Bradford Initial assessment report
Esholt
September 2016

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1 Initial Assessment Report

Scheme or project location name	Yorkshire Area Initial Assessment: Esholt

Church Lane, Esholt

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Senior User Approval:	Name:	Title:	Signature:	Date:
Project Sponsor Approval:				

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INITIAL ASSESSMENT REPORT

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1.1 Introduction and background

1.1.1 Background

In May 2016, CH2M were commissioned by the Environment Agency, on behalf of Bradford Metropolitan District Council (BMDC), to undertake a package of initial assessments into flooding issues in the Yorkshire area. This report focuses on an initial assessment for Esholt village, in West Yorkshire, and provides guidance on measures to reduce flood risk and identifies potential funding availability. A site visit for this Initial Assessment was undertaken on 18th of July 2016 to the Church Lane area of Esholt. This report has been produced with information from the site visit and previous studies and reports that are relevant to this Initial Assessment.

1.1.2 Description of Location

Esholt is a small village, with approximately 90 properties, in the metropolitan district of the City of Bradford in West Yorkshire. It is located between Shipley and Guiseley. The River Aire is located approximately 300m south of the village, however Esholt itself is not located within the natural floodplain. Esholt is made up of three landscape types: enclosed pasture, wooded incline and floodplain pasture.

According to the Index of Multiple Deprivation (IMD), Esholt is amongst the 50% least deprived areas in the country. There is currently a flood warning area within Esholt, however properties on Church Lane are not covered by this flood warning area.

A location plan of Esholt which details the approximate locations of culverts can be referred to in Figure 1, Appendix D.

1.1.3 Description of Watercourses and Geology

Very limited information is available on the watercourses around Esholt. The River Aire is the largest watercourse in the study area and is located approximately 300m south of the village and is classified Main River. The River Aire runs from Malham Tarn in the Yorkshire Dales National Park and on to Airmyn where it discharges into the River Ouse.

Three unnamed smaller watercourses were identified at the time of the site visit. These watercourses all discharge into the River Aire south of St Paul's Church in Esholt within 100m of each other. The EA understand that all three watercourses are culverted beneath Esholt village. The locations of the watercourses and culverted sections are shown in Appendix D.

The underlying bedrock in Esholt is Millstone Grit, overlain by lover coal measures. Ground conditions generally consist of freely draining, slightly acidic, loamy soils.

1.1.4 History of Flooding

The most recent flood event to occur in Esholt was during December 2015. The EA received notifications from circa 27 properties with flood reports. Amongst the damage caused in December 2015 in Esholt, were 8 records of damage to cellars and ground floors and a loss of fencing and a dry stone wall to approximately 15 acres of land. Fourteen flood reports in Esholt stated that their properties were inaccessible by road for two days.

Church Lane and the majority of properties within the village are located in Flood Zone 1, see Figure 1. Anecdotal evidence, provided by the EA and BMDC, during the site visit for this initial assessment, suggests the flooding was most likely caused by surface water and drainage related issues. The EA reported that during the event, the River Aire overtopped its banks adjacent to the sports grounds on Esholt Lane. It was not clear if the Aire overtopped its banks further downstream to the south of Church Lane. LiDAR data, obtained through the EA's geostore,

shows the ground slopes down from Esholt village towards the River Aire suggesting that any surcharge due to culvert blockages would result in surface water flowing towards the Aire. One report at Pullman Lane stated that rods had to be used to unblock the culvert (currently not conclusive which culvert at Pullman Lane was blocked). Large stones had to be removed and it was noted that a possible rebuild may be necessary. It is possible that the blocked culvert at Pullman Lane, may have caused manholes to surcharge resulting in overland flow towards the River Aire and also properties on Church Lane.

Figure 1 – Flood Map for Planning (Rivers and Sea)

There are areas of the village designated at high risk of surface water flooding on the EA Risk of Flooding from Surface Water mapping, see Figure 2. The high risk classification means that the study area has a greater than 3.3% (1 in 30) chance of surface water flooding in any given year.

Figure 2 – Risk of Flooding from Surface Water

1.1.5 Summary of modelling analysis

In 2008 hydraulic and hydrological modelling of the Upper River Aire was completed by JBA to support the development of the Flood Risk Management Strategy. For this study the River Aire was modelled from High Hill Weir upstream of Gargrave to Fleet Weir downstream of Leeds.

This 2008 study aimed to define flood risk within this area and identify potential flood risk management options. This informed the Flood Risk Management Strategy for the Upper Aire which proposed flood risk management options for the short, medium and long-term.

The report investigated two locations within Esholt for potential flood storage sites, however during the screening process it was decided that the two sites would not be taken forward for further consideration due to the potential storage areas being too small.

The report states that the overtopping threshold for some areas in Esholt (open land, farmland, sports grounds, Esholt Sewage Treatment Works, Esholt Hall grounds and other outbuildings) was found to be 0.1% (1in10 year event) Annual Exceedance Probability (AEP). It was decided that no new local defences would be considered, however it was mentioned that individual property level protection could be suitable as a local solution.

There are no further recommendations for Esholt village in this report.

1.1.6 Drivers, Constraints and Opportunities

The study area is covered by the Aire Catchment Flood Management Plan (CFMP), and is covered by sub-area 3 - Worth and Aire. A link to the Aire CFMP can be found here: https://www.gov.uk/government/publications/river-aire-catchment-flood-management-plan. The designated policy for the area at risk is Policy Option 5: *Areas of moderate to high flood risk where we can generally take further action to reduce flood risk.*

The following drivers, constraints and opportunities have been identified within the study area.

Table 1.1 Drivers, Constraints and Opportunities within the site extent.

Political Drivers	**Exist?**	**Summary Description**
Catchment Flood Management Plan	Yes	Aire CFMP 2010
Catchment Flood Management Policy	Yes	Policy 5 – Areas of moderate to high flood risk where we can generally take further action to reduce flood risk.
Economic Drivers	**Exist?**	**Summary Description**
Funding Time Constraints	Yes	Must be obtained within 6 year programme of capital investment
Technological Drivers	**Exist?**	**Summary Description**
Improved Public Safety	Yes	Via reduced flood risk
Environmental Constraints	**Exist?**	**Summary Description**
Sites of Special Scientific Interest (SSSI)	Yes	Yeadon Brickworks & Railway Cutting (SSSI) is located about 1.2 kilometres to the north east from Esholt

Ancient Woodland	Yes	There are two ancient woodlands near Esholt. Hollins Wood and High End are located less than 200 metres from Church Lane in Esholt. There is also an Ancient Replanted Woodland called Jerrison Wood – located directly behind Hollins Wood and High End.
Tree Preservation Orders	Yes	There are some trees protected by TPO's. If any work to trees is needed within the designation, written permission from the council prior to any works being undertaken is required
Listed Buildings	Yes	There are 31 listed buildings located within the site extent including one Grade II* and thirty Grade II assets.

1.2 Problem and objectives

1.2.1 Problem

During the December 2015 flood event, several properties in Esholt flooded due to prolonged heavy rainfall. It was recorded that 27 properties were affected by flooding (26 residential properties and 1 non-residential property). In addition, fluvial flooding affected caravan park located near to the Sports Ground on Esholt Lane.

The flooding in Esholt, in December 2015, was most likely as a result of surface water flooding. However, details of the existing drainage network are limited. A number of assets have been identified, including three culverts which drain into the River Aire to the south of Church Lane (see Appendix D). Unfortunately, the purpose and condition of these assets is yet to be established and the cause of the flooding is unknown, however one of the culverts is known to have been partially blocked at the time of the flooding.

Four possible flood mechanisms have been identified;

- high water levels in the River Aire causing the existing system to back up,
- the existing network having insufficient capacity,
- failure of the existing drainage system, and
- flooding directly from the River Aire on the area along Esholt Lane due to high water levels in the river.

Based on the EA comments during the site visit, fluvial flooding from the River Aire overtopping the banks near Church Lane has been ruled out.

Further works are recommended to be able to accurately determine the flood risk and to be able to recommend mitigation measures.

1.2.2 Objectives

As outlined in the project mandate, the primary objective is to find the most suitable solution to reduce the risk of flooding in Esholt. However, without sufficient information for the existing assets, it is not possible to fully understand the flood mechanism in Esholt, and to propose a suitable list of options to reduce the risk of flooding.

The purpose of this report is to identify future works required to be able to undertake the initial assessment and propose mitigation measures.

1.3 Benefits

During the December 2015 flood event, 27 properties affected flooding (26 residential and 1 non-residential). However, the benefits cannot be accurately assessed without identifying the flood mechanism and current standards of protection.

1.4 Initial environmental assessment

Expected works should not significantly worsen the environmental impact on the surrounding area. An environmental checklist has been completed for Esholt, highlighting environmental constraints in the area (Appendix C). Key environmental impacts should be reviewed should this project be progressed in the future.

Table 1.2 Key environmental impacts, mitigation and opportunities

Key positive impacts	Key negative impacts	Mitigation/ enhancement opportunity
• Reduces risk of and subsequent flooding • Reduces future maintenance costs	• Construction work takes place near/ alongside watercourse. Measures to prevent pollution of watercourse will be required. • Loss of agricultural land due to creation flood storage area • There is likely to be increased noise/vibration levels during any works.	• Best practice should be followed including referring to EA Pollution Prevention Guidance. • Early engagement with landowners recommended to enhance opportunities and minimum negative impacts • Local authorities and communities need to be fully engaged in maintenance activities • It is recommended that adverse impacts should be minimised as much as possible through the adoption of 'best practicable means' as defined in the Control of Pollution Act 1974 to minimise noise and vibration resulting from construction operations and shall have regard to British Standard BS 5228 1997 code of Practice for Noise Control on Construction and Open Sites.

1.5 Further work requirements

If the project is to be progressed, it is recommended the following work is carried out in order to propose a suitable list of options to reduce the risk of flooding to properties in Esholt:

- Provide data for existing assets in Esholt by carrying out CCTV surveys and condition surveys of culverts to understand the culvert system and their current conditions. This information is required to understand if there are any issues with blockages or pinch points in the culvert system and also to understand what their capacity is.
- There is currently very little hydraulic information available on the watercourses flowing through Esholt. Detailed modelling of the three tributaries and culverts around Church Lane is required. It is anticipated that a 1D hydraulic model will be suitable for the next stage of the assessment. In order to build the model a full topographical survey of the watercourses is required including regular cross-sections and bank top levels.
- The Leeds FAS Phase 2 scheme has identified three locations that could be potentially used as flood storage areas; Keighley Holden Park, Marley Bridge and Rodley. The Rodley site is downstream of the Esholt study area but the other two sites could potentially provide benefits for Esholt. The Upper Aire FRMS has estimated a reduction of 300mm to 400mm for a 1% (1 in 100 year) AEP event at Leeds Station. The impact at Esholt, however, is uncertain but is expected to be significant on peak water levels. Any future investigation should consider the impacts of the upstream storage areas on Esholt.

1.6 Conclusions and Recommendation

Before this initial assessment can be progressed, it is recommended that the following minimum investigations are carried out to better understand the problem at this site:

- Carry out CCTV surveys and condition surveys to understand the culvert system in Esholt.
- The ownership and inlet levels of the outfalls needs to be ascertained as a part of future work
- Modelling of the River Aire, tributaries and culvert system in Esholt to fully understand the flood mechanism and to assist with proposing solutions.

In addition, if the findings of the Leeds FAS Phase 2 modelling study are available, they should be taken into account for any further assessments for Esholt.