HIGHWAYS AGENCY

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A14 Cambridge to Huntingdon improvement scheme

Environmental Statement

Appendices

Appendix 11.2: Aquatic invertebrates

Date: December 2014

6.3

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Executive summary

This report is an appendix of the *A14 Cambridge to Huntingdon improvement scheme environmental statement (ES)*. This report presents an evaluation of aquatic invertebrates 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 aquatic invertebrates are considered in *Chapter 11 of the ES*.

Aquatic invertebrates were surveyed in 2013 and 2014 using standard methodologies taken from the *Council Directive (2000/60/EC) on a framework for the community action in the field of water policy* (European Union, 2000), referred to as the *Water Framework Directive* (*WFD*).

Ten sites were selected for study in 2014. Three of the sites lie within the A1 section of the scheme whilst the remaining sites were located on the main A14 improvement section. One notable species and a further three local species were identified from a total of five sites. Watercourses within the study area have been evaluated as local value for aquatic invertebrates.

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 aquatic invertebrates based on a desk-based review of records of aquatic invertebrates 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 aquatic invertebrates are considered in *Chapter 11 of the ES*.

1.1.2 This report presents the findings of the aquatic invertebrate surveys for the scheme undertaken in 2013 and 2014.

1.1.3 The study included a desktop survey to search for records of aquatic invertebrates and field survey to provide more detailed information. Study or search areas are described for different elements of the study. Where appropriate, these study or search areas include the confirmed footprint of 'borrow pits' at the time of reporting.

2 Aquatic invertebrate ecology

2.1.1 Freshwater environments are structurally complex, multifunctional habitats which support diverse aquatic invertebrate assemblages. Invertebrates are a widespread, abundant and diverse group of organisms which can be found in all waterbody types.

2.1.2 Freshwater invertebrates have been well studied, leading to a comprehensive understanding of community structure and function. As such, invertebrate populations are frequently used to determine impacts for a range of pressures on waterbodies, including flow stress (abstraction, discharge and drought), pollution (point source and diffuse), sedimentation, habitat modification and climate change.

2.1.3 The distribution of communities and species are determined by a wide range of factors, including in-channel habitat (substrate composition, bank structure), geomorphological process (erosion, deposition), hydrology (flow volume and diversity), water quality and connectivity of habitat between life stages.

2.1.4 Invertebrate species are often specialised to a niche within the aquatic habitat and may spend some, all or very little of their life cycle in an aquatic phase. As a result invertebrate communities may show seasonal variation, however, their relative immobility, longevity and known tolerances to pressures make them an effective indicator of wider ecosystem health.

2.1.5 Conservation value has been assigned to all major aquatic invertebrate species ensuring that a conservation value accounts for community richness, as well as the conservation value of specific individuals.

3 Policy and legislation

3.1 Legislation

3.1.1 Aquatic invertebrate 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);
- *Council Directive (2000/60/EC) on establishing a framework for Community action in the field of water policy,* (European Commission, 2000);
- *Wildlife and Countryside Act 1981 (as amended); and*
- *Natural Environment and Rural Communities Act (NERC) 2006*.

3.1.2 A number of aquatic invertebrate species are listed under various appendices of *Council Directive (92/43/EEC) on the conservation of natural habitats and wild flora and fauna* (European Commission 1992) (the *Habitats Directive*).

3.1.3 The *Council Directive (2000/60/EC) on establishing a framework for Community action in the field of water policy* (European Commission, 2000) also known as 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"*). Aquatic invertebrate populations form one biological quality element which is routinely assessed to ensure no ecological deterioration.

3.1.4 A number of aquatic invertebrate species are listed under various schedules of the *Wildlife and Countryside Act 1981 (as amended)* that protect against the taking, killing or intentionally disturbing individuals cited. The large majority of species protected by the *Wildlife and Countryside Act 1981 (as amended)* are unlikely to be present within the study area due to geographic distribution, poor habitat availability or scarceness.

3.1.5 *Section 40* of the *Natural Environment and Rural Communities* (*NERC*) *Act 2006* places a duty on all 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)* (Department for Communities and Local Government, 2012) 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 *NPPF* indicates that 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 on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning consent 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 for National Networks (NPS*) (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 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 (S41)* of the *NERC Act, 2006*. This list is used to guide decision-makers in public bodies. The species listed are priorities for nature conservation action and therefore for consideration in impact assessment.

3.3.2 The *UK Biodiversity Action Plan* (*UK BAP*) was the United Kingdom'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, 2011). In 2012, the *UK Post-2010 Biodiversity Framework* (JNCC, 2012*)* succeeded the *UK BAP* and is the 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 aquatic invertebrate species within the study area are a priority for conservation action as listed in the *HABAP*.

3.3.5 *Local BAPs (LBAP*) 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).

3.3.6 Priority species action plans exist for three invertebrate species listed on the Cambridge and Peterborough Biodiversity Partnership: shining ramshorn (*Segmentina nitidia*), Desmoulin's whorl snail (*Vertigo moulinsiana*) and glutinous snail (*Myxas glutinosa*).

3.3.7 Thirty one freshwater aquatic invertebrate species are listed on the *NERC Act 2006,* although it is unlikely that many of these would be found in habitats common to the study areas due to their specific habitat requirements or known geographic distribution, based upon the professional judgement of suitably qualified and experienced specialists, as listed in *Appendix 6.1 of the environmental statement.*

3.3.8 Although having no legislative status, the *IUCN Red Data lists* are a useful tool in assigning significance to an individual species or community. A number of aquatic invertebrates are listed within the *IUCN Red Data Book* and these are considered as species of conservation interest if encountered.

4 Methodology

4.1 Desktop survey

4.1.1 Desktop data were requested from the Environment Agency for all waterbodies within the study area, 250m buffer zone and waterbodies crossed by the scheme. Where limited data were identified within the 250m buffer zone, further data from a wider buffer zone were requested from those waterbodies crossed by the scheme. The search area for the desktop 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 aquatic invertebrate data, current *WFD* classifications were also compiled. Classifications are developed by the Environment Agency, as competent authority in England, and determine the status of biological quality elements (BQE), including aquatic invertebrates. Only main watercourses are classified under the *WFD* and not all main watercourses are classified for every BQE. The West Brook and Cock Brook are not classified using aquatic invertebrates, whereas all other main watercourses within the study area are. The absence of *WFD* classification for aquatic invertebrates does not infer that these watercourses are of poor quality for invertebrates, rather that invertebrates 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 Environment Agency data collected over the previous three year period were used to inform this assessment.

4.1.4 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 Ten sites were selected from the scheme (*Table 4.1*). Sites were chosen based on main river *WFD,* water bodies crossed by the scheme and tributaries of these water bodies that were likely to be significantly altered, either as a result of diversion, culverting or increased input from road drainage. Three sites, on the Alconbury Brook, Alconbury and Brampton Brook and Ellington Brook lie within the A1section of the scheme, whilst the remaining sites were located on the main A14 improvement section.

4.2.2 The proposed works will 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 waterbody, further surveys were scoped out of this watercourse. Sufficient data exists to enable an assessment of aquatic invertebrates for this watercourse.

Table 4.1: Aquatic invertebrate sites sampled in 2014.

Site name	WFD waterbody	NGR
Matcham Bridge	Alconbury and Brampton Brooks	TL1918473990
D/S footbridge	Alconbury Brook	TL1924873197
Ellington Brook (0.85km U/S A1)	Ellington Brook	TL1861871955
West Brook (B1040)	West Brook	TL2961067829
West Brook (West End Road)	Not surveyed – no access	-
West Brook (tributary)	Unnamed tributary of West Brook	TL2946567753
Conington Road	Cowells Drain	TL3327267103
Thorpes Farm	Swavesey Drain	TL3693966114
Catchall Farm	Cottenham Lode	TL4062562188
Washpit Brook	Tributary of Cottenham Lode	TL4185862084

4.2.3 A single sample was taken from each site in spring (April) and summer (July) 2014 using a *WFD* compliant, three minute kick sample and a one minute hand search at each site (Environment Agency, 2012). Samples were preserved using industrial methylated spirits (IMS) and identified in laboratory conditions.

4.2.4 Alongside aquatic invertebrate surveys, 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. Physio-chemical water quality data was 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. These data are used to support community level analysis of aquatic invertebrate data and are required to run the river invertebrate classification tool (RICT) (UKTAG, undated).

4.2.5 Samples were processed in the laboratory following standard *WFD* compliant procedures (Environment Agency, 2008). Samples were identified, where possible, to species level with the exception of *Oligochaeta* (worms), *Sphaeriidae* (bivalve molluscs) and *Diptera* (fly), which have large numbers of similar species and for which the separation to species level would not add significantly to the evaluation of the fauna.

4.2.6 Data were analysed using standard biological metrics, biological monitoring working party (BMWP) scores; the number of scoring taxa (NTAXA); average score per taxon (ASPT); lotic invertebrate flow evaluation (LIFE) scores; and community conservation index (CCI) and the RICT. A brief description of these metrics and analysis techniques are given below.

4.2.7 The RICT is the *WFD* tool used to classify the ecological quality of macro-invertebrate communities. RICT compares the observed macro-invertebrate community with macro-invertebrate communities observed at reference sites (expected community under no stress) allowing a more detailed interpretation of the metric scores at each site. Reference site selection is based on a similarity of environmental variables (physical attributes of the study site), including width, depth, substrate type, altitude, distance from source, alkalinity and geographical location. Comparison of observed (O) with expected (E) values for NTAXA and ASPT is used to calculate an ecological quality ratio (EQR), whilst the minimum of NTAXA and ASPT EQRs minimum taxa (MINTA) is used to determine the classification of the site. Classifications range from bad to high (bad, poor, moderate, good and high).

4.2.8 The BWMP score is based on the tolerance of different freshwater macro-invertebrates to organic pollution. Each macro-invertebrate family is assigned a score from 1 to 10, depending on their tolerance to pollution (low scores are given to pollution-tolerant taxa, pollution-intolerant taxa score highly). Scores are assigned based on the presence of a scoring family in the sample and abundance within families is not considered. The BMWP score is the total of all the scores from a given sample. This score is divided by the number of scoring taxa (NTAXA) to give the ASPT. NTAXA is a measure of species richness, giving the number of BMWP scoring macro-invertebrate families present in the sample. These metric scores are used as part of the macro-invertebrate *WFD* assessments.

4.2.9 The LIFE index (Extence et al., 1999) is used to link macro-invertebrates to flow conditions. Freshwater macro-invertebrates have precise requirements for flow conditions and can be used to determine not only predominant flow types but also changes in flow character. Each species or family within a sample is assigned to a flow group depending on their flow/velocity preference.

4.2.10 A high LIFE score represents a higher number of taxa with a preference for high velocity habitats and vice versa. Calculation of LIFE scores requires accurate abundance data, as the effect of flow may lead to changes in abundance without the complete loss or gain of a taxon group. Family level and species level LIFE scores have been calculated for the 2014 macro-invertebrate sites. Species level LIFE scores provide a more accurate score as species of the same family may have different flow preferences. RICT currently only calculates expected LIFE scores at family level. Comparison of observed (O) with expected (E) values produces a LIFE ratio. A ratio of >1 describes a site meeting or exceeding reference conditions. A ratio of <1 indicates stressors from flow.

4.2.11 The CCI (Chadd and Extence, 2004) represents the national rarity and diversity of species identified at a site and designates a conservation value to the sampled community based upon both a species rarity and the overall community richness. CCI scores are assigned into conservation classes; the class boundaries and descriptions are given in *Table 4.2*.

Table 4.2: CCI score classifications (Chadd and Extence, 2004).

CCI class	Score	Description
Low	<5.0	Site supporting common species and low taxon richness.
Moderate	5.0 – 10.0	Site supporting at least one species with limited distribution or moderate taxon richness.
Fairly High	10.0 – 15.0	Site supporting at least one uncommon species or several of limited distribution or high taxon richness.
High	15.0 – 20.0	Site supporting several uncommon species, one of which may be nationally rare or high taxon richness.
Very High	>20.0	Site supporting several rare species or very high taxon richness.

4.3 Evaluation

4.3.1 The population of aquatic invertebrates within the study area was valued using *Guidance on Ecological Impact Assessment* (Chartered Institute of Ecology and Environmental Management (CIEEM), 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 For *WFD* classification using aquatic invertebrates, multiple season sampling is required. This is typically spring (March to May) and autumn (September to November) to account for variation in life cycle and seasonal abundance of different invertebrate species. The use of a spring and summer multiple season sampling programme may miss key life stages of particular taxa, and affect those biological metrics that require abundance to be assessed as a component. It is unlikely that this will have a significant impact upon the evaluation of aquatic invertebrates as a receptor or *WFD* assessment but should be considered when interpreting the data.

4.4.2 The sampling methodology is accepted practice, but may always potentially miss isolated or rare species. The number and location of samples were assessed by suitably experienced aquatic ecologists to give a reasonable spread of the habitats present within the study area and likely to be affected. It is highly unlikely therefore that the sampling approach would significantly affect the assessment.

4.4.3 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. Sampling methodology and programme design have been selected to maximise the confidence in data collection, which when combined with historic data should allow determination of receptor value with good certainty.

4.4.4 Limitations specific to the surveys carried out in the study area included access constraints. In spring 2014 land access was refused to West Brook (West End Road). In summer 2014 land access was refused for all West Brook sites (West Brook, West Brook tributary and West Brook (West End Road).

4.4.5 The RICT is a *WFD* compliant tool designed for permanent flowing waterbodies. Where watercourses diminish under low flow conditions, to the point of stagnating or drying completely, RICT assessments should be treated with some caution. There is a limited number of reference sites included within the tool for these types of watercourses and therefore the predictive element of RICT (used to classify watercourses) is weakened. The professional judgement of suitably qualified and experienced specialists was used to determine on an individual basis whether habitat factors (such as low flows) limited the suitability of data for use in RICT.

4.4.6 The limitations to the surveys do not represent a significant constraint to adequately assessing the value of aquatic invertebrates for the purposes of undertaking an appropriate ecological impact assessment, with a high degree of confidence in the outcome. A single season's data (as is the case for West Brook and West Brook tributary) would provide a minimum baseline data set, which can be used alongside historic data to assess receptor value.

4.4.7 A walkover 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.

4.4.8 Likely significant effects on and mitigation for aquatic invertebrates are considered in *Chapter 11 of the ES*.

5 Results

5.1 Desktop data and incidental records

5.1.1 Desktop data were collated from the Environment Agency, National Biodiversity Network (NBN) website (National Biodiversity Network, 2014), records from previous surveys and the outputs produced from previous aquatic invertebrate reports from the study area.

5.2 WFD classification

5.2.1 Five of the watercourses crossed by the scheme have been classified for aquatic invertebrates by the Environment Agency under the *WFD* (*Table 5.1*). Cottenham Lode is classified as high quality for aquatic invertebrates, indicating that the invertebrate community is in reference condition and therefore unaffected by human intervention. Slight deviation from reference condition results in good quality classifications for Swavesey Drain and the river Great Ouse.

5.2.2 The sites on the Alconbury and Brampton Brook and the Ellington Brook are classified at moderate quality for aquatic invertebrates.

5.2.3 It should be noted that of the watercourses listed in *Table 5.1* all but Swavesey Drain are classified as highly modified waterbodies (HMWB) under the *WFD* and as such are required to meet a different criterion (good ecological potential, rather than good ecological status) to non-HMWBs.

Table 5.1: *WFD* aquatic invertebrate classification for *WFD* waterbodies (^ indicate sites classified as highly modified waterbodies).

WFD waterbody	*WFD* reference	Invertebrate classification
Cock Brook	GB105033042810	Not designated
Alconbury and Brampton Brook	GB105033042790	MODERATE^
Ellington Brook	GB105033042840	MODERATE^
River Great Ouse	GB105033047921	GOOD^
West Brook	GB105033042730	Not designated
Swavesey Drain	GB105033042770	GOOD
Cottenham Lode	GB105033043320	HIGH^

5.3 Environment Agency data

5.3.1 Data were received from the Environment Agency covering 13 sites from 11 water-bodies. Aquatic invertebrate data were made available from the years 1984 and 2013. Of the 13 sites for which data were received, only a single site (Grindleys Bridge, Alconbury Brook, TL1920073100) falls within the buffer zone of the current scheme, and biological metrics for this site are shown in *Table 5.2*.

Table 5.2: Historic Environment Agency aquatic invertebrate data recorded within the buffer zone.

Site / waterbody	Date	BMWP	ASPT	nTaxa
Alconbury Brook	1984 -2011	37 - 141	4.7 – 4.83	10 - 30

5.3.2 *Valvata macrostoma*, a *Red Data Book* 2 (vulnerable) species was recorded twice at Grindleys Bridge during routine Environment Agency sampling in 1993. A further four species of conservation interest (local or above) were recorded between 1996 and 2003, including the aquatic snail *Bithynia leachi* and three species of aquatic beetles, including *Gyrinus urinator, Nebrioporus depressus* and *Hydraena palustrius*.

5.3.3 A number of species of conservation interest were recorded at the other sites for which data were provided as shown in *Table 5.3*. Although falling outside of the scheme and associated buffer, the connectivity between these watercourses and the scheme requires an awareness of these species.

Table 5.3: Number of species of conservation interest (*local and above) from Environment Agency data.

Site	Waterbody	Species of conservation interest*
Grindleys Bridge	Alconbury Brook	5 species (1 RDB2)
Smithy Fen bridge	Cottenham Lode	11 species (1 RDB2)
High Causeway bridge	Longstanton Brook	12 species
Nature reserve track	Fen Drayton	2 species
Hall Green footbridge	Hall Green Brook	0 species
Leys Farm Woolley	Cock Brook	1 species
D/S Alconburyford	Alconbury Brook	3 species
Eaton Socon Mill	River Great Ouse	7 species
Sam Jones Mill	River Great Ouse	9 species
Offord intake	River Great Ouse	10 species (1 RBD2)
Houghton Mill	River Great Ouse	3 species (1 RDB2)
Lock St Ives Staunch	River Great Ouse	4 species
Brownshill Staunch	River Great Ouse	11 species

5.3.4 Environment Agency data indicate a number of species with restricted distribution or specific habitat requirements. Species encompass family groups including *Odonata* (dragon and damselflies), *Coleoptera* (aquatic beetles), *Gastropods* (snails), *Trichoptera* (caddisflies), *Hemiptera* (water bugs) and *Ephemoptera* (mayfly). *Valvata macrostoma* (*RDB2* vulnerable) has been recorded from four sites within the wider scheme catchment.

5.4 2013 data

5.4.1 An ecological assessment of the West Brook, Washpit Brook and tributary of the West Brook (nine samples in total) indicated that the observed habitat modification and poor habitat quality were factors in limiting the ecological potential of these three watercourses. A single species of conservation interest was reported, being the *Ochthebius punctatus.* It is noted that this species is typical of coastal lagoons and therefore may represent a mis-identification.

5.5 Incidental records

5.5.1 *Table 5.4* summarises desktop and incidental records for aquatic invertebrates from the 2013 and 2014 survey programmes. Records are shown on *Figure 11.2* in the *environmental statement*.

5.5.2 A large number of aquatic invertebrates have been reported from the 2013 great crested newt *(Triturus cristatus)* surveys. These records are centred on still waters – which are not considered in this report - and include common pond species such as *Odonata* (damsel and dragonflies), *Coleoptera* (diving beetles), *Hemiptera* (waterbugs e.g. water boatman, water stick insect and water scorpion) and *Gastropoda* (snails). The quality of incidental data is mixed due to the ad-hoc nature of collection and variable taxonomic abilities of the recorders.

Table 5.4: Incidental records for Aquatic Invertebrates.

Common name	Date	Location and grid reference	Source
Swan/duck mussel *Unionidae spp.*	April 2014	Matcham Bridge TL1918473990	2014 spring sample
Signal crayfish (*Pacifastacus leniusculus)*	24 July 2014	Cambridge reservoir TL 44607 61933	Bat survey

5.5.3 *Unionidae* (freshwater mussel) shells were observed among weed cut/dredged spoil on the bank top at Matcham Bridge. It is unknown whether these empty shells originated in the watercourse.

5.5.4 A single signal crayfish was recorded in the Cambridge reservoir during a night time bat survey. Identification was not possible at the time of survey. Signal crayfish were also reported from still waters as part of the 2013 great crested newt surveys. These data have previously been reported (Atkins, 2013).

5.6 Field survey results

5.6.1 Sampling for aquatic invertebrates was undertaken in spring (14–15 April 2014) and summer (26–27 July 2014). The spring samples were taken from nine sites, whilst seven sites were assessed in summer. The downstream site on the West Brook could not be surveyed in spring due to land access constraints, whilst permissions to survey were refused on all West Brook sites in summer.

5.6.2 The biological metrics are presented in *Table 5.5*, alongside the RICT classification. *Table 5.6* indicates that the aquatic invertebrate community reached good quality on the Ellington Brook only during 2014. Quality was driven by diversity (NTAXA) and pollution sensitivity (ASPT) metrics.

Table 5.5: *WFD* classifications of watercourses surveyed during 2014 (*spring season only).

Site	Index	EQR	Class	Probability of class (%)
D/S footbridge Alconbury and Brampton Brooks	ASPT	0.85	Moderate	71.487
	NTAXA	1.03	High	94.719
	MINTA		Moderate	71.487
Matcham Bridge Alconbury and Brampton Brooks	ASPT	0.83	Moderate	71.867
	NTAXA	0.95	High	75.468
	MINTA		Moderate	71.867
Ellington Brook U/S A1 Ellington Brook	ASPT	0.89	Good	49.125
	NTAXA	1.00	High	90.069
	MINTA		Good	49.125
West Brook B1040* West Brook	ASPT	0.93	Good	56.616
	NTAXA	0.71	Moderate	47.055
	MINTA		Moderate	48.165
Catch Hall Farm Cottenham Lode	ASPT	0.73	Poor	72.537
	NTAXA	0.64	Moderate	60.086
	MINTA		Poor	72.517
Thorpes Farm Swavesley Drain	ASPT	0.8	Moderate	60.026
	NTAXA	0.72	Moderate	57.226
	MINTA		Moderate	60.036
Conington Road Cowells Drain	ASPT	0.77	Poor	55.996
	NTAXA	0.83	Good	59.016
	MINTA		Poor	55.996
Washpit Brook tributary of Cottenham Lode	ASPT	0.81	Moderate	68.727
	NTAXA	0.73	Moderate	52.685
	MINTA		Moderate	68.727
West Brook tributary* Unnamed tributary of West Brook	ASPT	0.74	Poor	58.606
	NTAXA	0.53	Bad	38.434
	MINTA		Poor	42.204

5.6.3 Moderate aquatic invertebrate quality was observed at five sites, with water quality driving classification at both sites on the Alconbury and Brampton Brooks, whilst diversity was limiting the observed communities on the West Brook.

5.6.4 Three sites recorded poor quality for aquatic invertebrates. At Catch Hall Farm and Conington Road the site classification was determined by poor water quality, whilst on the West Brook tributary diversity was classified as bad, reducing the classification.

Table 5.6: Ecological metrics for aquatic invertebrates sampled in 2014 (* single sample season only).

Site	BMWP	NTAXA	ASPT	LIFE (SP)	LIFE (F)	LIFE (F) O/E EQR	PSI (F)	PSI (F) O/E EQR	CCI
D/S footbridge Alconbury and Brampton Brooks	135	30	4.5	6.0	5.7	0.84	20.8	0.46	10.7
Matcham Bridge Alconbury and Brampton Brooks	109	26	4.2	6.1	5.6	0.86	21.8	0.63	7.8
Ellington brook (U/S A1) Ellington Brook	139	29	4.7	6.2	6.1	0.89	29.0	0.65	12.3
West Brook B1040* West Brook	70	15	4.7	6.9	6.3	0.91	40.1	0.85	4.4
West Brook tributary* West Brook	34	9	3.8	5.3	5.0	0.7	12.5	0.24	4.3
Conington Road Cowells Drain	84	21	4.0	6.1	5.4	0.79	22.8	0.52	4.1
Thorpes Farm Swavesey Drain	77	19	4.1	6.0	5.8	0.87	22.5	0.54	7.9
Catch Hall Farm Cottenham Lode	62	16	3.9	6.7	6.0	0.87	27.5	0.58	3.3
Washpit Brook tributary of Cottenham Lode	83	20	4.2	6.9	6.3	0.93	39.0	0.87	7.6

5.6.5 LIFE scores for all sites were within the range expected from low gradient drainage channels and lowland rivers. The highest LIFE EQR were observed on the West Brook and Ellington Brook, whilst the lowest LIFE EQR were recorded on the West Brook tributary and Conington Road. The low LIFE EQRs were associated with ditch or slack flow type habitats.

5.6.6 The Ellington Brook and D/S footbridge (Alconbury and Brampton Brook) sites demonstrate fairly high conservation value, indicating a site supporting at least one uncommon species, several species of restricted distribution or a community of high taxon richness.

5.6.7 Matcham Bridge (Alconbury and Brampton Brook), Thorpes Farm (Swavesey Drain) and Washpit Brook demonstrate moderate conservation value, supporting at least one species of restricted distribution or a community with moderate taxon richness.

5.7 Species of conservation interest

5.7.1 Four species of conservation interest were recorded from five sites during the 2014 aquatic invertebrate surveys. A single species, *Enochrusmelano cephalus* is reported as notable, whilst the remaining three species are characterised as local (*Table 5.7*).

Table 5.7: Species of conservation interest recorded at aquatic invertebrate survey sites during 2014 sampling.

Site	Species	Conservation value
Matcham Bridge	*Erpobdella testacea* *Bithynia leachii*	Local Local
D/S footbridge	*Enochrusmelano cephalus* *Erpobdella testacea*	Notable Local
Ellington Brook (0.85km U/S A1)	*Erpobdella testacea* *Notonecta viridis*	Local Local
Thorpes Farm	*Erpobdella testacea*	Local
Washpit Brook	*Erpobdella testacea*	Local

5.7.2 *Enochrusmelano cephalus* is associated with richly vegetated habitats and has previously been recorded from Cambridgeshire. The three species of Local conservation interest have all been reported previously from Cambridge (*NBN, 2014*).

5.7.3 No species listed on the *Cambridgeshire or Peterborough LBAP, HABAP* or *Section 41* of the *NERC Act 2006* were recorded from the study area.

6 Evaluation

6.1.1 Aquatic invertebrates were recorded from every watercourse surveyed. Many of the species observed are ubiquitous to aquatic habitats with indistinct habitat preferences. There are a number of species of conservation interest reported from the surveyed sites and general aquatic invertebrate analysis indicates some watercourses supporting high species diversity.

6.1.2 Using the CIEEM *Guidance on Ecological Impact Assessment* (CIEEM, 2006), the areas of habitat for aquatic invertebrates have been evaluated as local value.

6.1.3 Disparity between Environment Agency *WFD* classifications and the findings of the current study are expected to be as a result of site position within the catchment. Sites used for formal *WFD* classification are placed in the lower reaches of watercourses to assess impacts from the entire waterbody, whereas sites in this study were selected around the scheme alignment. As such the 2014 sites may not be characteristic of the wider waterbody and therefore not directly comparable to the Environment Agency *WFD* classifications.

6.1.4 This is particularly apparent on the Cottenham Lode (classified as high quality for aquatic invertebrates under the *WFD*) and Swavesey Drain (classified as good quality for aquatic invertebrates under the *WFD*). The 2014 samples were taken in the upper reaches of both these watercourses and they are unlikely to represent the same habitat or pressures as the *WFD* classification sites. The low 2014 classification on the Cottenham Lode is partially driven by the low flows observed during the summer survey.

6.1.5 The A14 crosses the Alconbury and Brampton Brook sites, and the Ellington Brook site much lower down their respective catchments and as such the *WFD* classification for both watercourses (moderate quality for aquatic invertebrates) is much closer to the 2014 survey findings (Alconbury Brook –moderate quality, Ellington Brook – good quality).

6.1.6 As described in *Section 4.4,* the data output from a number of sites cannot be confidently assigned due to the limitation of the RICT classification tool. Sites such as Catch Hall Farm, that were partially dry at the time of sampling, and Conington Road (Cowells Drain) which demonstrated no appreciable flow (effectively becoming a ditch) are poorly represented in reference sites within the RICT programme. This results in the data from Catch Hall Farm and Conington Road being assigned to a *WFD* quality band with low confidence. Flowing water sites can be more confidently assigned accurate *WFD* quality bands as a larger number of reference sites exist. This reduces certainty or confidence in the data but represents the best available tool for this watercourse type. As such the RICT provides a minimum baseline data set, which can be used alongside historic data to assess receptor value, albeit with lower confidence that running water sites.

6.1.7 The inclusion of a spring/summer data set, as opposed to a spring/autumn data set as standard may create anomalies in the data set. A relatively large number of species were reported from a single season only. It is noted that the sites change character significantly between seasons, due in part to the abundance of marginal and aquatic vegetation present during the July survey The increase in aquatic habitat from the spring survey has the potential to significantly increase habitat abundance and diversity, providing for a richer aquatic invertebrate community.

6.1.8 The underlying geology of the study area result in waters naturally high in conductivity, with physiochemical determinants suggesting ion-rich waters (pH consistently between 7 and 8, and elevated salinity. Water conductivity may have an appreciable impact on the presence of certain species and distribution of taxa within a catchment. Given that raised conductivity is geological in nature, any influence from this source is likely to be effected catchment wide.

6.1.9 Further consideration of the invertebrate data and metrics indicate that a number of sites are heavily sedimented. This has the effect of increasing ion content/conductivity and typically reducing invertebrate classifications through the loss of habitat complexity, increased opportunity for re-suspension and accumulation of sediment bound contaminants. Aquatic invertebrate communities insensitive to sedimented catchments are largely dominated by leeches, beetles, water bugs, worms, fly larvae and snails. These are also often pollution tolerant and capable of surviving in lower dissolved oxygen conditions than more pollution sensitive species.

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Annex 1: Full survey data

Table A1.1: Species records for sites sampled in spring (14 – 15 April 2014)

Species	D/S footbridge *Alconbury and Brampton Brooks*	Matcham Bridge *Alconbury and Brampton Brooks*	Catch Hall Farm *Beck Brook*	Conington Road, Cowells Drain *Drayton*	Ellington Brook U/S A1	Thorpes Farm *Swavesley Drain*	Washpit Road D/S *Washpit Brook*	West Brook B1040(Spring only)	West Brook unnamed tributary(Spring only)
Acroloxus lacustris		1							
Agabus didymus				1					
Anacaena globulus							1	1	2
Anisus vortex	82	4		2	3				
Asellus aquaticus	49	509	29	202	49	102	7	16	143
Asellus sp.	8		207			8	4		
Baetidae								6	
Baetis rhodani		2			5		25	2	
Bathyomphalus contortus				1	11	1			
Bithynia leachii		6							
Bithynia tentaculata	1			1	36				
Calopteryx splendens	2								
Carychium sp.									2
Centroptilum luteolum								18	
Ceratopogonidae	1	8	23	13	1	6	5	1	10
Chironomidae	70	156	245	191	164	1127	335	135	249
Colymbetinae				2					
Crangonyx pseudogracilis	1		1	8		1			
Dicranota sp.				1			11	2	
Diptera		1				2			1
Donacia sp.					1				
Dryops sp.				1					
Dugesia sp.		3		5					
Dytiscidae				1					
Elmisaenea	25	294			15		27	8	
Enallagma cyathigerum	1								

Species	D/S footbridge *Alconbury and Brampton Brooks*	Matcham Bridge *Alconbury and Brampton Brooks*	Catch Hall Farm *Beck Brook*	Conington Road, Cowells Drain *Drayton*	Ellington Brook U/S A1	Thorpes Farm *Swavesley Drain*	Washpit Road D/S *Washpit Brook*	West Brook B1040(Spring only)	West Brook unnamed tributary(Spring only)
Erpobdella octoculata	68	51		5	19			1	
Erpobdella sp.	57	20	2	3				1	
Erpobdella testacea		1			1	1	1		
Galba truncatula						2			
Gammaridae		31	34	2	41	20		2	
Gammarus pulex	4	115	10	2	92	52	495	1	
Glossiphonia complanata	47	19	1	9	4	1	13		
Glyphotaelius pellucidus	2								
Gyraulus albus	1								
Gyraulus crista	33	1		2		12			2
Gyrinidae						1			
Haliplus lineatocollis		10	2	4	5				
Haliplus sp.		12							
Helius sp.		1							1
Helobdella stagnalis	10	1			5	34			
Helophorus brevipalpis									2
Hydracarina	14	14			8		16	10	
Hydraena gracilis			1						
Hydropsyche angustipennis	5	5					1	3	
Hydropsyche instabilis								1	
Hydropsyche siltalai								1	
Hydroptilidae								19	
Ischnura elegans	1								
Limnephilidae	4	4		28	3		12	7	
Limnephilus lunatus	2	10	2	22	1	1	8	6	7
Limnephilus marmoratus	1								
Limnephilus sp.	3	14		10		2	3	4	38
Limoniidae									7
Lymnaea stagnalis	1								

Species	D/S footbridge *Alconbury and Brampton Brooks*	Matcham Bridge *Alconbury and Brampton Brooks*	Catch Hall Farm *Beck Brook*	Conington Road, Cowells Drain *Drayton*	Ellington Brook U/S A1	Thorpes Farm *Swavesley Drain*	Washpit Road D/S *Washpit Brook*	West Brook B1040(Spring only)	West Brook unnamed tributary(Spring only)
Lype reducta							1		
Mystacides longicornis								5	
Oligochaeta	260	154	127	73	332	437	189	76	200
Ostracoda			1	9		2			2
Oulimnius sp.		35		1	7			1	
Oulimnius tuberculatus	16	64		1	48		16		
Oxycera sp.		1			2		2	1	
Pericoma sp.	3	9		2	3		2	2	18
Physa fontinalis	2	32		14					
Pisidium sp.	237	74	5	183	4	175	32	1	286
Planorbis carinatus		1							
Planorbis planorbis				1	1				
Polycelis felina		2							
Polycelis nigra/tenuis	30	126		139	73		2	1	201
Potamopyrgus antipodarum	67		3				44		
Psychodidae						1			
Radix balthica						24			
Rhantus sp.						2			
Segmentina sp.	12								
Sialislutaria				5					
Simuliidae		1	65	12	45	302	4		
Succinea sp.									19
Theromyzon tessulatum		1							
*Tipula*sp.	1								
Valvata cristata		28			14				
Valvata piscinalis	175	18							
Velia sp.			1	3		2	1		2
Zonitoides sp.	1								

Table A1.2: Species records for sites sampled in summer (22 – 24 July 2014)

Species	D/S footbridge *Alconbury and Brampton Brooks*	Matcham Bridge *Alconbury and Brampton Brooks*	Catch Hall Farm *Beck Brook*	Conington Road, Cowells Drain *Drayton*	Ellington Brook U/S A1	Thorpes Farm *Swavesey Drain*	Washpit Road D/S *Washpit Brook*
Aeshna mixta					1		
Agabus bipustulatus						2	
Agabus didymus			7				
Agabus sp.						1	
Anisus vortex	25	450	11	1	39		2
Asellus aquaticus	765	13	383	643	705	217	5
Baetis rhodani							14
Baetis sp.					3		
Bathyomphalus contortus					84		
Bithynia tentaculata	3				60		
Calopteryx splendens					4		
Centroptilum luteolum					1		
Centroptilum sp.					1		
Ceratopogonidae				2			1
Chironomidae	51		907	79	65	2587	56
Collembola	7						
Corixidae	8	17			5		
Crangonyx pseudogracilis			4	52	5	1	
Dendrocoelum lacteum	6						
Dicranota sp.				103			41
Dytiscidae				1			
Elmisaenea	99	3			18		12
Empididae	1					3	
Enochrus melanocephalus	1						
Erpobdella octoculata	21	7		3	3	1	8
Erpobdella sp.							1
Erpobdella testacea	25				7	1	1
Erpobdellidae		42		1			

Species	D/S footbridge *Alconbury and Brampton Brooks*	Matcham Bridge *Alconbury and Brampton Brooks*	Catch Hall Farm *Beck Brook*	Conington Road, Cowells Drain *Drayton*	Ellington Brook U/S A1	Thorpes Farm *Swavesey Drain*	Washpit Road D/S *Washpit Brook*
Galba truncatula				1			
Gammarus pulex	46		283	8	137	5	489
Glossiphonia complanata	16	19	6		3	1	15
Glossiphoniidae		56					
Glyphotaelius pellucidus			2				
Gyraulus crista	4						
Gyrinus caspius						1	
Gyrinus substriatus		1					
Gyrinus suffrani					1		
Haliplus flavicollis					1		
Haliplus lineatocollis	12	16	3	1	13	135	
Haliplus ruficollis	22						
Haliplus sp.	13				5	23	
Helobdella stagnalis		10			13	3	
Helophorus brevipalpis	1			1			
Helophorus sp.							1
Hemiclepsis marginata				1			
Hesperocorixa sahlbergi						1	
Hippeutis complanatus		7					
Hydra carina	1	2			1		5
Hydra enagracilis	1						
Hydrobius fuscipes		2				1	
Hydropsyche angustipennis	42				12		
Hydropsyche sp.					10		
Hydroptila sp.					3		
Ilybius fuliginosus	1		2			1	
Laccophilus minutus					1		
Leptoceridae	107						
Limnephilidae				9			1

Species	D/S footbridge *Alconbury and Brampton Brooks*	Matcham Bridge *Alconbury and Brampton Brooks*	Catch Hall Farm *Beck Brook*	Conington Road, Cowells Drain *Drayton*	Ellington Brook U/S A1	Thorpes Farm *Swavesey Drain*	Washpit Road D/S *Washpit Brook*
Limnephilus lunatus	**1**			**21**			**7**
Lonchopteridae	**1**						
Lymnaea sp.		**44**					**1**
Lymnaea stagnalis					**2**		
Lymnaeidae			**1**				
Molanna angustata					**1**		
Muscidae	**2**					**3**	
Nebrioporus elegans					**1**		
Nepa cinerea	**6**	**4**					
Notonecta sp.				**1**			
Notonecta viridis					**1**		
Notonectidae	**1**		**1**		**2**		
Oligochaeta	**304**	**105**	**4**	**73**	**82**	**3**	**71**
Ostracoda	**2**			**2**	**30**	**1**	
Oulimnius tuberculatus	**108**	**2**		**1**	**78**	**1**	**10**
Pediciidae					**10**		
Pericoma sp.		**33**	**6**	**4**			**2**
Phryganea bipunctata					**1**		
Physa fontinalis	**94**	**568**		**72**	**3**		
Piscicola geometra	**1**						
Pisidium sp.		**7**		**60**			**3**
Planorbarius corneus				**1**			
Planorbidae				**2**			**2**
Planorbis planorbis	3				2		
Polycelis felina		**33**					
Polycelis nigra	**96**	**49**			**43**		
Polycelis sp.				**4**			**1**
Potamopyrgus antipodarum			**5**			**1**	**41**
Proasellus meridianus	**2**						**4**

Species	D/S footbridge *Alconbury and Brampton Brooks*	Matcham Bridge *Alconbury and Brampton Brooks*	Catch Hall Farm *Beck Brook*	Conington Road, Cowells Drain *Drayton*	Ellington Brook U/S A1	Thorpes Farm *Swavesey Drain*	Washpit Road D/S *Washpit Brook*
Psychodidae	**30**						
Pyrrhosoma nymphula		**4**					
Radix balthica		**1**		**2**		**70**	
Sialis lutaria	**1**			**21**			**1**
Sigara dorsalis		**2**					
Simuliidae	**5**			**3**		**4**	
Simulium sp.					**2**		
Sphaeriidae	**23**	**522**				**3**	
Sphaerium sp.		**13**					
Stagnicola palustris	**7**	**13**					
Succinea sp.	**2**		**2**	**3**		**1**	
Theromyzon tessulatum	**3**						
Tipula sp.				**12**			
Tipulidae	**1**				**2**	**8**	
Valvata cristata	**16**						
Valvata piscinalis	**9**	**61**					
Velia sp.			**4**	**2**			