

# **A14 Cambridge to Huntingdon improvement scheme**

## **Environmental Statement**

### **Appendices**

#### **Appendix 11.3: Freshwater fish**

Date: December 2014

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## Executive summary

This report is an appendix of the *A14 Cambridge to Huntingdon improvement scheme environmental statement (ES)*. It presents an evaluation of freshwater fish based on recent surveys. It also presents the policy and legislative context within which the environmental impact assessment (EIA) has been carried out. Likely significant effects on and mitigation for fish are considered in *Chapter 11 of the ES*.

Freshwater fish were surveyed in 2014 using guidance within the Environment Agency Code of Practice for electric fishing.

Six sites were identified from the scheme for freshwater fisheries surveys, one of which was not surveyed due to access issues. Twelve species, comprising a total of 793 individuals, were recorded from the five sites. Fish within the study area have been evaluated as district value, based upon the current *Water Framework Directive (WFD)* status for freshwater fish, historic freshwater fish records and the presence of species of conservation interest.

# 1 Introduction

- 1.1.1 This report is an appendix of the *A14 Cambridge to Huntingdon improvement scheme environmental statement (ES)*. It presents an evaluation of the status of fish based on a desk-based review of records of fish and field surveys. It also presents the policy and legislative context within which the environmental impact assessment (EIA) has been carried out. Likely significant effects on and mitigation for fish are considered in *Chapter 11 of the ES*.
- 1.1.2 This report presents the findings of the surveys for the scheme undertaken in 2013 and 2014.
- 1.1.3 The study included a desktop survey to search for records of fish and field survey to provide more detailed information. Study or search areas are described for different elements of the study.

## 2 Freshwater fish ecology

- 2.1.1 There is the potential for a diverse range of freshwater fish, including European eel (*Anguilla anguilla*) to be present within the survey area. This is due to a significant diversity of suitable freshwater fish habitat.
- 2.1.2 The distribution of freshwater fish within a watercourse may be influenced by the position of the site within the water catchment, availability of habitat, competition and interconnectivity of habitats for different life stages, flow diversity and volume, water quality, exploitation and barriers to migration.
- 2.1.3 It is likely that species of the *Cyprinidae* (carp) family will dominate the fish fauna from most riverine habitats. This diverse group of species utilise a wide range of habitat and flow types, tolerating variable physical and chemical variation and hydrological modification. Rheophilic species, which favour faster flow watercourses, such as brown trout (*Salmo trutta*), common dace (*Leuciscus leuciscus*) and barbell (*Barbus barbus*) are likely to inhabit smaller watercourse or those watercourses higher in the catchment whilst limnophilic species, which favour slow flow or still waterbodies e.g. roach (*Rutilus rutilus*), rudd (*Scardinius erythrophthalmus*), common bream (*Abramis brama*), and pike (*Esox lucius*) are constrained to mid to lowland river sections and slow flow types. There is often a degree of overlap in species distribution, whilst some species, such as perch (*Perca fluviatilis*) are ubiquitous to both general habitat types. Specific habitat utilisation will differ significantly between species, depending on life history and behaviour.
- 2.1.4 Three species of conservation interest known from the study area are the European eel, bullhead (*Cottus gobio*) and spined loach (*Cobitis taenia*).
- 2.1.5 The European eel is found in a variety of freshwater environments, often associated with softer sediment but also utilising rocks and woody debris to reside under. Eel are migratory, spending their adult lives in freshwater but returning to the sea to spawn. They are also known to be able to cross land in wet conditions to some degree. The likelihood of adult eels being present depends, in part, on connectivity through the catchment to allow the egress of adult eels and ingress of juveniles.
- 2.1.6 Spined loach are typically found in slow flowing rivers and drainage canals where they bury themselves in fine sands and silt sediments, often associated with dense growths of filamentous algae and other macrophytes. With limited means of dispersal communities are likely to be genetically isolated.
- 2.1.7 Bullhead occur in freshwater streams, rivers and lakes with hard stony substrates and shows a preference for fast flowing, shallow water bodies. This species is typically only found in clean, well oxygenated watercourses.

## 3 Policy and legislation

### 3.1 Legislation

- 3.1.1 Fish species are afforded protection under one or more of the following conservation legislative frameworks:
- *Council Directive (92/43/EEC) on the conservation of natural habitats and wild flora and fauna* (European Commission 1992) (the *Habitats Directive*);;
  - *Council Directive (2000/60/EC) on establishing a framework for Community action in the field of water policy*, (European Commission, 2000) (the *Water Framework Directive*);
  - *The Eel (England and Wales) Regulations 2009*;
  - *Salmon and Freshwater Fisheries Act 1975*; and
  - *Natural Environment and Rural Communities (NERC) Act 2006*.
- 3.1.2 Atlantic salmon (*Salmo salar*), bullhead, sea lamprey (*Petromyzon marinus*), river lamprey (*Lampetra fluviatilis*), brook lamprey (*Lampetra planeri*) and spined loach are all listed in *Annex II* of the *European Commission (EC) Habitats Directive* which requires the designation of Special Area of Conservation (SAC).
- 3.1.3 Atlantic salmon and river lamprey are also listed on *Annex V* of the *EC Habitats Directive* which lists species whose taking in the wild and exploitation may be subject to management measures.
- 3.1.4 Of these species, only spined loach and bullhead would be expected from the survey area. There are two SACs within Cambridgeshire for which spined loach are a primary reason for designation. The Ouse Washes Special Protection Area (SPA) is 9.3km to the north east of the scheme and the Fenland SAC is 10.4km to the north east. Barriers to migration and poor habitat quality will reduce the likelihood of other *Habitats Directive* qualifying species.
- 3.1.5 The *Habitats Directive* is transposed into UK law through *the Conservation of Habitats and Species Regulations 2010* (as amended).
- 3.1.6 The *Water Framework Directive (WFD)* aims to prevent the deterioration of ecological status of watercourses from existing conditions and put in place measures to ensure water-bodies reach “good ecological status” (or “good ecological potential in highly modified waterbodies”). Fish populations form one biological quality element which is routinely assessed to ensure no ecological deterioration.
- 3.1.7 European eel receives protection under *The Eel (England and Wales) Regulations 2009*, which outlines, amongst other factors, fishing closed season for eels, construction and alteration of in-channel obstructions, eel passes on existing structures and screening of intakes and outfalls.

- 3.1.8 All fish species receive protection under *the Salmon and Freshwater Fisheries Act 1975*. *The Salmon and Freshwater Fisheries Act* provides the framework for legislation relating to the input of polluting materials into watercourses, construction, alteration and removal of in-channel obstructions, closed season for fishing, licencing and enforcement.
- 3.1.9 Fifteen species of freshwater fish are listed as species of principal importance (*NERC Act 2006*). Of those cited species, only European eel, spined loach and brown trout might be expected to be present in the vicinity of the scheme. The watercourses within the study area may support other migratory species (salmon, lamprey species) however given the number of barriers to migration on the main stem catchments and poor habitat quality in the tributaries for these specialist species the likely incidence is very low.
- 3.1.10 *Section 40* of the *NERC Act 2006* places a statutory duty on public bodies to have regard to the conservation of biodiversity in England, when carrying out their normal functions (the biodiversity duty).

### **3.2 National planning policy framework**

- 3.2.1 *The National Planning Policy Framework (NPPF)* sets out the Government's view on how planners should balance nature conservation with development and helps ensure that Government meets its biodiversity commitments with regard to the operation of the planning system. The planning system should contribute to and enhance the natural and local environment by minimising impacts on biodiversity and providing net gains in biodiversity where possible. If significant harm resulting from a development cannot be avoided (through locating to an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused.
- 3.2.2 The *NPPF* states that the wider benefits of an ecosystem should be recognised and the presence of a protected species is a substantial consideration for a development proposal (*Circular 06/2005* (ODPM, 2005)). It is therefore considered essential that the presence of protected species and the extent that they may be affected by the proposed development is established in advance of a planning application in order that planning permission can be granted (*Planning Practice Guidance 2014*).
- 3.2.3 The draft *National Policy Statement (NPS) for National Networks* (Department for Transport, 2013) sets out the Government's vision and policy for the future development of nationally significant infrastructure projects on the national road and rail networks. It provides guidance for promoters of nationally significant infrastructure projects, the basis for the examination by the Examining Authority and for decisions by the Secretary of State. The *NPS* includes general principles for the assessment of biodiversity issues in relation to national networks, including for EIA.

### 3.3 Priority species

- 3.3.1 Species of principal importance for the conservation of biodiversity in England are listed under *Section 41* of the *NERC Act*. The *Section 41* list is used to guide decision-makers in public bodies, in implementing their biodiversity duty. The species listed are priorities for nature conservation action and therefore for consideration in impact assessment. Fourteen freshwater fish species are listed under *Section 41*.
- 3.3.2 The *UK Biodiversity Action Plan (UK BAP)* was the UK's response to the *Global Convention on Biological Diversity (CBD)* in 1992. It lists priority species and habitats that are identified as being the most threatened and require conservation action (JNCC, 2014). In 2012, the *UK Post-2010 Biodiversity Framework* (JNCC, 2012) succeeded the *UK BAP* and is the UK Government's response to a new strategic plan of the *CBD* which was published in 2010.
- 3.3.3 Much of the work previously carried out under the *UK BAP* is now focussed at a county level. However, the *UK BAP* lists of priority species and habitats remain important and have been used to draw up the *Section 41* statutory list.
- 3.3.4 *The Highways Agency Biodiversity Action Plan (HABAP)* lists priority species and habitats of the soft estate of England's trunk roads and motorways (excluding London). No freshwater fish species within the study area are a priority for conservation action as listed in the *HABAP*.
- 3.3.5 *Local BAPs (LBAPs)* integrate the conservation measures provided in the *UK BAP* to enhance biodiversity at the local and regional level. The *Cambridgeshire and Peterborough LBAP (2007)* is pertinent to the scheme (Cambridgeshire and Peterborough Biodiversity Partnership, 2014). The *Cambridgeshire and Peterborough LBAP* includes no fish species.

## 4 Methodology

### 4.1 Desktop survey

- 4.1.1 Freshwater fish data were requested from the Environment Agency for all watercourses within the study area and a 250m buffer zone on watercourses crossed by the scheme. Where limited data were available within the 250m buffer, further data were requested from a wider buffer zone on those watercourses crossed by the scheme or with the potential to receive road discharge. The search area for the desk top survey has been based on the professional judgement of suitably qualified and experienced specialists, in accordance with best practice guidance (CIEEM 2013).
- 4.1.2 In addition to freshwater fish data, current *WFD* classifications were also compiled. Classifications are developed by the Environment Agency, as competent authority in England, and determine the status of the biological quality elements (BQE), including fish. Only main watercourses are classified under the *WFD* and not all watercourses are classified for every BQE. For example, whereas the river Great Ouse, Swavesey Drain and Alconbury and Brampton Brooks are classified for fish, West Brook, Ellington Brook and Cottenham Lode are not. The absence of *WFD* classification for freshwater fish does not infer that these watercourses are of poor quality for freshwater fish, rather that fish are not the most appropriate BQE to detect change in the identified significant pressures on that watercourse. *WFD* classifications are available from the Environment Agency website (Environment Agency, 2014).
- 4.1.3 A database of incidental records of species of interest recorded by other surveyors on the scheme was reviewed for records of relevance to this report.

### 4.2 Field surveys

- 4.2.1 Six sites were identified from the whole scheme for freshwater fisheries survey (*Table 4.1*) following site walkovers on 2-4 December 2013 and 4-5 March 2014. Surveys of five sites (access to the sixth site was refused) were undertaken using *WFD* compliant electric fishing between 25 and 29 July 2014; see *Figure 11.3 of the ES*.
- 4.2.2 The proposed works would also cross the river Great Ouse. Given the extent of historical data for this watercourse, technical difficulties in undertaking quantitative sampling on such a large site and likelihood of clear span crossing of the watercourse, further surveys were scoped out of this watercourse. Sufficient data exist to enable an assessment on freshwater fish on this watercourse.

**Table 4.1: Electric fishing sites surveyed in July 2014 (\* non WFD designated waterbody)**

Watercourse	Site	Grid reference
Alconbury Brook	D/S footbridge	TL1924873197
Ellington Brook	0.85km U/S A1	TL1861871955
Covells Drain*	Conington Road	TL3327267103
Swavesey Drain	Thorpes Farm	TL3693966114
Cottenham Lode	Catchall Farm	TL4062562188

- 4.2.3 Freshwater fish were surveyed by carrying out three sampling runs of fishing a 100m indicative reach on each watercourse crossed by the scheme or potentially affected by drainage design. The catch depletion between runs allows an estimate of the population to be made. A 100m reach on each watercourse was isolated with stop nets and fished in an upstream direction. All fish encountered were removed from the watercourse and placed into recovery buckets. On completion of the three runs all fish were identified, measured (fork length to the nearest mm) and returned alive to the watercourse.
- 4.2.4 All electric fishing surveys were undertaken by accredited and experienced surveyors working to *the Environment Agency Code of Practice* and under fisheries consent *B/AC/12052014/C3*. Surveyors held membership of either the Institute of Fisheries Management (IFM) or Chartered Institute of Ecology and Environmental Management (CIEEM), had completed an Environment Agency-approved electric fishing course and were experienced in the methodology of the survey and fish husbandry.
- 4.2.5 During the survey a standardised field sheet was completed to include detail of channel and bank physical habitat (material of banks and substrates, flow types, physical processes, bank structure), riparian land use and potential sources of anthropogenic stress.
- 4.2.6 Physiochemical water quality data were also collected by means of a calibrated YSI probe. Water quality metrics include temperature (degrees Celsius), dissolved oxygen (percentage and mg/L), conductivity (mS/L), salinity (no units) and pH.
- 4.2.7 These data were used to support community level analysis of the freshwater fish data.

### 4.3 Evaluation

- 4.3.1 The population of fish within the study area was evaluated using *Guidelines for Ecological Impact Assessment in the United Kingdom* (Chartered Institute of Ecology and Environmental Management, 2006). This method is in line with the most recently published guidance *Interim Advice Note (IAN) 130/10, 'Ecology and Nature Conservation: Criteria for Impact Assessment'* (Highways Agency, 2010) and represents best practice guidance. The evaluation uses a framework linked to a geographical scale at which the receptor has been valued (i.e. international, national, regional, county, local or site).

## 4.4 Limitations

- 4.4.1 A survey can only assess the site as it was found at the time of the survey. Species may move in and out of the site at different times and habitats are subject to change. Whilst the results of this survey may no longer be fully representative of the site at the time of construction, nationally recognised standard survey methodologies have been used. 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.
- 4.4.2 A single run is required for *WFD* classification; however electric fishing efficiency can be variable dependent on operator skill, weather, conductivity of water, turbidity, macrophyte growth and flow velocity. Catch depletion surveys ensure a higher accuracy of population estimate, increase the likelihood of encountering species present in low abundance and quantify the efficiency of the methodology.
- 4.4.3 The Environment Agency, as custodians of the *WFD* compliant assessment tool for freshwater fish, do not make the tool available to external parties and therefore the 2014 data for this report has not been classified using the *WFD* tool.
- 4.4.4 Access was not provided to allow surveys on the West Brook and its tributaries. The potential impact on this watercourse was assessed using the professional judgement of suitably qualified and experienced specialists, as listed in *Appendix 6.1*.
- 4.4.5 At the time of survey the Swavesey Drain was heavily vegetated, reducing survey efficiency. As a result the Swavesey Drain could not be surveyed using a fully quantitative method.
- 4.4.6 The limitations to the surveys do not represent a significant constraint to adequately assessing the value of fish habitats for the purposes of undertaking an appropriate ecological impact assessment, with high confidence in the outcome. .
- 4.4.7 Likely significant effects on and mitigation for fish are considered in *Chapter 11 of the ES*.

## 5 Results

### 5.1 Desktop data and incidental records

5.1.1 Three of the watercourses crossed by the scheme have been classified for freshwater fish under the *WFD* (Table 5.1). The river Great Ouse and Swavesey Drain are classified as good quality for fish, indicating that the composition, abundance and age structure of fish communities show a slight deviation from reference condition, described as sites unaffected by human intervention, but are otherwise in a good condition.

**Table 5.1: Fisheries classifications for those *WFD* waterbodies within the study area (^ refers to ecological potential, rather than ecological status due to those watercourses being classified as highly modified).**

<i>WFD</i> water body	<i>WFD</i> reference	Fish classification
Alconbury and Brampton Brook	GB105033042790	POOR <sup>^</sup>
River Great Ouse	GB105033047921	GOOD <sup>^</sup>
Swavesey Drain	GB105033042770	GOOD
West Brook	GB105033042730	Not classified
Ellington Brook	GB105033042840	Not classified
Cottenham Lode	GB105033043320	Not classified

5.1.2 The Alconbury and Brampton Brook is classified as poor quality for fish, indicating a significant deviation from reference condition. The river Great Ouse and Swavesey Drain are reported as having slight deviation from reference condition and as such meet the criteria for good quality.

### 5.2 Environment Agency data

5.2.1 The Environment Agency data request returned data from 45 sites on the watercourses crossed by the scheme. Six sites fall within the study area and associated buffer zone, predominantly in the A1(M) section of the scheme (Figure 11.3 in Volume 2 of the ES). The freshwater fish community at each site within the study area is listed in Table 5.2.

5.2.2 The Environment Agency data indicates a mixed cyprinid community from the sites within the buffer zone. This is typified by the mix of both limnophilic (species favouring still or slow moving habitats) and rheophilic (species favouring fast flowing habitats) cyprinid species across the varying size watercourses.

5.2.3 The Environment Agency data includes records of bullhead, European eel and spined loach from watercourses within the scheme buffer zone, all of which receive protection under European and national legislation.

**Table 5.2: Fish species present at sites that fall within the 250m buffer associated with the scheme (\* indicate species of conservation interest).**

Environment Agency site (ref)	Grid reference	Fish species present
Hall Green and Diddington Brook (CAMS193)	TL3130768636	Nine-spined stickleback ( <i>Pungitius pungitius</i> ), three-spined stickleback ( <i>Gasterosteus aculeatus</i> ), chub ( <i>Leuciscus cephalus</i> ), dace, European eel*, minnow ( <i>Phoxinus phoxinus</i> ), perch ( <i>Perca fluviatilis</i> ), roach, rudd
River Great Ouse (CAM348)	TL2170068400	Bleak, chub, common carp, common bream ( <i>Abramis brama</i> ), dace, European eel*, gudgeon ( <i>Gobio gobio</i> ), pike, perch, roach, roach x bream hybrid, ruffe ( <i>Gymnocephalus cernua</i> )
Alconbury and Brampton Brooks (CAM422)	TL1930073200	Chub, dace, European eel*, gudgeon, perch, pike, roach.
Ellington Brook CAM404	TL1870071900	Chub, European eel*, perch, pike, stone loach ( <i>Barbatula barbatula</i> )
Ellington Brook CAM2030	TL1750071900	Chub, dace, European eel*, gudgeon, perch, pike, spined loach*, stone loach
Ellington Brook CAM2029	TL1780071900	Chub, European eel*, gudgeon, perch, pike, roach, stone loach

### 5.3 Incidental records

5.3.1 Eleven species of fish were recorded in data gathered during great crested newt (*Triturus cristatus*) surveys undertaken in 2013 and invertebrate sampling on riverine sites during 2014. Incidental records of fish can be seen in *Annex 1*. No ponds have been selected for freshwater fish assessment purposes.

5.3.2 A wide diversity of fish have been reported from still-waters and ditch habitats within the study area. With the exception of rainbow trout (*Oncorhynchus mykiss*) all the other freshwater fish species recorded would be expected from the wider environment. Rainbow trout, a non-native species, are species introduced into lakes for recreational angling.

### 5.4 Other data sources

5.4.1 The river Great Ouse has not been sampled as part of this study due in part to the proposed clear span crossing minimising potential impacts on the watercourse and the technical difficulties in accurately assessing a watercourse of this size.

- 5.4.2 A significant volume of historic literature exists on the freshwater fisheries interests of the river Great Ouse. It is neatly summarised by Garner (undated) who states: “*The Great Ouse drainage basin has one of the most diverse fish faunas found in the United Kingdom, owing to its historic connection to mainland Europe and a number of successful introductions.... The river is an important recreational fishery, although in recent years this appears to have declined, due to poor returns*”.
- 5.4.3 Studies quoted within Garner (undated) indicate a numerical dominance of roach within the main stem of the river Great Ouse, whilst the side tributaries are dominated by minnow. Reductions in fish diversity are attributed to habitat degradation and loss/fragmentation of suitable habitat, particularly for juvenile fish and a lack of suitable prey, resulting in slow growth patterns.

## 5.5 Field survey results

- 5.5.1 Field surveys were undertaken between 23 and 24 July 2014 on five water courses. *Table 5.3* reports the abundance and range of fish lengths recorded during the July 2014 survey.

**Table 5.3: Freshwater fish abundance and length range (in mm) at each survey site (July 2014).**

Common name	Alconbury Brook	Ellington Brook	Covells Drain	Swavesey Drain	Cottenham Lode
Three-spined stickleback	3 (28-34)	2 (26-29)		1 (30)	279 (15-58)
Nine-spined stickleback	8 (25-46)	3 (34-41)			25 (20-50)
Bullhead	19 (25-86)				
Chub				16 (44-185)	
European eel				5 (260-360)	
Perch			13 (61-169)	8 (51-125)	
Pike		1 (305)	6 (218-334)	2 (184-187)	1 (230)
Roach				6 (40-91)	
Ruffe				24 (68-118)	
Spined loach				2 (57-83)	
Stone loach	343 (21-87)	14 (31-80)			10 (61-79)
Tench ( <i>Tinca tinca</i> )				2 (112-145)	

- 5.5.2 Seven hundred and ninety-three individuals, representing 12 species, were recorded from the five sites. Three-spined stickleback was reported from four sites whilst seven species were recorded from a single site.

- 5.5.3 All five sites were characterised as being historically modified. In the context of the *Water Framework Directive* all but the Swavesey Drain are designated as highly modified. On site this was typified by steep banks heavily vegetated with tall herb, shrub and terrestrial grasses. An exception to this was Catchall Farm (Beck Brook/Cottenham Lode), which had heavy tree shading and largely woody cover on both banks, although it still demonstrated a level of modified bank structure.
- 5.5.4 All of the watercourses run through lowland arable fields and this is reflected in the significant macrophyte growth at three of the sites, potentially indicating nutrient enrichment. Shading at Catchall Farm and Conington Road (Covells Drain) prevented in-channel aquatic macrophyte or algal growth.

#### **Alconbury Brook**

- 5.5.5 The Alconbury Brook section lies close to the existing A1(M) and at the time of sampling was heavily vegetated along both banks, providing significant in-channel and marginal cover to fish species. Stone loach dominated the fish community and a number of age groups (based upon length) were observed. Stone loach were recorded throughout the reach, utilising the homogenous flows over the predominantly gravel bed. This section of the Alconbury Brook is dissimilar to the section immediately upstream, which is of slower stream energy, is wider, deeper and less vegetated. A spot check of these areas yielded five juvenile pike, although the habitat would be suitable for adult *Cyprinidae* fish. The site surveyed, although not directly representative of the wider catchment, was chosen as this section is likely to be directly affected by the scheme. A trash line was observed in marginal vegetation indicating recent high flows. No species of conservation interest were recorded during the survey however, European eel has previously been reported from Environment Agency monitoring.

#### **Ellington Brook**

- 5.5.6 The Ellington Brook flows east to west through arable land. The steep banks are densely vegetated with tall grasses and herbs, shading the margins of the channel. The gravel and silt channel bed are obscured by a thick layer of filamentous algae and marginal reeds. This section is representative of the wider watercourse. Low numbers of fish were reported from the Ellington Brook. Stone loach dominated through the upper 10m of the survey reach where the channel was more open and flows faster over clean gravel. Two species of stickleback and pike were recorded from the lower survey reach where the vegetation was denser and the marginal cover provided by overhanging trees and woody debris. Electric fishing efficiency is likely to have been reduced due to the high density of the macrophytes and algae encountered through the middle section of the watercourse.

- 5.5.7 No species of conservation interest were recorded during the survey however, European eel and spined loach have previously been reported from the Ellington Brook (Environment Agency monitoring). Following seasonal die back of aquatic vegetation it is expected that European eel will be able to migrate from the Alconbury Brook into and along the Ellington Brook. There are no obvious constraints (habitat, access, water quality or quantity) that would prevent eel from utilising the Ellington Brook.
- 5.5.8 Covells Drain, (sampled on Conington Road) is characteristic of a lowland drainage channel. Steep banks and glide/slack flow types support a poor fish community dominated by pike and perch. Both species presented multiple age classes but no smaller prey fish were observed to support these populations. The channel is shaded from continuous trees lining along the right bank. Occasional in-channel macrophyte growth is associated with shallow silt deposits that include fine gravel substrates, whilst the majority of the channel is a stable clay and gravel bed. The shallow silts act to isolate sections of the watercourse, preventing the free movement of fish under summer flow conditions. Under higher flows it is expected that these deposits will flood out allowing connectivity through to the wider catchment. No species of conservation interest were recorded during the survey although the habitats present would support European eel and they are expected to be present in the wider catchment.

#### **Swavesey Drain**

- 5.5.9 Swavesey Drain was sampled below the Thorpe Farm access track, where the artificial watercourses associated with the sewage treatment and industrial park join at the head of the Swavesey Drain. Downstream of the access track the Swavesey Drain becomes more sinuous in nature, flowing north through agricultural fields. At the time of survey the steep channel banks were highly vegetated, choking the channel and preventing efficient survey. Nine species of fish were reported from the Swavesey Drain, the majority associated with the culvert and a deeper pool above the access track which provides good habitat for chub, ruffe and European eel. Species of interest recorded from the Swavesey Drain include ruffe (limited distributions largely restricted to the east coast catchments of England), spined loach and European eel, the latter two being species of conservation interest. Small numbers of coarse fish, including roach and chub were reported from the Swavesey Drain. No evidence of impact is apparent from the sewage treatment work or industrial estate discharge. The presence of European eel and spined loach indicate connectivity to the wider catchment, especially under higher winter flows when local land owners indicate the channel may come out of bank (over 2m) to flood local fields. Connectivity during winter high flow events may provide increased opportunity for the movement of fish species whereas summer low flows and choking of the channel from macrophyte growth may act as an obstruction to migration or free movement.

### Cottenham Lode

- 5.5.10 The Beck Brook (Cottenham Lode) at Catchall Farm (immediately upstream of the A14) demonstrated low summer flows at the time of sampling. The channel is heavily shaded and the gravel and silt/clay bed exposed through 40% of the reach. Water in the channel was isolated into pools which were very shallow at the time of sampling, supporting high numbers of three-spined and nine-spined stickleback and a single pike. No species of conservation interest were recorded during the survey, however the watercourse would be expected to support European eel under high flow with improved connectivity to the wider catchment.

## 6 Evaluation

### 6.1 Overview

- 6.1.1 Freshwater fish were recorded from all of the sites surveyed, the species observed being typical of lowland freshwater environments.
- 6.1.2 Minnow, dace, rudd and gudgeon have all been previously recorded from Environment Agency routine fisheries monitoring. The absence of these species from the 2014 survey should not imply either the absence of these species from these watercourses, nor a deficiency in the survey process. Fish are highly mobile and may undertake localised movements within a catchment to utilise different habitats for feeding, breeding or seeking shelter in high or low flow events.
- 6.1.3 At the time of sampling dense marginal and in-channel macrophyte growth reduces the available aquatic resource for freshwater fish. Shoaling species may prefer open, deeper water and as such may undertake local migration through the watercourse to preferential habitats. It is expected that these species may be present within the survey reaches under higher flow conditions or when heavy channel choking diminishes.
- 6.1.4 Factors affecting freshwater fish *WFD* status or potential are likely to include physical habitat modification (for flood defence, land drainage, water storage, supply and abstraction) and diffuse water quality (Environment Agency, 2009).
- 6.1.5 The observed *WFD* classifications for freshwater fish relate to the whole waterbody and as such may not be specific to the watercourse as surveyed. Classifications should be used with this consideration when evaluating receptor value in proximity to the scheme.

### 6.2 Species of conservation interest

- 6.2.1 European eel and spined loach were only observed on the Swavesey Drain, whilst bullhead were restricted to the Alconbury Brook. Historic data shows both European eel and spined loach have a wider distribution than suggested in the 2014 study data with the former previously having been recorded in Environment Agency monitoring on the Alconbury Brook.
- 6.2.2 Bullhead have not previously been recorded from watercourses within the study area but the Environment Agency have recorded this species from catchments outwith the study area.
- 6.2.3 Spined loach has been recorded from the Ellington Brook and Swavesey Drain. Neither of these watercourses are designated as one of five UK SACs (JNCC, undated a) for spined loach. The nearest SAC for which spined loach are a primary qualifying feature is the river Great Ouse (specifically Counter Drain) which lies to the north east of Huntingdon.
- 6.2.4 Given that spined loach do not undertake migrations it is unlikely that these two populations are connected. Spined loach favour clean silt in slow flowing rivers and drainage canals (Maitland and Herdson, 2010) and in late summer associate with dense filamentous algae beds (Wheeler, 1998) and submerged macrophytes.

- 6.2.5 Spined loach are important due to their specific habitat requirements, leading to populations often becoming genetically isolated from other populations. Isolation of populations is likely to have resulted from habitat degradation, pollution events or localised barriers to movement.
- 6.2.6 European eel have been recorded from all *WFD* watercourses crossed by the scheme with the exception of the Cottenham Lode and West Brook (the latter having not been assessed). A wider distribution of European eel may have been expected from the scheme area, with suitable habitat, previous records and limited obvious constraints indicating the potential for this species.
- 6.2.7 European eel are migratory in nature (including short overland migrations) and would be expected to utilise all watercourses connected to the river Great Ouse catchment. Incidental records from great crested newt surveys indicate the presence of European eel in offline ponds within the buffer zone.
- 6.2.8 Bullhead were reported from the shallow section of the Alconbury Brook. This watercourse is not designated as one of the UK SACs for which bullhead are a qualifying feature (JNCC, undated b). Bullhead favour fast-flowing, clear shallow water with a relatively coarse substrate, and are commonly associated with the headwaters of upland streams. This species may also be found in lowland rivers demonstrating well-oxygenated water with sufficient cover (rocks and large stones and dense weed beds) (Wheeler, 1998).

### 6.3 Evaluating freshwater fish

- 6.3.1 Using the CIEEM guidance on *Ecological Impact Assessment 2009*, freshwater fish have been evaluated as district value. Those watercourses not containing species covered by national or European legislation would be evaluated as local value in the absence of species of conservation value. Given the potential for migratory species to enter these watercourses under more preferential conditions, and the requirement for similar habitats between typical fisheries communities and those of conservation interest it is deemed appropriate to evaluate freshwater fish as a community as of district value.
- 6.3.2 Historic data has not been assessed to evaluate freshwater fish as a receptor on all watercourses, including those where survey work was not undertaken (such as on the West Brook or river Great Ouse). However, it is not likely that watercourses not individually assessed will differ significantly from those that have been.
- 6.3.3 The recorded presence or strong likelihood of European eel (designated under the *NERC Act 2006*) in all watercourses, is important in evaluating the fish population.
- 6.3.4 The presence of both spined loach and bullhead are also an important consideration. This area of Cambridgeshire represents some of the most important habitat for spined loach. The isolated nature of the remaining populations suggests that those individuals sampled during the 2014 survey work may represent a small, but important population.

**Table 6.1: Evaluation and justification of freshwater fish receptor on waterbodies within the scheme buffer zone.**

Watercourse	Evaluation	Justification
Cock Brook	District	European eel recorded in Environment Agency data.
Alconbury Brook	District	Bullhead recorded in J2A data, European eel and spined loach recorded in Environment Agency data.
Ellington Brook	District	European eel and spined loach recorded in Environment Agency data.
River Great Ouse	District	<i>WFD</i> good status, European eel in Environment Agency data.
West Brook	District	European eel recorded in Environment Agency data.
Swavesey Drain	District	<i>WFD</i> good status, European eel and spined loach in J2A data, European eel in Environment Agency data
Covells Drain	District	Potential for European eel.
Cottenham Lode	District	Potential for European eel.

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## Annex 1: Full survey data

**Table A.1.1: Desktop and incidental records for freshwater fish (\*indicates species of conservation interest)**

Common name	Date	Grid reference	Source
Three-spined stickleback ( <i>Gasterosteus aculeatus</i> )	22/07/14	TL4185862084	2014 J2A
	23/07/14	TL1918473990	Aquatic invertebrate
Chub ( <i>Leuciscus cephalus</i> )	23/04/13	TL3820263962	2013 GCN
European eel* ( <i>Anguilla anguilla</i> )	07/05/13	TL4802362123	2013 GCN
	23/04/13		
	13/05/13	TL3820263962	
	28/05/13		
Minnow ( <i>Phoxinus phoxinus</i> )	13/06/13	TL4307461017	2013 GCN
Perch ( <i>Perca fluviatilis</i> )	24/04/13	TL4492161919	2013 GCN
Pike ( <i>Esox lucius</i> )	23/04/13	TL3860363672	2013 GCN
	02/05/13		
	13/05/13		
	28/05/13		
	23/04/13	TL3820263962	
	02/05/13		
Rainbow trout ( <i>Oncorhynchus mykiss</i> )	12/06/13	TL4015461717	2013 GCN
Roach ( <i>Rutilus rutilus</i> )	23/04/13	TL3860363672	2013 GCN
	28/05/13	TL3820263962	
	23/04/13		
Rudd ( <i>Scardinius erythrophthalmus</i> )	25/04/13	TL4240061093	2013 GCN
	01/05/13	TL3820263962	
	13/05/13		
	28/05/13		
	13/05/13	TL3860363672	

Common name	Date	Grid reference	Source
Stickleback spp.	25/04/13	TL4674561775	2013 GCN
	29/04/13		
	01/05/13	TL4322261691	
	25/04/13	TL4162360934	
	01/05/13		
	08/05/13		
	03/06/13		
	13/05/13	TL4161960949	
	21/05/13		
	25/04/13	TL4144661484	
	01/05/13		
	08/05/13		
	03/06/13		
	03/06/13	TL4113061804	
	30/05/13	TL4094460957	
	03/06/13		
23/04/13	TL3820263962		
Stone loach ( <i>Barbatula barbatula</i> )	23/07/14	TL1918473990	2014 J2A
	24/07/14	TL1924873197	Aquatic invertebrate