PRELIMINARY OPINION

JBA Project Code	2009s0290
Contract	Manchester Salford Trafford Level 2 SFRA
Client	MST SG
Day, Date and Time	26 February 2011
Author	Jonathan Cooper
Subject	Preliminary Opinion on HRW reports on Bridgewater Canal

1 Introduction

The Bridgewater Canal is a fairly unique canal in that it is an integral part of the flood risk management assets on the River Medlock. It is a highly complex system which has only recently been studied by the EA. The Manchester Salford Trafford (MST) Level 2 SFRA screened a number of areas adjacent to the Bridgewater Canal as being potentially at risk.

Two reports have now been produced by HR Wallingford on behalf of Peel Land and Property that discuss the flood risks from the Bridgewater Canal. .

- Report Ex 6401: Potential for flooding from the Bridgewater Canal – An assessment of overtopping and breaching
- Report Ex 6448: Potential for flooding from the Bridgewater Canal – Model results for breaching scenarios

A more recent report EX 6470 concentrates on the potential for flooding from the canal in the Trafford District area. This has not been reviewed for this preliminary opinion.

2 The purpose of the SFRA

It is important to remember what purpose the SFRA evidence base provides. It is a broad spatial assessment of flood risk from a range of sources, using readily derivable information. It is there to inform development control and spatial planners alike as to when and where flood risk should be included in the decision making process. For those areas at risk from flooding more detailed assessments should be undertaken when development is being promoted.

The SFRA states:

Those considering development in the vicinity of canals should refer to this zone in the first instance in order to assess whether flood risk from canal overtopping should be included within a FRA. If the development is within the zone, then the developer will need to quantify this risk. In some cases this may simply mean that some topographic survey of the local area is required, which may indicate that overtopping at the specific site under consideration is highly unlikely.

3 Comments on the HRW methodology

3.1 Canal breach modelling

The approach has the benefit of detailed topographical data, historic sections, and detailed condition survey. The importance of assigning probabilities to breach mechanisms is welcomed, as it is the correct way to assess risk. This level of detail is not usually adopted within SFRAs.

However, an underlying concern with all condition surveys, and especially for those structures with such a legacy is that a visual condition assessment is not sufficient grounds to write off the risk as very low or low. The EA do not adopt this approach to their defences, when assessing FRAs. For example new development in Lower Broughton behind the recently constructed defences of the River Irwell would still need to consider a breach of these Condition Grade A assets. It is accepted this is not a risk based approach, but is certainly accepted custom and practice in development control. This supports the conservative screening approach adopted in the SFRA.

3.2 Emergency procedures to mitigate the risk

In the event of a breach or flood event on the Bridgewater Canal measures can be taken by the navigation authority to reduce the risk of flooding. Continual surveillance and monitoring is an important step, and this system provides comfort in deciding whether to accept some of the risks described in the SFRA. Two methods were noted in the HRW study.

<u>Isolating of canal pound lengths by use of stop logs</u>

JBA Project Code	2009s0290
Contract	Manchester Salford Trafford Level 2 SFRA
Client	MST SG
Day, Date and Time	26 February 2011
Author	Jonathan Cooper
Subject	Preliminary Opinion on HRW reports on Bridgewater Canal

The analysis provided in EX6448 shows that there is little change in the flood extent if the stop logs are inserted after 9 or 24 hours (see flood extents for Westwood Park). The SFRA assumed a worst case position, based on discussions with MSCC on the breach at Dunham. In this event predefined stop log locations could not be used because the velocities were too high, and so stop logs were sought further away from the breach. Therefore a longer pound length should be adopted, and hence will always provide a greater breach volume than shown in the HRW work. The issue is not one of timing of the emergency response, but of practicable location of the stop logs. Therefore the HRW study will have probably used too short a pound length and hence underestimated breach volumes. It is considered eminently practicable that the breach itself could be stemmed within 24hrs. 9 hrs would be highly optimistic. Insufficient information is provided in the HRW work to fully check their assumptions and breach mechanics.

Opening of sluices in times of flood flows on the Medlock

The HRW study states in Section 1.1 that a number of small sluices can be manually opened to allow flow from the Bridgewater Canal to the River Irwell. This is unlikely to be effective in a large event, as access will be limited due to flooding, and the scale of the flows (approximately 30m^3/s) would far exceed the capacity of these sluices.

4 Review of HRW results and conclusions

4.1 Overview of breach risk assessment

It is accepted from the detailed condition survey that the breadth and height of the canal banks are such that breach failure is unlikely. The additional detailed provided by the navigation authority will be useful to those promoting development to undertake a meaningful FRA. The SFRA maps remain a useful trigger to when this new evidence base is referenced. However, as is acknowledged by HRW, where the consequences are high in terms of loss of life (eg Westwood Park), a breach assessment should be undertaken irrespective of the condition and form of the canal embankment. This further supports the continued adoption of the SFRA canal breach hazard zones.

4.2 Overview of overtopping risk assessment

The increased resolution of canal geometry and bank levels contained in the HRW study is an essential baseline dataset that was not available at the time of the SFRA analysis. The complexity of the interface of the Medlock, Bridgewater Canal and River Irwell was identified in the Atkins study for the EA on Medlock Brook. This contains a revised increased hydrology, and included a length of the Bridgewater Canal in the model. The model does not go as far as Pomona. This allowed for a comprehensive flood zone map to be prepared in this area.

HRW were offered the SFRA models for their study, but it appears that they have used an older model of the Medlock/Bridgewater canal from the Potato Wharf FRA by Scott Wilson. This uses lower flows and possibly alternative model characteristics for key structures. The Q100 inflow is stated as 45m3/s in the Scott Wilson model, whereas the EA model prepared by Atkins reassessed this to be 63m3/s. In the Q100 event it is predicted that 30m3/s passes down the Bridgewater canal. It appears that the HRW model is grossly underestimating the amount of flow that will be retained in the canal. The overflow devices on the Medlock are rudimentary and subject to blockage, as can be seen below.

JBA Project Code	2009s0290
Contract	Manchester Salford Trafford Level 2 SFRA
Client	MST SG
Day, Date and Time	26 February 2011
Author	Jonathan Cooper
Subject	Preliminary Opinion on HRW reports on Bridgewater Canal

The Atkins Medlock model is considered by the EA as the most up-to-date model and one that should be used as a base for any flood risk assessment in this area. The EA Flood Zone map shows the extent of the overtopping predicted from the Medlock/Bridgewater canal. The Atkins report contains highly pertinent information on past events and flood mechanisms. This is reproduced below:

December 1978	Comparisons of recorded and calculated water levels indicate a substantial blockage of the Medlock Tunnel/Knott Mill arches, and a likely build up of debris at Potato Wharf.	

JBA Project Code	2009s0290
Contract	Manchester Salford Trafford Level 2 SFRA
Client	MST SG
Day, Date and Time	26 February 2011
Author	Jonathan Cooper
Subject	Preliminary Opinion on HRW reports on Bridgewater Canal

December 1979	Comparisons of recorded and calculated water levels indicate a partial blockage of the Medlock Tunnel/Knott Mill arches. Water levels at Potato Wharf indicate a possible build up of debris.	
October 1980	Water levels of 31.914m were recorded at London Road Gauging Station. Comparisons of recorded and calculated water levels indicate the Medlock Tunnel/Knott Mill arches to have been substantially blocked, with a possible build up of debris at Potato Wharf.	
December 1983	Water levels of 32.36m were recorded at London Road Gauging Station. Comparisons of recorded and calculated water levels indicate the Medlock Tunnel/Knott Mill arches to have been partially blocked.	
December 1991	Flooding in Castlefield, Manchester City Centre, Great Lever, Ramsbottom, Radcliffe, Marple Bridge, Didsbury, Hollingworth, Stretford and Bury.	Manchester Evening News
3rd June 2000	Water levels exceeded 25.99m and water was flowing into the Bridgewater Canal.	MSCC
30th July 2002	Analysis of London Road Gauging Station readings indicate the event return period to be approximately 80 years.	

Overtopping of the low lying areas around the Irwell/Medlock, and Bridgewater Canal confluences is a highly complex mechanism, but historic and modelled evidence suggests that a highly precautionary approach to development in the affected areas should be taken. Overtopping of the Bridgewater Canal is a significant issue in this reach.

Figure 2-4: Bridgewater Canal during December 1991 Flooding

JBA Project Code	2009s0290
Contract	Manchester Salford Trafford Level 2 SFRA
Client	MST SG
Day, Date and Time	26 February 2011
Author	Jonathan Cooper
Subject	Preliminary Opinion on HRW reports on Bridgewater Canal

Using the HRW study it states that in Reach 1 (From Old Basin Deansgate to Hulme Hall) there is NO flood risk issues in this reach. The flood mapping from the Medlock model, the historic data would suggest otherwise.

5 Implications for the SFRA

EX6401 states that the work presented in this report should be used in the screening and scoping stages of any FRA for site specific development. I would agree that the detail provided in the report has considerably advanced the level of understanding of the breach mechanisms appropriate to the Bridgewater Canal, the risks associated with breaching and the consequences.

When and where such an investigation is triggered is normally served by reference to a SFRA. HRW suggest that SFRA mapping of canal hazard should be updated. There are some isolated instances where the generic approach taken in the 2009 SFRA has been superseded by the detailed work presented by HRW. HRW work has added a probability dimension to the breach risk, and whilst it is an important element of the overall risk assessment, this level of detail is very much for the detailed flood risk assessment. SFRAs should adopt a precautionary approach where data is uncertain (as had to be the case for the SFRA), and we need to be consistent with how we treat fluvial sources for example.

The SFRA canal zones are similar to the Flood Zone maps. They ignore the probability of failure of defences, and define a zone that is potentially at flood risk. The SFRA canal hazard maps are informed primarily by level differences between canal water levels and surrounding land. This was further refined with some simplistic breach modelling, and brief walkover surveys.

The information provided in the HRW study would allow a further refinement of the SFRA methodology, and two refined breach hazard zones should be prepared.

The canal overtopping zone in the SFRA should be retained until the updated Medlock model is included in the HRW analysis. The mapping in the SFRA could be further improved for canal overtopping in areas where it has already been taken into account in the EA Flood Zones. This would allow a further understanding of the various sources of risk in the centre of Manchester.

There is still some degree of uncertainty in the flood risk at the Medlock/Bridgewater Canal interface. The 0.1% event outlines demonstrates the sensitivity in this area to increased flows exceeding the various overflow devices in the area. It should also be noted that debris is a significant risk, and has not been explicitly included in the EA models.

The SFRA remains the superior source of flood outline, flood hazard and depth data. In any update this study by HRW would improve and align a common view on the scale of the risks. Significant flood flows along the Bridgewater Canal should be expected and are considered a real and present danger. The new study HRW does not alter that view.

Jonathan Cooper BEng, MSc, CEng, C.WEM,

JBA Consulting