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Marine and Historic Environment Consulting

Historic Watercourses

Developing a method for identifying the historic character of watercourses

River Stour, Dorset

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Executive Summary

This project – entitled *Historic Watercourses: River Stour, Dorset* – has been designed and implemented by Fjordr Limited for Historic England. The project aimed to develop a means for both heritage managers and watercourse managers to identify, at a strategic level, the historic character of watercourses. The objectives of the project were as follows:

> To seek to increase awareness and integration of the historic character of watercourses in catchment management.
>
> To examine the scope for engaging members of the public in better understanding the historic character of watercourses.
>
> To develop a method for identifying the historic character of watercourses within a catchment, using the Dorset Stour as a case study.
>
> To disseminate information on the historic character of watercourses to heritage managers, watercourse managers and the general public.

This project was framed as a pilot consistent with Defra's Catchment Based Approach (CaBA) and was carried out in collaboration with the catchment partnership for the Dorset Stour, the Stour Catchment Initiative (SCI). The project addressed the entire length of the River Stour from its source at Stourhead in Wiltshire to the point where it reaches the sea, in Christchurch Harbour; the tributaries of the Stour were not included in this pilot.

Watercourses have played a central role in the historical development of England, yet – with some key exceptions – they seem to attract little direct attention from archaeologists. Nevertheless, other sectors – flood risk, water quality, nature conservation, development and so on – are making changes to watercourses that have implications for heritage assets in their vicinity. Such changes are contemplated and planned with relatively little archaeological information or advice to hand. Many of the issues to which watercourse managers are having to respond are a consequence of the history of human intervention in watercourses, exacerbated by human-induced climate change. While it is a concern that the potential impacts of these other sectors on watercourse heritage are being ignored, it is of even greater concern that the opportunity for heritage to inform decisions in these sectors is being lost.

Initially, it was thought that the historic character of the watercourse could be ascribed for each reach of the river, but in the course of the pilot it was found necessary to identify individual Historic Watercourse polygons (HWPs) to account for the density and variety of features reflecting the human history of the river. A total of 730 HWPs was identified using a single flat-file GIS layer. Each HWP has digitised extents, is described, ascribed to periods (to, from) and includes direct reference to the sources used in the identification. HWPs are also ascribed a type and a theme using standard terminology derived from Historic England's Monument Type Thesaurus.

The principal lesson of the pilot is that the River Stour retains a great deal of its history in its form and features. While there is a plenty of evidence for the history of human use and intervention in the river over many centuries – especially from the interpretation of historic maps and Environment Agency lidar data – this history is poorly recognised in existing archaeological records. Identification and recording of HWPs has been shown to offer a practical, intermediate level between detailed recording of individual sites and features, and wider landscape characterisation. The project has succeeded in generating a better understanding of the historic character of the Dorset Stour and provides a successful model that could be used in other catchments.

The range and variety of HWPs identified during the study underlines a major gap in the understanding of riverine archaeology. In addressing this gap, the project has demonstrated not only the possibility but also the value of integrating diverse existing sources of data into a single GIS output. The pilot offers a technical solution that can enable a greater role for the human history of the watercourse in informing its future management; accordingly, the report includes detailed appendices

on the methodology and its application. The pilot also underlines the potential for the public to participate in recording watercourse heritage through citizen science. Through an appreciation of the historic character of watercourses – informed by the methodology piloted in this project and facilitated by CaBA partnerships such as the Stour Catchment Initiative – archaeologists, watercourse managers and the public will be better able to understand England's rivers and to adapt accordingly.

Historic Watercourses

Developing a Method for Identifying the Historic Character of Watercourses: River Stour, Dorset

HE 7244
Fjordr ref: 16391

1. Introduction

Watercourses have played a central role in the historical development of England, yet – with some key exceptions – they seem to attract little direct attention from archaeologists. Nevertheless, other sectors – flood risk, water quality, nature conservation, development and so on – are making changes to watercourses that have implications for heritage assets in their vicinity. Such changes are contemplated and planned with relatively little archaeological information or advice to hand. Many of the issues to which watercourse managers are having to respond are a consequence of the history of human intervention in watercourses, exacerbated by human-induced climate change. While it is a concern that the impacts of these other sectors on watercourse heritage are being ignored, it is of even greater concern that the opportunity for heritage to inform decisions in these sectors is being lost.

As a response to this situation, this pilot project – based on the River Stour in Dorset – aims to develop a means for both heritage managers and watercourse managers to identify, at a strategic level, the historic character of watercourses. The objectives of the project are as follows:

- O1 To seek to increase awareness and integration of the historic character of watercourses in catchment management.
- O2 To examine the scope for engaging members of the public in better understanding the historic character of watercourses.
- O3 To develop a method for identifying the historic character of watercourses within a catchment, using the Dorset Stour as a case study.
- O4 To disseminate information on the historic character of watercourses to heritage managers, watercourse managers and the general public.

Watercourse-related heritage is broad in scope. The types of heritage asset that come most readily to mind are elements of the built environment, especially bridges, mill houses and waterfronts. Built heritage that is watercourse-related is the most likely to be protected by heritage designations, predominantly as listed buildings. There are also instances where earthworks and/or below-ground heritage next to rivers is known and may be designated by scheduling, for example. However, the character of the relationship between known sites – even designated sites – and the watercourse is often unspoken. Further forms of designation such as area designations like Conservation Areas or Registered Battlefields might include rivers almost incidentally. A degree of contrast is provided by Registered Parks and Gardens, where the incorporation of water into a designed landscape is more likely to be noted explicitly. Broadly, however, relationships between heritage assets and water are poorly considered, even for heritage assets that are regarded as of national importance (see Firth, 2015, 2014).

Watercourses do not appear to have been targeted systematically for designation purposes or under other strategic programmes (with the apparent exception of some canals, and some work on specific heritage asset types). Even the 'known' record of built heritage and visible earthworks adjacent to watercourses is inconsistent: so many reaches are blank areas in archaeological terms.

With the archaeology of waterside heritage assets so little explored, it is perhaps not surprising that there have been few investigations of the potential presence of significant archaeological material associated with watercourses either below ground or within watercourses ('instream') themselves. This generality holds for areas adjacent to the many significant buildings and structures that have waterside settings, but also for river reaches that are currently blank. The archaeological potential of instream and adjacent locations is heightened by survival of organic material as a consequence of waterlogging.

The imperative to look for archaeological material associated with watercourses is strengthened by the transitory and ephemeral character of some forms of water-based activity. Watercourse activities can be very important to understanding the history of a community whilst leaving little trace, which requires greater weight to be placed on identifiable evidence.

In contrast, some activities have such major physical consequences that watercourses are highly modified or are created outright by people. That is to say, many watercourses are themselves artefacts, even if their scale and the subsequent resumption of natural processes means that they appear natural today.

On several counts, therefore, it is necessary to look at watercourses in detail, focussing directly on the relationship between people and the watercourse through time: to understand the archaeological implications of known heritage assets; to identify as yet unknown heritage assets; to contemplate ephemeral evidence; but also to recognise that the watercourse itself may be an artefact.

Whether it is ephemeral or so substantial that it appears natural, the physical consequences of human activity – artefacts, structures, buildings, the river landscape itself – tell us something important about the relationship between people and watercourses. The major blind spot in the English heritage sector towards watercourses places those assets under threat. Perhaps more important, however, is the need to raise awareness of the human history of rivers in order to adapt to change. Archaeology could play a key role in mobilising evidence of past relationships with water in discussions about future relationships with water: in the context of climate change; loss of species and habitats; the cost of addressing water quality; and in enhancing social and economic benefits. The purpose of this project is, therefore, to arrive at a methodology that can both alleviate threats to watercourse heritage whilst also promoting awareness of the historic dimension to relationships between people and watercourses in the present and future.

As well as systematically examining available sources for evidence of historic watercourse features and activities, there is a need to make information about historic watercourses available to heritage managers and watercourse managers in a simple and straightforward manner. Unfortunately, the usual forms of heritage data do not serve watercourses very well. Listing Data is relatively limited because designation of watercourse heritage assets has been somewhat patchy (Firth, 2014, 2015) and plainly there are many heritage assets that are not designated. The coverage provided by HERs to watercourse-related heritage depends on the extent and focus of previous investigations and is also likely to be partial; but where heritage assets in the vicinity of watercourses are identified in HERs, their recording is often more fine-grained than would be practical in a strategic approach such as this. Mapping using aerial photography as their primary source – National Mapping Programme (NMP) and Aerial Investigation and Monitoring (AIM) projects – also offer fine-grained recording of individual assets and features, but they address all environments within map squares rather than focussing specifically on river-related heritage. Area-based approaches such as Historic Landscape Characterisation (HLC) are generally too broad in scale to distinguish watercourse-related heritage; the focus of HLC is on the contribution of heritage to the character of the landscape today whereas this approach addresses the history of the river even where its past is now inapparent (Firth, 2014, p. 48). All these sources and approaches offer valuable information on which to draw and are complementary: but given its focus and intent with respect to watercourses and their management, a novel approach has been pursued.

The solution developed here has been to collate such existing sources of data but also to review other sources in an integrated manner to identify mappable Historic Watercourse Polygons (HWPs). These HWPs flag the actual or likely presence of heritage features without the user having to consult

multiple sources, whilst pointing to the sources used in identifying HWPs so that they can be examined in more detail where required. A single layer GIS dataset of these HWPs – accompanied by the pilot methodology – is the principal output of this project, for use by SCI partners and heritage managers. The HWP GIS layer can be used in addressing specific proposals but also to provide a general understanding of the history of the Stour to inform the catchment-based approach. The GIS layer also flags features and evidence that can be used in public engagement, and could also be used to develop proposals for research and investigation. Its overall interpretative capacity is facilitated through the use of standard terminologies for heritage asset types and major themes, based on vocabularies developed by the Forum for Information Standards on Heritage (FISH)[1].

The Stour was chosen for the pilot because it presents a suitable scale of river that could be addressed in its entirety from its headwaters to the sea; because it encompasses a good range of heritage assets types and themes; and because of the management context provided by the Stour Catchment Initiative.

The Dorset Stour has its source at Stourhead in Wiltshire and briefly touches the border with Somerset, but for most of its course it flows through Dorset to Christchurch (historically in Hampshire) where it is met by the Avon at the head of Christchurch Harbour.

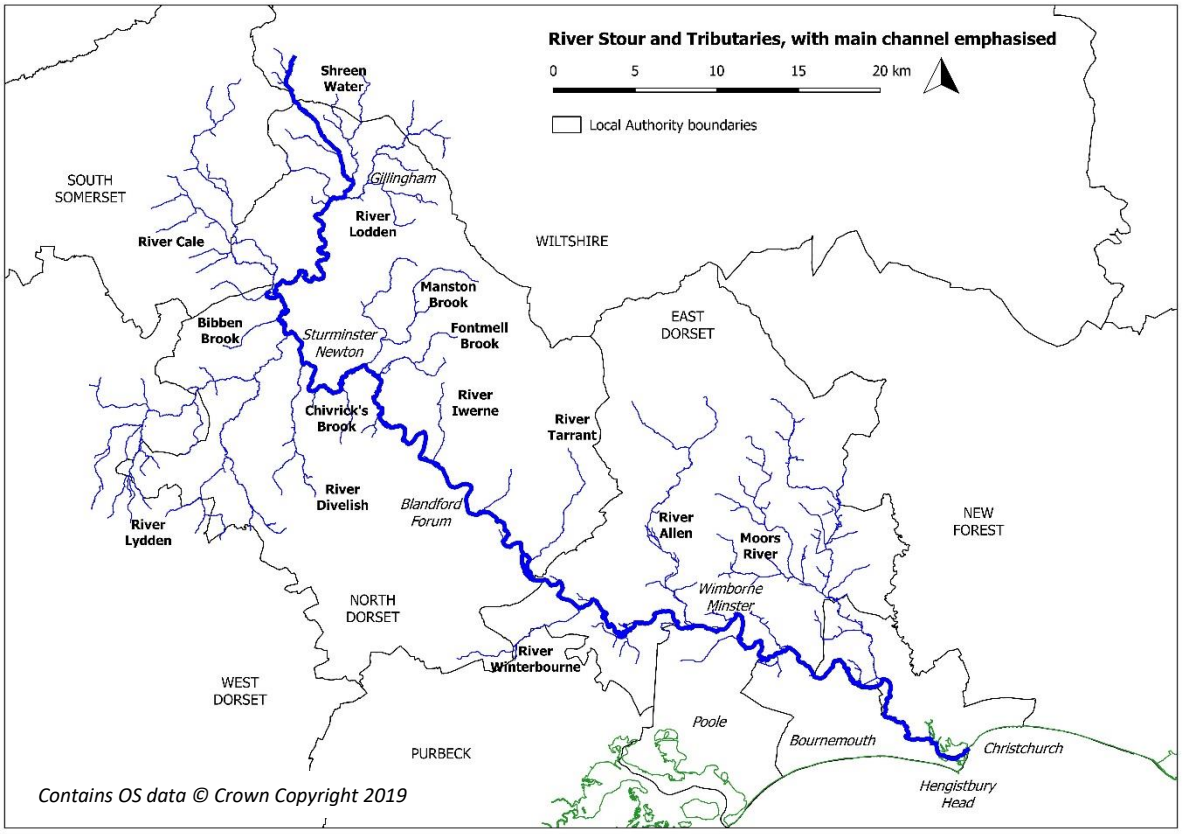

Figure 1 The Dorset Stour, with main channel in bold

The project is principally concerned with non-tidal waters, but tidal waters provide a key link and environment for certain human activities. Consequently, the project includes the tidal extent of the Dorset Stour to the point at which it reaches the sea between Mudeford and Hengistbury Head.

[1] http://www.heritage-standards.org.uk/

The Stour has a series of generally minor tributaries that join the Stour at the following locations:

Shreen Water	Gillingham
River Lodden	near Madjeston
River Cale	near Gibb's Marsh
Bibben Brook	near Stalbridge
River Lydden	near King's Mill, Marnhull
River Divelish	near Hinton St. Mary
Chivrick's Brook	near Rixon, Sturminster Newton
Manston Brook	near Manston
Fontmell Brook	near Fontmell Parva
River Iwerne	near Stourpaine
River Tarrant	near Spetisbury
River Winterborne	near Sturminster Marshall
River Allen	Wimborne Minster;
Moors River	near Hurn;

To keep the pilot manageable, the project focusses on the main channel of the Stour rather than encompassing all of these tributaries. The straight-line distance from Stourhead to Mudeford is about 59km, but the length of the main channel is about 119km. Although they have not been subject to systematic consideration and delineation of HWPs, occasional reference is made to the Stour's tributaries in the text below.

The project focuses on the linear watercourse of the Dorset Stour. Enclosed waters such as wells, ponds, lakes and reservoirs have not been included within the project except insofar as they are directly related to the main channel. The pilot also focuses on the watercourse and its immediate vicinity rather than the valley bottom / floodplain more broadly. There are, of course, important interactions between the floodplain and the watercourse, but the project is concerned principally with human use and modification of the watercourse itself; systematically addressing the archaeology of the floodplain could have considerably extended the project and encompassed matters unconnected to the watercourse. Nonetheless, key interactions between the floodplain and watercourse that have a bearing on past use and form of the watercourse have been addressed and are incorporated within relevant HWPs. This is particularly the case in respect of agricultural land use that is closely linked to the watercourse, including water meadows and flood meadows, where such land use may include interventions and infrastructure (weirs; sluices; carriers etc.) on the watercourse itself.

The range of heritage assets associated with the Dorset Stour is discussed at length below, but it is worth noting that there were sufficient indications of its history at an early stage to warrant its selection for this pilot. This included evidence of water mills, water meadows and designed landscapes, with a timespan for human activity extending back into prehistory indicated especially by the series of Iron Age hillforts located very close to the Stour. Although there are several small urban centres on or close to the Stour and some industry, the river is predominantly rural. The river runs close to the major conurbation of Poole and Bournemouth; however, built-up areas close to the river are primarily suburban and post-Second World War in date with the river itself having a 'green belt' effect. This is probably not untypical of rivers in England, but it does mean that the approach developed here has yet to be applied to extensive historically-urban reaches. Nonetheless, the Stour serves a large urban population centred on Poole and Bournemouth, which is important in terms of managing water quality and flooding, and also represents a large audience for engaging with the river as a key element of the region's historic environment.

The Stour Catchment Initiative (SCI) is a partnership of stakeholders organised as part of Defra's Catchment Based Approach (CaBA). The SCI is co-ordinated by Wessex Water with partners from the Environment Agency, Natural England, Dorset County Council and a range of other stakeholders with interests in the catchment[2]. SCI meetings and subsequent contacts have been a key means of understanding issues and projects relating to the Dorset Stour, and for raising awareness of the

[2] https://www.wessexwater.co.uk/environment/catchment-partnerships/stour-catchment-partnership

historic environment of the river. The project also included contact with Dorset County Council's Historic Environment team because of their interest in improving baseline knowledge of features associated with the management and use of the river. Contact was also maintained with Cornwall Archaeology Unit regarding a National Mapping Project (NMP) on the Dorset Stour, though the results of this work did not become available within the timescale of this project.

The project was initiated by Fjordr following an earlier project on heritage assets in inland waters (Firth, 2014, 2015), set out first in a Project Proposal dated 16 June 2016 and in more detail in a Project Design (PD) dated 11 January 2017. The PD was prepared within the timeframe of Historic England's Corporate Plan 2016-19 (Historic England, 2016a); the project was designed to contribute primarily to Aim 2 'Identify and protect England's special historic buildings and places' by developing a means of recognising the significance of watercourses and related assets[3]. Accordingly – and framed in terms of Historic England's Research Strategy (Historic England, 2016b) – the project was designed to contribute to the #understand, #adapt, #inspire and #innovate objectives.

Historic England's Research Agenda (2017), published after the project had been commissioned, has a specific section 'Waters, wetland and waterlogged' under the #understand theme. The section identifies two research questions that will help Historic England's mission, namely: what aspects of water management heritage are most at risk of loss and least understood; and how can we improve our understanding of the value and significance of individual sites or integrated landscapes associated with the exploitation of water? This project provides a methodology and data in a form accessible to heritage managers and watercourse managers that can help address both of these questions.

Additional impetus for the development of the project was provided by environmental conditions. The catastrophic failure of a number of bridges and the need to quickly reinstate them (Cornah and Vaughan, 2016; Jecock and Jessop, 2016) demonstrated the need for a range of parties to be aware of the historic environment considerations that apply to watercourses in the vicinity of bridges as well as to the designated structure of the bridge itself. Wool Bridge – a further designated bridge, in Dorset but on the Piddle rather than the Stour – partially collapsed in the course of the project. These examples emphasise the degree to which collapse of designated structures – together with damage to heritage from flooding – seem set to increase in frequency and severity as a consequence of climate change. The collapse of Wool Bridge underlined the importance of the approach developed here also serving as a strategic 'flag' to be taken into account when an urgent response is required.

As noted, the principal outputs of the project are this report, the pilot methodology, and the GIS layer of HWPs for the Dorset Stour. Following this introduction, Section 2 of this report sets the project in the context of the Catchment Based Approach (CaBA) and the range of approaches being taken towards watercourses as components of the historic environment. Section 3 introduces the methodological approach adopted in the pilot. Section 4 outlines aspects of the human history of the Dorset Stour observed from the project and their relevance to other watercourses. Section 5 addresses the potential for engaging the public in the investigation of watercourses through this kind of approach, and Section 6 presents our conclusions and recommendations. The methodology is set out in Appendix I and is accompanied by an account of the main themes and asset types encountered on the Dorset Stour in Appendix II, to serve as a practical guide to the kinds of features that might be found on other rivers, and how they appear in the sources used.

[3] The project was also intended to contribute to the following aims of Historic England's Corporate Plan 2016-19:

Aim 4 'Help those who care for historic buildings and places, including owners, local authorities, communities and volunteers' by examining in particular the scope to develop volunteer engagement in watercourse history.

Aim 1 'Champion England's historic environment' through Defra's Catchment Based Approach

Aim 3 'Promote change that safeguards historic buildings and places' by taking into account the specific pressures on watercourses in relation to environmental protection and climate change

Aim 5 'Engage with the whole community …' by using local contact with watercourses to broaden the relevance of historic environment information.

2. The Catchment Based Approach and Watercourse Heritage

Watercourses in England are paradoxical. Their fundamental importance to many aspects of modern daily life is simply a continuation of the importance they held for our predecessors. Throughout time, however, the benefits of running water have been accompanied by disbenefits. Although the benefits and disbenefits have altered, their historic importance is apparent in the degree to which the geography of modern society is deeply structured around watercourses. To obtain benefits and avoid disbenefits, people have intervened in watercourses – including the Dorset Stour – for millennia. Moreover, people's interventions in the wider environment have also had effects on watercourses, adding to the benefits and disbenefits that have required attention without the causality or implications necessarily being apparent. These interventions have, of course, gone hand-in-hand with natural processes, themselves responding to broader environmental variations including, now, human-induced climate change. The combined consequence is that watercourses in England are in need of further intervention yet, it would seem, with relatively superficial attention to the long history of past intervention and human-induced change. Simultaneously, archaeologists – whose specialism lies in identifying and understanding the material consequences of people's activities in the past – seem largely disengaged (with key exceptions) from what are probably the most influential features of England's historic environment across the millennia. That they often appear 'natural' – or subject only to recent interventions – suggests to watercourse managers that rivers can be restored to a natural state; and to archaeologists that this is the domain only of natural sciences.

The Catchment Based Approach (CaBA) focuses on partnership in its organisation and in its geographic scope. CaBA partnerships encompass entire catchments from source to sea, bringing together multiple stakeholders not only from the public sector but also from the private sector and civil society. Engaging directly with individuals is key facet of CaBA, including volunteers and the general public but also people whose activities and decisions have direct implications for watercourses, such as farmers. CaBA is currently described as follows[4]:

> The Catchment Based Approach (CaBA) is an inclusive, civil society-led initiative that works in partnership with Government, Local Authorities, Water Companies, businesses and more, to maximise the natural value of our environment.
>
> CaBA partnerships are actively working in all 100+ river catchments across England and cross-border with Wales, directly supporting achievement of many of the targets under the Government's 25 Year Environment Plan.

The explicit reference to the Government's 25 Year Environment Plan (25 YEP) (HM Government, 2018) underscores the influence of Natural Capital / Ecosystems Services approaches in CaBA, as reflected in the phrase 'to maximise the natural value of the environment'. Although CaBA is more people-centred ('society led') than previous approaches to watercourse management, services are regarded as flowing in one direction: from nature to people. Natural Capital and Ecosystems Services approaches are problematic from a heritage perspective on several levels (Firth, 2020). In this context, they contribute to the expectation that nature can be disentangled from its human history: that 'nature' can be reinstated by river restoration, by removing artificial barriers, and by practicing Natural Flood Management (NFM). Obviously, these techniques are all further phases of a long history human intervention: they are cultural rather than natural, as indeed are all efforts to obtain services for people from the environment. But the overall narrative remains dualistic, about removing culture from nature. The experience of working with a CaBA partnership during this pilot project has been very positive and CaBA is not inherently unsympathetic to cultural heritage. However, the degree and time depth of the entwining of nature and culture in watercourses is not recognised, nor are archaeologists sufficiently engaged in CaBA to represent this fundamental characteristic of English rivers.

The understanding that the physical characteristics of watercourses in England have been heavily influenced by human activity is not new, nor is the appreciation that rivers have– through history – had cultural dimensions evident in how they are perceived and treated. What might be new is the scope to operationalise such understandings of watercourses expressly in their management. Rhodes

[4] https://catchmentbasedapproach.org/about/

suggested 'we should be very cautious of characterizing the pattern of channels *in any British river* as "natural"'; and 'It seems rather likely that *very few of the river channels in the UK* have not been modified to a degree at some point in their history' (Rhodes, 2007, pp. 140; 151). Brown et al. have made this point emphatically in the context of restoration and rewilding:

> Early-mid Holocene streams in lowland temperate Europe lacked elevated floodplains, and were not formed by fine clastic flats and levees with meandering river planforms commonly seen today … The change in these rivers to their Anthropocene state, started in the Prehistoric period after the adoption of farming … ranging in date from as early as 6000 BP … It is clear from this review that it is impossible to return lowland streams and floodplains of temperate Europe to anything approximating an originally natural state or a hypothetical natural equilibrium condition with reference to a point in the past … Restoration should seek to recreate these culturally created semi-impacted systems, remains of which are often still visible and reconnect the channels with as much of the floodplain as is possible in order to achieve gains at the catchment scale.
>
> (Brown et al., 2018, pp. 200–201)

The results of geoarchaeological investigations in the Iwerne valley, a tributary of the Stour, confirm the impact on watercourses and valley bottoms of colluvial deposits mobilised by arable farming 'possibly in the Bronze Age, and certainly by Iron Age and Romano-British times' (Bell et al., 2008, p. 452). This corresponds to a regional pattern of changing river behaviour in the Late Bronze Age, Iron Age and thereafter in response to deforestation and arable farming (Wilkinson and Straker, 2007, p. 64; Straker et al., 2007, p. 105). On the Dorset Stour, culture and nature have been fundamentally entwined for three millennia, and this has to be accommodated within the Catchment Based Approach.

Human intervention in the Stour did not end with the introduction of arable farming in prehistory; there have been multiple phases of major reworking – for water mills, water meadows, navigation, drainage and so on – for which Edgeworth's conception of an 'Archaeology of Flow' is particularly important. Multiple interventions for different purposes connect with each other up and downstream, whilst remaining subject to natural process that are still partly 'wild':

> Most rivers today can be understood as systems of flow which include the human element as part of their dynamic. As such they are susceptible to archaeological as well as geomorphological and hydrological study.
>
> (Edgeworth, 2011, p. 33)

Clearly, complex human interventions in water courses are not motivated simply by the wish to intervene. Manipulation of the environment is driven by – and takes place within the context of – broader social and economic factors that extend far beyond the watercourse itself. Rivers are a facet of ways of life – rural; urban; industrial – hence watercourses are structured by, and help structure, wider society. This is evident in Oosthuizen's account of the Anglo-Saxon Fenland, for example:

> … evidence for the presence of canals and their subsidiary catchwaters across the fen basin before 970 {AD} indicates the presence of extensive, sophisticated systems of engineering for water management across the basin in the middle Anglo-Saxon period and perhaps earlier, supporting and complementing complex timetables for the cropping and management of the many ecologies that were exploited … It provides yet another example of the extent to which early medieval society, economy and landscape across the fen basin were mutually sustained …
>
> (Oosthuizen, 2017, p. 132)

There is an important echo here with CaBA being society-led. CaBA recognises that the state of watercourses across entire catchments is linked to overall societal expectations and behaviours in respect of watercourses and the benefits/disbenefits to which they give rise. Oosthuizen demonstrates that such interdependence between society and watercourses was true also of the early medieval period. Exploring the historical dimension to the relationship between people and watercourses – and how this is reflected in the historic watercourses we have today – might provide a foundation for CaBA dialogues about how such relationships need to change in future.

There is in fact a fair amount of recognition in watercourse management literature of the human dimension of rivers and their hybrid character. Notwithstanding the repeated reference to 'restoration' as if it is possible to return rivers to a natural state, it is often acknowledged that this is not achievable; what is sought is a restoration of (some) natural processes within hybrid systems, rather than restoration of the watercourse to a prior state. There is also recognition that 'restoration' is itself a cultural process that is affected – implicitly or explicitly – by current social and economic drivers rather than natural processes alone. There is also concern about the overall effectiveness of 'restoration' despite its extensive adoption. These considerations are, of course, inter-related, but it is worth underlining the appreciation in river management literature of the entwining of culture and nature in watercourses as historic entities, and in river restoration as a contemporary endeavour (Ashmore, 2015; Dufour and Piégay, 2009; Kondolf and Pinto, 2017; McDonald et al., 2004; Smith et al., 2014; van Diggelen et al., 2001; Wohl et al., 2015). Despite this appreciation, a sense that human influence is recent, that the clock can be turned back, and that this is principally a matter for the natural sciences, still seems to persist. For example, the current Strategic Plan (2016-2021) of the River Restoration Centre states:

> We focus on the restoration of active hydrological and morphological processes, that operate throughout a river catchment, which are essential to support a healthy river and its ecology.
>
> Many of our rivers have been damaged in the past by outdated engineering and management practices. River restoration and best practice management seeks to address and reverse this degradation and achieve wide-ranging benefits that result in healthy rivers and catchments.
>
> (River Restoration Centre, n.d.)

The Introduction of the Manual of River Restoration Techniques reinforces the impression that restoration is intended to return rivers to a natural state. Whilst a degree of past human intervention is acknowledged – 'in many places, existing development and associated modification of natural river features may preclude comprehensive river restoration' (River Restoration Centre, 2013 Introduction, p.3) – the sense that UK watercourses universally embody the deeply-rooted interaction of natural and human factors is absent. An ahistorical, acultural perspective may not matter practically if the focus is on restoring 'natural processes' rather than restoring 'nature': the Manual notes of modified rivers:

> A key part of achieving ecological improvements in such locations will be to introduce features and modifications to the channel so as to create new habitats, improved biological continuity and more 'natural' flow conditions.
>
> (River Restoration Centre, 2013 Introduction, p.3)

Here it seems the intention is to make ecological improvements to a system that is recognised as having considerable time-depth as a hybrid system. An interesting question is, therefore, whether such improvements can be informed by an understanding of watercourse history; and whether former interventions can be regarded not as 'damage' but as opportunities to 'recreate these culturally created semi-impacted systems' as suggested by Brown et al. above. If so, then the identification of HWPs could help in reintroducing sustainable processes to watercourses whose cultural past and present is broadly acknowledged.

As suggested above, archaeological investigation in and of watercourses[5] in England has been limited relative to the extent and importance of rivers as features of the historic environment. But river archaeology in England is not completely absent. Examples have been noted here and in the previous report on Heritage Assets in Inland Waters (Firth, 2014), to which could be added various others (Buglass, 2019; Heaton, 2004, 2011) as well as ongoing projects such as 'Dive into Durham'[6]. The article by Brown et al. already cited is also linked to an ongoing project funded by the Leverhulme

[5] This discussion relates to non-tidal watercourses. Tidal watercourses – or at least their inter-tidal areas – have received rather more attention as a component of the coast through Rapid Coastal Zone Assessment Surveys and related initiatives. Equally, the history of watercourses within wetlands have received attention because of the close relation between wetland and watercourse, though field investigation has tended to be limited to wetland rather than water.

[6] http://www.diveintodurham.uk/home.html

Trust called 'Flood and Flow'[7], examining the history of rivers by combining archaeological and place-name evidence (Jones, 2016; Jones et al., 2017).

Some watercourse-related heritage asset types have received specific attention, reflected in projects and guidance for Historic England on water mills (Alexander and Edgeworth, 2018; Historic England, 2018a; Stoyel, 2015), water meadows (English Heritage, 2014; Historic England, 2018b; Smith, 2015), fish weirs (Historic England, 2018c), flood defences (Historic England, 2018d) and pre-industrial canals (Historic England, 2018e). These are set within a wider literature on these asset types, notably water meadows (e.g. Cook and Williamson, 1999, 2007), bridges (e.g. Harrison, 2007) and early canals (e.g. Blair, 2007). Such volumes are more broadly historical than archaeological, which is true also of work being directed at watercourses systems as well as specific asset types.

Literature relating to the history of watercourses is to be found in a range of other disciplines – environmental history, cultural geography, historical geography, and cultural anthropology (e.g. Coates, 2013; Cosgrove and Petts, 1990; Haslam, 1997, 1991; Holt, 2018; Kelly et al., 2018; Skelton, 2017; Vallerani and Visentin, 2018). One such volume, by Strang, is based on a study of the Dorset Stour itself (Strang, 2004) and Strang's work on water has been a focus for more archaeological consideration of how the different roles of water – and the inter-relationship between nature and culture – might be understood (Strang, 2014a; Scarborough, 2014; Davies, 2014; Edgeworth, 2014; Alberti, 2014; Strang, 2014b). Attention to the cognitive role of water in earlier periods (e.g. Richards, 1996; Rogers, 2012) might provide grounds for addressing the historic character of watercourses where evidence from historic maps or topography is an inadequate guide.

As this brief review has shown, there is a body of research in river management, in environmental humanities and to some extent within archaeology about watercourses as historic entities. The degree and time-depth of human interaction with watercourses – including in their physical form – should not really be in contention; and the cultural dimension of rivers and their management in the present is also recognised. What seems to be lacking is a means of drawing archaeological perspectives into river management, to give the historic character of watercourses operational effect within CaBA. This is the task to which the methodological development in this pilot project has been addressed.

[7] https://waternames.wordpress.com/

3. Development and Application of Characterisation Methodology

The approach initially envisaged for this project was to try to summarise the historic character of reaches of the watercourse. This was anticipated in the conclusion of the Heritage Assets in Inland Waters as follows:

> A formal categorisation of watercourses in terms of their historic character would be very helpful … focussing on the identification of different 'types' of watercourse based on their historical development.
>
> (Firth, 2014, p. 53)

The amount and complexity of historic watercourse evidence on the Dorset Stour – which can vary considerably within a reach as much as from reach to reach – is such that the methodology evolved into mapping 'Historic Watercourse Polygons' (HWPs) that have been categorised by reference to theme and (monument) type, based on the Monument Type Thesaurus[8].

The HWPs are not intended to map individual assets or their individual elements or features; rather, they are intended to locate the approximate spatial extent within which evidence of historic activity and intervention associated with the watercourse might be found. As their purpose is to flag rather than map, the polygons are intentionally imprecise; their boundaries should not be taken to imply that the precise extent of an asset, feature or activity is known. As one area may have evidence of several different forms of watercourse activity, then HWPs may overlap. HWPs are not divided internally: they indicate the presence or likely presence of heritage assets – possibly with many separately-identifiable elements or features – but they are not assets or records of assets themselves. The record accompanying each HWP includes a brief description limited to 254 characters and indicates the sources of information used in identifying the HWP. The end result is a single layer GIS shapefile, which is flat-file and readily incorporated within a project workspace. It can be used independently of other forms of historic environment data, or as a starting point to direct the user to more detailed historic environment data layers if these are available.

Although the intention is not to map individual heritage assets, some of the features indicative of watercourse-related activity are quite small and simple, and the HWP might seem to correspond to a heritage asset record. Examples include watering places for animals to drink and various small inlets. While these might approximate to heritage assets, they have not been mapped precisely – as noted above – as their purpose is to flag their presence and the potential for archaeological material to survive in the vicinity. Further, their importance does not lie solely (or even largely) in the single HWP, because it is the existence of numerous example – linked by theme or type – that can indicate characteristic usage of the watercourse.

It is worth underlining that this methodology has been developed primarily to support watercourse management, contrasting with the mapping of individual heritage assets and features when enhancing Historic Environment Records (HERs) and through National Mapping Programme (NMP) and Aerial Investigation and Mapping (AI&M) projects[9]. Although detailed mapping of assets and their features could have been carried out from the sources used for this project, the implications in terms of time for precise mapping and for creating heritage asset records would have been considerable. As already noted, AI&M is in any case anticipated for the Dorset Stour in due course.

It is also worth drawing out the difference between this initiative and Historic Landscape Characterisation (HLC). This exercise is more granular and focusses on the multiplicity of activities and interventions specifically associated with watercourses, whereas HLC is concerned with the landscape as a whole divided into relatively broad categories of landscape character. Also, critically, HLC is concerned with the way in which the historic environment contributes to the character of today's landscape. This project is concerned with the (potential) presence of physical remains relating to historic activity and intervention, irrespective of whether such remains are apparent in the landscape or contributing to its character. In fact, it is the seeming failure of the history of watercourses to contribute to their current character that has helped motivate this project: watercourses are often

[8] https://historicengland.org.uk/advice/technical-advice/information-management/data-standards-terminology/; http://thesaurus.historicengland.org.uk/

[9] https://historicengland.org.uk/research/methods/airborne-remote-sensing/aerial-investigation/

seen through a prism of naturalness, so even if their character is largely a product of past human intervention, this might not be apparent or recognised. Historic watercourse activity may not make any perceptible contribution to current character, but the evidence survives nonetheless and needs to be flagged if it is to inform future management or be safeguarded. In the alternative, some reaches are so heavily engineered as to seem devoid of character, yet there may still be traces of past interventions to which this methodology seeks to draw attention. Historic Watercourse Characterisation – where the contribution of the past to current watercourse character is broadly acknowledged – is certainly conceivable, but it has not been the objective here.

The distinction between Historic Watercourse Polygons developed here and a) mapping and recording heritage assets and features and b) wider landscape characterisation such as HLC can be illustrated with reference to water meadows. The HLC of Dorset includes water meadow (as 'Water association: watermeadows' under the field Broad_HLC_), and extensive areas of the floodplain of the Dorset Stour are shown as polygons classed as water meadow. Equally, the internal features (banks and ditches) of water meadows can be individually mapped, where visible, in the course of NMP. The HWP sits between these different levels of detail. HWPs for water meadows can be broadly identified as discrete parcels with their own characteristics and relationships to other features of the watercourse. Further, the project strongly suggests that the construction and survival of water meadows on the Dorset Stour is not as extensive as indicated by the availability of suitable ground in the floodplain. The evidence suggests that water meadows are discrete entities, rather than an overarching characteristic of the landscape; characterisation of the floodplain as water meadow might obscure other forms of historic activity and intervention, and the specific context of each water meadow. Equally, detailing the extent of water meadows and their individual features would be beyond the resources available and firmly mapping boundaries and features of water meadows would be necessarily limited to visible remains. HWPs encompass areas where water meadows can be reasonably inferred without being clearly visible in their entirety. Hence HWPs fall between heritage asset mapping and landscape characterisation, flagging (in this case) former use of the river in a particular area as water meadow and indicating the potential for surviving remains.

Mills present a further illustration of the approach. The HWPs encompass the entire extent of watercourse features associated with mills, drawing attention to the presence and significance of mills as integrated water-driven systems rather than as buildings (which is commonly all that is protected by designation, for example). However, the HWP for a mill does not detail all the elements of which it comprises – weirs, leats, races, ponds, hatches etc. – even when this detail is mappable; not least because the features shown on historic maps are likely to present only the latest eighteenth and nineteenth century phases of sites that are likely to have seen numerous changes over a thousand-year history. On the Dorset Stour, mills are generally quite discrete even where they are extensive; though in some places water mills are in such complex watercourse systems, interacting with other watercourse features, that they are difficult to disentangle. Nonetheless, HWPs (overlapping if necessary) are sufficient to draw attention to the fact that the site as a whole – not just a designated building – should be taken into account; and to signpost the sources on which a more detailed assessment might be based. To some extent, the HWPs might serve as the 'mechanism' that will ensure that heritage is taken into consideration at an early stage in river management (Alexander and Edgeworth, 2018, p. 62) and be a step towards 'high level records for whole watermill landscapes' (Alexander and Edgeworth, 2018, p. 66).

The principal sources of data anticipated in the Project Design agreed with Historic England were as follows: designated heritage asset data from Historic England; HER and HLC data from Dorset County Council; and online sources of historic mapping and lidar data. In practice, it proved possible to incorporate directly within the project GIS the historic OS mapping, courtesy of Historic England, together with lidar data from the Environment Agency. Data from the National Record of the Historic Environment (NRHE) maintained by Historic England was not sought, as it was felt that this would largely duplicate data in Dorset HER. Separate artefact data from the Portable Antiquities Scheme was not sought either. No provision was made to look at aerial photographs other than via online sources because, as noted, an AI&M project covering the Dorset Stour was anticipated.

The pilot concentrates on the main channel of the Stour rather than on its tributaries, so most HWPs are located alongside or within a 1km buffer of the river. In some cases, the relationship between

tributary and main channel is complex so HWPs extend some way along tributaries. For example, Figure 2 shows Manston Brook where a mill (HWP 184), water meadows HWP 239 and 246 and river alteration HWP 259 have been recorded as it seems likely that there has been a major remodelling of the entry of Manston Brook to the Stour.

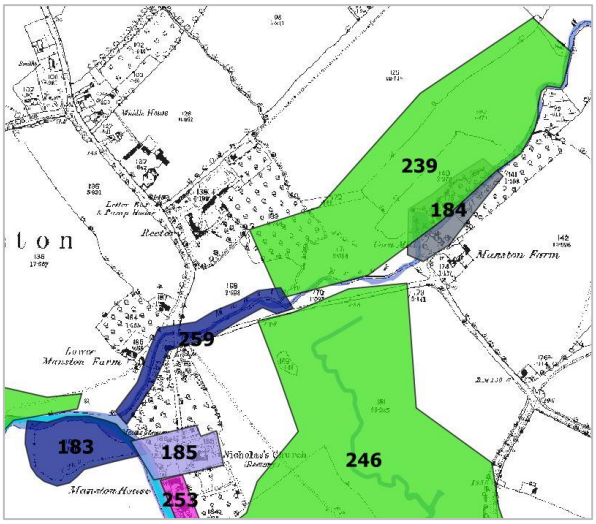

Figure 2 Map showing HWPs located along Manston Brook, tributary of the River Stour.

There are places on the Stour where the evidence points to a level of complexity that cannot be swiftly unpicked from the available sources. The watercourse and its surroundings is truly a palimpsest of multiple interventions across the millennia. Archaeological and/or geoarchaeological fieldwork is likely to be required to understand the sequences hinted at by mappable features on the surface of the land. The area around Manston and Hammoon is a relatively discrete example; on a larger scale, the Stour from Blandford to Wimborne is extensive and highly complex.

One of the themes that warrants specific comment is the 'non-themed' theme. These are HWPs whose purpose is not apparent or is ambiguous and is analogous to Monument <by Form> in the Monument Type Thesaurus. The non-themed theme also includes palaeochannels, which may be natural in origin (or, at least, a natural response to intervention elsewhere) but which have archaeological potential because of the deposits they contain.

The pilot was considerably assisted by a parallel exercise led by Professor Robin McInnes for Historic England on using historic imagery to support the identification of the historic character of the Dorset Stour (McInnes, 2018). Professor McInnes assembled a wide range of artworks and photographs showing the Stour or other comparable rivers, ranking their accuracy as historic sources. His report provides a valuable complement to this pilot and cross-references to images he collated are included at various points. It should be borne in mind, however, that the artworks and photographs add to the predominance of evidence from the nineteenth and twentieth centuries, which might not reflect the earlier history of the Stour. Notwithstanding their accuracy, account also needs to be taken of the selectivity of artists and photographers in choosing their locations, their physical point of view, and the composition of the work, quite aside from any artistic licence. As a whole, this selectivity probably reinforces particular perceptions of the watercourse, rather than reflecting the full range of characteristics and activities.

The methodology developed in the course of the pilot is set out in Appendix I. It shows how different sources were collated and used, and details the HWP layer that forms the core of the method. Appendix II goes through the different themes and many of the types observed on the Stour, showing examples, providing details of how they have been represented as HWPs, and commenting on their implications for watercourse management. Appendix II serves as a set of 'worked examples' that illustrate and provide guidance on the methodology.

4. Results: the Historic Character of the River Stour

The shapefile resulting from the pilot comprises a total of 730 HWPs. The total number of HWPs by theme ordered by count (left) and area (right) is set out below. Although the extents of HWPs have not been mapped precisely for the reasons explained above, their overall area still provides an order of magnitude for their contribution to the historic character of the Dorset Stour.

Theme	Count	Area (ha)
agriculture	208	1056.26
crossing	145	30.33
non-themed	83	203.38
river management	82	116.19
industrial	67	157.81
navigation	66	13.76
waterfront	31	132.23
designed landscape	15	97.20
religious ritual and funerary	12	5.91
aquaculture	8	5.40
recreational	4	0.76
military	4	4.46
domestic	4	0.46
civil	1	0.02
Grand Total	**730**	**1824.18**

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agriculture	208	1056.26
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Grand Total	**730**	**1824.18**

Table 1: Total HWPs by Theme

HWPs are summarised by type under each theme in Appendix III.

Both by count and area, HWPs relating to agriculture predominate, reflecting the degree to which agricultural activity – both pastoral and arable – has shaped the Dorset Stour through history. The agriculture theme encompasses bedwork and catchwork water meadows, but also funnel-shaped meadows and other flood meadows that hark back to earlier agricultural use of the river, with still-extant features perhaps reflecting prehistoric practice. The relationship between agriculture and the river must have gone through numerous phases, and certainly seems to have left a lasting impression on the overall character of not only the river but its surrounding landscape. Riverside meadows that were allowed or assisted to flood were an important resource for grazing and haymaking long before the introduction of constructed water meadows (bedworks and catchworks). They were unenclosed but apportioned in strips marked by posts or stones, as shown on Tithe Maps at Net Mead and Marnhull Ham, where the presence of posts and stones is noted in the earliest 25-inch OS map (see Appendix II). That this system was extensive and helped structure the whole landscape is apparent in the number of funnel-shaped meadows alongside the Stour, giving on to droves and lanes. The preponderance of related place names such as mead and hamm lends further weight to the influence of this form of agricultural production.

As already noted, although constructed water meadows are present on the Stour, they are not as extensive as might be expected nor as well-preserved, especially compared to other rivers in the region. It seems that water meadow construction was not engaged in so widely on the Stour, or that they were not maintained for as long or were ploughed out. Documentary references suggest that the pasture was already rich without water meadow construction – at least in some areas of the Stour – and it is possible that the existing system of naturally-flooding meadows was productive enough without additional investment (see Appendix II).

Other agricultural uses are reflected in the HWPs also: direct provision for livestock through watering places and sheepwashes, for example; and manipulation of plant resources such as osiers, withies and

rushes. Agricultural requirements also drive some of the other themes, such as water mills for grain (in the industrial theme) and many of the HWPs in the river management theme, especially relating to the 'improvement' of drainage to enable expansion of arable production (Firth, 2020, pp. 41–42).

Crossings are the most numerous HWP after agriculture but they appear quite far down the list when ordered by area because they are limited in size. Crossings have long histories: bridges still in heavy use today often include medieval structure. Even these medieval bridges are likely to be later rebuilds of yet earlier structures, often built close to former fords. In some case, these ancient crossings have remained as fords. The importance of crossings is deeply embedded in the pattern of roads, footpaths and settlements, underscored by the number of 'ford' place names.

Non-themed HWPs are numerous and extensive. As noted, they are a consequence of human activity – or have the potential to preserve deposits relating to human activity – though their purpose may be uncertain. The non-themed HWPs generally point towards the earlier history of human activity relating to the Stour.

The industrial theme largely comprises water mills, both numerous and extensive when their associated watercourses are included. A total of 46 HWPs have been identified for mills, amounting to over 135 hectares or an average of almost 3 hectares each (noting that HWPs do not present precise extents). Water mills were probably even more numerous than this in the medieval period; possible former mill sites have been identified as HWPs under the non-themed theme, pending further investigation. The tentative identification of former mill sites is based on islands comparable to the 'mill islands' left between the main channel of the river and the leats (head and tail race) of the bypass systems typical of many surviving mills on the Stour (see Alexander and Edgeworth, 2018 Fig. 10, p.15).

Quarries and gravel pits make up the other main types of industrial HWPs; their location may have been influenced by the Stour playing a part in transport. This certainly seems a possibility in respect of Pen Pits near the head of the Stour. Even though the Stour is very small today in the vicinity of Pen Pits, it could have provided a route downstream for heavy products. Rowe points expressly to the role of the river in transporting quarried goods in respect of querns found at the Neolithic causewayed enclosure above the Stour at Hambledon Hill:

> The nearest locality to Hambledon Hill where stone could be obtained is probably at Sturminster Marshall, some 20 km to the south-east, down the river Stour. This river could have provided an easy passage for quern material right up to the base of the hill.
>
> (Rowe in Mercer et al., 2008, p. 633)

Waterfront HWPs are extensive and indicative of human activity immediately alongside the river, as well as potentially in and on the river itself. Waterfronts have been identified where various forms of settlement are on the river bank, even though mapped evidence for waterfront structures (quays, jetties, slips etc.) may not be present. The range of watercourse-related activities in waterfront areas may have been diverse, including use of river water for drinking, washing, processing, disposal etc. as well as access to the river for transport, for example. The waterfront HWPs cover a wide rage of periods: as well as settlements with medieval origins, the waterfront HWPs include the series of Iron Age hillforts and settlements that are immediately adjacent to the Stour or closely connected. The role of the Stour in connecting the port-of-trade of Hengistbury (Cunliffe, 1990) with riverside sites at Dudsbury, Spetisbury, Hod Hill, and Sturminster Newton warrants further attention, bearing in mind that although Bradbury and Buzbury are a little more distant they appear to have direct land-based connections to the river also. The source of the Stour is masked by the artificial lake at Stourhead, but is overlooked by a further hillfort, Park Hill Camp.

The practical relationship between riverside settlements and the Stour is obscure today and in more recent mapped sources; communities seemed to have turned their backs on the water over the last 200 years, perhaps fearful of flooding, as a consequence of property rights asserted over a once commonly-used resource, or because essential water now comes and goes in pipes. Earlier maps suggest that settlements had more open access to the river. For example, there is a marked contrast

in Shapwick between the village as mapped in 1813 and the village today, when it is hardly possible to access the river at all and even the waterside church is separated from the village by a flood barrier.

Figure 3 Shapwick village, Manor of Shapwick, 1813[10]

The proximity and permeability of settlements to the river is also apparent in Deserted Medieval Villages (DMVs) identified in the course of the project, notably at Little Nutford (HWP 301) and near Milldown School, Blandford (HWP 413). These settlements – like many extant settlements – were at least partly within the floodplain. Their location might suggests that people lived with flooding, rather than battling against it (Firth, 2020, pp. 41–42).

HWPs indicative of direct intervention in the watercourse for the purpose of controlling its flow have been ascribed to the river management theme. These include both former courses of the river and later courses that have been cut, together with structures relating to river management such as weirs, sluices and pumping stations. In some cases, changes to the river predate the earliest map, but the former route is captured in evidence such as parish boundaries. There has, however, also been major intervention in the river's course in much more recent times, notably through major post-WWII dredging in the lower reaches of the river.

Another major source of interventions in the form of the Stour has been for aesthetic reasons relating to designed landscapes. This is plainly the case at Stourhead where large ornamental lakes were created, erasing the former channel and also earlier features including medieval fishponds (McKewan, 2006). It is now equally plain that the Stour upstream of Blandford bridge has seen major re-working as part of the landscaping of Bryanston, probably in the late-eighteenth century. The Bowles Map of 1659 and illustrations from the early eighteenth show the previous configuration of the river, but it appears in its current configuration of a slow sweeping curve with a prominent weir by the time of the earliest OS map. Such major intervention in the river for aesthetic reasons has a parallel (and no doubt shared skills and experience) with river navigations and early industrial canals, as well as the manipulation of water for landscape purposes. Other instances of major re-working of the river also appear to be connected with designed landscapes, though the details are obscure. Notably, the river adjacent to Langton Long Blandford has a long canalised straight section which is quite different to the character of the river elsewhere, but no information has been found on its origins. Manipulation of water for aesthetics is only one facet of the use of water on country estates; Bryanston also has a sophisticated system of pumps and reservoirs to enable the use of water to power machinery in the nineteenth century[11].

[10] https://dcc.dorsetforyou.gov.uk/bankes-archive/mapping-the-bankes/historical-map-manor-of-shapwick-1813/
[11] https://bryanstonvillage.com/uploaded_files/71

Although interventions in the river to facilitate navigation are not uncommon nationally, there seems to be relatively little evidence on the Dorset Stour. Some of the river management features already referred to may have assisted navigation, but drainage seems to have been the dominant motive. Numerous navigation HWPs have been identified but these tend to be small scale – inlets, small landing places and boathouses – that indicate only the use of small boats; many seem to be linked to recreational boating rather than other forms of boat use, though this may reflect river use in the nineteenth and twentieth century – as represented by the historic OS maps – rather than earlier navigation. There are no major navigational features such as river locks, wharves or boatyards, yet the river was to form the first stage of a navigation from the English Channel to the Bristol Channel: the ambitious but unsuccessful Dorset and Somerset Canal. Although an earlier route for the canal was planned all the way from Poole Harbour to the Avon at Bath, this was altered to use the Stour for its southern section up to Gains Cross near Shillingstone. This implies that the Stour was navigable by sizeable vessels from Christchurch at least as far as Shillingstone and this was in fact stated by Priestly (1831, p. 199), though there is no entry for the Dorset Stour itself. Extensive navigation is also implied in accounts of Christchurch's pre-eminence as a centre for smuggling, with both the Stour and the Avon allowing for movement of contraband far inland. Indeed, the Stour is certainly capable of supporting quite sizable, if shallow draft, vessels and would have been capable of navigation – perhaps with transhipment and portages – right back into prehistory. Nonetheless, navigation on the Dorset Stour does not seem to be fully represented in the mapped features upon which HWPs have been based in this project.

Religious, ritual and funerary is another theme that spans long timespans, encompassing prehistoric monuments but also churches and religious institutions with medieval origins. Most barrows and prehistoric monuments are associated with upland areas of Dorset; the Stour forms one of the boundaries of Cranborne Chase, well-known for the investigation of prehistoric sites. There are, however, a few barrows on the floodplain apparently referencing the river – notably river crossings – including examples near Shapwick, Tuckton, Hengistbury Head and at St. Catherine's Hill between the Stour and the Avon at Hurn. There is also a mound close to the river at Langton Long Blandford that might warrant attention, though it is in an area of landscaping and might be of much more recent date (HWP 356). Gauging the role of the Stour in prehistory is difficult as there are relatively few sites in its vicinity, but the presence of barrows might indicate a cognitive or spiritual role as has been argued for Neolithic monuments elsewhere (Richards, 1996). A circular feature at Stour Provost (HWP 88 – see Figure 31) has been tentatively identified as a possible henge on the basis of its apparent form and situation in the landscape. If the circular feature proves to have a prehistoric, ritual dimension, then there could be important parallels with other henges in river-related contexts in the region, such as Marden on the Avon or Stanton Drew on the River Chew in Somerset.

Although not especially numerous, the siting of parish churches immediately adjacent to the Stour echoes patterns noted on other rivers (Firth, 2014, pp. 20–21). This may simply reflect the fact that the riverbank has become settled, resulting in the establishment of a church in due course, but it is conceivable that settlement has followed the establishment of a church in a specific waterside location. The prospect of flooding appears not to have deterred construction. At Kinson, the church is some distance from the river at Longham Mill, but its location on a minor drain might suggest that the main channel has in fact been re-worked away from an earlier path (HWP 630) much closer to the church.

The remaining themes – aquaculture, military, recreational, domestic and civil – are represented only by small numbers of HWPs on the Dorset Stour, though these themes may be more important as contributors to the historic character of other catchments.

Although characterising individual reaches of the Stour did not prove possible, broad differences are apparent from mapping the themes across the Dorset Stour catchment. Figure 4 illustrates the northern section of the Dorset Stour, from Stourhead in the north to just beyond the A303/Silton in the south. This part of the river includes several HWPs in the industrial theme, including mills and quarries ranging in date from prehistory through to the early 20th century.

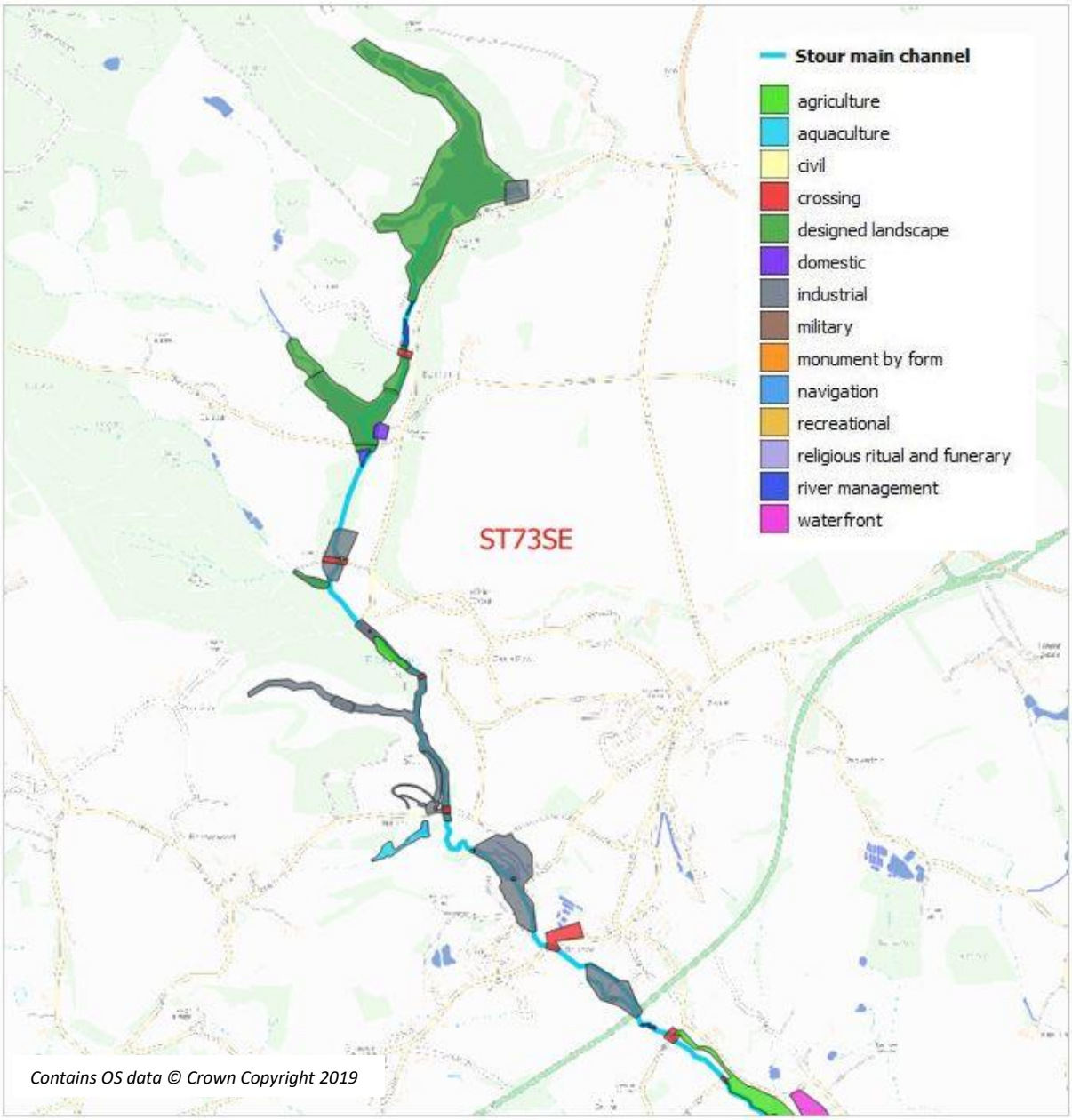

Figure 4 Thematic map showing the northern section of the Dorset Stour, from to the A303

Figure 5 covers an area from Nutford, to the north of Blandford Forum, down to Lower Blandford St Mary. There is a clear contrast with the upper Stour. This part of the Stour has more HWPs that fall within the agriculture theme, and although there is a small number of industrial-themed HWPs, they are dispersed. Stretches of the Dorset Stour have been modified and there is generally a greater range of themes represented including crossings and waterfronts.

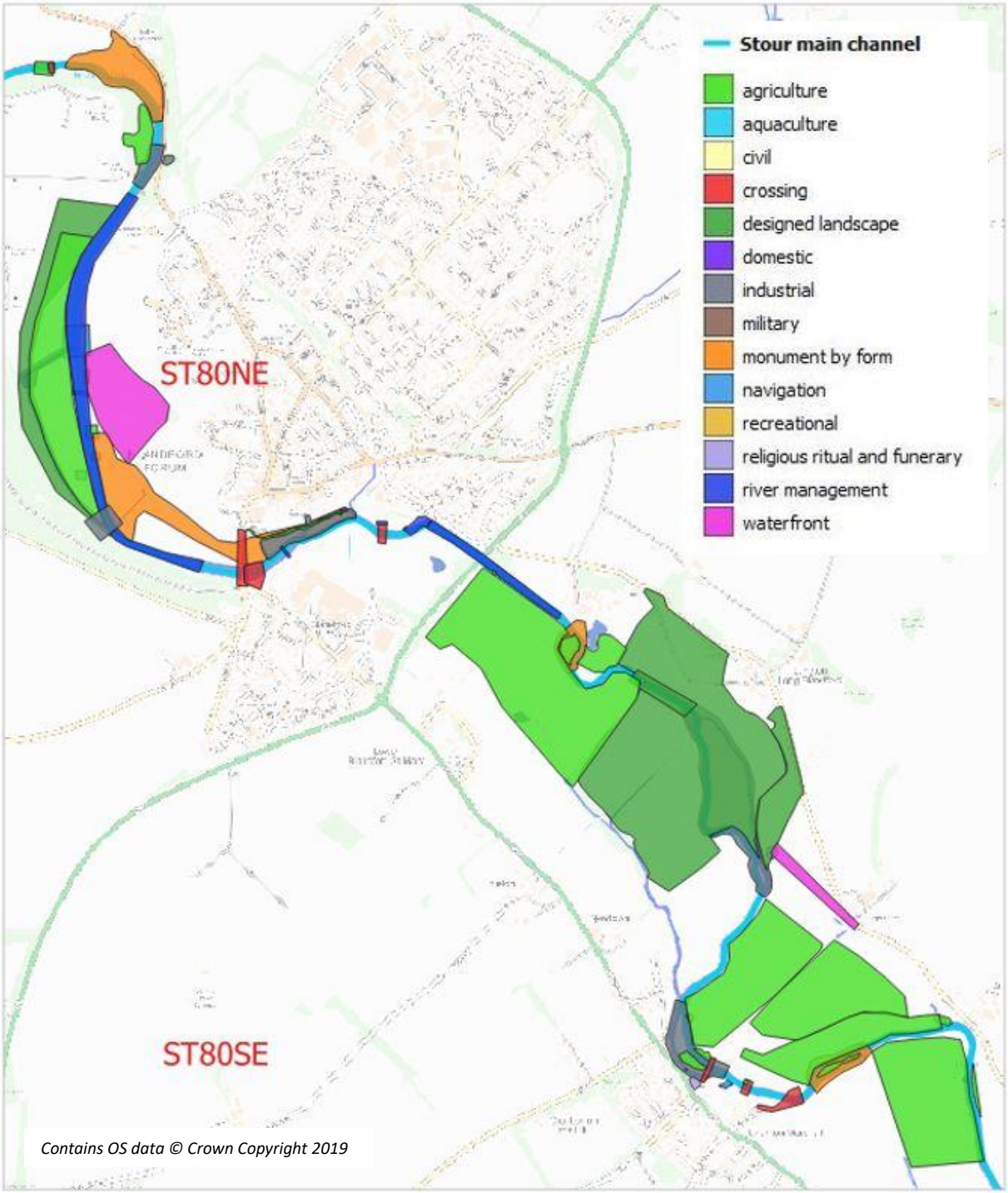

Figure 5 Thematic Map of the Dorset Stour with Blandford in the north

Figure 6 shows the Dorset Stour as it passes between the suburbs of Bournemouth and Christchurch. The thematic map is again quite distinct from the previous thematic maps: agricultural HWPs are infrequent and most HWPs relate to navigation (including inlets, boat house and berths) plus a small number of HWPs related to aquaculture; these are themes more directly related to activities on the river rather than beside it. This area also reveals recent management of the river in close relation to urbanisation in the 19th and 20th century, as human intervention has carved a new route for the Stour, most noticeably in the straightened reaches near Iford.

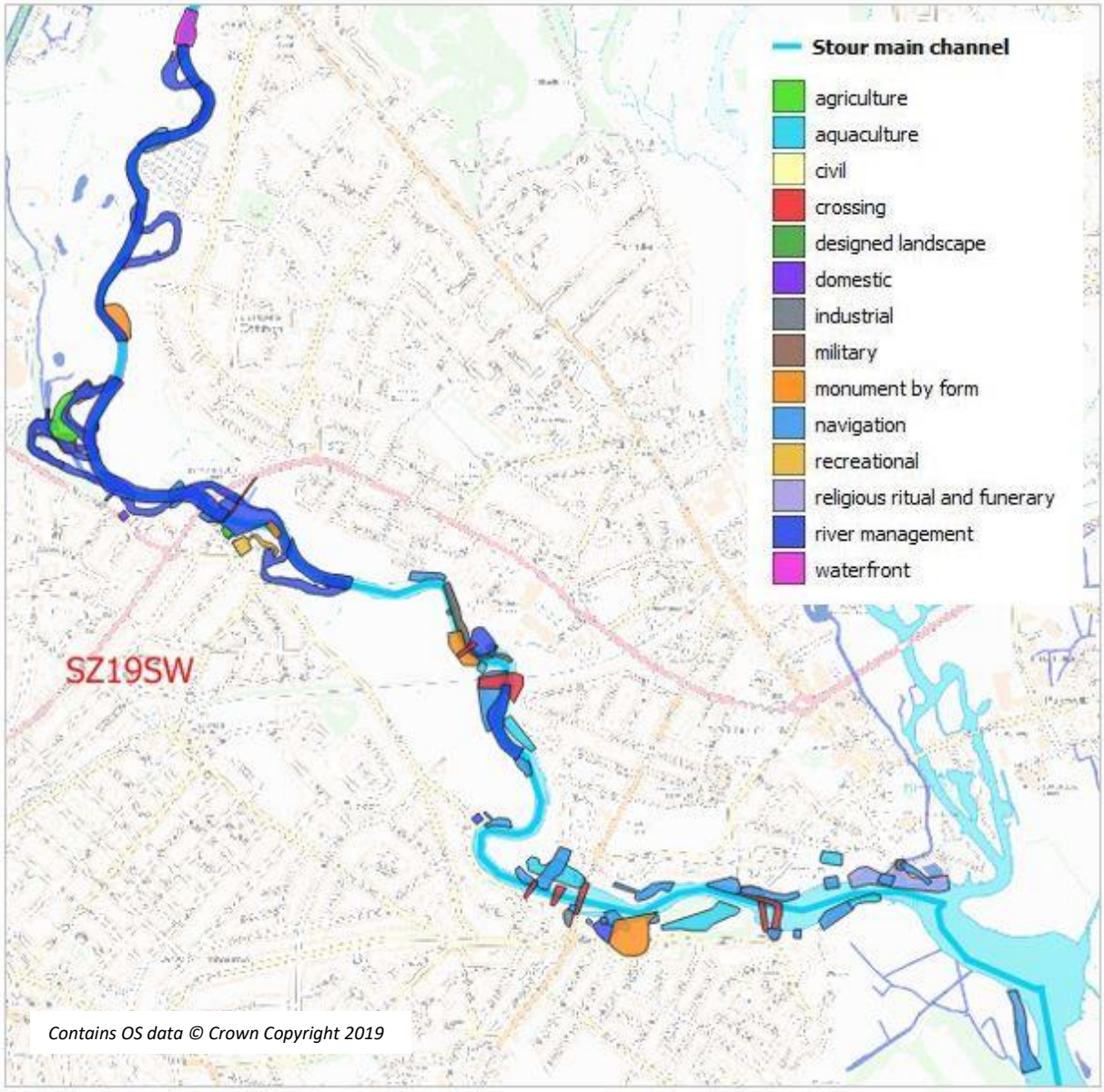

Figure 6 Thematic map of the Dorset Stour with Christchurch in south west corner

Each HWP has also been ascribed a start and end period, which in principle might allow the construction of a timeline for the River Stour. However, period information is dominated by the period to which evidence can be ascribed, rather than the period of the feature or activity. The methodology is heavily reliant on historic maps, so periodisation would be dominated by the modern period – nineteenth and twentieth century – from which evidence is available, even though the HWPs that have been identified are likely to have earlier origins. Some HWPs – notably those that are non-themed and/or observed from undated evidence such as lidar – lack periods. Refining – and probably extending backwards – the period to which HWPs first date would be a valuable step, though it is likely to require extensive research and/or fieldwork.

Notwithstanding, this pilot is a step towards at least a coarse river biography for the Dorset Stour. This would not be a biography that proceeds from the 'youthful' river in its headwaters to the 'mature' reaching the sea, but a human timeline for the whole river, noting both natural and cultural connectivity up and downstream. Construction of such a biography would underline the time-depth of human intervention, bearing in mind that people would have been interacting with the river before sea-level had risen to the approximate base level that would set its overall gradient for recent millennia. As noted above, certain gross phases might be distinguished: interventions affecting fauna

and flora in earlier prehistory; the impact of farming in Late Bronze Age / Iron Age; medieval development of water mill systems and flood meadows; eighteenth century interventions for designed landscapes and water meadows; nineteenth and twentieth century drainage, channel engineering and flood defence; twenty first century 'restoration' and 'natural' flood management. As the themes above have shown, many other physical and cognitive interactions with the river would have flowed through and between these major phases.

It is also worth noting apparent absences, both in themes and in periods. These may be actual absences – things that simply didn't happen on the Dorset Stour – or they may reflect only absences of evidence: things that happened, but for which no evidence is as yet apparent. The ambiguity over navigation has already been mentioned: the discovery of submerged boat remains from (for example) the Iron Age / Roman period would transform the understanding of the river. Specific evidence of the Stour in earlier prehistory – at Stour Provost for example – would be equally transformative. It is worth recalling that the Stour as it appears in historic maps from the mid-nineteenth century onwards had already gone through major changes, as demonstrated by yet earlier maps at Bryanston. Investigation of the palimpsest of channels or the mill islands at various points on the river could, again, provide significant insights into the manipulation of the river in early modern or medieval periods. There is, in short, much still to discover about the history of the River Stour; the systematic identification of HWPs in this project is but a first step.

5. Engaging People in the History of Watercourses

5.1. Introduction

One of the great advantages of watercourses as a focus for heritage interest is that they are such a prevalent feature of the English landscape. As noted already, many settlements, communities and transport links are structured around them. Consequently, most people encounter watercourses in the course of their daily lives. As well as giving rise to issues such as flooding, water quality and nature conservation, which are in turn a driver for the public-facing CaBA approach, watercourses often provide a setting for recreational activities ranging from informal walks to angling or kayaking. In short, there is a great deal of public contact with watercourses, and the concerns that give rise to river management interventions are a matter of public interest.

However – and with the exception of canals – watercourses are rarely an explicit focus of public heritage activity. Although many heritage assets include watercourses within their setting, the watercourse is largely incidental to interpretation. Even water mills are presented as buildings rather than watercourse systems, reflecting the approach also adopted to designation. There is, therefore, a major gap between the public's day-to-day encounters with watercourses, the public interest that is driving river management, and the attention directed to watercourses as public heritage. This gap exacerbates the general paucity of understanding of the time-depth of human intervention in watercourses (which may undermine river management decisions), and maintains the blind spot towards watercourse in heritage data. Re-framed, this gap suggests a major opportunity. Involving people in investigating the history of local watercourses could add a heritage dimension to the social and economic benefits already obtained from watercourses; engage the public in better understanding the context and challenges of river management; and improve the baseline of historic watercourse data.

Although not configured expressly as a community archaeology project, several aspects of this project suggest that there are good grounds for pursuing this optimistic path of seeking multiple benefits by engaging people in the history of watercourses.

5.2. Public Access to the Historic Environment of the Dorset Stour

There is good public access to much of the Dorset Stour. There are a number of public parks and nature reserves on the lower reaches of the Stour, providing access to the populations of Bournemouth, Christchurch and the surrounding communities – including large holiday populations. The National Trust estates of Stourhead and Kingston Lacy have large numbers of visitors, including visitors to White Mill; other attractions on the Stour such as Sturminster Mill also attract visitors (Firth, 2020, p. 27). The Stour Valley Way is a waymarked long-distance footpath all the way from Stourton at Stourhead to Hengistbury Head, making use of numerous rights of way that are used locally as well as for longer distance walking.

Good physical access does not mean that people are engaging with or even aware of the historic environment of the Stour. This is not to say that the historic dimension is entirely absent from people's experience: the accessible mills are plainly historical; there is some archaeological information at Kingfisher Barn Visitor Centre; and there are museums at Gillingham, Blandford and Sturminster Newton, for example, whose exhibits make reference to the history of the river. However, it is likely that most people are aware of the river predominantly as a natural feature of the environment with attributes that are mostly valued in natural environment terms. The complex history of the Dorset Stour and the surviving features of its past go largely unrecognised.

As noted above, this is not only a missed opportunity in terms of adding an extra dimension to people's experience and enjoyment of the Stour; it directly undermines public engagement in decisions about river management based on an understanding of the history of the watercourse.

There are, therefore, good grounds for substantially increasing the level of public information about the Stour, building on existing points of access. The HWPs offer a firm foundation as they are place-based but have explicit linkages to key themes and comparable sites of the type. The HWPs could,

therefore, provide a core of content that can be used in different media – physical signage, paper guides, online content, activities and so on – all along the Stour.

5.3. Local Knowledge

Fjordr made contact with several local history and archaeology societies in the vicinity of the Stour, and gave presentations to Bryanston Village History Society (March 2018), Shaftesbury and District Archaeology Group (March 2019) and Blandford Museum Archaeology Group (November 2019). This contact demonstrated very great interest and even a degree of surprise at the richness of the history of the Stour and the surviving evidence. It also showed that there was a good deal of locally-held information and a willingness to share it.

Contact with stakeholders through the Stour Catchment Initiative adds to the sense that there is information relating to the history of the Stour held as local knowledge that could be shared. This includes information about potential heritage assets, and information about activities and processes that might have affected the survival of assets. This is not necessarily information that is formally recorded; rather, it is information that comes to light through dialogue, including visiting reaches of the river in the company of stakeholders.

As a predominantly desk-based study concerned with the historic character of the Stour over extensive areas, this pilot was not optimised or resourced for pursuing local knowledge with respect to specific sites. Informal contact suggests that there is a definite audience for relatively detailed information about the river as a key feature of the historic environment, both amongst those who have an archaeological or historical interest, and amongst those with interests or responsibilities in the river itself. Informal contact also indicates that these audiences are willing to contribute their own information.

Again, the HWPs developed in the course of this pilot could form a solid base for engaging with local groups and stakeholders, both to spread awareness of the historic watercourse and to gather additional information. This would take a certain level of resourcing and the addition of a recording capability tailored to finds and features. A productive step forward might be to use a local selection of HWPs as the basis for a workshop or a site visit, to give people an opportunity to comment on the HWPs, their boundaries, the evidence on which they are based and their interpretation. As well as honing the HWPs already identified, it is likely that information about other features and possible HWPs would come to light. Provision for a certain amount of co-production of archaeological knowledge (see Jeffrey et al., 2020) about the river with local groups and stakeholders could considerably strengthen interest in the management of the watercourse and its historic features.

5.4. Parallels with Coastal Archaeology

There are strong parallels between the historic environment of rivers and the changes that have occurred in coastal archaeology over the last few decades. Until the 1990s, the coastal zone was largely a blind spot for archaeological recording, though various projects had demonstrated the high potential it presented across a wide range of periods and themes. The central role of the coast and its resources for the communities that lived there in the past was not especially well understood: the coast was regarded more as a fringe or a boundary than as a focal point, and as a zone shaped by nature rather than people. The coast was, however, recognised to be important in terms of future management, especially in view of likely changes to the shoreline as a result of climate change. Although requiring caution, the coast is also an environment with often good public access, and where people are willing to spend time as volunteers engaging in archaeological fieldwork.

Watercourses present very similar circumstances, though they have the advantage of being much more widespread and therefore local. The scope for developing community archaeology projects in riverine environments based on the experience of coastal projects is especially encouraging as many of the practical issues relating to recording systems, training and supervision, maintaining health, safety and welfare and so on are directly comparable. Schemes that have been developed and implemented locally or nationally by organisations such as the Nautical Archaeology Society, Maritime

Archaeology Trust, SCAPE Trust, CITiZAN and others suggest that engaging the public in field investigations on rivers would be well-received and productive. There is, potentially, scope to develop a greater desk-based role for volunteers also, to draw upon the increasing amount of open access data including historic maps, archive material and indeed the Environment Agency lidar used in this project.

There have already been instances of community archaeology projects focussing on watercourse heritage run by archaeologists such as John Buglass (e.g. Buglass, 2019), Michael Heaton[12] and the Nautical Archaeological Society (e.g. McKewan, 2006; Bird and Jallands, 1991). However, such initiatives have yet to translate into widespread community engagement in an aspect of heritage that is local to so many people.

HWPs along the lines developed here would help provide an organising framework for both fieldwork and desk-based investigation in watercourse-based community archaeology initiatives. They provide both baseline data that can be reviewed and amended with additional findings, and a model for the identification of additional HWPs. As they are relatively simple – a single flat-file layer with controlled terminology – they are amenable for incorporation within online recording applications suitable for volunteers.

5.5. River-based Citizen Science

Community groups and initiatives already play an important role in river management, including on the Dorset Stour. However, their focus is predominantly on aspects of the natural environment such as habitat improvement[13] and control of invasive species[14]. The Riverfly Partnership is also active on the Stour, which involves training and support for volunteers to record invertebrate species that indicate water quality and habitat condition[15].

Noting the points already made, it would be relatively straightforward to add heritage-based initiatives to the portfolio of community-based projects already active on the Stour, or to seek to integrate a degree of heritage awareness into existing volunteer programmes, using the HWPs as a starting point.

[12] http://www.watermeadows.org/index.html

[13] https://gis-services.wessexwater.co.uk/storymaps/environment/stour/documents/1705026.pdf

[14] https://gis-services.wessexwater.co.uk/storymaps/environment/stour/documents/1701208.pdf;

https://gis-services.wessexwater.co.uk/storymaps/environment/stour/documents/1700602.pdf

[15] http://riverflies.org/

6. Conclusion

The archaeology of watercourses in England is seriously underdeveloped in terms of baseline knowledge. At the same time, watercourses are subject to major pressures that have implications for the historic environment, especially works relating to flood risk, habitat enhancement and waterside development. Two aspects of watercourses are especially concerning: the presence and potential of archaeological material within and immediately adjacent to watercourses; and the form of the watercourse itself.

The project, in collaboration with the Stour Catchment Initiative (SCI), was framed as a pilot consistent with Defra's Catchment Based Approach (CaBA) to develop a method for identifying the historic character of watercourses within a catchment using the Dorset Stour as a case study. The conduct of the project – which included attending and presenting at numerous SCI meetings – helped increase awareness of the historic character of watercourses in catchment management.

The intention of this project has been to develop a method through which the historic character of waterways can be identified relatively quickly at a broad scale. Initially, it was thought that the historic character of the watercourse could be ascribed for each reach of the river, but in the course of the pilot it was found necessary to identify individual Historic Watercourse Polygons (HWPs) to account for the density and variety of features reflecting the human history of the river. A total of 730 HWPs was identified using a single flat-file GIS layer that can be adopted by river managers and heritage mangers. Each HWP has digitised extents, is described, ascribed to periods (to, from) and includes direct reference to the sources used in the identification. HWPs are also ascribed a type and a theme using standard terminology derived from the Monument Type Thesaurus.

The inclusion within the GIS environment of large-scale historic mapping and Environment Agency lidar added substantially to the methodology. Other documentary sources, such as estate maps and legal documents relating to disputes over river resources, also provided insights that would not have been apparent from Ordnance Survey mapping alone.

Using historic map-based evidence and historic non-mappable evidence, topographic features such as water meadows, changes in the route of the river and paleochannels could be identified and mapped as Heritage Watercourse Polygons. Examination of the lidar downloaded from the Environment Agency, which was processed using several visualisation methods, enabled identification of otherwise unknown features such as deserted or shrunken medieval villages. In some instances – such as the possible identification of former mill sites and fish weirs – the form of the river itself was a key source.

The project demonstrates that, along the Stour, a high level of watercourse-related heritage is present that has hitherto been unrecorded. Although HERs note the more obvious sites such as hillforts and bridges, the full extent of mills and their associated water courses are often not recorded. Similarly, little consideration has previously been given to the changes to the route of the river, where human action has altered its course. The important role of agriculture in shaping the Dorset Stour and its environs has been demonstrated, noting that water meadows are perhaps less prevalent than might be anticipated, but the presence of funnel-shaped meadows and flood meadows indicate the survival of much earlier forms of agricultural interaction with the river.

The desk-based investigation of historic map-based evidence and historic non-mappable evidence has generated a GIS layer comprising HWPs that can be used to inform catchment management by river managers. The results should also inform day-to-day operational activities that may cause damage to topographic features, but which do not meet a threshold for archaeological advice through the planning system, for example.

The project has engaged with several local groups. The Bryanston Village History Group, for example, provided much valuable information regarding both the layout of the river at Bryanston School; in turn information, about the project provided them with an insight into the history of the river and mills at Bryanston. Engagement in the course of the project suggests that the HWP methodology could provide a firm base for extending public awareness of the historic character of watercourses as well as providing a foundation for community projects relating to watercourse heritage.

The project has succeeded in generating a better understanding of the historic character of the Dorset Stour and provides a successful model that could be used in other catchments. The range and variety of HWPs identified during the study highlights a major gap in the understanding of riverine archaeology. In seeking to fill this gap, the project has demonstrated not only the possibility but also the value of integrating existing sources of data, including historic maps, HER records and lidar data available from the Environment Agency.

The principal lesson of the pilot was that the River Stour retains a great deal of its history in its form and features, and there is a plenty of evidence for the history of human use and intervention in the river over many centuries. The large number of HWPs underlines the important role of the river in the human history of the catchment, which was otherwise poorly recognised in archaeological records. The desk-based sources used in the pilot emphasise the history of the river over recent centuries. Even so, they give – in places – a strong indication of the structuring of the landscape around the river back into the medieval period and perhaps earlier. As already noted, the complex, multi-faceted use of the river along its length quickly showed there was little scope for characterising entire stretches of the river as originally intended; but by attributing themes to individual HWPs it is nonetheless possible to see a degree of overall patterning in the historic character of the river. As the pilot engaged with recording individual HWPs – using rich sources such as historic OS maps and lidar optimised for viewing low-relief features within the project GIS rather than externally – it also became clear that the process would take longer than originally intended. Options for streamlining the process will be pursued in subsequent work; though it would also be instructive to include at least some tributaries to gauge the degree of human activity and intervention on smaller channels. Notwithstanding, identification and recording of HWPs appears to provide a practical, intermediate level between detailed recording of individual sites and features – as might occur in HER enhancement or AI&M projects – and wider landscape characterisation through HLC. It is also worth emphasising that the historic watercourse methodology is not intended to comprehensively map all evidence of past human activity in the catchment or floodplain, but only to draw out human activity and intervention relating to the river itself. This is a question of balance and judgment, as watercourses can influence human activity quite far from their banks; whilst some human activities close to the river may have little direct relation to it. Judgement has also been required in dealing with features whose purpose and/or age is ambiguous; apparently modern drainage ditches have not been individually mapped and recorded as HWPs, for example. Throughout, the focus has been upon achieving a single, simple GIS layer that can be used by heritage managers and watercourse managers to flag the human past of the river and its archaeological potential, and to raise awareness generally of the historic character of watercourses.

As well as this pilot, the information about the historic environment of the Stour made a major contribution to a related project on the relationship between heritage and Natural Capital and Ecosystem Services, framed as a case study on the Dorset Stour (Firth, 2020). The project has also flagged a number of potential avenues for further examination of the history of the Dorset Stour, notably geoarchaeological investigation of the complex palimpsests of river-related features around Manton and Hamoon, or between Blandford and Wimborne.

Provision was made in the Project Design for a short signposting article about the conduct and results of the project for publication in an appropriate journal. This article will be prepared following submission of the final version of this project report.

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Appendices

Appendix I: Methodology

Introduction

This Appendix sets out the methodology developed for identifying Historic Watercourse Polygons (HWPs), focussing on the sources of evidence that were reviewed and the means used to record HWPs. It is accompanied by Appendix II, which discusses the main themes and types of HWP, including the recording practices that were applied including numerous illustrated examples.

The methodology was GIS-based using QGIS 2.18, which is a widely-used free and open source GIS package compatible with other major packages. Within the GIS environment ('project'), data is introduced in layers (in .shp/shapefile format); a further layer – Dorset Stour HWP.shp – was created to digitise the extent of HWPs and to record their attributes.

The evidence collated for identifying HWPs falls into three categories: base mapping; archaeological data; and historic non-mappable evidence. The different forms of evidence in each category are discussed below. For the base mapping and archaeological data, the methodology sets out the how the layers were managed and processed. As the name implies, the non-mappable evidence was not produced in layer form, but it could be used qualitatively alongside the data layers.

As well as the layers within the GIS project, reference was made routinely to published and online sources, including air photographs / satellite imagery on Google Earth. Google Earth provides access to some historic air photographs through its timeline feature. However, the project did not involve systematic consideration of historic air photographs because of the intended scale of the project, and because a National Mapping Project (NMP) investigation on at least some sections of the Dorset Stour was anticipated.

The Study Area was defined by the main channel of the Stour from its source at Stourhead to Mudeford in Christchurch Harbour, with a 1km buffer around the centreline (see below). The Study Area formed by the buffer polygon was used in searching other datasets and provided a general boundary for the project. Tributaries of the Stour were excluded, as noted in the main body of the project report.

Base Mapping

OS Open Map - Local - Raster

Modern background Ordnance Survey mapping was obtained from OS Open Map - Local (Raster)[16]. Coverage for the whole of the study area was downloaded as raster images for each quadrant (NE, SE, SW, NW) of each 10km square. These raster images were placed into a single folder, and a virtual layer called OS Map background.vrt was created. The virtual layer enabled the OS raster map background to load seamlessly while moving around the GIS project.

River Stour Layers

Layers for the Stour main channel and for the Stour main channel and tributaries were obtained from OS Open Rivers[17], which is a free download. The dataset is national, so the Stour and its tributaries were selected and saved to new layers: Stour Main Channel; and Stour Main Channel and Tributaries. The Open Rivers dataset comprises a centreline only for watercourses; the centreline of the main channel of the Stour was buffered to create the study area.

In order to represent the Stour not only as a centreline but also as having lateral extents, a separate layer was created named Stour Surface Area and Tidal Water. This layer was created using OS Open

[16] https://www.ordnancesurvey.co.uk/opendatadownload/products.html#OMLRAS

[17] https://www.ordnancesurvey.co.uk/business-and-government/products/os-open-rivers.html

Map - Local (Vector)[18] by selecting and combining the Surface Water Area shapefile for each 10km grid square covering the study area, i.e.:

SZ_SurfaceWater_Area.shp

ST_SurfaceWater_Area.shp

SU_SurfaceWater_Area.shp

SY_SurfaceWater_Area.shp

Parish and County Boundaries

Parish and county boundaries were obtained from the OS Boundary-Line[19] product, which contains shape files for all administrative boundaries in Great Britain. The parish_boundary.shp and county.shp files were imported into the GIS. These layers were useful for general orientation and administrative purposes, including searches to local authority HERs (see below). The parish boundary layer was also of specific interest because parish boundaries commonly follow natural features such as rivers; deviation of parish boundaries from the river can indicate that the river has been altered from the historic channel, whose line is preserved by the parish boundary (see Appendix II, civil theme).

OSGB Grid

A layer showing the OS GB Grid at 5km was downloaded[20] and added to the GIS to help select lidar or historic mapping files for viewing.

CaBA Risk of Flooding Layer

The risk of flooding layer – Risk_of_Flooding_from_Rivers_and_Sea.shp – was obtained as a WMS (web map server) layer from the CaBA Data Pack[21] (also available as a download from the Defra Data Services Platform[22]). The layer shows, in effect, the extent of the modern floodplain. This layer was used to highlight the potential presence of bedwork water meadows, which can generally function only within the floodplain.

Archaeological Data

Historic OS Maps

Initially, it was anticipated that historic map evidence would be accessed via the National Library of Scotland's online viewer[23]. However, Historic England was able to provide, under licence, complete coverage for inclusion directly within the GIS project. Historic Ordnance Survey (OS) maps of the entire catchment of the River Stour were provided by Historic England as georeferenced tifs[24]. The maps provided by Historic England were in two main series:

1-inch to the mile series, first edition, 1890s

25-inch to the mile County Series, in five epochs:
Pre War 2500 (Epoch 1): the first County Series survey; published dates 1843 to 1893
Pre War 2500 (Epoch 2): the first County Series revision; published dates 1891 to 1912

[18] https://www.ordnancesurvey.co.uk/opendatadownload/products.html#OPMPLC

[19] https://www.ordnancesurvey.co.uk/opendatadownload/products.html#BDLINE

[20] https://github.com/charlesroper/OSGB_Grids

[21] http://theriverstrust.maps.arcgis.com/apps/PublicGallery/index.html?appid=a747787473e048e5ae2949d55767fdaa

[22] https://environment.data.gov.uk/dataset/8d57464f-d465-11e4-8790-f0def148f590

[23] https://maps.nls.uk/

[24] Names of maps sourced from http://www.landmarkinfo.co.uk/corp/graphics/corp2/techInfoLeaflet.pdf

Pre War 2500 (Epoch 3): the second County Series revision; published dates 1904 to 1939
Pre War 2500 (Epoch 4): the third County Series revision; published dates 1919 to 1939
Post War 2500: the first survey/overhaul to the National Grid; published dates from 1945

The OS 1-inch first edition was supplied as four folders for each of the 10km grid squares ST, SU, SY and SZ, covering the area through which Dorset Stour flows. These folders contained map files for the following grid squares:

OSE_SZ08
OSE_SY88
OSE_SU00
OSE_ST62
OSE_ST60
OSE_ST80
OSE_ST82

Very limited information was obtained from the 1-inch first edition; due to the scale, the detail is much less than that of the 25-inch County Series.

The OS 25-inch to the mile County Series (1841-1952) is the most comprehensive mapping available for the Dorset Stour for this period. Many landscape features are mapped at a level of detail that is readily interpreted. Industrial features such as mills, quarries and smithies are shown, as are agricultural features such as sheep washes. Areas of woodland, parkland and known historical sites are also marked on these maps. The route of the river is recorded in detail, including islands, inlets and riverbank vegetation such as withy beds. There is sometimes variation between the epochs, with HWPs identifiable on earlier maps but not on later ones. Epoch 1 and 2 provided the most comprehensive coverage of the study area.

The georeferenced tifs were supplied within folders by County (Dorset, Somerset and Wiltshire) and ordered by Epoch 1, 2, 3 and 4, plus Post War 2500. Within each epoch folder, the georeferenced tifs covered either a whole or a portion of a 1 km tile from the 10km grid squares ST, SU, SY and SZ. There is some overlap between the county maps from Wiltshire, Dorset and Hampshire.

Given the large number of georeferenced tifs, the most effective way to organise these files within the GIS project was to order them first by epoch and then by each 10km grid square. This was achieved by creating a virtual raster catalogue, which would load the tiles seamlessly for each 10km grid square within an epoch as it was viewed.

The 25-inch County Series was used as the main source for identifying many HWPs.

Historic Environment Record (HER) data

HER data was requested from Dorset County Council, Somerset County Council and Wiltshire County Council based on the Study Area which, as noted above, was a 1km buffer either side of the centreline of main channel of Stour. HER data was provided as shapefiles (points and polygons) that could be added to the GIS project.

Designated Heritage Assets (HE Data)

Designated Heritage Assets (HE data) was obtained from Historic England via the Listing Data Downloads area. Layers relating to Listed Buildings, Scheduled Monuments and Registered Parks and Gardens and were incorporated into the GIS project. As with the HER data, this information was

cropped to the study area so only those records that fell within the buffer zone of the River Stour were included.

Historic Landscape Character (HLC) Layer

As well as HER data, the HLC layer was requested from and supplied by Dorset County Council. Polygons representing water associated character types such as water meadows were selected. The water meadow HLC polygons were of particular interest because they had potential for representing water meadows. However, the HLC polygons appeared to conflate areas of bedwork water meadows, flood meadows and other areas of floodplain as 'water meadow' without there necessarily being evidence of bedworks. Whilst the HLC polygons were helpful – as with the risk of flooding layer – for indicating potential, they were not reused as HWPs. Instead, bedworks, catchworks and other forms of water-related meadows were identified on the basis of mapped evidence (e.g. lidar) as discrete HWPs.

Environment Agency Lidar

Lidar is a very useful tool for identifying watercourse-related features in the mixed arable and grassland that forms much of the landscape around the Dorset Stour. Minor topographic variations indicate features that have not been shown even on large scale historic maps, in some cases because they predate the mapping. Depressions caused by former watercourses – including palaeochannels that are almost completely filled – are often evident on lidar but not elsewhere. Processed lidar data alongside historic maps, modern maps and Google Earth imagery provide a powerful suite of data types for identifying and interpreting HWPs.

Initially, the intention was to make use only of lidar already processed by third parties. However, as the project got underway, the decision was taken to make use of the Environment Agency's open access lidar directly within the project GIS, which meant that additional visualisation methods could be applied.

Lidar tiles were downloaded from the Environment Agency website[25] for the entire study area. The lidar survey data offered by EA comprises both DSM (digital surface model) and a DTM (digital terrain model) datasets. DSM includes all the surfaces including buildings and vegetation, while DTM is a 'bare earth' (Davis, 2012, p. 5) model of the underlying topography with buildings and vegetation removed. The DTM composite tiles at 1m resolution were found to be the most suitable for the purposes of the study. Although tiles at 50cm resolution are available, the coverage within the study area was limited so the decision was made to use 1m resolution tile to maintain consistency for the whole study area.

[25] https://environment.data.gov.uk/ds/survey/

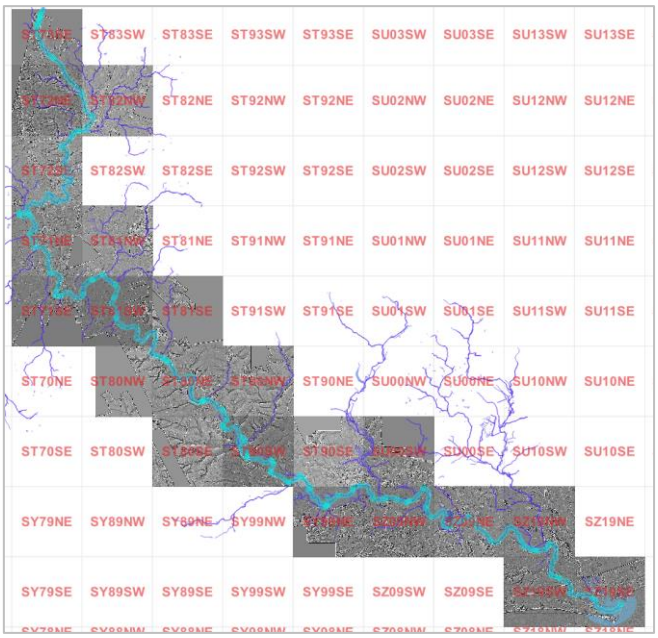

Figure 7 Coverage of lidar tiles showing route of the River Stour in light blue

The EA lidar data is split into tiles for each 10km grid square. These tiles were downloaded then merged using QGIS to create a single tile for each 10km grid square, to facilitate viewing and processing. Once merged, the resulting raster tiles were suitable for further processing to enhance features for identification. There are several methods available using either QGIS or specialist visualisation tools to 'remove' gross topography so that minor topographic variations are more readily visible. The package used for the Dorset Stour project was the Relief Visualisation Toolbox (RVT) developed by Ziga Kokalj at the Institute of Anthropological and Spatial Studies, Slovenia. RVT enables several visualisation methods to be applied to a raster image simultaneously, allowing the resulting images to be compared within the QGIS project.

Each 10km merged tile was processed using RVT Standalone, Windows 64-bit, version 1.3[26]. The following four visualisation methods were applied to each merged tile:

Hill-shade

Pixels are shaded using a greyscale according to the direction of the light source (sun) using altitude and azimuth properties. As a result, topographic features are highlighted and/or produce shadows, enabling them to be picked out by eye. This method does have limitations: for example, linear features that lie parallel to the light source may not be revealed as no shadow is cast. Repeatedly creating hill-shades with different azimuth and altitude properties can resolve this problem but is time consuming and, with such a large area as the Dorset Stour, not practical; consequently, only a couple of hill-shades were used alongside the other methods described below.

Multidirectional Hill-shade

Multidirectional hill-shade is a method that automatically combines hill-shade illumination from several different azimuth and altitude properties, removing the limitations of a standard hill-shades to pick out topographic features that would not be otherwise apparent.

Simple Local Relief Model (SLRM)

SLRM creates a visualisation based on the height of features relative to each other, rather than applying notional lighting. The visualisation is, in effect, a difference model that removes the effect of large-scale topographic features. Otherwise, the gross topography across a tile – the difference in

[26] https://iaps.zrc-sazu.si/en/rvt#v

height between valley bottom and adjacent hill tops, for example – may overwhelm the minor topographic anomalies that are likely to be of archaeological interest.

Sky View Factor (SVF)

SVF combines the total diffuse illumination that any point could receive based on its prominence, rather than direct illumination from a hypothetical sun. It is based on a method developed by Kokalj (with reference to Figure 7):

> (Sky View Factor is) the proportion of visible sky (Ω) above a certain observation point as seen from a two-dimensional representation (A). The algorithm computes the horizon angle γ in n (presented are eight) directions to the specified radius R (B)
>
> (Kokalj et al., 2013, p. 109)

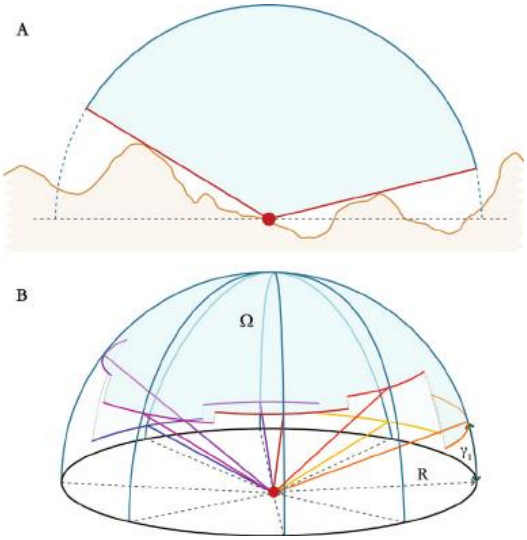

Figure 8 Illustrating where the illumination derives from in a sky view factor (from Kokalj et al., 2013109, Figure 8.14)

Different visualisation techniques provide varying results in different topographies. Kokalj et al. (2017) discuss how different visualisation methods suit different terrains so the use of more than one single method of visualisation is important. Bennett et al. (2012, cited in Historic England, 2018f, p. 43) comment 'no single technique records more than 77% of features, whereas all combinations of two visualisations recorded more than 80% and a combination of any three visualisations recorded more than 90%'. This was borne out when identifying HWPs along the Dorset Stour. SLRM and SVF worked well on the open, flat areas of the Stour while the multi hill-shade was more successful on areas where the terrain is more varied, for example around Byranston and Dudsbury. When identifying bedwork systems, multi hill-shading and SVF provided the most useful results. For each stretch of the river, the hill-shades, SVF and SLRM were all examined to confirm and clarify the presence of features. Figure 9 illustrates the different visualisation techniques at Dudsbury.

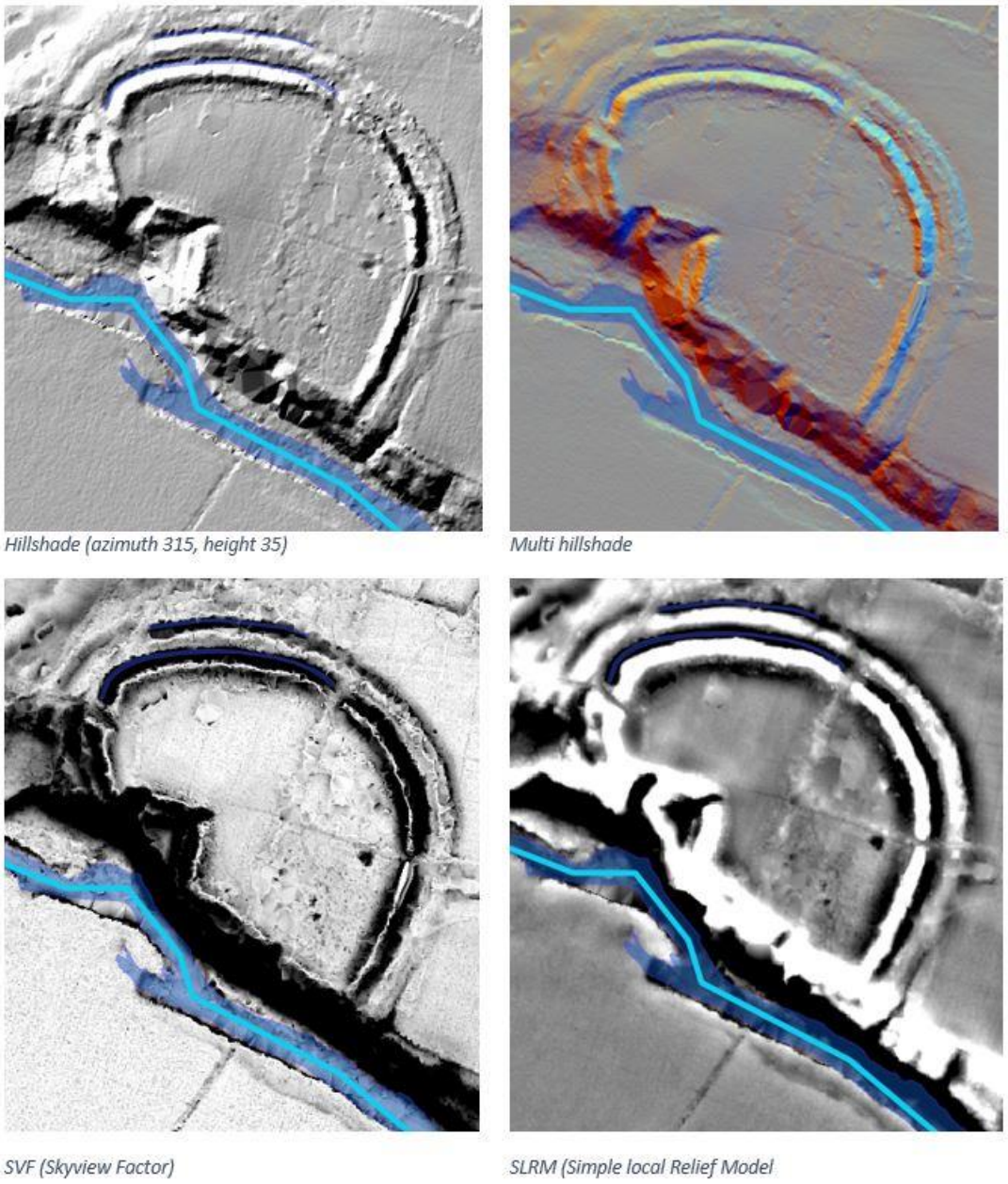

Figure 9 Results of different visualisations of lidar data at Dudsbury Castle showing the Dorset Stour

Profile Tool within QGIS

The profile tool within QGIS was used with the merged DTM in areas where there were suspected areas of water meadows, but where the processed lidar was not always conclusive. It is important that the merged DTM is used (i.e. with the unprocessed z (height) data) rather than a SVF or hill-shade where the z value represents a calculated value optimised for visualisation. From the SVF file, traces of water meadows can often be barely seen, possibly because they have been ploughed out or levelled. Using the profile tool, a line is drawn across the area of interest on the DTM to create a profile. Figure 10A illustrates a profile across a bedwork water meadow that is very visible using SVF (at Benjafield Farm on the River Sheen, a tributary that joins the Dorset Stour at Gillingham and is outside of the study area). This contrasts with an area of bedworks (HWP 221 – Figure 10B) near Sturminster Newton. HWP 221 is not as visible on the SVF image and is more representative of bedworks in processed lidar along Dorset Stour. However, using the profile tool, the similarity between the two areas is evident. Although HWP 221 is not as clearly defined as the bedworks at Benjafield, the profile illustrates that bedwork structures are still present.

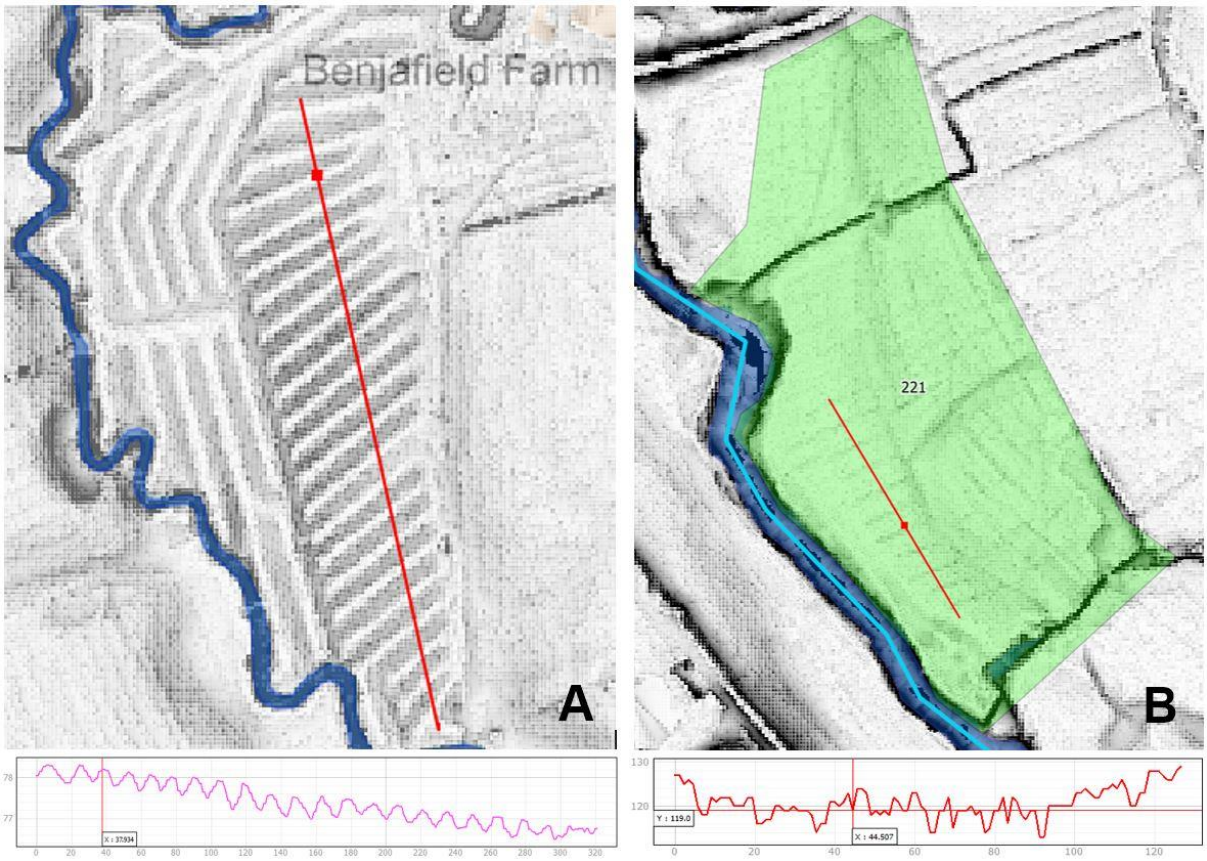

Figure 10A Profile across area of bedworks water meadow on the River Shreen, north east of Gillingham. Contrasts with Figure 10B, HWP 221 near Sturminster Newton which shows an area of faintly identifiable bedworks water meadow present on the SVF processed lidar.

Historic Non-mappable Evidence

National Trust Bankes Archive

Owned by the National Trust and curated by the Dorset History Centre, the Bankes Archive was digitised and recorded as part of an HLF project *Unlocking the Bankes Archive*. Digital copies of estate maps from this archive were kindly provided on CD by Dorset History Centre. Although this was to map evidence, it was not georeferenced and could not be added directly to the project GIS, hence it is regarded as non-mappable evidence to be used alongside mapped sources. The information provided comprised the following:

Manor of Shapwick 1813 by Robert Page, D-BKL/N/A/2/21

Manor of Kingston Lacy, 1773-74 by William Woodward, D-BKL/E/A/1/12 (overview key map of Kingston Lacy), including the following detailed maps:

OO page 80

MM page 76

TT page 90

NN page 78

B page 8

O page 33

L page 25

M page 27

Q page 37

T page 43
WW page 48
W page 49

These estate maps illustrate areas of the Kingston Lacey Estate and list the tenants and freeholders. The observations section sometimes refer in passing to the land use, and sometimes names of fields can indicate use or former use. The level of detail on these maps is higher than the First County OS Series, resulting in the identification of a number of HWPs and enhancement of others.

Bowles Map 1659

The Mannar of Brainston and part of Nutford, late the land of Richard Rogers deceased in the countie of Dorsett. Surveied in the yeare 1657 and 1658 by William Bowle{s}: and reduced by Margaret Bowle{s} and finished in 1659. Dorset, 1659[27]

A high-resolution copy of the Bowles map was kindly provided by the Bryanston Village History Group. This is a detailed map of the estate as surveyed and illustrated by William and Margaret Bowles in 1659 and provides details of features and land use as well as annotations suggesting which lands would be beneficial to the estate of Bryanston. It illustrates the former route of the river and a number of specific features, including White Cliff Mill and a further mill towards Blandford Bridge.

Blandford Forum, Survey by J. and W. Bastard, showing extent of fire of 1731[28]*.*

The accuracy of this map appears quite low. However, two islands were identified that did not appear near the downstream mill on the 1659 Bowles map (HWP 377).

Artworks of Bryanston House

Several artworks illustrating the Dorset Stour at Bryanston were examined:

Leonard Knyff (1650-1722) - A View of Bryanston House[29]

Jan Kip (c.1709) engraving of Bryanston House from 'Britannia Illustrata' (McInnes, 2018, p. 60 Fig. 97)

John Preston Neal (1831) Bryanston (McInnes, 2018, p. 60 Fig. 98)

These artworks provide views of the Dorset Stour at Bryanston. Artistic interpretation can result in topographic features in the landscape being enhanced so care must be taken to use the images alongside other evidence. The river in all these artworks appears wide and sweeping through the hills, with Bryanston House set within a grand vista of gardens and riverscape. However, the landscape in the artworks cannot be fully reconciled with the actual topography. However, the artworks enable identification of HWPs not otherwise shown on historic maps or lidar, including gardens, bridges, mills and roads.

County Record Offices

Visits were made to the Dorset History Centre and Somerset Heritage Centre to view a selection of maps and documents pertaining to the Dorset Stour. Only a selection of material was viewed, to evaluate the usefulness of this material for the pilot.

Maps examined at Dorset History Centre

Searches of the Dorset History Centre Archives were made online before visiting the centre, using search terms 'River Stour', 'estate map' and 'water meadow'. The results of these searches were used to select documents and maps that appeared pertinent to the pilot. Documents were skimmed and

[27] http://www.sothebys.com/en/auctions/ecatalogue/lot.27.html/2014/english-literature-history-childrens-books-illustrations-l14408 - accessed March 2019.

[28] https://www.british-history.ac.uk/rchme/dorset/vol3/plate-104 - accessed March 2019.

[29] https://www.rct.uk/collection/406633/a-view-of-bryanston-house?language=ja – accessed March 2019.

photographed whilst at the centre and the document images were read subsequently. The following documents were examined:

D1/1412B Map of the river Stour Sturminster Marshall annotated with the names of landholders on the south 1804

D1/1412C Map of the river Stour Sturminster Marshall annotated with the names of landholders on the south 1804

D/BKL/E/M/1/36 Counterpart lease of the Rushes on the River Stour

D/BKL/E/M/1/37 Lease of the Rushes in the River Stour

D/BKL/E/M/1/38 Agreement for renting the bullrushes and flags in the River Stour

D/BKL/E/M/1/54 Documents relating to the drainage of land into the Rivers Avon and Stour

D/BKL/E/M/1/112 Correspondence about rushes on the Stour 1947-1955

D/CDN/F/4/145 File Marked File marked 'Sheepwash - River Stour Land' containing working papers re Cooper Dean land 1955 - 1972

D/PHP/T/42/1 Land in Ham Field comprising the Picked Halves, Shortland, Longacre, Upper Street Mead and land.

The 1804 map of the River Stour at Sturminster Marshall (D1/1412C) provided information on a stretch of river from Crawford Bridge in Shapwick parish through Sturminster Marshall parish to Corfe Mullen Mill. It documents the beds of rushes and who had rights to cut them. Few activities such as rush or reed cutting could be identified during the pilot, so this map provided valuable evidence that such activities were taking place in the early nineteenth century. Rushes were traditionally cut in the summer and then dried ready for turning into saleable items or for using as a covering for earthen floors, as well as being used for thatching. This map also contained place names which suggest the presence of flood meadows at Culverhams to the east of Barford Farm and Dockhams, which lay to the west of Barford Farm.

Tithe Maps

Tithe maps held by DHC that illustrate sections of the Dorset Stour were photographed and briefly examined. Tithe maps are earlier in date than the OS 25-inch to the mile County Series and can provide an additional level of information not present on OS maps. The following tithe maps were photographed, together with a small selection of apportionment records:

Ref No.	Title	Date
T/BF	Blandford Forum tithe map and apportionment, 1838; altered apportionment 1866.	1838-1866
T/BLM	Blandford St. Mary tithe map and apportionment, 1840.	1840
T/BRY	Bryanston tithe map and apportionment, 1837.	1837
T/CAM	Canford Magna. Middle division: tithe map, 1843; apportionment, 1844; altered apportionment, 1934.	1843-1934
T/CHO	Child Okeford tithe map, 1840; apportionment, 1841.	1840-1841
T/COM	Corfe Mullen tithe map and apportionment 1840; altered apportionment, 1871, 1917 (with map), 1929.	1840-1929
T/DUR	Durweston tithe map and apportionment, 1837.	1837
T/EST	East Stour tithe map, 1842; apportionment, 1843.	1842-1843
T/FIM	Fifehead Magdalen tithe map and apportionment, 1839.	1839
T/GIL	Gillingham tithe map & apportionment.	1841-1936
T/HAM	Hammoon tithe map and apportionment, 1839; altered apportionment, 1876.	1839-1876
T/HAP	Hampreston tithe map, 1838; apportionment, 1839; altered apportionment, 1855 (with map), 1935.	1838-1935
T/HIP	Hinton Parva tithe map and apportionment, 1847.	1847
T/HIS	Hinton St. Mary tithe map and apportionment, 1843.	1843
T/KIW	Kinson tithe map, 1839; apportionment, 1840; altered apportionment, 1873, 1921, 1922 (with map.	1839-1932
T/LAL	Langton Long tithe map, 1841; apportionment, 1842; altered apportionment, 1865.	1841-1865

Ref No.	Title	Date
T/MAL	Marnhull tithe map, 1838; apportionment, 1840; altered apportionment, 1884, 1845, 1923 (with map.	1838-1936
T/MAN	Manston tithe map, 1840; tithe apportionment, 1841; altered apportionment, 1921.	1840-1921
T/OFP	Okeford Fitzpaine tithe map, 1839; apportionment, 1840; altered apportionment, 1934 (with map).	1839-1934
T/SHI	Shillingstone tithe map, 1839; apportionment, 1840; altered apportionment with map, 1886, 1925.	1839-1925
T/SIL	Silton tithe map, 1837; apportionment, 1839.	1837-1839
T/SML	Sturminster Marshall tithe map, 1844; apportionment, 1846; altered apportionment, 1868 (with map).	1868-1927
T/SN	Sturminster Newton tithe map, 1840; apportionment, 1841.	1840-1841
T/SPK	Shapwick tithe map, 1849; apportionment, 1850.	1849-1850
T/SPN	Stourpaine	
T/SPV	Stour Provost tithe map, 1842; apportionment, 1843.	1842-1843
T/SPY	Spetisbury tithe map, 1839; apportionment, 1840; altered apportionment with map, 1867, 1930.	1839-1930
T/TTC	Tarrant Crawford tithe map and apportionment, 1850.	1850
T/TTK	Tarrant Keynston tithe map, 1840; apportionment, 1841; altered apportionment, 1848, 1883; Glebe.	1840-1853
T/WM	Wimbourne Minster	1847
T/WPY	West Parley tithe map, 1839; apportionment, 1841; altered apportionment, 1855 (with map).	1839-1855
T/WSR	West Stour	1842

Tithe maps record strip fields and plots which enabled earlier field systems such as funnel-shaped meadows to be identified. These field systems are not always as clear on the later historic OS maps, and in some instances the tithe maps showed internal sub-divisions that confirmed the manner of use. The tithe maps and apportionments also provided more detailed information on islands and place names, which may indicate former land use or associations with the river.

Maps and Documents held at Somerset Heritage Centre

The Dorset Stour formed part of the planned route of the Dorset to Somerset Canal, so a visit was arranged to Somerset Heritage Centre to view the 1795 Plan of the Proposed Dorset and Somerset Canal (Somerset History Centre Q/RUP/12). Unfortunately, the canal map proved to be too small in scale to be useful and showed little detail of the Stour itself. However, other documents relating to the Dorset Stour were identified; the following selection of documents and maps was examined:

A/CWO/5/3/49 Railway bridge over the Stour Hodmoor and Fiddleford

DD/WY/9/8/1 Plan for unidentified house, adjoining River Stour (so Wiltshire or Dorset). Colour. Paper. Scale 69 cm x 49 cm. n.d., late 18th century

DD/HC/99/8/25 Legal documents regarding rights to beds of rushes

DD/HC/66/18/1 to 15 Barnes against Reed and Russell

DD/HC/89/10/1 to 4 Plan entitled 'Trenchard Esq. against Churchill Esq. and others 1805' - property near Shapwick in Dorset.

D/HC/89/13/16 Letter from E Barnes to Mr Hancock regarding the Cowards who cut the rushes from a boat at Dockhams.

DD/HC/89/13/19 Trenchard Esq against Coward

DD/HC/99/8/21 Barnes against Gollop for Trespass

DD/HC/112/3/1 to 70 Papers relating to taking of rushes from Trenchard

Q/RUP/12 Plan of the Proposed Dorset and Somerset Canal. 30 Sep 1795

Legal documents pertaining to a case between a John Trenchard Esq against William Churchill, John Flook and William Sherwood provided further insight into the cutting of rushes noted at Dorset History

Centre. This dispute concerned rights to rushes along the Stour from Shapwick to Sturminster Marshall in 1805.

Field Visits

Field visits to sites were made to many locations on the Dorset Stour to visit specific features and gain a fuller overall understanding of the character of the river. Field visits were documented with photographs, which were also used in public outreach activities.

Field visits were made to the following locations:

03/07/15	Blandford Bridge, Bryanston, Crawford Bridge, Keynston Mill, Langton Long Blandford
09/07/15	Fiddleford, Hammoon
03/05/16	Shapwick
23/04/17	White Mill
26/04/17	Julian's Bridge
04/07/17	Hod Hill
27/07/17	Corfe Mullen, Eye Bridge, Iford Bridge
15/10/17	Cut Mill, King's Mill
08/11/17	Stourhead to Gillingham, including Bourton Foundry, Silton Mill, Gasper Mill, Pen Mill, Waterloo Mill and Rolls Bridge
02/01/18	Stour Provost
08/01/18	Bryanston
11/02/18	High Bridge Mill, West Stour
08/05/18	Hammoon
22/05/18	Bryanston
10/07/18	Shapwick
16/07/18	Stour Provost
03/10/18	Sturminster Marshall

Other Paper and Online Sources

A variety of other sources were used, both online and on paper – including reports and published works. McInnes' parallel project on historic imagery was a valuable source to which reference could be made for specific HWPs, though in some instances it was not possible to resolve the location of the feature showed in an artwork or photograph. Other additional imagery was sought through online searches: individual sites such as Alwyn Ladell's Flickr collections of historic images of Dorset[30] could be very helpful. Other 'standard' online sources that were used routinely included British History Online[31], National Library of Scotland Maps[32] (to supplement the historic mapping within the GIS), Google Earth (especially its historical imagery function), the Key to English Place Names[33] and the Internet Archive[34] for antiquarian books. The online archive of Dorset Life[35] also helped in providing general background. In additional to the usual range of published books and articles relating to watercourse heritage and archaeology of Dorset, specific use was made of local topographic literature such as Hutchings' volumes on the Stour and Dorset (Hutchings, 1956, 1970).

[30] https://www.flickr.com/photos/alwyn_ladell/collections/72157626402091201/

[31] https://www.british-history.ac.uk/

[32] https://maps.nls.uk/

[33] http://kepn.nottingham.ac.uk/

[34] https://www.archive.org/

[35] https://www.dorsetlife.co.uk/articles-archive/

Identifying, Digitising and Classifying HWPs

Historic Watercourse Polygons (HWPs) were recorded in a shapefile – Dorset Stour HWP.shp – created in QGIS. An attribute table is automatically created for the polygon shapefile, to which an ID field automatically assigns a value for each polygon created. Within this attribute table, the following additional fields were created:

ID	Identifying number for each HWP – as assigned by QGIS
Area_name	Area where the HWP is located, limited to 254 characters
Periodfrom	Period that the HWP dates from. Some flexibility required so Roman features noted on First County Series maps would be dated as Roman, but a watering place would be dated to the map on which it was identified.
Periodto	Latest date (if know) of the HWP – usually based on the date of the last source.
Description	Description of the HWP – limited to 254 characters so necessarily concise.
RationalExt	Rationale for the extents of the HWP, e.g. whether its extents were identified from a map or whether they were refined by looking at Google Earth, for example.
RationalDat	Rationale for the date of the HWP, for example if it appeared on one map but not a later map, or can be dated by type (e.g. Roman Road).
Source	The sources used to identify HWP, for example maps, documents or processed lidar, including references.
Assoc_HA	Associated Heritage Assets that are close to the HWP. These were sourced from the HER and Designated Asset layers
Broadterm	HWP types, based on Monument Type Thesaurus.
Theme	HWP themes, derived from Monument Type Thesaurus.

All the data sources (historic maps, lidar, base mapping and CaBA data) were loaded into a QGIS project. Using the OS 10km grid square as a guide, the data sources were studied along the route of the river. Where HWPs were identified, their approximate extents were digitised and their attributes recorded. Sources were compared to confirm and enhance the records for each HWP identified; many HWPs were recorded based on multiple sources. The process of identifying and recording HWPs is illustrated by theme and type in Appendix II.

Appendix II: HWP Themes and Types

Introduction

The themes attributed to each HWP are based on Historic England's Monument Type Thesaurus[36] and are comparable with the Classes used within that thesaurus[37]. Four additional themes were created (river management; waterfront; navigation; and designed landscape) as there were no comparable classes in the Monument Type Thesaurus and there was a clear need given the focus on watercourses. HWPs where there is evidence of human activity or intervention, but the purpose of the activity/intervention is not clear form the sources used were recorded as 'non-themed'. Consequently, the overall list of themes used in this pilot are as follows:

- Agriculture
- Aquaculture
- Civil
- Crossings
- Designed Landscape
- Domestic
- Industrial
- Military
- Non-themed
- Navigation
- Recreational
- Religious, ritual and funerary
- River Management
- Waterfront

HWPs were allocated to types following, as closely as possible, the Scope Note, Broad Term, Narrow Term or Related Term in the Monument Type Thesaurus. A degree of flexibility with the broad terms was required when using the Monument Type Thesaurus, opting for the single term that best described the HWP rather than adopting a hierarchy. For example, a mill falls within the industrial theme and can be recorded as a mill (scope note in the Monument Type Thesaurus) or as a flour mill (narrow term in the Monument Type Thesaurus), where it is known that this was the actual function of the mill.

Agriculture

Association with the River

The agriculture theme is, unsurprisingly, the commonest theme along the Dorset Stour and includes twenty broad terms covering a range of HWPs identified on the margins of the river such as sheep washes and beds of rushes, as well as HWPs in the wider vicinity such as meadows, drained land, osier beds, and field systems directly bordering the river.

Agriculture along the route of the Dorset Stour was highly dependent on access to the river for irrigation, fertilisation (from floods), watering of livestock, and for specific crops. Reeds, osiers and withies are likely to have been grown for domestic and small-scale industrial activities such as basket, wattle and fish trap production and were very much part of the agricultural landscape of the Dorset Stour represented on historic maps.

[36] See http://www.heritage-standards.org.uk/fish-vocabularies/; https://heritagedata.org/live/schemes/eh_tmt2.html.

[37] http://heritage-standards.org.uk/wp-content/uploads/2016/05/Definitions-to-the-Classes-in-the-FISH-Thesaurus-of-Monument-Types.docx.

Key Sources

The agriculture-themed HWPs were identified from the OS First County Series Epoch 1 to 3 historic maps, lidar and documentary sources. The use of the historic mapping was supported by review of lidar to confirm the presence of water meadows, for example. Tithe mapping also provided a valuable source of information, as land use could be found from the apportionment records. Other documentary sources such as legal documents provided information not recorded elsewhere such as reed bed locations.

The HLC layer, Environment Agency flood risk layer and lidar were all examined to identify water meadows present along the River Stour. The HLC layer characterises large areas of the valley bottom as water meadow. However, the HLS polygons cover extensive areas often with very little topographic or map evidence of irrigation for bedwork systems. The identification of water meadows for this study has been based on the presence of tangible features on lidar, enabling classification as either catchwork or bedwork systems. In some instances, confirmation of these areas was made by field visits, where extant features could be seen. HWP 29 (Area from Stour Bridge down to Bagmore Farm, Silton) was identified from lidar and map evidence, which indicated the presence of linear channels that run both horizontally and vertically in the fields to the east of the River Stour. A field visit confirmed structures and earthworks present in the fields consistent with those found in catchwork water meadow systems, where the slope of the land made bedwork systems impractical (Figure 11).

Figure 11 Catchwork water meadow feature comprising a bridge and culvert at Bagmore Farm, near Silton

Field systems were recorded where they lie close to the river, such as 17th century strip fields, medieval ridge and furrow and Roman and prehistoric field systems. Strip field systems were generally identified from the early OS maps and tithe maps, while lidar tended to show the medieval ridge and furrow and Romano-British and Prehistoric field systems.

Application of Methodology

Agricultural features such as irrigation channels and bedworks for water meadows – and ridge and furrow – are usually visible on lidar to a lesser or greater extent and the polygons for these HWPs can be digitised relatively easily. However, sometimes the extents are unclear: the lidar data is not always conclusive and where bedworks were not maintained, identification could be problematic. There are cases where only faint traces of a bedwork system remains – no more than an organised sequence of channels suggesting that an area may originally have been water meadow. In those cases, the polygon would be loosely digitised around the area in question, as the actual extents are unknown.

Not every channel was mapped that was present along the route of the Dorset Stour. Many channels marked on maps are field drainage channels allowing water on the surface and from field drains to run off to the river. The quantity of drains was simply too high to make it practical to digitise every

instance shown on the maps. Most are still in use, mapped as blue lines (water) on modern maps and probably still maintained for that purpose.

HWPs associated with land use such as osier beds and reed beds could only be recorded where they appear on historic OS or tithe maps, as they leave no trace on lidar. These types of features, alongside funnel shaped fields and 17th century strip field systems, were digitised just outside their mapped boundaries, which could be clearly seen on the historic maps. Often, their boundaries are still visible on Google Earth and could be compared for accuracy, even if the land use has changed.

Sheep washes may simply be marked by a spot on a map with the word 'sheep wash' next to them, so the polygon for these HWPs tends to be generous as their actual extent is not known. Watering places, denoted by rectangular embayments often between two fields, were digitised slightly larger than the mapped feature.

Examples

Beds of rushes could only be identified along one stretch of the river, from an 1804 plan of the river documenting rights to the rushes. The stretch of river runs from east of Crawford Bridge to Corfe Mill. Beds of rushes were cut to provide material that could be used for floor coverings and for constructing baskets.

Stevenson (1812) observes that 'The River Stour is not applied to purposes of irrigation after it enters the chalky district, but it frequently overflows a considerable quantity of meadow land, and its winter floods are very advantageous.' The paucity of bedwork water meadows along the route of the Stour compared to other rivers in the region appears to reflect Stevenson's conclusion. It is likely that there were flood meadows that were not of the bedwork form and which leave little archaeological trace either on lidar or in the historic mapping. While it is true that there is not the same density of bedwork water meadows along the route of Stour as found in the Nadder, the Avon or the Ebble valleys that meet at Salisbury, there is some evidence of bedwork water meadows on the Stour, as illustrated in Figure 12. This small area of bedwork water meadow is situated to the east of Canford Bridge, opposite Wimborne. The lidar SVF image shows the bedworks and the channels supplying them, several of which are marked on the modern Open Rivers layer in blue. Below the lidar image is the Epoch 1 OS first county series map showing a sluice marked at the south-east end of the HWP (see purple inset box). This sluice would have been opened and closed to allow the water to drain from the bedworks and flow back into the Stour.

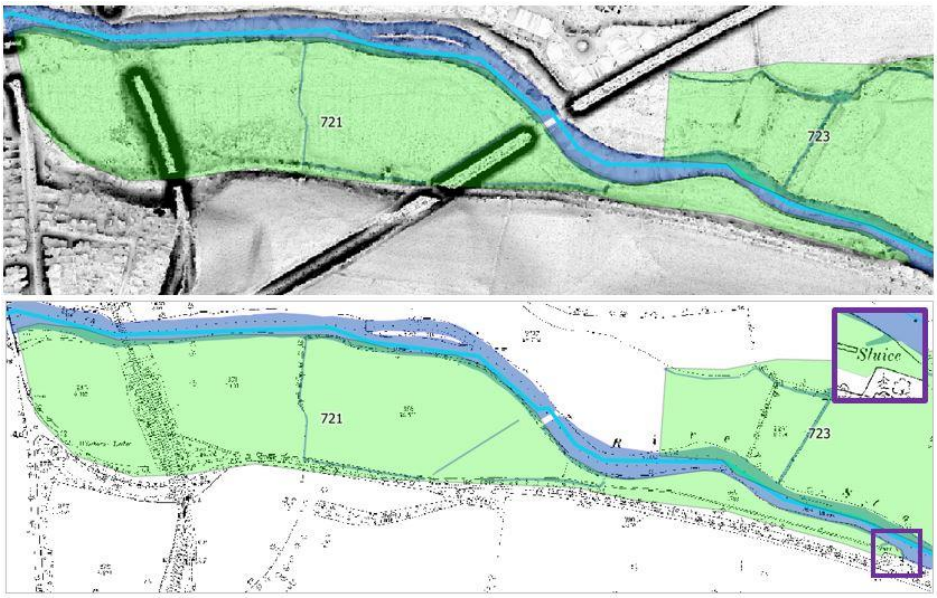

Figure 12 HWP 721 Bedwork water meadow to the east of Canford Bridge, Wimborne Minster shown on SVF processed lidar (top) and Epoch 1 first County Series survey (bottom) with sluice shown at south east extent of the Dorset Stour (insert highlighted purple).

Funnel-shaped fields – characterised by the way their entrances are shaped – originated as medieval common meadows, often having field names that reflect their association with the river, such as Steart Mead, Sturminster Newton (HWP 739). There are three elements that help characterise these types of meadows:

- funnel-shaped entrance;
- entrance comes off a drove or trackway;
- meadow opens out in a roughly triangular configuration, with one side often being bounded by the river.

The boundary of these former common meadows often respects the edge of the flood plain and the river. These meadows can be identified on tithe maps as open field systems that have been apportioned to different tenants in long, narrow strips (Figure 13).

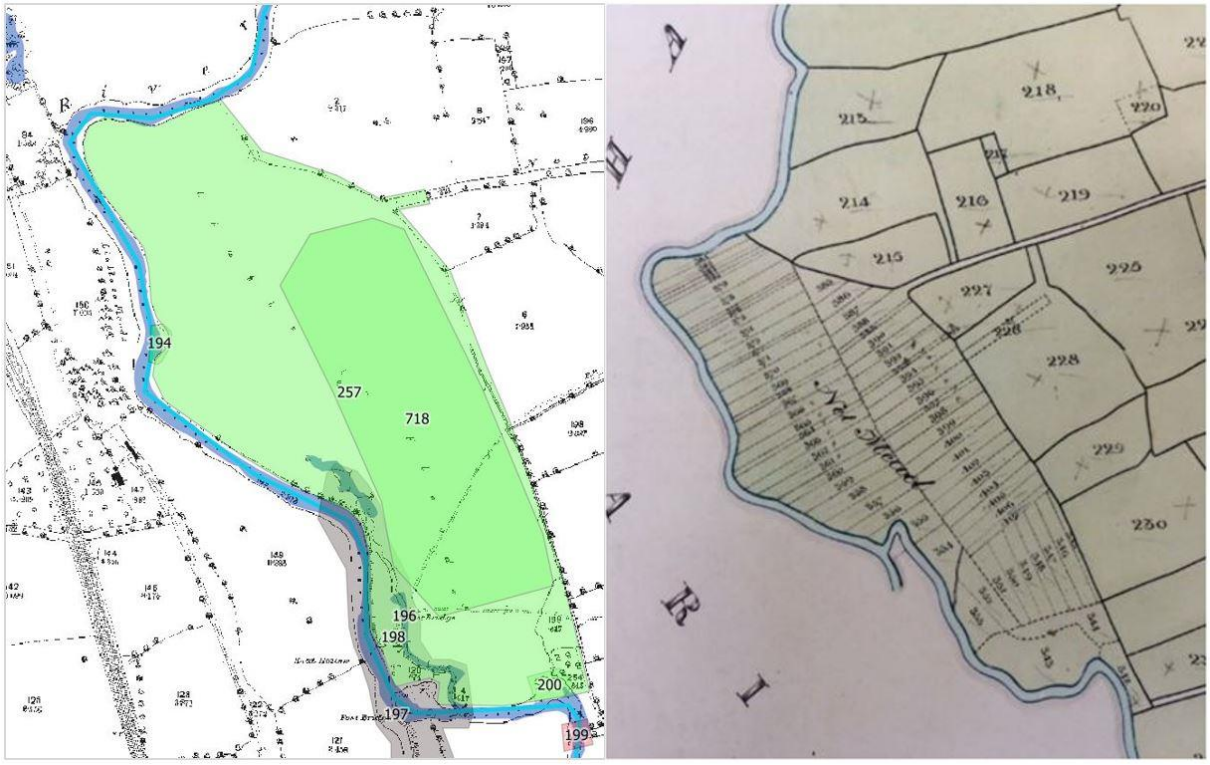

Figure 13 HWP 257 Funnel-shaped meadow Net Mead at Child Okeford near Gold Hill on Epoch 1: the first County Series survey and Tithe map (T-CHO, Dorset History Centre). Also shown on Epoch 1 survey are HWP 718 water meadow, HWP 194 and 200 watering place, HWP 198 Bere Marsh Mill, HWP 197 footbridge and HWP 199 ford.

The strips may have historically been marked by stones. The Epoch 1 and 2 first County Series survey sometimes have these stones annotated. An excellent example of this is at Marnhull Ham, where Epoch 1 records multiple stones (Figure 14), and the tithe map[38] illustrates the strip fields (Figure 15).

[38] Dorset History Centre, T-MAL Marnhull 1838

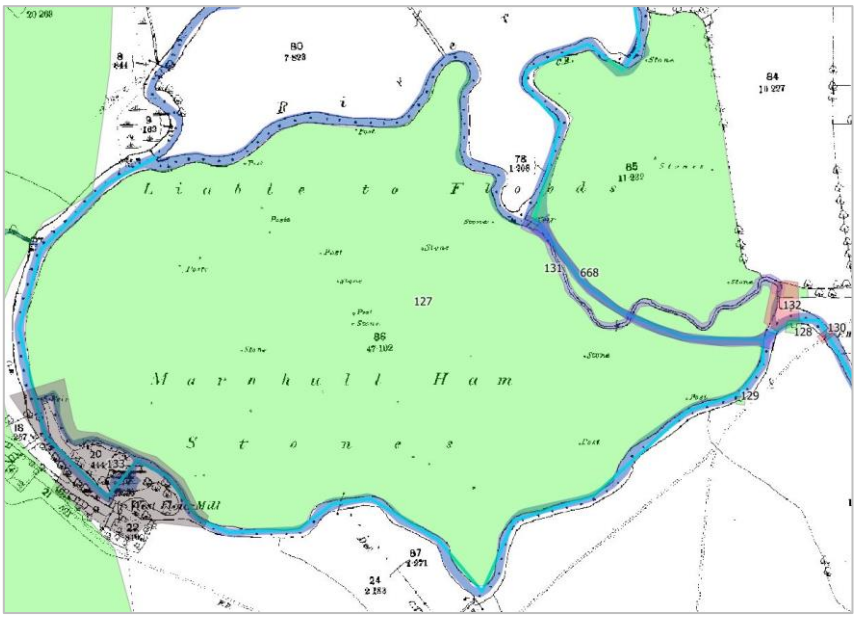

Figure 14 HWP 127 Marnhull Ham showing the location of stones marking the plots on the Epoch 1 first County Series survey. Also shown are crossings (HWPs 132 and 130), HWP 128 watering place, mill HWP 133 Stallbridge Mill, weir and original course of the river HWP 131 and new course of the river HWP 668.

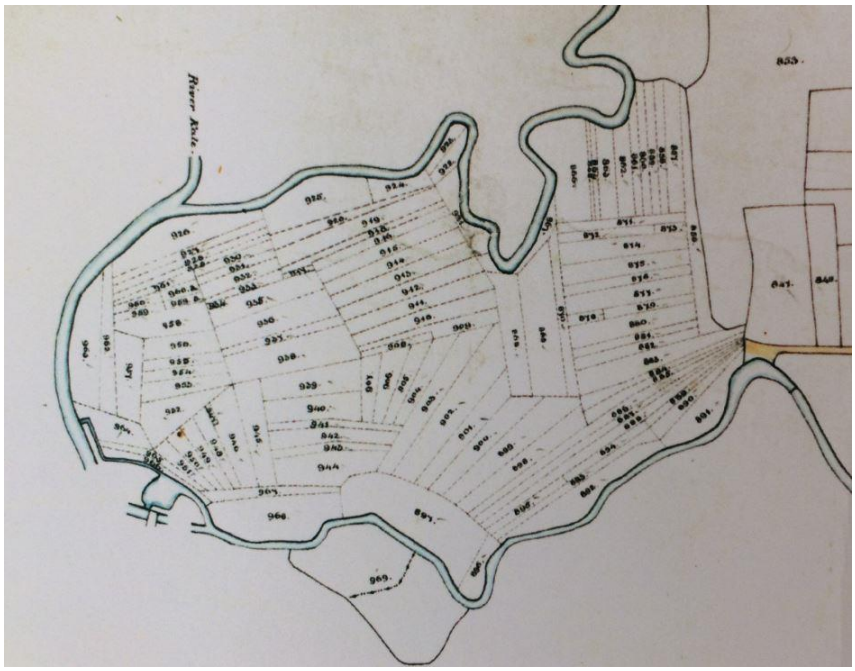

Figure 15 HWP 127 Marnhull Ham showing the strip fields on the 1838 Tithe Map (Dorset History Centre, T/MAL).

Osier and withy beds, common along the route of the Stour, comprised beds of willows that would have been coppiced and harvested each year for the withies. These thin, flexible branches would have then been used in small scale local industries in the construction of fish traps and baskets. Osier beds were noted on islands associated with mills. The keying used on the early maps can make it difficult to distinguish between marsh land and withy beds. Figure 16 demonstrates how the representation of the osier beds can alter through time on the historic maps.

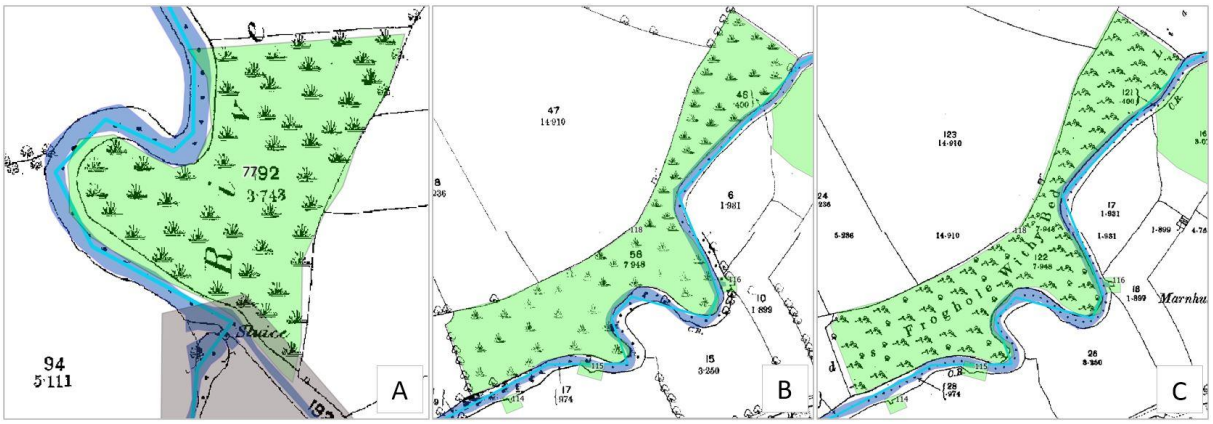

Figure 16A HWP 77 Highbridge Willow bed between West Stour and East Stour (Epoch 1: the first County Series survey); Figure 16B HWP 118 Froghole Withy Bed (Epoch 1: the first County Series survey); Figure 16C Froghole Withy Bed Epoch 2 first County Series survey.

A small number of sheep washes were marked on the historic maps. Sheep washes would have been important structures in those areas of the Stour where sheep were reared. They provide a method for washing the sheep prior to shearing, removing the grease and dirt built up over the winter. It is reasonable to assume that there were more of these types of structures on the river given the importance of sheep and wool, but they were not all mapped at the time. Although sheep washes were sometimes constructed permanently from stone or brick, many would have been temporary structures created using wattle hurdles. The wattle hurdles were used to create dams to deepen stretches of the river, as well as being used to construct pens/walk ways for holding the sheep and driving them into the water for washing. Sheep washes may also have incorporated an area where the shepherds could stand and keep relatively dry while washing the sheep. An early photograph of the Fontmell Brook – a tributary of the Stour – at Fontmell Magna illustrates a simple sheep wash constructed using wattle hurdles (Figure 17). A similar construction at Shapwick, photographed during the early twentieth century, shows timber revetments with wattle hurdles to corral the sheep within the river (McInnes, 2018 Fig. 161, p. 81).

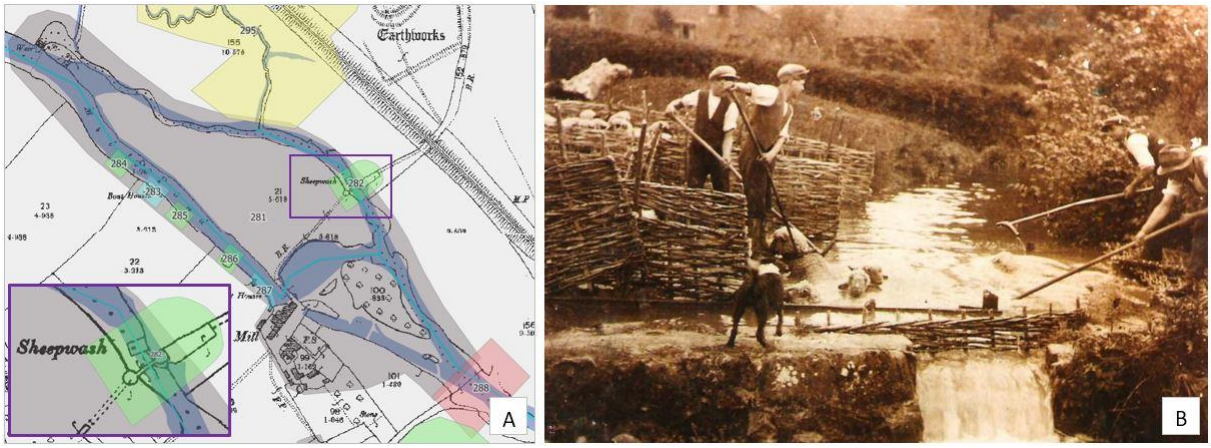

Figure 17 A: HWP 282 Sheep wash noted on Epoch 2 first County Series survey showing location of the sheep wash at Durweston and B: an example of a sheep wash on a tributary of the Stour at Fontmell Magna[39].

Watering places, also known as 'cattle drinkers' (Haslam, 1997 Fig. 10.5) appear on the early historic maps as small rectangular embayments cut into the banks of the river. These HWPs are one of the most common HWPs found on the historic maps. Their function is not annotated on the maps, but their use in providing access to the river for watering livestock is self-evident. Quite often they are

[39] https://www.fontmellmagna.net/2006/02/memories-of-a-fontmell-born-inhabitant/

found on field boundaries, allowing shared access from either side. Some watering places are located next to bridges and may indicate earlier fords that predate the bridges. It is possible that the fords are then reused as watering places after the bridge has been constructed, and that water might also have been taken from the river at these points, as in a photograph illustrating a water cart stood in the river at Blandford in the late 19th century (McInnes, 2018 Fig. 160, p. 81). Another watering place is illustrated on an early 20th century postcard of Iford Bridge, showing horses watering at the edge of the Stour (Figure 18). Fencing the watering holes stops the edges of the river becoming too poached and prevented animals from straying via the water. It is not clear if this watering place is a relic of the former ford implied by the place name, Iford.

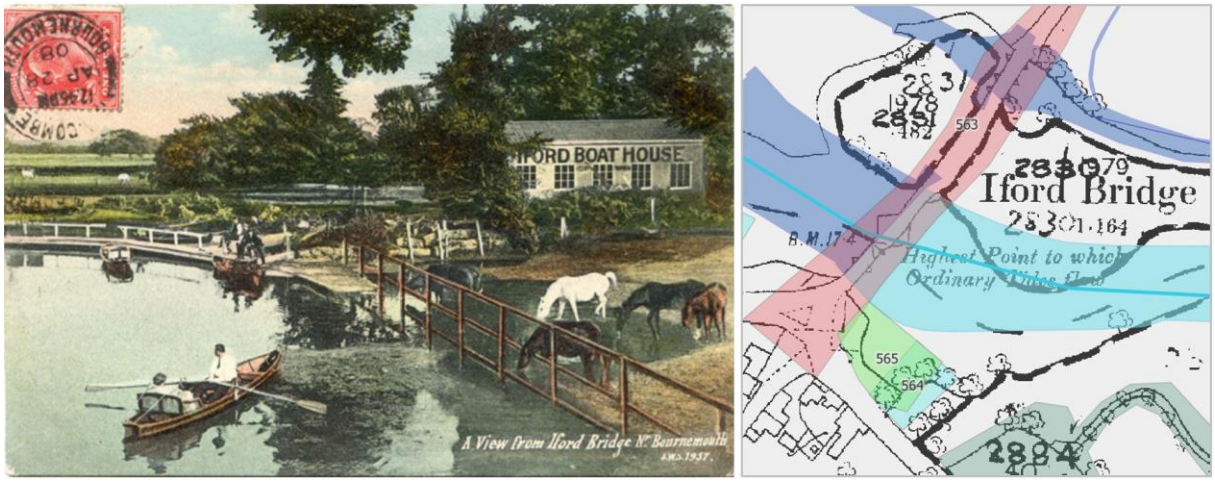

Figure 18 HWP 565 Embayment and HWP 564 boat house next to Iford Bridge, as show on an early postcard40 with horses watering in the embayment and marked on the Epoch 1 first County Series survey (marked in yellow, with rectangular feature showing the boathouse).

Although most watering places appear as small rectangular embayments, an inlet at Sturminster Marshall was identified as a watering place for animals following a field visit to the area. Originally identified on the historic mapping and tithe map, this was thought to be an inlet providing access to the river, possibly for small vessels. However, the field visit revealed that this 'inlet' is known locally as 'Johnnies Ditch'. An information board at the site reads:

JOHNNIES DITCH
Site former village watering
hole, where drovers watered
their flocks when passing
through the village

Figure 19A illustrates a section from the tithe map for Sturminster Marshall (source Dorset History Centre, T/SML Sturminster Marshall 1844). The Stour comes right up to the back of plots 701 to 705 and 806 to 809, with Johnnies Ditch situated between 705 and 806. By Epoch 1 of the OS maps Figure 19B), the Stour no longer comes up to the back of the plots – in fact there is now a flood defence across the back of the properties – and Johnnies Ditch is now a redundant space between the two plots. Figure 19C shows the site as it is today, with the information board in situ.

[40] https://www.flickr.com/photos/alwyn_ladell/31157851606

Figure 19 HWP 693 Watering Place known as Johnnies ditch at Sturminster Marshall, shown on (A) Tithe map T-SML Dorset History Centre, (B) Epoch 1 first County Series survey and (C) from site visit.

Archaeological Implications

The archaeological implications for the agriculture-themed HWPs are variable. Water meadows may leave physical evidence in the form of ditches and banks, but there may also be sluices, bridges and culverts associated with their construction near the river (see Figure 9, brick bridge over a culvert and Figure 10, sluices shown on map). Channels associated with the water meadow have the potential to contain palaeo-environmental remains. Marker stones or posts, originally demarcating the boundaries of strips in water meadows and strip field systems to identify tenants, might still be present in these HWPs. It is likely that such stones were moved once the strip field or water meadow fell out of use and they may have been discarded within hedgerows or ditches, or even deposited within the river. These stones are sometimes known to have the initials of tenants inscribed or carved onto them[41].

Ridge and furrow are seen both as extant in the field and as plough marks on stripped archaeological sites; funnel shaped fields leave no archaeological trace other than, perhaps, discarded marker stones or a diffuse pattern of post holes. Nonetheless, the presence of these types of field systems may indicate medieval settlement nearby.

Sheep washes situated in the river may leave less tangible remains depending on the materials used in the original structure. Some remains are likely to be submerged and there may be ditches at the river edge. Should a sheep wash be constructed of stone, these elements may remain at the edge of or within the river.

HWPs such as withy, osier and reed beds will leave little obvious trace other than map evidence, although they may be visible by way of areas of naturalised vegetation as a result of no longer being cultivated or regularly cut. The archaeological importance of the osier and reed beds lies in the potential for waterlogged archaeological remains and palaeo-environmental remains (Farrell and Hazell, 2016, p. 57). There may also be an association with fish traps and weirs as they are often found near each other – osiers and withies being used in their construction.

[41] http://www.floodplainmeadows.org.uk/about-meadows/history

Aquaculture

Association with the River

Aquaculture on the Dorset Stour relates to the raising or catching of fish and oysters. Live capture fisheries using traps or nets have also been included, as has aquaculture of plants such as watercress.

During the medieval period, river fish are likely to have been an important part of the diet and the Dorset Stour fisheries would have been a valuable asset for food and trade. Historically, the river has been fished for different species of fish: the place name Blandford is derived from blay – gudgeon or bleak; and a nineteenth century document providing an overview of agricultural practices in Dorset states that the 'Stour yields trout, eel and tench, which last is observable, because that fish generally delights in ponds and pits' (Stevenson, 1812, p. 72). A number of 'holes' in the river are named on various map sources. Although they may be associated with fishing, there is no firm evidence for their use so they have not been identified as HWPs.

Methods of catching fish would have included passive fishing using v-shaped weirs constructed in the river to funnel the fish into fish traps. These traps would be regularly checked and emptied. Islands identified in the non-themed HWP theme might represent the remains of weirs that have since degraded (Haslam, 1997 Fig. 10.15). It is also known that mill races often had fish traps placed within them (Historic England, 2018c, p. 8), an example of which is illustrated at a fourteenth century mill in the Luttrell Psalter[42]. Catching eels in this way provided an additional income for the miller and was a practiced continued until the mid-nineteenth century. Fish traps and weirs have a close association to withy beds, which would have provided raw materials for the traps.

The low number of HWPs in this theme makes it difficult to draw conclusions as to distribution along the Dorset Stour. If the non-themed smaller island HWPs are taken into consideration and are considered to have potential as fish weirs, then combined with the aquaculture themed HWPs their distribution is at regular intervals from Charlton Marshall down towards the tidal part of the river. Above Charlton Marshall there appear to be no small island-type features in the river.

Fishing with nets or lines may have been widespread in the past and recreational angling continues today. However, they do not require much in the way of fixed infrastructure so their traces are unlikely to appear often on the sources used for this pilot. Consequently, the overall extent of past fishing activity is likely to be under-represented.

Key Sources

The key sources for identifying HWPs in this theme was limited to the OS First County Series Epoch 1 to 3. Fish ponds could sometimes be seen on lidar. An example of a fish trap is illustrated on the Dorset Stour at Christchurch (McInnes, 2018, p. 85 Fig. 172), but unfortunately the exact location could not be determined from the painting so it could not be recorded as a HWP.

Application of Methodology

A polygon was traced around the mapped extents, including a slight margin.

Examples

Evidence of passive fishing was limited to HWPs that are recorded as small islands, discussed under the non-themed category. Fish ponds were only mapped if they were located close to the river. Carp ponds at Beresford, a known deserted medieval village now known as Barford Farm, are recorded on an estate map from Bankes Archive[43]; these carp ponds (HWP 657) are visible on lidar. The Dorset Stour at this point also has islands that may be the remains of fish weirs (Figure 20, HWP 426). A

[42] https://waternames.wordpress.com/2017/05/08/medieval-welsh-fish-weirs/ fig 3

[43] D_BKL_E_A_1_12_O.jpg Estate map from Banke's Archive held at Dorset History Centre

small number of oyster pits were found where the Dorset Stour approaches Christchurch harbour, but their identification is tentative.

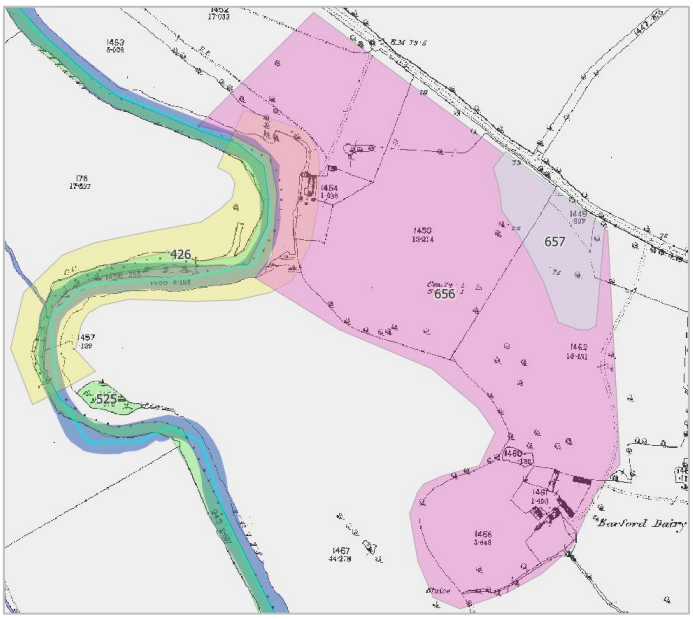

Figure 20 HWP 426 islands within the Dorset Stour (non-themed), HWP 656 medieval settlement and HWP 657 carp ponds at Bereford (Epoch 1 first County Series survey).

Archaeological Implications

The archaeological implications of the aquaculture theme are the possibility of extant remains of fish traps and related structures in the river, including within the river bed, and in palaeochannels. Islands found and recorded within the non-themed theme have the potential for being former fish weirs and any intervention in the locality of these HWPs should consider this possibility. Fish ponds may contain palaeo-environmental remains relating to the wider environment as well as fishing, including the possibility of material that can be carbon dated.

Civil

Association with the River

The river has been used to mark boundaries between parishes and counties, providing a clear boundary that communities have respected and taken advantage of for centuries. However, the use of the river as a parish boundary has not been recorded as it is evident on modern mapping; and marking every instance of a boundary along a watercourse would obscure rather than illuminate.

As a result, the civil theme is limited to a single boundary stone which has high historical value as the meeting point between the county boundaries of Somerset, Dorset and Wiltshire just north of Bourton, with the river forming the boundary between Wiltshire and Somerset upstream to Orchard Castle. As there is only one civil HWP in a very specific location, little can be noted regarding distribution.

Key Sources

The one HWP under this theme (HWP 31) appears on the OS First County Series Epoch 1 map. There is also an HER record for this HWP.

Application of Methodology

The civil-themed HWP was identified and digitised as a small polygon from map evidence.

Examples

Instances where the parish boundary indicates a former route of the river have also been flagged. HWP 687 demonstrates such an alteration, where the river follows along a different route to the parish boundary between Fifehead Magadalen and Marnhull (Figure 21). However, it was felt that this type of change should be recorded under the river management theme rather than the civil theme as it indicates the river that has changed, rather than implying anything significant about civil administration of the parishes.

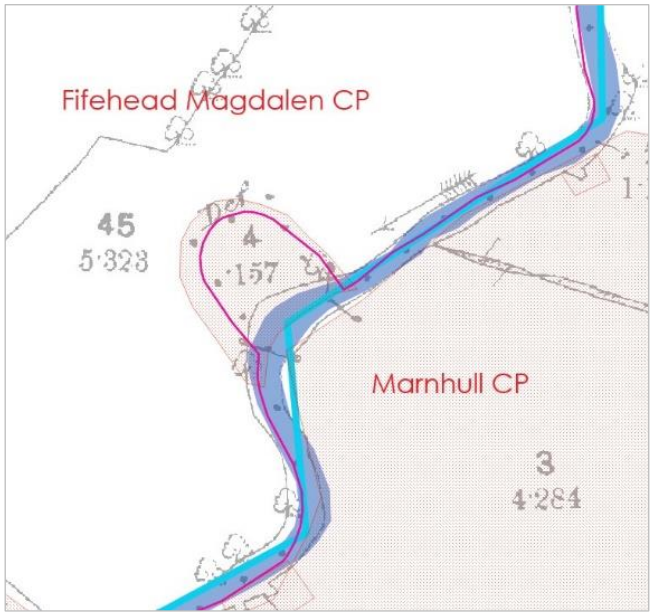

Figure 21 Feature 687 Alteration in Parish boundary (pink line) showing Fifehead Magdalen CP to the north of the parish boundary and Marnhull CP to the south west (Epoch 1 first County Series survey).

Archaeological Implications

The archaeological implications of this theme are limited, though the importance of the single HWP within this theme is high.

Crossings

Association with the River

Crossings form the second most common theme after the agriculture theme on the Dorset Stour. Their association with the river extends back into prehistory and many later bridges will have their origins in those early crossing points. Crossings form a key communication link between communities enabling the movement of people and facilitating trade. They provide access between areas of rich grazing, enabling animals to be moved across the river. Over the course of time, crossings have developed from simple fords, providing access across the low points in the river, to stone arched bridges still in use today, together with more complex railway and road bridges in recent centuries.

Bridges, foot bridges and fords are found along the entire route of the Dorset Stour; ferry crossings are found in the lower reaches. The presence of a ferry might imply that the river is too deep or wide to ford or bridge, that traffic is insufficient to warrant such capital investment, or that a permanent structure might block other uses, such as navigation.

Key Sources

Most crossings were identified from the historic maps and could be verified using Google Earth. Lidar was not found to be particularly useful in the identification of crossings though sometimes depressions and holloways either side of the river provide circumstantial evidence. Foot bridges are often found next to fords, for example HWP 24 at Silton Mill, which has a wrought iron footbridge situated next to the ford (Figure 22).

Figure 22 HWP 24 Footbridge and ford at Silton Mill.

Fords are usually marked on the historic maps, although some unmarked fords were identified from Google Earth imagery as well as documentary sources such as tithe maps and legal documents, which may refer to crossing points. Place names ('ford') are also a useful indicator, though the location of the crossing indicated by the place name is not always clear.

The location of the Roman crossing indicated by the Roman road either side of the river at Shapwick is not marked on any historic map, but it is likely that it was a ford rather than a bridge. This is supported by an observation by Monica Hutchings:

> The Roman ford is no longer used but I was astonished one day to see some cows enter the river on the village side and cross over to the meadows on the far side with little apparent effort. The river is both wide and deep here and there was a good current, flowing fast, but as one after the other of the cattle plunged down the bank and entered the water intent on fresh fields and pastures new, I realised that in fact they were scarcely swimming at all, for most of the way they were walking over it. It was then I realised where the Roman road had crossed this natural obstacle for the legions.
>
> (Hutchings, 1956, p. 214)

Lidar indicates a depression coinciding with the end of the Roman Road where it meets the river (Figure 21), also suggesting the presence of a ford.

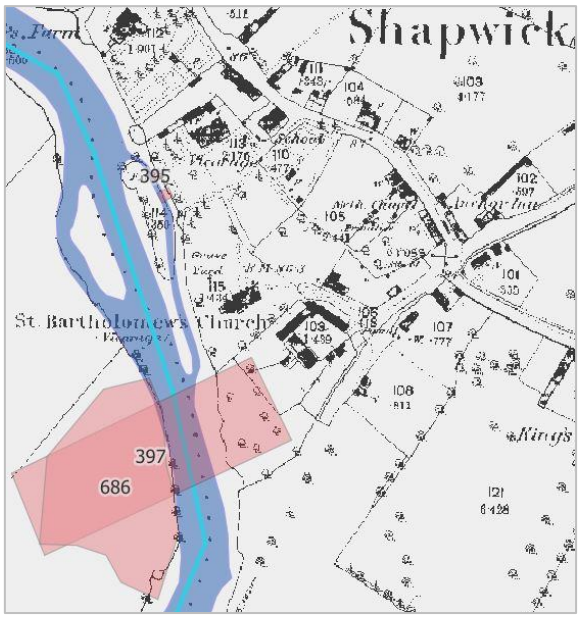

Figure 23 HWP 397 Likely crossing point for the Roman Road at Shapwick. Also shows HWP 686 depression between the visible extent of Roman road and the River. Possibly an early fording place which may have been in use from prehistoric times onwards. Correlates with the later Banke's map which shows a road coming down to the river. (Epoch 1 first County Series survey).

Application of Methodology

The crossing theme consists of all types of crossings that enable movement across the Dorset Stour, and includes fords, road bridges, green bridges (access between fields), railway bridges, ferry crossing points, toll houses, viaducts, tramway bridge and foot bridges. Crossings were digitised with a polygon covering the broad area of the location of the crossing.

Examples

There are numerous examples of bridges across the Dorset Stour, from small green bridges enabling access across the river between fields, to more substantial stone bridges such as Blandford Bridge (Figure 24) and Julian's Bridge near Wimborne. These bridges still serve as essential transport links despite their age.

Figure 24 View of Blandford Bridge

Ferry crossings were found in the southern extents of the Dorset Stour, where the river widens and becomes tidal. Ferry crossings operated at Redhill in Bournemouth, Blackwater Ferry at Heron Court Estate and the Wick Ferry at Christchurch from the nineteenth through to the early 20th century. The ferry at Wick is accompanied by a ford, perhaps used at low tide whilst the ferry was used when the tide was high (Figure 25). The ferry crossings not only provided a means for people to cross the Dorset Stour but would have been used for transporting animals across the river.

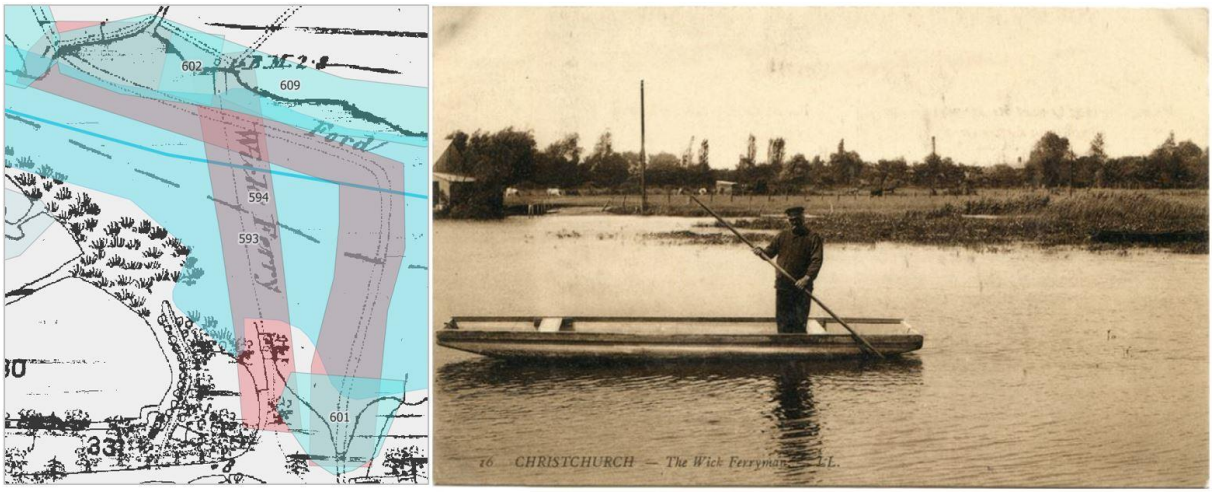

Figure 25 HWP 593 ferry crossing and HWP 594 ford at Wick (Epoch 1 first County Series survey) and postcard of the Wick Ferryman[44]

Archaeological Implications

The different types of crossing will each have different archaeological implications to take into consideration. Bridges are likely to have submerged remains of earlier structures present beneath the water, possibility from earlier bridges (Figure 26) or from the construction of the existing bridge. Fords may be found within the water next to bridges, and there may be the remains of surfaces which would have provided secure footing.

The fact that barrows on the floodplain coincide with crossings at Wick, Blackwater, Shapwick and perhaps also Langton Long Blandford might suggest that these places are of very great antiquity. This might also be reflected in the presence of prehistoric archaeological material within the river or in its vicinity.

Figure 26 The modern Eye Bridge at Pamphill, with stone blocks which may be the remains of the abutments from the original bridge visible on the bank of the river

[44] https://www.flickr.com/photos/alwyn_ladell/6050709288/

Designed Landscape

Association with the River

The designed landscape theme comprises places where the river has been manipulated to enhance views to and from country houses or as a feature within parkland. In several instances the river has been shaped to contribute to an aesthetic panorama within areas of parkland, as can be seen at Langton House, Langton Long Blandford (Figure 27). The designed landscape theme can also include ornamental lakes and ponds or built features such as the spring head in a garden at Sturminster Newton (HWP 701).

The designed landscape HWPs occur infrequently along the Stour.

Key Sources

Designed landscape HWPs were identified from the OS First County Series Epoch 1 historic maps, HER and Designated Asset records, and documentary sources.

Application of Methodology

HWP extents under this theme were digitised as reasonably exact polygons as historic maps show where the river lies with respect to these landscapes.

Examples

Stourhead is probably the best-known designed landscape on the Dorset Stour. There are several smaller estates and large country houses that have also manipulated either the surrounding landscape or the river itself to include it within their panoramas. At Bryanston, the river was heavily altered to enhance the view of Bryanston House and it surroundings when the house was rebuilt in the late eighteenth century.

Archaeological Implications

There may be alterations to the course of the river, including reaches that have been straightened, leaving an archaeological footprint of the original water course. Ornamental ponds may provide a rich source of palaeo-environmental evidence and could produce results similar to those from Stourhead, where sediment cores yielded pollen grains that enabled records of plant species listed in historic documents to be confirmed (Farrell and Hazell, 2016, p. 47).

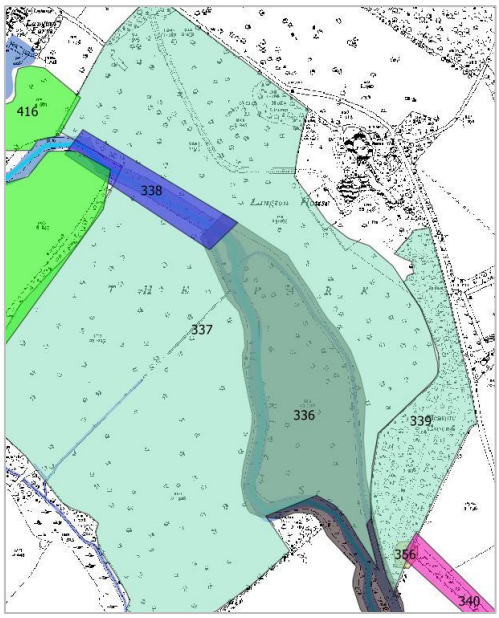

Figure 27 HWP 337 and HWP 339 designed landscapes and at Langton House, HWP 338 altered river course at Langton House, Langton Long (Epoch 1 first County Series survey).

Domestic

Association with the River

Only a few domestic-themed HWPs were identified, including an ice house, laundry and a tunnel portal. Both the ice house and laundry would require access to water, explaining their location near the river. The tunnel portal is a feature in the grounds of Bryanston, included within the domestic theme as the tunnel runs up to Bryanston House. The function of the tunnel is unknown, however.

With so few HWPs identified, no comment can be made about the distribution of this theme along the Dorset Stour. Their absence is perhaps surprising, suggesting that domestic activity involving the river was too ephemeral to be marked by physical features; though domestic activity might have been captured more effectively by the waterfront theme.

Key Sources

Domestic HWPs were identified from the OS First County Series Epoch 1 historic maps and documentary sources. Usually their function is marked on the mapping. HER and Listed Building records were also sources that could provide information about buildings associated with this theme.

Application of Methodology

All these HWPs are buildings; polygons were digitised just beyond the building extents.

Examples

See above.

Archaeological Implications

There are likely to be extant historic buildings – and other traces of built heritage such as foundations, pathways and gardens – surviving in the vicinity of these HWPs.

Industrial

Association with the River

This theme covers HWPs related to industrial activity such as milling, quarrying, tanning, smithies and lime kilns. Milling industries would have relied upon the energy of the river to power the mills – whether for grinding grain or driving machinery – while quarries, tanneries, smithies and lime kilns would have used water in the course of processing. Areas such as Burton and Penselwood, now thought of as tranquil and picturesque, was formerly an industrial riverine landscape, utilising the power from the river for a number of mills probably from the medieval period to the nineteenth century (Figure 28).

Industrial-themed HWPs are distributed evenly along the Dorset Stour, with HWPs generally being located near or in towns or villages. The most intensive area of milling and industrial activity is in the area from Gasper to Silton, where there is a total of six mills in approximately 5km of the river. Quarries and gravel pits are found below Gillingham down to Little Canford. The largest quarry, HWP611, is at Marnhull, where there is still a quarry today. Other forms of HWP, such as crossings, are often associated with mills; the connection between mills and aquaculture (fishing) has been noted above.

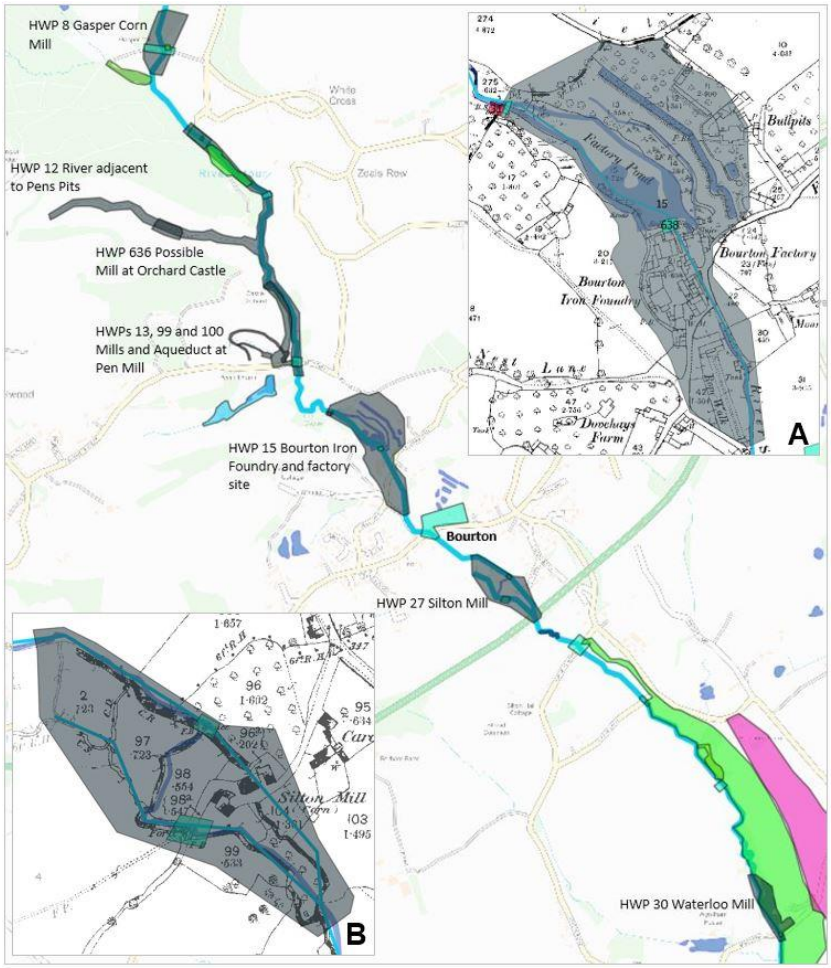

Figure 28 Industrial themes around Bourton with detail of HWP 15 Bourton Iron Factory (A) and HWP 27 Silton Mill (B) (Epoch 1 first County Series survey).

Key Sources

Industrial-themed HWPs were identified from the OS First County Series historic maps, lidar and documentary sources. HER and Listed Building records were used to enhance the dating and naming of these industrial HWPs.

Application of Methodology

Mills have many structural elements, including weirs, leats, mill ponds, footbridges as well as the mill building itself. A polygon was digitised which encompassed the entire area of the mill and its constituent parts, including the full extent of any islands, leats and sluices. Where identified, mill types were recorded. Mills were not classified according to the type of waterwheel used.

A similar approach was taken for quarries if their function – e.g. gravel, chalk or stone – was identifiable from the source material. Other industrial-themed HWPs were digitised to just outside of their extents. A larger area was digitised around tanneries and smithies in case there are external features such as tanning pits or slag pits near the industrial buildings.

Examples

Mills are by far the most commonly occurring type of HWP in this theme with 45 mills identified along the main channel of the river. Appendix III lists the mill types by count, with the majority being corn mills; however, a paper mill (HWP 658) was identified on an estate map from the Bankes Archive[45]. Documentary evidence shows some mills started out as flax mills before being used to process corn. When the flax industry declined, Bourton mill (HWP15) was redeveloped into an iron foundry producing threshing machines and water wheels throughout the nineteenth century. It was used as a factory for Mills Bombs (grenades) during the First World War.

An aqueduct at Pen Mill, Coombe Lane brought water across the valley to Pen Mill and was recorded under the industrial theme because of its association with the mill (Figure 29).

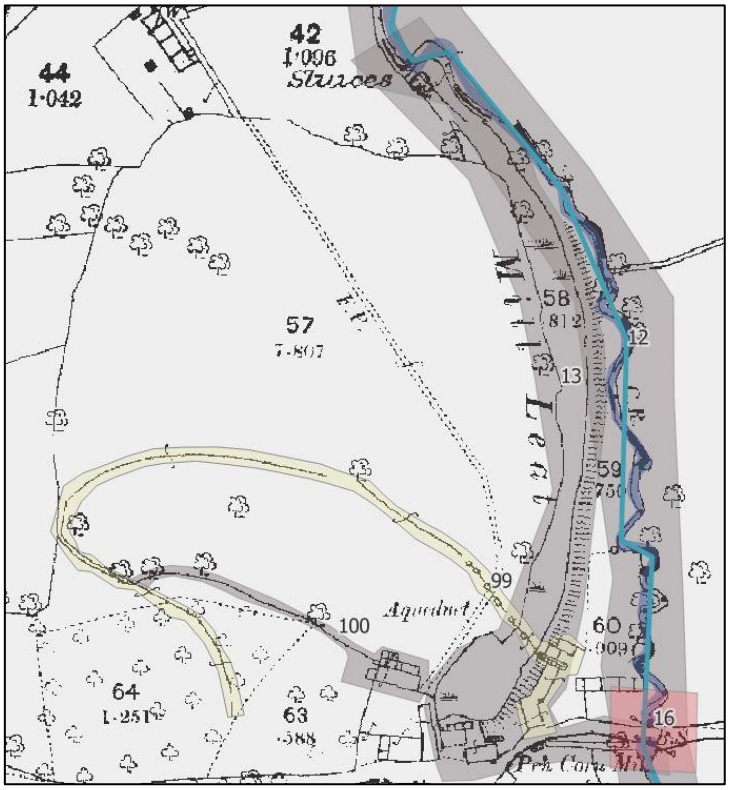

Figure 29 HWP 99 Aqueduct (coloured yellow) and associated mills (HWP 100 and 13) at Pen Mill. HWP 12 is the river frontage for River adjacent to Pens Pits which were quarried from the prehistoric period through to the medieval period, and tributary noted on which runs through Combe Bottom (Epoch 1 first County Series survey).

[45] HWP 658 Paper mill D_BKL_E_A_1_12_WW.jpg estate map in Bankes Archive held at Dorset History Centre

Archaeological Implications

Archaeological implications for the industrial theme include standing building remains and submerged remains of mills, tanneries and smithies. Given the longevity of many mills there will be a high potential for earlier remains at most mill sites. Leats and mill ponds could be a rich source of palaeo-environmental remains but might also contain artefactual evidence such as waterlogged wooden structural remains including wattle revetments, wooden sluices or lining planks. Structural elements and former channels from earlier mills may survive. Waste from processing corn or flax may also be found. Industrial-themed HWPs such as tanneries, smithies or foundries are likely to have specific waste associated with it; deposits of archaeological interest should be anticipated at these sites. As discussed previously in the agriculture and aquaculture themes, mill races up until the mid-19th century often had fish traps placed in them; it is possible that some of mill races may still contain the remains of traps preserved within their watercourses.

Military

Association with the River

Settlement sites such as hillforts have been captured under the waterfront rather than the military theme. However, such sites may be taking advantage of the river as part of their defences, as at Orchard Castle (HWP 751).

Otherwise, there are very few HWPs associated with military use along the route of the River Stour, limited to a barracks, a firing range and a single pill box. Other than noting that the pillbox is close to White Mill Bridge, arguably a strategic crossing point, there are so few military HWPs that no comment can be made about their distribution.

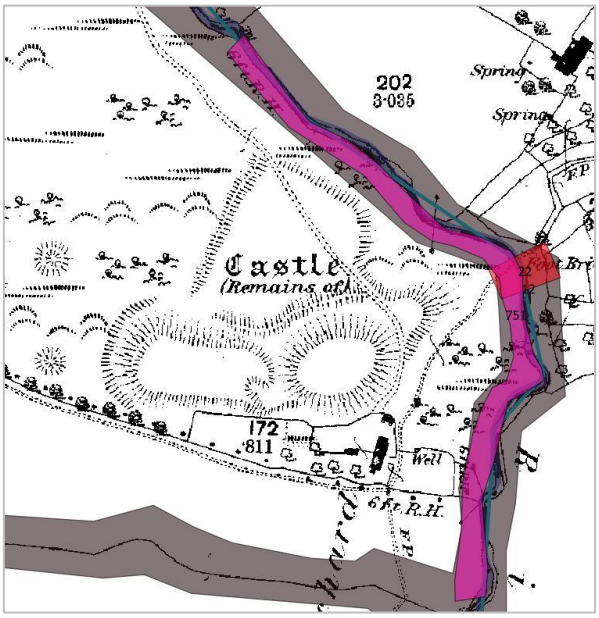

Figure 30 HWP 751 Waterfront below Orchard Castle, Combe Bottom (Epoch 1 first County Series survey).

Key Sources

Military-themed HWPs were identified from the OS First County Series historic maps and in the course of a field visit (pill box 603); the pill box was also visible on Google Earth.

Application of Methodology

HWPs were digitised quite closely around the observed extents of the features.

Examples

See above.

Archaeological Implications

The archaeological implications of these HWPs will vary according to type. None of the military HWPs had elements within the river, though the firing range traverses the Stour and could conceivably have resulted in spent ammunition ending up in the river.

Non-themed

Association with the River

This theme includes those HWPs that could not be assigned to any of the other themes because although they are plainly artificial, their function or form could not be discerned from the map or lidar evidence alone. These features would require further investigation in order to assign them to a specific theme.

Key Sources

HWPs from this theme were identified from the OS First County Series Epoch 1 historic maps (mainly islands and riverside features), lidar and Google Earth. Circular feature HWP 88 (Figure 31) was first noted on the lidar, but subsequent examination of Google Earth images of the site showed the HWP's presence more clearly. A field visit concluded that although the feature has very little relief, a bank and ditch is still present. It has been tentatively identified as a henge on the basis of its apparent form and situation within the landscape, and flagged to historic England for further investigation.

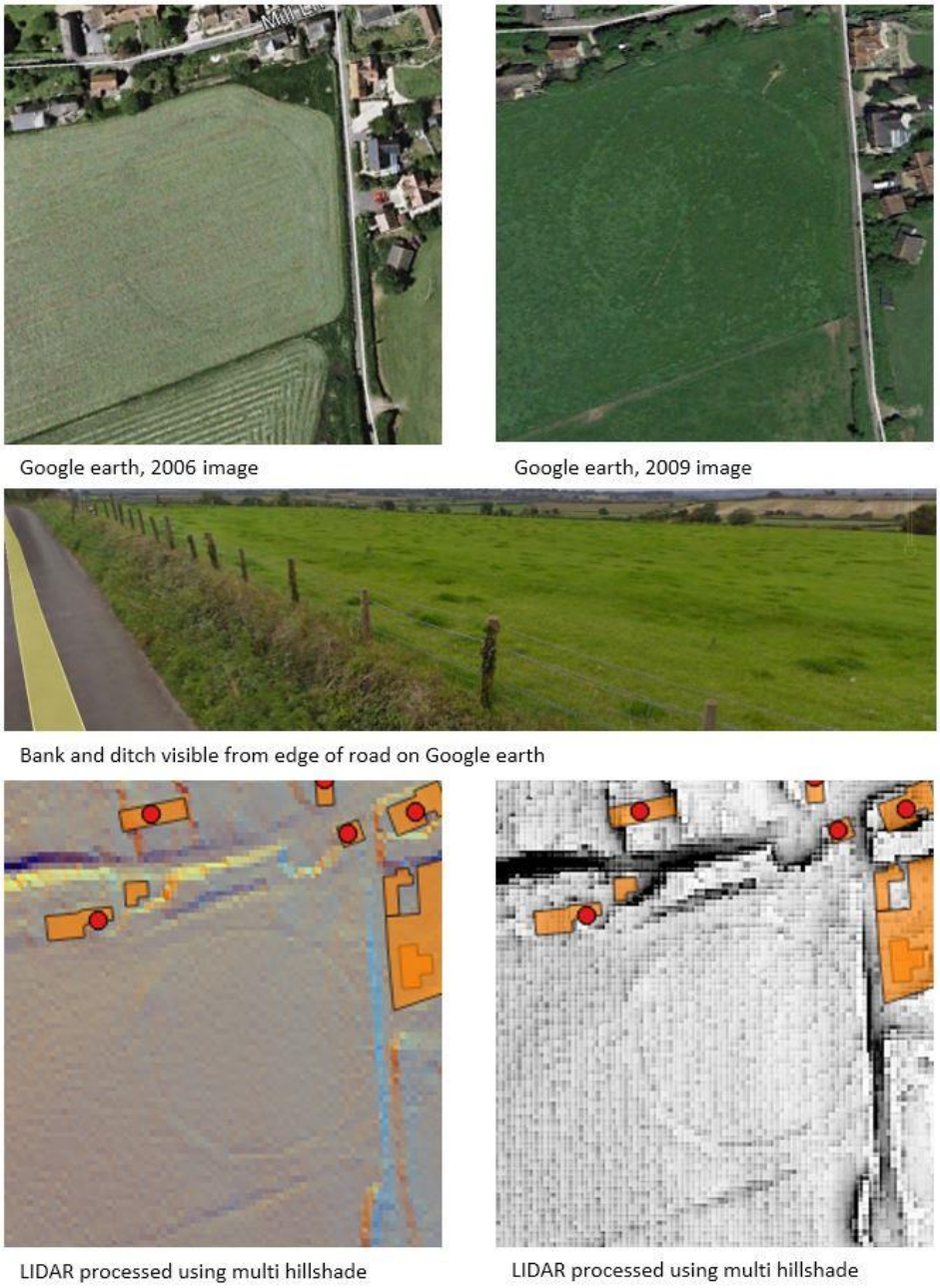

Figure 31 HWP 88 Circular feature at Stour Provost, showing the feature as it appears on Google Earth (2006 and 2009), view from the road of the bank and ditch and the lidar.

Application of Methodology

Polygons were digitised around the outer extents of the non-themed HWPs.

Examples

The HWPs that have been identified as non-themed include earthworks, enclosures, linear features, islands, palaeochannels and riverside features. The largest group of HWPs are islands within the river and as recorded on historic maps. They are unlikely to be natural and it is possible that they are the remains of former fish weirs (Haslam, 1997 fig 10.15) while larger islands may be the remains of early mills sites. However, without further field investigation, these HWPs remain ambiguous. Also included in this theme are palaeochannels identified using lidar.

Archaeological Implications

The archaeological implications for this theme are considerable because these are HWPs that cannot be identified without further investigation. All the HWPs from this theme have the potential for archaeological remains to be present, including potentially rich palaeo-environmental remains. Palaeochannels may contain preserved wooden artefacts, such as fish weirs or fish traps, as well as being abundant in palaeo-environmental remains.

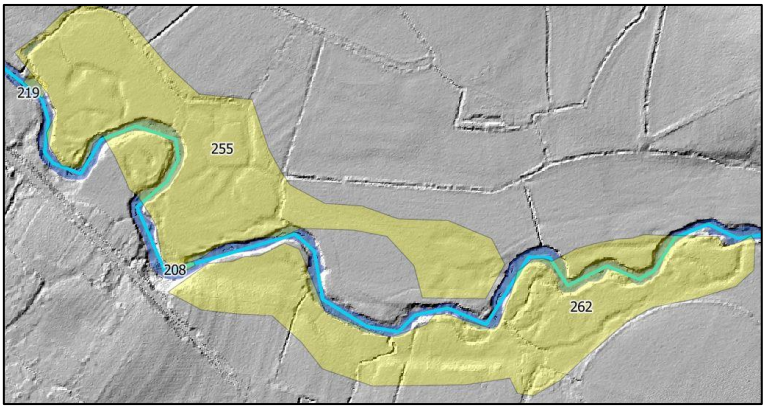

Figure 32 HWP 255 at Shillingstone showing paleochannels visible on lidar hill-shade.

Navigation

Association with the River

The navigation theme identifies HWPs associated with boat-based activity along the Dorset Stour. The theme includes HWPs related to the movement, landing or storage of boats including boathouses, inlets, landing stages, landing points, quays and slipways. Boathouses may have been used for pleasure craft or for vessels used to move people, goods and animals along the river. Several boathouses appear in the parkland surrounding large estate houses, perhaps suggesting recreational use, including hunting and fishing.

The navigation theme shows two distinct areas on the Dorset Stour, with small boat houses found all along the river but a wider range of navigation-themed HWPs in the tidal reaches. While there is little map evidence for landing points along the upper reaches of the Stour, it is possible that use was made of the embayments identified as watering places (agriculture HWPs), which appear regularly along the route of the river.

Key Sources

All HWPs within this theme were identified on from the OS First County Series Epoch 1 historic maps, with many HWPs in the tidal area of the Stour identified from the OS First County Series Epoch 3 maps. As this Epoch is relatively late, it might suggest that relatively modern expansion of recreational boating near the coast is a feature of the Dorset Stour.

Application of Methodology

Polygons were drawn fairly broadly around the extents of navigational HWPs; in the case of landing stages the polygon was taken out into the river.

Examples

Navigation HWPs include boathouses, inlets, berths, landing stages, landing points, quays and slipways. Figure 33 illustrates an example of landing stages and boathouses at Tuckton Bridge in the tidal reaches of the Dorset Stour.

Archaeological Implications

Archaeological implications for these HWPs include the possibility of extant remains both above and below the water, as well as structures on land. There is likely to be waterlogged wood remaining within the river from revetments and structures and also the possibility of finding vessel remains or components of vessels in the vicinity of these HWPs.

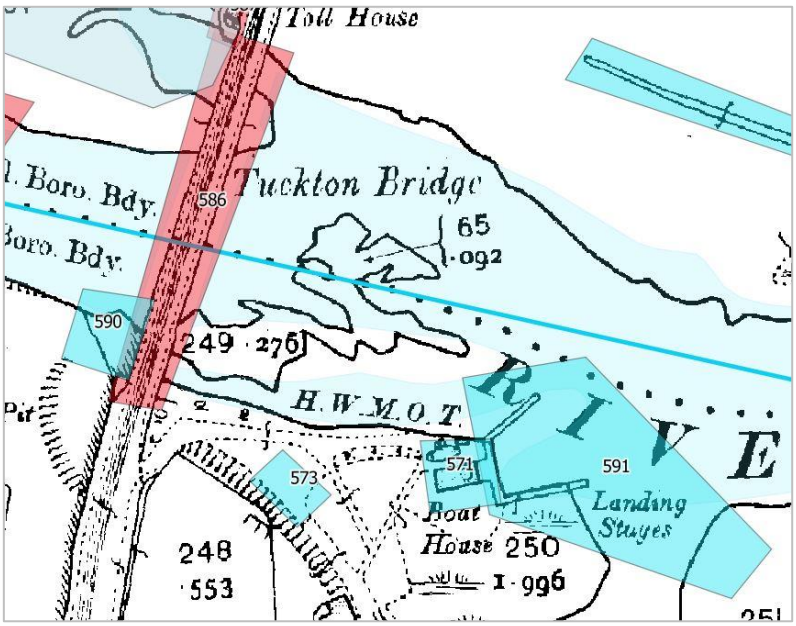

Figure 33 HWP 591 landing stage and HWP 571, 573 and 590 boathouses at Tuckton shown on the Epoch 3 first County Series survey.

Recreational

Association with the River

The recreational theme was one of the smaller themes, with only a swimming pool, summer house, bathing house and a skating rink being identified. Recreational HWPs generally leave little physical evidence: the swimming pool was identified from a documentary reference and refers to an area of the Dorset Stour that was used as a pool for swimming. It is also likely that these types of features – which could be informal – were not always marked on early maps.

Key Sources

Recreational HWPs were mostly identified from the OS First County Series.

Application of Methodology

Polygons were drawn quite closely around mapped extents.

Examples

As above.

Archaeological Implications

Archaeological remains associated with recreational HWPs are likely to be quite ephemeral.

Religious, Ritual and Funerary

Association with the River

Water has had a strong association with ritual since prehistory and often has religious significance. Consequently, rivers are often a focal point for religious ceremonies such as burial and worship.

Only eleven HWPs of this theme were identified, so it is difficult to come to general conclusions regarding their distribution along the Dorset Stour. However, there appears to be an association between barrows in the floodplain and the river, at crossing points in particular. There also appears to be an association between at least some churches and the river, based on their proximity to the Stour.

Key Sources

Religious, ritual and funerary HWPs were identified from historic maps, documentary sources, and HER, Scheduled Monument and Listed Building records.

Application of Methodology

Polygons were digitised around the extents of these HWPs. Churches and their cemeteries were digitised, and the area around barrows. Churches were only identified if they were immediately adjacent to the river, as at Hammoon, Manston and Shapwick.

Examples

The religious, ritual and funerary theme covers all ecclesiastical buildings in the near vicinity of the Dorset Stour, as well as earlier monuments such as barrows. Five parish churches are located close to the river including St Bartholomew's at Shapwick, known to be at risk of risk of flooding (Figure 34). The Shapwick barrow lies in a curve in the river, opposite the church. Both the church and the barrow are close to the crossing point of the Roman Road.

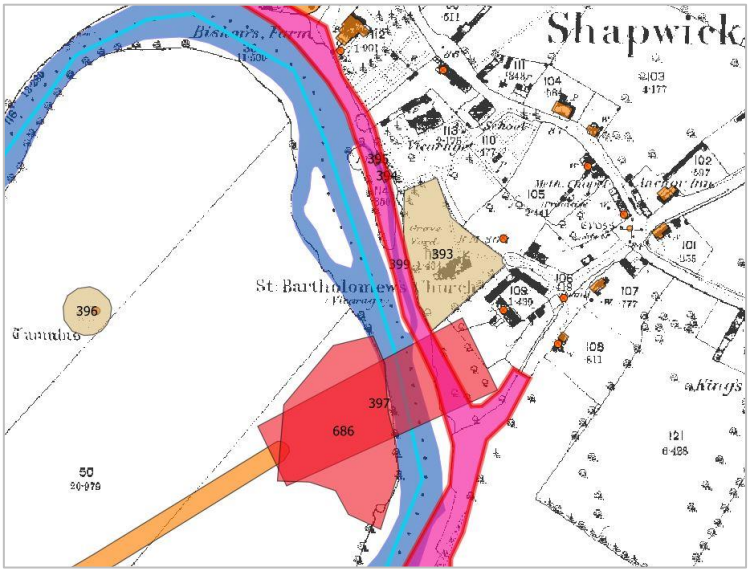

Figure 34 HWP 396 Barrow, HWP 393 St Bartholomews, HWP 399 water front to village and HWP397 depression and HWP 686 predicted crossing point for Roman Road (Epoch 1 first County Series survey).

One of the most intriguing HWPs ascribed to this theme was identified on the 1659 Bowles map of Bryanston Estate. Located in the river between the mill at the southern end of the estate and Blandford Bridge is a point on the river called Lady Well. Marked on the map with a bright blue spot, the river at this point is shown on the map coloured grey rather than green implying there is some

form of change in the river at this place. Later OS County Series Epoch 2 and 3 surveys record an embayment at the side of the river in the same location as the Lady Well. It is not clear whether these are the same feature or not. The term 'Lady Well' usually refers to a sacred spring or holy well dedicated to the Virgin Mary. Why this is marked within the river is not known; it may have been mapped incorrectly and its location could be the embayment marked on the later maps. Lady Well might be comparable to the spring head listed at Sturminster Marshall (HWP 701), situated just next to the river. Due to its monumental character, however, the spring head at Sturminster Marshall has been ascribed to the designed landscape theme rather than the religious, ritual and funerary theme.

Archaeological Implications

The archaeological implications of these HWPs is considerable as there may be a range of archaeological artefacts and deposits, including human remains, associated with these sites. Interventions in the vicinity of known religious sites will require consents before works can be undertaken; under the Burial Act 1857, exhumation of human remains cannot be made without a licence issued by the Ministry of Justice. Any work on or in the near vicinity of a site suspected of having human remains should have a licence in place preferably before any work commences. If remains are within a Church of England churchyard, authorisation called a Faculty will be required. There are also certain conditions that must be met when excavating burial sites and archaeological advice should be sought.

River Management

Association with the River

The Dorset Stour has been subject to much alteration, including canalisation, dredging, widening and straightening over a long period. The river has been managed by drainage systems, dykes, flood channels, pump houses, sluices, water channels, water pumping stations, water tanks and weirs. River management systems not only take water from the river, but also bring it back in the course of draining land to improve arable productivity. The route of the river has been altered for a variety of purposes, such as flood protection at Hammoon or to improve the aesthetics of the landscape, as at Bryanston.

River alterations occur the entire length of the Dorset Stour, from Stourhead Lakes downstream. Major modern interventions are particularly apparent in the lower reaches of the river, upstream of Iford Bridge, for example.

Key Sources

River management HWPs have been identified mainly from historic maps, supported by lidar, compared to the modern route of the river.

Application of Methodology

River management HWPs relating to changes in the position of the river were digitised following exact routes, as it was felt necessary to show these changes precisely. All other river management HWPs were digitised with a margin around their extents.

Three broad terms describe the key types of alterations to the river:

MODERN CUT	The configuration of the river as it is today following alteration.
FORMER RIVER COURSE	Route of the Stour as it appears on the Epoch 1 first County Series survey where another route has been cut.
ALTERED RIVER COURSE	River course that has been altered by human activity, usually involving river straightening, but where the alteration is not documented both 'before and after' in the sources – i.e. there is insufficient evidence to map both the former course and modern course.

Only drainage systems in fields that appear to have been elements of water meadow systems have been identified as HWPs; field drainage systems are too extensive for identification of HWPs to be practical. Other elements that are part of larger systems, such as sluices as elements of water meadows, were recorded as part of the larger system under the relevant theme. Weirs tend to be associated with mills, so again they have been recorded within mill HWPs under the industrial theme rather than separately. However, six weirs not associated with mills have been identified as river management HWPs.

Examples

Much river management has been carried out on the Dorset Stour; straightening sections and bypassing loops to created straight runs in the river. A complex area just upstream of Iford Bridge (Figure 35) illustrates how the course of the river has altered at least three times since the nineteenth century though to the modern cut in the twentieth century (HWP 676 - red edged), bypassing all the twists and turns of two earlier routes (HWP 556 in yellow and 554 in purple).

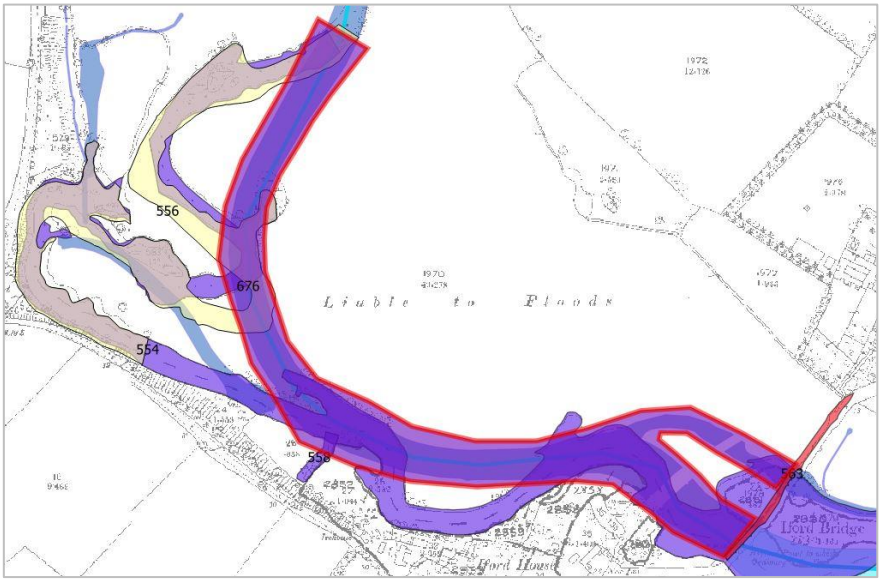

Figure 35 HWP 676 new route of the Dorset Stour, HWP 556 former course of the Stour from Epoch 4 first County Series survey and HWP 554 former course of the Dorset Stour from Epoch 1 first County Series survey just before Iford Bridge where the river becomes intertidal.

Archaeological Implications

Former river courses may be rich in palaeo-environmental remains and have the potential to contain wooden artefacts and structures. Modern cuts are likely to be of low archaeological potential, unless they happen to cut other archaeological features in the floodplain.

Waterfront

Association with the River

The waterfront theme includes areas where the Dorset Stour fronts prominent sites such as castles, deserted medieval villages, hillforts and settlements. These HWPs have an important relationship with the river, but there may not always be physical features recognisable from the historic map or lidar. This theme also includes country houses where the riverscape has not necessarily been landscaped, but the house is located on the river frontage. The river provides multiple benefits to all these settlements: it provides a boundary (both defensive and civil); it can be used for transport, communication and trading; it would supply water for both small-scale industrial processes and for everyday living; and it could be used for disposal of waste.

Waterfront HWPs are situated at numerous points along the Dorset Stour.

Key Sources

Waterfront HWPs could be identified from the County Series OS maps, HER and designated heritage asset records, and documentary sources. HWPs for waterfronts associated with deserted medieval villages were usually identified using lidar.

Application of Methodology

In the case of mapped or known sites, a polygon was digitised along the length of the river that fronts the settlement, extending wider than the settlement frontage. Deserted medieval settlements and shrunken medieval settlements identified from lidar had the area of the settlement digitised as these are not mapped and there is as yet no other record of them in the HER.

Examples

There is a total of 30 waterfront HWPs identified along the Dorset Stour. Five of these are deserted medieval villages (DMVs) whose presence or extents were identified from lidar supplemented by HER or documentary sources, where available. There are also two shrunken medieval villages including one at Silton, located south of Silton Mill. The settlement at Silton was identified on the lidar SVF image; the Epoch 1 first County Series reflects the field boundaries as seen on the lidar. There are other features also present on the historic map – including some buildings – indicating the persistence of the settlement into the nineteenth century. A site visit was carried out by walking the right of way running through the field; various earthworks could clearly be seen. The settlement abuts the catchwork water meadow (HWP 29) discussed in the agriculture theme (Figure 11).

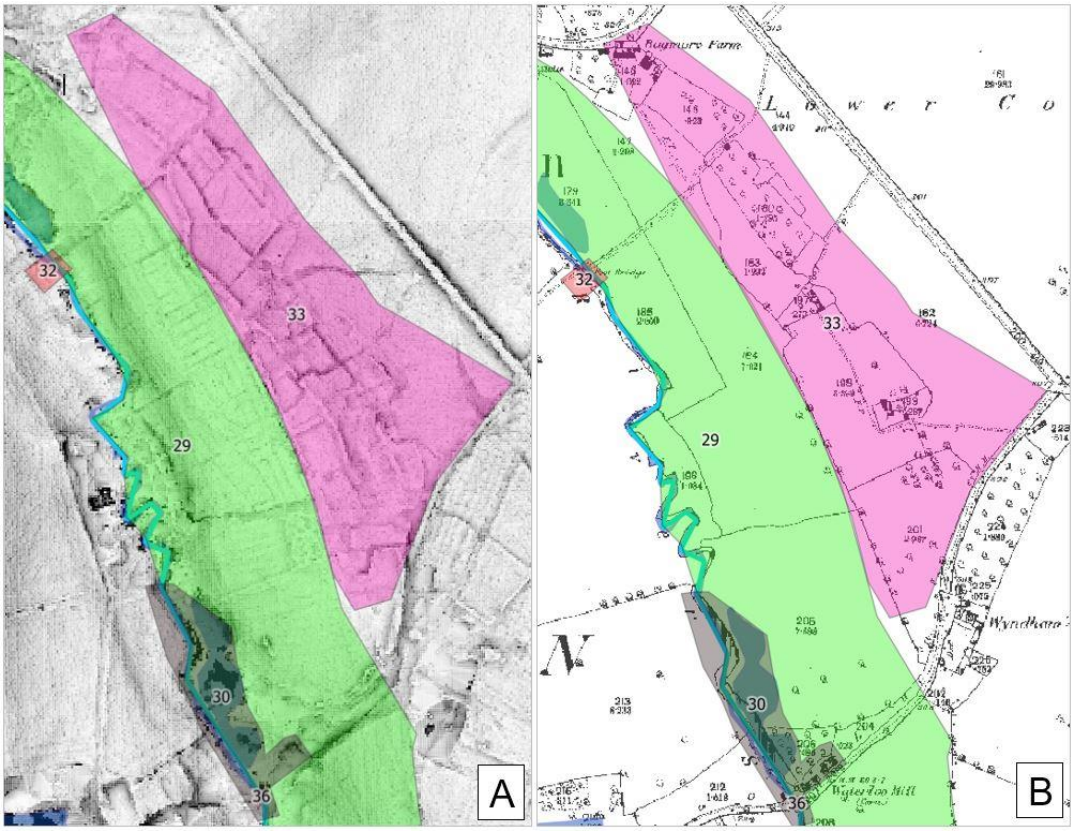

Figure 36 HWP 33 former settlement at Silton, with HWP 29 catchwork water meadow below it. HWP 30 Waterloo Mill is to the south west of HWP33. A. Shows HWP33 on lidar SVF, B. shown on Epoch 1 first County Series survey.

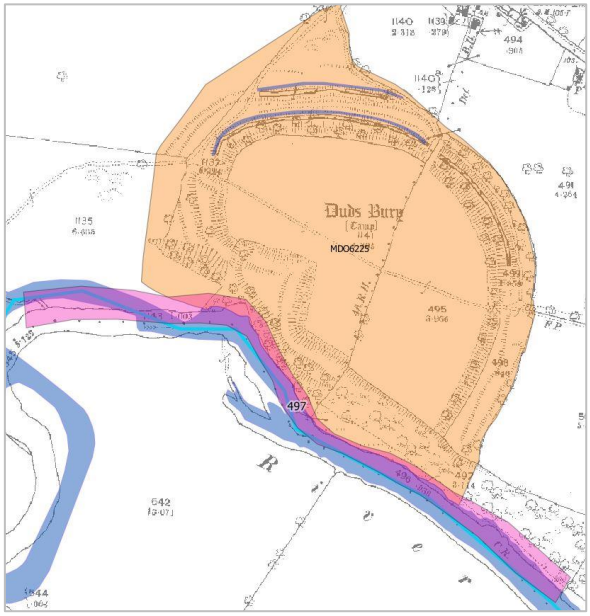

Figure 37 HWP 497 Waterfront at Dudsbury Camp shown on Epoch 1 first County Series survey. Also includes the HER monument region for the camp (in orange) which shows the extent of the hillfort.

HWP 497 illustrates the waterfront at Dudsbury Camp. Like hillforts such as Hod Hill and Spetisbury (Crawford Camp) the river may have provided a defensive boundary as well as providing access to water for the people in the settlement.

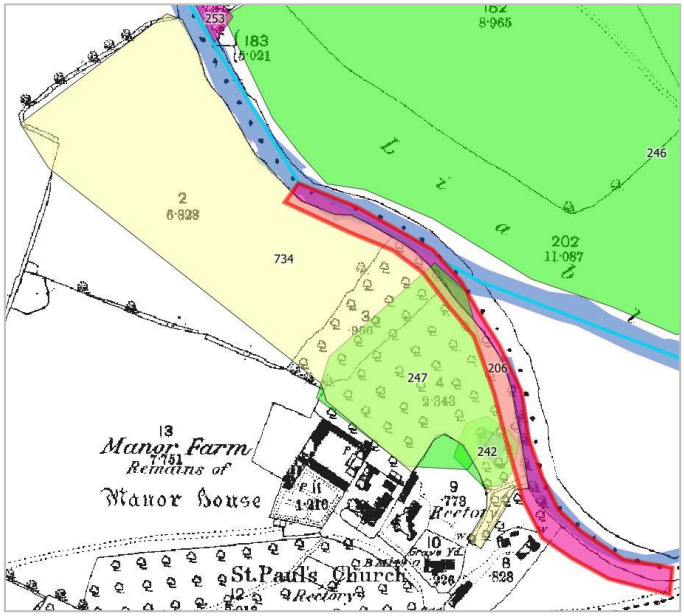

Figure 38 HWP 206 waterfront at medieval Hammoon (edged in red for clarity). Also shows HWP 734 (in yellow) a funnel shaped field (medieval common meadow), HWP 242 post medieval pond and HWP 247 water meadow (Epoch 1 first County Series survey).

HWP 206 is an example of a waterfront at medieval Hammoon, on the former route of the river before it was re-routed in the 19th century. The Epoch 1 first County Series survey shows St Pauls Church, which has its origins in the medieval period. The location of the church, together with HWP 734 (a funnel-shaped field or medieval common meadow identified from the tithe map) strongly suggests medieval settlement associated with the river.

Archaeological Implications

Any settlement fronting the river will have potential for archaeological remains to be both present on land, at the margins of the river and submerged within the river. Artefactual and palaeo-environmental evidence are also likely be present, as could building remains. With any settlement there will also be the possibility of human remains.

Appendix III Total Number and Area of HWPs by Theme and Type

Theme / Type	Count	Area (ha)
agriculture	**208**	**1056.26**
funnel-shaped meadow	24	393.00
bedwork water meadow	36	343.77
catchwork water meadow	8	156.28
ridge and furrow	5	48.62
flood meadow	3	25.32
osier bed	33	18.48
beds of rushes	8	12.97
field system	1	11.24
lynchet	2	11.02
watercress beds	1	7.64
strip fields	1	6.84
carrier channel	2	5.46
withy bed	3	4.81
watering place	64	3.73
burgage plots	3	2.28
drainage system	1	1.82
sheep wash	4	1.50
pond	7	0.82
oak bed	1	0.61
pound	1	0.03
aquaculture	**8**	**5.40**
oyster pit	4	2.66
fish pond	3	2.50
fishing site	1	0.25
civil	**1**	**0.02**
boundary stone	1	0.02
crossing	**145**	**30.33**
ford	47	17.13
road bridge	29	6.82
railway bridge	6	2.47
foot bridge	51	2.39
ferry	2	0.55
green bridge	4	0.32
tramway bridge	1	0.22
viaduct	1	0.22
ford with foot bridge	3	0.20
toll house	1	0.02
designed landscape	**15**	**97.20**
parkland	6	67.39
ornamental lake	5	28.71
pond	2	0.72
causeway dam	1	0.33
spring head	1	0.06

Theme / Type	Count	Area (ha)
domestic	**4**	**0.46**
laundry	2	0.39
ice house	1	0.07
tunnel portal	1	0.00
industrial	**67**	**157.81**
corn mill	26	82.03
mill	17	44.46
gravel pit	7	13.76
flour mill	2	7.07
stone quarry	2	5.29
paper mill	1	2.03
quarry	5	1.36
chalk quarry	1	0.74
tannery	2	0.48
lime kiln	2	0.28
aqueduct	1	0.24
smithy	1	0.08
military	**4**	**4.46**
firing range	2	3.62
barracks	1	0.84
pillbox	1	0.00
navigation	**66**	**13.76**
inlet	9	3.83
landing point	12	3.64
boat house	29	1.64
jetty	1	1.03
berth	5	0.98
landing stage	3	0.86
quay	4	0.73
slipway	1	0.49
landing place	1	0.35
marina	1	0.21
non-themed	**83**	**203.38**
palaeochannel	25	156.41
island	40	33.65
enclosure	4	6.52
earthwork	4	4.90
riverside feature	8	1.15
linear feature	1	0.65
oval feature	1	0.10
recreational	**4**	**0.76**
skating rink	1	0.40
swimming pond	1	0.31
bathing shed	1	0.04
summer house	1	0.01

Theme / Type	Count	Area (ha)
religious ritual and funerary	**12**	**5.91**
parish church	5	2.01
monastery	1	1.78
Augustinian Priory	1	1.27
barrow	4	0.67
holy well	1	0.16
river management	**82**	**116.19**
former river course	34	46.96
modern cut	17	36.45
altered river course	8	22.80
water channel	8	4.46
dyke	2	2.03
weir	6	1.84
pump house	2	0.82
drainage system	1	0.38
sluice	1	0.17
flood channel	1	0.16
water pumping station	1	0.08
water tank	1	0.05
waterfront	**31**	**132.23**
deserted medieval village	5	68.80
hillfort	4	24.24
villa	2	15.57
shrunken medieval village	2	7.43
house platforms	1	3.85
farmstead	2	2.99
medieval village	3	2.07
trackway	2	2.01
road	1	1.87
castle	2	1.20
settlement	2	0.90
hollow way	2	0.64
promontory fort	1	0.49
country house	1	0.13
building	1	0.04
Grand Total	**730**	**1824.18**

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