River Meon – Titchfield

An Advisory Visit by the Wild Trout Trust, June 2017

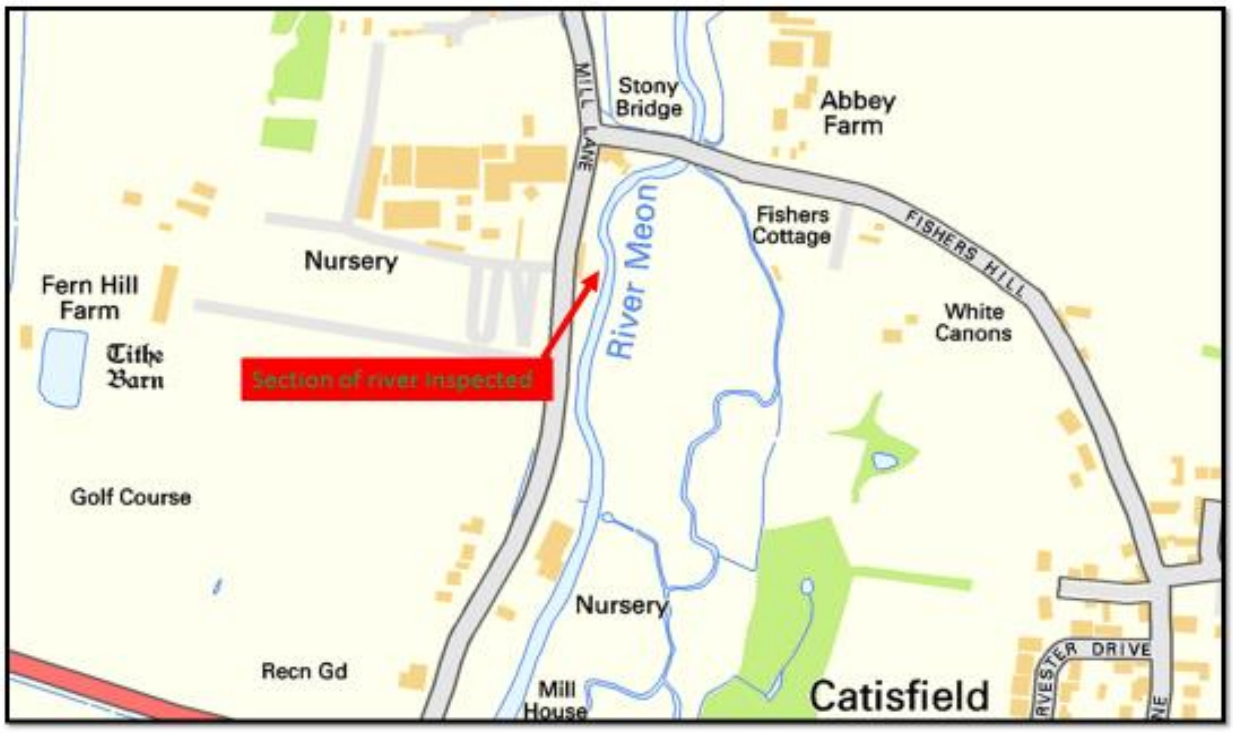
1. Introduction

This report is the output of a site visit to a short 50m section of the River Meon near Titchfield in Hampshire. The river here, which borders residential property at Place House Cottages, is owned by Mr and Mrs Wilton-Smith and Mr and Mrs Groves. The request for the advisory visit came from Elaina Whittaker-Slark who is Lead Ranger for the South Downs National Park Authority (SDNPA).

The reason for the site visit was to inspect a section of river where the owners have concerns about bank erosion and to explore options for effective and sustainable bank defences. This section of the River Meon has recently been the subject of a collaborative water vole reintroduction programme. So far, this project has been very successful, with water vole now well established in the lower Meon following the re-introduction and a concerted campaign to eradicate non-native mink from the catchment. The land owners have concerns that water vole burrows might be responsible for weakening the river bank adjacent to their property.

Comments in this report are based on observations on the day of the site visit and discussions with the land owners and Ms Whittaker-Slark and staff from the SDNPA.

Throughout the report, normal convention is followed with respect to bank identification, i.e. banks are designated Left Bank (LB) or Right Bank (RB) whilst looking downstream.



Map 1. River Meon, Tichfield © streetmap

	River Meon
River	River Meon
Waterbody Name	River Meon
Waterbody ID	GB 107042016640
Management Catchment	East Hampshire rivers
River Basin District	South East
Current Ecological Quality	Moderate Status – Good by 2027
U/S Grid Ref inspected	SU5430306567
D/S Grid Ref inspected	SU5430006520
Length of river inspected	0.05km

Table 1. Overview of the waterbody. Information sourced from http://environment.data.gov.uk/catchment-planning/WaterBody/GB107042016640

2. Catchment overview

The River Meon rises from the Hampshire chalk aquifer near the village of East Meon and flows south for approximately 37km before entering the sea at Hill Head. The river enjoys a steep gradient for a chalk river, falling approximately 120m from source to sea. The middle and upper reaches of the river flow over deposits of Lower Chalk, which is less permeable than the Upper Chalk geology predominantly found in the rest of East Hampshire. As a result, the Meon tends to have a greater flow range compared to other southern chalk streams.

Near Exton and Warnford, the river flows over a predominantly chalk geology, but further downstream (near Soberton) glacial deposits of London Clay and Reading Sand become more prominent. These deposits dominate the Meon catchment south of Soberton Heath until the river enters the sea at Titchfield Haven.

For much of its length, the river displays the classic chalk stream characteristics of clear water, low soft margins and an abundance of in-channel macrophytes dominated by water crowfoot (*Ranunculus* spp.), starwort (*Callitriche* spp.*)* and water moss (*Fontinalis antipyretica).* As with most chalk rivers, the channel is

heavily modified and in-channel habitats are influenced by the numerous structures and milling impoundments found throughout its length.

Fishery surveys of the Meon conducted by the Environment Agency (EA) have concluded that the river is "a productive brown trout river". The Meon is also noted for a strong run of migratory sea trout although they are rarely targeted by anglers. Sea trout are known to run upstream of Droxford during wet years and the EA have plans to improve access for migratory fish by improving existing fish passes on the lower river. In recent years, a small salmon population has become established in the lower reaches of the Meon, probably as a result of changes to water level control structures located near Titchfield which has seen more flow allowed to flow via the natural channel, as opposed to the high level mill channel, which is the location of this particular site visit.

The river also supports a range of coarse fish, eel and strong populations of brook lamprey and bullhead which, along with salmon, are designated as species of conservation importance under the EU Habitats Directive.

The Meon (Waterbody ID GB107042016640) has been assessed as being in 'Moderate Condition' under the Water Framework Directive (WFD) and the river is known to be both over-abstracted and over-licensed for abstraction under the EA's own Catchment Abstraction Management Plan.

3. Channel and bank assessment

The river channel adjacent to Place House Cottages forms part of the old mill leat which was constructed to feed high level flows to Titchfield Mill, located approximately 0.5km downstream. The leat is very much a man-made feature, albeit an old one. The mill leat has a shallow bed gradient and the water is impounded by the weir structure downstream. The slow-moving water in the leat means that sediment which had been carried by faster-moving water upstream is deposited in the mill channel, particularly towards the lower sections. Deposited fine sediment is only moved on in exceptionally high flow years, when the gates at Titchfield Mill will be fully drawn (opened) for long periods of time to prevent flooding. Under normal flow conditions, water velocities will invariably be slower in the mill leat compared to the parallel river channel, resulting in a mainly depositional, rather than an eroding flow regime.

In the mill leat, water is contained in a perched (raised) channel to the west of the valley floor. Any bank erosion pressures to the left bank could potentially lead to a serious bank breach, which would require early intervention because flow would naturally spill through any gap in an effort to reach the valley floor, potentially leading to a serious failure. Any erosion of the right bank is highly unlikely to lead to serious bank damage because there is no scope for the water to cut in and flow down-hill.

In depositional channels, it is very rare to have bank erosion issues, other than those caused by anthropogenic, rather than river-related activities. These generally include inappropriate land use, poor bank management and maintenance, non-native plant communities, heavy footfall, dog slides or heavy grazing pressures coupled with livestock trampling. Some burrowing animals are

known to exacerbate bank erosion but this is invariably associated with non-native species, such as signal crayfish and mitten crab, which in some systems can turn a vertical river bank into veritable Swiss cheese, sometimes resulting in block slumping and partial collapse.

Voles are most likely genetically predisposed to burrowing into comparatively stable bank areas. Natural selection pressures suggest that if voles decided to burrow where flow velocities are potentially erosive then they are far less likely to be as successful in breeding compared to those animals that elect to bring up their young in stable environments. This may be one of the reasons why benign mill leats, with stable banks and managed water levels make attractive locations for voles to colonise. As a native species, with a host of native predators, it is highly unlikely that vole populations can build to such an extent as to cause serious bank failure and where bank failure on a man–made channel has occurred, it is invariably due to a combination of factors.

Following the inspection of the banks at both properties, it would appear that the banks adjacent to the upstream property (photo 1) are potentially more at risk from a block bank failure than the banks adjacent to the downstream property. This is simply because the bank here is on the outside tail of a sweeping bend. Potentially, any high flow velocities will sweep down the outside of the bend adjacent to the well defended (tree lined) bank next to the Fisherman's Rest car park before barreling into the vertical bank upstream of the large willow tree (marked A).

Photo 1 Bank adjacent to the upstream property

The large willow tree will undoubtedly have a network of strong roots that will help to bind the bank together. This extensive root system is providing bank

protection in the vulnerable area marked A. It will be important to keep this tree healthy to maintain optimum bank protection. Crack and white willow have a tendency to split and fall, rather than upending with root plate attached. Pollarding tall trees to take the weight of the top of the tree will often increase the lifespan of large willow trees, however expert arboriculture advice is required before contemplating any work.

Without an extensive root system, the bank marked A would be extremely vulnerable due to its vertical configuration and undefended top soils (managed lawn). Ordinary lawn grass is very shallow rooted and does not provide any significant support for the top or face of the bank and therefore leaves the bank vulnerable to erosion. The vertical "cliff" face is also a hostile environment for any plants to grow and therefore there is no complex root matrix available to help bind the soils. Battering back the bank to a sloping angle would enable some planting to become established but would involve a loss of garden and leave the willow vulnerable. The best option here is to establish a new toe to the existing bank and plant up with energy-absorbing aquatic emergent plants. This is discussed further in the recommendations section.

The bag work bank protection highlighted at B in photo1 and also shown in photo 2 has obviously been installed to provide critically important protection for the ancient wall behind. This will undoubtedly protect the wall immediately behind the bag work from any bank failure but it will lead to increased erosion pressures on the downstream end of the bag work, where flow will eddy off the hard promontory created by the bag work and nibble away at any soft, vertical surfaces downstream.

The dead tree stump (photo 2) located a short distance downstream of the bagwork is also of concern as the network of large roots will be slowly rotting away to leave substantial voids that would be far larger than any colony of voles could ever create. Again a new planted toe to the bank is required but should extend out from the apex of the bag work to run downstream in a smooth arc and knit back into the bank just downstream of where the shed is located. A smooth arc of energy absorbing aquatic emergent plants will help to avoid excessive flow eddying.

The bank adjacent to the downstream property (photo 3 and 4) is far less vulnerable to any bank failure because it is located on the downstream and inside of a slight right hand bend. As a result, the river will be the naturally depositing on this side of the channel.

Gaps between the existing clumps of emergent burr reed may act as attractive thoroughfares for water fowl to exit and enter the river, potentially damaging soft banks and leaving them vulnerable to erosion. Burr reed (*Sparganium* spp.) dies back during the winter months and is not considered to be as durable as some species of emergent sedge (*Carex* spp.) for bank protection purposes.

Photo 2. Highlighting the area of vulnerable bank immediately downstream of the bagwork.

Photo 3. The vertical nature of the bank leaves it more susceptible to failure. Planting up a low, energy absorbing toe to the existing bank would create effective and attractive bank defences.

Photo 3. The bank adjacent to the downstream property sits on the inside of the bend and is situated in a natural area of sediment deposition. River-related erosion is highly unlikely to occur in this location.

Photo 4. Undefended gaps in the stands of burr reed could be vulnerable to erosion via bank trampling by large water fowl.

4. Conclusions and Recommendations

Sections of the bank adjacent to the upstream property of Place House Cottages are vulnerable to failure due to a combination of the vertical nature of the bank face and the configuration of the bank in relation to the upstream bend. The short section of hard bagwork defences in the central section of the bank-line exacerbate the risks of bank erosion immediately downstream, especially where there is the possibility of voids developing where a dead tree root mass is rotting back. There was no evidence of a high density of vole burrows in this location although it must be accepted that burrowing animals will only make the bank weaker.

The section of bank located adjacent to the downstream property is highly unlikely to fail due to any river erosion pressures. Plugging the small gaps between existing clumps of emergent plants is all that is required to ensure full bank protection.

Effective protection against bank failure adjacent to the upstream property can be achieved by building out a new low-level toe to the existing bank. A narrow gutter of at least 150mm between any new bank toe and the existing bank toe must be retained to avoid blocking any low-level vole burrows, which would be illegal. The gutter can be plugged at the upstream end of the gutter in an area which is known to be absent of any vole burrows. This will help to avoid any heavy erosive flows from funneling down between the existing bank line and the inside line of any newly created bank toe.

The outline of the new bank toe should be constructed from two lines of soft revetment (300mm diameter faggot bundles secured behind driven untreated chestnut stakes) or coir rolls secured in the same manner, to form an envelope of approximately 1m in width. The approximate 400mm void between the two lines of revetment to be lined with a biodegradable geotextile, made from coir or jute and the pocket created filled with a gravel/soil mix to within a few centimeters of mean winter water level. It is essential to then plant up the new bank toe with a range of emergent aquatic plants. Sedge is highly recommended as a tough plant, that will not grow as tall as burr reed and has well-developed root systems. Photo 5 depicts the use of faggot revetment with new planting to create a new bank-line in front of a vertical brick lined bank on the River Meon at Meonstoke.

The new bank toe should be constructed to form a nice smooth arc around the existing bank and promontory and should be keyed back into the existing bank line just short of the adjacent tree lined sections that form the property boundaries. Creating any planted toe to the existing bank beneath existing tree shading will fail.

A project of this nature will require a Bespoke Permit to be issued by the Environment Agency prior to any construction work. Reducing the channel width by creating a new toe to the bank might raise questions over reduced flood capacity. Given the size and proximity of the adjacent flood plain, these concerns should be academic.

Although materials for creating a new toe to the bank will be comparatively cheap, work to install them would be relatively labour-intensive. A double run of revetment to create a 30m long (approx) pocket would take in the region of four to five man-days to install. A competent river contractor would charge in the region of £5000 to deliver the work required.

Photo 5. A new bank toe created using faggot bundles plus a gravel in-fill and planted with aquatic emergent plants. If properly constructed, a bank like this is hugely resilient and will protect the foundations of the existing hard wall (now obscured from view). The new toe also creates a valuable new habitat.

Acknowledgement

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