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Royal Borough of Windsor and Maidenhead

Wraysbury Drain Ecology and Geomorphology Assessment

September 2014

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Executive Summary

Jacobs UK Ltd has been commissioned by the Royal Borough of Windsor and Maidenhead (RBWM) to undertake a walkover survey and ecology and geomorphology assessment of the Wraysbury Drain to assess baseline conditions. The initial purpose of the report is to inform RBWM of the current status of the drains and to then assess this in relation to the Wraysbury Award Act (Act 39 Geo.III Chapter 118, 1799), providing any further recommendations for maintenance to meet the Award Act as appropriate.

The Wraysbury Award Act (1799) was established by the Parish of Wraysbury. There are three public drains referred to in the Award which are as follows: the 'Horton Drain', the 'Drain on the Green' and 'Queens Mead Drain' now referred to as the Wraysbury Drain.

This assessment aims to provide an understanding of the existing baseline conditions of the Wraysbury Drain. The report consists of two parts, a desk based assessment of available information and a field based assessment of the current conditions. The report assesses the current baseline conditions of the drain following the field based assessment, including width, riparian corridor (area adjacent to the river) and in-channel features, as well as the ecological constraints that may be present (for example notable or legally protected habitats or species). Where ecological constraints have been identified, the requirement for further survey work and mitigation is considered should engineering or maintenance work of the channel be carried out. In addition, reaches along the channel that could be suitably enhanced for promoting wildlife are identified where appropriate. The Wraysbury Drain is split into eight reaches and four spot checks for the purpose of this report.

It has been assessed that three reaches and all spot checks are currently compliant with the channel dimensions detailed in the Wraysbury Award Act (1799). However, it is important to note that five reaches were wider than the specified width in the Award Act and therefore were not assessed to be compliant as surveyed. The predominant reason for this is urban and residential constraints (particularly the reach that passes through the centre of Wraysbury).

The recommendations provided for the Wraysbury Drain have been subdivided into three categories: Riparian Corridor and In-channel Vegetation, Channel Features and Ecological Constraints. The key recommendations for the Wraysbury Drain include investigating the low flows in the drain, dredging the channel to remove thick layers of silt (or equivalent less intrusive techniques), riparian corridor maintenance and in-channel maintenance works (including native species planting in local gardens).

Contents

1 Introduction

1.1 Overview

Jacobs UK Ltd has been commissioned by the Royal Borough of Windsor and Maidenhead (RBWM) to undertake a walkover survey and ecology and geomorphology assessment of the Wraysbury Drain to assess the baseline conditions. The initial purpose of the report is to inform RBWM of the current status of the drains and to then assess this in relation to the Wraysbury Award Act (Act 39 Geo.III Chapter 118, 1799), providing any further recommendations for maintenance to meet the Award Act as appropriate.

1.2 Aims

This assessment aims to provide an understanding of the existing baseline conditions of the Wraysbury Drain. The report consists of two parts, a desk based assessment of available information and a field based assessment of the current conditions. The report assesses the current baseline conditions of the drain following a field based assessment, including width, riparian corridor (area adjacent to the river) and in-channel features, as well as the ecological constraints that may be present (for example notable or legally protected habitats or species). Where ecological constraints have been identified the requirement for further survey work and mitigation is considered should engineering or maintenance work of the channel be carried out. In addition, areas along the channel that could be suitably enhanced for promoting wildlife are identified where appropriate.

The primary aims of the survey are to:

- Identify the current geomorphological conditions of the drain, including the width, riparian corridor and in-channel features;
- Identify areas that would be suitable for enhancement/maintenance to improve the drain;
- Identify designated sites having the potential to be adversely impacted by works to the drain;
- Identify any habitats of ecological sensitivity and/or habitats having the potential to support legally protected or notable species;
- Assess areas suitable for enhancement to promote wildlife; and,
- Provide recommendations with regard to the legislation protecting protected and or notable species, habitats and designated sites present.

1.3 Legislative and Planning Context

1.3.1 Legislation

Wraysbury Award Act 1799

The Award was established by the Parish of Wraysbury. There are three public drains referred to in the Award which are as follows: the 'Horton Drain', the 'Drain on the Green' and 'Queens Mead Drain' now referred to as the Wraysbury Drain. For this drains, the Award specifies the conditions detailed in Table 1.1, which are to be maintained by the Surveyor of Highways.

Table 1.1 Wraysbury Award Act (1799) specified conditions

Drain	Depth of watercourse	Minimum breadth at surface water level	Minimum ditch bed width
Horton Drain	Same as at the time of the Award (unknown)	14' 0" (4.3m)	6' 0" (1.8m)
Drain on the Green		8' 0" (2.4m)	3' 0" (0.9m)
Queens Mead Drain		8' 0" (2.4m)	3' 0" (0.9m)

The Award also specified that the following should be adhered to on the three public drains:

- Bridges, troughs and tunnels along the drains should be repaired; and
- Drains should be cleansed, scoured and repaired.

Land Drainage Act 1991
The Land Drainage Act 1991 requires that the free flow of water in any watercourse is not impeded and is maintained by its owner. This relates to ordinary watercourses and construction in and around watercourses.

Water Framework Directive 2000
The Water Framework Directive (WFD) (Directive 2000/60/EC) is a substantial piece of European Union (EU) water legislation that came into force in 2000, with the overarching objective of ensuring that water bodies in Europe attain Good or High Status by 2015. The WFD is implemented in England and Wales by "The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003" (SI 3242/2003). The Environment Agency (EA) is the competent authority in England and Wales[1] responsible for delivering objectives of the WFD. River Basin Management Plans (RBMP) have been created setting out measures to ensure that water bodies in England and Wales achieve 'Good Status', which comprises of 'Good Ecological Status' and 'Good Chemical Status'.

Wildlife and Countryside Act 1981 (as amended) and Conservation of Habitats and Species Regulations 2010 (as amended)
Particular species of flora and fauna and their habitats are subject to legal protection, normally because of their vulnerable conservation status. The two principal pieces of legislation protecting wild species and habitats in England are the *Wildlife and Countryside Act 1981* (as amended) and the *Conservation of Habitats and Species Regulations 2010 (as amended).* Badgers are afforded protection under the *Protection of Badgers Act* (1992) (see below for further details).

The *Wildlife and Countryside Act 1981* (as amended) affords protection to Sites of Special Scientific Interest (SSSI). Special Areas of Conservation (SAC) and Special Protection Areas (SPA) are designated under the EU Directive (92/43EEC) on the Conservation of Natural Habitats and Wild Flora and Fauna (the Habitats Directive) and EU Directive (79/4009/EEC) on the Conservation of Wild Birds (the Birds Directive) respectively, and receive legal protection under the *Conservation of Habitats and Species Regulations 2010* (as amended). The Regulations also provide for the control of potentially damaging operations whereby consent may only be granted once it has been shown through appropriate assessment that the proposed operation will not adversely affect the integrity of the site.

[1] From 1st April 2013, Natural Resources Wales took over the functions carried out by the Countryside Council of Wales, Environment Agency Wales and Forestry Commission Wales.

Bats

Bats and their roosts are protected by *the Wildlife and Countryside Act 1981* (as amended) and the *Conservation of Habitats and Species Regulations 2010 (as amended)*. The combined effect of this legislation makes it an offence to:

- Intentionally or deliberately kill, injure or capture (take) bats.
- Deliberately or recklessly disturb bats (whether in a roost or not) in such a way which is likely to –
  - impair their ability to:
    - survive, to breed or reproduce, or to rear or nurture their young; or,
    - hibernate.
  - affect significantly the local distribution or abundance of bats.
- Damage, destroy or obstruct access to bat roosts.

Great Crested Newt

Great Crested Newts (GCN) and their habitat are protected by the *Wildlife and Countryside Act 1981* (as amended) and *the Conservation of Habitats and Species Regulations 2010* (as amended).

- Intentionally or deliberately kill, injure or capture (take) great crested newts.
- Deliberately take or destroy the eggs of a great crested newt.
- Deliberately or recklessly disturb great crested newts in such a way which is likely to –
  - impair their ability to:
    - survive, to breed or reproduce, or to rear or nurture their young; or
    - hibernate.
  - affect significantly the local distribution or abundance of great crested newts.
- Damage or destroy a breeding site or resting place.

Water Voles

Water voles receive full legal protection under *the Wildlife and Countryside Act 1981* (as amended). Under the Act it is an offence to:

- Intentionally kill, injure or take (capture) a water vole;
- Possess or control a live or dead water vole, or any part of a water vole; or,
- Intentionally or recklessly damage, destroy or obstruct access to any structure or place which water voles use for shelter or protection or disturb water voles while they are using such a place.

Otters

Otters are protected by the *Wildlife and Countryside Act 1981* (as amended) and the *Conservation of Habitats and Species Regulations 2010* (as amended). Taken together it is an offence to:

- Deliberately capture or kill otters;
- Possess or control a live or dead otter, or any part of an otter;
- Deliberately or recklessly damage, destroy or obstruct access to any structure or place which otters use for shelter or protection, or;
- Deliberately or recklessly disturb otters in such a way that is likely to –
  - impair their ability to survive, to breed or reproduce, or to rear or nurture their young.
  - affect significantly the local distribution or abundance of these animals.

Dormice
Dormice are protected by the *Wildlife and Countryside Act 1981* (as amended) and the *Conservation of Habitats and Species Regulations 2010* (as amended). Taken together it is an offence to:

- Deliberately capture or kill dormice;
- Possess or control a live or dead dormouse, or any part of an dormouse;
- Deliberately or recklessly damage, destroy or obstruct access to any structure or place which dormice use for shelter or protection, or;
- Deliberately or recklessly disturb dormice in such a way that is likely to –
  - impair their ability to:
    - survive, to breed or reproduce, or to rear or nurture their young; or,
    - hibernate.
  - affect significantly the local distribution or abundance of these animals.

White-Clawed Crayfish
White-clawed crayfish are protected under Schedule 5 of the *Wildlife and Countryside Act 1981* (as amended)[1]. Under this Act, it is an offence to:

- Intentionally take white-clawed crayfish from the wild;
- Sell, or attempt to sell, any part of a white-clawed crayfish, alive or dead, or advertise that one buys or sells, or intends to buy or sell any part of a white-clawed crayfish.

Natura 2000 Sites
SAC, SPA and Ramsar sites form part of a network of 'Natura 2000 sites'. SPA are designated under the Birds Directive, SAC by the Habitats Directive and Ramsar sites are designated under the Ramsar Convention. All are afforded protection by the EU Habitats Directive.

The Conservation of Habitats and Species Regulations 2010 (as amended) implements the EU Habitats Directive and requires a Habitats Regulations Assessment (HRA) for projects and plans with potential to impact the integrity of a Natura 2000 site.

Articles 6(3) and 6(4) of the Habitats Directive sets out the decision-making tests for plans and projects affecting Natura 2000 sites. Article 6(3) establishes a requirement for an assessment as outlined below:

"Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans and projects, shall be subject to assessment of its implications for the site in view of the site's conservation objectives. In light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after ascertaining that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public."

1.3.2 National Planning Policy and Guidance

National Planning Policy Framework
Amongst other commitments, the National Planning Policy Framework (NPPF) (2012) states that the planning system should contribute to and enhance the natural and local environment by:

- Protecting and enhancing valued landscapes, geological conservation interests and soils;
- Recognising the wider benefits of ecosystem services; and,
- Minimising impacts on biodiversity and providing net gains in biodiversity where possible, contributing to the Government's commitment to halt the overall decline in biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures.

Natural Environment and Rural Communities Act 2006
In addition to the guidance within Planning Policy Statement 9 and the accompanying circular and good practice guide, Section 40 of the *Natural Environment and Rural Communities* (NERC) *Act 2006* states that *'Every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity'.* Section 40(3) also states that *'conserving biodiversity includes, in relation to a living organism or type of habitat, restoring or enhancing a population or habitat'.*

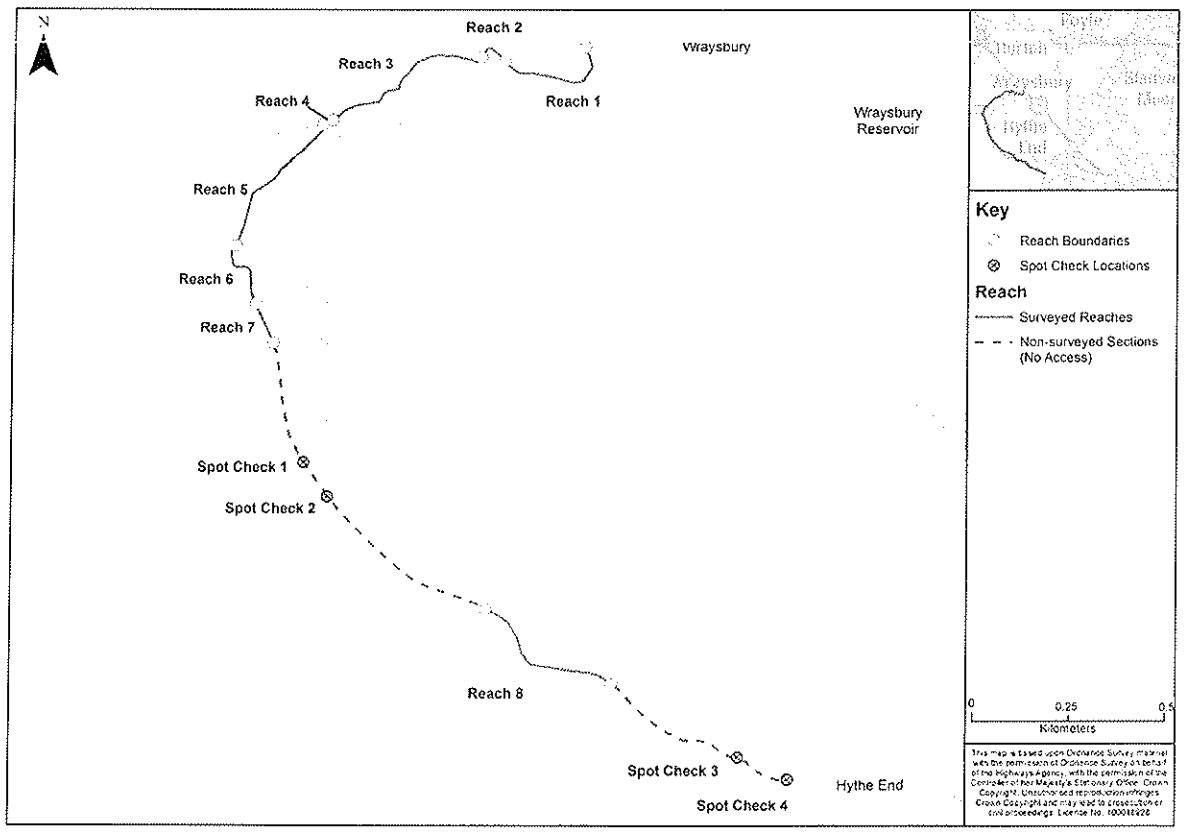
Through the NERC Act, local and public authorities have a key part to play in conserving biodiversity, through their role in developing and influencing local policies and strategies, planning and development control, managing their land and buildings and developing infrastructure. As a result they have a duty to have regard to the conservation of biodiversity in exercising their functions. The duty affects all public and local authorities and aims to raise the profile and visibility of biodiversity, to clarify existing commitments with regard to biodiversity and to make it a natural and integral part of policy and decision making.

UK Post-2010 Biodiversity Framework
The UK Post 2010 Biodiversity Framework was published in July 2012 and succeeds the UK Biodiversity Action Plan (BAP). It demonstrates how the UK aims to contribute to the Aichi Biodiversity Targets identified in the Convention of Biodiversity's (CBD's) 'Strategic Plan for Biodiversity 2011-2020'. These species and habitats listed as conservation priorities in the UK (or within Local BAPs) are capable of being a material consideration when making a planning decision (ODPM Circular 06/2005).

1.4 Study Area

The Study Area begins just west of the Wraysbury Mainline Train Station and passes in an arc west and then south to Hythe End adjacent to the M25. The Study Area is located in a predominantly urban area passing through the gardens of houses along Station Road and Staines Road. Figure 1.1 shows the location and survey extent of the drain; in some instance access was not possible and these have been marked accordingly.

Figure 1.1 Wraysbury Drain location plan



2 Methodology

2.1 Desktop Survey

A desk study has been undertaken to obtain baseline information on the historical background of the drain, past assessments and current ecological information relating to the site and its immediate surroundings. Analysis of historical maps has provided an understanding of the drain location over the last century as well as details of the land use in the surrounding area. Past reports on the Wraysbury Drain (1981 and 2004-2005) have also been used to provide an understanding of past practices and conditions of the drain.

Protected and notable species records and details of designated sites within 2km of the site were requested from Thames Valley Environmental Records Centre (TVERC), with additional information retrieved from the National Biodiversity Network (NBN) Gateway. MAGIC (Multi-Agency Geographical Information for the Countryside) was also used to identify SSSIs, SACs, SPAs, Ramsar sites, Local Nature Reserves (LNR) and National Nature Reserves (NNR), within 10km of the Study Area.

SPA data sheets (JNCC, 2000) and SSSI citations Natural England (Natural England, 2013), can be referred to in Appendix B.

2.2 Field Survey

A survey was undertaken from 9th–11th July and on the 20th August 2014 by an experienced geomorphologist and ecologist, to assess the baseline conditions and the potential for protected or notable species and habitats, respectively. Photographs were taken as a record of the site.

2.3 Limitations

Parts of the channel were not assessed during the walkover surveys due to lack of access either caused by inaccessibility due to dense vegetation and scrub or because permission had not been granted by landowners for sections of the channel which run through their property.

An absence of a species record within an area does not necessarily reflect an absence of that species from the same area. Similarly the distribution of species records may reflect survey effort rather than an accurate distribution of that species. As such, historic records should be assessed with caution.

The scope of the survey was limited to the banks and accessible habitats adjacent to the channels and did not include entering the watercourses.

A walkover survey can only assess the site as it was found at the time of the survey. The results are only indicative of the likelihood of the presence or absence of protected species and use of the sites by other animals. If the habitats found on the site are subject to change, the results of this survey may no longer be representative of the site.

The findings of this report represent the professional opinion of qualified ecologists and geomorphologists and do not constitute professional legal advice. The client

may wish to seek professional legal interpretation of the relevant legislation cited in this document.

3 Desk Study

3.1 Background Information

The Wraysbury Drain has its source as an offtake from the Horton Drain just west of the Wraysbury Mainline Train Station adjacent to a dive centre lake (Figure 1.1). The drain then flows west and south-west to re-join the Horton Drain prior to its confluence with the Colne Brook in Hythe End. The drain predominantly flows through an urban area, with only small sections where it flows through recreational land including fishing lakes.

The Wraysbury Drain lies within the vicinity of a number of WFD water bodies, including lakes, groundwater and watercourses. There are two WFD lake water bodies within the Study Area, that border the channel to the north and east. These are the Wraysbury II Gravel Pit/Wellapool Lake (GB30642489) which is classified as artificial and achieving Poor Potential; and the Wraysbury No1 Gravel Pit (GB30642430) which is also classified as artificial but achieving Moderate Potential.

The Wraysbury Drain also lies above the Lower Thames Gravels WFD groundwater body which is currently classified as achieving Good Quantitative Quality and Poor Chemical Quality. The Horton Drain, where the Wraysbury Drain flows from and to, is also classified under the WFD and is currently achieving Moderate Status and isn't assessed to be heavily modified.

3.1.1 Geology

The bedrock geology in the vicinity of the Wraysbury Drain is London Clay Formation consisting of clay silt and sand (www[2]). The superficial deposits consist of Shepperton Gravel Member including sand and gravel, with the local environment previously being dominated by rivers. The land within the Study Area has been and still is used for gravel extraction, with both new and redundant pits (now lakes) are present within the vicinity and catchment area of the Wraysbury Drain.

There are a number of historic and authorised landfills within the Study Area, bordering the Wraysbury Drain.

3.2 Historical Analysis

The area surrounding the Wraysbury Drain has progressively developed over the decades from a rural surrounding with small hamlets and farms, to larger villages with evidence of gravel extraction and the resulting lakes. Modern development has seen the rise in the number of houses adjacent to the drain and a shift in the types of pressures on the drain from agricultural to urban.

The Award Act in 1799 set out specific channel widths assigned for the Wraysbury Drain, then referred to as the 'Drain on the Green' and 'Queens Mead Drain'. Table 3.1 provides a summary of the more significant historical events over the last few decades, including gravel extraction, construction of reservoirs and realignments of the Wraysbury Drain. The construction of the four large reservoirs and the excavation of gravels put considerable pressure on the natural flow dynamics within the catchment, compared to the previously rural catchment. The redundant gravel pits are now lakes which are used for recreational purposes and have leisure facilities including a scuba diving centre.

Table 3.1 Historical changes to the Wraysbury Drain based on historical map analysis (www[1])

Date (approximate)	Historical Change
1970	Construction of Wraysbury Reservoir
1976	Construction of Queen Mother Reservoir
1971-1972	773m of Horton Drain culverted for constuction of Queen Mother Reservoir
1972-1975	Construction of gravel pits at Horton
1975-1989	Gravel pits converted into lakes
1989-present	Construction of two further gravel pits south-east of Horton Drain
1989-present	Horton Drain and Wraysbury Drain both diverted for construction of Wraysbury Dive Centre
1920-1926	Wraysbury Drain – development of several houses on the left bank
1938-1960	Construction of Gravel pits at Wraysbury

A more recent development has seen the area of open land to the south of Horton gain an additional area of gravel extraction, with permission having been granted for the extraction of 2 million tonnes of gravel. The works commenced in 2011 and the quarry is expected to operate until 2020. These were not present during the completion of the past reports on the Wraysbury Drain (1981 and 2004-2005).

3.3 Ecology Receptors

3.3.1 Statutory Wildlife Sites

The location of statutory wildlife sites within 10km of the Study Area is shown in Figure 3.1.

There are three international designated sites within 10km of the Study Area, the:

- South West London Waterbodies SPA and Ramsar site;
- Windsor Forest and Great Park SAC; and,
- Thursley, Ash, Pirbright and Chobham SAC.

The South West London Waterbodies SPA is located adjacent to the route of the Wraysbury Drain, approximately 500m west from where the Wraysbury Drain splits from the Horton channel. Here it is located within 50m of the Wraysbury No. 1 Gravel Pit (SSSI), one of the component gravel pits making up the SPA. Windsor Forest and Great Park SAC is approximately 3km west at its closest point to the Wraysbury Drain and Thursley, Ash, Pirbright and Chobham SAC is approximately 7.5km south west from the southern confluence of the Wraysbury and Horton channels.

The South West London Waterbodies SPA is 828.14ha in size and comprises a series of embanked water supply and former gravel pits supporting a range of man-made and semi-natural open water habitats. They function as important feeding and roosting sites for wintering wildfowl in particular gadwall *Anas strepera* and shoveler *Anas clypeata* both of which occur in numbers of European importance[2].

Windsor Forest and Great Park SAC is 1687.26ha in area. The primary reason for its SAC status is the presence of Annex 1 habitat old *acidophilous* oak woods (the

[2] http://jncc.defra.gov.uk/page-2051-theme=default

site has the largest number of veteran oaks in Britain) and the presence of the Annex 1 species violet click beetle *Limoniscus violaceus*[3].

Thursley, Ash, Pirbright and Chobham SAC is 5138ha in area. The primary reasons for SAC status are the presence of Annex 1 habitats, northern Atlantic wet heaths, European dry heaths and depressions of peat substrates of the *Rhynchosporion*[4].

There is one SSSI that is located adjacent to the Study Area namely the Wraysbury No. 1 Gravel Pit SSSI. A further four SSSI are located within 1km of the Study Area, Wraysbury and Hythe End Gravel Pits, Wraysbury Reservoir SSSI, Langham Pond SSSI and Staines Moor SSSI.

Wraysbury No. 1 Gravel Pit is a single unit of standing open water and canals, designated for its national importance for wintering gadwall and with significant numbers of shoveler, (*Anas clypeata),* golden eye (*Bucephala clangula)*, and smew (*Mergus albellus.)* The site is also locally important for other wintering bird species including great crested grebe (*Podiceps cristatus*), cormorant (*Phalacrocorax carbo)* pochard (*Ahthya farina*), tufted duck (*Aythya fuligula*) and coot (*Fulica atra*). View Appendix B for the full citation. When last assessed for condition (October 2009) was found to be in an unfavourable yet recovering condition.

Wraysbury and Hythe End Gravel Pits SSSI

Of the four other SSSI Wraysbury and Hythe End Gravel Pits lie to the south and east within approximately 100m to the channel. This SSSI is comprised of a mosaic of open water, islands, grassland, scrub and woodland within an area of former gravel extraction. The site supports nationally important numbers of three species of wintering wildfowl together with an important assemblage of breeding birds associated with open waters and wetland habitats. The Wraysbury Reservoir lies 750m east of the confluence of the Horton and Wraysbury Drains and is designated for supporting nationally important numbers of wintering cormorant, great crested grebe and shoveler. Staines Moor SSSI lies approximately 850m east at its closest point and is the largest area of alluvial meadows in Surrey and supports a rich flora and important populations of wintering wildfowl. Langham Pond lies approximately 950m south-west at its closest point to Wraysbury Drain and is designated for its alluvial meadows, rich aquatic, marginal and meadow floras. Parts of all four SSSI except for Langham Pond are components of the South West London Waterbodies SPA and Ramsar site. Full citations for these SSSI can be found in Appendix B. An additional five SSSI are located within 10km (see Table 3.2).

Table 3.2 SSSI within 10km of the study site

Site name	Approx Location relative to study site
Thorpe Hay Meadow	2.5km south-east
Thorpe Park No. 1 Gravel Pit	4km south-east
Black Park	7km north
Dumsey Meadow	7km south-east
Chobham Common	8km south-west

[3] http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0012586
[4] ttp://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUcode=UK0012793

3.3.1 Non Statutory Wildlife Sites

There is one Local Wildlife Site (LWS) that lying adjacent to the channel, namely the Wraysbury 1 Gravel Pit LWS which is also designated as the Wraysbury No. 1 Gravel Pit SSSI, as previously discussed. In addition there are another three LWSs within 1km of the Wraysbury Drain; The Colne Brook LWS, which essentially runs north east to south-east of the Wraysbury Drain and its most southerly reach meets the Horton channel within 100m following its convergence with the Wraysbury Drain at Hythe End; the Horton and Kingsmead Lakes LWS which lie approximately 300m north at their closest point; and Wraysbury II Gravel Pit LWS part of the Wraysbury and Hythe End Gravel Pits SSSI.

3.3.2 Protected and Notable Species

TVERC and NBN Gateway hold records for the following legally protected species within 2km of the site. Due to the volume of data, only records from 1985 onwards are detailed (refer to Appendix A for detailed species records).

Due to the extensive data for bird species, a separate table has been drawn up, (refer to Table 3.4) with records from 2000 onwards recorded. This information has been filtered by the most recent records first, then by their distance to the Wraysbury drain.

Table 3.3 Records for legally protected species within 2km of the channels.

Species	Year of most recent record	Closest location
European Eel (*Anguilla anguilla*)	2009	River Thames, Ham Island, Weir Stream
Stag Beetle (*Lucanus cervus*)	2007	Within a private garden
West European Hedgehog (*Erinaceus europaeus*)	2006	Old Windsor
Grass snake (*Natrix natrix*)	2005	Colne Brook – river and wet margins
Dittander (*Lepidium latifolium*)	2004	Datchet Common and gravel pits
Water vole (*Arvicola amphibious*)	1999	(Lower) River Thames
Good-King-Henry (*Chenopodium bonus-henricus*)	1998	Wraysbury & Hythe End Gravel Pits SSSI
Pipistrelle Bat species (*Pipistrellus*)	1997	Roost in house The Green, Wraysbury
Cornflower (*Centaurea cyanus*)	1997	Arthur Jacobs Reserve
A Mouse-eared bat (*Myotis*)	1991	Malthouse Close, Old Windsor
Common Frog (*Rana temporaria*)	1986	Job's Meadow
Cinnabar (*Tyria jacobaeae*)	1986	Job's Meadow

Table 3.4 Records for legally protected bird species within 2km of the channels

Species	Year of most recent record	Closest location
Hedge Accentor (*Prunella modularis*)	2009	Crown Meadow – 250m north east
Common Cuckoo (*Cuculus canorus*)	2007	Poyle Poplar Community Wood – 1.5km east
Mallard (*Anas platyrhynchos*); and Common Kingfisher (*Alcedo atthis*)	2005	Wraysbury Pond
Bewick's Swan (*Cygnus columbianus*)	2004	Wraysbury Pond
Gadwall (*Anas strepera*); Common Pochard (*Aythya farina*); Tufted Duck (*Aythya fuligula*); Common Goldeneye (*Bucephala clangula*); and Smew (*Mergellus albellus*)	2003	Scuba Lake
Common Kestrel (*Falco tinnunculus*); Song Thrush (*Turdus philomelos*); and Common Whitethroat (*Sylvia communis*)	2000	Arthur Jacobs Reserve – 1.8km east

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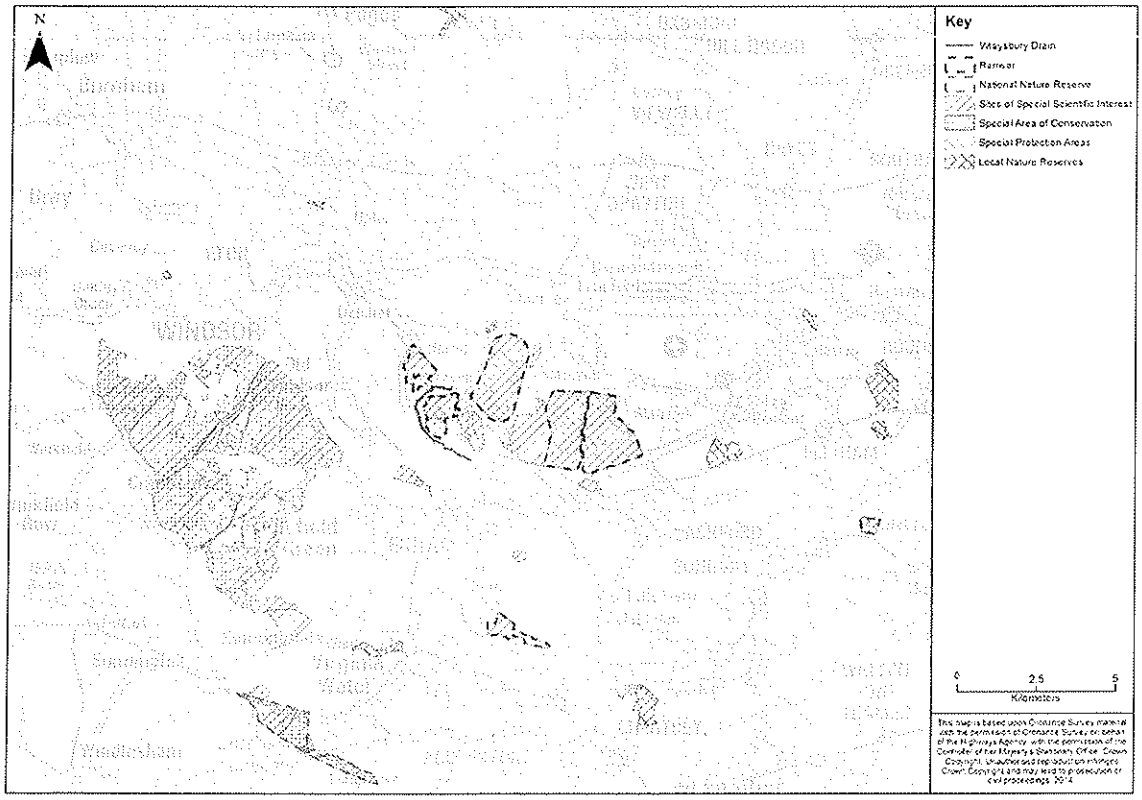
Figure 3.1 Location of statutory wildlife sites within 1km of the Wraysbury Drain



4 Field Survey Results

4.1 Field Survey Results

The Wraysbury Drain has been subdivided into reaches to help establish the current baseline conditions of the drain following the field survey. There are eight reaches in total with an additional four 'spot checks' from bridges where access was possible; as shown in Figure 1.1. Plans of each reach with some indications of the structures, average channel widths and deposits recorded during the field survey are contained in Appendix D.

4.1.1 Reach 1

Reach 1 begins at the head of the Wraysbury Drain where it splits off from the Horton Drain. The Wraysbury Drain follows the circumference of the diving lake towards the centre car park, where it passes into the urban area of Wraysbury. The Wraysbury Drain within this reach was noted to have a uniform channel cross-section, approximately 3m bankfull width and 1.2-1.5m bed width. The drain was observed to be shallow and predominantly consisted of silt.

Reach 1 was surveyed on two different occasions, approximately one month apart. During the first survey some water was observed to be present in the channel; however, there was no perceptible flow and the water was primarily ponding. During the second site visit there was observed to be no flow in the drain throughout this reach, accept for some small areas of ponded water. The channel was found to be receiving no water from the Horton Drain despite the weir downstream of the confluence of the two drains.

The Wraybury Drain in reach 1 was surrounded by scrub dominated by hawthorn (*Crataegus monogyna*), nettle (*Urtica spp*), and bramble (*Rubus fruticosus*), and a pocket of broadleaved woodland with managed grassland running alongside the lake. As the channel borders Station Road the banks were noted to be mainly devoid of vegetation apart from ivy (*Hedera sp.*). The banks were gentle sloping and approximately 0.1-0.3m deep. The majority of the reach was observed to be heavily shaded and as a result there was little in-channel vegetation (Photo 1); however, woody debris was present in the channel, primarily small branches.

A number of mature and semi-mature trees were observed to be overhanging into the channel, including poplar (*Populus spp*), oak (*Quercus robur*), ash (*Fraxinus excelsior)*, sycamore (*Acer pseudoplatanus*) and willow (*Salix spp*). In the upstream section of the reach, a 10m portion of the bank had lifted and fallen towards the Horton Drain (Photo 2).

Photo 1: Over-shaded channel adjacent to the dive lake

Photo 2: Section of bank lifted where tree has fallen

4.1.2 Reach 2

Reach 2 was observed to be slightly wider than the above reach, with bankfull width being approximately 4-4.5m and bed width being 3m. The drain within reach 2 was choked with in-channel vegetation, primarily dominated by watercress (*Rorippa nasturtium-aquaticum)* (Photo 3). The riparian zone consisted of managed grass, including tall ruderal species, such as nettle and dock (*Rumex spp*), with mature trees overhanging the channel (such as horse chestnut (*Aesculus hippocastanum*), ash and willow). A culvert was located at the start and end of the reach, enabling access to the dive centre and the land behind (Photo 4).

Reach 2 was surveyed twice, approximately a month apart. During the first survey a small portion of the channel (approximately 1m wide) had water in it suggesting a low flow channel had formed (Photo 5). During the second site visit, there was no water evident in the channel.

Photo 3: Dense in-channel vegetation

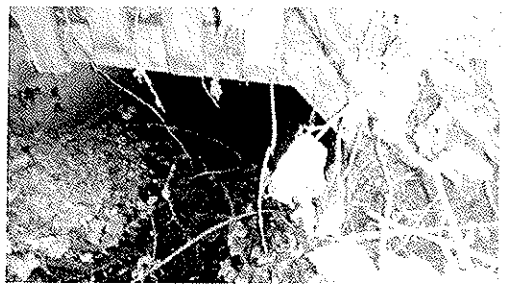


Photo 4: Culvert at the beginning of the reach crossing the dive centre driveway

Photo 5: Low flow channel during first survey

4.1.3 Reach 3

Reach 3 flows adjacent to a number of neighbouring properties. Gardens were surveyed where access permitted. The Wraybsury Drain through reach 3 was noted to be approximately 3.5-4m wide at bankfull and 3m bed width; the channel was approximately 0.3m deep.

In the upstream section of the channel which runs adjacent to a large yard, there was recorded to be dense in-channel vegetation, including species such as watercress. Fly tipping was evident in the channel, including stones and bricks. Within the first survey the upstream section of this stream had some ponded flow (Photo 6), but upon return in August, there was no flow and the channel was dry. Within this upstream section, the right bank was concrete and the left banks were dominated by tall ruderal vegetation (Photo 6).

In the mid and downstream extent of reach 3, the Wraysbury Drain was located adjacent to the Wraysbury No. 1 Gravel Pit SSSI. The SSSI is located within 50m of the drain, with managed grassland (with clumps of dumped arisings and grass clippings) spanning between the two (Photo 7). This section of reach 3 had gentle sloping banks on the right bank, with the left bank lining the gardens and

predominantly being reinforced (Photo 8). The drain had no water in it at the time of survey, with parts of the drain choked with in-channel vegetation. Other sections of the drain had been cleared by local residents. A number of mature and semi-mature trees lined the gravel pit.

Throughout reach 3 the Wraysbury Drain had a layer of silt, which was measured at approximately 0.18m at the channel margins and approximately 0.6m in the centre of the channel.

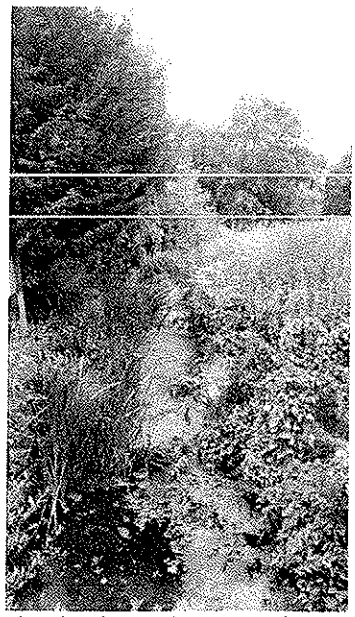


Photo 6: In-channel vegetation, with concrete bank reinforcement on the right bank and tall ruderal vegetation on the left bank

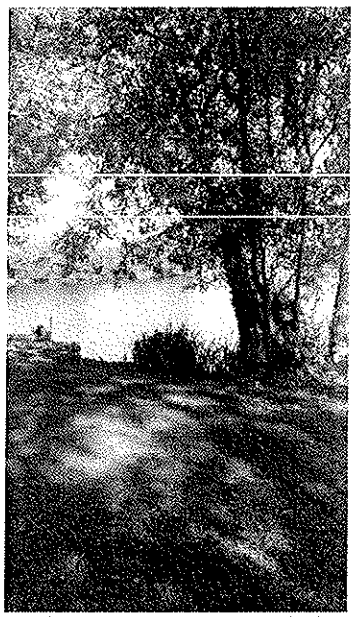


Photo 7: Looking from the drain to the Wraysbury No1 Gravel Pit SSSI

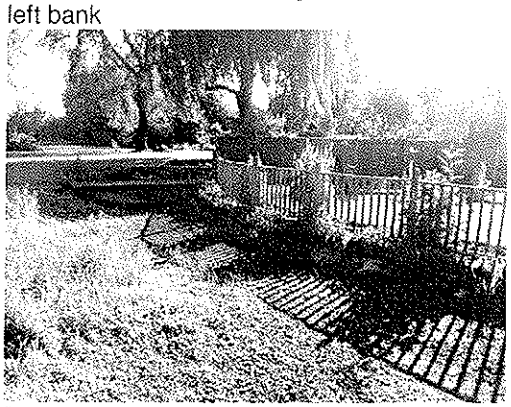


Photo 8: The mid-downstream section of reach 3 running adjacent to gardens

4.1.4 Reach 4

Reach 4 was a small section of the Wraysbury Drain within the urban centre by The Green. Here the drain passes into a large pond feature, approximately 22m long and 6m wide (Photo 9). At the time of survey the pond was receiving no flow and was dry except for a small area of ponded water at its natural low point. Some vegetation was present, in particular around the margins of the pond, which included watercress, willowherb spp (*Epilobium spp*) and sedge species (such as pendulous

sedge (*Carex pendula*). A number of mature trees bordered the pond with numerous overhanging branches.

This pond area has two bridge structures: one to the north-east end, and one to the south which both demarcate the boundary of the reach.

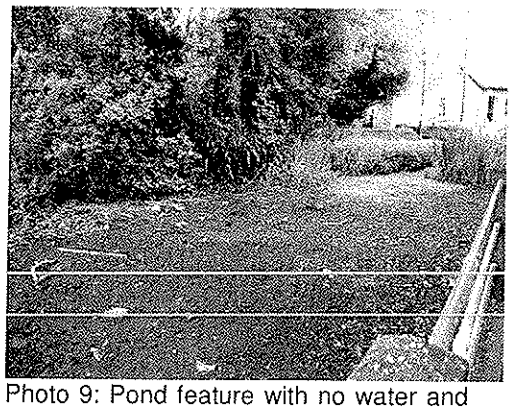


Photo 9: Pond feature with no water and some in-channel vegetation

4.1.5 Reach 5

Reach 5 runs adjacent to The Green, a recreational area with managed grassland and a number of scattered trees along the margins. The drain at the time of survey had no water present, except for some areas where water remained ponded as a result of higher flow periods (Photo 10). The drain was noted to be a lot wider in this section, on average being approximately 7m wide at bankfull and 6m at the bed width. The Wraysbury Drain consisted of a thick layer of silt measuring over 1m in depth in the centre of the channel by The Green. Fly-tipping and debris was present, in particular fallen branches from overhanging trees.

The left bank was predominantly modified with sheet piling and backs onto residential and commercial properties (Photo 11). The west side of the bank was noted to be dominated by tall ruderal vegetation with a number of large overhanging limbs from nearby ash and willow trees. The channel flows underneath a brick bridge structure which crosses Windsor Road, where it widens with a narrow stream of water flowing in the centre and continues to head south. This part of the channel had numerous mature trees overhanging and dense scrub along the left bank.

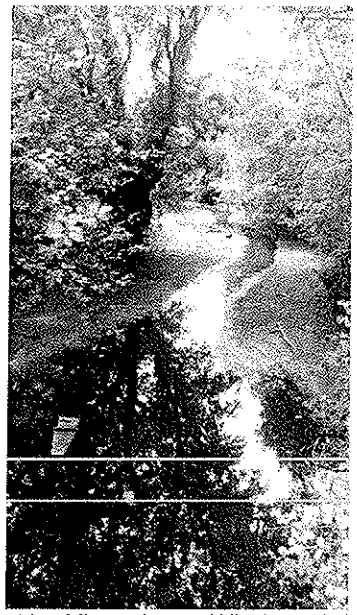


Photo 10: View from Windsor bridge looking downstream where some water was present in the wide channel

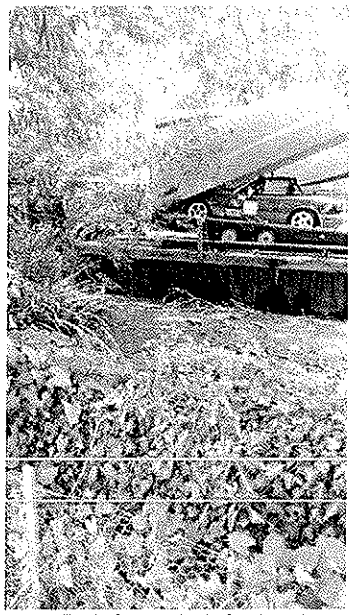


Photo 11: Reinforced left bank and dry channel

4.1.6 Reach 6

Reach 6 flows adjacent to a number of properties and is similar to reach 3. The channel typically had a reinforced left bank at the toe of the gardens with dense scrub and trees on the right bank (Photo 12). A secondary channel had been constructed creating a circular feature at the upstream extent of this reach, where pooling of water was noted (Photo 13).

The Wraysbury Drain through reach 6 was noted to be approximately 3m wide bankfull and 2.5m wide bed width. The drain remained silty, as was characteristic of the drain at the time of survey. The local residents reported that they clear the channel in this section of the drain, removing the excessive in-channel vegetation that builds up in the summer, probably as a result of a lack of flow keeping the channel clear. The drain was found to be lined by scattered mature and semi-mature trees with some overhanging branches across the drain. The majority of the gardens are managed and an allotment and compost heap were also noted within one of the gardens.

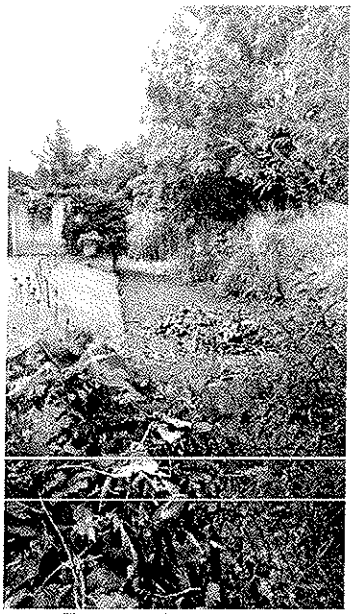


Photo 12: Facing downstream with a cleared, uniform channel

Photo 13: Secondary channel feature, with some ponded water

4.1.7 Reach 7

Reach 7 was very similar in channel cross-section size to reach 6, being approximately 3m bankfull width and 2.5m bed width. However, in reach 7 the channel had little shading and was not cleared by the local residents and as a result is completely choked with in-channel vegetation (Photo 14). The channel was noted to be primarily full of reeds (*Phragmites sp.*) and watercress. There was no water within the Wraysbury Drain in reach 7. The reach was recorded to have a number of man-made structures present in the form of culverts and a bridge with mature trees overhanging. The drain runs adjacent to managed gardens of nearby properties and had bank reinforcements on the left bank.

Photo 14: Dense in-channel vegetation within a uniform channel

4.1.8 Reach 8

Reach 8 is located in the downstream extent of the Study Area in an open section of the drain that flows between a number of fishing lakes. The drain was observed to be approximately 6-8m wide at bankfull and 4m in bed width. The drain was noted to be embanked within steep banks, confining the drain to the channel and limiting any lateral connectivity. The landowner eluded that this was to prevent any mixing of the lake and drain water during high flows.

The drain in reach 8 typically had no water (Photo 15); however, some areas had ponded water, probably a result of the last high flow event. There was debris and fly-tipping in parts of the channel (Photo 16). The drain was surrounded by broadleaved woodland, with species present including beech (*Fagus sylvatica*), alder (*Alnus glutinosa*), oak, elder (*Sambucus nigra*), hazel (*Corylus avellana*) and ash. There was minimal marginal vegetation but the channel was heavily shaded by the overhanging trees. A man-made culvert/bridge was observed to be present along this reach.

Photo 15: Channel with no water adjacent to the fishing lakes

Photo 16: Fly-tipping and in-channel debris

4.1.9 Spot Checks

Spot check 1 (Photo 17) and spot check 2 (Photo 18) were completed from bridges that crossed the Wraysbury Drain. At both spot checks the channel was recorded to have no water. Some in-channel vegetation was observed, but the channel typically consisted of leaf detritus and fallen branches, and the location where the water would pass in higher flows was still evident (i.e. had not become invaded by terrestrial vegetation species). The drain was noted to be approximately 3m wide at bankfull and 2m bed width. The in-channel vegetation included water mint (*Mentha aquatica*). The banks were noted to be dominated by tall ruderal vegetation or scrub and a number of mature trees overhang the channel.

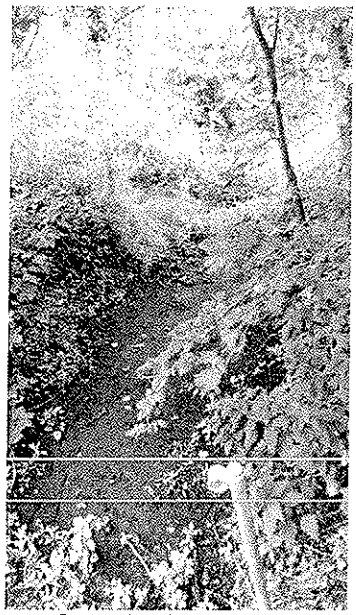


Photo 17: Spot check 1

Photo 18: Spot check 2

Spot check 3 (Photo 19) was carried out from a bridge on a local access road. The Wraysbury Drain had a dry bed. The channel was recorded to be approximately 3m wide at bankfull and 1.5m bed width. The channel bed was covered in leaf detritus and small branches from the surrounding overhanging trees and scrub. The right bank was steep and covered in ivy, with the left bank covered in nettles and scrub with a number of mature ash trees situated close to the bridge.

Spot check 4 (Photo 20) was carried out from a bridge. The Wraysbury Drain at this location near its confluence with the Horton Drain was recorded to be approximately 4.5m wide at bankfull and 2m at bed width. There was standing water within the channel, likely to result from the last high flow event in the Horton Drain. The drain banks were noted to be steep on the right bank with young stands of ash and horse chestnut overhanging the channel. The view of the channel was restricted due to panelling running alongside the bridge.

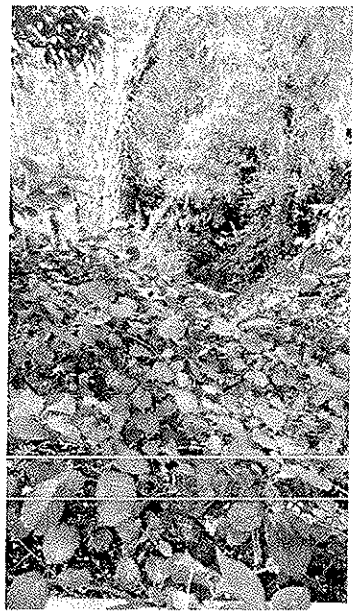


Photo 19: Spot check 3

Photo 20: Spot check 4

4.2 Generic Ecology Baseline Conditions

Walkover surveys to ascertain the likelihood of presence of any protected and/or notable species and recognise any ecological constraints that may be present was carried out by walking along accessible banks of the Wraysbury Drain.

4.2.1 Protected Species

(a) Bats

Bridges and culverts

Bats will roost in many different locations including new and old bridges, specifically in locations where holes, cracks, crevices are present which lead to voids within the structure (BCT, 2012). Bats will regularly use bridges that cross slow flowing watercourses or are close to good quality foraging habitat.

There are numerous bridges and culverts present along the Wraysbury Drain that may support bat roosts. There is good foraging habitat along the majority of the channel including woodland, parkland, mature trees, hedgerows, watercourses, ponds, lakes and reservoirs.

In most circumstances it was not possible to carry out an adequate preliminary assessment on each structure. This was due to an inability to observe the structure in its entirety either due to dense vegetation surrounding the structure, or an inability to observe from below the structure due to water or deep silt in the channel. A number of structures were seen to have features that would hold potential for roosting bats, such as deterioration to the mortar joints, gaps/cracks within the brick work or concrete structures.

Trees

There are numerous features that can offer potential for bats to roost within trees including natural holes, woodpecker holes, cracks and splits in major limbs, loose bark, hollows and cavities and bird and bat boxes. Bat surveys conducted during

spring, summer or autumn months can be limited by foliage on trees which can obscure bat roost features, whereas winter surveys where there are less leaves on the trees will reveal more potential for roosting opportunities The survey was carried out in summer months and is for that reason limiting.

An exhaustive survey and categorisation of all mature and semi-mature trees along both channels was not part of the scope of the survey however, general assessments were made for roosting potential along sections of the channels where mature and semi-mature trees were present.

Features offering roosting potential were observed in a number of trees within these sections and a large number of fallen trees or overhanging limbs were noted.

(b) Birds

There is potential for birds to nest within the vegetation on site including the woodland, tall ruderal vegetation, scrub on the channel margins and riparian vegetation along the banks.

The extent of the Wraysbury Drain would support breeding birds during the spring and summer months. The South West London Waterbodies SPA, Wraysbury and Hythe End Gravel Pits, Wraysbury No. 1 Gravel Pit and the Wraysbury Reservoir SSSIs are known for their importance to wintering species of wildfowl (see Appendix B for details).

(c) Reptiles

Typical reptile habitats include brownfield sites, allotments, compost heaps, railway and road embankments, rough grassland woodlands and hedgerows. In addition, grass snakes are known to favour habitats near wetlands and ponds.

There are numerous sections along the channel where there is suitable, foraging, basking, refuge, and hibernation opportunities for common reptile species, in particular grass snakes, slow worm and common lizard (*Lacerta vivipara).* All surveyed reaches of the Wraysbury drain possessed suitable adjacent habitat for this group of species.

(d) Amphibians

Most of the known largest great crested newt (GCN) *Triturus cristatus* populations occupy disused or partially used mineral extraction sites (Froglife, 2001). There are two large disused gravel pits, the Wraysbury and Hythe End Gravel Pit SSSI which lies to the south and east of the channel, and the Wraysbury No.1 Gravel Pit SSSI which is located to the north and lies adjacent to the channel In addition, there is the diving lake adjacent to reach 1, a number of water bodies (fishing lakes) adjacent to reach 8 and a number of smaller ponds seen on Ordnance Survey maps within gardens not accessed between reaches 7 and 8 and beyond reach 8 just north of Hythe End.

GCN tend not to use large lakes such as those mentioned for breeding due to predation by fish. However, where parts of the channel had slow flowing or standing water and were located adjacent to suitable terrestrial habitat (such as rough grass, scrub and woodland) these offer potential refuge, foraging and hibernation opportunities for GCN and other amphibians.

(e) Otters and Water Voles

The walkover survey was limited to the banks of the channels only. No signs of presence such as burrows, foraging, droppings, spraints or holts were noted which would indicate presence of these species.

Parts of the Wraysbury Drain are densely shaded with little diverse marginal vegetation. In a number of areas the banks are dominated by managed grass or clumps of nettle or bramble. This is suboptimal habitat for water vole and is unlikely to support this species. There are stretches of suitable habitat noted but these were short stretches isolated from other suitable habitat.

Although nearby woodland pockets can provide suitable habitat for the construction of otter *(Lutra lutra)* holts, the channel itself is suboptimal habitat for this species. It is quite possible that the channel is used as a commuting route for otter especially between the larger lakes that are present within, adjacent or nearby the Study Area.

(f) Dormice

The woodland blocks, located adjacent to reaches of the channel have potential to support dormice (*Muscardinus avellanarius),* in particular the woodland strip surrounding the dive centre, reach 1 and the woodland block adjacent to Staines Road near Ankerwyke farm, between reaches 7 and 8 (not accessed) and that alongside the fishing lakes to the south, reach 8.

In addition dormouse will utilise hedgerow and scrub for foraging purposes during summer months across the wider landscape if these are connected to nearby woodland blocks, further increasing its potential for this species.

(g) White-clawed Crayfish

White-clawed crayfish (*Austropotamobius pallipes*) are found in a wide variety of environments including canals, lakes, streams, reservoirs and water filled quarries where the water PH is above 6.5 and generally with calcium concentrations of more than 5mg/l. It is typically found in water that is 0.75m to 1.25m deep but may occur in very shallow streams of water 5cm deep. They are intolerant of pollution (Natural England, 2013). This species has been radically modified by whole population losses due to invasive non-native signal crayfish (*Pacifastacus leniusculus)*, the associated crayfish plague and habitat loss.

The majority of the Wraysbury Drain where it was dry or with only shallow standing water, from Douglas Lane south until it meets the Horton channel was noted to provide unsuitable habitat for this species. In addition large sections of both channels that run adjacent to roads or farming areas may suffer from pollution and fly tipping making it unlikely this species will be present.

(h) Badger

Suitable habitat for badger *(Meles meles)* was limited to those areas of channel that were adjacent to woodland, arable, scrub and rough grassland. No signs, such as badger setts, badger guard hairs, prints, snuffle holes, latrines were noted alongside the channel.

Large sections of scrub were impenetrable surrounding the channel and it is possible that setts exist within these areas.

5 Discussion and Recommendations

5.1 Riparian Corridor and In-channel Vegetation

5.1.1 Bank Vegetation

The riparian zone in a number of the reaches was found to be heavily vegetated with dense scrub preventing any sunlight from reaching the channel. This was observed to be typically brambles and nettles that had grown into dense stands. In some reaches the riparian corridor would be likely to have prevented any in-channel macrophyte growth and have contributed to 'blocking' the channel in high flows due to the overhanging vegetation.

Recommendations

Riparian Scrub Maintenance

In these instances it is likely to be beneficial to remove some of the riparian corridor to open up the channel and remove the terrestrial vegetation growing into the channel. However, this is recommended to be selective removal and some riparian corridor should be retained to maintain shading of the channel and a riparian buffer zone adjacent to the drain. Where conservation interest is high the riparian corridor should be maintained as it is and only cut back slightly if deemed appropriate for flood water conveyance and access for channel maintenance.

If any reseeding of the banks is required this should be with an appropriate mixture of native species considered suitable to riparian species.

Prior to undertaking any vegetation clearance, please refer to Section 5.3.2 of this report in relation to recommendations for protected species.

5.1.2 Tree Lining

Tree lining along the drain corridor typically provides some shade to the channel, leaf detritus and woody debris. The tree roots also help to bind the soil in the channel banks, stabilising them and preventing erosion in higher flows. The leaf detritus and woody debris also provide natural habitat within the drain and create flow diversity.

Recommendations

Tree Planting

In some locations there was no tree lining or riparian corridor and the in-channel vegetation growth was noted to be dense and out of control. In these locations, the planting of a few scattered trees could provide some shading to the channel and reduce the amount of in-channel macrophyte growth. It is recommended that only a few trees are planted to prevent complete over-shading and that these are native trees that will improve the natural habitat and promote native species.

Tree Maintenance

Tree maintenance may be necessary to reduce the amount of channel shading, remove the risk of trees falling into the channel or to remove low-growing limbs that accumulate floating debris in high flows. It is recommended that, if required, the younger trees are removed to open up the canopy and allow some light into the drain. Coppicing is preferred over felling and all these works would rely on the ecological quality of the tree. A rotation of coppicing along a river could help to

maintain various stages of tree growth and refuges and cover for wildlife; whilst not allowing complete overgrowth. Canopy lifting (removal/pruning of lower tree branches) could also be undertaken, enabling more light to enter the channel without requiring any complete tree removal.

5.1.3 In-channel Vegetation

In-channel vegetation is important within a watercourse as it provides habitat heterogeneity for fauna and also promotes flow diversity within a channel by creating a 'low flow channel' which can maintain flow through the summer months. However, in some reaches along the Wraysbury Drain, the in-channel vegetation was either non-existent or was significantly dense.

Where in-channel vegetation is too dense, the channel was noted to become choked and flow impeded. If the flow ceases, the in-channel vegetation would subsequently grow further adding to the initial problem. This is particularly evident where there no tree lining to shade the channel. In-channel vegetation can also act to trap fine sediment, particularly in the spring season when water levels are decreasing and have a high sediment load following higher flows causing turbidity.

Recommendations

In-channel Maintenance

In some areas the drain was noted to be densely chocked with vegetation preventing the conveyance of water and potentially enhancing the deposition of fine sediment. The removal of stands of in-channel vegetation could help to locally improve channel processes. The removal of vegetation in the centre of the channel, retaining some areas of marginal growth, would concentrate the flow into the centre of the channel at the natural low point. It is not recommended that the in-channel vegetation is completely removed, as some vegetation is beneficial. Coupling this work with tree planting could also provide greater longevity of the works and require less regular maintenance. It is recommended that in-channel vegetation is removed by hand.

Prior to undertaking any vegetation clearance, please refer to Section 5.4 of this report in relation to recommendations for protected species.

5.2 Channel Features

5.2.1 Sediment

All reaches surveyed along the Wraysbury Drain were found to have a thick layer of fine sediment covering the channel bed. Although some quantity of fine sediment is deemed to be natural, excessive fine sediment can smother habitats and remove potential fish spawning areas. Fine sediment could become trapped by in-channel vegetation and settle out as flows subside following high flow events. The source of sediment can be both natural (e.g. eroded material) but also anthropogenic (e.g. drains, road runoff and agricultural runoff). Contaminants can be attached to sediments. Due to there being no perceptible flow or no flow in all of the surveyed reaches, it is likely that sedimentation occurs after high flow events, and then builds up over time due to the lack of flow.

Recommendations

Desilting

Dredging could be used to de-silt the channel. However, dredging could fundamentally alter a re-naturalised channel cross-section; and there are modern

alternatives to this method. Dredging works should be undertaken in specified areas only, with any re-formed natural gravels, riffles and areas of cobbles left untouched. Activities to remove silt from the channel should try to disturb the channel banks and cross-section as little as possible. Works should be carefully planned as to not remove too much sediment or alter the overall bed gradient of the channel, resulting in ponding of water and preventing flow conveyance. Spoil should be removed from site once taken from the channel. Construction best practices, including sediment bunds, should be used during this activity to prevent any downstream movement of fine sediment or impacts on increased turbidity on downstream receptors. Where possible, works should be undertaken on one bank at a time, to minimise any potential impacts on riparian receptors.

Less intrusive means of desilting a channel (compared to dredging) could be preferred in the Wraysbury Drain, subject to further hydrological/hydraulic studies. This would involve creating a low flow channel that works towards maintain excessive sediment in suspension. The Wraysbury Drain in some reaches was found to show evidence of a low flow channel forming, with the centre of the channel consisting of fine gravels instead of silt.

5.2.2 Channel Cross-section

The Wraysbury Act 1799 states that the Wraysbury Drain should be 2.4m wide throughout its length. Although this could have been applicable at the time of the Act, the use of the drain has changed over the years and this may no longer be suitable (further hydrological/hydraulic studies required to confirm this).

In locations the Wraysbury Drain was observed to be naturally narrowing to accommodate low flows. The side bars leading to this narrowing primarily were found to consist of deposited silt and are predominantly semi-permanent features. It is judged that the channel could therefore accommodate both low and high flows without causing any detrimental impacts to flood conveyance.

Sections of channel were determined to be much wider than the width specified in the Award Act, particularly through the recreational areas around The Green. In these sections, the channel is over wide to accommodate for the low flow conditions.

In addition, some lengths of bank along the Wraysbury Drain have been modified with man-made materials; in particular in reach 5 by 'The Green', spot check 4 where the channel joins the Colne Brook, and reach 2.

Recommendations

Naturalisation

The removal of bank reinforcement and re-profiling the banks using soft engineering (if required) or natural bank materials (such as soil) and re-seeding this with native species to enable suitable refuge and foraging habitat to develop for riparian species.

5.2.3 Fly-tipping

Debris that has been thrown into the drain could pose the threat of pollution, prevention of flow conveyance and blocking structures in higher flows if transported. At a number of reaches debris was noted within the channel, potentially posing a threat to fauna in the area.

Recommendations

Fly-tipping Removal

It is recommended that where possible any substantial areas of man-made debris are removed from the channel. The natural bed substrate should be maintained and this should be achieved from the bank where possible to minimise and disturbance to the channel.

5.2.4 Flow Regulation

At the time of survey, little flow was evident in a number of the reaches. Reduced flow encourages siltation in a channel and this was evident in a number of reaches. A lack of flow diversity can also minimise the potential habitats within a drain.

At the time of survey there was no flow in the Wraysbury Drain; according to local residents is known to flow in wetter times. However, during low flow conditions the channel has been observed to dry up and was noted to be in that state during the survey. A weir located on the Horton Drain just downstream of the Wraysbury Drain confluence was observed to have the gate lifted at the time of survey. Although the water was observed to be backed up, it was determined to be significantly below a level needed to supply enough water to the Wraysbury Drain.

Recommendations

Further Investigation

It was determined that the flow in the Wraysbury Drain is obviously conditional on the flow in the Horton Drain, particularly in low flow conditions. The lack of varying flow types in the drain is also likely to be causing siltation and reducing potential habitat for fauna. It is recommended that further investigation into the hydrology of the channel is conducted, primarily focusing on the impact of recent developments such as the new gravel pits located at the northern extent of the Study Area.

5.3 Ecological Receptors

The recommendations detailed below are provided to highlight ecological constraints which may affect implementation of the recommendations above. They are provided to inform RBWM of wildlife legislation which may affect the scope of timing of works in order to prevent a breach of legislation.

5.3.1 Designated Sites

(a) International Designated Sites

The main pathway for impacting designated sites would be through pollution of water carried downstream by the channel. The Horton Drain joins up with the Wraysbury Drain in Hythe where it then meets the Colne Brook before entering the River Thames, approximately 250m further south.

South West London Waterbodies SPA and Ramsar Site falls within the site, Windsor Forest and Great Park SAC is approximately 3km west and Thursley, Ash, Pirbright and Chobham SAC is approximately 7.5km south west of the site.

It is unlikely that the proposals would have any impact on either Windsor Forest and Great Park SAC or Thursley, Ash, Pirbright and Chobham SAC due to the nature of their designation and the spatial and topographical relationship they have with the Wraysbury Drain. In addition there are major carriageways such M3 to the south,

Windsor Road to the east and the sprawling urbanisation of Egham between them and the survey site.

It is considered that the proposals could have a direct impact on the South West London Waterbodies SPA and those species for which it has been designated for, namely gadwall and shoveler and for other species, such as great crested crebe, great cormorant and tufted duck all occurring at levels of national importance.

A number of activities associated with construction/engineering works upstream and within the site could have a direct impact on the integrity of this SPA. There is potential for wintering birds to use the tall ruderal and scrub vegetation in the channel margins as cover. Therefore vegetation clearance could directly disturb wintering species using this site. Noise and visual disturbance associated with engineering works could lead to disturbance of a number of wintering birds in particular for those species the SPA has been designated for.

In addition works upstream and within the SPA could lead to pollution of the site by way of released contaminants from the soil through construction works, and from potential leaks from machinery on site potentially damaging the integrity of this SPA.

Therefore, it is recommended that RBWM will require a screening assessment and consultation with Natural England before approval is given for any such works to be carried out along the Wraysbury Drain.

(b) Nationally Designated Sites

The Wraysbury and Hythe End Gravel Pits SSSI, and Wraysbury No.1 Gravel Pit SSSI are component water bodies that make up the South West London Waterbodies SPA and Ramsar site.

The Wraysbury No.1 Gravel Pit is adjacent to the Wraysbury Drain, and lies within 50m north. The Wraysbury and Hythe Gravel Pits SSSI lies to the south and east within approximately 100m to the channel.

Works carried out upstream of the Wraysbury Drain have potential to cause a direct impact on the Wraysbury No. 1 Gravel Pit SSSI due to the immediacy of the drain to the SSSI site. Works carried out around the upper reaches of the Wraysbury drain, where the Wraysbury drain divides from the Horton drain, has the potential to directly impact The Wraysbury and Hythe End Gravel Pits SSSI. Natural England has identified a list of potential damaging operations for this and all SSSI sites (see Appendix C) which include:

- The destruction, displacement, removal or cutting of any plant or plant remains, including tree, shrub, herb, or leaf-mould.
- Dumping, spreading or discharge of any materials.
- Management of aquatic and bank vegetation for drainage purposes
- Modification of the structure of watercourses (e.g. streams), including their banks and beds, as by re-alignment, re-grading and dredging.
- Construction, removal or destruction of roads, tracks, walls, fences, hardstands, banks, ditches or other earthworks, or the laying, maintenance or removal of pipelines and cables, above or below ground.
- Storage of materials.
- Erection of permanent or temporary structures, or the undertaking of engineering works, including drilling.
- Use of vehicles or craft likely to damage or disturb features of interest.

It is likely that some or all of these operations would be undertaken as part of the works. It is considered therefore that RBWM should consult with Natural England before approval is given for any such works to be carried out along the Wraysbury Drain.

It is unlikely that the proposals would have any impact on the other SSSIs within 10km from the channel due to the nature of their designation and their spatial and topographical relationship to the Wraysbury Drain.

(c) Other Designated Sites

The Wraysbury I Gravel Pit LWS, part of the Wraysbury No.1 Gravel Pit SSSI, and Wraysbury II Gravel Pit LWS part of the Wraysbury and Hythe End Gravel Pits SSSI and have been discussed already. The Colne Brook LWS which meets with the joined Wraysbury and Horton channel at its' most southerly reach could be affected by engineering works. It is considered therefore that the Borough Council of Windsor and Maidenhead would require consultation with the Local Wildlife Trust before approval is given for any such works to be carried out along the channel.

In addition it is recommended that adherence to Pollution Prevention Guidelines set by the Environment Agency, in particular PPG5 and PPG6, are followed in respect to impacts to all designated sites, so as to avoid any potential pollution throughout the construction period.

5.3.2 Protected Species

(a) Bats

Bats and their roosts are protected by the *Wildlife and Countryside Act 1981* (as amended) and the *Conservation of Habitats and Species Regulations 2010 (as amended).* Refer to Table 3.3 for details of the most recent bat roost for *Pipistrelle* species at The Green, Wraysbury, 1997 and for *Myotis* species at Malt House Close, Old Windsor, 1991. There are a number of additional roosts located within 2km for *Pipistrelle* and *Myotis* species, for later years, see Appendix A for details.

Recommendations

Bat (Bridges and Culverts)

There are numerous bridges and culverts located along the Wraysbury Drain. Should the scope of engineering works involve structural changes to any bridge or culvert, including repairs and infilling of cracks/crevices, a detailed bat roost inspection should be carried out on any man-made structures within the channel To thoroughly assess the potential for bats. This assessment can be undertaken at any time of year, however if bat dawn/dusk surveys are subsequently recommended these can only be undertaken between April and the end of September (Hundt, 2012). All surveys should conform with best practice guidelines and might require multiple visits spread throughout the surveys period.

Bat (Trees)

Following the determination of engineering works, should felling or pruning of trees be required, it is recommended a bat roost assessment of trees should be undertaken to determine whether there is any potential for roosts to be impacted. If potential roost features are identified, further surveys may be required. It is preferable to undertake bat roost assessments during winter months, when trees are less vegetated and therefore roost features are more visible; however, they can be

undertaken at any time of year. Should dawn or dusk surveys be required to confirm the presence or likely absence of bats these can only be undertake between April and the end of September (Hundt, 2012). All surveys should conform with best practice guidelines and might require multiple visits spread throughout the survey period.

(b) Birds

All wild birds, their chicks, nests and eggs are protected from intentional killing, injury, damage or destruction under the *Wildlife and Countryside Act 1981* (as amended). Species listed on Schedule 1 of the Act are afforded special protection and cannot be intentionally or recklessly disturbed when nesting.

In addition the survey area falls within the South West London Waterbodies SPA designated for its international importance for wintering wildfowl lending it protection under the Union (EU) Habitats Directive (see Sections 5.4.1(a) above).

Kingfishers (a Schedule 1 species) have been recorded along the nearby Horton channel during the site visit and historically at Wraysbury pond which falls within reach 4 of this channel. There are large amounts of suitable foraging areas nearby to the channel for this species especially those areas adjacent to the lakes, along reaches 1-4 and reach 8.

Recommendations

Breeding Birds

For those areas that fall outside of the SPA clearance of vegetation and works to the earth banks should be avoided during the breeding season (March – August) to avoid the killing and injury of birds and disturbance of breeding birds. If works between March and August is unavoidable, vegetation and banks should be inspected immediately prior to removal by a suitably experienced ecologist for the presence of nesting birds. If nesting birds are present, works will have to be delayed until nesting activity ceases. If vegetation clearance is anticipated during these periods, it is advised that the programme be amended to that riparian habitat and scrub can be removed outside of the breeding season (August – February), and maintained at a low level in the intervening period prior to works to prevent nesting later in the year when it may impact upon the programme.

(c) Reptiles

All native species of reptile are protected under Schedule 5 of the *Wildlife and Countryside Act 1981* (as amended) against intentional killing and injury. Sand lizard (*Lacerta agilis)* and smooth snake (*Coronella austriaca)* receive additional protection but these species are not present within this part of the UK or within the habitats present on site. There are records for grass snake within 2km of site, at Colne Brook in 2005.

Recommendations

Reptiles

Measures will be required to prevent killing and injury of reptiles during work. These should be proportional to the risk of committing an offence and therefore are best determined once the scope of engineering works have been finalised. Depending on the scope and scale of works, and the area of suitable habitat affected, further detailed surveys might be necessary in order to inform the methodology of a

mitigation strategy required to avoid committing an offence. Mitigation could include fingertip searches of the works area and removal of features which could be used by reptiles for sheltering; or alternatively, the erection of herpetile fencing around the works area and the catching and removing of reptiles from the works footprint might be appropriate. The initial phase of ground works should not be undertaken between November and the end of February to avoid the period when reptiles may be hibernating.

(d) Great Crested Newt

Great crested newts (GCN) and their habitat are protected by the *Wildlife and Countryside Act 1981* (as amended) and the *Conservation of Habitats and Species Regulations 2010* (as amended). No records have been identified for GCN within 2km of the drain.

Recommendations
Great Crested Newt
The adjacent woodland habitat, scrub and rough grassland along the channel offer terrestrial habitat and the numerous nearby lakes and ponds provides potential aquatic habitat for great crested newts. Once the extent of engineering works are known, the risk of committing an offence under the legislation protecting GCN should be assessed by an ecologist (assuming that GCN are present).

If there is sufficient risk of committing an offence, further surveys could be required. This should include an initial Habitat Suitability Index (HSI) Survey of the ponds and watercourses to assess their potential to support GCN, potentially followed by presence/absence surveys of the ponds between mid-March and mid-June.

(e) Water Vole

Water voles receive full legal protection under the *Wildlife and Countryside Act 1981* (as amended). There are no recent records for water vole within 2km of the drain with the last record detailed from 1999, along the River Thames.

It is considered that the majority of the channel does not offer suitable habitat to support this species. However, there are numerous water bodies located nearby to the channel which may provide suitable habitat for this species. In addition the survey was not conducted within those parts of the channel where water was present or close to the water's edge and therefore as a precaution, the following is recommended:

Recommendations
Water Vole
A water vole survey of the channel banks and should be undertaken. This survey can be undertaken in conjunction with further surveys for other species.

(f) Otters

Otters are protected by the *Wildlife and Countryside Act 1981* (as amended) and the *Conservation of Habitats and Species Regulations 2010* (as amended).There are no recent records for otter received from TVERC within 2km of the channel.

It is considered that the channel does not provide optimal habitat to support this species. The water flow is either very slow generally devoid of fish and in large stretches it is dry. Although nearby woodland pockets along the channel can provide

suitable habitat for the construction of otter *(Lutra lutra)* holts. There are a number of nearby lakes and other suitable watercourses which may offer suitable habitat for this species and there is potential for this species to use the channel as a route to commute between them. Therefore the following is recommended:

Recommendations

Otters

Should works impact woodland habitat, a survey should be undertaken to confirm the presence of potential holts within the works area.

(g) Dormice

Dormice are protected by the *Wildlife and Countryside Act 1981* (as amended) and the *Conservation of Habitats and Species Regulations 2010* (as amended). There are no recent records for this species received from TVERC within 2km of the channel.

Recommendations

Dormice

The pockets of woodland habitat located adjacent to the channel and areas of scrub provide potential habitat for dormice. Once the extent of vegetation clearance required for engineering works is known, it is recommended that proposals are reviewed by an ecologist to assess the likely risks to dormice and the requirement for further surveys or mitigation. It should be noted that dormouse surveys (if required) can only be undertaken between April and November, and that multiple visits are required throughout this period.

(h) White-clawed Crayfish

White-clawed crayfish receive partial protection under Schedule 5 of the *Wildlife and Countryside Act 1981* (as amended), however it is not an offence to kill white-clawed crayfish or to damage or destroy their habitat. However, given the serious concern for their conservation, it is strongly recommended that all reasonable means are put into place to prevent harm to the species or its habitat. There are no recent records for white-clawed crayfish with the last records dated 1900-1986 at Colne Brook and in 1983 Runnymede, River Thames[5].

The majority of the channel was found to be dry and hence does not currently offer suitable habitat for this species. However the channel dries seasonally and some areas of the channel did continue to hold water in the later stages of the summer. Despite the majority of the channel not possessing optimal habitat for this species as a precaution the following is recommended.

Recommendations

White-clawed Crayfish

Where possible impacts to the banks and bed of the channel should be avoided when water is present to limit impacts to white-clawed crayfish if present.

(i) Badger

For those areas accessed no evidence was noted of badger presence within the near vicinity of the channel during the walkover survey. However, there were

[5] http://old-data.nbn.org.uk/

pockets along the channel which were not surveyed either due to a lack of permission from landowners' or due to dense thick scrub and vegetation obscuring any potential signs.

Dredging or earthworks have potential to kill, injure, and disturb badgers or to damage or destroy a sett.

Recommendations

Badger

Once the extent of engineering works is known, it is recommended that a badger survey is carried out in suitable habitats within a 30m perimeter to those areas to ensure an of setts.

5.4 Opportunities for Enhancement

Additional improvements that would enhance the habitat for particular species along the channel include:

- Thinning of trees/canopy lifting to increase the light levels along the watercourse, promoting growth of aquatic and riparian vegetation;
- Planting of native shrub species along those parts of the drain that are currently choked with vegetation to provide some shading but specifically to extend the wildlife corridor and provide additional nesting opportunities along the channel;
- Naturalisation of the banks which are currently modified with man-made materials will provide burrowing opportunities for species such as water vole, white-clawed crayfish and kingfisher;
- Provide transitional vegetation, such as grassland transitioning into scrub, reeds transitioning into grasses, woodland into scrub in order to provide suitable foraging habitat and refuge opportunities for a wide range of wildlife, in particular reptile species. This could be done through all reaches of the channel;
- Creation of reed/sedge borders along sections of the drain measuring up to 2m in width, incorporating species such as canary-grass (*Phalaris canariensis*), common reed (*Phragmites australis*), reed sweet-grass (*Glyceria maxima*), soft rush (*Juncus effuses*), jointed rush (*Juncus articulates*) and sedges which will enhance the habitat for a range of species. In particular along reaches 1, 3 and 8 where the channel runs adjacent to large open water bodies and would provide connectivity along the channel;
- Sections of the banks could be strimmed during the autumn and regularly maintained through spring and summer, in particular along reach 3, which lies in the near vicinity, to where incidental sightings of kingfisher have been made, and to historical records for this species. This can encourage kingfishers to find a suitable nesting site. In addition small enhancements can be made on overhanging tree limbs along this section, from which the kingfishers can hunt so it is easy for the kingfisher to land on and dive from. This could be achieved by fashioning perches for hunting kingfishers that are solid, provide a good view overlooking the channel and are easy for birds to land and take off from (NB recommendations to in relation to kingfisher would only be worthwhile where in sections which will hold water and provide suitable habitat);
- Any works to bridges or culverts should be designed to accommodate use by otters and other riparian mammals. Box culverts as opposed to cylindrical ones are preferred with a ledge provided, to provide a path of safe passage under the culvert (preventing animals attempting to cross or them where they

may be struck by traffic) during times of high water levels. These should be installed at least 150mm above the highest water level with 600mm head room above and 500mm wide. Ramps must be provided to allow otters access to the ledge from the banks (Highways Agency, 1999).

- A number of bat and bird boxes could be placed onto mature trees that line the drain providing additional roosting and nesting opportunities, in particular along reaches 1-3 and 8; and
- Creation of log piles close to the channel, located at a suitable distance from the channel to ensure it does not flood at times of high water. Hibernacula can be created from felled trees/limbs which would provide suitable refuge habitat for both reptile and amphibian species, in particular along reaches 1 and 8.

6 Summary of Recommendations

The following section provides a summary of key recommendations for each of the eight reaches that have been provided for the surveyed extent of the Wraysbury Drain.

6.1 Wraysbury Award Act (1799) Compliance

It has been assessed that reaches 1, 6 and 7 and spot checks 1, 2, 3 and 4 are currently compliant with the channel dimensions detailed in the Wraysbury Award Act (1799). However, it is important to note that five reaches (reaches 2, 3, 4, 5, and 8) were all wider than the specified width in the Award Act and therefore were not in compliance as surveyed. The predominant reason for this is assumed to be urban and residential reasons (particularly reach 4 which is used as a feature through Wraysbury). Reach 8 is an embanked channel between a series of fishing lakes and therefore the drain measures a set width between these embankments.

6.2 Reach Specific Recommendations

Table 6.1 provides details of the recommendations detailed in Section 5 that are applicable to each of the eight reaches. A brief summary is provided for each recommendation, but reference should be made to Section 5 for a more detailed explanation. The appropriate sections for each recommendation are as follows:

- Riparian Corridor and In-channel Vegetation – Section 5.1
- Channel Features – Section 5.2
- Ecological Receptors – Section 5.3
- Ecological Recommendations – Section 5.3.2
- Ecological Enhancements – Section 5.4

Table 6.2 Designated Sites and associated recommendations

Section	R1	R2	R3	R4	R5	R6	R7	R8	SP1	SP2	SP3	SP4	Summary of Recommendation
Riparian Corridor and In-channel Vegetation													
Riparian Scrub Maintenance	■								■	■	■	■	Reduce riparian corridor to open up the channel, primarily by reducing scrub dominance
Tree Planting			■		■		■						Plant trees to provide some shading consequently reducing in-channel vegetation growth
Tree Maintenance	■	■						■					Remove low-growing limbs, coppice younger trees to reduce channel shading
In-channel Maintenance			■		■		■						Remove in-channel vegetation (typically by hand) from the centre of the channel, leaving some marginal vegetation
Channel Features													
Desilting	■	■	■	■	■	■	■	■	■	■	■	■	Dredging a channel to remove thick layers of silt; or using less intrusive techniques such as channel narrowing via berms to promote flow and encourage natural movement of sediment
Naturalisation					■								Removing bank reinforcement and re-profiling the bank with natural material or soft-engineering techniques if required
Fly-tipping removal		■			■								Removal of fly-tipping from the channel
Further Investigation	■	■	■	■	■	■	■	■	■	■	■	■	Investigation into low flows in the Horton Drain, including recent development of gravel pits
Ecological Constraints													
International Designated Sites	■		■										Screening assessment prior to undertaking engineering works to assess the potential for impacts.
National Designated Sites	■		■										Consult with Natural England to assess the potential for impacts
Local Designated Sites	■		■									■	Consult with Local Wildlife Trust prior to undertaking works which may impact the

Section	R1	R2	R3	R4	R5	R6	R7	R8	SP1	SP2	SP3	SP4	Summary of Recommendation
													site
Ecological Recommendations													
Bats (Bridges and Culverts)													Complete a bat roost inspection on any structures where works are required
Bats (Trees)													Undertake a bat roost assessment of trees to be pruned/felled. If potential features identified, furthers surveys may be required
Breeding Birds													Areas outside the SPA – clearance of vegetation and works to embankments should be avoided during the breeding season (March-August). If unavoidable, inspection by and ecologist should be completed immediately prior to removal
Reptiles													Consultation with an ecologist to discuss potential impacts to reptiles and likely breach of legislation once scope of works is provided
Great Crested Newts													Once scope of works are known, the risk of committing an offence under GCN legislation should be assessed by an ecologist
Water Vole													Undertake a water vole survey of the channel banks if impacted by proposals
Otter													Works impacting woodland habitat should have a survey undertaken to confirm the presence of potential holts within the works area
Dormice													Once scope of works near woodland or scrub is known, assess the risks to dormice
White-Clawed Crayfish													Where possible impacts to the banks and bed of the channel should be avoided to limit impacts to white-clawed crayfish if present.
Badger													Once the extent of engineering works is

Section	R1	R2	R3	R4	R5	R6	R7	R8	SP1	SP2	SP3	SP4	Summary of Recommendation
													known, it is recommended that a badger survey is carried out in suitable habitats within a 30m perimeter to those areas to ensure an absence of setts.
Opportunities for Enhancement													
Creation of reed/sedge borders													Creation of reed/sedge borders along sections of the drain measuring up to 2m in width, incorporating native plant species. This will enhance the habitat for a range of species and would provide connectivity along the channel.
Areas of short vegetation													Sections of the banks could be strimmed during the autumn and regularly maintained through spring and summer. This can encourage kingfishers to find a suitable nesting site.
Works to bridges/culverts													Should be designed to accommodate use by otters and other riparian mammals to prevent drowning.
Installation of bat/bird boxes													Placed on mature trees that are located along the channel. This will providing additional roosting and nesting opportunities.
Creation of log piles													Hibernacula can be created from felled trees/limbs which would provide suitable refuge habitat for both reptile and amphibian species.
Summary of Reach													
Is the Award Act met?	Y	N	N	N	N	Y	Y	N	Y	Y	Y	Y	Reach 2, 3, 4, 5 and 8 are all wider than the specified width in the Award Act, making them non-compliant.

6.3 Generic Recommendations

A number of designated sites could be negatively impacted as a direct result of any works carried out on the Wraysbury Drain. Table 6.2 details those sites at risk and lists the recommendations to safe guard these areas

Table 6.2 Designated Sites and associated recommendations

Level of Designation	Site Names	Recommendation
All	All	Implement EA PPG guidelines
International Designated Sites	SW London Waterbodies SPA and Ramsar site	Screening assessments for works with potential to impact the integrity of the site(s)
National Designated Sites	Wraysbury and Hythe End Gravel Pits (also part of SW London Waterbodies SPA) Wraysbury No.1 Gravel Pit (also part of the SPA)	Consult with NE Consult with NE
Local Designated Sites	The Wraysbury I Gravel Pit LWS, part of the Wraysbury No.1 Gravel Pit SSSI Wraysbury II Gravel Pit LWS part of the Wraysbury and Hythe End Gravel Pits SSSI Colne Brook LWS	As per SSSI. As per SSSI Consult with Local Wildlife Trust.

7 Conclusion

The Wraysbury Drain is referred to within the Wraysbury Award Act 1799 as one of the public drains for which the Award Act specifies conditions that are to be maintained by the Surveyor of Highways. For the Wraysbury Drain, the minimum width at surface water level was specified to be 2.4m, with the minimum ditch bed width being 0.9m.

The field survey resulted in the Wraysbury Drain being divided into eight reaches and four spot check locations, which have been clearly described to provide the contemporary baseline conditions. Following this a series of recommendations have been developed to ensure the Wraysbury Drain is in line with the Award Act; although this may have been applicable at the time of the Act, the use of the drain has changed over the years and may no longer be suitable. There are a number of legally protected ecological receptors that are within close proximity to the site and as a result, would need to be considered prior to any permanent works or maintenance.

The recommendations provided for the Wraysbury Drain have been subdivided into four categories: Riparian Corridor and In-channel Vegetation, Channel Features and Ecological Constraints. For each reach the appropriate recommendations have been highlighted. The following are the key recommendations for the Wraysbury Drain that should be prioritised over and above those provided in the report:

- **All reaches:** Further investigation into low flows in the Wraysbury Drain, including recent development of gravel pits in the upstream reaches.
- **All reaches:** Removal of silt within the channel through techniques such as dredging.
- **Reaches 2 and 8:** Riparian corridor maintenance, primarily riparian thinning to reduce shading of the channel.
- **Reaches 3, 5 and 7:** In-channel maintenance works and encouraging native species planting in local gardens. Tree planting in local residents land would provide shade, reducing the density of in-channel vegetation growth.

8 Glossary and Abbreviations

Abbreviation	Definition
AA	Appropriate Assessment
BAP	Biodiversity Action Plan
BCT	Bat Conservation Trust
EA	Environment Agency
EC	European Commission
EU	European Union
GCN	Great Crested Newt
HRA	Habitats Regulation Assessment
HSI	Habitat Suitability Index
LNR	Local Nature Reserve
LWS	Local Wildlife Site
MAGIC	Multi-Agency Geographical Information for the Countryside
NBN	National Biodiversity Network
NE	Natural England
NERC	Natural Environment and Rural Communities
NNR	National Nature Reserve
NPPF	National Planning Policy Framework
RBMP	River Basin Management Plan
RBWM	Royal Borough of Windsor and Maidenhead
SAC	Special Area of Conservation
SPA	Special Protection Area
SSSI	Special Site of Scientific Interest
TVERC	Thames Valley Environmental Records Centre
WFD	Water Framework Directive

Terminology	Definition
Berm	An adjustment feature in a channel, perhaps in response to over-widening when deposition occurs to form a berm (may become colonized by vegetation)
Deposition	Laying down of part, or all, of the sediment load of a stream on the bed, banks or floodplain. Mostly occurs as high flows recede. The process forms various sediment features such as bars, berms and floodplain deposits
Ecological status	The overall ecological status assessed by a number of different quality elements that represent indicators of ecological quality of the water body
Erosion	Removal of sediment or bedrock from the bed or banks of the channel by flowing water. Mostly occurs during high flows and flood events. Forms various river features such as scour holes and steep outer banks
Floodplain	A floodplain is flat or nearly flat land adjacent to a stream or river, stretching from the banks of its channel to the base of the enclosing valley walls and (under natural conditions) experiences flooding periods of high discharge
Flow types	Varying hydraulic patterns such as runs, glides, unbroken standing waves and broken standing waves
Geomorphology	The study of landforms and the processes that create them

Pressure	The influence or effect of something, for example land use pressure that causes a change. Pressures include morphological alterations, abstraction, diffuse source pollution, point source pollution and flow regulation
Reach	A length of channel which, for example, may have a homogeneous (similar) geomorphology (river type) or restoration solution
Riparian zone	Strip of land along the top of a river bank. Plant communities along the river banks are often referred to as riparian vegetation
Side bar	Area of deposition at the channel margins
Tributary	A stream or river which flows into a larger river. A tributary does not flow directly into the sea
Water body	Discrete section of a river, groundwater area, lake or coast that is a defined management unit under the WFD.
Woody debris	Woody debris includes logs, sticks, branches, and other wood that falls into streams and rivers. This debris can influence flow and the shape of the stream channel

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Appendix A TVERC Records

Due to file size, these records will be available upon request as a separate document.

Appendix B SSSI Citations

File Reference: TQ/07-1

County: Surrey **Site Name:** Staines Moor

District: Spelthorne

Status: Site of Special Scientific Interest (SSSI) notified under Section 28 of the Wildlife and Countryside Act 1981

Local Planning Authority: Spelthorne Borough Council

National Grid Reference: TQ 040730 **Area:** 513.6 (Ha) 1269.1 (Acres)

Ordnance Survey Sheet: 1:50,000 : 176 1:10,000: TQ 07 SW, NW, SE

Date Notified (Under 1949 Act): 1955 **Date of last Revision:** 1975

Date Notified (Under 1981 Act): 1984 **Date of last Revision:** -

Reasons for Notification:

The site chiefly consists of Staines Moor, a semi-natural stretch of the River Colne which flows through it, and three adjacent reservoirs. Staines Moor represents the largest area of alluvial meadows in Surrey and supports a rich flora while the reservoirs hold nationally important populations of wintering wildfowl. A pond at the site carries an aquatic flora which is of national importance; this flora includes one plant which is extremely rare in Britain.

The alluvial deposits of Staines Moor Poyle meadows (TQ 033753) and Shortwood Common (TQ 048717) lie above river sands and gravels. There is great variation in terrain and drainage and the alluvial meadows are consequently an intricate juxtaposition of a wide range of grassland types. Several plant species which have a restricted distribution in Surrey are present in the meadows. In addition to the River Colne and the reservoirs open water habitats are represented by a small stretch of the River Wraysbury and by open ditches and ponds. A belt of scrub, flanked by rough grassland lines the old railway embankment in the west of the site and woodland is present in places. Wintering wildfowl and wading birds use Staines Moor as an alternative ground to the reservoirs and a number of birds breed on the moor.

The alluvial meadows have not been subject to intensive agricultural use in recent years; this factor, combined with the large size of the meadows and the richness diversity of their flora, is responsible for the importance of these grasslands to wildlife. The plant communities of the alluvial meadows are complex but range from dry grassland dominated by red fescue *Festuca rubra*, sweet vernal grass *Anthoxanthum odoratum*, bent grass *Agrostis capillaris* an sheep's sorrel *Rumex acetosella* to wet communities with marsh fox-tail *Alopecurus geniculatus*, tussock grass *Deschampsia cespitosa,* hard rush *Juncus inflexus* and floating sweet-grass *Glyceria fluitans.* Depressions with a permanently high water table occur throughout the meadows and support a fen-type flora with reed sweet-grass *Glyceria maxima,* reed canary-grass *Phalaris arundinacea* and yellow flag *Iris pseudacorus.* These alluvial meadows support one plant which is uncommon in Britain: small water-pepper *Polygonum minus.* Several other plants which occur are uncommon in the County, these include brown sedge *Carex disticha,* southern marsh orchid *Dactylorhiza praetermissa*, marsh stitchwort *Stellaria*

palustris, strawberry clover *Trifolium fragiferum*, marsh arrowgrass *Triglochin palustris*, meadow rue *Thalictrum flavum* and upright chickweed *Moenchia erecta*. Three other plants which are scarce in Surrey occur on Shortwood Common, these are wormwood *Artemisia absinthium* wild clary *Salvia verbenaca* and Bermuda grass *Cynodon dactylon.*

Scrub on the old railway embankments consists of hawthorn *Crataegus monogyna*, sallow *Salix cinerea,* birch *Betula pendula* and pedunculate oak Quercus robur. The adjacent rough grassland is dominated by cocksfoot Dactylis glomerata, tall fescue *Festuca arundinacea*, tussock grass *Deschampsia cespitosa* and thistles.

Woodland is present along Bonehead ditch and at the southern end of the old railway; these woodlands consist of crack willow *Salix fragilis,* sycamore *Acer pseudoplatanus,* birch and pedunculate oak. Mature hedgerows of hawthorn, oak and crack willow line the drains south of Lower Mill Farm (TQ 035741) and are present in Poyle meadows.

The areas of open water support a rich and varied flora. The rivers carry stands of tall fen vegetation with common reed *Phragmites australis*, rushes *Juncus* species and yellow flag *Iris pseudacorus*. Water crowfoot *Ranunculus peltatus,* an uncommon plant in Surrey, occurs in this stretch of the River Colne. The ditch flora includes stands of tall fen vegetation and small aquatic plants such as arrowhead *Sagittaria sagittifolia,* water-cress *Rorippa nasturtium-aquaticum* and thread-leaved water-crowfoot *Ranunculus trichophyllus.* The ponds carry a tall fen flora which includes common reed, rushes, yellow flag, trifid bur-marigold *Bidens tripartita* and great reedmace *Typha latifolia*; plants of open water which are present include white waterlily *Nymphaea alba*, water fern *Azolla filiculoides* and water-starworts *Callitriche* species. A number of uncommon plants occur in the ponds at this site including one of only three known British localities of the brown galingale *Cyperus fuscus.*

Other plants which have a restricted distribution nationally are orange foxtail grass *Alopecurus aequalis,* needle spike-rush *Eleccharis acicularis* and sharp-leaved pondweed *Potamogeton acutifolius*. Several other aquatic plants are scarce in Surrey including sweet flag *Acorus calamus,* alternate-flowered water-milfoil *Myriophyllum alterniflorum* and greater bladderwort *Utricularia vulgaris.* Although the flora of the reservoirs is of limited interest their large expanse of open water and the bare muds on their margins provide the ideal habitat for some birds, particularly wildfowl and waders.

The reservoirs carry over 1% of the total British wintering populations of tufted duck, pochard, goosander and shoveler; the numbers of shoveler are also internationally significant. Other birds which winter on the reservoirs in large numbers include wigeon, teal, garganey, goldeneye and great crested grebe. Staines Moor regularly supports a large flock of wintering golden plover and redshank, ruff, snipe and dunlin are other wading birds which travel between the moor and the reservoirs in winter. In recent years Staines Moor has carried up to six wintering short-eared owls and other raptors, such as buzzard and hen harrier, have been recorded on passage. Birds which regularly breed on Staines Moor include yellow wagtail, lapwing and meadow pipit. In all 130 species of bird have been recorded from the site in recent years.

Although Staines Moor has not been well studied for invertebrates it does support the oldest known anthills of *Lasius flavus* in Britain; some of these anthills are estimated to be 180 years old and they have considerable research value. In addition over sixty species of

mollusc have been recorded from the meadows and ditches while the areas of open water and fen support several species of dragonfly.

County:	Berkshire	**Site Name:**	Wraysbury No. 1 Gravel Pit
District:	Royal Borough of Windsor and Maidenhead		
Status:	Site of Special Scientific Interest (SSSI) notified under Section 28 of the Wildlife and Countryside Act 1981 (as amended)		
Local Planning Authority:	Windsor and Maidenhead Borough Council		
National Grid Reference:	TQ 004745	**Area:**	57.75 ha
Ordnance Survey Sheet:	1:50,000 176	1:10,000:	TQ 07 NW
Date Notified (under 1949) Act:	Not applicable		
Date of Last Revision:	Not applicable		
Date Notified (under 1981) Act:	26 October 1999		
Date of Last Revision:	Not applicable		

Reasons for Notification:

Wraysbury No 1 Gravel Pit is of national importance for wintering gadwall *Anas strepera.*

General Description:

Shoveler *Anas clypeata* goldeneye *Bucephala clangula* and smew *Mergus albellus* are regular winter visitors in small but significant numbers.

The site is also locally important for other wintering bird species including great crested grebe *Podiceps cristatus* cormorant *Phalacrocorax carbo* pochard *Ahthya farina* tufted duck *Aythya fuligula* and coot *Fulica atra.*

The pit was excavated in the 1950s and is now almost fully mature, with most of the lake margins dominated by trees and scrub. In a few places there are still small areas of neutral grassland containing such species as common knapweed *Centaurea nigra* bird's-foot trefoil *Lotus corniculatus* meadow vetchling *Lathyrus pratensis* and wild carrot *Daucas carota.*

The woodland and scrub surrounding the gravel pits support a range of woodland birds including hobby *Falco subbuteo* garden warbler *Sylvia borin* treecreeper *Certhia familiaris* and great spotted woodpecker *Dendrocopus major.*

COUNTY: BERKSHIRE **SITE NAME:** WRAYSBURY AND HYTHE END GRAVEL PITS

Status: Site of Special Scientific Interest (SSSI) notified under Section 28 of the Wildlife and Countryside Act 1981

Local Planning Authorities: Berkshire County Council, Windsor & Maidenhead Borough Council

National Grid Reference: TQ 014737

Ordnance Survey Sheet 1:50,000: 176 **1:10,000:** TQ 07 SW

Date Notified (Under 1981 Act): 3 July 1992 **Date of Last Revision:**

Area: 116.65 ha 288.24 acres

Description and Reasons for Notification

Wraysbury and Hythe End Gravel Pits comprise a mosaic of open water, islands, grassland, scrub and woodland within an area of former gravel extraction. The site supports nationally important numbers of three species of wintering wildfowl together with an important assemblage of breeding birds associated with open waters and wetland habitats. In addition the site supports two nationally scarce invertebrates and a number of locally uncommon plants.

The site, which incorporates four former gravel pits, lies within the floodplains of the River Thames and the Colne Brook. The unworked areas of the site comprise floodplain gravels and alluvium of the Quaternary period. The site also includes part of the Colne Brook.

The flooded gravel pits are structurally diverse with Wraysbury North pit having the most complex shoreline and a number of islands. Of note is the shingle bank in the north-east corner with a colonising ruderal community. Small areas of swamp and carr occur, dominated by common reed *Phragmites australis*, lesser pond-sedge *Carex acutiformis* and greater pond-sedge *C. riparia*. Aquatic species include the locally uncommon pondweed *Potamogeton pusillus*. Wraysbury South pit has a more regular shoreline with willow predominant along the banks and bulrush *Typha latifolia* and common reed occurring along the shores. The Hythe End pits have steep banks fringed with alder and crack willow *Salix fragilis*. Species occurring around the water's edge include the locally uncommon trifid bur-marigold *Bidens tripartita* and horned pondweed *Zannichellia palustris*.

The habitat west of the Colne Brook supports an area of scrub and damp grassland. The flora is rich, but secondary, having developed from alluvial material deposited on the site during construction of the Wraysbury Reservoir. Species found here include grass vetchling *Lathyrus nissolia*, spiked sedge *Carex spicata* and buckthorn *Rhamnus catharticus*.

As a consequence of its biological richness and structural diversity the site regularly supports more than 1% of the national populations of wintering tufted duck, gadwall and goosander. It is also important for the smew, holding a significant percentage of Britain's wintering population. The total number of all wintering wildfowl regularly exceeds 1,000 individuals at any one time. As well as being used for feeding and roosting, the site is also an important sheltered refuge, particularly for diving duck, within the complex of adjoining larger pits and reservoirs. Other species which frequent the site include pochard, goldeneye, wigeon and the introduced mandarin.

The range of habitats support an important assemblage of breeding bird species typical of lowland open waters and their margins. Shelduck and pochard breed along the pit margins, the banks attract kingfisher whilst passerines, such as the grasshopper warbler and reed warbler favour the Phragmites and scrub. The wet meadow area supports breeding redshank. The pits and their margins also have a rich invertebrate community which includes the nationally uncommon white-legged damselfly *Platycnemis pennipes* and two species listed in the British Red Data Book*, a riffle beetle *Oulimnius major* and a caddisfly *Leptocerus lusitanius*.

*The British Red Data Book is a listing of species judged to be endangered, vulnerable or under threat in Great Britain

COUNTY: SURREY **SITE NAME:** WRAYSBURY RESERVOIR

DISTRICT: SPELTHORNE DISTRICT

Status: Site of Special Scientific Interest (SSSI) notified under Section 28 of the Wildlife and Countryside Act 1981 as amended.

Local Planning Authority: Spelthorne District Council

National Grid Reference: TQ 025745 **Area:** 205.03 (ha.)

Ordnance Survey Sheet 1:50,000: 176 **1:10,000:** TQ 07 NW

Date Notified (Under 1949 Act): – **Date of Last Revision:** –

Date Notified (Under 1981 Act): 26 October 1999 **Date of Last Revision:** –

Reasons for Notification:
Wraysbury reservoir regularly supports nationally important numbers of wintering cormorant *Phalacrocorax carbo*, great crested grebe *Podiceps cristatus* and shoveler *Anas clypeata*.

Description:
Wraysbury Reservoir is an artificially embanked reservoir constructed around 1970. The reservoir also support notable numbers of wintering gadwall *Anas strepera*.

Appendix C List of Potentially Damaging Operations to SSSI

Operations likely to damage the special interest

Site name: Wraysbury and Hythe End Gravel Pits, Berkshire

OLD1004168

Ref. No.	Type of Operation
1	Cultivation, including ploughing, rotovating, harrowing, and re-seeding.
2	Grazing.
3	Stock feeding.
4	Mowing or other methods of cutting vegetation.
5	Application of manure, fertilisers and lime.
6	Application of pesticides, including herbicides (weedkillers).
7	Dumping, spreading or discharge of any materials.
8	Burning.
9	The release into the site of any wild, feral or domestic animal*, plant or seed.
10	The killing or removal of any wild animal*, including pest control.
11	The destruction, displacement, removal or cutting of any plant or plant remains, including tree, shrub, herb, hedge, dead or decaying wood, moss, lichen, fungus, leaf-mould or turf.
12	Tree and/or woodland management+.
13a	Drainage (including the use of mole, tile, tunnel or other artificial drains).
13b	Modification of the structure of pits or watercourses (eg rivers, ditches, drains), including their banks and beds, as by re-alignment, re-grading and dredging.
13c	Management of aquatic and bank vegetation for drainage purposes.
14	The changing of water levels and tables and water utilisation (including irrigation, storage and abstraction from existing water bodies and through boreholes).
15	Infilling of ditches, drains, ponds, pools, marshes or pits.
16a	Freshwater fishery production and/or management, including sporting fishing and angling.
20	Extraction of minerals, including peat, shingle, sand and gravel, topsoil, subsoil, chalk and spoil.
21	Construction, removal or destruction of roads, tracks, walls, fences, hardstands, banks, ditches or other earthworks, or the laying, maintenance or removal of pipelines and cables, above or below ground.
22	Storage of materials.
23	Erection of permanent or temporary structures, or the undertaking of engineering works, including drilling.
24	Modification of natural or man-made features and infilling of pits and quarries.
26	Use of vehicles or craft likely to damage or disturb features of interest.
27	Recreational or other activities likely to damage features of interest.
28	Game and waterfowl management and hunting practices.

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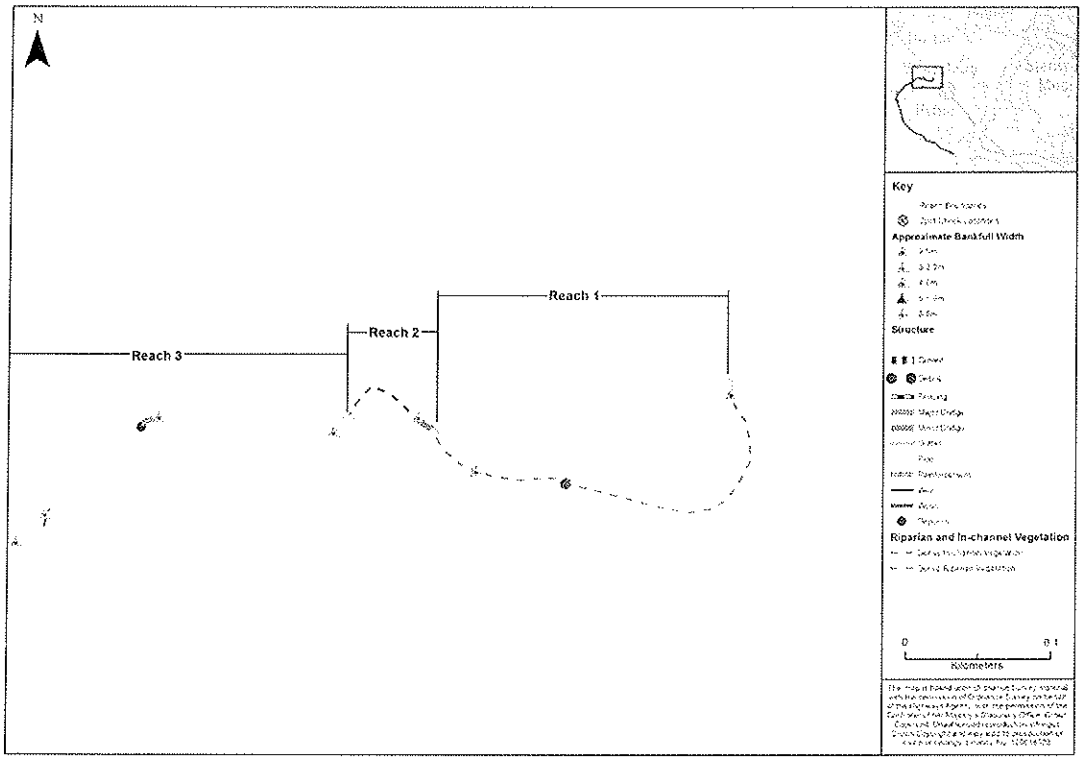
* 'animal' includes any mammal, reptile, amphibian, bird, fish or invertebrate.

\+ including afforestation, planting, clear and selective felling, thinning, coppicing, modification of the stand or underwood, changes in species composition, cessation of management.

Appendix D Reach Plans



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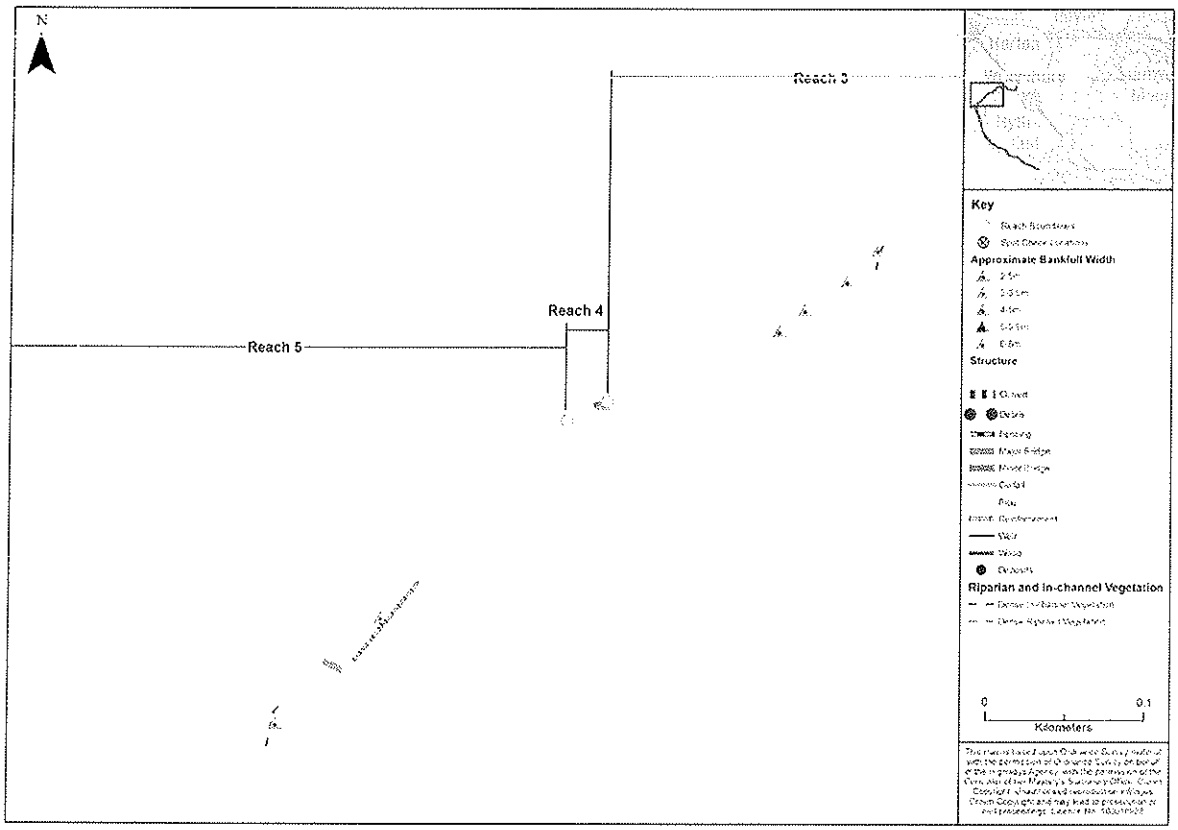
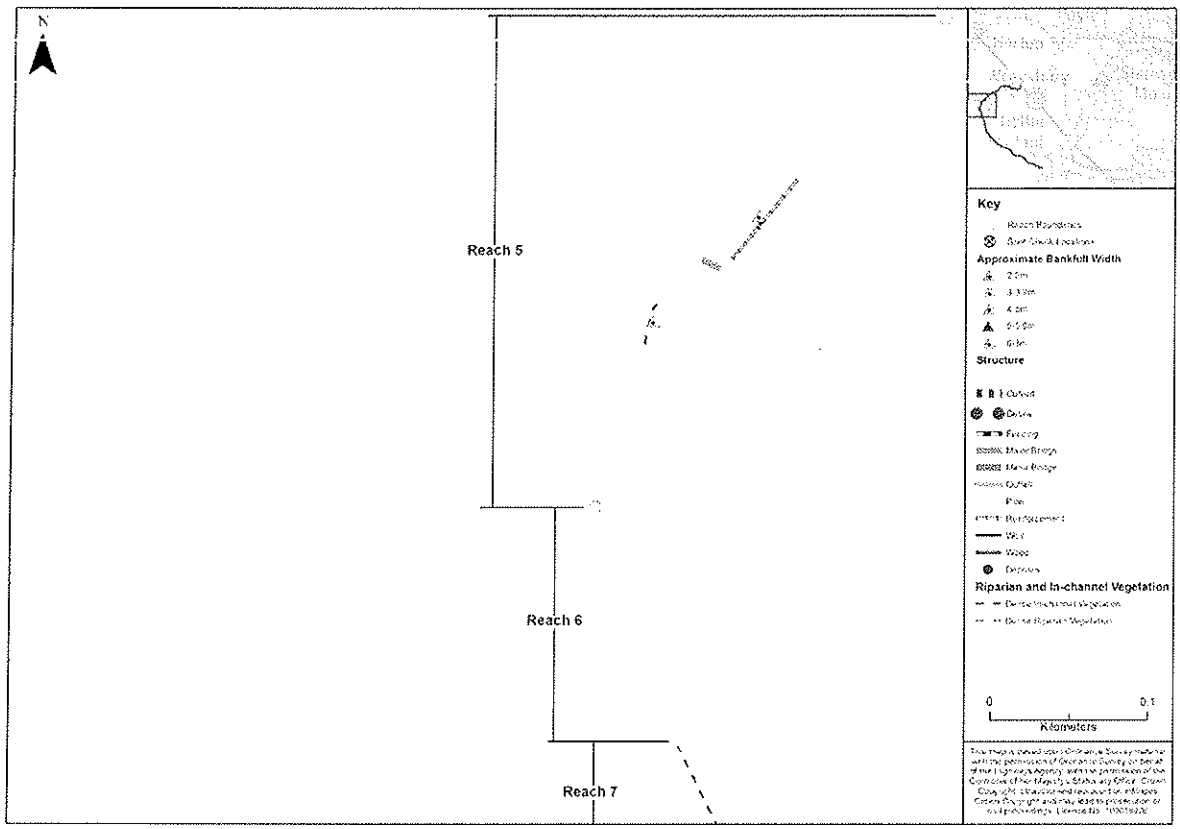

N
Reach 3
Reach 4
Reach 5
Key
Approximate Bankfull Width
Structure
Riparian and in-channel Vegetation
0
0.1
Kilometers

JACOBS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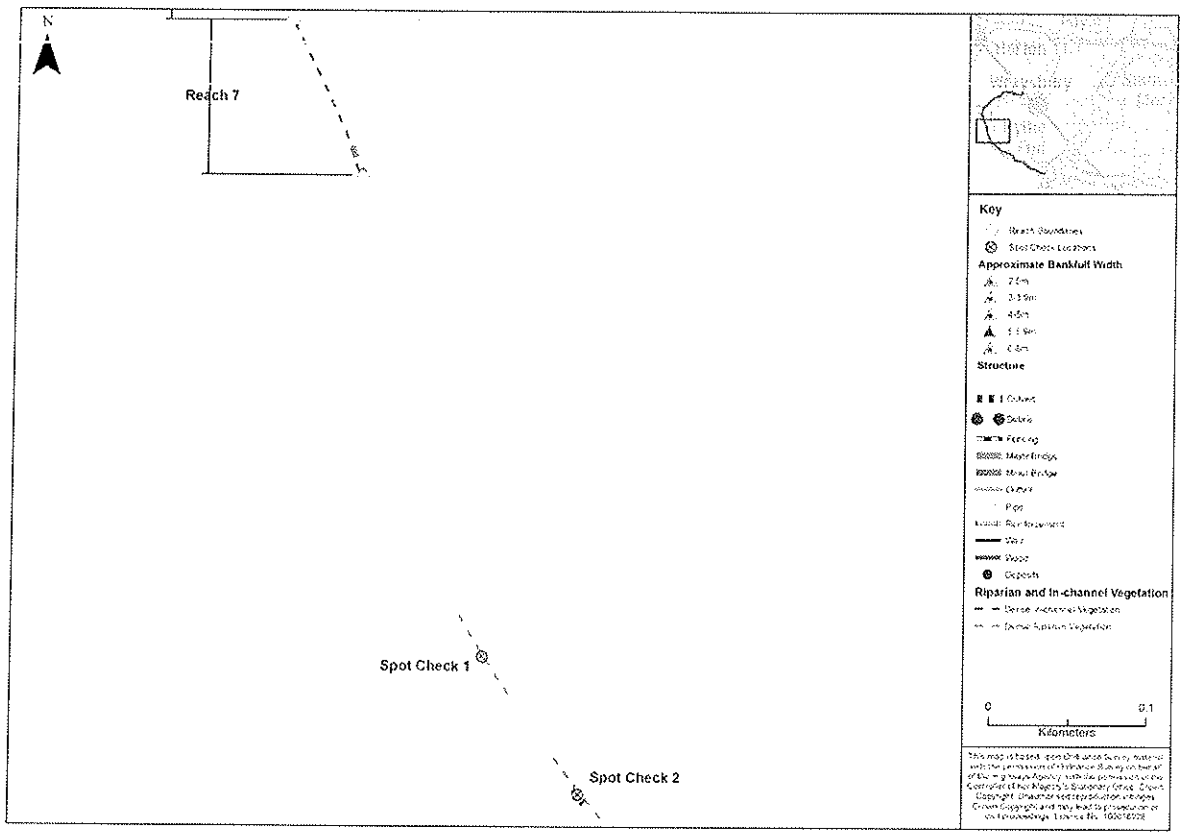
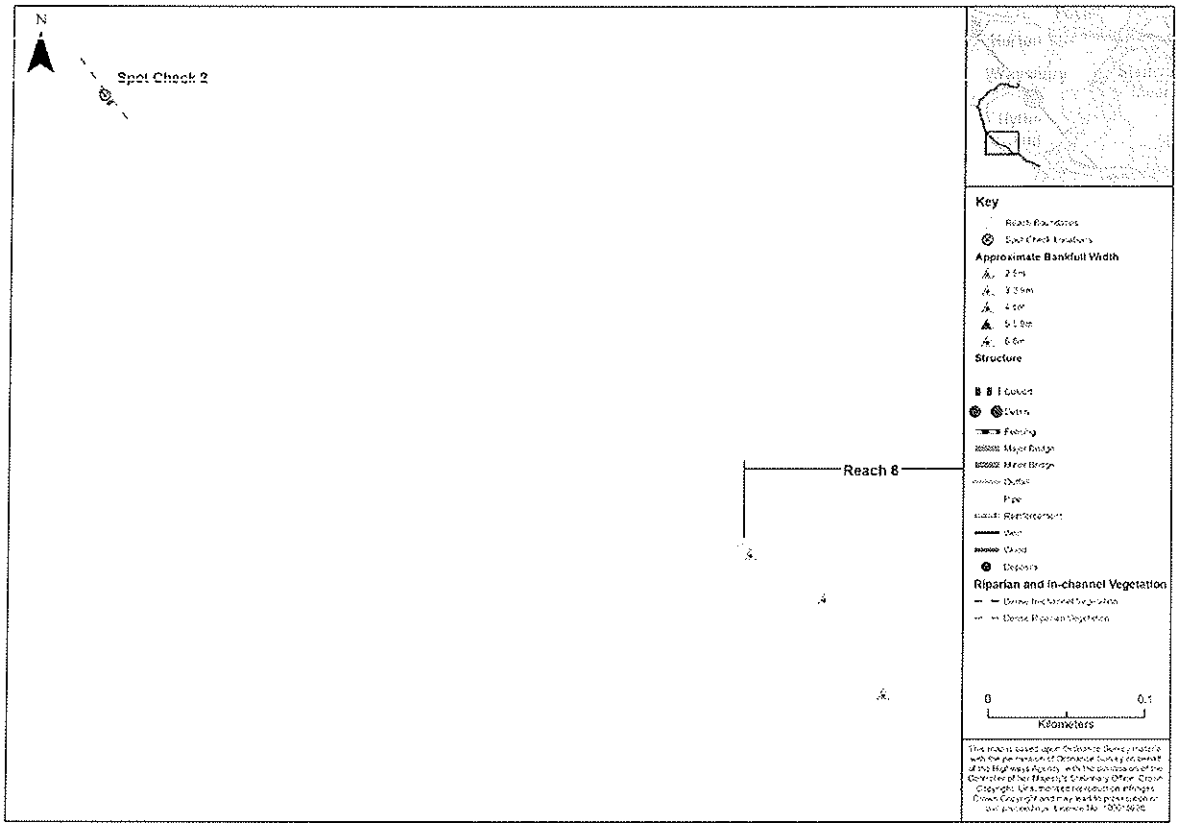
Reach 5
Reach 6
Reach 7
Key
Approximate Bankfull Width
Structure
Riparian and In-channel Vegetation
0
0.5
Kilometers

JACOBS


N
Reach 7
Spot Check 1
Spot Check 2
Key
Approximate Bankfull Width
Structure
Riparian and In-channel Vegetation
0
0.1
Kilometers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Spot Check 2
Reach 8
Key
Approximate Bankfull Width
Structure
Riparian and in-channel Vegetation
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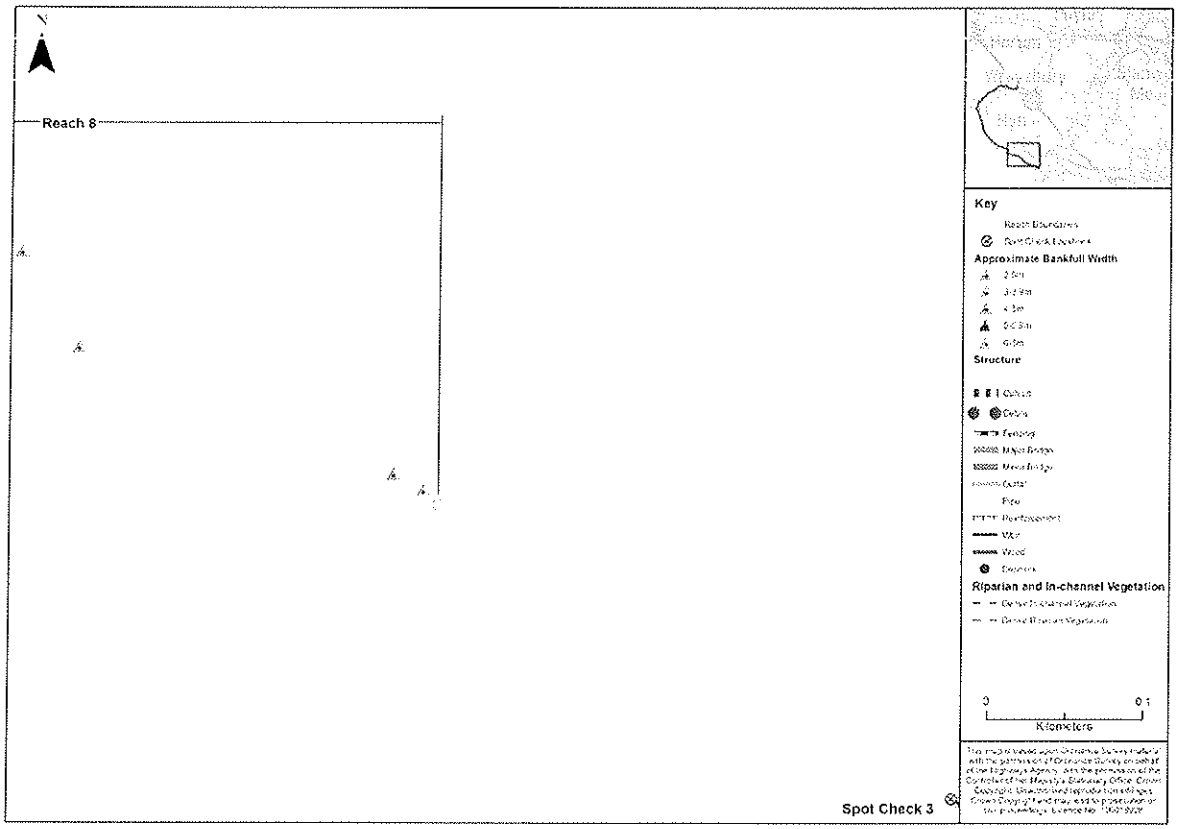
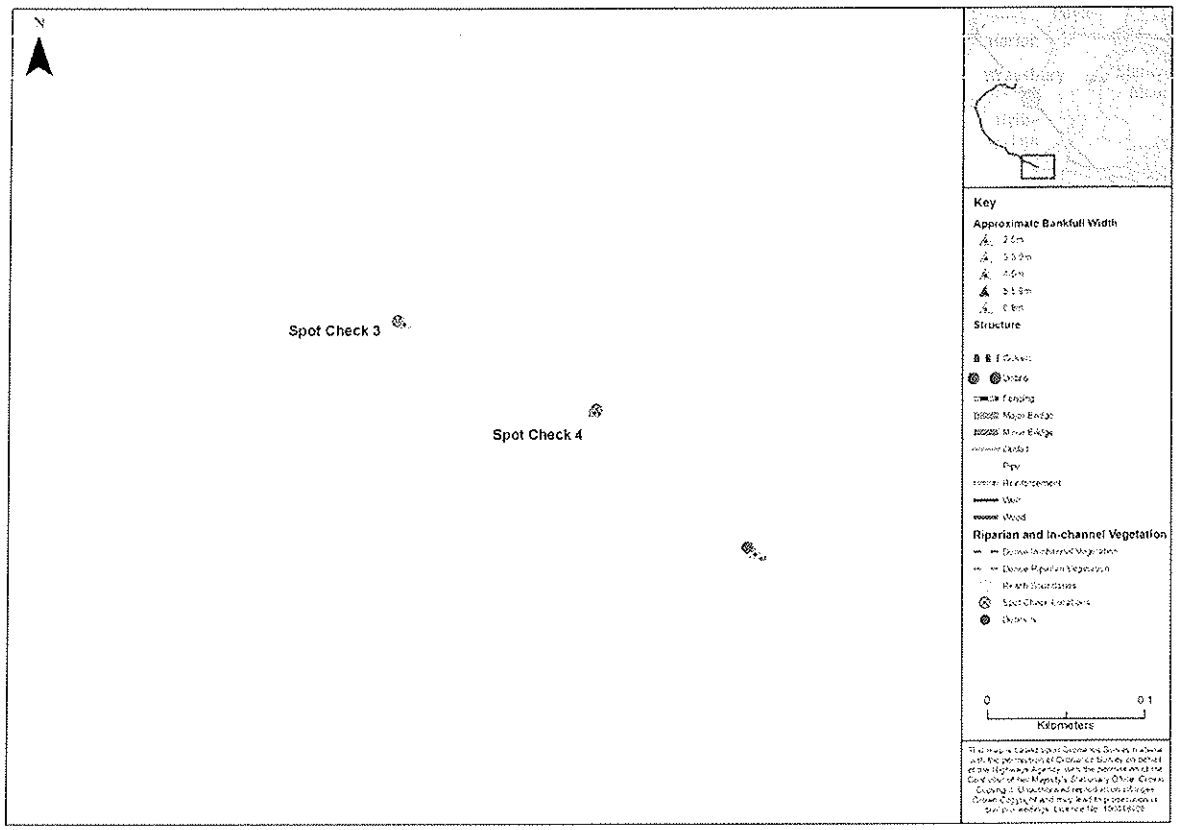
0.1
Kilometers


Reach 8
Spot Check 3
Key
Approximate Bankfull Width
Structure
Riparian and In-channel Vegetation
0
0.1
Kilometers

JACOBS


N
Spot Check 3
Spot Check 4
Key
Approximate Bankfull Width
Structure
Fencing
Major Bridge
Minor Bridge
Pipe
Wall
Weed
Riparian and In-channel Vegetation
0
0.1
Kilometers