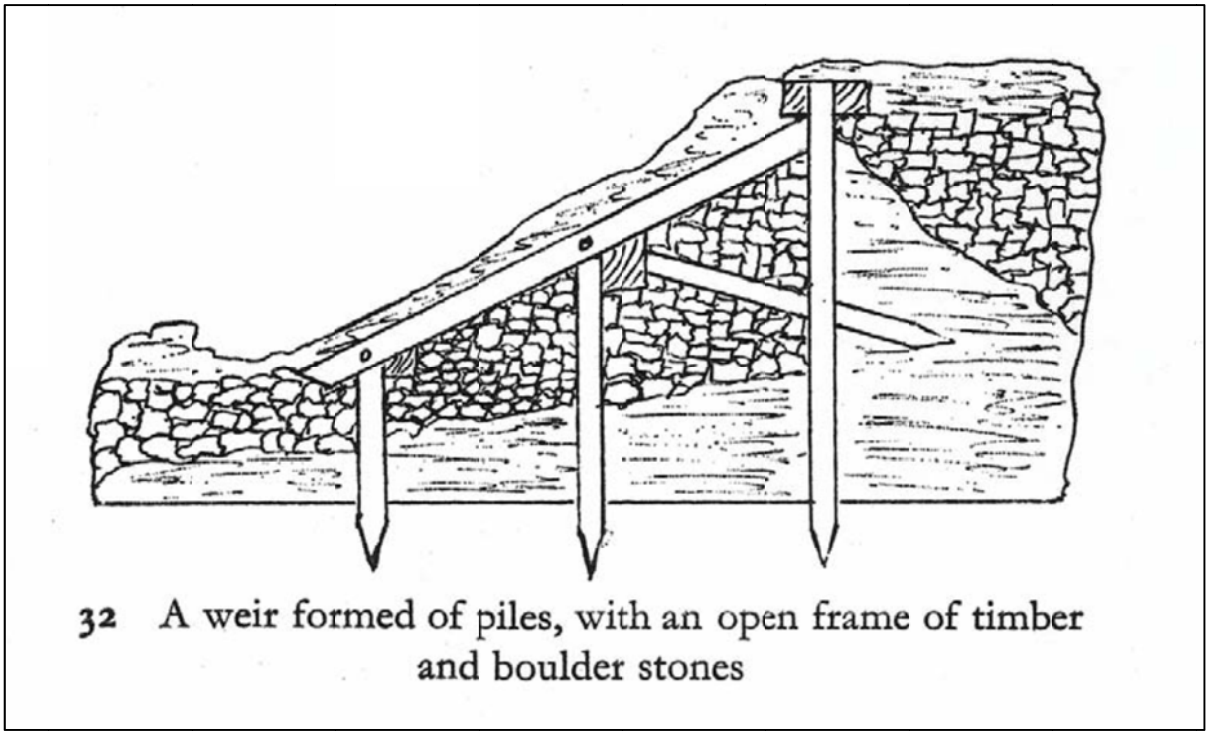
Photograph 10: Upright timbers and planks forming the front (east side) of the weir, looking south-west

Photograph 11: Front upright posts and remains of central upright posts, looking south

Photograph 12: Planks set on edge forming the rear (west side) of the weir, looking east

Photograph 13: Gravel and smaller cobbles forming the main body of the weir, looking south

Photograph 14: Cobbles forming the surface of the weir (disturbed by the removal of the modern concrete), looking south-east



Photograph 15: A common type of weir construction (after Syson 1065, 75)

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Figure 1: Site location

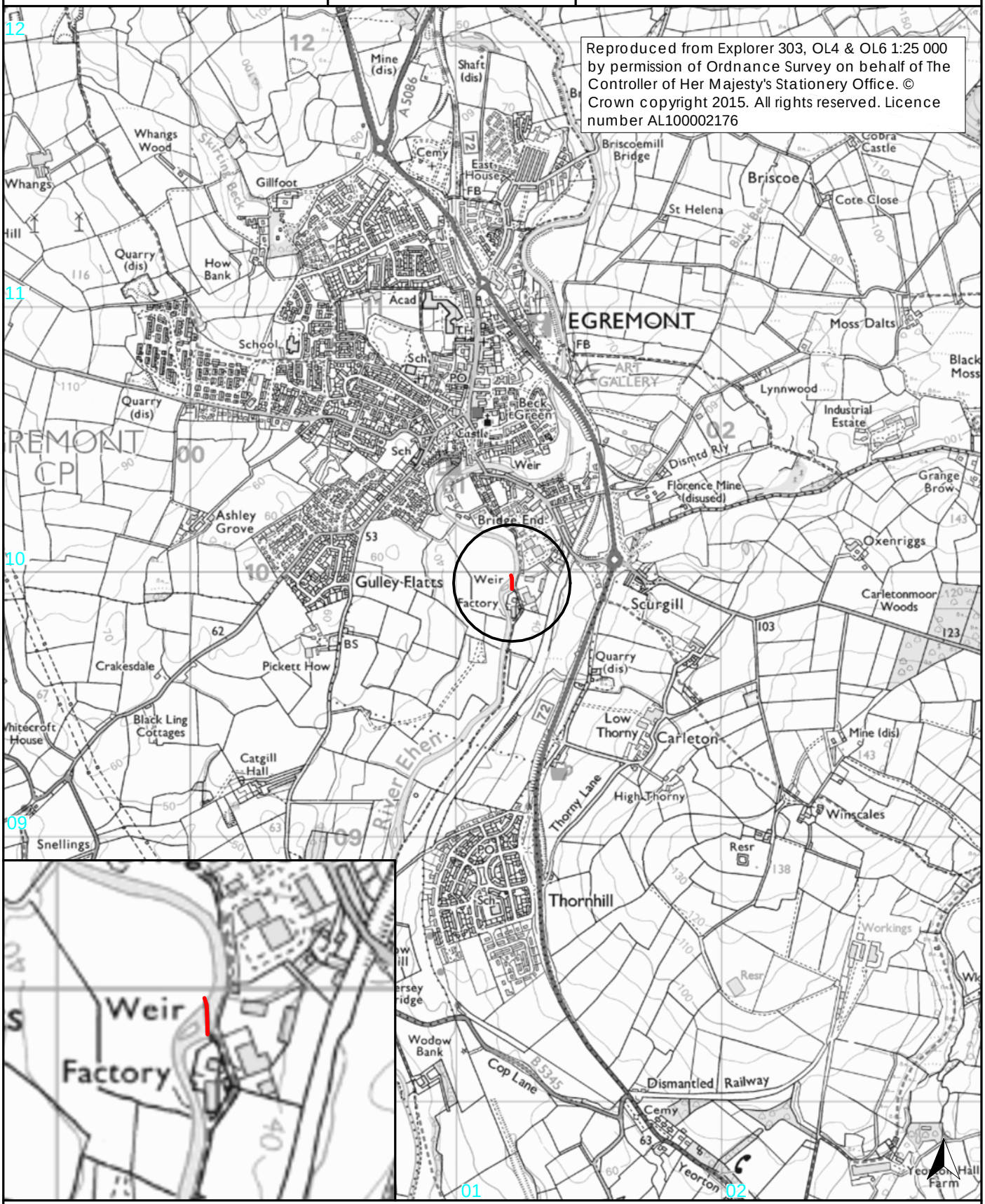

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Figure 2: Photograph locations

8 photograph

0 20m
scale 1:400 for A4 plot