

8. Darley Abbey

8.1 Introduction

- 8.1.1 The Darley Abbey area is located approximately 2km upstream of Derby. It comprises:
- Darley Abbey Mills, which are a collection of historic mill buildings (designated a World Heritage Site) and residential properties located on the east bank of the Derwent (on Folly Road and Haslam's Lane), all bounded by existing flood defences;
 - undefended residential properties located on the west bank of the Derwent.
- 8.1.2 Darley Abbey Mills is bounded by the River Derwent to the north, west and south, with low lying land to the east that acts as floodplain. The existing flood defences are a combination of flood walls and embankments located within the residential gardens of Folly Road and Darley Abbey Mills properties, bordering the historic buildings and business units within the Mills site and the western boundary of the Derby Rugby Club grounds. They provide protection against events smaller than a 1 in 50 annual chance flood. During a flood the defences form a 'ring-bank' around Darley Abbey Mills which is completely surrounded by either the River Derwent or the flooded low lying land either side of Haslams Lane.
- 8.1.3 There are no existing flood defences to protect the Darley Abbey west bank properties. Flooding of these properties is also expected to commence for events exceeding the 1 in 50 annual chance flood. It should be noted that 'Mill House' is particularly low lying, with flooding of this property predicted to occur during a 1 in 20 annual chance flood.
- 8.1.4 The proposed approach to flood risk management at Darley Abbey Mills was developed through consideration of the feedback from local residents and business owners, and through steering group meetings between the Environment Agency, Derby City Council, Derbyshire County Council, English Heritage and the Derwent Valley Mills Partnership Group.
- 8.1.5 It is not proposed to raise the existing flood defences, or construct new defences, at Darley Abbey. The proposed work at Darley Abbey is to:
- significantly upgrade the bridge over the river;
 - maintain the existing flood defences and adopt a site specific flood management plan;
 - install a new chamber and non-return valve at the southern end of Folly Road to prevent flood water from the River Derwent backing-up in to the surface water drainage system; and
 - offer flood resilience measures to properties on the west bank of the river.
- 8.1.6 The option to raise the defences will be reviewed again when the existing assets come to the end of their design life.

8.2 Principles for not raising the existing defences

8.2.1 Six key determining factors have shaped our preferred approach at Darley Abbey. .

Flood risk

8.2.2 The impact on flood risk at Darley Abbey varies dependent on the size of flood event. In smaller more frequent flood events flood levels are reduced. In larger less frequent flood events there is an increase in flood levels at Darley Abbey. This means that the defences at Darley Abbey Mills are less likely to be overtopped, but if they do then the depth of flooding will increase. The existing defences will provide protection against overtopping in a 1 in 50 annual chance event, and flood depths will only increase in events with an annual probability of less than 1 in 75. If predicted climate change is taken into consideration then this will result in a gradual reduction in the standard of protection to approximately 1 in 30 in 60 years' time. (Further detail is provided in the Flood Risk Assessment.)

Economic regeneration

8.2.3 Darley Abbey Mills is a key part of the Derwent Valley Mills World Heritage Site. Derby City Council has an adopted Regeneration Strategy for the Mills which recognises that the best way to preserve them is to find an economically viable future use. Whilst the Regeneration Strategy has an aim to reduce flood risk to the Mills to promote regeneration, the current principal landowner has cast doubt on whether flood risk is actually hampering regeneration of the site. Currently, small businesses are being successfully encouraged onto the site through lease agreements and these uses are appropriate to Flood Zone 3 sites.

8.2.4 The Regeneration Strategy promotes a reduction in flood risk to the site so that it is protected against a 1 in 100 annual chance event. With this level of protection, the Regeneration Strategy suggests that residential use could be promoted for 1st floor accommodation and above. However, this would require safe access and egress to the site via a new bridge over the river. Derby City Council and the Environment Agency do not consider residential use to be a sustainable use within the Mills and is not being promoted.

Historic Environment

8.2.5 Many of the mill buildings are listed and therefore the impact of any works on the setting of the mills is an important consideration. There is also a UNESCO monitored view of the Mills which adds an additional significant constraint. Discussions with Historic Environment stakeholders confirmed that there is likely to be an acceptable design solution if the defences were to be raised.

Darley Abbey Bridge

8.2.6 The bridge is critical to the sustainability of the site. Whilst not the primary advertised access route to the Mills it is used significantly by those employed there and its loss would have a detrimental economic impact on the Mills. It is also the highest access point to the Mills. Therefore in more frequent, less severe flood events when Haslam's Lane has flooded, the bridge provides the only means of access to the site. This enables

the Mills to continue to be used for economic activity as well as providing safe access for residents.

- 8.2.7 The bridge is currently in poor structural condition and its ownership has devolved to the crown meaning no-one is currently maintaining the bridge. Its repair or replacement is considered essential to the sustainable economic future of the Mills and as a flood access route.

Consultation

- 8.2.8 A drop-in session was held at Derby Rugby Club on 1st May 2013. Directly affected landowners and residents, within the Darley Abbey Mills area, were invited and were sent an information pack prior to the event which explained the impact of Our City Our River on the area and the height to which defences would need to be raised to protect against a flood with a 1% (1 in 100) chance of occurring each year. Key aims of the consultation were to:

- Advise residents of their current flood risk, and how much the existing flood defences would need to be raised;
- Understand any issues from the residents' perspectives that may result from raising the existing defences; and
- Gain first-hand accounts of previous flooding experiences in the area and of problems with the existing flood defences.

- 8.2.9 A total of 45 people attended the event and 28 feedback forms were provided, as well as photographs and first-hand accounts of previous flooding in the area. Attendees included residents from the west bank of the river.

- 8.2.10 Seepage beneath the existing defence was the primary concern for 70% of residents on Folly Road rather than overtopping of defences, as past flooding in their gardens was as a result of seepage only. The lower flood levels in smaller flood events would have a similar benefit on flood levels from seepage. In larger events where flood levels would be greater, the existing defences would over-top and flooding from seepage would not be the primary cause of flooding. Therefore, the change in flood levels would not have any adverse impact on seepage under the defences.

- 8.2.11 Of the 28 feedback forms received, the majority of respondents (18 respondents; 64%) were either strongly opposed to the raising of existing defences or unsure whether the works are either wanted or required. Only 1 resident (4%) had a strong preference for raising the existing flood defences; the flood defences do not pass through this resident's land-holding but they were keen to have the highest level of flood protection in place. 9 respondents (32%) did not express a preference.

- 8.2.12 Those with a strong preference against any works taking place were located on the southern end of Folly Road, where existing flood defences would need to be raised by up to 0.85m within a few metres of their property. The residents here expressed strong concerns, including: significant visual impacts (refer to Figure 8.1), loss of riverside views, and disturbance during construction. They were happy to accept the existing flood risk even though they may have insurance issues. Further north up Folly Road, residents were largely undecided but had concerns over the details of any raised

defence, especially maintenance of a larger embankment and discontinuity of their gardens; riverside access was also considered to be important.



Figure 8.1: Views of existing flood defence and mock-up of raised defence from property at southern end of Folly Road.

Cost and Funding

- 8.2.13 The cost of the significant engineering works to raise existing flood defences to provide protection against a 1 in 100 annual chance flood with a seepage cut-off has been estimated to be £8.3m. This is a significant sum of money that would not provide any additional flood risk benefit.

8.3 Darley Abbey Mills

General Arrangement Drawing Number	07	Sections Drawing Number	N/A	Package	1
Type of planning application	Works where planning permission is not required <i>Maintenance works to existing flood defence asset</i>				
Proposed use	Flood defence	Works carried out by:	Environment Agency		

Key constraints

8.3.1 Located in Derwent Valley Mills World Heritage Site adjacent to listed buildings.

Scale

8.3.2 Replacing the copings and repointing the joints of an approximately 50m long section of existing flood wall.

Layout

8.3.3 Works will be undertaken on the existing wall between the former fire station and the embankment around the northern edge of Darley Abbey Mills. (Refer to figure 8.2.)



Figure 8.2: View of existing wall at Darley Abbey Mills to be maintained

Access

8.3.4 No impact on existing access arrangements.

Landscaping/external appearance

8.3.5 The copings and repointing will match the existing wall.

Basis of design

8.3.6 The works will maintain the existing standard of flood protection to Darley Abbey Mills and minimise any impact on the World Heritage Site.

8.4 Flood bank at Nevinson House, Folly Road

General Arrangement Drawing Number	07	Sections Drawing Number	N/A	Package	1
Type of planning application	Works where planning permission is not required <i>Maintenance works to existing flood defence asset</i>				
Proposed use	Flood defence.	Works carried out by:	Environment Agency		

Key constraints

- 8.4.1 Works are located within Derwent Valley Mills World Heritage Site and in a residential garden.

Scale

- 8.4.2 Removal of trees and their root systems from an approx. 10m length of existing flood embankment; and the reconstruction of the flood embankment as necessary.

Layout

- 8.4.3 In the garden of Nevinson House, Folly Road. No change to existing layout of defence.

Access

- 8.4.4 No impact on existing access arrangements.

Landscaping/external appearance

- 8.4.5 The embankment will be reinstated with grass.

Basis of design

- 8.4.6 The works will maintain the existing standard of flood protection to Darley Abbey Mills.

Consultation

- 8.4.7 The Environment Agency has discussed the proposed works with the landowner.

8.5 New penstock chamber, Folly Road

General Arrangement Drawing Number	07	Sections Drawing Number	N/A	Package	1
Type of planning application	Permitted development under Schedule 2, Part 15, Class A (b) of the GPDO				
Proposed use	Flood defence	Works carried out by:		Applicant	

Key constraints

8.5.1 Folly Road and the footpath connecting it to Darley Playing Fields forms part of regional cycle network route number 66 and National Cycle Network route number 54.

8.5.2 Trees in vicinity have Tree Preservation Orders.

Scale

8.5.3 Constructing a 3m deep chamber on an existing surface water drain that outfalls into Watermeadow Ditch (also known as Red Ditch) for the installation of a penstock. Relaying sections of drains as required to route all drainage through the proposed chamber. The structure will be below existing ground levels.

Layout

8.5.4 The chamber will be located adjacent to the footpath at the southern end of Folly Road just north of Watermeadows Ditch. A facility to use a temporary pump to remove surface water from Folly Road into the River Derwent will be provided.

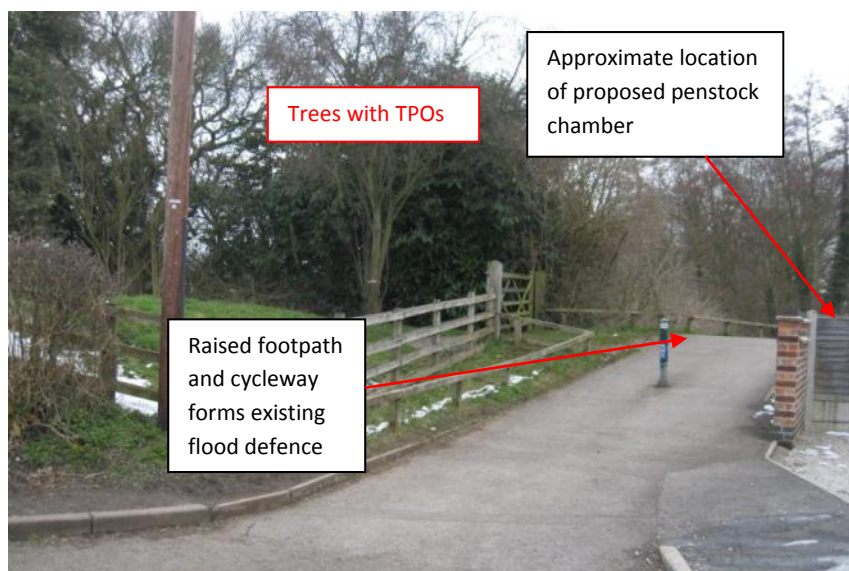


Figure 8.3: Layout of existing path and proposed location of p

Access

8.5.5 Access to private property, the highway and the cycle route will not be permanently impacted by the proposed works.

8.5.6 Any temporary impacts on access will be appropriately managed and advertised, with diversions put in place and times kept to a minimum.

Landscaping/external appearance

- 8.5.7 An access cover to the top of the chamber will be visible in the ground.

Basis of design

- 8.5.8 The penstock chamber is required as a second line of defence to prevent flood water from the River Derwent backing up Watermeadows Ditch and into the surface water drainage system. There is an existing 'flap valve' on the outfall but local residents have reported that in previous flood events this has failed to prevent water backing up the existing drains which has caused flooding to properties at the southern end of Folly Road. This work will provide immediate benefit to local residents in improving the functionality of the existing defences.

Consultation

- 8.5.9 The Environment Agency have discussed the proposed works with the neighbouring resident who is keen to have the works undertaken.

8.6 Individual property protection, Darley Abbey

General Arrangement Drawing Number	07	Sections Drawing Number	N/A	Package	1
Type of planning application	Permitted development				
Proposed use	Flood resilience measures	Works carried out by:	Applicant		

Key constraints

- 8.6.1 The Abbey Public House forms part of a Scheduled Monument.
- 8.6.2 Private residential, commercial and leisure property, many of which are listed buildings.
- 8.6.3 Mill House is located in Darley Abbey Conservation Area.

Scale

- 8.6.4 Property Level Protection (PLP) measures at up to 43no. properties (as shown in Figure 8.4) to raise their threshold of flooding by up to 0.6m. These measures could include, but are not limited to, air brick covers, stop boards, non-return valves and pumps for ground water.

Layout

- 8.6.5 43no. properties will be offered property protection measures as shown on the diagram on the following page.

Access

- 8.6.6 The proposals are not able to provide safe access and egress during a flood event. Therefore an enhanced flood response plan will be agreed with Derbyshire County Council to ensure sufficient prior warning is given to property owners to ensure they have safe access and egress prior to the onset of flooding.

Landscaping/external appearance

- 8.6.7 All PLP measures will be discrete and any specific consents (eg listed building consent) will be secured as required.

Basis of design

- 8.6.8 Whilst overall flood risk is reduced, mitigation is still required for the proposed increase in flood levels in severe flood events (approx. 0.24m in a 1 in 100 annual chance flood).
- 8.6.9 A 0.6m increase in the threshold of flooding is specified as a greater hydrostatic load against an average property might cause structural damage. Structural surveys would be undertaken during detailed design to determine the appropriate standard of protection that could be achieved by PLP for each property.

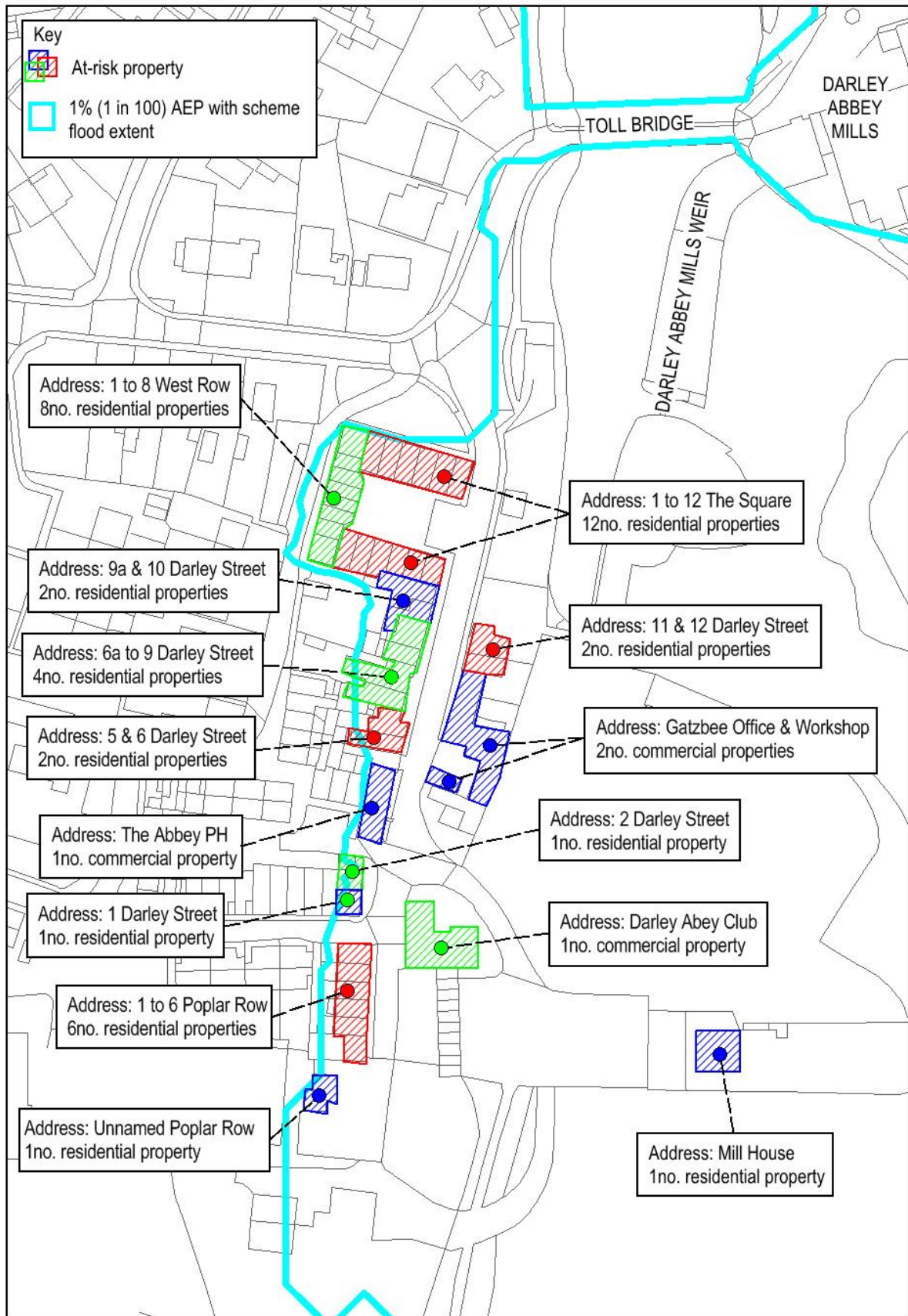


Figure 8.4: Properties to be offered property level protection

8.7 Darley Abbey Mills Bridge

General Arrangement Drawing Number	07	Sections Drawing Number	38	Package	2
Type of planning application	Outline				
Proposed use	Bridge deck suitable for vehicle, cycle and pedestrian crossing.	Works carried out by:	Applicant		

Key constraints

- 8.7.1 The bridge is not a public highway.
- 8.7.2 Regional cycle path route number 66, and the Derwent Valley Heritage Way both cross the bridge.
- 8.7.3 The bridge forms one of only two vehicular access routes to Darley Abbey Mills businesses and residents of Folly Road and Haslam’s Lane. The other is Haslam’s Lane from Alfreton Road Industrial Estate.

Scale

- 8.7.4 Removal of the existing concrete deck and replacement with a new deck up to 0.1m higher than existing, and strengthening of the existing iron piers and foundations.

Layout

- 8.7.5 The replacement bridge deck will be constructed in the same location as the existing bridge. The bridge layout will provide clear segregation for vehicular and pedestrian access. The existing bridge is shown in Figure 8.5.



Figure 8.5: Existing views of Darley Abbey Mills Bridge

Access

Construction access

- 8.7.6 Access across the bridge from Old Lane to Darley Abbey Mills will be closed for a period of several months whilst the bridge deck is replaced. Closures will be applied for and advertised in advance, diversions put in place and times kept to a minimum.
 - A highway diversion via Haslam’s Lane will be put in place for vehicles.

- The viability of installing a temporary foot/cycle bridge across the river will be investigated.

8.7.7 The works on Haslam's Lane will not be undertaken at the same time as these works.

8.7.8 All efforts will be made to maintain vehicular access to private properties at all times during construction. Where this is not possible, pedestrian access will be maintained and assistance will be provided to affected parties.

Pedestrian access

8.7.9 The new bridge deck will provide improved segregation between pedestrians and vehicular traffic.

8.7.10 The bridge will be designed to provide safe access and egress during a severe flood as it will form the highest access route from Darley Abbey Mills and Folly Road during a flood.

Operational access

8.7.11 The bridge will be designed to take the loading of fire engines to improve emergency services access to Darley Abbey Mills and Folly Road.

8.7.12 It is proposed that Derby City Council, as local highway authority, will adopt the bridge on completion of the works, assuming the maintenance liability will be minimal.

Temporary transport network closures during a flood event

8.7.13 Haslams Lane will be closed during a flood event with a flood gate spanning the private road at Alfreton road Industrial Estate. All access will be via Darley Abbey Bridge but restricted by weight limits and the narrow access through Darley Abbey Mills.

Landscaping/external appearance (RESERVED MATTER)

8.7.14 The detailed design and overall appearance of the new bridge deck will be agreed with English Heritage, the Conservation and Planning Panel for the Derwent Valley Mills World Heritage Site, and the local highway authority.

Potential environmental enhancement

8.7.15 Potential to install otter ledges beneath bridge and buried recycled plastic artificial otter holts on the islands within the river to the south.

Basis of design

8.7.16 Ownership of the bridge has devolved to the Crown following the liquidation of the Darley Abbey Toll Bridge Company. However, it is understood that the Crown accepts no liability for the bridge. This means no one is currently maintaining the bridge on to which the public highway (Old Lane) leads.

8.7.17 A structural condition survey of the bridge concluded that the bridge sub-structure (abutments and piers) is in fair condition, with some localised corrosion of the cast iron piers and some scour under the masonry pier. The superstructure (deck) is in poor condition, mainly because of the extensive concrete spalling, and exposed corroded reinforcement to the bridge soffit (Figure 8.6). A preliminary structural

assessment of the bridge deck has concluded that it fails a 7.5 tons live loading assessment. With extensive defects identified to the bridge deck, it is not possible to confirm with confidence any reliable live load capacity that the bridge can safely carry at the moment. It is clear, however, that the bridge continues to carry vehicular traffic without any visible signs of structural distress having occurred yet. On that basis alone, it seems reasonable to assume that some significant structural capacity remains.



Figure 8.6: Existing condition of the underside of Darley Abbey Bridge

8.7.18 A historic environment appraisal of the bridge has been undertaken to determine the context of the bridge to the World Heritage Site. Three main phases of bridge construction have been identified:

- Phase 1: the earliest phase of the bridge is represented by the truncated limestone piers which are just visible at the water level on the eastern side of the bridge. The presence of these piers, along with an illustration from 1862 suggests that the earliest bridge form was an arched stone structure and that these piers are representative of that phase having being incorporated into the modern structure to provide a suitable footing for the more recent cast-iron columns.
- Phase 2: the next phase is represented by the cast-iron paired columns of a trestle type of bridge which appear to be of greater antiquity than the current concrete deck. The use of this style of construction, using cast-iron pillars, was adopted particularly in the second half of the nineteenth century and very early twentieth century. This style of construction contrasts markedly with the present concrete and steel deck and parapet. The iron columns have a date stamp of 1853.
- Phase 3: the most modern structural elements, added in 1934, are the concrete and steel deck and the pyramidal topped parapet columns with associated plain wrought-iron railings. This element of the structure is of twentieth century date and is plain and utilitarian, lacking the flair or style of the industrial Georgian and Victorian architecture that is evident elsewhere within the mill complex.

8.7.19 The bridge design is not particularly rare, it is poorly documented and it is not listed; the bridge in its own right may be considered to be of regional importance, reflecting its incorporation of a number of different building styles and their selective survival. However, because of its close association with Darley Abbey Mills, it may be considered to be of national importance. While the bridge retains elements of three phases of development, the later elements, comprising the concrete and steel deck, are not of the same level of importance as the earlier components such as the early bridge

piers. However, the deck is a component part of the UNESCO monitored view and therefore any changes to the bridge would have to be done sensitively.

- 8.7.20 The piers of the bridge create an obstacle for debris which floats down the river, and results in significant accumulation of debris. However, their historic significance means it is proposed to retain these.
- 8.7.21 The existing bridge is narrow with poor segregation of vehicular traffic and pedestrians. Any improvements to the bridge would offer the opportunity to improve pedestrian access to improve safety and help increase visitor footfall and promote regeneration.
- 8.7.22 Design cues for the replacement bridge deck could be taken from the Redbrook Railway Bridge, Monmouthshire (Figure 8.7), as it is considered to be a comparable example of the style of construction associated with the Phase 2 cast-iron columns.



Figure 8.7: View of Redbrook railway bridge (Source: www.radnorimages.co.uk)