



Picture 24 - Redundant brickwork / masonry pier between pier 5 and west abutment.



Picture 25 - metal service pipes suspended beneath bridge deck



Picture 26 - Location of TBM used for bed profile measurements.

**14.Parking**

Parking					
	Off Road	Verge	C/ Way	Safe Parking	Comments
			Yes		There is free unrestricted parking adjacent to Darley Mills restaurant on the east side of the bridge and roadside parking to the west side of the bridge, maximum vehicle width 3.1m, no height restriction, 7.5 ton weight restriction on bridge deck.

**15.Access**

Access					
	Good	Fair	Poor	No Access	Comments
	Yes				Dive van was parked in designated road side parking to west side of the bridge and diver was able to dress in and enter water from river bank (perennial vegetation previously cleared by client)

**16.Environmental**

Environmental						
	Bees	Voies	Badgers	Cray Fish	Himalayan Balsam	Japanese Knotweed
	Yes	Possible		Possible	Yes - north east bank	

**17. Completion of Examination**

Completion of Examination		
Complete Examination	Parts Not Examined	Reason
	Base of upstream piers 3, 4 and 5 - restricted access / view	Large amounts of accumulated debris including tree trunks in excess of 300mm diameter and 4m length, unable to clear by hand.

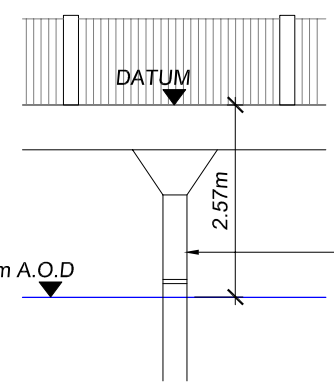
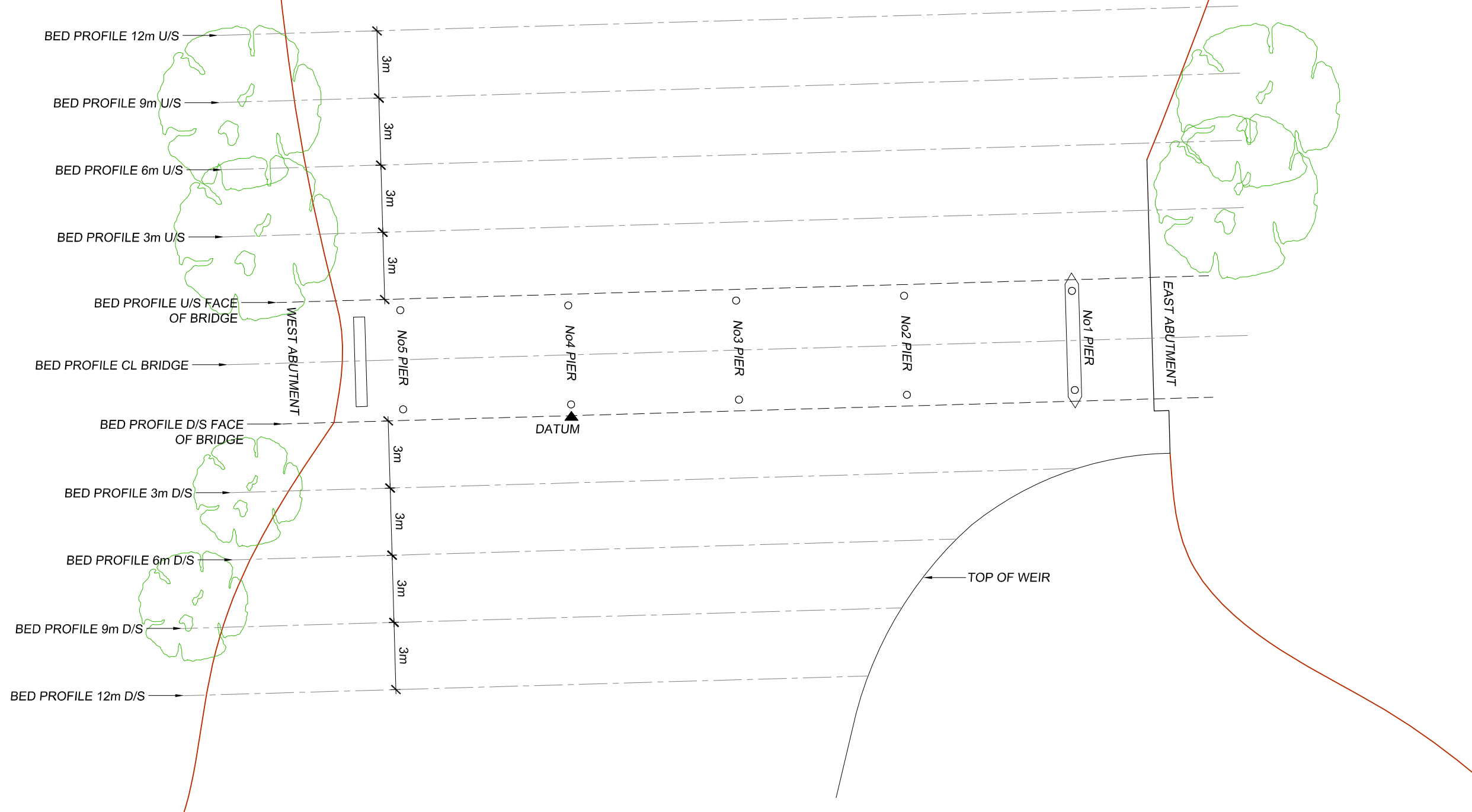
**18. Brief Condition Assessment**

Brief Overall Condition Assessment			
Poor	Fair	Good	Underwater elements appear to be in fair condition. Superstructure is detailed in a separate report but considered to be in poor condition.
	Yes		

**19. Recommendations**

Recommendations	Approximate Quantity
Urgent - Undertake considerable and specialist repairs to spalled concrete and badly corroded reinforcement visible on over 50% of the reinforced concrete bridge soffit and bridge support beams.	200m <sup>2</sup>
Minor - Replace are of missing pitched stone adjacent to 4th keystone from east side of weir.	0.5m <sup>2</sup>
Moderate - Consider permanent repairs to undermining and scour along upstream face of weir apron	150m <sup>3</sup>
Moderate - Consider repair to undermined scour apron on leading edge of pier 1	1m <sup>3</sup>
Moderate - Clean and treat / paint piles to prevent further decay, consider NDT to validate estimations of section loss.	25m <sup>2</sup>
High - Remove vegetation from pier 1, abutments and downstream east wingwall. Poison roots where necessary to prevent re-growth. Re-grout ay open joints.	5m <sup>2</sup>
Minor - Further investigation of settlement of approaches to bridge deck.	30m <sup>2</sup>
Minor - Repair / Replace anti-trespass fencing along service pipes suspended from either side of the bridge	40m
High - Remove considerable amount debris from riverbed in vicinity of bridge	5-10m <sup>3</sup>
High - Remove or repair service pipes supported beneath bridge deck, spanning between abutments	80m

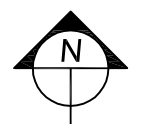
- PLAN -



DATUM LEVEL:  
49.94m A.O.D

- DATUM DETAIL N.T.S -

NOTES:  
- ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED  
- DO NOT SCALE  
- CONFIRM ALL DIMENSIONS ON SITE



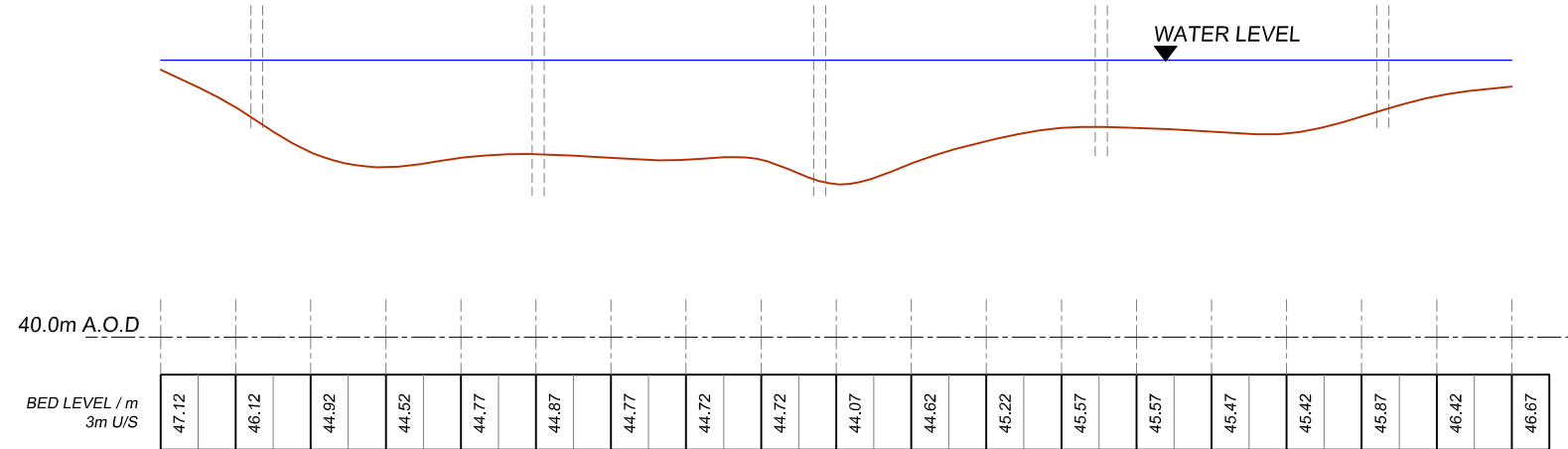
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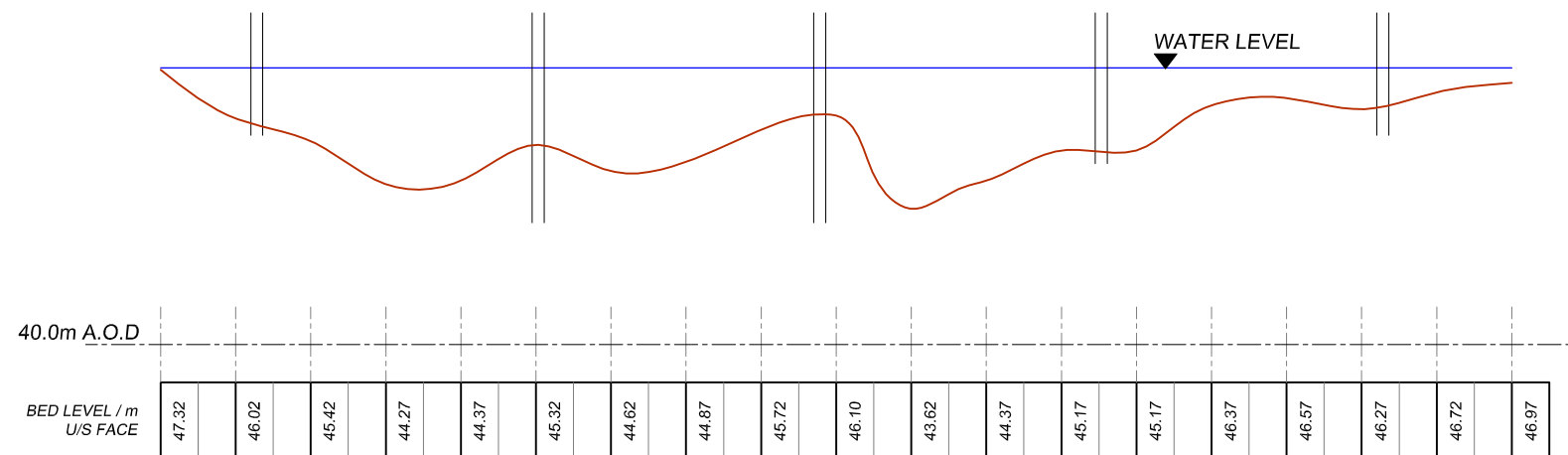
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BRIDGE INSPECTION

Drawn by: R.R.	Date: 12.07.13	Scale: 1:200	Drawing No: MLM / 13 / 001	Rev:
			SHEET 1 / 5	

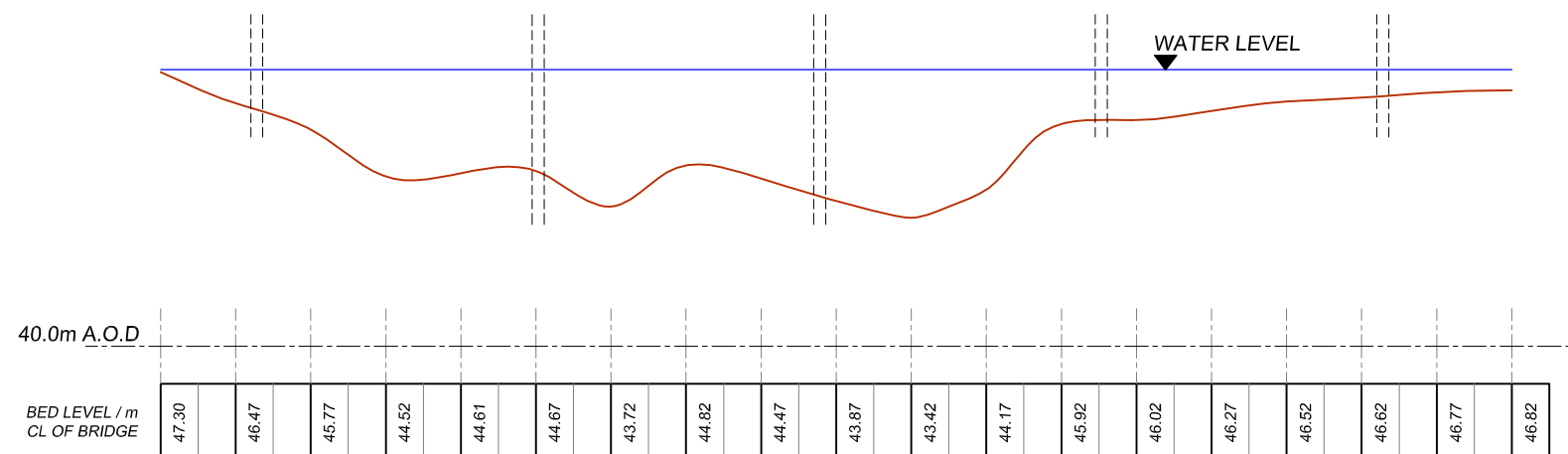
- SECTION @ 3m U/S OF BRIDGE -



- SECTION @ U/S FACE OF BRIDGE -



- SECTION @ CL OF BRIDGE -



NOTES:  
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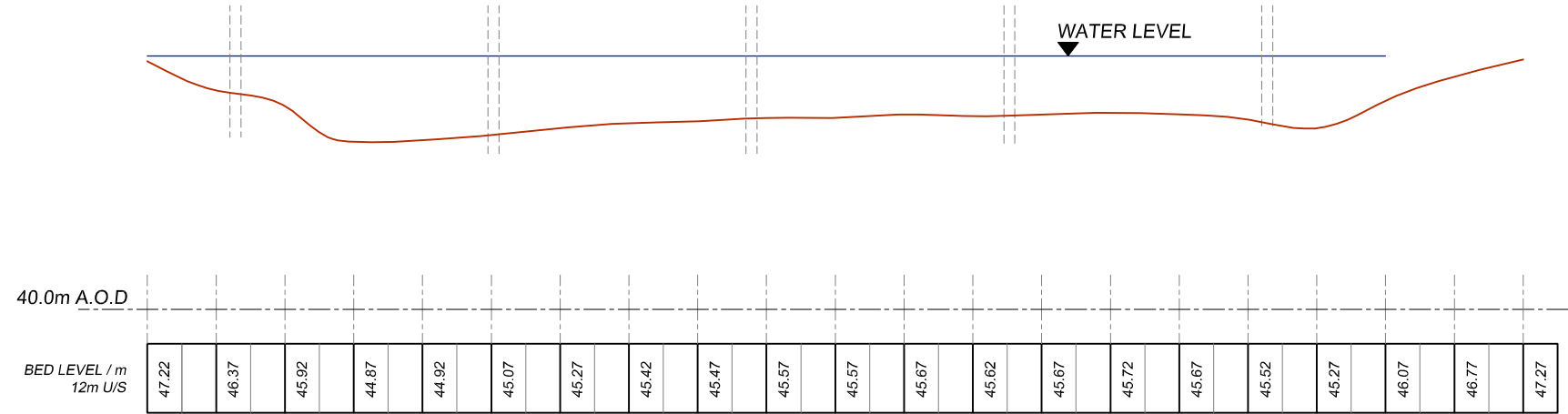
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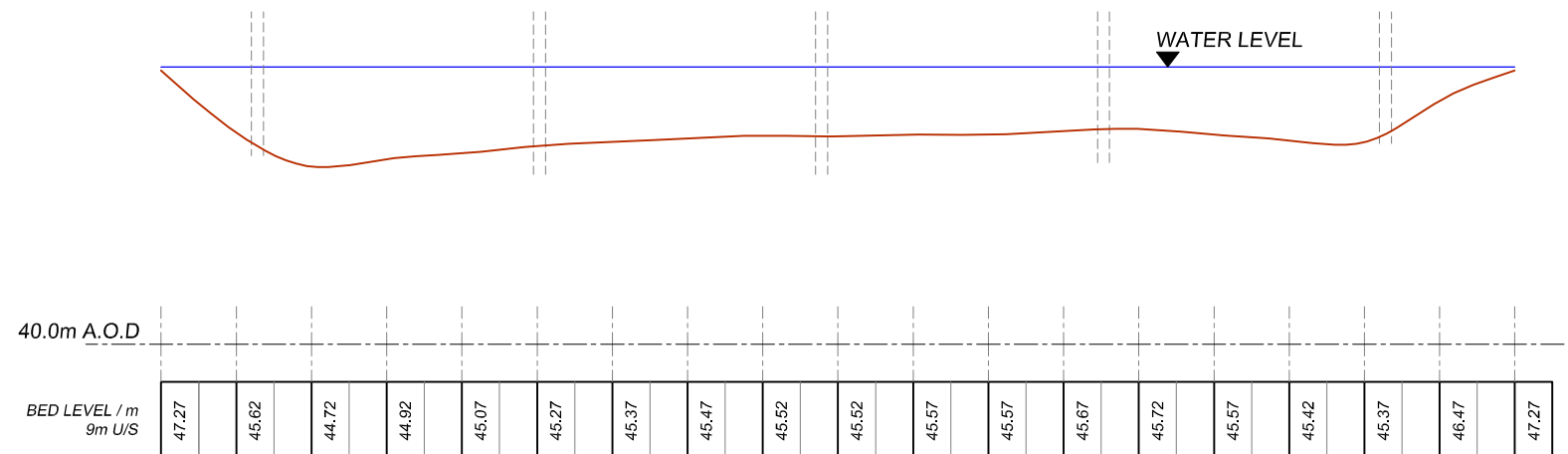
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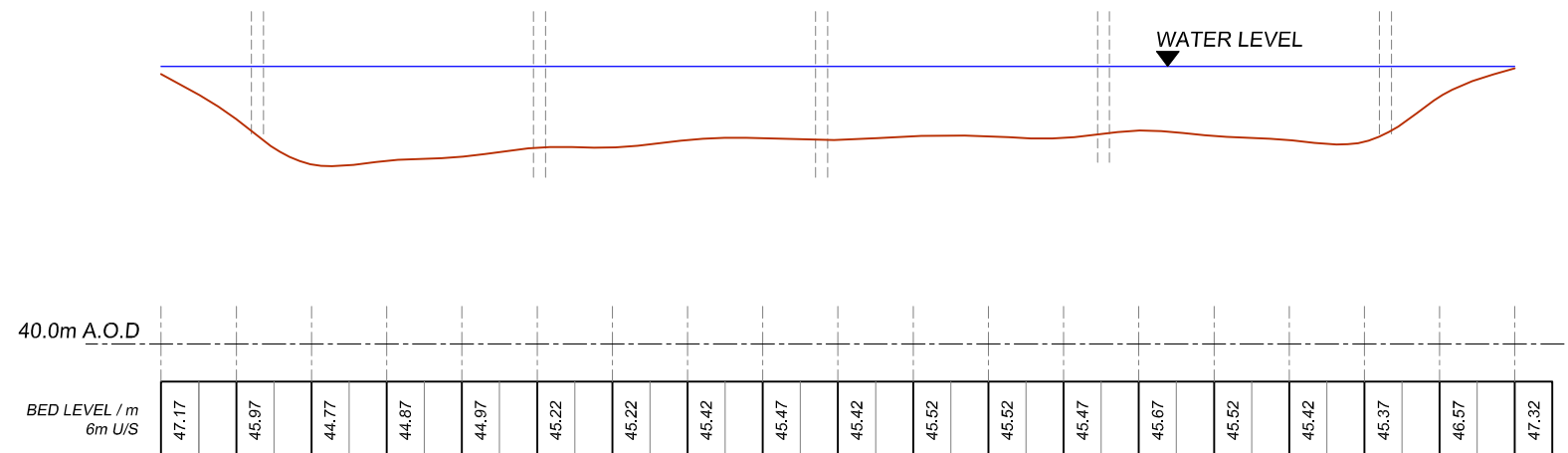
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- SECTION @ 9m U/S OF BRIDGE -



- SECTION @ 6m U/S OF BRIDGE -



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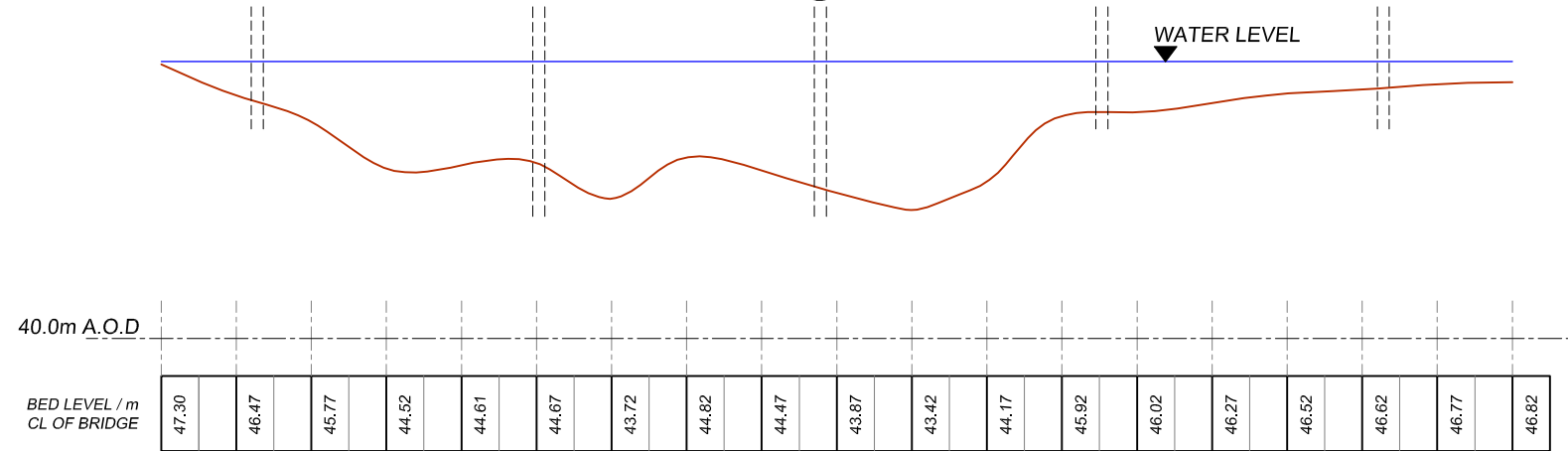
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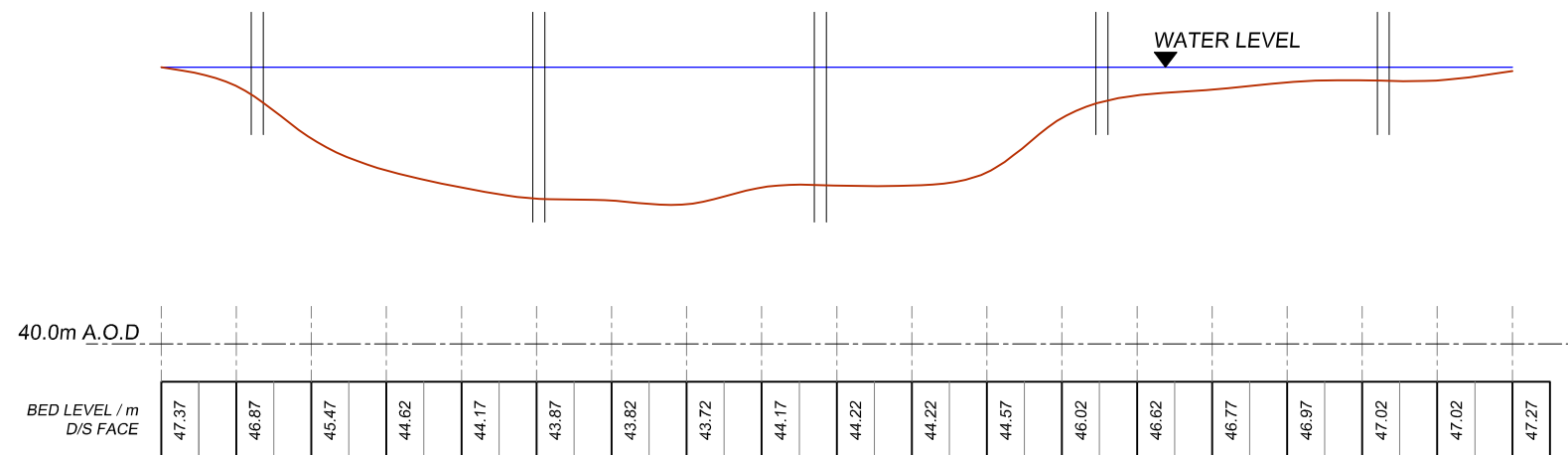
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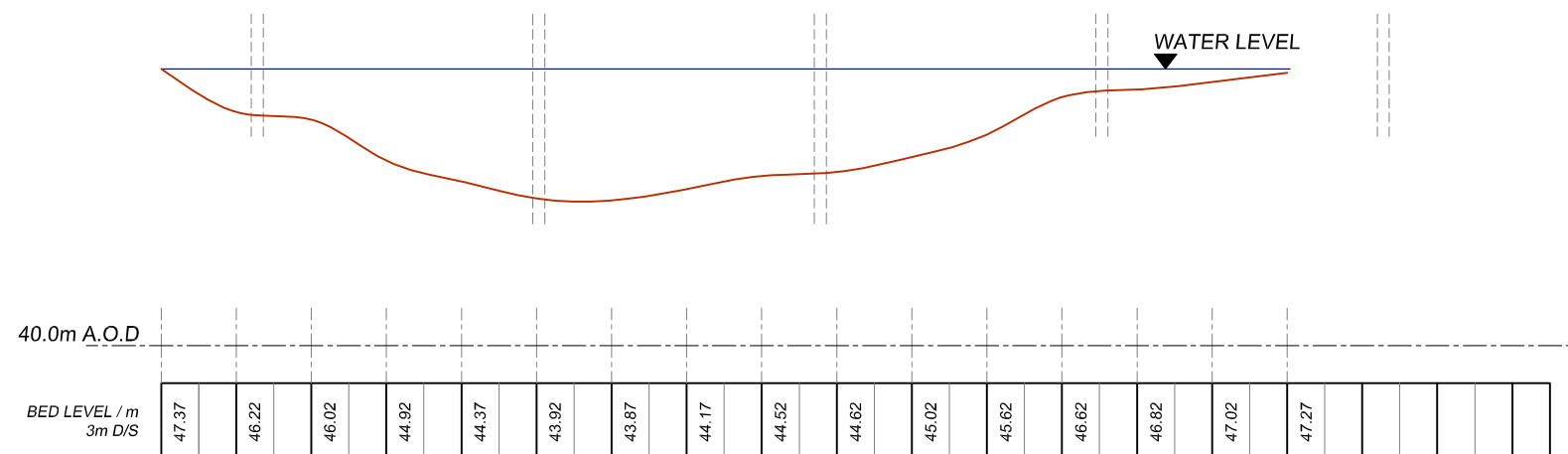
- SECTION @ CL OF BRIDGE -



- SECTION @ D/S FACE OF BRIDGE -



- SECTION @ 3m D/S OF BRIDGE -



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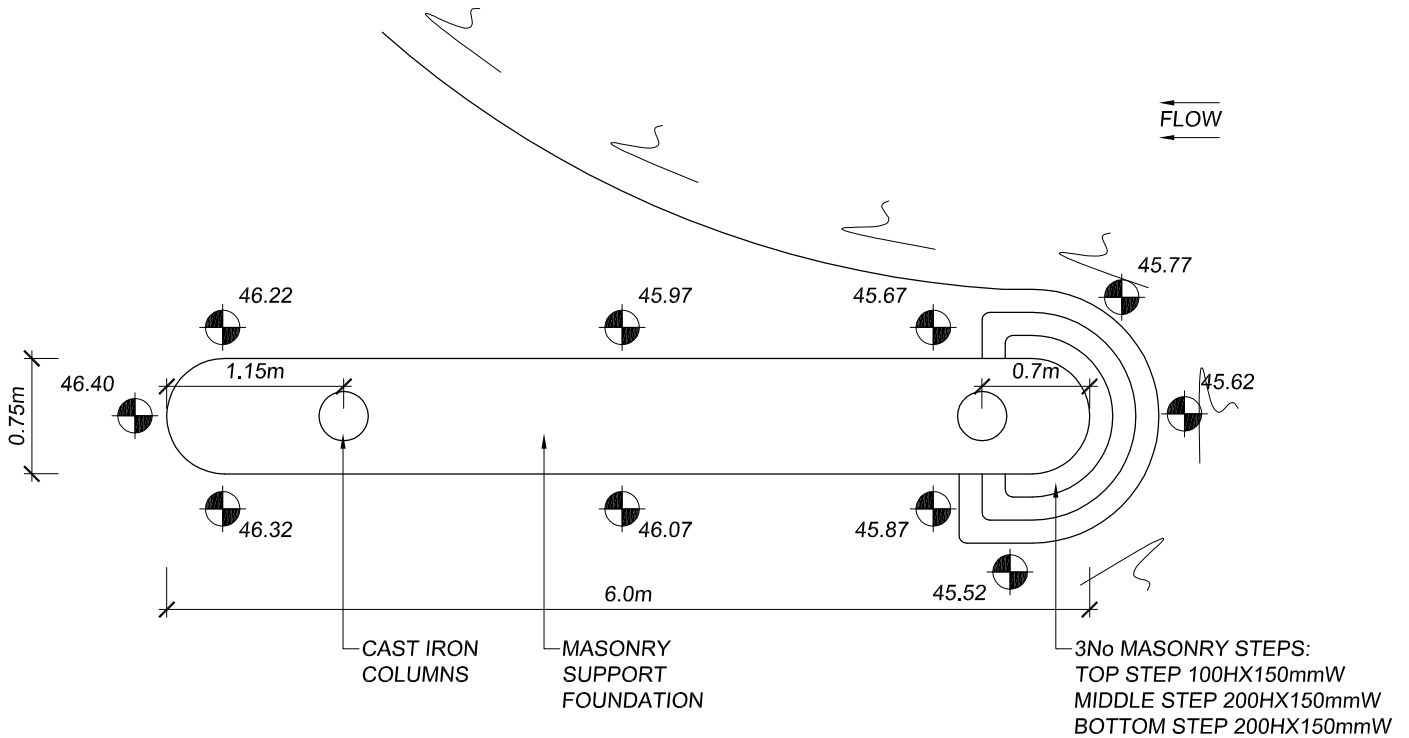
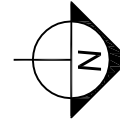
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 BRIDGE INSPECTION

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R.R.	12.07.13	1:200		





- DETAIL OF PIER No1 -



**NOTES:**

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0.95 : BED LEVEL /m



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BRIDGE INSPECTION: DETAIL

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**Appendix C**  
**Archaeological Report**

Historic Structure Recording at

# **DARLEY ABBEY MILLS BRIDGE**

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For MLM Consulting

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John Duffy MA AIfA

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L~P:ARCHÆOLOGY

Historic Structure Recording at

# DARLEY ABBEY MILLS BRIDGE

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Client: MLM Consulting

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Local Authority: Derby City Council

---

NGR: 435320, 338770

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Planning App: N/A

---

Author(s): J. Duffy

---

Doc Ref: LPI539E-HBR-v1.1

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Date: July 13

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## L-P:ARCHÆOLOGY

A trading name of L - P : Heritage LLP.

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# Abstract

A survey was carried out at Darley Abbey Mills Bridge, Derby. The archaeological survey was implemented as part of a planning condition in order to understand any implications during proposed flood alleviation works.

Site work was carried out by John Duffy on 1<sup>st</sup> July 2013. The report has been prepared by John Duffy of L – P : Archaeology on behalf of MLM Consulting.

The current bridge has a concrete upper structure on iron columns with a stone pier visible above the water line at the eastern end of the bridge. The bridge is the main access to the Darley Abbey Mills Complex from the west and forms a crossing point of the Derwent River. The site is within the area of the Derwent Valley Mills Complex World Heritage Site.

The objectives of the survey were to identify the different phases of construction of the bridge and attempt to date them. The report comments on the significance of the bridge structure and any implications for further work.

The earliest phase appears to be two stone piers possibly surviving from a single span stone bridge. The latest is the 1930s concrete upper structure which sits on iron columns with an attached date marker of 1853. Timbers visible in the river bed are likely to be associated with construction or repair work rather than an earlier bridge. The site is of significance due to its association with the mill complex as it forms an important access point. The concrete upper structure has little historic value but the iron columns and stone piers are associated with the origins of the mill complex and its continued development.

# 1. Introduction

- 1.1. This structure survey report has been prepared by John Duffy of L - P : Archaeology on behalf of MLM Consulting. The fieldwork was carried out by John Duffy of L – P : Archaeology 1<sup>st</sup> July 2013.
- 1.2. The site is the toll bridge located at Darley Abbey Mills, Derby (FIGURE 1 AND PLATE 1, PLATE 2). The NGR is 435320,338770.
- 1.3. The bridge is within the Derwent Valley Mill complex, a UNESCO World Heritage Site, reference 1030 (WHC.UNESCO.ORG/EN/LIST/1030).
- 1.4. The work was carried out in accordance with the written scheme of investigation prepared by John Duffy of L – P : Archaeology (DUFFY 2013) to fulfil the requirements of the brief prepared by Black & Veatch (BLACK & VEATCH 2013).
- 1.5. This report should be read in conjunction with the desk based assessment (OA NORTH 2013) and the condition survey by MLM Consulting.



## 2. Site Background

### 2.1.PLANNING

- 2.1.1. In March 2012 the Department for Communities and Local Government issued the National Planning Policy Framework (NPPF) (DEPARTMENT FOR COMMUNITIES AND LOCAL GOVERNMENT 2012). Section 12 of this document sets out planning policies on the conservation of the historic environment.
- 2.1.2. In considering any planning application for development the local planning authority, Derby City Council, must consider policies E19 (Listed Buildings and Buildings of Local Importance) and E21 (Archaeology) within the City of Derby Local Plan review (2006).
- 2.1.3. The structure is within the UNESCO World Heritage site of the Derwent Valley Mill complex.

### 2.2.SITE CONDITIONS

- 2.2.1. The site is currently still in use as a toll bridge crossing the River Derwent.
- 2.2.2. At least two phases of bridge construction are visible forming the current bridge and it was the purpose of this survey to identify any further phases of the bridge or the existence of earlier phases.
- 2.2.3. The river banks were also included in the survey with the banks to the south west and north east accessible. The bank on the south east of the bridge was a wall associated with the mill complex with a weir to the south.
- 2.2.4. The banks were overgrown with vegetation, with only the south west bank cleared. The south east bank is a vertical wall formed during the construction of the mill complex with a weir to the south.

## 3. Aims

3.1.1. The general aims of the investigation were:

- ◆ To secure and promote the understanding and appreciation of the structure.
- ◆ To document the structure prior to material changes and to deposit a permanent record of the structure in a suitable archive.
- ◆ To collect enough information to allow a suitable mitigation or conservation strategy to be devised, if required. Any such strategy could consist of further fieldwork followed by a programme of post fieldwork analysis, reporting and possible publication of the results.

3.2. The specific aims of the investigation were:

- ◆ To investigate the different phases of the bridge as outlined in the desk based assessment (OA NORTH 2013).
- ◆ To identify and record earlier phases of the structure surviving below the existing water level.
- ◆ To record specific features and markings identified in the desk based assessment (OA NORTH 2013).

## 4. Archaeological & Historic Background

- 4.1. Below is a summary of the historical background of the site. For a more detailed account please refer to the desk based assessment (OA NORTH 2013).
- 4.2. The Darley Abbey Mills bridge spans the River Derwent and forms an access to the mill complex from the west and is part of the Derwent Valley Mills Complex World Heritage Site. However, it is poorly documented and has been heavily modified throughout the 19<sup>th</sup> and 20<sup>th</sup> centuries.
- 4.3. The current bridge deck, parapet and railings date from the 1930s but earlier phases of construction are visible, including stone piers onto which the current cast iron columns built.
- 4.4. The Liberty Map of 1811 shows a bridge on the site, however it is likely that there has been a bridge at the site since the construction of Long Mill, c. 1782-3 and the development of the Boar's Head Mills Complex (OA NORTH 2013).
- 4.5. It is also possible that this site may have provided a crossing point in the Medieval period allowing access to Darley Abbey.

## 5. Methodology

- 5.1. For a full description of the archaeological methodology please refer to section 4 of written scheme of investigation (DUFFY 2013).
- 5.2. There was limited access during the survey of the banks. Parts of the north east bank were overgrown and access was also restricted due to the presence of a bees' nest.
- 5.3. Vegetation was cleared from the south west bank but this also was used as the main access point for the dive team.
- 5.4. There was no access to the north west bank at the time of the survey.

## 6. Results

6.1. Recording was carried out on the bridge structure at Darley Abbey Mills and along the banks to the north and south of the bridge. The results of this survey have been divided into three sections below. Section one will discuss the visible bridge structure. Section two will discuss the results of the underwater survey and Section three will discuss the results of the bank survey.

### 6.2. RESULTS OF THE BRIDGE SURVEY

- 6.2.1. The upper structure of the bridge is a concrete construction with a tarmac surface (PLATE 3). The road surface and pavement are both tarmac and separated by concrete kerbs. The edge of the bridge is defined by a series of concrete pillars, approximately 1.26m high, separated by iron railings mounted on a concrete base (PLATE 4). At the east end of the bridge are a set of tall iron gates which would allow the bridge to be closed to any traffic.
- 6.2.2. The upper structure is constructed using pre formed concrete sections to form the base of the road and concrete beams supported by the iron work below (PLATE 5).
- 6.2.3. The bridge is built on five iron piers placed at irregular intervals. The iron columns all extend to the river bed with the exception of the eastern pier (discussed below). The four identical piers are formed by two iron columns supporting an iron cross beam (PLATE 6). The concrete upper structure is mounted directly onto these piers.
- 6.2.4. The central pier of the bridge has a date marker on both the north and south sides (PLATE 7). The date is AD 1853 which indicates the iron piers are likely to date from then. However, as the date markers are attached to the end of the iron beams it is possible that they are a later addition.
- 6.2.5. The eastern pier is of a different construction to the other four piers and is formed by short iron columns supporting an iron beam but mounted on stonework rather than directly on the river bed (PLATE 8). The stonework consists of large limestone blocks of varied sizes with two tiers visible above the water line with further stonework below (see underwater survey results

below).

- 6.2.6. The stonework shows evidence of repair, with iron straps across the stone joints, and also earlier columns with iron frames and gaps in the stonework for possibly timber posts (PLATE 9). It is unclear whether the stonework was constructed around earlier timbers from a previous bridge or if the posts were part of the construction of the bridge. The short iron posts mounted on the stonework suggests this construction is earlier than the iron work which was adapted at this end rather than the removal of the stone pier during construction.
- 6.2.7. Similar stonework to the eastern pier was also visible forming the eastern and western revetment walls on the river bank (PLATE 10). The revetment walls were constructed with two courses of large irregular size blocks with concrete above for the later concrete upper structure. The stonework had cutaways along the top suggesting joints for an earlier upper bridge structure.
- 6.2.8. Located approximately 2.65m east of the western revetment was a brick wall (PLATE 11) on top of a stone base which was below the waterline (see underwater survey results below). The wall appeared to be stepped and bricks had been removed from the top of the wall. The top two courses of the wall had slightly smaller bricks, measuring 225mm by 110mm by 50mm, and were a course of stretchers over a course of headers. The remaining courses were the same pattern but with bricks measuring 230mm by 100mm by 75mm. It is likely that this brick work was associated with the repair of the bridge or construction of the concrete upper structure and it utilised an existing older stone pier.
- 6.2.9. The survey of the bridge structure above the waterline identified two clear phases of construction. The latest phase was the concrete upper structure dated to the 1930s (OA NORTH 2013) which was built upon the earlier iron bridge which had a date marker of 1853 attached. However, there is a possibly earlier phase identified with the stone work forming the eastern pier, the revetments and below the brick work near the western end of the bridge. The earlier posts within the eastern pier stonework suggest an earlier date with the iron columns

a later addition.

### **6.3.RESULTS OF THE UNDERWATER SURVEY**

- 6.3.1. The underwater survey identified several features associated with the development of the bridge structure. At the eastern end of the bridge, surrounding the eastern pier and extending to the revetment wall and south to the weir was a concrete apron. This apron is likely to be of a similar date to the refurbishment of the bridge in the 1930s when the concrete upper structure was added.
- 6.3.2. Two stone piers were identified during the underwater survey at the eastern and western limits of the bridge. The eastern pier, as discussed above, had two courses of stone work visible above the waterline. The pier extended to the river bed and was curved at its northern and southern limits and had two steps at the northern end below the water line. The east, west and south sides were vertical.
- 6.3.3. The western stone pier did not have the curved northern and southern ends and was more rectangular. However, it was also stepped at its northern end in a similar way to the eastern pier. The brick work, discussed earlier, was located on top of this stone pier.
- 6.3.4. It is possible that the eastern and western stone piers are the remains of an earlier bridge on the site before being replaced by the iron structure. The adaptation of the iron columns on the eastern pier suggest the reuse of an earlier structure rather than the removal of the stone work to build the iron bridge. As there was no indication of other stone piers on the river bed it would be likely that this would have been a single span stone bridge.
- 6.3.5. Several timbers were also identified during the underwater survey near the eastern end of the current bridge. A tapered timber was recorded between the eastern pier and the second pier from the east on the northern limit of the bridge. This timber measured 0.25m by 0.25m and survived to a height of 1m above the river bed.
- 6.3.6. A group of four timbers were identified between the middle pier and the pier to the east on the southern edge of the bridge. These four timbers formed a

square and were 0.25m apart and each measured 0.25m by 0.25m and tapered to a point above the river bed. A angled raker pile was identified immediately to the south of these timber and was a similar size and survived 1.2m in length.

6.3.7. As only a limited number of timbers were identified in the river bed it is difficult to get a clear understanding of their function. It is possible they formed an earlier timber bridge pre-dating the stone piers but this is believed unlikely due to the lack of timbers elsewhere in the river bed. It is also possible that these timbers were associated with the construction or repair work on one of the first two phases of the bridge.

6.3.8. A single larger timber, 0.5m by 0.5m, was identified to the north of the four timbers and angled into the concrete apron. It measured 3.5m in length. It is likely that this larger timber, based on the relationship with the concrete apron and its size, was associated with the construction of the concrete apron.

6.3.9. Overall the underwater survey identified the two stone piers, possibly indicating an earlier bridge, and several timbers more likely to be associated with construction and repair work rather than an earlier timber bridge.

#### 6.4.RESULTS OF THE BANK SURVEY

6.4.1. The north east bank had heavy vegetation along the edge of the river and no archaeological remains were visible. The low lying river edge was stepped up by a low retaining wall approximately 1m in height (PLATE 12). To the east of the retaining wall was a raised embankment with some tree cover (PLATE 13). The eastern edge of the embankment is defined by another retaining wall as the ground level steps down again to road level (PLATE 14). No archaeological features were identified but the embankment appears to be a later addition and archaeological deposits maybe preserved below it.

6.4.2. The south west bank was cleared of vegetation and was used as the access point for the dive team to the river. The bank slopped down from the road level to the edge of the water and no archaeological features were visible.

6.4.3. The bank to the south east of the bridge is defined by a revetment wall forming



part of the mill construction with the weir to the south (PLATE 15). The construction work in this area would have likely disturbed any earlier archaeological deposits.

- 6.4.4.** Access was not permitted to the north west bank and vegetation cover meant that no archaeological features were visible when viewing the bank from the bridge or eastern river bank.

## 7. Analysis & Conclusions

### ANALYSIS

- 7.1. The results of the historic structure survey and associated research indicate that there are likely to be at least three phases of development.
- 7.2. The survey suggests the latest phase of construction was the concrete upper structure forming the modern bridge surface built in the 1930s (OA NORTH 2013). This concrete upper structure was built onto the earlier iron bridge which, based on the date markers, dates from 1853. An earlier single span stone bridge may predate the iron bridge and it was reused in the construction of later phases of the bridge. This earlier phase of bridge maybe the bridge visible on the earlier maps dating from the early 19<sup>th</sup> century.
- 7.3. The timbers identified in the river bed could be part of an earlier structure though it is more likely they are associated with construction or repair work.
- 7.4. There is no evidence to suggest any further structures visible along the river banks to the north and south of the bridge. However, the raised nature of the north eastern bank suggests structures could be preserved below ground level.
- 7.5. The bridge forms part of the Darley Abbey Mills complex and is a significant part of the site providing a crossing of the river allowing easy access to the mill site from the west. Although an individual structure it should not be treated in isolation and forms part of the Derwent Valley Mill Complex, a World Heritage Site.

### CONCLUSIONS

- 7.6. The original stone structure may date from the late 18<sup>th</sup> or early 19<sup>th</sup> century and would have formed a single span bridge associated with the growing mill complex. This is likely to be the bridge visible on the 1811 Liberty Map (OA NORTH 2013). The bridge appears to have been rebuilt using iron piers in the mid 19<sup>th</sup> century with a date marker of 1853 attached to the bridge. This is likely to be the bridge depicted in the Illustrated Times in 1862 (OA NORTH 2013: PLATE 2). The final phase of bridge is the concrete upper structure from the 1930s rebuild.
- 7.7. The bridge forms part of the Darley Abbey Mill and provide a vital access across the

River Derwent. As such it also forms part of the Derwent Valley Mills Complex World Heritage Site. The concrete upper structure has little historic value being late in the development sequence and visually not in keeping with the mill site as a whole. The iron piers date from when the mill complex was at its height and is indicative of the industrial nature of the site. The stone piers may represent the earliest phase of construction although little of this structure survives above the water line.

## **RECOMMENDATIONS**

- 7.8. Any recommendations for further work on the structure will be influenced by design proposals. It is unlikely that the upper structure will need further recording or preservation. However, the iron piers represent a bridge constructed during the height of the mill complex and should be preserved in situ.
- 7.9. As with the iron piers it is recommended that the stone piers be preserved in situ as they provide the surviving evidence of the earliest identified phase of the bridge.
- 7.10. If any work is undertaken on the river bed it is suggested that further detailed study of the timbers, including dendrochronological or radiocarbon dating be undertaken if possible. It would help better understand these timbers and their function, such as whether they are associated with a construction phase or are earlier.
- 7.11. It is not recommended that further work be undertaken on the banks to the south of the bridge. To the north of the bridge it is recommended that further archaeological work be undertaken should ground disturbance be undertaken to the north east. It must be noted that further work maybe needed on the north west bank as it was not available for survey at this time.

# Sources Consulted

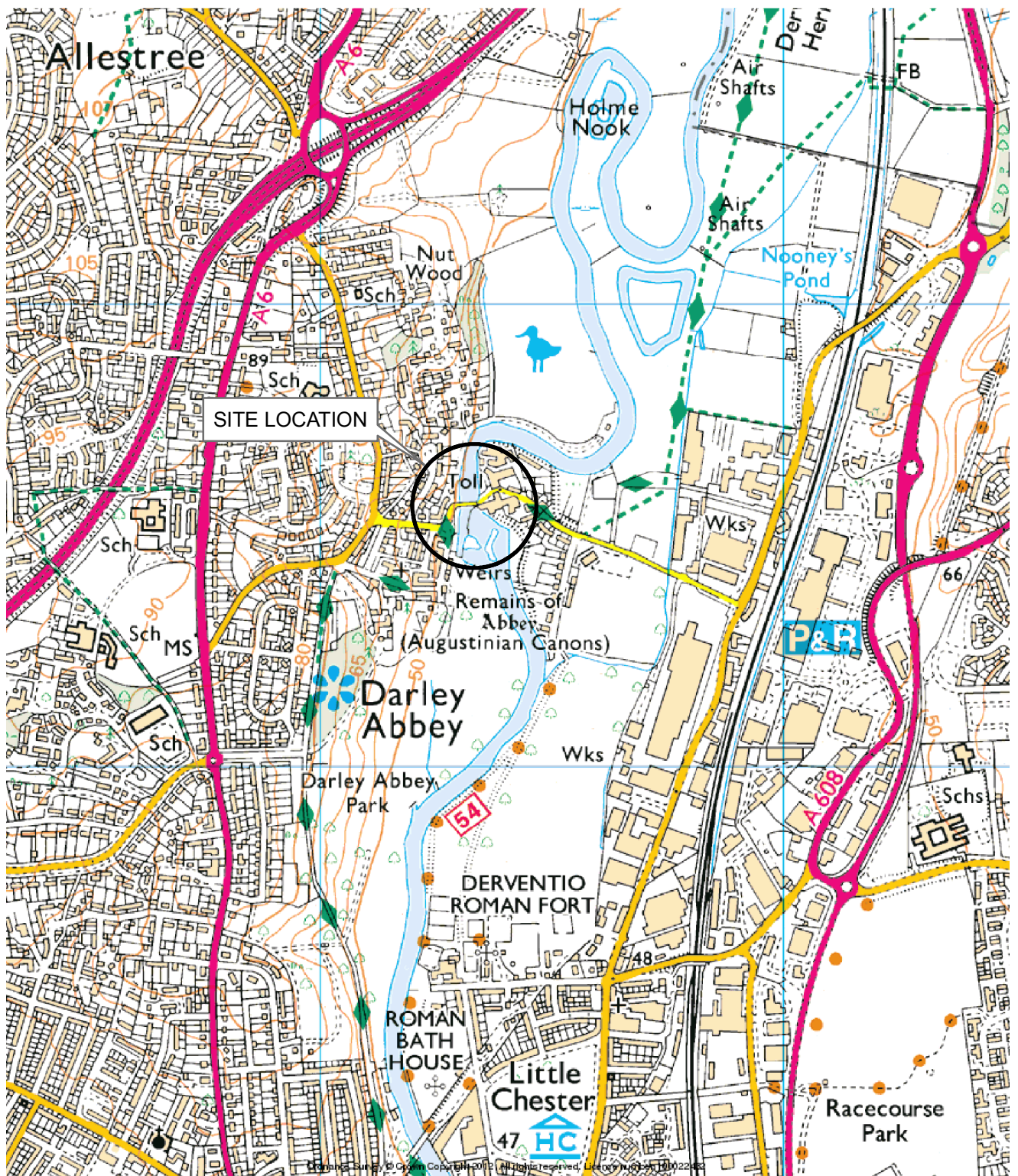
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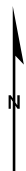
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# FIGURES

FIGURE I // Site location



0 750m



PROJECT // I539E - Darley Abbey Mills Bridge

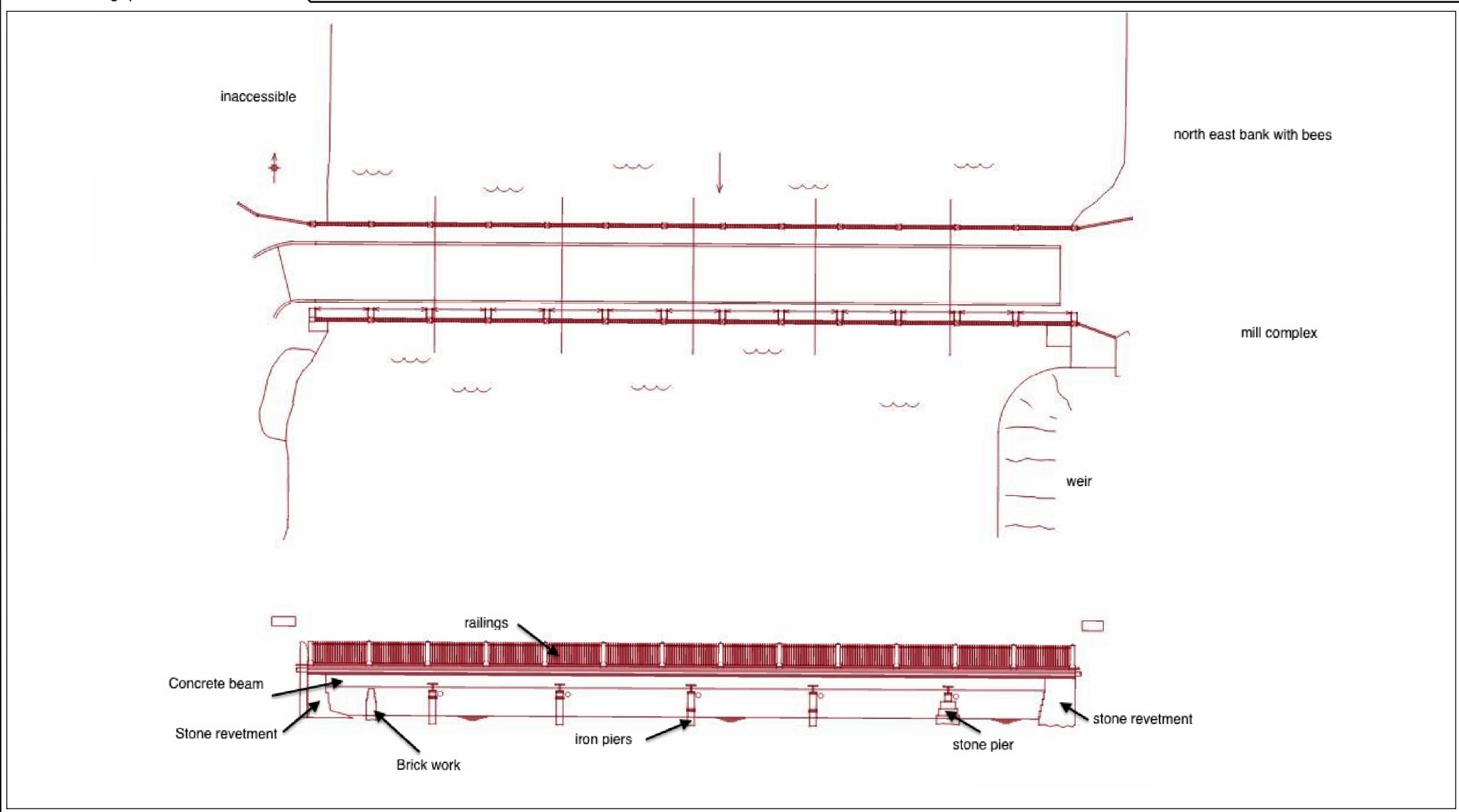
DESCRIPTION // Site location

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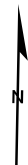
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FIGURE 2 // Bridge plan and elevation



0 20m



PROJECT // I539E - Darley Abbey Mills Bridge

DESCRIPTION // Bridge plan and elevation

Drawings provided by MLM Consulting

DOC REF: LP I539E-HBR-v1

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# PLATES