Natural England Commissioned Report NECR140

New Forest SSSI Geomorphological Survey Overview

Annex J: Wick Wood Riverine Woodland - SSSI Unit 368

First published 06 March 2014

www.naturalengland.org.uk

NATURAL ENGLAND

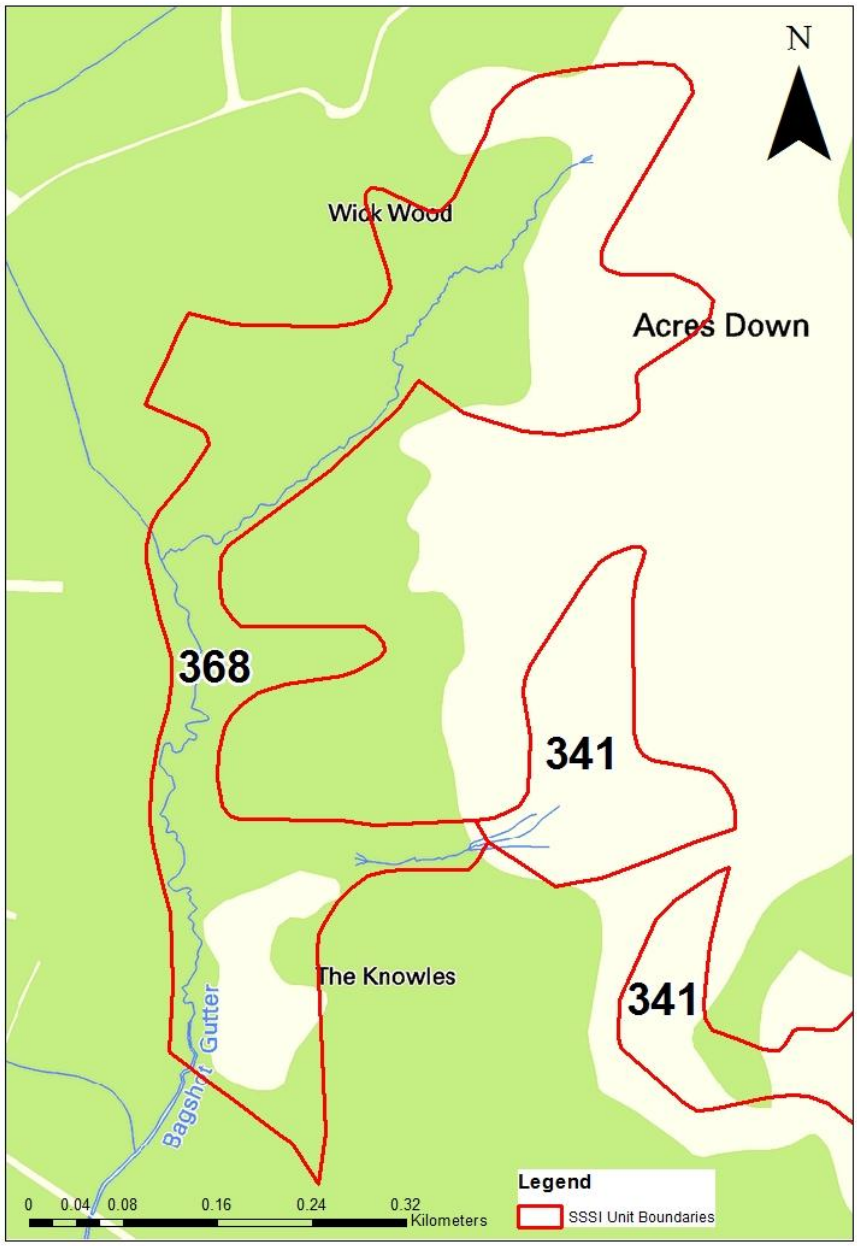
1 Wick Wood Riverine Woodland - SSSI Unit 368

1.1 Introduction

Wick Wood Riverine Woodland (Unit 368) has Baghot Gutter running north to south through the unit. It is adjoined by both parts of Unit 341 to the east (Figure 1-1). The unit is in unfavourable recovering condition and is approximately 14.4ha in size.

This unit consists primarily of mixed plantation woodland with more broadleaved riparian woodland adjacent to the watercourse. At the northernmost, upstream section there is an area of wet heath and valley mire.

Figure 1-1: SSSI Unit 368 location (flow direction north to south)



Contains Ordnance Survey data © Crown copyright and database right 2013.

1.2 Current hydromorphic conditions and issues

A summary of the hydromorphic conditions for unit 368 is given in Table 1-1.

Table 1-1: Summary of hydromorphic conditions for unit 368

Geomorphological Assessment Area		Bagshot Gutter
Site name		Wick Wood Riverine Woodland
Size (ha)		14.4
SSSI unit(s)		368
Channel Condition	River type (s)	Lowland anastomosed, active single thread
	Responsiveness	Moderate to high - anastomosed section (mainly u/s section) relatively robust, single thread section responsive as moderate gradient, moderate gravel supply, some tree clearance (historic)
	Sediment delivery, type and mobility	Moderate gravel supply, not as many gravel features but those present are mobile, few fines, some local gravel sources (banks)
	Main source of water	Upstream source (Acres Down) and the Knowles, Bagshot Gutter, drains
	Aquatic vegetation	No in-channel vegetation present
	Drainage damage	Some drains, left bank one marked on map not incised (some multi-thread / spread on this tributary) and appears natural, upstream drain not incised but dug and straight
	Morphology	Debris jams common and create multi-thread sections, pools, riffles, runs, lateral bars, transverse bars in single thread section
	Incision	Yes - downstream of confluence with Bagshot Gutter, maybe response to modified flow regime here as Bagshot looks straightened
	Engineering	Maybe some straightening at d/s end, footbridges, some embankments d/s of SSSI boundary
	Bank activity	Moderate in single thread wandering / active section. Some bank collapse associated to incision
	Flow type (s)	Less impacts on natural flow regime here through artificial drains. Flood peaks concentrated in channel where incised
Floodplain Condition	Valley type	Wide floodplain
	Main source of water	Drains / overland flow, out of bank flows
	NVC communities	W1, M25a, M16a, M21a, M23a
	Key habitat types	Broadleaved woodland, Mixed plantation woodland, Valley mire, Wet heath, Marshy grassland
	Drainage	Minor artificial drain presence (u/s), otherwise relatively natural
	Scrub / tree encroachment damage	Floodplain consists of woodland.
	Palaeo features	Yes - in downstream single thread section, could be reconnected
	Floodplain connectivity	Good connectivity in upstream section where anastomosed and spread, worse downstream in single thread where mildly incised
	Poaching and grazing pressures	Minimal
Generic restoration options		Debris jams in section downstream of confluence with Bagshot Gutter (may need to go beyond SSSI boundary) to reconnect floodplain and palaeo channels, would create multi-thread as well. Fill in artificial drain at upstream end. Leave anastomosed u/s section.
Additional comments		

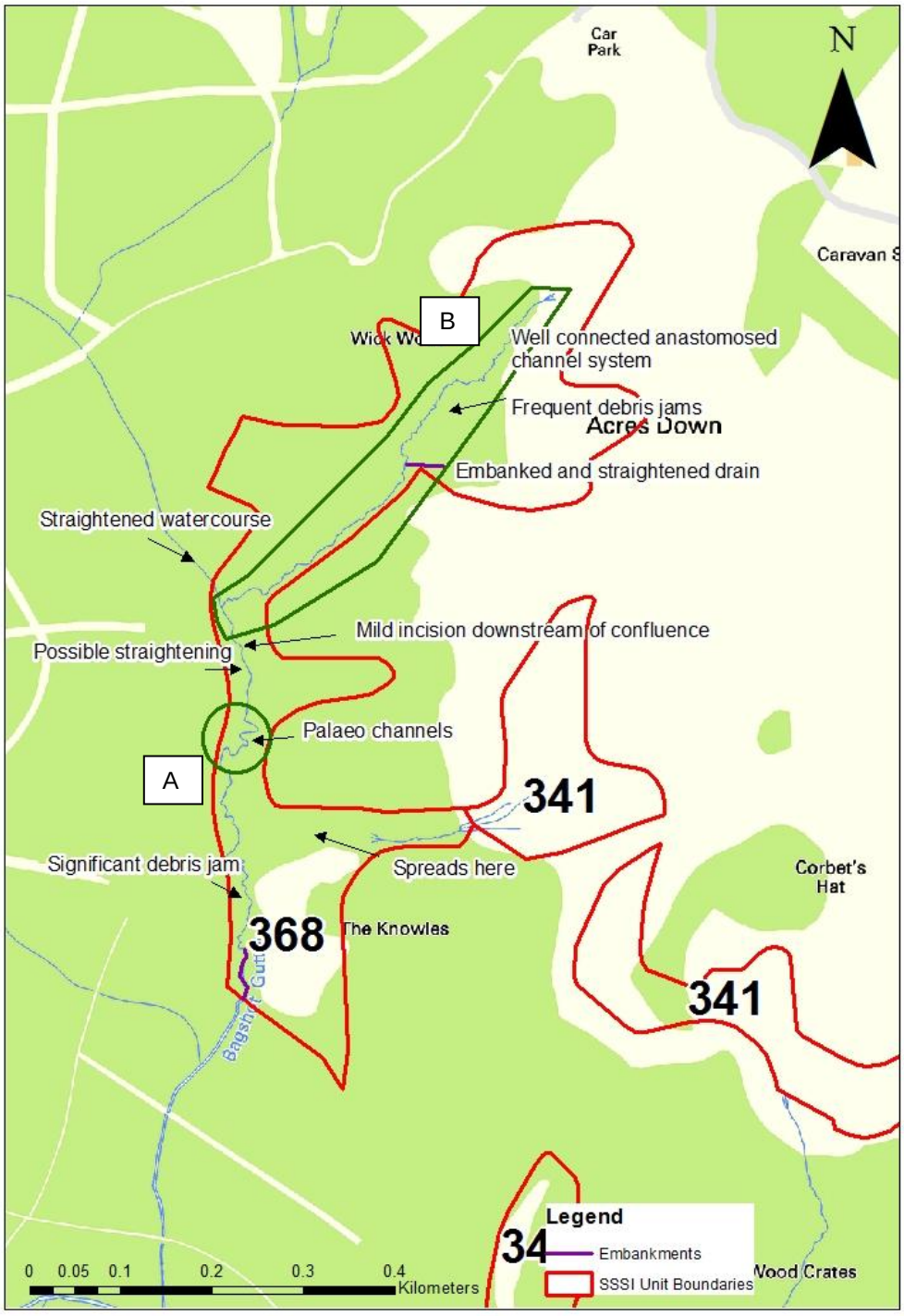
The Wick Wood Riverine Woodland SSSI unit and Bagshot Gutter is characterised by a lowland anastomosed system (Figure 1-2) in the upper reaches and an active single thread system in the lower reaches (Figure 1-3). The stream becomes more single thread downstream of the confluence with the Bagshot Gutter from the west at approximately the midpoint of the unit.

Figure 1-2: Anastomosed channel type along the Bagshot Gutter upper reaches

Figure 1-3: Active single thread channel type along the Bagshot Gutter lower reaches

The source of the stream is Acres Down and the Knowles. Figure 1-4 summarises the existing hydromorphology and pressure impacting unit 368.

Figure 1-4: Current hydromorphic conditions and pressures



Contains Ordnance Survey data © Crown copyright and database right 2013.

Some straightening has probably been undertaken in the downstream single thread section (Figure 1-4 - A), alongside over-deepening through dredging and some embankment creation on the bank tops (there are some palaeo features within the floodplain locally that were identified during the audit and from LIDAR, these are shown in Figure 1-11). This has created some

incision (Figure 1-5), due to the moderate gradient and energetic flows, within this downstream section (below the confluence with the main Bagshot Gutter) with artificially concentrated flows in the single channel leading to increased erosive energy. However, incision is not extreme as the drains remain relatively unaffected and the stream in the upper reaches of the unit is not impacted at present.

Figure 1-5: Mild incision in downstream reach

Despite the historic straightening a well wooded riparian corridor has restricted excessive lateral erosion (Figure 1-5), however, bed incision has occurred leading to variable disconnection from the floodplain. Widespread incision has also been prevented through the frequent occurrence of natural woody debris jams within the channel (Figure 1-6).

Figure 1-6: Woody debris jams in downstream reach

In the upper anastomosed reach (Figure 1-4 - B), multiple channels were active during the survey with distinct hydraulic differences between the dominant channel and subordinate channel network (Figure 1-7). The sub channel network is very well connected at this location and this should be maintained as part of the restoration for this unit. This can also be used as an analogue for restoration downstream.

Figure 1-7: Anastomosed network in upper reach

The riparian woodland is well developed along the SSSI unit and is presently acting to concentrate flood flows along anastomosed sub-channels creating and helping to maintain hydraulic, morphologic and habitat diversity in the upper reaches (Figure 1-7).

Natural woody debris features, both live and dead, are also common in the anastomosed reach. These create short lengths of impounded watercourse and promote flow spreading, improving floodplain connectivity and inundation frequency significantly (Figure 1-8).

Figure 1-8: Woody debris jams in upper anastomosed wet woodland (W1) section

The gravel supply to the unit, and from local bank sources, is moderate but not abundant enough to create and sustain large gravel features. The development of gravel features is also controlled by the mild incision in the downstream single thread reach, which creates energetic conditions as a result of maintaining flood flow energy within the channel, meaning more gravel is transported rather than stored within the channel.

Ditching of the catchment will have impacted on the flood flow regime of the watercourse creating a more responsive system where flood peaks are concentrated and increased and water enters the main channel more efficiently and at concentrated points. This is particularly evident on the left bank drains and on Bagshot Gutter to the west (and outside of the SSSI unit boundary). The degree of artificial drain creation is shown in Appendix A and this is impacting on the flow regime, particularly in the downstream single thread section which is likely to be a contributing factor to the mild incision seen in this reach. This effectively creates a higher energy system more capable of erosion and sediment transport.

Surface and groundwater flows have also been altered as a result of the incision, infilling and spoil dumping (small embankment creation) in the downstream section of the unit. Some sections of the immediate floodplain have become drier than natural as a result.

Riffle - pool - run sequencing has developed (Figure 1-9) throughout the unit as a result of the moderate gravel supply and moderate gradient. Gravel bars and berms are generally only small, functionally developed features throughout as a result of the transporting conditions created by the incision and restricted floodplain connectivity.

Figure 1-9: Riffle - pool - run development

1.3 Probable channel development

The Bagshot Gutter downstream of the confluence is a responsive system as a result of past straightening, dredging and low level embanking, as well as drainage modification. However, the well connected anastomosed system in the upper reaches is robust and, as long as incision does not migrate up from the single thread channel downstream, should continue to thrive as a multi thread channel network.

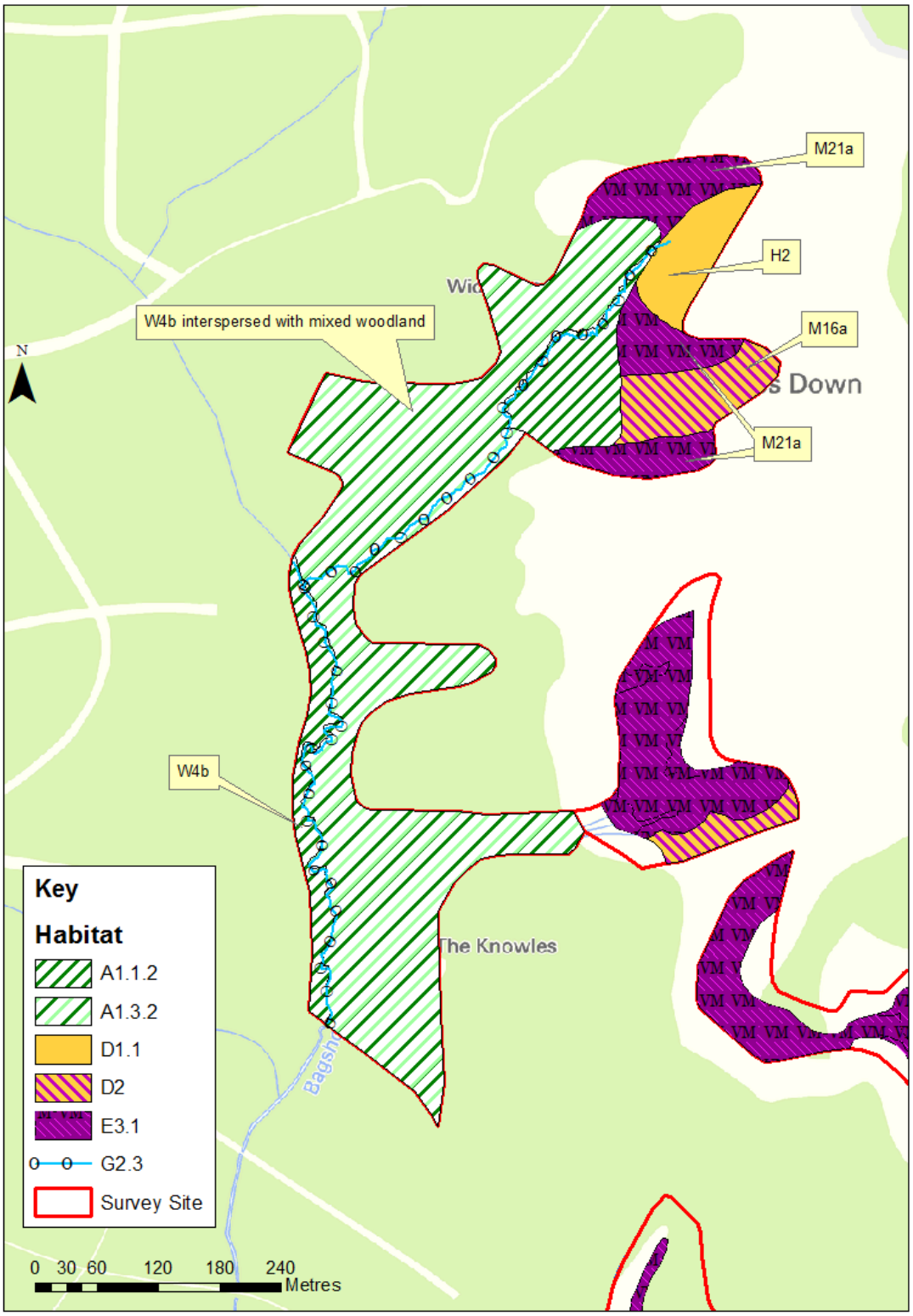
Hydromorphic recovery of the single thread section of the stream is slow due to the mild incision and poor floodplain connectivity. As such, in-channel features are rare or poorly developed as a result of incision increasing energy levels in the channel creating transporting conditions.

Unless action is taken, incision is likely to continue resulting in increased floodplain disconnection and reduced wet woodland inundation in the mid to lower reaches of the unit. Over time this will alter the nature of the riparian vegetation community and in the medium to long term, this could impact the anastomosed section upstream.

1.4 Current Ecological Condition

This unit consists primarily of mixed plantation woodland with broadleaved riparian woodland adjacent to the watercourse. The wet woodland is dominated by Downy Birch *Betula pubescens*, with Grey Willow *Salix cinerea* and Alder *Alnus glutinosa* and is analogous to NVC W1 woodland. Within the most northern section of the unit, adjacent to the watercourse that joins Bagshot Gutter, there is an area of wet heath and valley mire which appeared to be in good condition. The wet heath areas contained a mosaic of Purple Moor-grass *Molinia caerulea* tussocks and Cross-leaved Heath *Erica tetralix* (M25A). The valley mire areas were extremely boggy, with Deer-grass *Trichophorum cespitosum* and White Beak-sedge *Rhynchospora alba* frequent (M21a).

Figure 1-10: Phase 1 Habitat Map



Contains Ordnance Survey data © Crown copyright and database right 2013.

1.5 Restoration plan proposals

A summary of the current pressures, unmitigated impacts and restoration proposals is given in Table 1-2 and shown in Figure 1-11.

The key hydromorphological and ecological gains associated to the proposed restoration measures are:

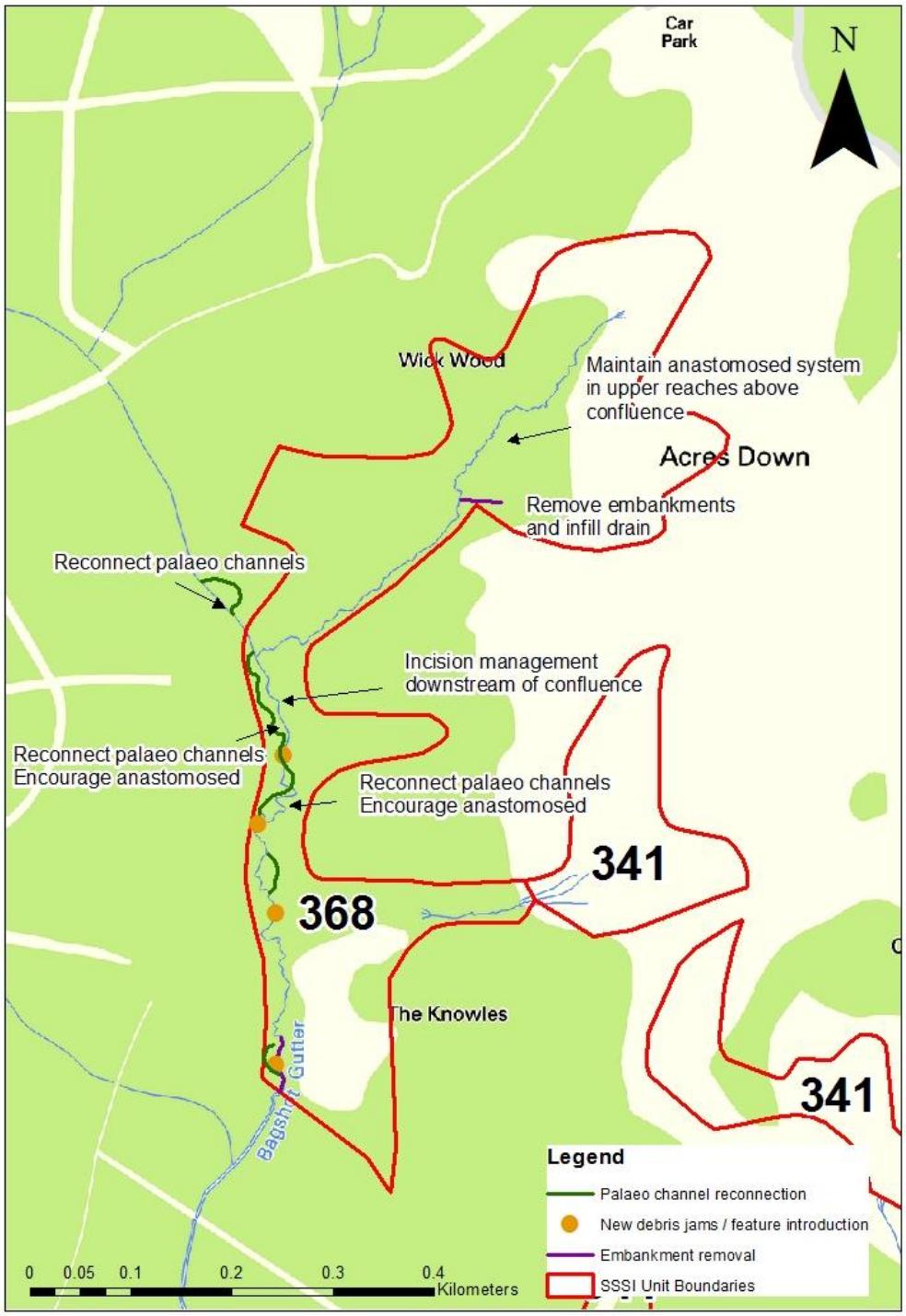
- Palaeo channel reconnection through new debris jams, alongside low level embankment removal and incision management via debris jams in the mid to lower reaches creating improved morphological features and floodplain connectivity, which could promote multi thread channel development;
- Improved anastomosed channel network development will improve hydromorphological diversity in the mid to lower reaches;
- Artificial drain infilling will help to restore a natural flow regime;
- Potential to improve and extend bog woodland areas and in-channel habitat diversity.

Table 1-2: SSSI Unit 368 current pressures, unmitigated impacts and proposed restoration measures

Pressure	Impact	Restoration proposal	Hydromorphic improvement	Ecological improvement	Constraints / issues
Historic dredging Straightening	Long term river response, cut and fill activity. Enhanced in-channel energy levels. Disconnected sub-channels. Loss of in-channel features.	Infilling of the main channel through morphologic unit reinstatement and debris jam installation in the mid to lower reaches. Restore connectivity. Treat knick points.	Will promote out of bank flows, raise surface and groundwater levels, lower energy levels in the main channel, reducing incision. Debris jams naturally occur along the reach, use local materials. Will create in-channel diversity. Encourages anastomosing channel development. Reduces fine sediment inputs. Slows gravel movement. Stabilises in-channel features.	Will protect the mire habitats from headward erosion and subsequent drying out. Debris dams will promote the anastomosing of the stream and the dynamic preservation of the M29 Soakway community. In-channel features, such as small bars, will vegetate over creating habitat diversity. Increase water table on the adjoining floodplain and encourage the growth of M25a *Molinia* mire and M21a valley mire communities	Considerable amounts of material may be required to raise bed levels. Likely to require significant tree felling to allow access for works. Debris jams may form a barrier to fish, however, a fish pass is unlikely to be required. Cost Cultural objections
Embanking	Enhanced in-channel energy levels. Disconnected sub-channels.	Embankment removal - main channel and drains	Reconnect the floodplain, reducing incision rates and improving in-channel hydromorphic conditions. Drain embankment material could be used to infill drains. Slows gravel movement. Stabilises in-channel features.	Reconnection of stream with associated mire habitats and allowing for an increase in the latter. Allows vegetation to colonise bar features.	Drains may also require infilling to restore natural flow regime and reduce incision. Likely to require some tree felling to allow access for works. Loss of grazing Cultural objections
Artificial drainage	High flows impacted.	Drain infilling	Restore a natural flow	Improve connectivity of	May require import of

Pressure	Impact	Restoration proposal	Hydromorphic improvement	Ecological improvement	Constraints / issues
	Water table lowered locally.		regime, reducing incision in the drain and channel network. Reduces flood peaks. Reduces fine sediment inputs. Slows gravel movement. Stabilises in-channel features.	main watercourse with the mire habitats upstream and in the riparian strip. Allows nutrient input at high flows to surrounding grazed mire areas. Promotes variable flow channels on the floodplain (M29)	material. Likely to require some tree felling to allow access for works. Cost Loss of grazing
Riparian vegetation removal	Loss of bank stability. Loss of shading. Loss of organic inputs to the watercourse.	Reduced tree clearance at bank edge. Ring barking Half felling	Will help to stabilise banks in the active sections and alongside bed restoration to minimise incision, could improve floodplain connectivity. Creates riparian hydromorphic diversity. Acts as fine sediment trap. Allows woody debris accumulation.	Will allow light to reach the woodland floor and promote greater botanical diversity leading to greater invertebrate diversity. Half felled trees can re-grow and alter channel patterns and promoting habitat diversity.	Tree clearance is a necessity in some locations, especially exotics Cultural objections Cost

Figure 1-11: Proposed restoration measures for SSSI Unit 368



Contains Ordnance Survey data © Crown copyright and database right 2013.

1.6 Design considerations

Palaeo-channel entrance and exit elevations must be carefully considered to avoid instigating uncontrolled instability.

The channel is unlikely to completely stabilise as a result of the proposed restoration, however, retaining the dynamism of the channel should be an objective of the restoration plan.

Reconnecting the floodplain in the mid to lower reaches through incision management may promote multi thread channel development and help to reactivate palaeo channels.

Debris jams must extend into the adjacent banks to ensure longer term functioning.

The upstream anastomosed system must not be impacted as part of any restoration works as this is a successfully functioning channel network at present.

The major straightened / modified drainage channels are identified in Figure 1-11. Other minor modifications could be considered for infilling and Appendix A should be used for reference.

No works have been suggested for the tributary over the left bank that is joined by unit 341 at its upstream extent. Therefore, restoration proposals are unlikely to impact the conditions of unit 341.

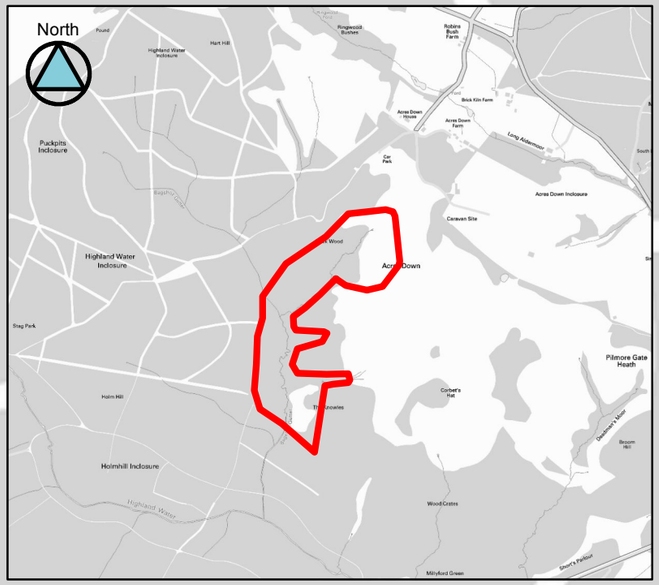
1.7 Monitoring requirements

It is anticipated that the proposed restoration works will create a dynamic, potentially multi thread, channel system with frequent / increased overbank flooding and a heightened potential for local channel switching in response to natural debris blocking. This pattern of development is difficult to document accurately due to the complex nature of the river network and the difficult surveying conditions. As such a qualitative monitoring approach is recommended with automated time lapse photography employed at key restoration points to record daily images of flow types, morphology and vegetation character. This could be undertaken alongside two-yearly reconnaissance audits to determine hydromorphological change over the entire reach, which fixed point photography will not cover. The daily photographic records should be analysed to estimate and record the parameters detailed in Table 1-3.

Table 1-3: Monitoring parameters, frequency and suggested approaches for unit 368.

Parameter	Approach	Frequency	Approximate cost
Morphologic unit change	Time lapse camera / audit	Daily (Annual statistical summary)	Capital 4 x £200 Half yearly downloading £200 Annual summary £300 Two - yearly reconnaissance audit £500
Flow change	Time lapse camera / audit	Daily (Annual statistical summary)	
Sedimentology	Time lapse camera / audit	Daily (Annual statistical summary)	
Vegetation change	Fixed point camera survey	Biennially	
	Fixed point quadrat survey	Biennially	Survey £350 Analysis £500
	Fixed point aquatic macrophyte survey		
NB. Costs assume downloading and site visits as part of wider field campaign.			

Appendix A - Artificial drainage and flow lines - SSSI Unit 368



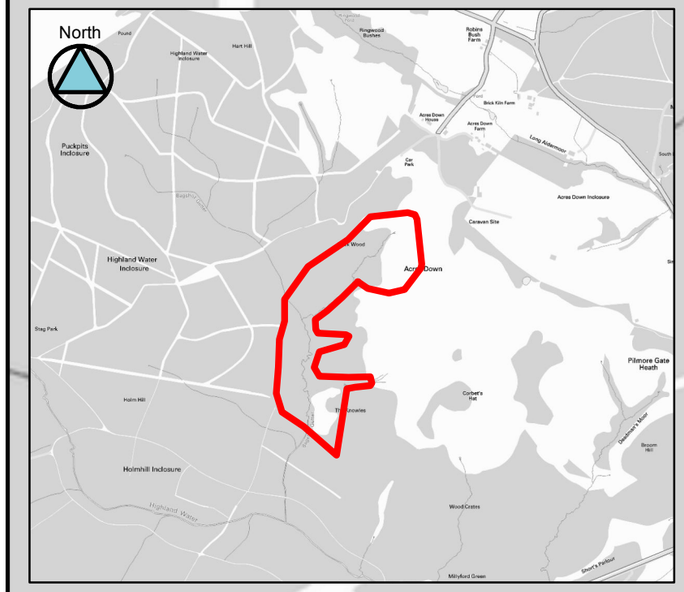
SSSI 368: Wick Wood Riverine Woodland

The Knowles

Bagshot Gutter

0 50 100 Metres

Contains Ordanance Survey Data © Crown Copyright and Database Right 2013
© JBA Consulting on behalf of Natural England.' Derived from Cambridge University Technical Services and New Forest National Park data.



SSSI 368: Wick Wood Riverine Woodland

Wick Wood

Acres Dow

0 50 100 Metres

Contains Ordanance Survey Data © Crown Copyright and Database Right 2013
© JBA Consulting on behalf of Natural England.' Derived from Cambridge University Technical Services and New Forest National Park data.