

TECHNICAL NOTE

JBA Project Code
Contract
Client
Date
Author
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Subject

2019s0951
Smithies geomorphological improvements
Yorkshire Wildlife Trust
15th April 2019
Natasha Todd-Burley
Matt Hemsworth
Geomorphological walkover and
proposed channel improvements

JBA
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1 Introduction

Yorkshire Wildlife Trust are proposing to carry out channel improvements works at the Smithies site. The site is located adjacent to the River Dearne (SE 34484 08168), north of Barnsley in South Yorkshire.

The purpose of this document is to provide a concise summary of the geomorphological conditions at the Smithies site as well as a brief description of the proposed channel improvement works.

2 Geomorphological walkover

2.1 Overview

A fluvial geomorphological walkover survey was undertaken on Friday 29th March 2019 by two JBA Geomorphologists. The walkover was undertaken along a c.500m stretch of the River Dearne, within the Smithies site as well as a short section immediately upstream of the site boundary. The purpose of the walkover was to identify the existing sediment transport and morphological conditions within the River Dearne at the site location and to establish the baseline geomorphological condition. A number of spot checks were also made within the catchment further upstream to contextualise the site within the wider catchment setting. The site walkover discusses the following two reaches, as shown in Figure 2-1:

- Downstream reach
- Upstream (wet woodland) reach

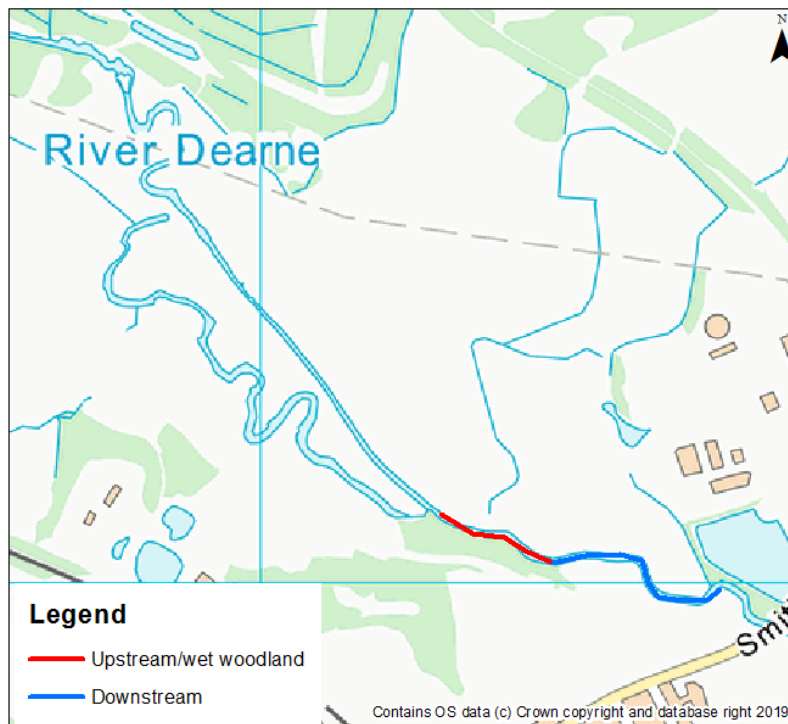


Figure 2-1: Walkover extent

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The River Dearne is a single thread, alluvial river which has been heavily modified historically within the vicinity of the site. Upstream of the site, a c.1km stretch of river has been straightened, resulting in a significant loss of sinuosity from the planform of the river. The disconnected palaeo channel is still evident within the floodplain and reconnection of this channel in the future would provide an excellent opportunity to significantly increase the hydromorphology of the River Dearne. The historic channel straightening and realignment continues to influence the present-day morphology. The channel-floodplain connectivity is generally poor throughout the site, most likely due to incision in response to the historic channel realignment, coupled with channel deepening to increase conveyance.

2.2 Downstream reach

The channel is overwide through the downstream reach and, as a consequence, the flow velocity is low (almost imperceptible). The river is unable to flush fine sediment through the reach during low flows, causing it to deposit on the bed and smother the gravels present in the substrate (Figure 2-2a). The banks are steep and the low flow water levels are c.2m below the surrounding floodplain on the left bank. The riparian cover is patchy, with stretches of mature trees interspersed with areas of grassy banks. At the far downstream extent of the site, a combination of bank collapse and fine sediment deposition is causing a fine sediment berm to develop on the inside of the channel meander on the left bank (Figure 2-2b)

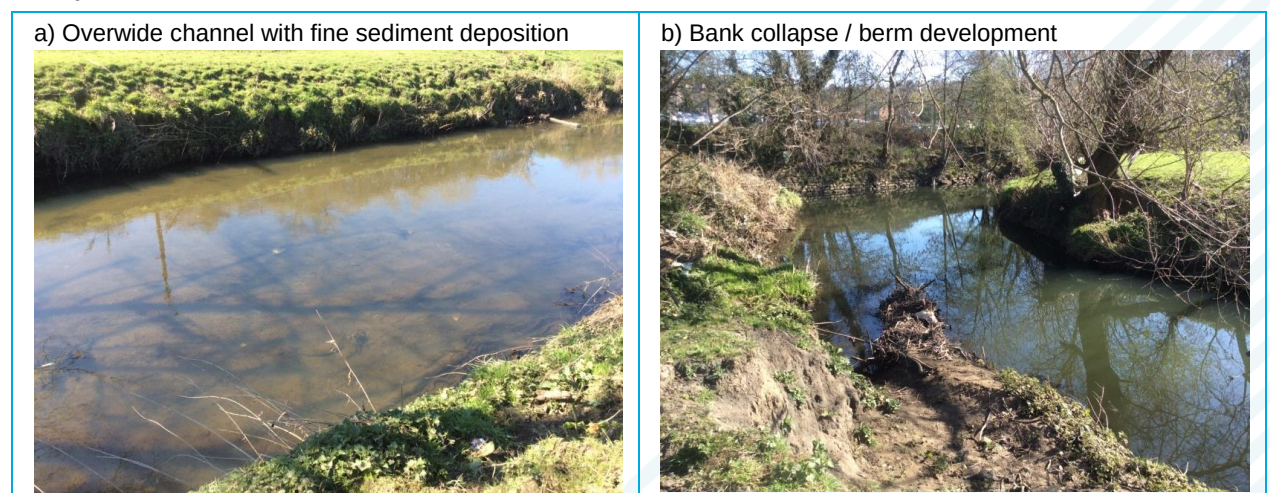


Figure 2-2: Conditions within the downstream extent of the site

2.3 Upstream (wet woodland) reach

Further upstream towards the top end of the site, and beyond into the surrounding farmland, the hydromorphology of the river improves substantially. The right bank floodplain connectivity is good and there is a large area of wet woodland in the vicinity of the palaeo channel on the right bank floodplain associated with the old river course. The river in this location provides an excellent analogue section for understanding the improvements that could be made downstream. The river width is narrower and more varied through this section (Figure 2-3a) and flow velocity is faster than in the downstream portion of the site. As a result, the river bed exhibits more diversity, with riffled flow over gravel deposits in places (Figure 2-3b).

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Figure 2-3: Conditions within the upstream extent of the site

3 Proposed improvements

3.1 Overview

Improvements have been proposed for the downstream section of the site where the hydromorphology is severely degraded, as summarised in Figure 3-1.



Figure 3-1: Proposed improvements for the downstream reach

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3.2 Berms

Narrowing the channels with berms formed from fine sediment will improve low flow velocities through the reach and increase in-channel flow diversity, helping to flush fine sediments from the bed. The berm elevation should be set so that the surface of the berm is above low flow water levels (typically Q95-Q80 flow levels). The berms should be stabilised with suitable planting and/or green protection measures until they have established to prevent erosion of the features.

3.3 Bank re-grade

Re-grading the banks will improve floodplain connectivity and improve the riparian habitat by decreasing the slope of the bank. The material removed by battening back the slope could be used to form the berm features that have been proposed to narrow the channel. The banks should be stabilised with suitable planting and/or green protection measures until they have established to prevent erosion.

3.4 Woody material

Introducing woody material in the channel will help to improve in-channel hydromorphological diversity. Woody material locally narrows the channel, causing locally significant increases in shear stress and erosion/scour during flood events, as well as local flow impoundment and sediment aggradation upstream.