An Archaeological Watching Brief during Improvement Works to the Inclined Plane at Foxton, Leicestershire.

NGR: SP 496230 289590 (centre)

Gerwyn Richards and Matthew Beamish

For: British Waterways

Checked by

Signed:  **.Date**: 14/1/2009

Name: ...Vicki Score...

Approved by

Signed:  **Date**: 14/1/2009.

Name: R.J. Buckley..

Archaeological Services
University Rd., Leicester, LE1 7RH
Tel: (0116) 2522848 Fax: (0116) 2522614

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An Archaeological Watching Brief during Exposure Of the Inclined Plane at Foxton Inclined Plane, Leicestershire.
(NGR SP 496230 289590 (centre))

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Summary

University of Leicester Archaeological Services was commissioned by British Waterways to undertake an archaeological watching brief during exposure and improvement of the inclined plane at Foxton Locks – rare survival of late Victorian canal engineering and a scheduled ancient monument. Works included the removal of paths and tracks, the exposure of original surfaces and the restoration of the original gradients on the lower halves of both inclines. During the later part of the 20th century, the upper halves had been restored and maintained while the lower halves were neglected and became considerably overgrown. The aims of the proposed works were to stabilise and enhance the monument as well improve visitor understanding.

Significant differences in preservation between the two inclines were apparent; the southern plane (Plane 1) has suffered systematic robbing of the concrete runners to approximately half way up the incline. The northern plane (Plane 2), on the other hand had survived much better with most of the concrete still in-situ and the concrete and granite apron at the incline's foot, still intact.

Introduction

The well-known flight of ten narrow-beam locks at Foxton was constructed in 1810 and raised boats some 23m in height. The locks here, together with those at Watford (Northants.), linked the waterways running north to the cities of the East Midlands, with those of the South Midlands and the South East. It would take about 45 minutes for a single boat to traverse the flight and with increasing waterways traffic, congestion was eased with the construction of the Inclined Plane in 1898-1900. This remarkable feat of engineering consisted of two water-filled tanks or caissons which raised and lowered two pairs of boats simultaneously in just 8 minutes, whilst also saving large quantities of water. It was hoped, by its owners, that the increased speed would allow the Grand Union Canal to compete with the railway in transporting goods between the Midlands and London.

The inclined plane was the last and the most sophisticated incline built in the United Kingdom. Steel was used for the first time instead of cast and wrought iron, and according to the designers it was able to lift loads of up to 240 tonnes, three times that of earlier inclines. Arguably, the improvements brought about to waterways traffic by the opening of the Foxton Inclined Plane were too little and too late to halt the decline of the canal and the rise of the railways. The inclined plane only remained in operation for a decade, boats reverted to the original flight in 1910 and the incline was closed in 1911. It was not until the late 1920s that major demolition began; as a result the inclined plane has survived in a relatively complete condition.

Context of the project

The inclined plane at Foxton Locks is a Scheduled Ancient Monument (NMR 30248; NGR SP 69230 89590, Centre) and is an exceptionally rare and near complete example of late Victorian canal engineering which has remained largely undeveloped. University of Leicester Archaeological Services was commissioned by British Waterways to undertake an archaeological watching brief during improvement works which aimed to establish visual continuity over the inclined plane. For most of the later 20th century, significant differences in land use between the upper and lower halves of the inclines has resulted in the latter becoming considerably overgrown, in a poor state of repair with structural remains barely visible.

The proposed works included the grinding out of tree-stumps, the hand and machine excavation of infilled drains, the exposure of concrete tracks, the removal of material from the foot of the incline (probably dredgings), the re-establishment of the original profile of the inclined plane, and the reinstatement of a pronounced bank that sloped down to the west and ran the full length of the plane separating the two levels (visible on Figure 2, Figure 3 and Figure 4). In the upper half of the northern incline, an undesignated track of brick and brick rubble running up its western side, and an undesignated foot path that had become established crossing both inclines approximately half way up the slope, were to be removed.

The broad intention of the work was to re-establish visual continuity over the inclined plane, so enhancing the monument and its interpretation and help to improve visitor understanding.

Scheduled Monument Consent from DCMS was received in January 2008 (HSD 9/2/9932). Work took place on site between March and June 2008.

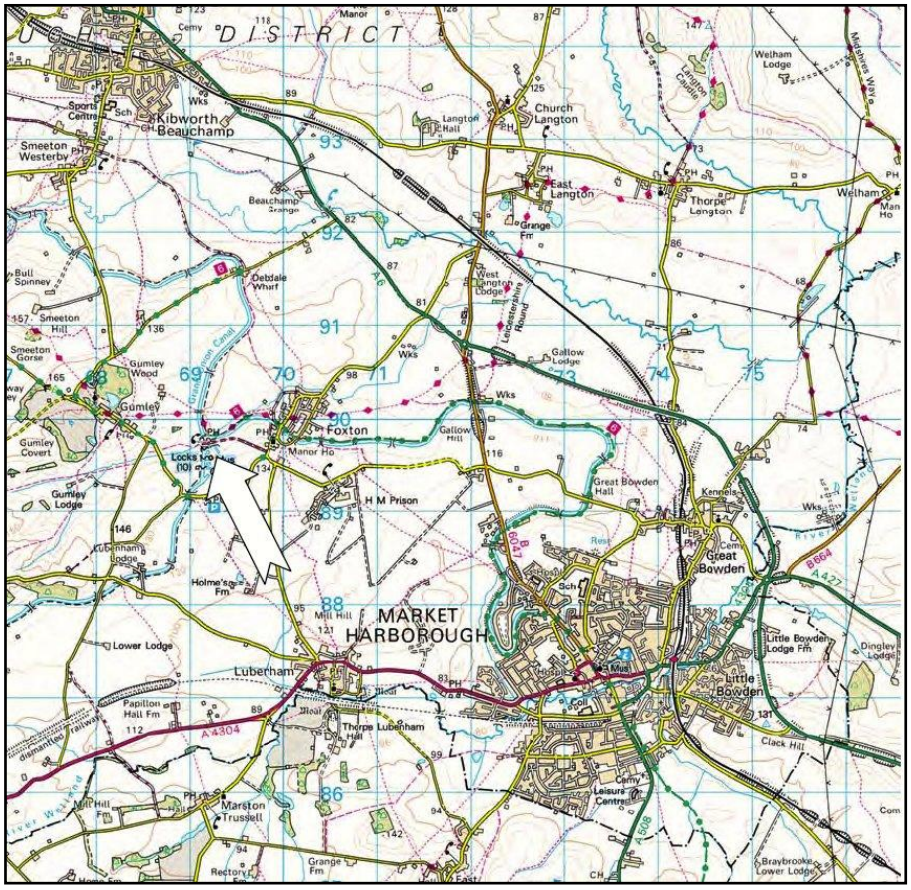

Figure 1: Site location Scale 1:50000

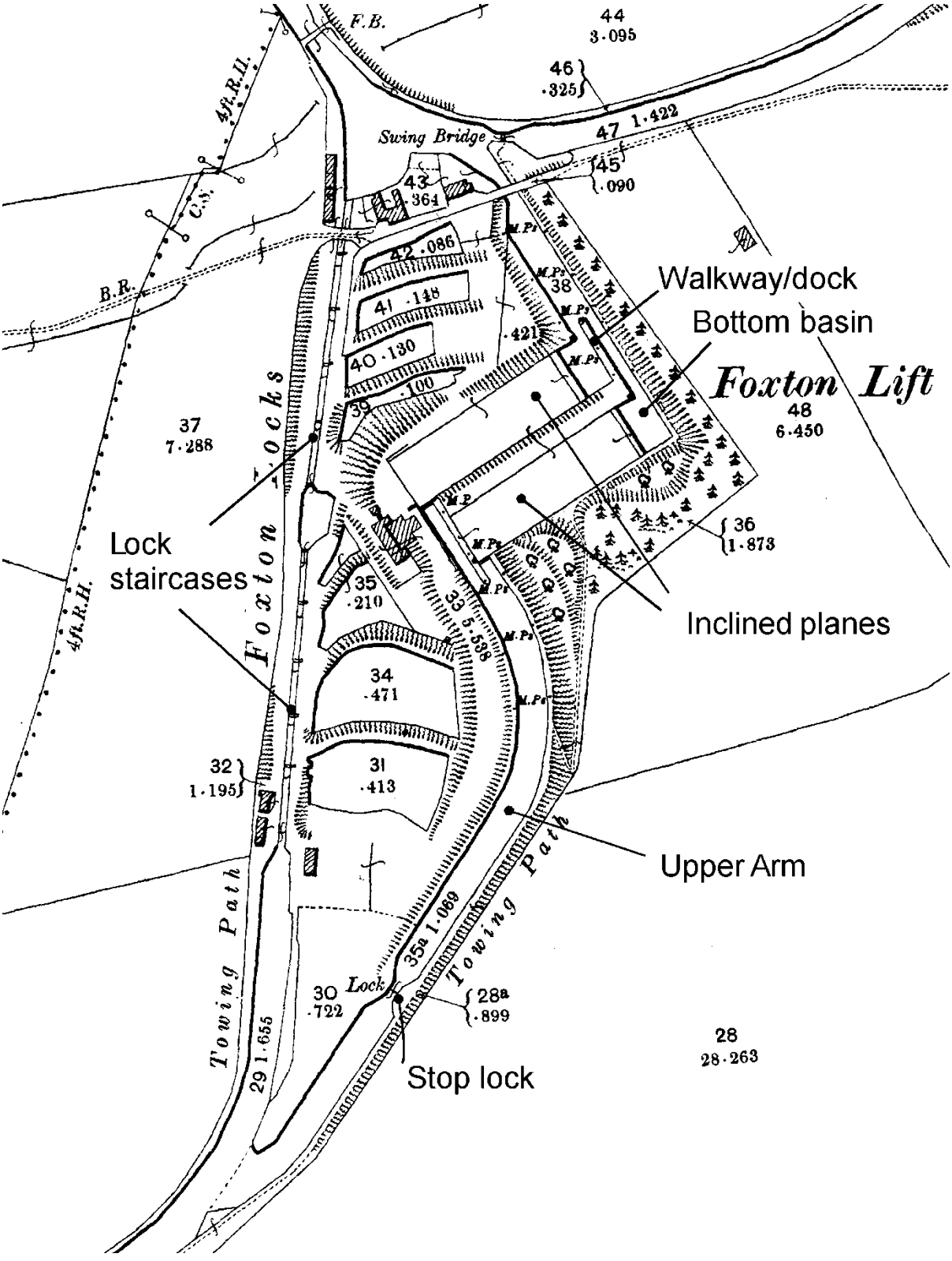

Figure 2: Ordnance Survey first edition (1st revision) 1904 with explanatory annotation.

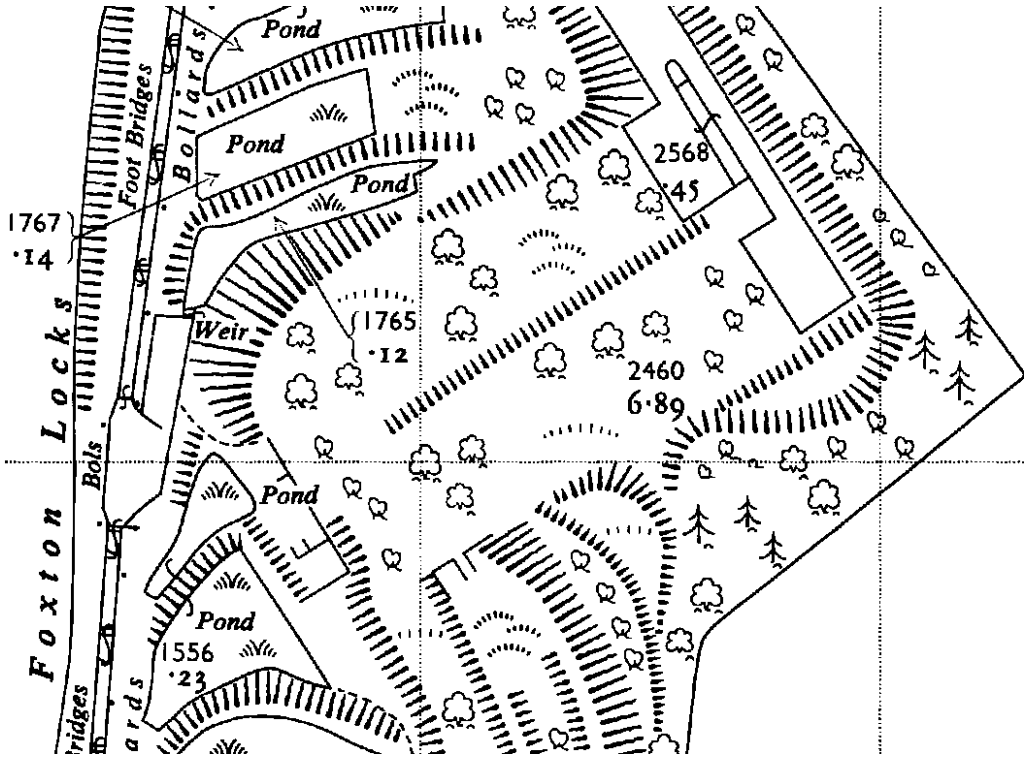

Figure 3: Detail from National Survey, 1:2500, 1962 showing encroachment of woodland over both of the inclined planes and the lack of change to the bottom basin.

Aims and Methodology

The aim of the archaeological work, as defined by the Design Specification (ULAS Specification 08/903) was to:-

- Identify the presence/absence of any archaeological deposits (including identified and unidentified structural features).
- Establish the character, extent and date range for any archaeological deposits to be affected by the proposed ground works.
- To supervise the exposure and minimise damage to elements of the inclined plane by hand and machine excavation.
- To record any archaeological deposits to be affected by the ground works.
- To produce an archive and report of any results.

For identification purposes the Planes have been numbered as Plane 1 and Plane 2, using Gardner & Foden, 1978, (Figure 6). Plane 1 is the southernmost Plane (the left hand plane when looking up slope) and Plane 2 is the northernmost plane (the right hand plane when looking up slope).

The project involved the monitoring of works carried out by site contractors, Greenford Ltd on behalf of British Waterways. Excavations were carried out by mini digger with a ditching bucket and by hand under continuous archaeological supervision. Excavation began at the top left-hand extremity of Plane 1, working down slope and then to the right. Spoil was cast down slope, and used as a platform on which the machine could stand to minimise disturbance to underlying archaeological deposits. Once at the base of the slope the spoil was loaded onto a tracked dumper which traversed the Inclined Plane using a terrace of earlier dredgings at the base of Plane 2 and a temporary ramp of spoil between the two planes.

Where it was obviously apparent that structural remains had been displaced, it was decided that such remains could be returned to their original position, providing there was no excessive or unnecessary excavation involved.

Initial soft vegetation strip was carried out using mini-digger with ditching bucket. The majority of the vegetation was burnt on site; one fire was located on the platform of dredgings at the base of Plane 2, while another fire was located within an area of the bottom basin dock area monitored during an archaeological watching brief during 2006 and known to be devoid of any significant archaeological remains.

After the vegetation strip, sub-contractors were engaged to remove all tree stumps, the number and extent of which had been recorded in a previous survey (Halcrow Dwg 5612_T) which is reproduced here in part, in relation to the General Layout of the Inclined Plane (Figure 4). The removal of the stumps was undertaken using a tracked stump-grinder under archaeological supervision. Where possible stumps were removed to *c*.300mm below desired ground level; this was not possible where trees had seeded in archaeologically-sensitive areas, most commonly within the concrete runners; in such cases the stumps were removed to a level flush with adjacent concrete.

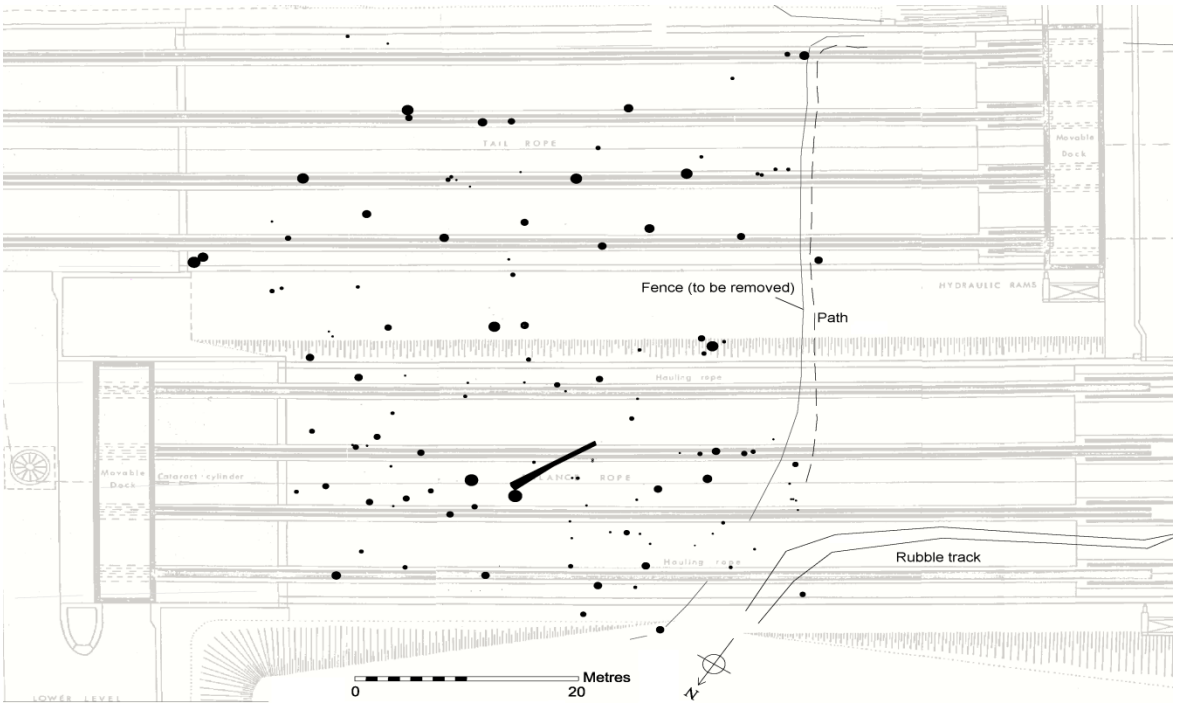

Figure 4: Location of stumps (Halcrow Dwg 5612T) of self-seeded trees requiring removal by stump-grinding, superimposed over the general layout of the inclines as built, and the location of the path and the rubble track.

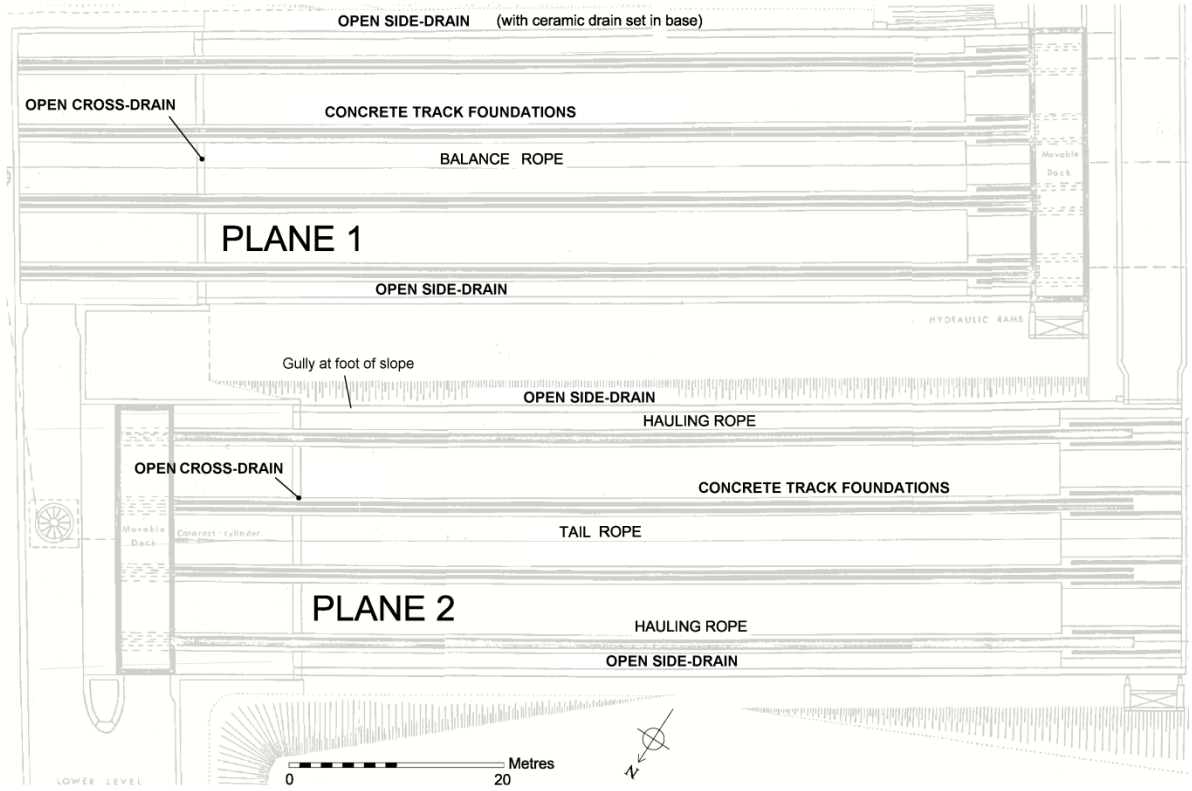

Figure 5: Detail of general arrangement as constructed, with location of open gullies and concrete runners.

Results

Plane 1

Prior to the grading work, the stone-lined open side-drains which delimited each incline (Figure 5) were first exposed and excavated in order to establish a level to work to across each plane. This level was also clear in that the original made surface of the Plane comprised homogeneous grey clays in comparison with the dark brown soil that had developed above them.

The side-drains had also filled with accumulated humic dark brown soils in which occasional bricks, stone and iron objects were included. The side-drains were in much better condition than was anticipated; granite rubble had been used for the sides with cement pointing and a cement base, and it was decided that as they were so robust that careful machine excavation with a narrow bucket would not cause any damage (Figure 13). A 4 inch glazed ceramic pipe-drain was found concreted into the base of the southern side-drain of Plane 1.

Following the exposure and excavation of the side-drains, stripping of the incline surface commenced on Plane 1. Using the upper plane as a guide it, a minimum of 150mm of accumulated material needed to be removed in order to re-instate the original gradient. It was also necessary to in-fill the scar of footpath which crossed perpendicular to the incline, following the old fence line (Figure 4). Some of the brick surface of this path was left *in-situ* while some was removed. The spoil from the grading was used where any in-filling was required.

Fragmentary concrete track runners were still largely in-situ on all four lines for the first five to ten metres from the line of the old path. Subsequently the upper runners began to thin and eventually disappeared completely. This occurred on all four runners across Plane 1, and at approximately the same point (Figure 7). Probing along the alignment of the foundations indicated the lower concrete foundations were still *in-situ* but the upper runners themselves were gone. A hand-excavated section across the alignment of the left hand track (Figure 14) confirmed their absence, although the outline of the upper runners was visible on the surface of the exposed

foundation. The lower foundations are thought to extend down to natural ground level, and are some 9m on the upper parts of the made up inclines (FIPT 1985, 11).

As grading progressed down the incline most of the excavated material consisted of soil accumulations and very little of archaeological significance was exposed. Towards the base of the incline, however, a length of wire rope was uncovered, very close to, if not in its original position; although badly corroded it still measured approximately 50mm (2inches) in diameter.

Towards the base of Plane 1 a terrace excavated into the incline was to be re-instated to the original gradient as per the scheme of work (Figure 7). This was done using the spoil accumulated from the grading which was then compressed. The spoil was also used to reinstate the toe of the bank between the two planes using an early photograph and drawings as a guide.

The removal of accumulated spoil at the base of the incline exposed parts of a fragmentary apron near to the water level which had been previously suggested by photographic evidence but is not indicated in any available drawings. The apron at the foot of Plane 1 had been truncated by the cutting of the terrace, and was in overall poor condition, and no detailed records were made of it.

Neither side-drain reached the basin; the northern side-drain had been truncated by the terrace mentioned above. Excavation along the line of this drain partly exposed an *in-situ* structure of blue bricks. The southern side-drain had been buried by slipping of the adjacent bank. In an early photograph, instability in this area is apparent as the southern side-drain is buried in a similar way to that re-excavated. However it is also clear that the last line of tracks is also buried, and the plane cannot be functioning at the time of the photograph (Figure 19). The photograph may pre-date the opening of the planes.

Plane 2

The process of grading Plane 2 was identical to that of Plane 1; approximately 150mm of accumulated material was excavated using the side-drains and the upper plane as a guide. It soon became apparent that Plane 2 had for the most part fared considerably better than Plane 1 throughout the 20th Century, as with the exception of the northernmost, the upper runners were largely intact and *in-situ*. Where the concrete runners have broken up elsewhere on site they have remained in relatively large pieces; on Plane 2, some were lying upside-down while one piece was clearly laying perpendicular to the others, and it appears that some attempt at restoration has been carried out on this part of the plane at some stage in the past.

As well as the high level of *in-situ* concrete runners, a large number of the longitudinal timber sleepers were also still present on Plane 2 (Figure 7). A number of the bolts for the original mounting points were still visible in the sleepers; the mounting points consisted of four bolts in a rectangle 120mm by 240mm (4 ¾ inch by 9 ½ inch), the bolts themselves were 20mm (3/4 inch) in diameter.

The rails of the incline had used the 'bridge-rail' technique used by Brunel on the Great Western Railway (FIPT 1985, 12) in which wooden sleepers were fixed longitudinally rather than transverse to the line of the track.

A length of the wire rope was also uncovered on Plane 2, slightly shorter than that recorded on Plane 1, and again probably *in-situ* given its central location, as well as a number of detached fragments of wire rope.

Evidence was uncovered toward the foot of the incline of a substantial apron, as suggested for Plane 1. The apron of Plane 2, having not suffered truncation and having benefited from the protection given by accumulations of silt, was nearly intact and a plan was drawn at 1:50 (reproduced here as Figure 8).

The central element of the apron was a pre-cast cross-drain. This drain, set 1.80m from the normal water level was 25m long overall and connected the two side-drains. The cross-drain comprised three sections around 5m long running between each of the four tracks, and two sections of some 2.5m running outwards to below the side-drains at each end. Each section was approximately 750mm wide and consisted of a concave section between two concrete slabs placed on edge. The drain was not excavated during this phase of work.

The plane between the drain and the basin was surfaced with mainly granite pebbles and cobbles set in concrete in five beds as per the arrangement for the drains, with the concrete runners and timbers continuing into the

basin between each bed. Photographic evidence suggests that the granite surface did not continue much further than the normal water level, although this cannot be confirmed (Figure 20).

To the rear of the drain (upslope) was more evidence of surfaces. Immediately behind each drain was a concrete slab approximately 1.8m wide and of width as per the cross-drains. Although now badly fractured, the slabs had been originally poured as single units. At the centre of the plane the surfaced area was much longer, extending 5 metres up the incline in total. The higher part of the slab was made up of many smaller fractured concrete pieces and it appears it was originally laid this way. It is possible that this larger slab was a later addition in which broken concrete was used. Photographic evidence clearly shows that materials were being laid in this area during a maintenance closure during the Plane's operation (Figure 20).

Both side-drains were in good condition, and were found to stop where they abutted small brick and concrete built structures, each 1.4m square and some 4m upslope from the normal water level, just before the cross-drains (Figure 25, Figure 26 and Figure 8). The southernmost trap of Plane 2 was excavated revealing a concrete base, at a depth of around 600mm, although overnight slumping and infilling of the trap from the bank above precluded detailed recording.

Each trap had a concave profile to upper and lower walls, continuing the form of the side-drains. Little difference in level was apparent between the tops of the two walls (Figure 26) although this was not recorded in detail. The brick structures appear as chambers at the foot of each side-drain, connecting side to cross-drains. It is likely that the blue bricks observed near the apron on Plane 1 came from a similar structure. Each chamber would have served as a form of trap.

As the excavation of the left hand trap had left an unstable vertical face at the foot of the reinstated bank, it was decided to re-grade the bank in order to achieve a slight slope on this face and improve its stability, although examination of the available early photographs suggests this face was intended to be nearly vertical.

Some of the granite coping stones on the left hand basin wall below the trap were missing and the wall was slightly displaced; the missing stones were replaced with loose coping stones recovered in the vicinity during the grading of Plane 1 (Figure 8).

The final excavation work on Plane 2 involved the removal of a brick and rubble track from the upper half of the incline. The dumping of this material had created a terrace approximately 500mm high, disrupting the original gradient of the incline and infilling the right hand side-drain. Excavation confirmed that the brick rubble track way was a recent deposit and not *in-situ* surface material from the inclined plane's use.

An erosion scar on the upper part of Plane 2 between the two right hand channels was in-filled using sorted material recovered during the grading of the plane. An earlier repair to this scar used dumped brick and rubble, and most of this was removed

Central Dock

As well as the two inclines the work also involved the clearing and levelling of the central dock. Work here was limited to de-turfing and the removal of some humic build up. Where such deposits were removed a surface of heated shale, mainly red in colour was often exposed. Previous work on the inclined plane has revealed that this burnt shale had been used extensively on the towpaths (Richards 2006, 4; Richards and Beamish 2007, 6).

In the south-easternmost corner of the dock was a mounting point consisting of four 20mm (3/4inch) anchor bolts some of which retained their nuts, in a rectangle 300mm by 250mm (Figure 9). These bolts were in turn mounted on a brick built footing approximately 400mm by 340mm in size. Early photographs show a hydraulic stand pipe for the portcullis gate in this position (below Figure 10, Figure 11) that was later housed in a part glazed timber building (Figure 20 and Figure 22). A connection was made to the stand-pipe each time the lower gates needed to be raised or lowered (Gardner and Foley 1979, 17). The bolts, therefore, are what remains of the mounting of this mechanism. To the right, *in situ* blue bricks defined a possible chamber, 460mm by 420mm abutting the coping stones, probably forming ducting for the route the hydraulic hoses, also visible in a contemporary photograph (Figure 11).

Adjacent to this mounting point there is an irregular shaped piece of sandstone, with a very smooth, weathered surface. Towards the centre there is what looks like an anchor bolt, sheared off at ground level held in place by

hot poured lead. The bolt itself is 20mm (3/4 inch) in diameter, while the poured lead is approximately 100mm by 80mm in size; hot poured lead is most effective in small areas, in this example, there appears to be too much lead. A second poured lead mounted anchor bolt was mounted between two of the granite coping stones approximately 400mm to the north of the main mounting point. The anchor bolt was still *in-situ* with the bolt still attached, same size as the previous bolts. Again, this bolt appears to be poorly mounted, a large amount of lead only supported on three sides, one side only being supported by the shale surface of the wharf.

The function of the later two anchor bolts is not clear although it is considered unlikely to have been able to bear any substantial weight before it would have given way and pulled free. It is possible that the mountings relate to the part-glazed timber structure that encloses the hydraulic mechanism (Figure 12). This structure appears to have been added to the dock, as it is not visible in some photographs.

Discussion

The drains

The side-drains appear to have been designed primarily to carry water leaking from the caissons while the planes were in operation. A ceramic pipe drain was built into the base of the southernmost side-drain only. This was perhaps installed to control a separate drainage issue. The inclines were half cut and half fill (see Figure 6 for approximate gradient of the original ground surface), passing through beds of Blue Lias Formation, Charmouth Mudstone Formation and Whitby Mudstone Formation and it is probable that where the interfaces between geological layers were exposed, extensive water seepage was encountered. Water running between these beds would have come from the ground to the south, and would perhaps have been intercepted by the first side-drain which would have drained the whole construction of ground water. In the duration of the watching-brief, the surface and soils of Plane 1 were much wetter than those of Plane 2, especially on the southern edge. However, without exposure of the top of the pipe-drain and its input, discussion of its function remains speculation.

The track foundations

On the surface of the concrete slab on which track runners were laid, it was possible to trace the outline of the concrete runners and it was clear that the runners and the slab were separate pours and were not strongly bonded together. It is suggested that the slab was poured first, on to which the sleepers were laid, followed by the runners, using the sleepers and the surrounding clay as shuttering. Other studies have identified that the foundations were poured in 450mm 'lifts' (FITP 1979, 11). The method of construction considering the stresses the fully laden caissons would generate, is of questionable strength. Problems with the security of the rails were part of the planes' history (FITP 1985, 12).

An examination of the fragments of concrete runners also suggested that they too were not of the highest quality. The aggregate is large and the cement has frequently failed to completely bind it, with the result that there are large voids towards the base of the runners, which, undoubtedly contributed to the weak joint between the runners and the slab below. The ease at which the two pieces were separated probably encouraged their removal.

The track runners were absent from much of Plane 1. The original incline surface was exposed during the watching brief as indicated by the stratigraphic change from the soil that had developed over the old surface, and the clays it had been built from. This level was also corroborated by the identification of the wire ropes on the surface of the plane. The absence of the runners may possibly be due to the robbing of the concrete for use as hard-core or aggregate.

The ropes

The function of the wire ropes recorded toward the centre of each incline was to provide an initial 'nudge' to move the stationary caissons. These ropes were attached to the centre of each caisson, while the main weight was taken by the hauling ropes, attached on the right and left of the caissons (Figure 5).

The Surfaces

The exact reason for the provision and extension of the surfaces above the cross-drains is not clear, but it seems most probable that it was due to unforeseen erosion caused by the balance and tail ropes. Although no obvious indications of an extended surface was preserved on Plane 1, photographic evidence does suggest that Plane 1

was surfaced in a similar way to Plane 2, and erosion caused by the rope is evident in the photograph, as are remedial surface repairs (Figure 20). The absence of such a surface on Plane 1 now must be due to a lack of preservation either by truncation or robbing. Erosion caused by the wire rope higher up the incline is also evident on other photographs (Figure 21) clearly suggesting that the ropes caused erosion along their whole lengths as the lowest (mid-point) part of the unsupported rope moved with the caisson to which it was attached. Localised surfacing was perhaps carried out in these areas central to each plane.

However no indications that the 'whole surface was topped with a layer of granite flakes' was found on either Plane 1 or Plane 2 (FITP 1985, 12). On the basis of the evidence recorded on the lower halves of both inclines, the use of granite was limited to below the aprons. The use of stone for surfacing areas that were more prone to erosion at the top of each incline is also probable, and is possibly visible in some photographs (Gardner and Foden 1979, 27) and was apparent when the upper area was improved (Mike Beech pers. comm.), but the use of granite over both the inclines as a whole is not supported by the surviving evidence.

The broken concrete apparently used as a repair to the central surface to the Plane 2 incline might indicate tight budget constraints for maintenance work.

The traps

The function of the traps recorded at the foot of each side-drain is not clear. An assumption was made when they were revealed, that these were silt/sediment traps, but the lack of great difference between input and output side of the chamber, combined with the indications of large volumes of water running down each side drain when in use in surviving photographs, combine to make this seem very unlikely.

Two alternative explanations are suggested. The first that the traps functioned to catch larger objects cascading down the side-drains, akin to *trash grilles* found on some side-weirs (Crowe 1994, 39). Alternatively, the traps were built as sediment traps, but the extent of water-loss from the caissons was not anticipated when they were designed and built.

Conclusion

The aims of this phase of work were to enhance the monument and its interpretation and help to improve visitor understanding, and these were undoubtedly achieved. The removal of the vegetation and tree stumps along with limited earth moving and clearing of the open side-drains has returned the plane to a more original form, greatly aiding visual understanding of the monument.

A number of significant structural elements, buried by accumulated material were also re-exposed for the first time. Elements of the structure of the inclined plane not found in surviving drawings has been clarified. This has most notably included the apron structures at the base of both inclines. Only photographic evidence of these aprons remained prior to this watching brief, and post-abandonment they had become completely concealed by vegetation and dredgings dumped from the basin. Excavation showed that considerable thought had gone into protecting the base of the inclines from erosion. The erosion was probably caused by a combination of downwash from water draining down the inclines, backwash caused by the caissons entering the basin and displacing water, and the sawing action of the balance and tail ropes. Laid granite rubble was used along the water's edge with an early example of the use of pre-cast concrete as drainage channels behind.

Erosion caused by the wire ropes was also the probable cause of the further repair and extension of the central concrete slab on Plane 2. This slab extended a full four metres further up the incline than the adjacent slabs and appeared to have been laid using already fractured concrete slabs, possibly recycled from elsewhere.

Scrutiny of the available photographs suggests that either bank slippage was a problem during the early life of the monument, or that photographs were being taken showing the plane in use before it had been officially opened.

The enclosing of the hydraulic mechanism on the lower dock with a timber structure was possibly a remedial measure, as mounting points recorded in this area are not of the same quality as those used for the hydraulics, and the structure does not appear on early photographs.

Significant variations in the preservation of the monument were found. Some elements had clearly survived better than others, and there was also a marked difference in preservation between the two inclines. The most

striking contrast was the near-complete robbing of the concrete runners from the lower half of Plane 1, with the exception of a few isolated fragments. It appears the lower half of Plane 1 was systematically lifted and shipped off site. Plane 2 did not appear to have suffered any systematic robbing, suggesting that Plane 1 was directly targeted, possibly because access from the basin or from land to the south was easier at the time of the robbing.

Evidence of the abandonment and scrapping of the incline was also uncovered, artefacts, such as iron mounting plates were recovered, along with lengths of the wire ropes, possibly abandoned still in their original positions. Possible evidence of cosmetic restoration work carried on the incline was also uncovered, most notably the re-setting of some of the concrete runners upslope on Plane 2.

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Archive and Publication

The site archive consists of

5 A2 permatrace sheets; 1 A3 permatrace sheet; 111 Black and white negatives with contact sheets; 142 Digital Colour Images on CD and A4 contact sheet; 10 Colour Side; 3 A4 Photo Index Sheet; 5 A4 Context Sheet
1 A4 Context Summary Sheet; 10 A4 Watching Brief Sheets; 1 A4 Levels Index

An unbound copy of this report
Unbound copy of ULAS Report Numbers 2006-114, 2006-169 & 2007-005

The archive will be held at Leicestershire County Council, under accession number X.A82.2006. A version of the summary (above) will be published in *Transactions of Leicestershire Archaeological and Historical Society* in due course.

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Gerwyn Richards and Matthew Beamish
14/01/2009

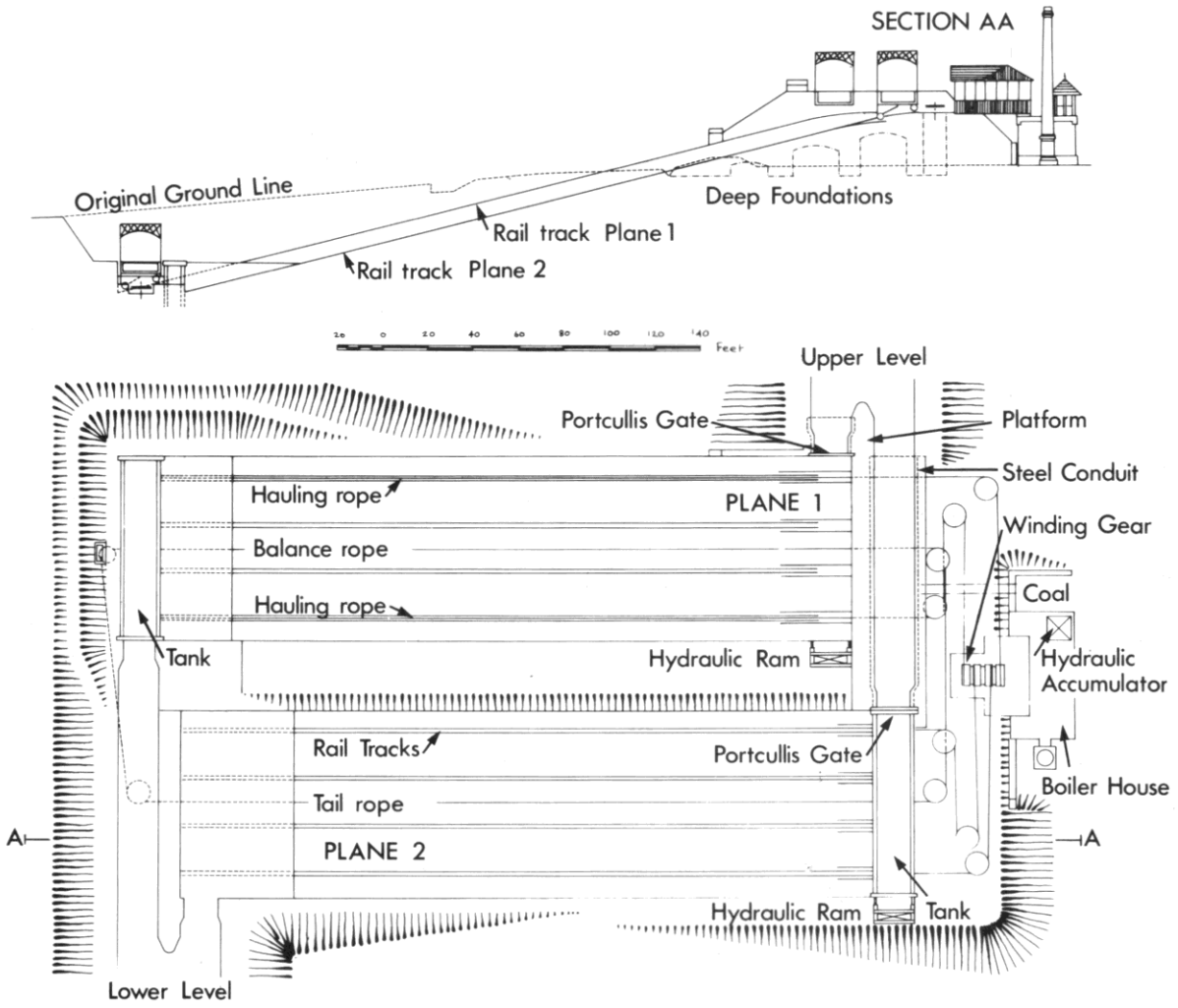

Figure 6: Plan of the Inclined Plane (after Gardner and Foden 1978, Fig 4). This plan omits the open side- and cross- drains.

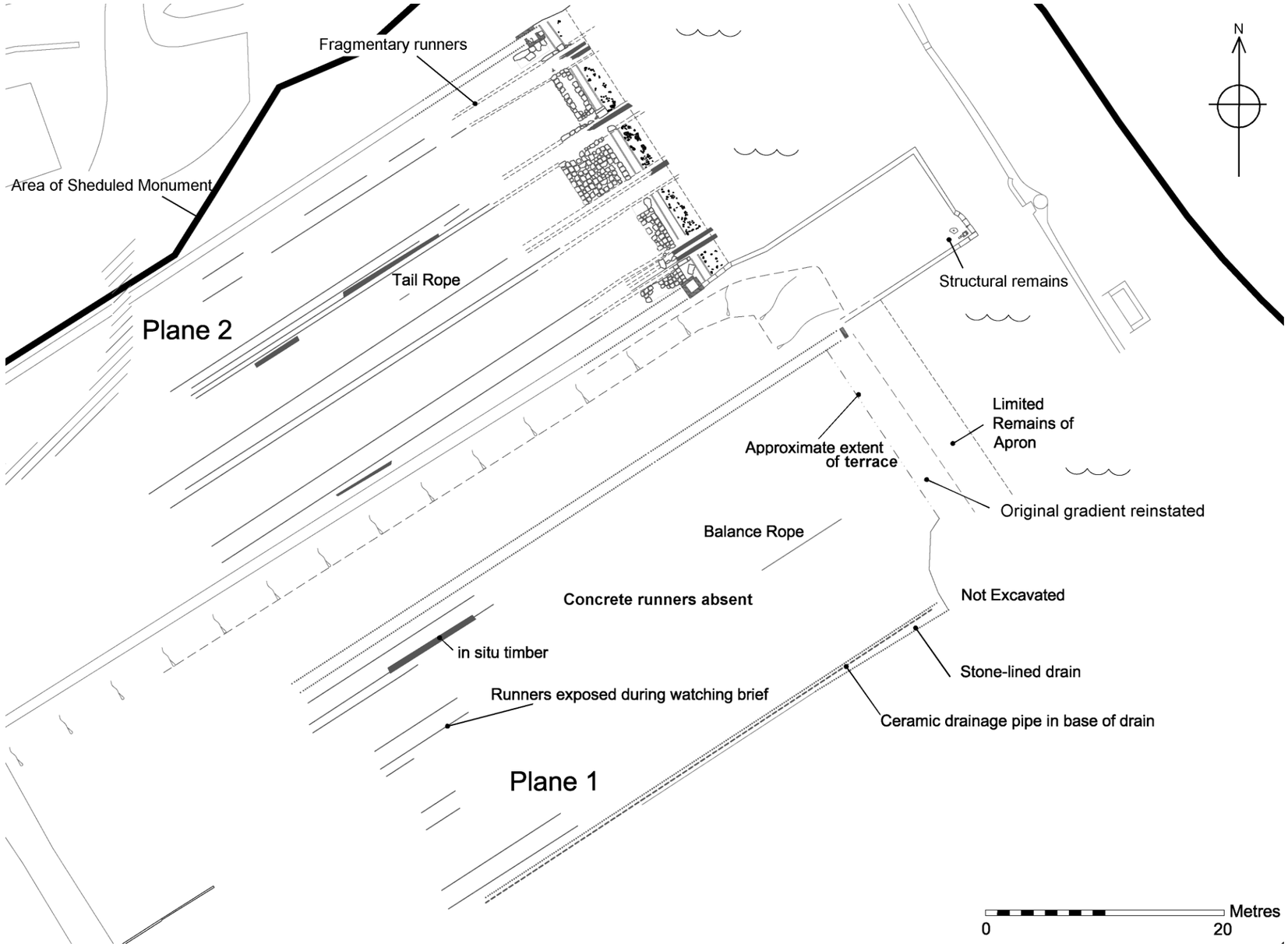

Figure 7: Overall plan of features recorded during the watching brief.

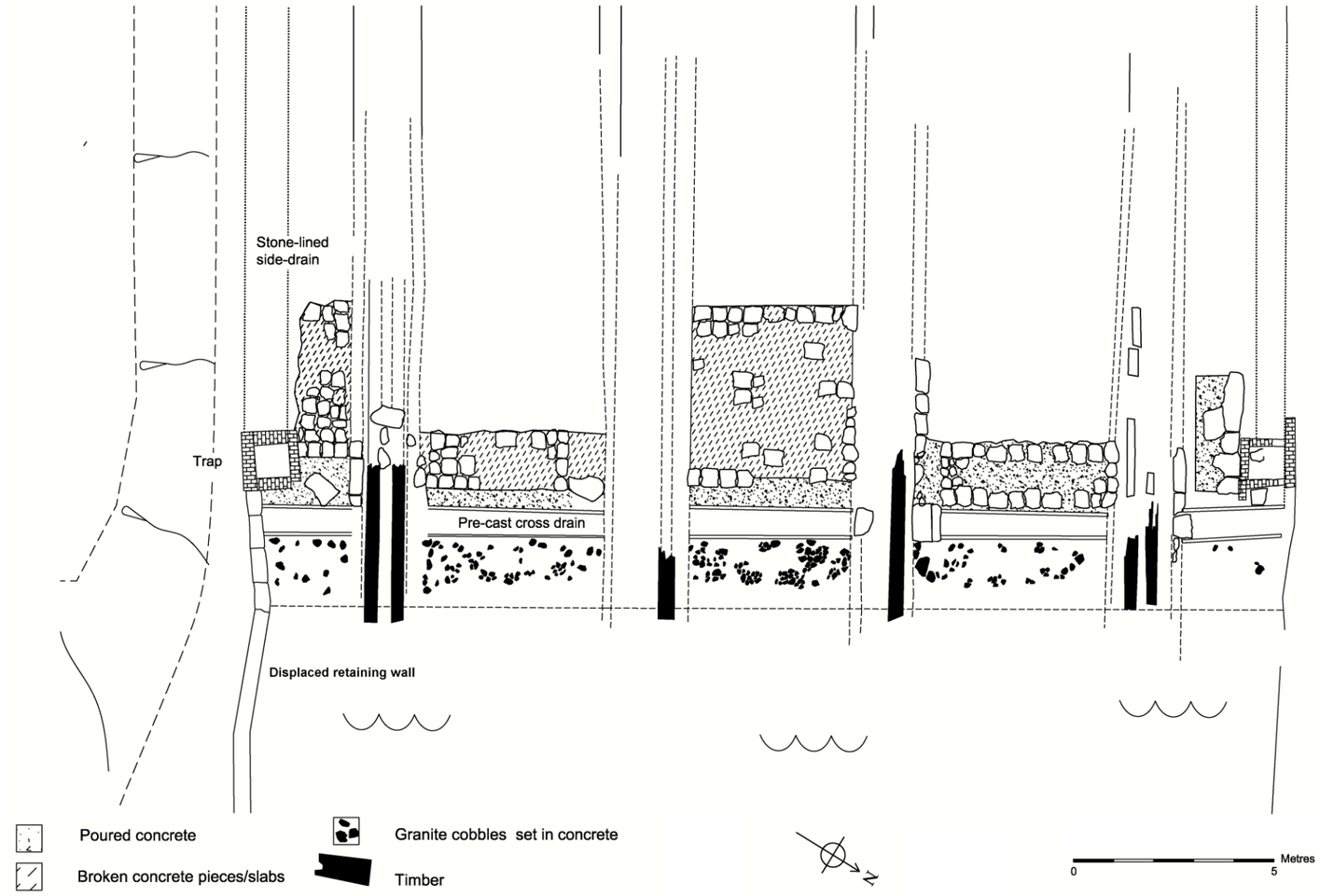

Figure 8: Detailed plan of apron at base of Plane 2

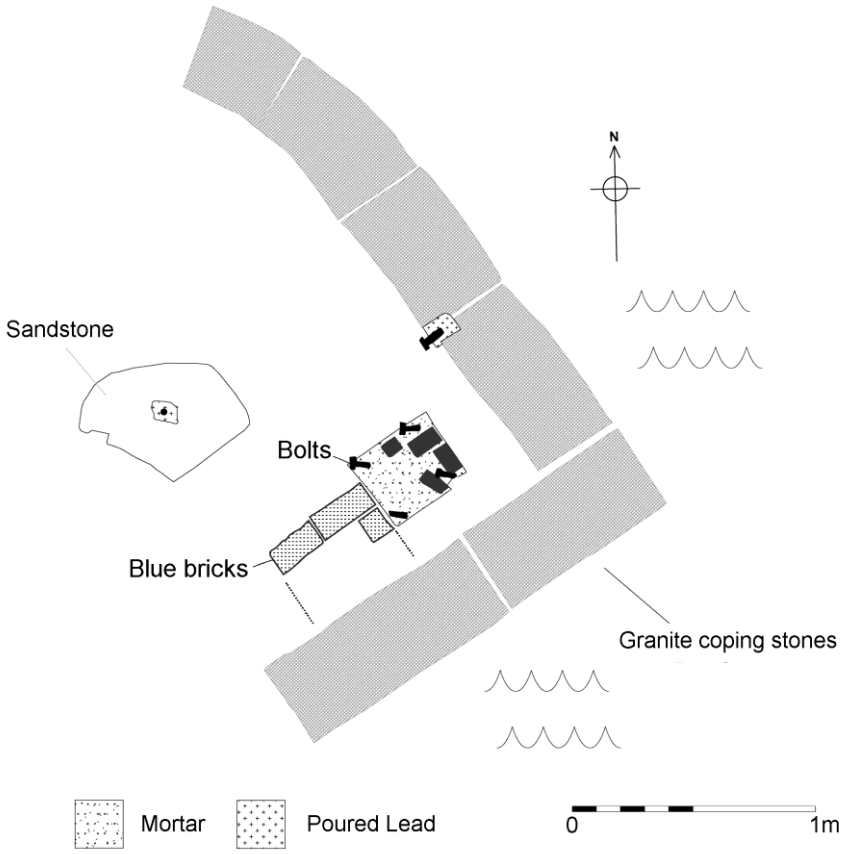

Figure 9: Detailed plan of mounting points on wharf.

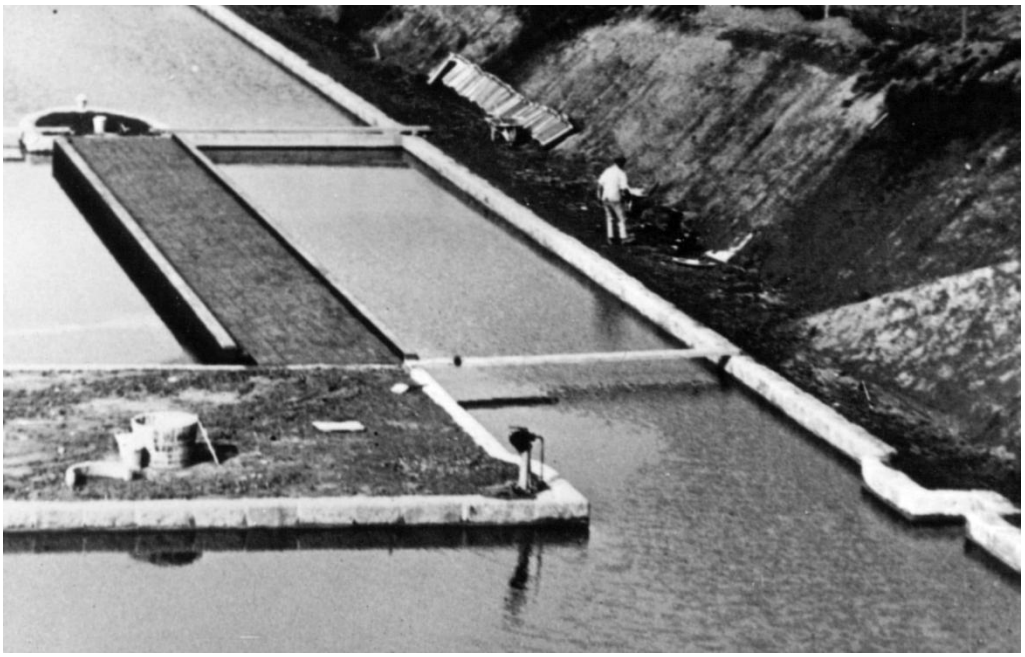

Figure 10: Detail from construction photograph showing hydraulic mechanism prior to construction of housing structure.

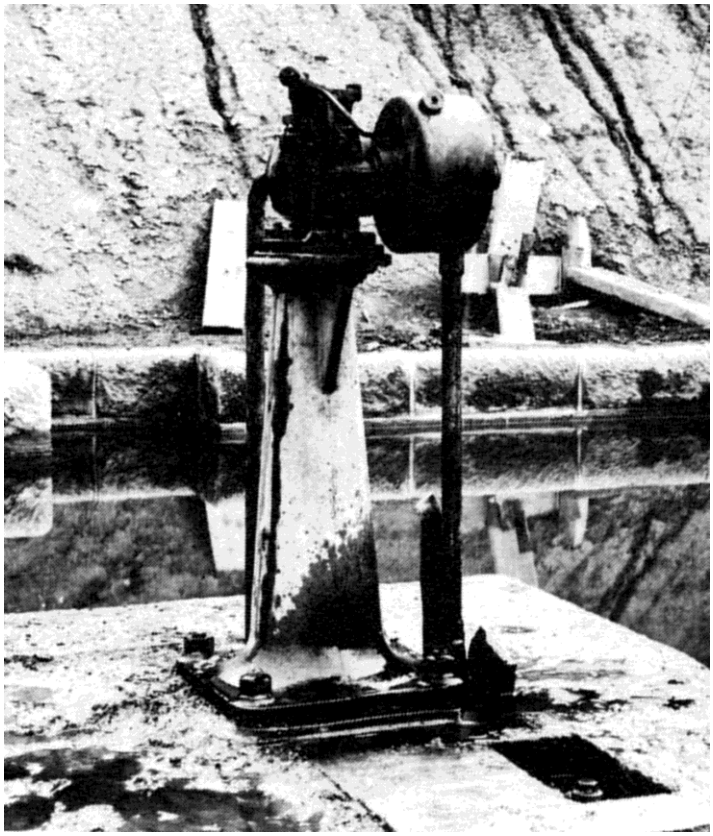

Figure 11: Detail of bottom basin portcullis mechanism prior to housing, and adjacent brick chamber (after Gardner and Foden 1979, 17)

Figure 12: Detail of hydraulics housing (after FITP 1984, 24)

Figure 13: Detail of excavated granite-lined side-drain, Plane 1 (southern).

Figure 14: Plane 1: hand-excavated section across line of track showing soil accumulation above lower foundation slab and absence of upper runners.

Figure 15: Plane 1: detail of granite and pre-cast concrete cross-drain.

Figure 16: Rope, Plane 1, possibly near *in situ*.

Figure 17: Plane 2: hand-excavated section across concrete runners and in-situ timber.

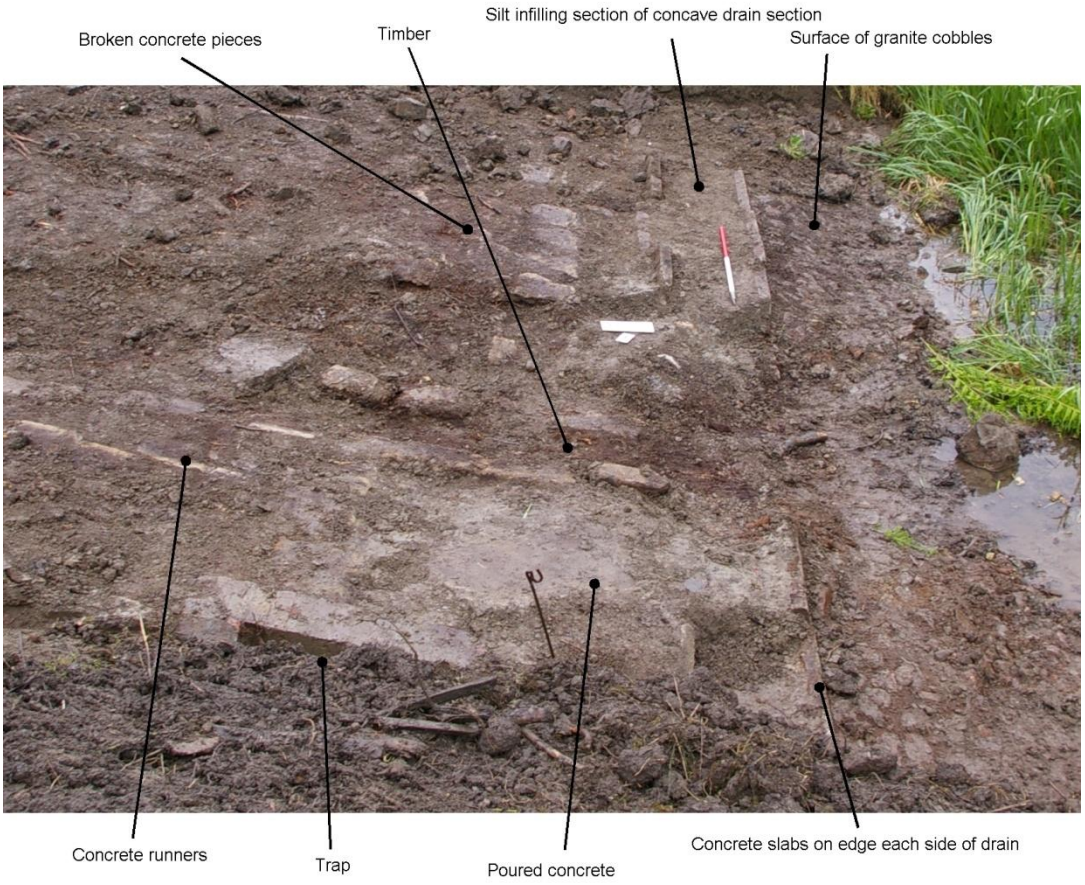

Figure 18: Detail of apron, Plane 2.

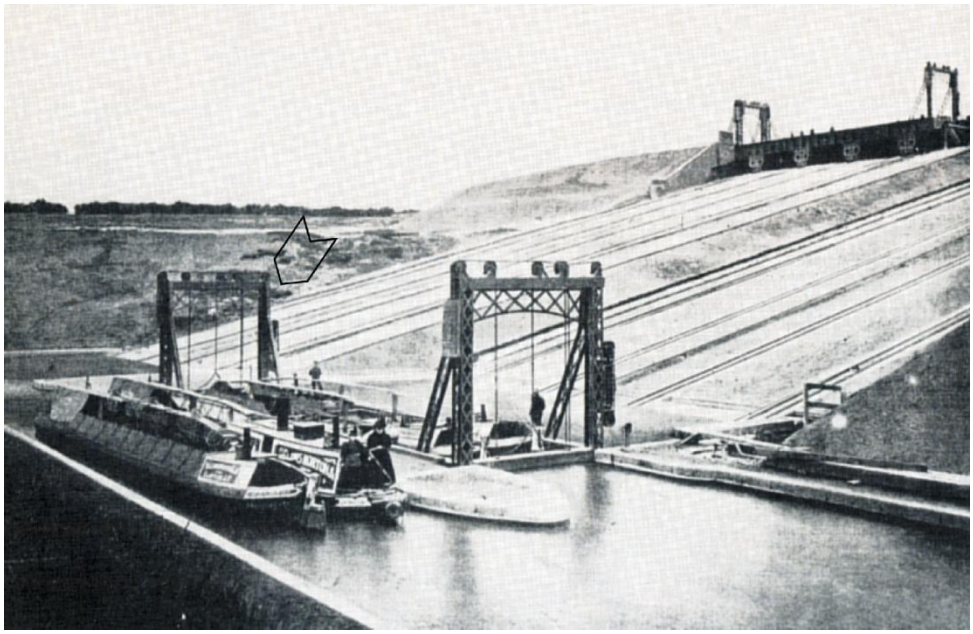

Figure 19: Landslide at rear of Plane 1 has encroached over the drain and first runners. The lack of vegetation suggests this has occurred early in the plane's operation. Little evidence for surfacing above the aprons is visible (after FIPT 1985, 18). This photograph may predate the operation of the planes.

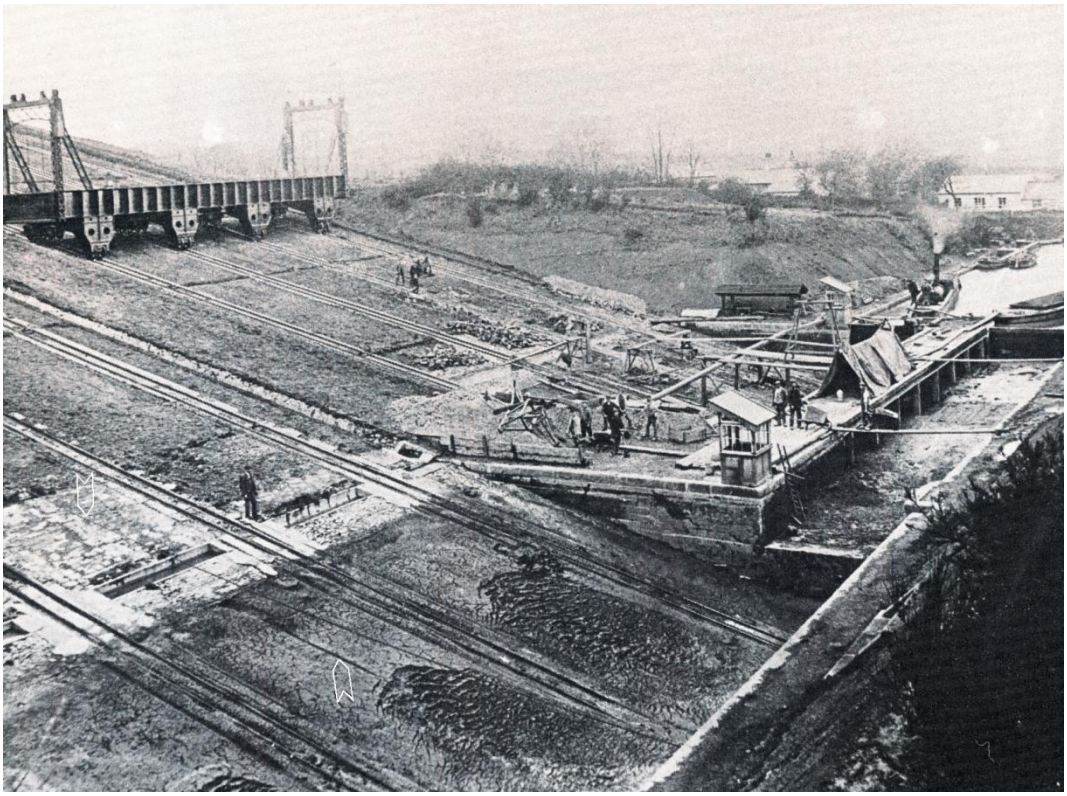

Figure 20: Maintenance photograph showing the addition of surface materials above the apron on Plane 2, winter 1902/3 (Photo D.Hipwell, after Garder and Foden 1978, 29). Erosion from the balance rope, and probably remedial surfacing to Plane 1 arrowed.

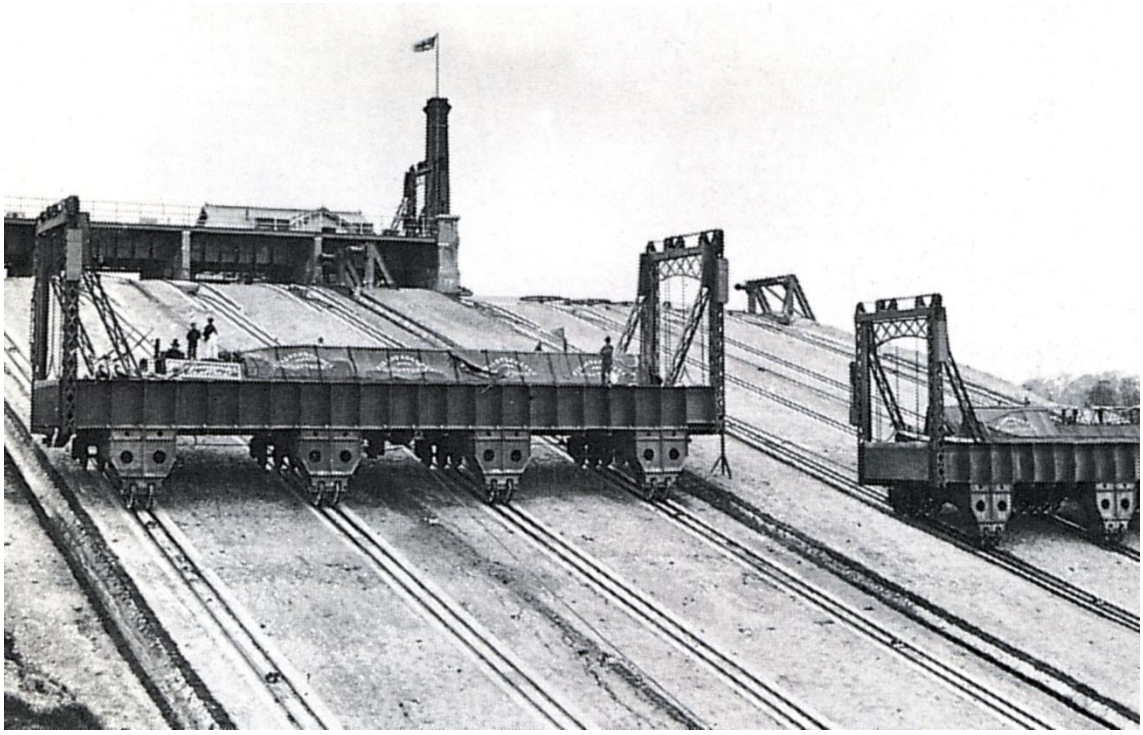

Figure 21: Incline in use, showing localised but extensive erosion caused by balance rope (after Crowe 1994, 36)

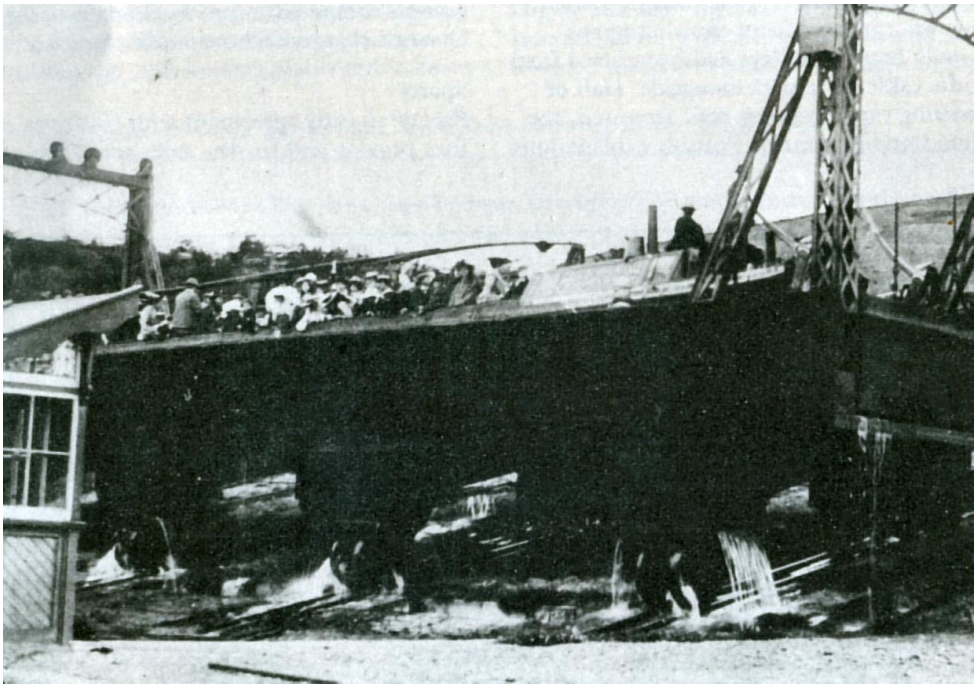

Figure 22: Leaking caisson (after FIPT 1985, 20)

Figure 23: Plane 1 following completion of works.

Figure 24: Plane 2 nearing completion of works.

Figure 25: Plane 2, southern trap, side-drain above (left) and cross-drain below (right).

Figure 26: Plane 2, northern trap and abutting stone-lined drain above (right) and cross-drain immediately below (left).

Figure 27: Detail of mounting points on central dock.