highways england

A1 in Northumberland: Morpeth to Ellingham

Scheme Number: TR010041

6.7 Environmental Statement – Appendix 9.3 Aquatic Ecology Survey Report

Part A

APFP Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

June 2020

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

The A1 in Northumberland: Morpeth to Ellingham

Development Consent Order 20[xx]

Environmental Statement - Appendix

Regulation Reference:	APFP Regulation 5(2)(a)
Planning Inspectorate Scheme Reference	TR010041
Application Document Reference	TR010041/APP/6.7
Author:	A1 in Northumberland: Morpeth to Ellingham Project Team, Highways England

Version	Date	Status of Version
Rev 0	June 2020	Application Issue

A1 in Northumberland

B2104700/OD/336

Aquatic Ecology Survey Report

Version 2

March 2018

Document Control

Document Title	B2104701/OD/336 Aquatic Ecology Survey Report
Author	Evonne Maxwell (Senior Ecologist)
Owner	Nannette Hoyle, Highways England
Distribution	
Document Status	Final

REVISION HISTORY

Version	Date	Description	Author
1	January 2018	Aquatic Ecology Survey Report	Evonne Maxwell
2	March 2018	Aquatic Ecology Survey Report	Evonne Maxwell

REVIEWER LIST

Name	Role
Jon Barnes	Technical Director

APPROVALS

Name	Signature	Title	Date of Issue	Version
Peter Farrer		Project Manager	22/3/18	2

EXECUTIVE SUMMARY

This technical report presents the results of the aquatic ecology surveys undertaken by Jacobs UK Ltd. (Jacobs) on behalf of Highways England. The purpose of the survey was to establish the ecological status of watercourses and waterbodies in proximity to the proposed upgrade to dual carriageway of the A1 between Morpeth and Felton: Section A - Morpeth to Felton.

A desk study exercise was carried out in 2017, to obtain records of aquatic receptors up to 2km from the scheme. Records were returned by the Environment Agency and local records centre.

Field surveys were conducted, following best practice, for the following receptors:

- River habitat
- Macrophytes
- Macroinvertebrates
- Ponds
- Freshwater fish
- White-clawed crayfish
- Exposed riverine sediments

The majority of watercourses in the area were small, shallow and heavily shaded with poor ecological value. The River Coquet is a large watercourse, designated as a Site of Special Scientific Interest (SSSI) and provides high quality aquatic habitat for a number of receptors including freshwater fish and macroinvertebrates. Likewise, the Longdike Burn supports diverse macroinvertebrate and fish communities. The River Lyne was found to have poor ecological value and supported a significant population of the non-native North American signal crayfish.

Mitigation will be required to prevent impacts on water quality during construction and operation, and consideration should be given to the design of crossing structures to minimise loss of habitat or habitat fragmentation.

Biosecurity measures must be in place to prevent the transfer of non-native species and the diseases they carry.

1 INTRODUCTION

Scheme Background

1.1.1 Following the outcomes of the 2014 A1 North of Newcastle Feasibility Study the Department of Transport confirmed, in its first Roads Investment Strategy, the intention to upgrade twenty-one kilometres of the existing A1 to a dual carriageway between Morpeth and Ellingham in Northumberland. This comprised two discreet sections:

- Section A - Morpeth to Felton, and;
- Section B - Alnwick to Ellingham.

1.1.2 At this stage of the project (PCF Stage 3) one option was under consideration for Section A, this is briefly described below:

Section A - Morpeth to Felton

- Offline Option – this option would be online at its north and south ends, but a large central section would form a new bypass to the west of the existing A1 between the Floodgate Burn crossing and Bockenfield Bridge. The existing A1 would be de-trunked and form part of a local road network, which would separate local and strategic traffic.

Report Rationale

1.1.3 The aim of this report is to present the results of aquatic ecology surveys undertaken by Jacobs on behalf of Highways England. The information presented will be used to inform the preferred option and identify the requirement for additional surveys to be completed at PCF Stage 3. The data will ultimately inform the Environmental Impact Assessment (EIA) for the preferred options.

Background to surveys

1.1.4 Surveys have been completed by qualified ecologists within Jacobs, competent in their fields and holding appropriate qualifications (River Habitat Survey accreditation, white-clawed crayfish license, and electric fishing competency training). All lead surveyors were members of one of the following institutions: Chartered Institute of Ecology and Environmental Management (CIEEM), Royal Society of Biology (RSB) or Institute of Fisheries Management (IFM).

1.1.5 The objective of the surveys was to describe the baseline status of aquatic ecology receptors potentially affected by the proposed scheme. The surveys were undertaken between May and October 2017. Aquatic surveys and ecology receptors of interest were:

- Aquatic Habitat Assessment
- River Habitat Survey (RHS)
- Macrophytes
- Macroinvertebrates
- Ponds
- Freshwater fish
- White-clawed crayfish (*Austropotamobius pallipes*)
- Exposed Riverine Sediments (ERS)

1.1.6 The survey programme included a desktop study to search for records of the receptors listed above and field survey to provide more detailed information. For the purposes of the surveys, “the site” was taken to mean the footprint of the scheme. Study area is the area covered by the desk study and survey area is used to describe the area covered by field surveys.

Definitions

1.1.7 The proposals refer to the footprint of the proposed development (scheme boundary).

1.1.8 The study area relates to a 2 km buffer around the proposed options for Section A in which desk study information has been collated via online and third party sources.

1.1.9 The survey area refers to a 250 m buffer around the offline option for Section A.

Legislative and Regulatory Context

1.1.10 A summary of the legislation and policy framework for relevant aquatic receptors is provided below. Full details, including information regarding the biology, habitat requirements and nature conservation status are provided in Appendix A.

Water Framework Directive

1.1.11 The 'Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy' (Water Framework Directive or WFD) was adopted and came into force in December 2000 in order to protect inland surface waters, groundwater, transitional waters and coastal waters. The aim of the directive was to ensure that all aquatic ecosystems meet Good Ecological Status. In England and Wales the WFD is transposed into UK legislation by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003.

Freshwater Fish

1.1.12 Atlantic salmon (*Salmo salar*), brown/sea trout (*Salmo trutta*), river lamprey (*Lampetra fluviatilis*), sea lamprey (*Petromyzon marinus*) and European eel (*Anguilla anguilla*) are all listed as species of principal importance in accordance with the requirements of Section 41 (England) of the Natural Environment and Rural Communities (NERC) Act 2006. Atlantic salmon and all three species of lamprey are listed in Annex II of the Habitats Directive. Atlantic salmon, brown/sea trout and European eel are also listed as protected species within the Northumberland Biodiversity Action Plan.

1.1.13 European eel are protected under the Eels (England & Wales) Regulations 2009 which requires eel passage to be considered and the Environment Agency to be notified of any development likely to affect passage of eels.

White-clawed Crayfish

1.1.14 The white-clawed crayfish receives partial protection under Schedule 5 of the Wildlife & Countryside Act 1981 (as amended) in respect of Sections 9(1) and 9(5). This makes it an offence to: intentionally take (capture); and sell, offer or expose for sale, or have in his possession or transport for the purpose of sale, any live or dead white clawed crayfish or part thereof. It has full protection under Annex II and V of the Habitats Directive (Council Directive 92/43/EEC) requiring the designation of Special Areas of Conservation for its protection and prohibiting the taking or disturbance of the species in the wild. The white-clawed crayfish is also listed in accordance with the requirement of Section 41 (England) of the Natural Environment and Rural Communities (NERC) Act 2006 and is listed as a protected species on the Northumberland Biodiversity Action Plan (Northumberland Wildlife Trust, undated).

1.1.15 Licences can be granted by Natural England to allow development to take place if carried out in accordance with the provisions of the licence.

2 AQUATIC HABITAT ASSESSMENT

2.1 Objective

2.1.1 An aquatic habitat assessment forms the preliminary phase of all aquatic ecology surveys, and is used to characterise watercourses and identify sites that are suitable for specific aquatic surveys.

2.2 Desk Study

2.2.1 Seventeen watercourses and minor tributaries were identified as being crossed by the proposed route from a high level assessment of OS mapping overlaid with the proposed route option. Of these, three are designated Water Framework Directive (WFD) water classification rivers. Data from the 2016 monitoring cycle is shown in Table 2.1.

Table 2.1: Selected water body classification data for River Coquet, Longdike Burn and River Lyne (Environment Agency, 2017a).

Site name	River Coquet (from Forest Burn to Tidal Limit)	Longdike Burn	Lyne from Source to Tidal Limit
ID	GB103022076693	GB103022076550	GB103022076820
Overall	Good	Moderate	Poor
Biological	Good	Moderate	Poor
Fish	N/A	N/A (High in 2014)	Poor
Invertebrates	High	High	Moderate
Macrophytes + phytobenthos	Good	Moderate	Poor
Physicochemical quality elements	Good	Moderate (Phosphate)	Good
Chemical	Good	Good	Good

2.2.2 WFD classifications demonstrate that all biological receptors on the River Coquet are at good status or above, indicating only minor deviation from reference conditions. The Longdike Burn and River Lyne are influenced by environmental stresses so that they fail to meet Good status for their biological components, with the exception of macroinvertebrates on the Longdike Burn. Nutrient pressures are a potential cause of failure on the Longdike, either form point source discharges or diffuse agricultural sources. Elevated phosphate may influence the macrophyte community and result in the Moderate status of the aquatic flora elements.

2.2.3 The River Coquet forms part of the River Coquet and Coquet Valley Woodlands Site of Special Scientific Interest (SSSI). The aquatic notified features for this site include Atlantic salmon, brook lamprey and sea lamprey in addition to five different types of flowing water habitat.

2.3 Field Survey

Methods

2.3.1 A preliminary walkover of the seventeen watercourses (Figures 1.1 – 1.4), identified by the desk study, that will be potentially impacted by the proposed scheme was undertaken in May 2017, in order to identify sites suitable for specific aquatic surveys. Surveys covered at least 100m up and downstream of the proposed crossing point where possible. Notes were made of the substrate composition, flow type, depth, ease of access and other general characteristics of each watercourse.

Survey Limitations

2.3.2 Due to access restrictions, only the area downstream (east) of the crossing points on the River Lyne and Floodgate Burn could be surveyed. Therefore, the character of these watercourses west of the A1 could not be determined. While this may present a limitation to assessment of habitat lost under the footprint, most potential impacts would affect the downstream habitat, which was surveyed.

Results

2.3.3 The results of the aquatic habitat assessment are given in Appendix B and an assessment of the suitability of each site for further survey is given in Table 2.2.

2.3.4 Of the seventeen sites surveyed, four were typical of small (<1m), predominantly dry or ephemeral water features, often associated with field boundaries and wet fencing (Unnamed Tributaries 1 and 2, Earnsdon Burn Tributary and Fenrother Burn Tributary 2). These sites were determined to be unsuitable to support aquatic receptors of any value and removed from any further survey.

2.3.5 The largest watercourse in the survey area was the River Coquet which is up to 40m wide flowing through a steep wooded valley. Habitats in the River Coquet were substantially different on the upstream and downstream sides of the existing A1, with the upstream side dominated by bedrock and the downstream having a shallower water depth and varied substrates and flow types. Longdike Burn and the River Lyne were the only other designated main rivers in the survey area, both around 3m wide flowing predominantly through woodland and rough pasture.

2.3.6 Sites selected for River Habitat Surveys were designated main rivers, permanently wetted and crossed by the proposed scheme.

2.3.7 Sites selected for macrophyte surveys were permanently wetted watercourses, that were not heavily shaded (overhead or marginal cover of >70%). Heavy shading will reduce the potential growth and diversity of macrophyte communities and any sites with marginal or overhead shading form riparian vegetation were screened out of further study.

2.3.8 Sites selected for macroinvertebrates were permanently wetted watercourses with water depths exceeding 5cm of water. Sites were chosen close to the proposed crossing point to best represent the habitat that may be affected by new infrastructure or changes to hydrology or channel morphology form discharge points.

2.3.9 Sites selected for fish surveys were permanently wetted channels, not choked with aquatic macrophytes, connectivity to the wider catchment for eel and salmonids, could be safely accessed for 100m through the study area. The Coquet was deemed too deep to survey safely and desk based assessments were used to evaluate the fish receptors in this watercourse. Where watercourses were shallow (<10cm), longitudinal connectivity broken up by frequent debris dams, or natural barriers to movement and water flow types indicated stagnant or slow flowing water types, sites were discounted from further study.

2.3.10 Sites selected for crayfish surveys were determined by a licenced surveyor. They confirmed the presence of optimal and sub optimal crayfish habitat types, taking cognisance of flow types, substrate, marginal and submerged cover, macrophytes and woody debris. An assessment was made during the aquatic habitat assessment of suitability for crayfish to bury and seek refuge under submerged structures. Where access allowed crayfish survey sites were selected to encompass the proposed crossing point.

Table 2.2: Suitability of sites for further survey based on aquatic habitat assessment.

Site	RHS	Macro-phytes	Macro invertebrates	Fish	Crayfish	Reasoning
Minto's Dean Tributary	-	-	✓	-	-	Heavily shaded with little water depth. No suitable habitat for crayfish or fish
Minto's Dean	-	✓	✓	✓	-	Small and relatively shallow but with potential eel habitat
Back Burn Tributary	-	-	✓	✓	-	Heavily shaded but potential eel habitat. No suitable habitat for crayfish
River Coquet	✓	-	✓	-	✓	Too large and fast flowing to survey for macrophytes and fish
Thirston Burn Tributary	-	-	✓	-	-	Very little water with lots of terrestrial grasses, unlikely to support fish, crayfish or macrophytes
Unnamed Tributary 1	-	-	-	-	-	Dry – no surveys undertaken
Unnamed Tributary 2	-	-	-	-	-	Dry – no surveys undertaken
Longdike Burn 1	✓	✓	✓	✓	✓	Habitat present for all receptors
Longdike Burn 2	✓	✓	✓	✓	✓	Habitat present for all receptors
Earsdon Burn Tributary	-	-	-	-	-	Dry – no surveys undertaken
Earsdon Burn	-	-	✓	-	-	Relatively shallow with silt substrate and heavily poached by cattle
Fenrother Burn 1	-	-	✓	-	-	Very little water and heavily shaded – no further surveys undertaken
Fenrother Burn 2	-	-	-	-	-	Dry – no surveys undertaken
River Lyne	✓	-	✓	✓	✓	Too heavily shaded for macrophytes
Floodgate Burn	-	-	✓	✓	-	Small and shallow but with potential eel habitat
Shieldhill Burn	-	-	✓	-	-	Very little water, heavily shaded and culverted for long distances
Shieldhill Burn Tributary	-	-	✓	-	-	Ditch with septic input - no surveys undertaken

3 RIVER HABITAT SURVEY

3.1 Objective

3.1.1 RHS is used to assess overall habitat quality and the degree of artificial modification present to a watercourse. RHS can be used to determine a hydromorphological baseline against which modification to bank and bed structures can be assessed, and the effect of any modification on ecological functioning predicted. Outputs of RHS surveys are the Habitat Quality Score (HQS) and Habitat Modification Score (HMS). Habitat Quality Score refers to the "overall habitat diversity provided by natural features in the channel and river corridor. Points are scored for the presence of features such as point, side and mid-channel bars, eroding cliffs, large woody debris, waterfalls, backwaters and floodplain wetlands" (www.riverhabitatsurvey.org). The Habitat Modification Score (HMS) and subsequent class is an indication of artificial modification to river channel morphology, based upon the presence and extent of artificial features such as culverts and weirs, re-profiling and reinforcement of banks, bridges and outfalls and embankments.

3.2 Desk Study

3.2.1 Results of previous RHS were obtained from www.riverhabitatsurvey.org/map-open-os/. Although the River Coquet, Longdike Burn and the River Lyne have all been previously surveyed, only the River Lyne site falls within the study area. This site (reference number 19694) was classed as predominantly unmodified in 2007 (HMS 120 and HQA 78).

3.2.2 Several sites on the River Coquet have previously been surveyed by RHS. The nearest sites to the study area lie 13.5km upstream (site 8818, surveyed in 1996) and 7.6km downstream (site 24033 surveyed in 2008). All sites ranged from pristine/semi-natural to obviously modified, with the exception of one site, at Warkworth Ford, which was classed as severely modified in 2011. The section of the River Coquet within the survey area has no previous RHS surveys. The Coquet within the survey area is not designated as artificial or heavily modified under WFD and the hydrological regime is classified as supporting good status (Environment Agency, 2017a). Areas of the Coquet catchment have been subject to historic dredging and straightening (The Wild Trout Trust, 2014).

3.2.3 The only previously surveyed RHS site on Longdike Burn is approximately 1.3km downstream of the survey area and was recorded as obviously modified in 1995. The Longdike Burn is not designated as artificial or heavily modified under WFD and the hydrological regime and morphology are classified as supporting good status (Environment Agency, 2017a).

3.3 Field Survey

Methods

3.3.1 RHS was undertaken over a 500m stretch on the main watercourses encompassing, where access allowed, the crossing point of the proposed scheme (Figures 1.1 – 1.3, Appendix C). The survey was undertaken by an accredited surveyor, experienced in the assessment of lowland river typologies and having received the 2017 RHS update (Sean McGrogan – RHS accreditation ID FA023E). RHS is a standard monitoring method and requires an audit of a 500m reach of the physical characteristics and surrounding land use of a river. Ten spot checks are taken at 50m intervals within the 500m survey reach, followed by a sweep up of overall channel, bank and riparian zone characteristics. Features of geomorphological, hydromorphological and ecological interest are also recorded (Environment Agency, 2003).

3.3.2 Surveys were undertaken in August 2017, during a period of normal summer flow. Whilst considered outwith the preferential time to conduct an RHS survey (May – June) the low

macrophyte cover in the survey reaches and shallow water at this time of year were deemed suitable to allow a full assessment of the river bed and banks at each site.

3.3.3 Once collected, RHS field data was Quality Assessed by a second accredited RHS surveyor Jon Barnes - AT004) before being provided to the Environment Agency (custodians of the national database) and compared to a nationwide network of reference sites.

Survey Limitations

3.3.4 Due to access restrictions the RHS survey on the River Lyne was conducted from the crossing point downstream, rather than including the section upstream and downstream. However, as previously mentioned, most potential impacts would occur downstream of the crossing point.

3.3.5 Surveying in August (outside of the preferred survey window of May – June) is not considered a limitation. Spring surveys are preferred to avoid macrophyte growth obscuring bed and bank features. The proposed Scheme crossing points selected for RHS do not demonstrate heavy macrophyte growth and therefore this is not considered a limitation to the RHS survey.

3.3.6 Where possible the proposed crossing point was included within the RHS. With potential physical habitat modification occurring at the crossing point (and predominantly downstream in the form of changes to surface water drainage) a separate upstream RHS site was deemed unnecessary if the crossing point could be encompassed within a downstream site.

Results

3.3.7 The main watercourses crossed by the proposed scheme were surveyed between the 1st and 4th August 2017 (Figures 1.1 – 1.3). The survey results are presented in Table 3.1.

Table 3.1: RHS survey results.

Watercourse	Survey Reach	HQA	HMS	HMS class
River Coquet	u/s: NZ 17187 99820 d/s: NZ 17689 99877	54	365	3 – Obviously Modified
Longdike Burn 1	u/s: NZ 17838 97169 d/s: NZ 18051 97412	52	1860	5 - Severely Modified
Longdike Burn 2	u/s: NZ 18056 96711 d/s: NZ 17880 97024	60	800	4 – Significantly Modified
River Lyne	u/s: NZ 18570 91627 d/s: NZ 18899 91656	53	420	3 - Obviously Modified

3.3.8 All sites received a Habitat Modification Class of obviously modified to severely modified, predominantly due to the inclusion of the existing crossing structures in the survey reaches (Table 3.1). Inclusion of the crossing structure is also likely to account for the difference from the previous result of predominantly unmodified for the River Lyne.

3.3.9 The River Coquet received the lowest HMS (365) as it was the only site where no culverts were recorded. Contributory factors to the modification score on the Coquet include the presence of the existing A1 crossing and associated infrastructure, including bank reinforcement and an outfall. The river planform was predominantly natural, with no evidence of realignment or over deepening, although some isolated resection was recorded. The bank habitat features and flow diversity contributed to the HQA score. The RHS scores are comparable to the historic RHS cores reported from RHS surveys undertaken up and downstream of the A1 crossing.

3.3.10 Both Longdike sites reported significantly or severely modified HMS scores, with over a third of each survey sites both realigned and over deepened. Site 1 on Longdike Burn received the highest HMS (1860) due to the presence of significant habitat modification. Both sites are affected by culverting, bridges, and significant amount of re-sectioning/re-profiling, whilst the Longdike Burn site 1 RHS also reported reinforced banks. Despite this the Longdike Burn Site 2 survey recorded the highest HQA, although tis was largely driven by marginal and adjacent habitat features rather than inchannel habitat diversity or quality.

4 MACROPHYTES

4.1 Objective

4.1.1 A survey of the macrophyte community in a watercourse can be used to assess ecological condition and indicate impacts of nutrient enrichment and alterations in flow.

4.2 Desk Study

4.2.1 The citation for the River Coquet and Coquet Valley Woodlands SSSI indicates that the lower reaches of the river support a variety of aquatic plants, including river water-crowfoot (*Ranunculus fluitans*). The nearest NBN records for *R.fluitans* on the Coquet are beyond 5km both up and down stream of the current A1 crossing. Environment Agency macrophyte data from the wider catchment shows that the plant communities present in the River Coquet are diverse, consisting of many common and widespread species. There were no records of species with legislative designations or local conservation interest.

4.2.2 No macrophyte records were found for the other watercourses in the study area. No species of conservation interest were returned from the local biodiversity records centre data request.

4.3 Field Survey

Methods

4.3.1 Macrophyte surveys were undertaken at three sites identified during the aquatic habitat assessment (Figures 1.1 and 1.2). These sites were chosen as they remained largely unshaded during summer months, were permanently wetted and supported substrates conducive to macrophyte communities to establish. The survey involved compiling macrophyte species lists and percentage cover from a 100m reach of the watercourse following the WFD compliant method (WFD-UKTAG, 2014a). Field data detailing the physical characteristics of each sample site were also collected including location, width, depth, substrate, habitats (for example pools and riffles), shading, water clarity and bed stability.

4.3.2 The results of the survey were analysed using the WFD assessment tool LEAFPACS2 (WFD-UKTAG, 2014a), which uses the following metrics:

- River Macrophyte Nutrient Index (RMNI): a measure of nutrient enrichment at the site. Values range from 1 to 10, with high scores assigned to nutrient-tolerant taxa (Wilby *et al*., 2012).
- Number of macrophyte taxa (NTAXA): the number of truly aquatic taxa observed in the survey.
- Number of functional groups (NFG): a measure of the functional diversity at the site.
- Cover of green filamentous algae (ALG): the percentage cover of green filamentous algae observed over the whole of the survey reach.

4.3.3 An ecological quality ratio (EQR) was calculated for each of the above metrics as well as for the site as a whole. The EQR is the ratio of the observed conditions at the site to those expected in reference (i.e. high quality or pristine) conditions. The EQR ranges from zero to one, with one indicating that the observed conditions are equal to reference conditions. A WFD classification of High, Good, Moderate, Poor or Bad is also assigned to each site.

Limitations

4.3.4 Macrophyte surveys were not conducted on the River Coquet due to the size and fast-flowing nature of this river. No macrophytes were observed in the study area during other aquatic surveys at this location.

Results

4.3.5 Three sites, Minto's Dean and two sites on Longdike Burn, were surveyed for macrophytes between the 31st July and 2nd August 2017. Macrophyte surveyors were Environment Agency accredited and experienced in the monitoring and assessment of lowland macrophyte species.

4.3.6 Macrophytes were reported in low diversity at all sites (7 species on Minto's Dean and a 3 and 4 species on Longdike Burn 2 and 1 respectively). Of these, only 2 species on Minto's Dean, and 1 on the Longdike Burn sites are considered truly aquatic (NTAXA in table 4.1). Macrophyte coverage on the Longdike Burn was very low (1%), whilst the Minto 's Burn site was choked with 75% cover.

4.3.7 All sites were considered 'poor' quality using WFD compliant metrics. The metrics calculated for each site area given in Table 4.1 (and Appendix D).

4.3.8 Himalayan balsam (Impatiens *glandulifera*) was reported as marginal vegetation on the Minto's Dean site.

Table 4.1: Macrophyte indices.

Metric	Minto's Dean	Longdike Burn 1	Longdike Burn 2
RMNI	8.06	7.60	7.55
RMNI EQR	0.431	0.609	0.616
NTAXA	2	1	1
NTAXA EQR	0.307	0.133	0.133
NFG	2	1	1
NFG EQR	0.465	0.204	0.204
Number of taxa (including non-hydrophytes)	7	4	3
Overall Macrophyte Cover (%)	75	2	1
ALG (%)	7.50	0.05	0.05
ALG EQR	0.925	1	1
Overall EQR	0.262	0.326	0.331
WFD Class	Poor	Poor	Poor

4.3.9 The RMNI and associated EQR for each site indicate that the macrophyte communities contain more nutrient-tolerant species than would be expected at sites sharing similar physical characteristics without nutrient enrichment. Both Longdike Burn sites indicate less nutrient tolerant macrophyte communities than Minto's Dean, however the lack of diversity results in the poor quality classification using the WFD metric.

4.3.10 The overall EQRs indicate that none of the macrophyte communities surveyed are comparable to what would be expected under pristine conditions and all three sites are impacted by poor community diversity, nutrient input and/or altered flows. No species of conservation interest were recorded.

5 MACROINVERTEBRATES

5.1 Objective

5.1.1 Macroinvertebrates are used to detect a range of environmental stressors, such as organic pollution, low flows, sedimentation and habitat quality. The use of biotic metrics (see below) can attribute community composition to different environmental factors. Whilst very few species are protected under UK legislation the distribution of many species are well documented and conservation metrics can be applied to both individual species and community composition.

5.2 Desk Study

5.2.1 Results of Environment Agency macroinvertebrate sampling for WFD monitoring indicate that the River Coquet and Longdike Burn have a classification of High and the River Lyne has a classification of Moderate (Environment Agency, 2017a). Environment Agency data shows that the macroinvertebrate communities present in these watercourses are diverse, consisting of many common and widespread species. The caddisfly *Polycentropus kingii*, valued as of 'local' conservation interest (Chadd and Extence, 2004), but relatively common, was recorded from the River Coquet at Felton in 2012 and 2014, which is located approximately 1.2km downstream of the study area.

5.2.2 Riverfly Trust monitoring in 2015 returned good macroinvertebrate species abundance and diversity throughout the River Coquet but with a few samples showing impacts of nutrient (phosphorus) enrichment (Salmon & Trout Conservation UK, 2015).

5.2.3 No aquatic macroinvertebrates are listed on the Northumberland Biodiversity Action Plan (Northumberland Wildlife Trust, undated), nor data provided in a data request to the local biodiversity records centre.

5.3 Field Survey

Methods

5.3.1 Samples were taken in May and October 2017 using the WFD compliant method, three-minute kick sample and a one-minute hand search at each site (Environment Agency, 2012). Samples were preserved using industrial methylated spirits (IMS) on site as per Environment Agency guidelines. Alongside aquatic invertebrate sampling, a standardised field sheet was completed to include details 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; temperature, dissolved oxygen, conductivity, salinity and pH was also collected by means of a calibrated YSI probe.

5.3.2 Species level identification was undertaken in the Jacobs aquatic ecology laboratory by experienced, Environment Agency trained, species level macroinvertebrate taxonomists. As per Environment Agency quality assurance procedure 10% of samples were reanalysed by a senior taxonomist. All samples passed internal quality assurance.

5.3.3 The following biological metrics were calculated from the community data of each site:

River Invertebrate Classification Tool (RICT)

5.3.4 Based on a comparison of macroinvertebrate communities observed at each study site, with macroinvertebrate communities observed at reference sites, RICT determines the ecological condition of a given location. Reference site selection is based on a similarity of physical attributes with the study site (for example; width, depth, substrate type, altitude, distance from source, alkalinity). RICT reference sites are deemed to be as close as possible to pristine conditions and not impacted by environmental stressors such as

pollution, habitat modification or flow stress. Reference sites provide an expected macroinvertebrate community score for that river type. The observed macroinvertebrate community score at a given study site is divided by the expected community score. Reference and bias adjustments are then applied to obtain the Ecological Quality Ratio (EQR). RICT can derive EQR scores for a number of biological metrics including LIFE (measure of macroinvertebrate flow preferences), WHPT NTAXA (measure of macroinvertebrate richness) and WHPT ASPT (measure of macroinvertebrate tolerance to organic pollution); these metrics are discussed further below.

Whalley, Hawkes, Paisley & Trigg (WHPT) Metrics

5.3.5 The WHPT metric is the classification method for the assessment of macroinvertebrates in rivers in relation to general degradation, including organic pollution under the WFD (WFD-UKTAG, 2014b). In 2014 the WHPT scoring system replaced the BWMP scoring system; the WHPT metric is abundance weighted and scores have been revised to be more representative of the family as a whole and reflect general pollution rather than just organic pressures (Paisley et al., 2007). Scores are assigned to macroinvertebrate families based on tolerance to pollution with the final WHPT score taking into account the abundance of each of the families. Average Score Per Taxon (WHPT ASPT) EQR scores are calculated by dividing the WHPT score by the Number of Scoring Taxa (WHPT NTAXA). WHPT and WHPT ASPT scores are used as a measure of water quality; WHPT NTAXA is used as a measure of diversity.

WFD Classification

5.3.6 The WFD uses the pollution sensitivity (WHPT ASPT) and macroinvertebrate richness (WHPT NTAXA) EQR scores to determine whether a watercourse meets Good Ecological Status, as required under the Directive. There are five ecological status classes: Bad, Poor, Moderate, Good and High. Where a macroinvertebrate community is recorded at, or above Good Ecological Status, then biological or physical pressures including flow and pollution are not assumed to be affecting aquatic ecology. Watercourses failing to meet Good Ecological Status for macroinvertebrates may be influenced by a variety of stressors, and EQRs can be interrogated to determine the likely cause of failure to meet Good Ecological Status. For WFD classification the lower scoring of these EQR scores determines the macroinvertebrate classification of a given site. Classifications cannot be generated for sites less than 2.5 km from the watercourse source.

Community Conservation Index (CCI)

5.3.7 The CCI metric represents the national rarity and diversity of species identified within a site and designates a conservation value to the sampled community (Chadd & Extence, 2004). A conservation score (CS) is applied to each species based upon its national rarity. The CCI is calculated from the sum of conservation scores divided by the number of contributing species to obtain the mean value. This is then multiplied by the community score (CoS), derived from the rarest taxon present. CCI scores are assigned into conservation classes. The CCI value tends to fall in a range of between 0 and 40 (Table 5.1). CCI scores and classes can be adjusted to take into account local conditions. For example, a species may be nationally scarce but relatively common in a particular location, and vice versa.

Table 5.1: CCI conservation classes (Chadd and Extence, 2004).

Conservation Class	Score	Description
Low	<5.0	Site supporting common species and low taxon richness
Moderate	5.0 to 10.0	Site supporting at least one species with limited distribution or moderate taxon richness
Fairly High	10.0 to 15.0	Site supporting at least one uncommon species or several of limited distribution or high taxon richness

Conservation Class	Score	Description
High	15.0 to 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.

Lotic-invertebrate Index for Flow Evaluation (LIFE)

5.3.8 Freshwater macroinvertebrates have specific requirements for flow conditions and can be used to determine not only predominant flow types (Extence *et al.*, 1999) but also changes in flow character. The LIFE metric uses abundance data to assign a flow preference score to macroinvertebrate families present in a sample and an overall score for the site can be interpreted as an abundance-weighted average score per taxon metric.

Proportion of Sediment-sensitive Invertebrates (PSI)

5.3.9 The PSI metric aims to act as a proxy for the quantity of fine sediment at a site (Extence *et al.*, 2011). Macroinvertebrate species are assigned a fine sediment sensitivity rating that ranges from highly insensitive to highly sensitive to fine sediment (Table 5.2). The PSI score is calculated as the percentage of sensitive taxa in the sample.

Table 5.2: PSI score interpretation (Extence et al., 2011).

PSI	River Bed Condition
81 - 100	Minimally sedimented/unsedimented
61 - 80	Slightly sedimented
41 - 60	Moderately sedimented
21 - 40	Sedimented
0 - 20	Heavily sedimented

Limitations

5.3.10 Due to access restrictions the spring and autumn macroinvertebrate samples on Minto's Dean were taken from opposite sides of the A1, with the spring sample being taken from downstream of the A1 and the autumn sample taken from upstream. Best efforts were made to ensure that the samples were taken from comparable habitats in each season, however micro variation in habitat (substrates and flow types for example) may result in minor differences in community composition. This is not considered a significant limitation to the interpretation of invertebrate data from this site. Both sites lie within 2.5km of the source of the Minto's Dean and as such cannot analysed using RICT (lack of suitable reference sites in headwater locations), however all other metrics were calculated separately.

5.3.11 Samples were taken from all wetted sites visited during the aquatic habitat assessment in May. In October the number of surveyed sites was reduced from 14 to eight, as a result of summer low flows reducing the wetted flow in a number of the watercourses. This affected sites on Thirston Burn, Minto's Dean Tributary, Longdike Burn 2 (sample 2), Fenrother Burn 1, Shieldhill Burn and Shieldhill Burn Tributary. All of these sites either dried up completely or water levels dropped below 5cm, (and therefore a compliant macroinvertebrate sample could not be collected). The lack of data from these sites in October indicate the ephemeral nature of the minor watercourses, reliant on rainfall or baseflow to maintain wetted area. It is considered that these sites provide limited permanent macroinvertebrate habitat.

Results

Biological Indices

5.3.12 The site on the River Coquet had a diverse macroinvertebrate community (Appendix E), with a WHPT-NTAXA of 24 (Table 5.3). There were good abundances of pollution sensitive families including Heptageniidae, Ephemerellidae (mayflies) and Perlodidae (stoneflies), alongside ubiquitous families including Oligochaeta (worms) and Gammaridae (freshwater shrimp). A dominant flow type can be deduced from this community; with a number of macroinvertebrate families with a preference for faster flows recorded. This is reflected in the LIFE scores from this site, which are indicative of a community with a preference for faster flows (Table 5.3). PSI scores (Table 5.3) indicate that the site is minimally impacted by sedimentation, which is reflected by the presence of taxa which are intolerant of sedimentation.

5.3.13 Longdike Burn 1 and Longdike Burn 2 (sample 1) both exhibit a diverse macroinvertebrate community (Appendix E), with a WHPT-NTAXA of 24 at each site (Table 5.3). There are good abundances of pollution sensitive families including Ephemeridae, Heptageniidae (mayflies) and Leptoceridae (cased caddisflies) alongside common families including Elmidae (riffle beetles) and Gammaridae (freshwater shrimp). The macroinvertebrate community recorded at Longdike Burn 2 (sample 2) is dominated by a number of pollution-tolerant taxa (Appendix E), suggesting that the site is of moderate biological quality (WHPT-ASPT of 5.51; Table 5.3). This is supported by the reduced diversity (WHPT-NTAXA of 20; Table 5.3) recorded in the watercourse compared to the other sites on the Longdike Burn. LIFE scores from the three sites on the Longdike Burn, are indicative of a community with a preference for faster flows (Table 5.3). PSI scores (Table 5.3) indicate that the sites are slightly impacted by sedimentation, which is reflected by the presence of taxa which are intolerant of sedimentation.

5.3.14 The macroinvertebrate community on the River Lyne is dominated by ubiquitous pollution-tolerant families (Appendix E), including Oligochaeta (worms) and Chironomidae (non-biting midge), suggesting that the site is of moderate biological quality (WHPT-ASPT of 5.29; Table 5.3), which is supported by the lack of diversity (WHPT-NTAXA of 15) recorded in the watercourse. LIFE scores are indicative of a community with a preference for faster flows (Table 5.3). PSI scores (Table 5.3) indicate that the sites are impacted by sedimentation, which is reflected by the presence of taxa which are tolerant of sedimentation.

5.3.15 The remaining sites were located on a number of minor watercourses, these sites displayed macroinvertebrate communities typical of these habitats. The majority of these sites contained flow stressed macroinvertebrate communities typical of moderately to heavily sedimented habitats and display low community conservation scores (Table 5.3).

Table 5.3: Macroinvertebrate results.

Site	WHPT - ASPT	WHPT - NTAXA	LIFE		PSI		CCI Score	
			Spring	Autumn	Spring	Autumn	Spring	Autumn
Minto's Dean Tributary	3.89	10	6.00	-	22.22	-	1	-
Minto's Dean	5.60	21	6.86	7.00	59.26	63.64	5.33	4.15
Back Burn Tributary	5.90	19	6.75	6.42	61.76	75	11.07	5.33

Site	WHPT - ASPT	WHPT - NTAXA	LIFE		PSI		CCI Score	
			Spring	Autumn	Spring	Autumn	Spring	Autumn
River Coquet	6.74	24	7.91	7.69	85	80	15.4	7.33
Thirston Burn Tributary	3.86	14	5.4	-	0	-	1.13	-
Longdike Burn 1	6.15	25	7.15	7.33	67.57	67.57	9.78	7.05
Longdike Burn 2 (sample 1)	6.22	25	7.36	7.50	78.57	70	13.73	7.25
Longdike Burn 2 (sample 2)	5.51	20	7.13	-	63.64	-	10.00	-
Earsdon Burn	5.22	19	7.06	6.80	63.64	62.07	8.25	7.73
Fenrother Burn 1	3.53	14	5.43	-	11.11	-	1.29	-
River Lyne	5.29	15	6.33	7.21	35.29	61.90	3.86	3.82
Floodgate Burn	4.54	22	6.27	6.21	40.63	45.16	3.00	3.25
Shieldhill Burn	2.45	6	5.67	-	0	-	1.00	-
Shieldhill Burn Tributary	3.33	10	5.80	-	5.88	-	1.14	-

River Invertebrate Classification Tool

5.3.16 RICT analysis was performed on five sites. The River Coquet and two sites on Longdike Burn achieved Good status for macroinvertebrates. The remaining site on the Longdike Burn and the River Lyne both achieved Moderate status (Table 5.4).

5.3.17 River Coquet achieved High WHPT-ASPT and Good WHPT-NTAXA classifications, suggesting that there is only a minor deviation from the macroinvertebrate community which would be expected under reference conditions.

5.3.18 Longdike Burn 1 and Longdike Burn 2 (sample 1) achieved Good WHPT-ASPT and High WHPT-NTAXA classifications, which again indicates that there is only a slight deviation from the macroinvertebrate community which would be expected under reference conditions.

5.3.19 Longdike Burn 2 (sample 2) and the River Lyne achieved Moderate WHPT-ASPT and High WHPT-NTAXA classifications, which suggests the community at this site is affected by environmental stress and dominated by pollution-tolerant species.

Table 5.4: RICT analysis output.

Site	Index	EQR	Class	Probability of class (%)	Macroinvertebrate Classification (Potential)
River Coquet	WHPT-ASPT	0.78	High	97.42	Good
	WHPT-NTAXA	1.06	Good	55	
Longdike Burn 1	WHPT-ASPT	0.92	Good	78.64	Good
	WHPT-NTAXA	0.90	High	51.59	
Longdike Burn 2 (sample 1)	WHPT-ASPT	0.94	Good	73.38	Good
	WHPT-NTAXA	0.89	High	49.06	
	WHPT-ASPT	0.82	Moderate	69.25	Moderate

Site	Index	EQR	Class	Probability of class (%)	Macroinvertebrate Classification (Potential)
Longdike Burn 2 (sample 2)	WHPT-NTAXA	0.89	High	75.19	
River Lyne	WHPT-ASPT	0.80	Moderate	88.43	Moderate
	WHPT-NTAXA	0.58	Moderate	47.02	

Species of conservation interest

5.3.20 Four macroinvertebrate species of conservation interest were identified from the 14 sites surveyed (Table 5.5). The mayfly *Ecdyonurus insignis*, caddisflies *Athripsodes bilineatus* and *Beraeodes minutus*, although valued as Local (CCI score 5), are all relatively common. The Regionally Notable *Baetis buceratus* (Scarce Olive) is a widespread, though localised species. The aquatic nymph life stage typically lives amongst sand and gravel in riffles and in the generally in the North East are reported above the Riverfly Partnership / Freshwater Biological association threshold for this species.

Table 5.5: Macroinvertebrate species of conservation interest with CCI scores above 5 (Local)

Site	Species	Season	CCI Definition (score)
Back Burn Tributary	*Baetis buceratus*	Spring	Regionally Notable (6)
River Coquet	*Ecdyonurus insignis*	Spring	Local (5)
Longdike Burn 1	*Athripsodes bilineatus*	Spring	Local (5)
Longdike Burn 2 (sample 1)	*Athripsodes bilineatus*	Spring	Local (5)
Longdike Burn 2 (sample 2)	*Athripsodes bilineatus*	Spring	Local (5)
Earsdon Burn	*Beraeodes minutus*	Autumn	Local (5)

6 PONDS

6.1 Objective

6.1.1 The Predictive SYstem for Multimetrics (PSYM) has been developed by the Ponds Conservation Trust (now the Freshwater Habitats Trust) and the Environment Agency to assess the ecological quality of still waters by comparing them to pristine ponds with similar physical features. Community conservation scores and water quality can also be assessed from PSYM output.

6.2 Desk Study

6.2.1 Review of OS maps identified nine ponds within 300m of the proposed scheme. The Northumberland Biodiversity Action Plan suggests that Northumberland has not experienced the net decline in ponds that has been recorded on a national level (Northumberland Wildlife Trust, undated). No information regarding specific ponds within the survey area was found during the desk survey.

6.3 Field Survey

Methods

6.3.1 PSYM surveys which include macrophyte and macroinvertebrate surveys were performed at five waterbodies within the 300m scheme buffer (Figures 2.1-2.4, Appendix F), the other four ponds were not accessible (see limitations section). Physical characteristics, including altitude, pH and presence of and inflow were also recorded at each pond in accordance with the standard survey method (Environment Agency & Ponds Conservation Trust, 2002).

6.3.2 Survey results were sent to the Freshwater Habitats Trust for comparison against the national database. Metrics used to compare with expected values in order to obtain final score were:

- number of submerged and marginal plant species;
- number of uncommon plant species;
- Trophic Ranking Score (TRS) an average of the trophic scores of individual plant species depending on their affinity to particular nutrient conditions;
- Average Score per Taxon (ASPT);
- number of Odonata and Megaloptera Families (OM); and
- number of Coleoptera families (CO).

6.3.3 Ecological Quality Indices (EQI), the ratio between the observed and expected values, are calculated for each metric as a measure of how close they are to the minimally impacted baseline condition. These are reported on a scale of 0 to 3 with 0 representing poor quality and 3 representing good quality.

6.3.4 The pond scores an Index of Biotic Integrity (IBI) based on the macrophyte and macroinvertebrate data which was used to determine the PSYM quality category. The following IBI ranges were used: IBI >75%=Good, 51-75%= Moderate, 25-50%=Poor and <25%=Very Poor.

6.3.5 Limitations

Four ponds within 300m of the proposed scheme could not accessed due to on-going pond management at the time of survey and the presence of game birds which are easily disturbed. These ponds were not directly under the footprint of the proposed Scheme.

Results

6.3.6 PSYM surveys were undertaken on five ponds between the 14th and 15 h August 2017. The survey team included surveyors accredited through the Environment Agency freshwater macrophyte training programme and competent of macroinvertebrate identification in the field.

6.3.7 Results are presented in Table 6.1. None of the ponds surveyed contained any species of conservation interest nor met the criteria to be classed as a priority pond (JNCC, 2016).

Table 6.1: Summary of PSYM results.

Indices	A5	A6	A14	A15	A17
NGR	NZ 18708 93718	NZ 18585 95240	NZ 18081 97126	NZ 18057 97368	NZ 17604 98184
No. of submerged + marginal plant species (SM)	2	4	12	14	14
EQI (SM)	0.11	0.21	0.63	0.62	0.76
Number of uncommon plant species (U)	0	0	0	1	0
EQI (U)	0.00	0.00	0.00	0.26	0.00
Trophic Ranking Score (TRS)	8.75	9.17	8.70	8.73	8.39
EQI (TRS)	1.57	1.63	1.17	1.11	1.48
Average Score Per Taxon (ASPT)	4.00	4.06	4.00	4.33	4.52
EQI (ASPT)	0.71	0.73	0.77	0.84	0.87
Odonata + Megaloptera (OM) families	2	2	2	2	3
EQI (OM)	0.68	0.77	0.60	0.62	0.96
Coleoptera families (CO)	3	3	4	2	4
EQI (CO)	0.85	0.84	1.04	0.53	1.02
Index of Biotic Integrity (%)	39	44	56	56	67
PSYM quality category	Poor	Poor	Moderate	Moderate	Moderate
Meet Priority Pond criteria?	No	No	No	No	No

6.3.8 Ponds A5 and A6, west of the A1 at Earsdon and Causey Park were classed as Poor quality (IBI between 25-50%) due to a low number of plant species relative to that expected from a pond with similar physical conditions in reference, or pristine condition. Ponds A14 and A15 both within Felmoor Park and A17 in the Northumbrian Woodland Burials site were all classed as Moderate (IBI = 51-75%). Both ponds demonstrate near identical invertebrate and macrophyte metrics.

6.3.9 Pond A17 is an ornamental pond and contained the non-native macrophytes New Zealand pigmyweed (*Crassula helmsii*) and curly waterweed (*Lagarosiphon major*). Despite this, Pond A17 reported the highest IBI score, driven by the highest number of macrophyte species, highest invertebrate scores and lowest trophic rank scores.

7 FRESHWATER FISH

7.1 Objective

7.1.1 Electric fishing surveys are used to determine the presence or absence of fish species in watercourses crossed by the scheme. This enables identification of species of where species of conservation interest may be impacted by the scheme.

7.2 Desk Study

7.2.1 The River Coquet is reported to be one of the best known migratory fisheries in northern England with Atlantic salmon, sea trout and brown trout present throughout most of the river system. Rod catch statistics place it in the top ten salmon fisheries in England and sea trout are caught in this river each year (Environment Agency, 2017b). It has also been reported that all three species of lamprey spawn in the River Coquet (Environment Agency, undated).

7.2.2 Table 7.1 presents the species of fish recorded by the Environment Agency from their monitoring sites on the River Coquet, Longdike Burn and River Lyne (more than 5km downstream of the survey area). The most recent results of WFD monitoring for fish classified the Longdike Burn as High and the River Lyne as Poor (Environment Agency, 2017a).

Table 7.1: Fish species recorded by the Environment Agency.

Species	River Coquet	Longdike Burn	River Lyne
Atlantic salmon	✓		
Brown/sea trout	✓	✓	✓
European eel	✓	✓	✓
Lampetra sp.	✓	✓	✓
Bullhead			✓
Stone loach	✓	✓	✓
Minnow	✓	✓	✓
3-Spined Stickleback	✓	✓	✓

7.2.3 The Coquet supports a natural wild trout population in its head waters, supplemented by annual stocking by the Northumberland Angling Federation through the lower and medium catchment (The Wild Trout Trust, 2014).

7.2.4 Given the known sensitivity of fish species in the Coquet, the assumed presence of migratory species passing through the study area to reach spawning grounds in the tributaries and the large size of the Coquet within the study area it was deemed unnecessary to assess fish populations as part of this study. Site visits made for macroinvertebrates and Exposed Riverine Sediment species could accurately assess fish habitat suitability (Appendix B). All watercourse with a hydrological connection to the River Coquet would have the potential to support suitable habitats for migratory species.

7.3 Field Survey

Methods

7.3.1 Freshwater fish were surveyed by means of electric fishing undertaken to the British Standard (BS) EN 14011:2003 (water quality – sampling of fish with electricity) and in compliance with fish monitoring requirements under the WFD. The survey was led by surveyors accredited in electric fishing and affiliated to either the IFM or CIEEM. All fisheries work was undertaken licence from the Environment Agency (EP/EW090-N-9560/02)

7.3.2 An E-Fish backpack was used to carry out fully quantitative surveys (using a three run catch-depletion method) at three sites (River Lyne, Longdike Burn 1 and Longdike Burn 2). Catch depletion allows enumeration of a stock or stock component within a given site, and provides a reasonably accurate estimate of a given population.

7.3.3 Where the watercourse is very shallow, marginal areas heavily overgrown or fish are assumed not be present then a qualitative single-run survey was conducted. Minto's Dean, Back Burn Tributary and Floodgate Burn were assess using qualitative sampling which allows the determination of presence/absence of species.

7.3.4 Prior to the survey, water conductivity (µS/cm) and temperature (°C) measurements were recorded to determine the power output of equipment. Photographs of the site and habitat notes were also taken. Sites were stop-netted at upstream and downstream limits to stop the movement of fish in and out of the survey site.

7.3.5 Sampling was undertaken between the 18-20^{h} August 2017, within the optimal summer sampling period for lowland fish. Water levels and flows were typical of the time of year.

Limitations

7.3.6 Floodgate Burn and Minto's Dean had dense overhanging or encroaching vegetation in areas, which reduced the catch efficiency of the electric fishing methodology. Fish of conservation interest were unlikely to be found in these watercourses due to lack of suitable habitat.

7.3.7 River and brook lamprey species are difficult to speciate in the field, especially in larval or ammocete life stages. Whilst there remains difference in life cycle biology between the two species, both brook and river lamprey are similarly important in terms of conservation value, therefore all lamprey, regardless of species will result in the same value, and mitigation being applied to the watercourse.

Results

7.3.8 The results of the field surveys are shown in Table 7.2 (raw field sheets in Appendix G). No fish were caught during the qualitative surveys on the Back Burn Tributary or Minto's Dean. Both watercourses were less than 1m wide and shallow at an average of only 10cm deep and demonstrated predominantly low energy flow typologies (glide or ditch / no perceivable flow types with isolated areas of run or riffle flow. Substrates were a mix of coarse substrates (gravel, pebble cobble) with small fractions of sand and silt. Bordered by woodland, the Back Burn Tributary was heavily shaded (>75%) whilst Minto's Dean was moderately shaded (25-75%). The habitats within these two watercourses were considered to provide suboptimal habitats for freshwater fish species and unlikely to support typical habitats associated with species of conservational importance (see Appendix A and B).

7.3.9 Low numbers of 3-spined stickleback were caught in Floodgate Burn. This watercourse was characterised by very low energy flow types, (ditch 70%, pools 30%) over a predominantly fine substrate bed (sand 40%, clay 40%). Bordered on both banks by improved pasture the uniform bank structure creates limited habitat for fish. Stickleback are habitat generalists and tolerant of most types of pollution.

Table 7.2: Number of fish captured at each site with size range (mm) in brackets.

Site	Brown trout	Lamprey	European eel	Stone loach	3-spined Stickleback	Minnow	Bullhead
Longdike Burn 1 U/S: NZ 17892 97329 D/S: NZ 18002 97336	14 (58-172)	8 (93-145)	0	19 (28-107)	60 (12-55)	53 (26-74)	0
Longdike Burn 2 U/S: NZ 17977 96904 D/S: NZ 17928 96968	56 (45-135)	12 (50-180)	1 (300)	2 (74-93)	70 (14-54)	164 (17-85)	0
River Lyne U/S: NZ 18652 91665 D/S: NZ 18678 91655	0	0	0	0	16 (24-59)	0	6 (62-83)
Floodgate Burn U/S: NZ 18596 91258 D/S: NZ 18756 91288	0	0	0	0	10 (14-55)	0	0
Back Burn Tributary U/S: not recorded D/S: NZ 17580 00548	0	0	0	0	0	0	0
Minto's Dean U/S NZ 17398 00939 D/S NZ 17457 00943	0	0	0	0	0	0	0

7.3.10 The sites on Longdike Burn contained several species of fish in relatively high numbers. This is reflective of the variety of habitats present in Longdike Burn with deeper slow-flowing areas with tree roots and woody debris suitable for trout and minnow and shallower stony riffles for stone loach. Channel substrates and flow types were diverse along the burn, providing habitat variation suitable for a range of fish species. Flows variation included higher energy run and riffle flows, interceded with pool and glide sections. Channel vegetation, both aquatic and encroaching terrestrial provided cover for stickleback and smaller trout. Minnow and stickleback were numerically at the Longdike Burn sites, 34% at Longdike Burn 1 and 54% at Longdike Burn 2 (minnow) and 39% and 23% (stickleback) at these sites respectively. One European eel was recorded at Longdike Burn 2 and one was observed at Longdike Burn 1 but evaded capture. This indicates good connectivity to the main river network, allowing the free movement of eel through the catchment.

7.3.11 Twenty lamprey ammocoetes (juveniles) were recorded in the Longdike Burn sites. Ammocoetes are difficult to identify in the field and could be identified only as either Lampetra *spp* (river or brook lamprey). The abundant areas of soft silt and sand substrate in this watercourse provide optimum habitat for these species. Sea and river lamprey migrate into freshwater catchments during their life cycle. Brook lamprey may undertake very localised migration within the catchment but never leave freshwaters. Brook lamprey are the commonest of the three species in freshwaters.

7.3.12 The River Lyne provided few areas of sufficient water depth to support adult fish. In areas where water depth was sufficient to support fish the predominantly sand and silt substrate provided little optimal habitat for feeding or spawning. Bullhead were recorded in low numbers in the sections of shallow stony riffle. Bullhead are sensitive to pollution and

normally found in fast currents over stony ground. They are a key prey species for adult trout and habitat supporting bullhead often also supports minnow, stickleback and stone loach as there is similarity in their use of vegetation for cover. This species was not recorded in any other watercourse.

7.3.13 No salmon were recorded at any of the sites, however an incidental capture of a salmon parr was recorded during crayfish surveys on the River Coquet. A juvenile chub was also recorded from an invertebrate sample from the River Lyne.

8 WHITE-CLAWED CRAYFISH

8.1 Objective

8.1.1 The use of trapping and manual searching determines the presence or absence of white-clawed crayfish (WCC) in watercourses that could potentially be impacted by the scheme, facilitating the development of appropriate mitigation.

8.2 Desk Study

8.2.1 An NBN Atlas search returned Biological Records Centre records of WCC in the River Coquet at Felton in 1981 with records in nearby tributaries in 1997 (BRC, Crayfish (Crustacea; Astacura) data for Britain and Ireland 2003 obtained via NBN under CC-BY licence). The North American signal crayfish has been recorded throughout the UK, and is present in several catchments within 500m of the scheme. No historic records for WCC were returned from the local biodiversity records centre data request or Environment Agency for the study area or immediate catchment up and downstream.

8.3 Field Survey

8.3.1 Methods

WCC surveys were undertaken at the locations shown in Figures 2.1-2.4, between the 1st and 3rd August 2017 using a combination of survey methods as described below. A single visit was made to each site; this was deemed appropriate based upon the findings of the Habitat Assessment walkover survey.

Walkover Survey / Habitat Assessment

8.3.2 Prior to commencing surveys each site was assessed for crayfish suitability. This included a desk assessment of catchment geology, water quality and previous records, as described above. In the field each site was examined for habitat suitability, such as the presence of either soft banks (for burrows) or substrates, macrophytes or bank side vegetation that could provide cover to crayfish. This habitat assessment informed the screening of sites to take forward for field assessment (see below).

Manual Searches

8.3.3 Manual searches were undertaken at all four screened sites using the standard protocol for monitoring white-clawed crayfish (Peay, 2003). This involved searching under boulders and cobbles, examining undercut banks for signs of burrowing activity, and searching under large woody debris. Sweep netting for juvenile crayfish was undertaken in stands of vegetation and kick sampling was used in areas of the River Coquet that were too fast-flowing for trapping or hand searching.

Trapping Survey

8.3.4 A trapping survey was undertaken following the standard protocol for monitoring white-clawed crayfish (Peay, 2003). Only the sites on Longdike Burn were suitable for trapping, with areas of deep, slow-flowing water. A total of 24 crayfish traps, baited with cat food and pegged by a length of rope to the bank, were set at each site. The traps were left overnight and recovered the following morning. Any white-clawed crayfish present in the traps were recorded and returned to the river, any non-native crayfish were humanely destroyed on site.

8.3.5 The trapping was authorised by the Environment Agency and undertaken by a licensed surveyor (Permit Number: EP/EW090-Q-184/9593/01).

Limitations

8.3.6 Water clarity of the Longdike Burn was poor meaning that manual searching was less efficient, however a combination of trapping and manual searching was used at these sites. As with other surveys, the River Lyne could only be surveyed downstream of the A1 due to access restrictions. In the absence of further information, species presence can be assumed to be contiguous along the length of the watercourse as the culvert is not expected to present a barrier to crayfish movement.

8.3.7 Due to the size and fast flows of the River Coquet the surveys were limited to the shallower margins of the northern bank, which could be safely accessed. Whilst the prevalence of bedrock in this area indicates the habitat has limited suitability, the known presence of WCC in the wider catchment should ensure full protection is extended to this species during construction and operation.

Results

8.3.8 The results of the crayfish surveys are shown in Table 8.1. No WCC were reported from any of the survey sites.

8.3.9 Of the four sites surveyed, North American signal crayfish (*Pacifastacus leniusculus*) were recorded in the River Lyne. Signal crayfish are listed under Schedule 9 of the Wildlife and Countryside Act 1981. Whilst there are limited examples of signal crayfish and WCC co-existing it is more commonly assumed that the presence of signal crayfish within a watercourse is often at the detriment to WCC, through the spread of disease carried by the signal crayfish and direct completion. In most recorded instances, the presence of signal crayfish results in the loss of WCC from the wider catchment.

Table 8.1: Crayfish survey results.

Site	Upstream NGR	Downstream NGR	No. Traps	No. Manual Searches	White-Clawed Crayfish	Signal Crayfish
River Coquet	NZ 17490 99834	NZ 17512 99864	0	3	0	0
Longdike Burn 1	NZ 17772 97297	NZ 17918 97312	24	4	0	0
Longdike Burn 2	NZ 18049 96838	NZ 17949 96923	24	3	0	0
River Lyne	NZ 18580 91627	NZ 18685 91635	0	4	0	31

8.3.10 North American signal crayfish were also recorded during the fish surveys and both the spring and autumn invertebrate sampling on the River Lyne. This indicates that the population of signal crayfish in the River Lyne may be high, reducing the potential for a co-existing WCC population.

8.3.11 The site on the River Coquet provided isolated areas of habitat capable of supporting crayfish species. The watercourse substrate was predominantly boulder and cobbles, providing suitable conditions for crayfish refuge. There were several areas along the bank with exposed tree roots, which have to the potential to provide refuge. Variability in seasonal flows may restrict the distribution of crayfish within the Coquet to areas that provide suitable protection and refuge during periods of flood flows.

8.3.12 The sites on the Longdike Burn both provided numerous areas of habitat suitable to support crayfish species. The watercourse substrate was dominated by cobbles, with areas of boulders, which provided suitable conditions for crayfish refuge. There were numerous

areas of exposed bankside roots along the watercourse which are suitable crayfish refuge. Despite this neither species of crayfish were reported from the Longdike Burn during the 2017 surveys.

9 EXPOSED RIVERINE SEDIMENT

9.1 Objective

9.1.1 Exposed Riverine Sediment (ERS) surveys determine the presence of unique beetle communities of conservation importance which may be impacted by the scheme.

9.1.2 Exposed riverine sediments represent important primary habitats within the aquatic terrestrial interface of the river corridor. In active rivers, the deposition of gravel/shingle bars in marginal areas that are typically seasonally inundated under high flow conditions, provide a unique habitat supporting a wide range of invertebrate taxa. Taxa associated with ERS have a high fidelity to the habitat type, in that taxa may be ERS specialists and not widely associated with other aquatic or terrestrial habitats in the catchment. As such many ERS species receive protection in regards to their rarity.

9.1.3 ERS varies considerably in both distribution within a river catchment and in composition, which depends on the hydromorphology and geology of the catchment.

9.2 Desk Study

9.2.1 The citation for the River Coquet and Coquet Valley Woodland SSSI states that the riverside shingle and sand habitats support an important assemblage of ground beetles with several nationally scarce species including *Bembidion schuppeli*. The Northumberland Biodiversity Action Plan for rivers and streams states that in 2005 the River Coquet was found to be the second best river in England for Exposed Riverine Sediment quality (Northumberland Wildlife Trust, undated).

9.3 Field Study

Methods

9.3.1 Discrete areas of ERS were noted during the initial aquatic habitat assessments. Of these only one, a small island on the River Coquet (NZ 17509 99842), downstream of the existing crossing (Figure 2.1), was considered to be suitable for survey. The smaller deposits of ERS were assessed to be more frequently inundated and therefore considered aquatic features.

9.3.2 Typical ERS taxa surveys require a network of pitfall traps to be set across the ERS structure and left in-situ. This method works well in areas of gravel and pebble. Due to the large substrate sizes pitfall traps could not be set level as required by the standard sampling method. Therefore, the survey method was adapted from Sadler & Bell (2002) and involved hand searching and the creation of ten small excavations down to the water level. Water pooling in these excavations carry invertebrates from the surrounding sediment and were collected, preserved in alcohol before being sent for identification. Identification was undertaken by an experienced invertebrate taxonomist to species level.

9.3.3 The survey was undertaken on 3rd August 2017.

Limitations

9.3.4 The ERS identified for survey was comprised of large substrate types, atypical of high quality ERS habitats. Despite this the potential value of ERS to aquatic/terrestrial habitats is such that survey as considered valid.

9.3.5 Due to the large substrate sizes excavations were limited in size and number but samples are expected to be representative of communities present.

Results

9.3.6 The area sampled was a small island of approximately 140m^2 with 85% simple vegetative cover. The substrate comprised 60% boulder, 25% cobble, 10% pebble and 5% gravel. The presence of terrestrial vegetation indicated that the ERS structure was only infrequently inundated, most likely during high winter flows.

Plate 9.1: ERS situated downstream of existing A1 bridge

9.3.7 Four species of beetle were identified from the ERS sample (Table 9.1). All of these species are typical of river shingle and none have any conservation designations.

Table 9.1: ERS results. Conservation status from Sadler & Bell (2002).

Species	No. Recorded	Conservation Status
Paranchus albipes	4	n/a
Bembidion decorum	1	Common
Bembidion tibiale	11	Common
Bembidion femoratum	1	Local

9.3.8 *P.albipes, B.decorum* and *B.tibiale* are principally associated with aquatic habitats, common through the UK and found in gravelly river margins and banks. *B.decorum* and *B.tibiale* are often found together despite the former being confined to open gravelly rivers at low attitude, and the latter being characteristic of waters from a montane source. *B.tibiale* is also more tolerant of shaded conditions.

9.3.9 *B.femoratum* is a terrestrial species that may be found in open, sparsely vegetated gravel and sandy marginal environments, although its range extends through to clay and sand fully terrestrial habitats.

9.3.10 All three *Bembidion* species are considered to have a high fidelity to ERS habitats. Therefore, whilst the overall abundance of ERS species is considered low, the importance of minor areas of ERS within the reach may be important in providing discrete areas of suitable habitat for specialist ERS taxa.

10 DISCUSSION AND CONCLUSIONS

10.1.1 An assessment has been made on 17 watercourses crossed by the proposed Scheme. Of these three are designated main rivers under the WFD (River Coquet, Longdike Burn and River Lyne). The remaining 14 watercourses identified from desk study are a mix of tributaries draining the main rivers listed above to minor field drains, largely ephemeral in nature.

10.1.2 The River Coquet is an important river in Northumberland as it provides habitat for Atlantic salmon, as evidenced by the incidental capture of a juvenile salmon in close proximity to the existing crossing during crayfish surveys. The desk study indicates that this river also provides habitat for other fish species of conservation interest; European eel, sea trout and lamprey species. Surveys were not undertaken as part of the 2017 assessment however the known migration of these species through the survey area, and importance of the Coquet as a salmonid river in the North East should ensure a high level of conservation importance ins placed upon this watercourse, and its adjoining tributaries. This is supported by invertebrate sampling which demonstrated a community of good ecological value, consistent with the 2016 WFD classification. White-clawed crayfish are reported from the River Coquet at Felton and although not recorded during the 2017 surveys, should be assumed present within the catchment, if not the immediate area around the A1 crossing.

10.1.3 Although the macrophyte community and level of physical habitat modification on Longdike Burn are considered poor, the burn supports a diverse community of fish and aquatic macroinvertebrates, reflective of the heterogeneous habitat available in the burn. Lamprey and European eel are important conservation species reported from the 2017 surveys and indicate a connectivity to the wider Coquet catchment.

10.1.4 The results of the surveys on the River Lyne are consistent with the most recent WFD classification of Poor for this watercourse, with no macrophytes recorded and only three fish species (bullhead, 3-spined stickleback and an individual juvenile chub) recorded in low numbers. The presence of a significant number of the invasive non-native North American signal crayfish in the River Lyne further reduces the ecological quality of this watercourse; this species is known to feed on fish eggs and juveniles in addition to invertebrates, often resulting in reduced diversity and richness (GB Non-native Species Secretariat, 2016). The fish community recorded in the survey area is much reduced from the community recorded by the Environment Agency at other sites on the burn in 2002 and 2010. While it is likely that this is due to different habitat types between the sites, it cannot be ruled out that anthropogenic stress, including the presence of non-native species has had a detrimental effect on the fish community at the survey site.

10.1.5 The minor tributaries and field drains surveyed for various receptors provide a wide range of predominantly low value aquatic habitat. No species of conservation interest were reported from the surveys of minor watercourses. Habitat diversity in these features was generally low, as a result of low summer or ephemeral flows and heavy shading of sites preventing macrophyte growth and associated habitat diversity. Ecological quality (and value) of these sites is considered typical for aquatic habitats type observed.

10.1.6 Whilst these watercourses hold limited ecological value on their own, modifications to hydromorphological condition or the use of minor tributaries to take construction and/or operation road drainage has the potential to affect WFD status of the wider catchment and therefore the importance of these watercourses may become greater during Scheme design.

10.1.7 None of the ponds potentially impacted by the proposed scheme contained any species of conservation interest, and are considered poor quality using the Index of Biological Integrity (IBI).

10.1.8 During construction of the A1 upgrade the main potential impacts on the aquatic environment will include:

- Modification of physical habitat through the use of culverts, bridges and outfalls. This may result in habitat loss, habitat fragmentation and the disruption to migratory pathways.
- Disturbance to sensitive species. This is particularly important on the River Coquet, where both noise and visual stimuli may influence the seasonal migration of salmonids, eels and lamprey between spawning, nursery and feeding grounds. Even in the smaller waterbodies species may undertake localised migrations with the sub catchment to utilise different habitat types which may be affected by construction and operational activities.
- Reduction in water quality form construction and operational discharges. Site run-off may include a wide range of chemicals (hydrocarbons, fuels, salt, metals) that can bioaccumulate in living organisms or accrete into soft sediments to become bioavailable in the future. Contamination of watercourses may result in behavioural responses by mobile species or in extreme cases, mortality in sessile organisms.
- Modification to flow from new discharge points. In the minor tributaries that dominate the majority of new proposed crossings small changes in flow, especially linked to new road drainage or realigned watercourses has the potential to influence existing habitat types, leading to changes in geomorphological processes and habitat morphology.
- Introduction or facilitation of movement of non-native species. Under the Wildlife and Countryside Act 1981 (as amended in England and Wales) it is an offence to release into the wild any animal which is not ordinarily resident in or a regular visit to Great Britain or to plant or cause in the wild a plant listed on Schedule 9, including New Zealand pigmyweed and curly waterweed. A significant population of North American signal crayfish was recorded in the River Lyne. This species is known to carry crayfish plague (*Aphanomyces astaci*) which can devastate populations of the native white-clawed crayfish. Several non-native plant species were recorded in the pond in the Northumbrian Woodland Burial site and care must be taken not to transfer these. Himalayan balsam was recorded as present along the Minto's Dean.

10.1.9 Design and mitigation measures to reduce these impacts include; controlling the timing of in-channel works during key sensitive times of the year, silt control during construction, design of appropriate drainage, including the use of Sustainable Urban Drainage Systems (SUDS), the use of pollution prevention guidance and minimising the footprint of crossing structures.

10.1.10 Cognisance should be made of the WFD, which in England and Wales covers not only the main stem waterbody identified by the Environment Agency as the competent authority but also the broad water catchment. This means that minor tributaries and drainage features that discharge into the designated river body should be considered part of the designated waterbody.

11 REFERENCES

Armstrong, J. D., Kemp, P. S., Kennedy, G. J. A., Ladle, M. and Milner, N. J. (2003). Habitat requirements of Atlantic salmon and brown trout in rivers and streams. Fisheries Research, 62(2), 143–170.

Chadd, R. and Extence, C. (2004). The conservation of freshwater macro-invertebrate populations: a community based classification scheme. Aquatic Conservation: Marine and Freshwater Ecosystems, 14, 597-624.

Dawson, H., Quintella, B.R., Almeida, P.R., Treble, A.J. and Jolley, J.C. (2015). Chapter 3 The ecology of larval and metamorphosing lampreys. In: Docker, M. (ed.) The Biology of Lampreys, Springer.

Environment Agency and Ponds Conservation Trust (2002). A guide to monitoring the ecological quality of ponds and canals using PSYM.

Environment Agency (2003). River Habitat Survey in Britain and Ireland. Field Survey Guidance Manual: 2003 Version.

Environment Agency (2012). Freshwater macro-invertebrate sampling in rivers. Operational instruction. Document no. 018_08.

Environment Agency (2017a). Catchment Data Explorer. Available online at http://environment.data.gov.uk/catchment-planning [accessed November 2017].

Environment Agency (2017b). Salmonid and freshwater fisheries statistics for England and Wales 2016. Available online at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/668648/Salmonid_and_Freshwater_Fisheries_Report_2016.pdf [access January 2018].

Environment Agency (Undated). River factfiles The Northumberland catchment.

Extence, C.A., Balbi, D.M. and Chadd, R.P. (1999). River flow indexing using British benthic macroinvertebrates: A framework for setting hydroecological objectives. Regulated Rivers: Research and Management, 15, 543-574.

Extence, C.A., Chadd, R.P., England, J., Dunbar, M.J., Wood, P.J. and Taylor, E.D. (2011). The assessment of fine sediment accumulation in rivers using macro-invertebrate community response. River Research and Applications, 29, 17-55.

GB Non-native Species Secretariat (2016). Signal Crayfish, *Pacifastacus leniusculus*. Available online at http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2498 [accessed December 2017].

Hendry, K. and Craggs-Hine, D. (2003). Ecology of the Atlantic salmon. Conserving Natura 2000 Rivers Ecology Series No.7. English Nature, Peterborough.

Holdich, D. (2003). Ecology of the White-clawed Crayfish. Conserving Natura 2000 Rivers Ecology Series No. 1, English Nature, Peterborough.

JNCC (2016) UK Biodiversity Action Plan Priority Habitat Descriptions. Ponds. Available Online at http://jncc.defra.gov.uk/page-5706 [accessed November 2017].

Knights, B. and White, E.M. (1998) Enhancing immigration and recruitment of eels: the use of passes and associated trapping systems. Fisheries Management and Ecology, 5: 459-471.

Maitland, P. S. (2003). Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000 Rivers Ecology Series No. 5, English Nature, Peterborough.

Maitland, P.S. (2007) Scotland's Freshwater Fish. Ecology, Conservation & Folklore, Trafford Publishing (UK) Ltd.

Northumberland Wildlife Trust. (undated) Northumberland Biodiversity Action Plan. Available online at http://www.nwt.org.uk/northumberland-BAP [accessed December 2017].

Paisley, M.F., Trigg, D.J. and Walley, W.J. (2007) Revision and Testing of BMWP scores. Final report SNIFFER Project WFD72a. Edinburgh, SNIFFER.

Peay, S. (2003). Monitoring the White-clawed Crayfish *Austropotamobius pallipes.* Conserving Natura 2000 Rivers Monitoring Series No. 1, English Nature, Peterborough.

Sadler, J. and Bell, D. (2002). Invertebrates of Exposed Riverine Sediments. Phase 3 – Baseline faunas. Technical Report W1-033/TR.

Salmon & Trout Conservation UK (2015). Riverfly Census 2015. Available online at https://www.salmon-trout.org/wp-content/uploads/2017/08/2015-Report_Riverfly-Census.pdf [accessed January 2018].

Smith, G.R.T., Learner, M.A., Slater, F.M. and Foster, J. (1996). Habitat features important for the conservation of the native crayfish *Austropotamobius pallipes* in Britain. Biological Conservation 75, 239–246.

Solomon, D.J. and Beach, M.H. (2004). Fish pass design for eel and elver (*Anguilla Anguilla*). EA R&D Technical Report W2-070/TR1.

The Wild Trout Trust (2014). Advisory visit to the River Coquet 9th April 2014. Available online at www.wildtrout.org/system/files/private/River%20Coquet%20AV%20-%20NAF.pdf [accessed January 2018].

WFD-UKTAG (2014a). UKTAG River Assessment Method Macrophytes and Phytobenthos. Macrophytes (River LEAFPACS2).

WFD-UKTAG (2014b). Invertebrates (general degradation): Whalley, Hawkes, Paisley & Trigg (WHPT) metric in River Invertebrate Classification Tool (RICT).

Wilby, N.J., Pitt, J-A. and Phillips, G.L. (2012). The ecological classification of UK rivers using aquatic macrophytes. Science Report SC01008O/R1. Environment Agency, Bristol.

FIGURES

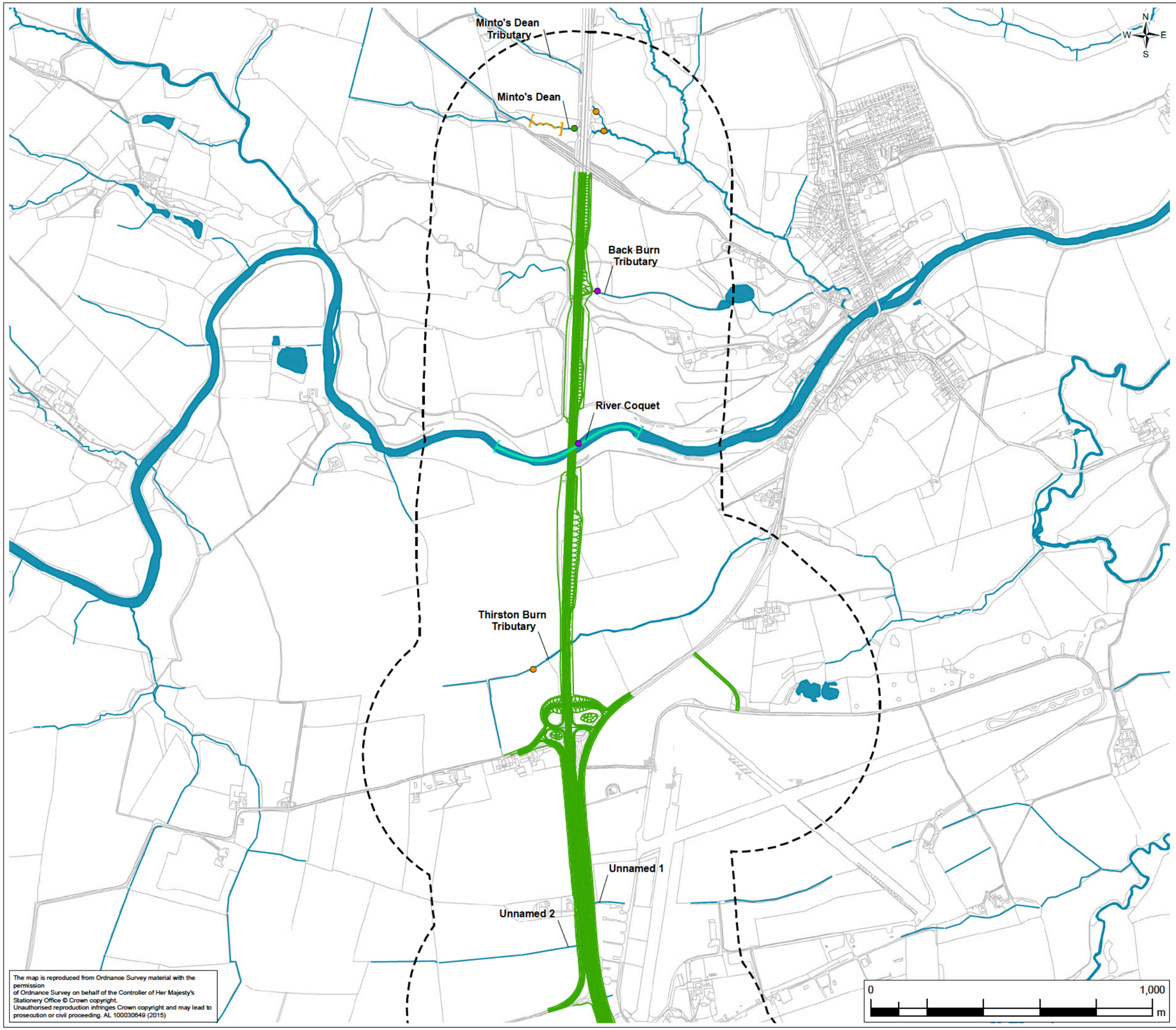


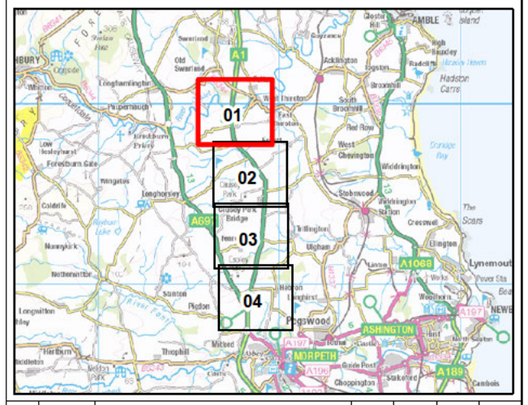
FIGURE 1.1

Legend

- Offline Option
- 500m Buffer from Offline Option
- Watercourse
- Waterbody
- River Habitat Survey
- Macrophyte Survey

Macroinvertebrate Survey

- Autumn
- Spring
- Spring and Autumn



Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	DEC 17	Initial Issue	LT	IM	EM	PF

JACOBS
1 City Walk, Leeds, LS11 9DX, UK.
Tel: +44(0)113 242 6771 Fax:+44(0)113 389 1389
www.jacobs.com

Client: highways england

Project: A1 IN NORTHUMBERLAND

Drawing Title: SECTION A - MORPETH TO FELTON
RHS, MACROPHYTE AND MACROINVERTEBRATE SITES

Drawing Status

Scale @ A3	1:13,000	DO NOT SCALE
Jacobs No.	B2104701	
Client No.		

Drawing No. B2104700_EC_AQ_0101

FIGURE 1.2

Longdike Burn 1

Longdike Burn 2

Earsdon Burn Tributary

Earsdon Burn

Q2

N
W E
S

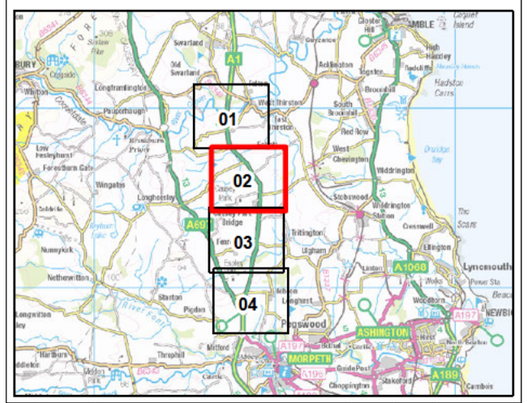
0 1,000 m

Legend

- Offline Option
- 500m Buffer from Offline Option
- Watercourse
- Waterbody
- River Habitat Survey
- Macrophyte Survey

Macroinvertebrate Survey

- Spring
- Spring and



Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	DEC 17	Initial Issue	LT	IM	EM	PF

JACOBS
1 City Walk, Leeds, LS11 9DX, UK.
Tel: +44(0)113 242 6771 Fax:+44(0)113 389 1389
www.jacobs.com

Client: highways england

Project: A1 IN NORTHUMBERLAND

Drawing Title: SECTION A - MORPETH TO FELTON
RHS, MACROPHYTE AND MACROINVERTEBRATE SITES

Drawing Status:

Scale @ A3	1:13,000	DO NOT SCALE
Jacobs No.	B2104701	
Client No.		

Drawing No. B2104700_EC_AQ_0102

FIGURE 1.3

Fenrother Burn 1

Fenrother Burn 2

River Lyne

Floodgate Burn

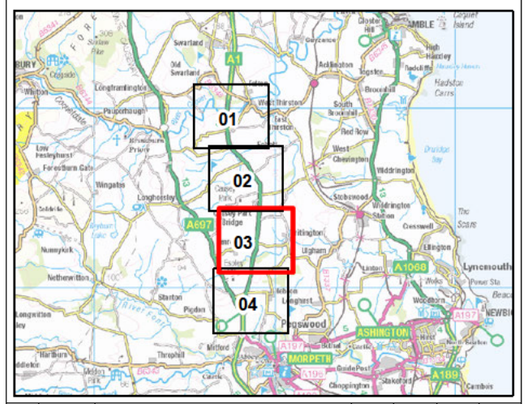
N
W E
S

Legend

- Offline Option
- 500m Buffer from Offline Option
- Watercourse
- Waterbody
- River Habitat Survey

Macroinvertebrate Survey

- Spring
- Spring and Autumn



Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	DEC 17	Initial Issue	LT	IM	AM	PF

JACOBS
1 City Walk, Leeds, LS11 9DX, UK.
Tel: +44(0)113 242 6771 Fax:+44(0)113 389 1389
www.jacobs.com

Client: highways england

Project: A1 IN NORTHUMBERLAND

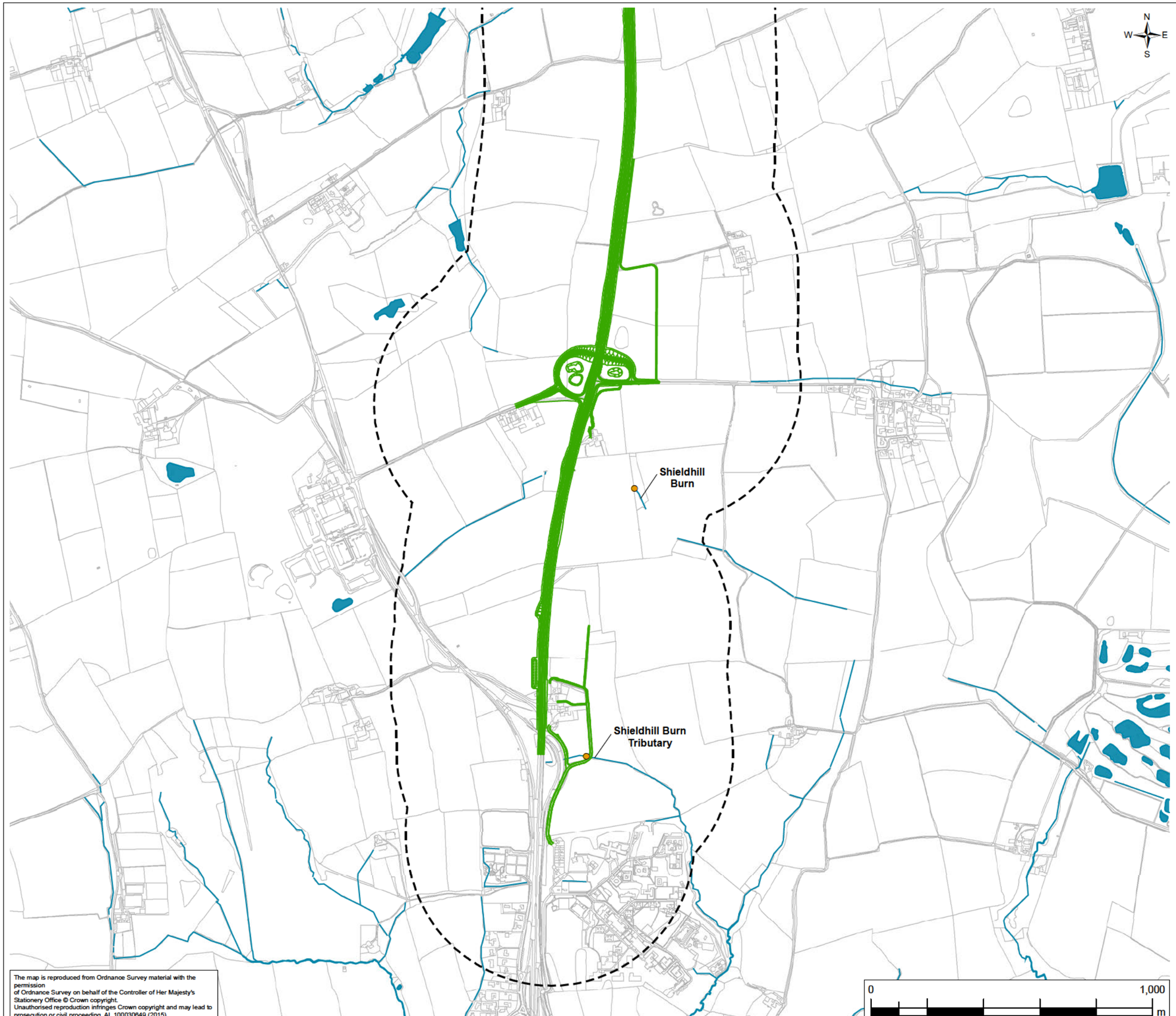
Drawing Title: SECTION A - MORPETH TO FELTON
RHS, MACROPHYTE AND MACROINVERTEBRATE SITES

Drawing Status

Scale @ A3	1:13,000	DO NOT SCALE
Jacobs No.	B2104701	
Client No.		

Drawing No. B2104700_EC_AQ_0103

0 1,000 m



The map is reproduced from Ordnance Survey material with the permission
of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office © Crown copyright.
Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceeding. AL 100030649 (2015)

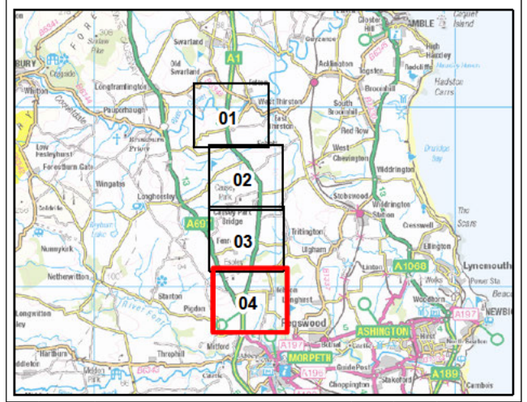
FIGURE 1.4

Legend

- Offline Option
- 500m Buffer from Offline Option
- Watercourse
- Waterbody

Macroinvertebrate Survey

- Spring



Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	DEC 17	Initial Issue	LT	IM	EM	PF

JACOBS
1 City Walk, Leeds, LS11 9DX, UK.
Tel: +44(0)113 242 6771 Fax:+44(0)113 389 1389
www.jacobs.com

Client: highways england

Project: A1 IN NORTHUMBERLAND

Drawing Title: SECTION A - MORPETH TO FELTON
BARN OWL HABITAT SUITABILITY ASSESSMENT

Drawing Status:

Scale @ A3	1:13,000	DO NOT SCALE
Jacobs No.	B2104701	
Client No.		
Drawing No.	B2104700_EC_AQ_0104	

FIGURE 2.1

Minto's Dean Tributary

Minto's Dean

Back Burn Tributary

River Coquet

Thirston Burn Tributary

Unnamed 1

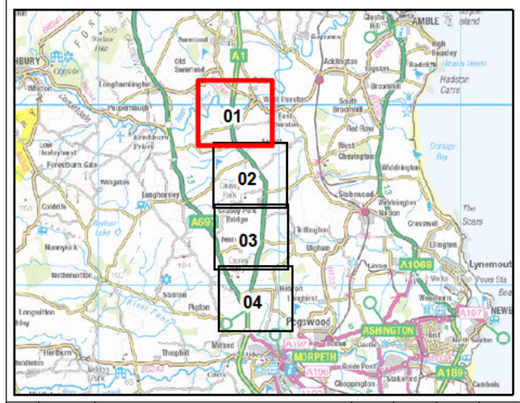
Unnamed 2

A17

N
W
E
S

Legend

- Offline Option
- 500m Buffer from Offline Option
- Watercourse
- Waterbody
- psym
- Exposed Riverine Sediment
- Crayfish Survey
- Fishing Survey



Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	DEC 17	Initial Issue	LT	IM	EM	PF

JACOBS
1 City Walk, Leeds, LS11 9DX, UK.
Tel: +44(0)113 242 6771 Fax:+44(0)113 389 1389
www.jacobs.com

Client: highways england

Project: A1 IN NORTHUMBERLAND

Drawing Title: SECTION A - MORPETH TO FELTON
ELECTRIC FISHING, CRAYFISH, PSYM AND ERS SITES

Drawing Status

Scale @ A3	1:13,000	DO NOT SCALE
Jacobs No.	B2104701	
Client No.		

Drawing No. B2104700_EC_AQ_0201

0 1,000 m

FIGURE 2.2

Legend

- Offline Option
- 500m Buffer from Offline Option
- Watercourse
- Waterbody
- psym
- Crayfish Survey
- Fishing Survey

Longdike Burn 1

A15

A14

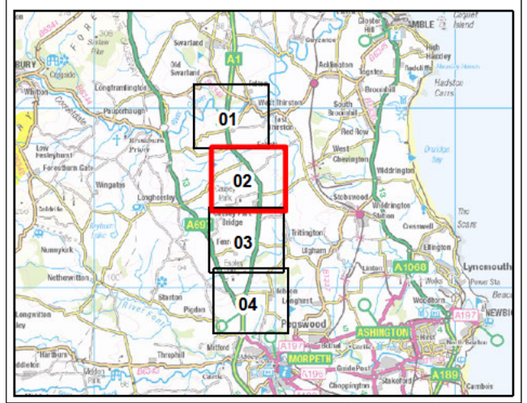
Longdike Burn 2

A6

Earsdon Burn Tributary

Earsdon Burn

Q3



Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	DEC 17	Initial Issue	LT	IM	EM	PF

JACOBS
1 City Walk, Leeds, LS11 9DX, UK.
Tel: +44(0)113 242 6771 Fax:+44(0)113 389 1389
www.jacobs.com

Client: highways england

Project: A1 IN NORTHUMBERLAND

Drawing Title: SECTION A - MORPETH TO FELTON
ELECTRIC FISHING, CRAYFISH, PSYM AND ERS SITES

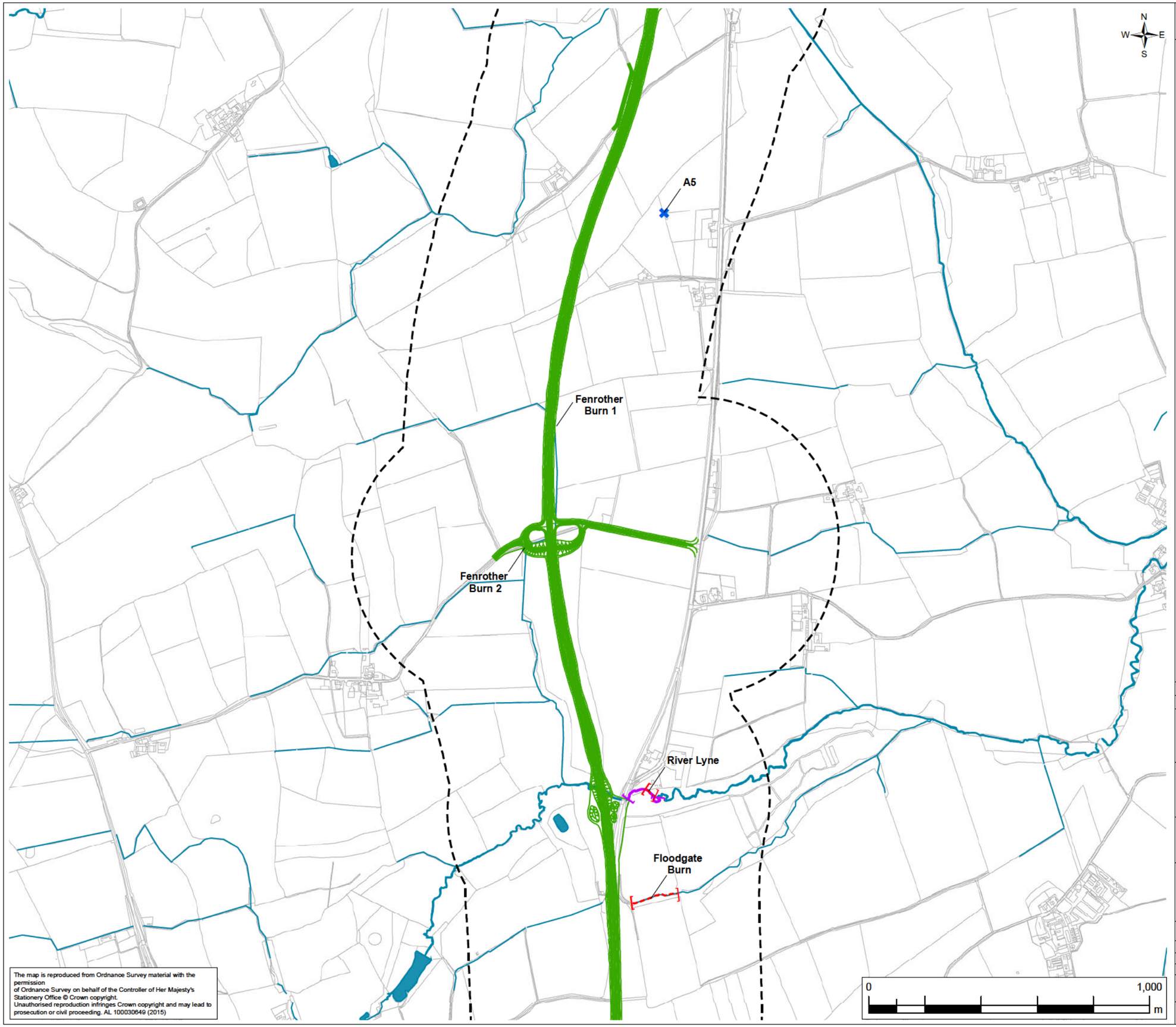
Drawing Status:

Scale @ A3	1:13,000	DO NOT SCALE
Jacobs No.	B2104701	
Client No.		

Drawing No. B2104700_EC_AQ_0202

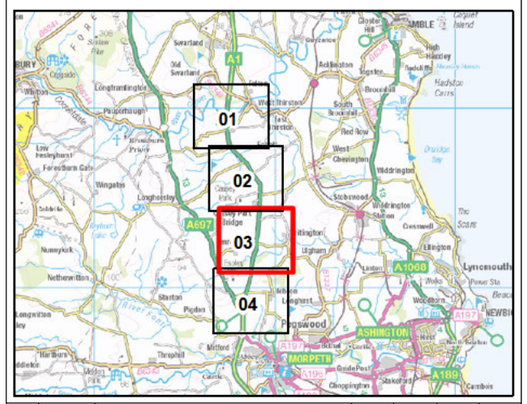
0 1,000 m

FIGURE 2.3



Legend

- Offline Option
- 500m Buffer from Offline Option
- Watercourse
- Waterbody
- psym
- Crayfish Survey
- Fishing Survey



Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	NOV 17	Initial Issue	LT	IM	AM	PF

JACOBS
1 City Walk, Leeds, LS11 9DX, UK.
Tel: +44(0)113 242 6771 Fax:+44(0)113 389 1389
www.jacobs.com

Client: highways england

Project: A1 IN NORTHUMBERLAND

Drawing Title: SECTION A - MORPETH TO FELTON
ELECTRIC FISHING, CRAYFISH, PSYM AND ERS SITES

Drawing Status:

Scale @ A3	1:13,000	DO NOT SCALE
Jacobs No.	B2104701	
Client No.		
Drawing No.	B2104700_EC_AQ_0203	

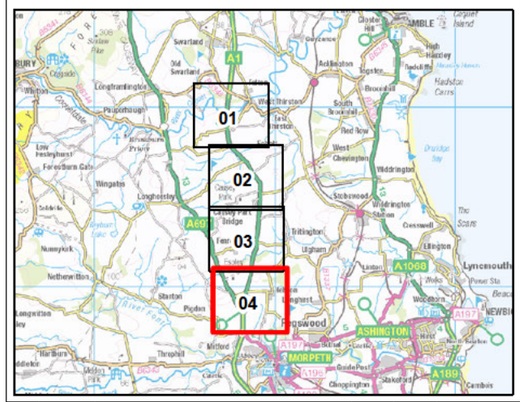
FIGURE 2.4

Legend

- Offline Option
- 500m Buffer from Offline Option
- Watercourse
- Waterbody

Shieldhill Burn

Shieldhill Burn Tributary



0 1,000 m

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	DEC 17	Initial Issue	LT	IM	EM	PF

JACOBS
1 City Walk, Leeds, LS11 9DX, UK.
Tel: +44(0)113 242 6771 Fax:+44(0)113 389 1389
www.jacobs.com

Client: highways england

Project: A1 IN NORTHUMBERLAND

Drawing Title: SECTION A - MORPETH TO FELTON
ELECTRIC FISHING, CRAYFISH, PSYM AND ERS SITES

Drawing Status:

Scale @ A3	1:13,000	DO NOT SCALE
Jacobs No.	B2104701	
Client No.		
Drawing No.	B2104700_EC_AQ_0204	

APPENDIX A - BIOLOGY, HABITAT REQUIREMENTS AND CONSERVATION STATUS OF AQUATIC RECEPTORS

Atlantic Salmon

11.1.1 Atlantic salmon are anadromous, hatching and spending their juvenile life stages (fry and parr) in freshwater, migrating out to sea as smolts where they undergo rapid growth and, after a few years, return to their natal rivers as adults to spawn. During their freshwater phases, habitat requirements of salmon are relatively specific with clean cobble/ pebble mixes being the preferred habitat. Favourable locations for spawning are likely to occur where there is a river gradient of ≤3% and sites are typically in transitional areas between pool and riffle where suitable course gravels and cobbles are present. Relatively shallow depths (20-40cm) and fast flows (50-75cm/s) are optimal for juveniles, although migrating adults generally require higher flows especially if there are obstructions to pass. Slow flowing systems with a high proportion of silt are not suitable for Atlantic salmon (Hendry and Cragg-Hine, 2003). In general juvenile fish are more sensitive than adults as they are less mobile, being more dependent on specific habitats during development stages. However, much of the available data quantifying impacts relate to adults. Very good water quality is required at all stages of the salmon life cycle.

Brown/Sea Trout

11.1.2 Brown trout and sea trout represent different morphs of the same species. Sea trout are anadromous, hatching and spending their juvenile life stages (fry and parr) in freshwater, and migrating out to sea as smolts. Sea trout adults return to natal rivers to spawn, after spending several months to a year in rich coastal feeding grounds. Brown trout complete their entire life cycle in the freshwater environment. Interbreeding occurs between sea and brown trout, and habitat requirements for spawning and successful juvenile development are therefore the same. Trout share similar spawning preferences with Atlantic salmon, although trout will reproduce earlier in the season and use smaller headwaters (Armstrong *et al*., 2003). Relatively shallow depths (20-30cm) and moderate flows (20-50cm/s) are optimal for juveniles, although migrating adults generally require higher flows especially if there are obstructions to pass. In general juvenile fish are more sensitive than adults as they are less mobile, being more dependent on specific habitats during development stages. However, much of the available data quantifying impacts relate to adults. Very good water quality is required at all stage of the trout life cycle.

European Eel

11.1.3 Eels are catadromous, and live their adult lives in freshwater before returning to sea to spawn. Spawning takes places in the Sargasso Sea and elvers (juveniles) migrate back to freshwater systems in the UK, arriving in late winter to spring. Elvers then mature into adults and remain in freshwaters, feeding and growing for up to 40 years (Maitland, 2007).

11.1.4 Eel habitat is particularly hard to define, as the species is capable of thriving in all freshwater habitats, providing there is access to the sea. During the daytime eels remain buried under weeds, stones or in mud, but can be found on a variety of other substrate types (Maitland, 2007).

11.1.5 Vertical falls present a barrier to eel migration, as eels are incapable of swimming through strong laminar flows or jumping in excess of half their body length (Knights and White,

1998). Traditional fish passes may not assist upstream migration of European eel, although utilisation of some fish pass types have been observed in larger (>30cm) individuals. Eels can use boundary layers and rough substrates to facilitate migration and the design of eel passes over barriers often incorporates brushes or bristles to encourage climbing as opposed to swimming (Solomon and Beach, 2004).

Sea/River/Brook Lamprey

11.1.6 There are three species of lamprey in the UK; sea lamprey, river lamprey and brook lamprey. Brook lamprey are typically a non-migratory species that reside in the same stretch of river throughout their entire life cycle, whereas young adults of sea and river lamprey migrate downstream to feeding grounds in estuaries (river lamprey) or the open ocean (sea lamprey). All three species require the same critical habitat in rivers for spawning and the development of ammocoetes (juveniles).

11.1.7 Spawning times for the three species differ and are dependent on temperature. Clean spawning gravels in relatively low energy flowing water are essential for spawning (Maitland, 2003). Hatching larvae migrate downstream to nursery areas in slow flowing reaches. Examples of potentially suitable habitat include large deposits of silt and sand on river or stream margins, detritus covering coarser substrates, patches of silt and sand found among tree roots, emergent vegetation, submerged woody debris and larger substrates. Ammocoetes burrow down into the silt/ sand substrate and spend several years developing in tunnels within the sediment. Older ammocoetes may prefer coarser sand and gravel during this time (Maitland, 2003; Dawson *et al*., 2015). Because of their habitat preferences, ammocoetes exhibit a patchy distribution at small and large spatial scales as they seek out suitable habitat. When ideal habitat is not found, ammocoetes will occupy less suitable habitat, such as areas with mobile coarse sand and gravel, at lower densities (Dawson *et al*., 2015). After metamorphosis, young adults of river and sea lamprey migrate downstream to estuaries (river lamprey) or open seas (sea lamprey), where they feed and develop into adults.

11.1.8 Adults of river and sea lamprey migrate upstream to suitable freshwater spawning habitat, resting in suitable vegetative or rocky cover until suitable water temperatures for spawning are achieved. Brook lamprey do not feed as adults, and therefore only require vegetative or rocky cover to provide hiding places to rest until optimal spawning conditions are achieved. If suitable spawning and ammocoete habitat are located close to each other, brook lamprey do not need to migrate, although individuals are capable of considerable migrations if required. Adult lamprey die shortly after spawning.

White-clawed Crayfish

11.1.9 The white-clawed crayfish is the only species of crayfish native to the UK. They have a preference for hard, mineral-rich water, and are commonly found under larger cobbles or patches of vegetation in rivers and lakes (Holdich, 2003). White-clawed crayfish are found at a range of depths, from shallow (5cm) streams to deep (up to 2.5m) lakes. Some individuals migrate into pools or burrow into river banks during colder winter months. Key habitat features noted by Smith *et al*. (1996) include vertical banks, tall overhanging vegetation and tree roots projecting into the watercourse.

11.1.10 The females hold fertilised eggs in a clutch attached to their abdomen until they are ready to hatch. Hatched juveniles develop in the suitable habitat available in their natal waters. Multiple moulting and growing phases are required for crayfish to reach full maturity, although habitat requirements are consistent throughout their life span.

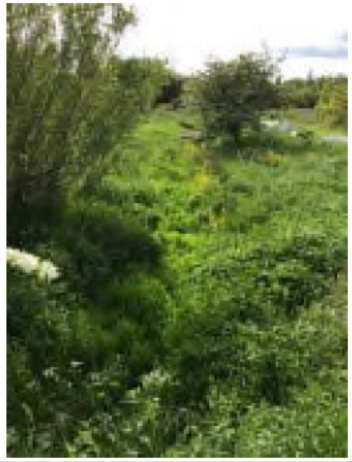
11.1.11 The UK population of white-clawed crayfish is in decline due to habitat loss and the spread of crayfish plague, both of which are largely attributed to the presence of invasive North American signal crayfish (*Pacifastacus leniusculus*). The North American signal crayfish is widespread throughout the UK and has reduced habitat quality for white-clawed crayfish by eroding muddy embankments in areas where they have become established. They can also act as vectors for crayfish plague, which causes no pathological effects in affected individuals of the North American species but has the capacity to greatly reduce native white-clawed crayfish populations in areas where the two species co-exist.

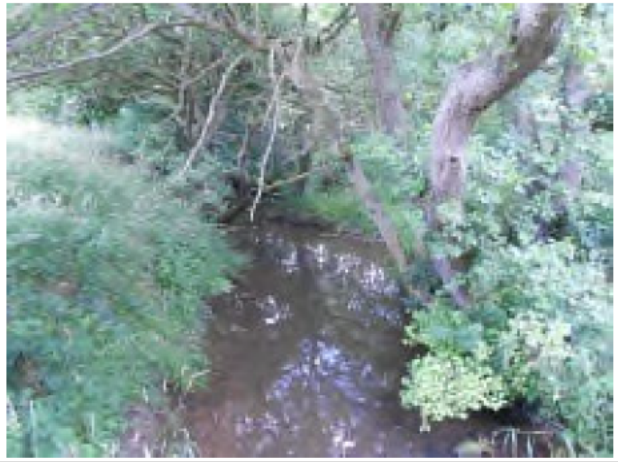
APPENDIX B: AQUATIC HABITAT SITE DESCRIPTIONS

Watercourse	Upstream	Downstream	Description	Photograph
Minto's Dean Tributary	NU 17374 01194	NU 17567 00933	Small woodland channel, 40cm wide and up to 20cm deep in grassy wooded boundary between pasture fields. No macrophytes 70% silt clay substrate with cobbles (15%), pebbles (10%) and gravel (5%) Moderate shading (25-50%) Evidence of cattle poaching	
Minto's Dean	NU 17366 00966	NU 17595 00923	Small channel = 50-75cm wide and on average 10cm deep in small area of broadleaved woodland. Cobbles (35%), pebbles (35%) gravel (20%) and silt/clay (10%) Light shading (<25%) Pool, run and ditch flow types	

Watercourse	Upstream	Downstream	Description	Photograph
Back Burn Tributary	NU 17327 00446	NU 17634 00335	Small heavily shaded channel 50cm – 1m wide and an average depth of 5cm flowing through conifer woodland west of the A1 and mixed woodland to the east. No macrophytes Silt/clay (50%), pebbles (25%) and gravel (25%) Heavy shading (>50%) Run flow types	
River Coquet	NZ 17258 99797	NZ 17532 99867	Large channel up to 40m wide with depth varying from a few centimetres to over 1m. Upstream (west) of the A1 bedrock dominates whereas downstream (east) the substrate is a mixed with small amounts of bedrock at the channel edges. No macrophytes Cobbles (40%), Pebbles (20%), gravel (20%), boulders (15%), bedrock (4%), sand (1%) Riffle, run and glide flow types	

Watercourse	Upstream	Downstream	Description	Photograph
Thirston Burn Tributary	NZ 17308 99021	NZ 17575 99152	0.5m wide ditch along hedgerow in arable field. Much of channel contains terrestrial grasses. Water depth ranges from 0-15cm over a soft silt substrate. No macrophytes 100% silt/clay bed Heavy shading (>50%) Ditch flow type	
Unnamed Tributary 1	NZ 17543 98195	NZ 17634 98188	Small dry channel along hedgerow in arable field.	

Watercourse	Upstream	Downstream	Description	Photograph
Unnamed Tributary 2	NZ 17371 98023	NZ 17478 98039	Dry channel connected to ornamental pond.	
Longdike Burn1	NZ 17781 97294	NZ 17954 97320	Medium sized channel with an average width of 2.5m and depth ranging from 10cm to 1m. Upstream (west) of the A1 the watercourse flows between two rough pasture fields. Downstream of the A1 the watercourse flows along the boundary on a caravan park, wooded on one bank and open on the other. Pebbles (40%), cobbles (20%), gravel (20%), silt/clay (15%) and sand (5%) Run and glide flow types	

Watercourse	Upstream	Downstream	Description	Photograph
Longdike Burn 2	NZ 18046 96792	NZ 17916 96946	Medium sized channel with an average width of 3m upstream of the B-road and 2m downstream. Water depth ranges from 10cm to 1m. Gravel (40%), pebbles (30%), cobbles (15%) sand (5%), silt/clay (5%). Overlying silt (20%) Light shade (<25%) Pool, run and slack flow types	
Earsdon Burn Tributary	NZ 18674 95031	NZ 18717 94830	Small dry channel under hedgerow at edge of grazing pasture	N/A
Earsdon Burn	NZ 18665 94589	NZ 18839 94638	Small watercourse in over-deepened channel 1m wide along boundary of grazing pasture. Average water depth of 15cm No macrophytes Silt/clay (65%), gravel (20%), pebbles (10%), cobbles (5%) Moderate shade (25-50%) Heavily poached by cattle Run and ditch flow types	

Watercourse	Upstream	Downstream	Description	Photograph
Fenrother Burn 1	NZ 18329 92707	NZ 18210 92402	Small channel under hedge row between arable and pasture fields. Mostly dry with 1-2cm water depth in areas. No macrophytes Gravel (40%), silt/clay (30%), pebbles (25%) and cobbles (5%) Heavy shading (>50%) Over deepened Ditch flow type	
Fenrother Burn 2	NZ 18267 93031	NZ 18329 92863	Dry channel in scrubby boundary between two arable fields	

Watercourse	Upstream	Downstream	Description	Photograph
River Lyne	NZ 18606 91651	NZ 18699 91636	Medium sized watercourse with an average width of 3m and average water depth of 20cm. Heavily shaded (>50%) as it runs through broadleaved woodland. Seasonal algal film Pebbles (40%), gravel (35%), cobbles (20%), silt/clay (10%). Overlying silt deposits (50%) Run, riffle and slack flow types	
Floodgate Burn	NZ18591 91253	NZ 18764 91291	Small channel running through pasture fields. Average width of 40cm and depth of 15cm. Cattle poaching evident. No macrophytes Gravel (60%), pebbles (25%) silt/clay (10%), cobbles (5%) Light shading (<25%) Run and ditch flow types	

Watercourse	Upstream	Downstream	Description	Photograph
Shieldhill Burn	NZ 18554 89399	NZ 18588 89329	Small channel 1m wide with approximately 3cm water depth and mixed substrates. Watercourse culverted under arable fields for much of its length with small section less than 100m in length open in a patch of coniferous woodland. Non filamentous algae (5%) Silt/clay (35%), gravel (30%), pebbles (25%) cobbles (8%), boulders (2%) Low flows, Heavy shading (>50%) Run and ditch flow types	
Shieldhill Burn Tributary	NZ 18312 88440	NZ 1838288446	Ditch at bottom of residential garden. 1m wide and 35cm deep with evidence of septic input. No macrophytes Silt/clay (50%), gravel (40%), cobbles (5%), pebbles (5%) Heavy shading (>50%) Ditch flow types	

APPENDIX C: RIVER HABITAT SURVEY SHEETS

RIVER HABITAT SURVEY 2003 VERSION: SITE HEALTH AND SAFETY ASSESSMENT

Site Number[1]:	Site Ref: U/S FELTON	River Name: RIVER COQUET	Date: 04/08/17
Grid References/Co-ordinates:	Spot 1[2]: NZ 1787 9880	Mid-site: NZ 17437 99795	End of site[2]: NZ 17619 99877
Surveyor Name: [redacted]		Accredited Surveyor Code: FA023	

[1] Leave blank if new site. [2] Optional

Weather Conditions: OVERCAST WITH SUNNY SPELLS

Flow Conditions: NORMAL

Site details: (enter comments or circle if applicable and give details)	Risk Level (Low/Mod/High)
Access and Parking: park in church carpark + access NE via PROW (entry & exit)	LOW.
Conditions: comment on ground stability, footing, exposure/remoteness	LOW
Obstacles/Hazards: fencing, stiles, dense vegetation, steep bank	MOD
Occupied/Unoccupied: people, livestock, animals Anglers / Dog walkers / Walkers	LOW
Activities/Land-use: agriculture, woodland, residential, industrial, construction, recreational	LOW
Risk if lone-working N/A	LOW

IF THERE ARE ANY HIGH RISKS OR MORE THAN THREE MODERATE RISKS DO NOT CONTINUE WITH THE SURVEY.

Weil's Disease (*Leptospirosis*)

Instructions to card holders

1. As infection may enter through breaks in the skin, ensure that any cut, scratch or abrasion is thoroughly cleansed and covered with a waterproof plaster.
2. Avoid rubbing your eyes, nose and mouth during work.
3. Clean protective clothing, footwear and equipment etc. after use
4. After work, and particularly before taking food or drink, wash hands thoroughly.
5. Report all accidents and/or injuries, however slight.
6. Keep your card with you at all times.

Lyme Disease

1. Dress appropriately with skin covered up.
2. Regularly inspect for ticks when in the field.
3. Check for, and remove, any ticks as soon as possible after leaving the site.
4. Seek medical attention if bitten by a tick.

RIVER HABITAT SURVEY 2003 Version

Page 1 of 4

A FIELD SURVEY DETAILS

Site Number: (leave blank if new site)

Site Reference: U/S FELTON

Spot-check 1 Grid Ref: NZ 1787 9880

Spot-check 6 Grid Ref: NZ 17437 99795

End of site Grid Ref: NZ 17689 99877

Reach Reference:

River name: RIVER COQUET

Date 4/8/2017 Time: 09:20

Surveyor name: S MC GRORAN

Accredited Surveyor code: FA023

Is the site part of a river or an artificial channel? River ☑ Artificial ☐

Are adverse conditions affecting survey? No ☑ Yes ☐

If yes, state .....

Is bed of river visible? barely or not ☐ partially ☑ ±entirely ☐

Is health and safety assessment form attached? Yes ☑ No ☐

Number of photographs taken: 6

Photo references: RC_001 - RC_006

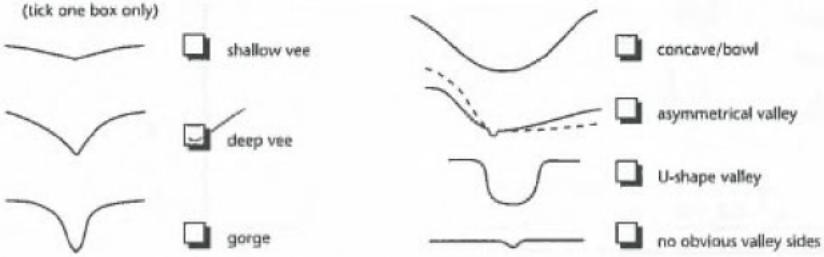
Site surveyed from: left bank ☑ right bank ☐ channel ☑

☐ When options shown with 'shadow boxes', tick one box only

LEFT banks determined by facing downstream RIGHT

B PREDOMINANT VALLEY FORM (within the horizon limit) (tick one box only)

(tick one box only)



☐ shallow vee ☐ concave/bowl

☑ deep vee ☐ asymmetrical valley

☐ U-shape valley

☐ gorge ☐ no obvious valley sides

Distinct flat valley bottom? No ☑ Yes ☐

Natural terraces? No ☑ Yes ☐

C NUMBER OF RIFFLES, POOLS AND POINT BARS (enter total number in boxes)

Riffle(s)	3	Unvegetated point bar(s)	0
Pool(s)	0	Vegetated point bar(s)	0

D ARTIFICIAL FEATURES (indicate total number of occurrences of each category within the 500m site)

If none, tick box ☐

	Major	Intermediate	Minor		Major	Intermediate	Minor
Weirs/sluices	0	0	0	Outfalls/ intakes	0	0	1
Culverts	0			Fords	0	0	0
Bridges	1	0	0	Deflectors/ groynes/revet	0	0	0
Other - state							

Is channel obviously realigned? No ☑ Yes, <33% of site ☐ ≥33% of site ☐

Is channel obviously over-deepened? No ☑ Yes, <33% of site ☐ ≥33% of site ☐

Is water impounded by weir/dam? No ☑ Yes, <33% of site ☐ ≥33% of site ☐

SITE REF.

RIVER HABITAT SURVEY: TEN SPOT-CHECKS

Page 2 of 4

Spot-check 1 is at: upstream end ☑ downstream end ☐ of site (tick one box)

E PHYSICAL ATTRIBUTES (to be assessed across channel within 1m wide transect)

When boxes 'bordered', only one entry allowed	1 GPS	2	3	4	5	6 GPS	7	8	9	10	GPS
LEFT BANK	Ring SC or SC if composed of sandy substrate										
Material NV, BE, BO, CO, CI, EA, PE, CL, CC, SP, WP, GA, BR, RR, TD, FA, BI	EA	NV	EA	EA	EA	BE	EA	EA	EA	EA	
Bank modification(s) NR, NO, RS, RI, PC(B), BM, EM	NO	NR	NO	NO	NO	NO	NO	NO	NO	NO	
Marginal & bank feature(s) NV, NO, EC, SC, PB, VP, SB, VS, NB	EC	NV	NO	NO	EC	EC	EC	NO	NO	NO	
CHANNEL	Circle either C or P if predominant										
Channel substrate NV, BE, BO, CO, CP, SA, SI, CL, PE, FA, AR	BE	BE	BE	BE	BE	BE	CO	NV	NV	NV	BO C P SA
Flow-type NV, FF, CH, BW, UW, CF, RP, UP, SM, NP, DR	SM	SM	SM	SM	RP	BW	UW	RP	SM	SM	
Channel modification(s) NR, NO, CV, RS, RI, DA, FO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Channel feature(s) NV, NO, EB, RO, VR, MB, VB, MI, TR	NO	NO	NO	NO	NO	NO	VB	NO	NO	NO	
For braided rivers only: number of sub-channels											
RIGHT BANK	Ring SC or SC if composed of sandy substrate										
Material NV, BE, BO, CO, CI, EA, PE, CL, CC, SP, WP, GA, BR, RR, TD, FA, BI	NV	NV	BE	BE	NV	BR	NV	NV	NV	NV	
Bank modification(s) NR, NO, RS, RI, PC(B), BM, EM	NO	NO	NO	NO	NO	RS/RI	NO	NO	NO	NO	
Marginal & bank feature(s) NV, NO, EC, SC, PB, VP, SB, VS, NB	EC	EC	NO	NO	NO	NO	NO	NO	EC	EC	

Enter channel substrate(s) not occurring as predominant in spot-checks but present in >1% of whole site.

F BANKTOP LAND-USE AND VEGETATION STRUCTURE (to be assessed over a 10m wide transect)

Land-use: choose one from BL, BP, CW, CP, SH, OR, WL, MH, AW, OW, RP, IG, TH, RD, SU, TL, IL, PG, NV

LAND-USE WITHIN 5m OF LEFT BANKTOP		BL	BL	BL	BL	BL	BL	BL	BL	BL	BL
LEFT BANKTOP (structure within 1m)	B/U/S/C/NV	C	C	C	C	C	C	C	C	C	C
LEFT BANK-FACE (structure)	B/U/S/C/NV	S	S	S	C	C	S	C	C	C	C
RIGHT BANK-FACE (structure)	B/U/S/C/NV	S	C	V	V	C	B	C	C	S	S
RIGHT BANKTOP (structure within 1m)	B/U/S/C/NV	C	C	C	C	C	NV	C	C	C	C
LAND-USE WITHIN 5m OF RIGHT BANKTOP		BL	BL	BL	BL	BL	SU	BL	BL	BL	BL

G CHANNEL VEGETATION TYPES (to be assessed over a 10m wide transect; use E (≥33% area), ✓ (present) or NV (not visible))

None (✓) or Not Visible (NV)											
Liverworts/mosses/lichens		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Emergent broad-leaved herbs					✓	✓	✓				
Emergent reeds/sedges/rushes/grasses/horsetails		✓			✓	—	✓	✓			
Floating-leaved (rooted)											
Free-floating											
Amphibious											
Submerged broad-leaved											
Submerged linear-leaved											
Submerged fine-leaved											
Filamentous algae							✓				

Use end column for overall assessment over 500m, including types not occurring in spot-checks (use ✓, E or NV)

SITE REF.

RIVER HABITAT SURVEY : 500m SWEEP-UP

Page 3 of 4

H LAND-USE WITHIN 50m OF BANKTOP (use ✓ (present) or E (≥ 33% banklength))

	L	R		L	R
Broadleaf/mixed woodland (semi-natural) (BL)	E	E	Natural open water (OW)		
Broadleaf/mixed plantation (BP)			Rough/unimproved grassland/pasture (RP)		
Coniferous woodland (semi-natural) (CW)			Improved/semi-improved grassland (IG)		
Coniferous plantation (CP)			Tall herb/rank vegetation (TH)		
Scrub & shrubs (SH)			Rock, scree or sand dunes (RD)		
Orchard (OR)			Suburban/urban development (SU)	✓	✓
Wetland (e.g. bog, marsh, fen) (WL)			Tilled land (TL)		
Moorland/heath (MH)			Irrigated land (IL)		
Artificial open water (AW)			Parkland or gardens (PG)		
			Not visible (NV)		

I BANK PROFILES (use ✓ (present) or E (≥ 33% banklength))

Natural/unmodified	L	R	Artificial/modified	L	R
Vertical/undercut	E	E	Resectioned (reprofiled)		✓
Vertical with toe			Reinforced - whole		✓
Steep (>45°)		E	Reinforced - top only		
Gentle			Reinforced - toe only		
Composite			Artificial two-stage		
Natural berm			Poached bank		
			Embanked		
			Set-back embankment		

J EXTENT OF TREES AND ASSOCIATED FEATURES (*record even if <1%)

TREES (tick one box per bank)

	Left	Right
None	☐	☐
Isolated/scattered	☐	☐
Regularly spaced, single	☐	☐
Occasional clumps	☐	☐
Semi-continuous	☐	☐
Continuous	☑	☑

ASSOCIATED FEATURES (tick one box per feature)

	None	Present	E (≥33%)
Shading of channel	☐	☑	☐
*Overhanging boughs	☐	☑	☐
*Exposed bankside roots	☐	☐	☑
*Underwater tree roots	☐	☑	☐
Fallen trees	☐	☑	☐
Large woody debris	☐	☑	☐

K EXTENT OF CHANNEL AND BANK FEATURES (tick one box for each feature) (*record even if <1%)

	None	Present	E (≥33%)		None	Present	E (≥33%)
*Free fall flow	☑	☐	☐	Exposed bedrock	☐	☑	☐
Chute flow	☑	☐	☐	Exposed boulders	☐	☑	☐
Broken standing waves	☐	☑	☐	Vegetated bedrock/boulders	☐	☑	☐
Unbroken standing waves	☐	☑	☐	Unvegetated mid-channel bar(s)	☐	☐	☐
Rippled flow	☐	☑	☐	Vegetated mid-channel bar(s)	☐	☑	☐
*Upwelling	☑	☐	☐	Mature island(s)	☑	☐	☐
Smooth flow	☐	☐	☑	Unvegetated side bar(s)	☑	☐	☐
No perceptible flow	☑	☐	☐	Vegetated side bar(s)	☑	☐	☐
No flow (dry)	☑	☐	☐	Unvegetated point bar(s)	☑	☐	☐
Marginal deadwater	☑	☐	☐	Vegetated point bar(s)	☑	☐	☐
Eroding cliff(s)	☐	☐	☑	*Unvegetated silt deposit(s)	☑	☐	☐
Stable cliff(s)	☑	☐	☐	*Discrete unvegetated sand deposit(s)	☑	☐	
				*Discrete unvegetated gravel deposit(s)	☑	☐	

SITE REF.

RIVER HABITAT SURVEY : DIMENSIONS AND INFLUENCES Page 4 of 4

L CHANNEL DIMENSIONS (to be measured at one location on a straight uniform section, preferably across a riffle)

LEFT BANK		CHANNEL		RIGHT BANK	
Banktop height (m) ESTIMATED	30	Bankfull width (m)	35	Banktop height (m) Estimated	30
Is banktop height also bankfull height? (Y or N)	N	Water width (m)	35	Is banktop height also bankfull height? (Y or N)	N
Embanked height (m)	/	Water depth (m)	0.5	Embanked height (m)	/

If trashline lower than banktop, indicate: height above water (m) = width from bank to bank (m) =

Bed material at site is: consolidated ☐ unconsolidated (loose) ☑ unknown ☐

Location of measurements is: riffle ☑ other ☐ (state)

M FEATURES OF SPECIAL INTEREST

None	☐	Very large boulders (>1m)	☑	Backwater(s)	☐	Marsh(es)	☐
Braided channels	☐	*Debris dam(s)	☐	Floodplain boulder deposits	☐	Flush(es)	☐
Side channel(s)	☐	*Leafy debris	☐	Water meadow(s)	☐	Natural open water	☐
*Natural waterfall(s) > 5m high	☐	Fringing reed-bank(s)	☐	Fen(s)	☐	Others (state)	☐
*Natural waterfall(s) < 5m high	☐	Quaking bank(s)	☐	Bog(s)	☐		
Natural cascade(s)	☐	*Sink hole(s)	☐	Wet woodland(s)	☐		

N CHOKED CHANNEL (tick one box)

Is 33% or more of the channel choked with vegetation? No ☑ Yes ☐

O NOTABLE NUISANCE PLANT SPECIES

	bankface	banktop to 50m		bankface	banktop to 50m
None ☑					
*Giant hogweed	☐	☐	*Himalayan balsam	☐	☐
*Japanese knotweed	☐	☐	*Other (state).....	☐	☐

P OVERALL CHARACTERISTICS (Circle appropriate words, add others as necessary)

Major impacts: landfill - tipping - (site) - sewage - pollution - drought - abstraction - mill - dam (weir) - rail - industry - housing mining - quarrying - overdeepening - afforestation - fisheries management - silting - waterlogging - hydroelectric power

Evidence of recent management: dredging - bank mowing - weed cutting - enhancement - river rehabilitation - gravel extraction - other (please specify)

Animals: (otter) mink - water vole - kingfisher - dipper - grey wagtail - sand martin - heron - dragonflies/damselflies

Other significant observations: if necessary use separate sheet to describe overall characteristics and relevant observations

Q ALDERS (tick one box in each of the two categories)

*Alders? None ☐ Present ☑ Extensive ☐ | *Diseased Alders? None ☑ Present ☐ Extensive ☐

R FIELD SURVEY QUALITY CONTROL (✓ boxes to confirm checks)

Have you taken at least two photos that illustrate the general character of the site and additional photos of any weirs/ sluices and major/intermediate structures across the channel?	☑
Have you completed all ten spot-checks and made entries in all boxes in E & F on page 2?	☑
Have you completed column 11 of section G (and E if appropriate) on page 2?	☑
Have you recorded in section C the number of riffles, pools and point bars (even if 0) on page 1?	☑
Have you given an accurate (alphanumeric) grid reference for spot-checks 1, 6 and end of site (page 1)?	☑
Have you stated whether spot-check 1 is at the upstream or downstream end of the site (top of page 2)?	☑
Have you cross-checked your spot-check and sweep-up responses with the channel modification indicators given on page 2 of the spot-check key?	☑

RIVER HABITAT SURVEY 2003 VERSION: SITE HEALTH AND SAFETY ASSESSMENT

Site Number[1]:	Site Ref: DS A1	River Name: RIVER LYNE	Date: 02/01/17
Grid References/Co-ordinates:	Spot 1[2]: NZ 18530 91622	Mid-site: NZ 18319 91675	End of site[2]: NZ 18099 91656
Surveyor Name: [redacted]		Accredited Surveyor Code: FA023	

[1] Leave blank if new site. [2] Optional

Weather Conditions: OVERCAST W/ SHOWERS

Flow Conditions: NORMAL.

Site details: (enter comments or circle if applicable and give details)	Risk Level (Low/Mod/High)
Access and Parking: (entry & exit) PARK IN OFFLANE LAYBY + ACCESS VIA WOOD - LAND - ACCESS PERMISSIONS OBTAINED FROM OWNERS.	MOD.
Conditions: comment on ground stability, footing, exposure/remoteness	LOW
Obstacles/Hazards: fencing, stiles, dense vegetation, steep bank	LOW
Occupied/Unoccupied: people, livestock, animals WALKERS / DOG WALKERS	LOW
Activities/Land-use: agriculture, woodland, residential, industrial, construction, recreational	LOW
Risk if lone-working N/A	LOW

IF THERE ARE ANY HIGH RISKS OR MORE THAN THREE MODERATE RISKS DO NOT CONTINUE WITH THE SURVEY.

Weil's Disease (*Leptospirosis*)

Instructions to card holders

1. As infection may enter through breaks in the skin, ensure that any cut, scratch or abrasion is thoroughly cleansed and covered with a waterproof plaster.
2. Avoid rubbing your eyes, nose and mouth during work.
3. Clean protective clothing, footwear and equipment etc. after use
4. After work, and particularly before taking food or drink, wash hands thoroughly.
5. Report all accidents and/or injuries, however slight.
6. Keep your card with you at all times.

Lyme Disease

1. Dress appropriately with skin covered up.
2. Regularly inspect for ticks when in the field.
3. Check for, and remove, any ticks as soon as possible after leaving the site.
4. Seek medical attention if bitten by a tick.

RIVER HABITAT SURVEY 2003 Version — Page 1 of 4

A FIELD SURVEY DETAILS

Site Number: (leave blank if new site)

Site Reference: RL-S1

Spot-check 1 Grid Ref: NZ 18530 91627

Spot-check 6 Grid Ref: NZ 18317 91625

End of site Grid Ref: NZ 18099 91656

Reach Reference:

River name: RIVER LYNE

Date 2 / 1 / 20 17 Time: 1400

Surveyor name: [redacted]

Accredited Surveyor code: FA023

Is the site part of a river or an artificial channel? River ☑ Artificial ☐

Are adverse conditions affecting survey? No ☑ Yes ☐

If yes, state .....

Is bed of river visible? barely or not ☐ partially ☑ ±entirely ☐

Is health and safety assessment form attached? Yes ☑ No ☐

Number of photographs taken: 6

Photo references: RL-001 – 006

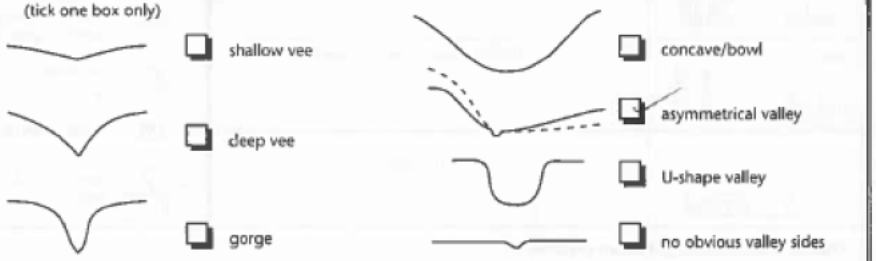
Site surveyed from: left bank ☑ right bank ☑ channel ☑

☐ When options shown with 'shadow boxes', tick one box only

LEFT banks determined by facing downstream RIGHT

B PREDOMINANT VALLEY FORM (within the horizon limit) (tick one box only)

(tick one box only)



☐ shallow vee
☐ deep vee
☐ gorge
☐ concave/bowl
☑ asymmetrical valley
☐ U-shape valley
☐ no obvious valley sides

Distinct flat valley bottom? No ☑ Yes ☐

Natural terraces? No ☑ Yes ☐

C NUMBER OF RIFFLES, POOLS AND POINT BARS (enter total number in boxes)

Riffle(s)	6	Unvegetated point bar(s)	4
Pool(s)	6 (Some pools on tight meanders)	Vegetated point bar(s)	0

D ARTIFICIAL FEATURES (indicate total number of occurrences of each category within the 500m site)

If none, tick box ☐

	Major	Intermediate	Minor		Major	Intermediate	Minor
Weirs/sluices	0	0	0	Outfalls/ intakes	0	0	0
Culverts	1			Fords	0	0	0
Bridges	0	0	0	Deflectors/ groynes/croys	0	0	0
Other - state							

Is channel obviously realigned? No ☑ Yes, <33% of site ☐ ≥33% of site ☐

Is channel obviously over-deepened? No ☑ Yes, <33% of site ☐ ≥33% of site ☐

Is water impounded by weir/dam? No ☑ Yes, <33% of site ☐ ≥33% of site ☐

SITE REF.

RIVER HABITAT SURVEY : 500m SWEEP-UP

Page 3 of 4

H LAND-USE WITHIN 50m OF BANKTOP

Use ✓ (present) or E (≥ 33% banklength)

	L	R		L	R
Broadleaf/mixed woodland (semi-natural) (BL)	E	E	Natural open water (OW)		
Broadleaf/mixed plantation (BP)			Rough/unimproved grassland/pasture (RP)		
Coniferous woodland (semi-natural) (CW)			Improved/semi-improved grassland (IG)		
Coniferous plantation (CP)			Tall herb/rank vegetation (TH)		
Scrub & shrubs (SH)			Rock, scree or sand dunes (RD)		
Orchard (OR)			Suburban/urban development (SU)	✓	✓
Wetland (e.g. bog, marsh, fen) (WL)			Tilled land (TL)		
Moorland/heath (MH)			Irrigated land (IL)		
Artificial open water (AW)			Parkland or gardens (PG)		
			Not visible (NV)		

I BANK PROFILES

Use ✓ (present) or E (≥ 33% banklength)

Natural/unmodified	L	R	Artificial/modified	L	R
Vertical/undercut	E	E	Resectioned (reprofiled)		
Vertical with toe			Reinforced - whole		
Steep (>45°)	✓	✓	Reinforced - top only		
Gentle	✓		Reinforced - toe only	✓	
Composite			Artificial two-stage		
Natural berm			Poached bank		
			Embanked		
			Set-back embankment		

J EXTENT OF TREES AND ASSOCIATED FEATURES

*record even if <1%

TREES (tick one box per bank)	Left	Right
None	☐	☐
Isolated/scattered	☐	☐
Regularly spaced, single	☐	☐
Occasional clumps	☐	☐
Semi-continuous	☐	☐
Continuous	☐	☑

ASSOCIATED FEATURES (tick one box per feature)	None	Present	E (≥33%)
Shading of channel	☐	☐	☑
*Overhanging boughs	☐	☑	☐
*Exposed bankside roots	☐	☑	☐
*Underwater tree roots	☐	☑	☐
Fallen trees	☐	☑	☐
Large woody debris	☐	☑	☐

K EXTENT OF CHANNEL AND BANK FEATURES

(tick one box for each feature) *record even if <1%

	None	Present	E (≥33%)		None	Present	E (≥33%)
*Free fall flow	☑	☐	☐	Exposed bedrock	☑	☐	☐
Chute flow	☑	☐	☐	Exposed boulders	☐	☑	☐
Broken standing waves	☑	☐	☐	Vegetated bedrock/boulders	☑	☐	☐
Unbroken standing waves	☑	☐	☐	Unvegetated mid-channel bar(s)	☑	☐	☐
Rippled flow	☐	☑	☐	Vegetated mid-channel bar(s)	☑	☐	☐
*Upwelling	☑	☐	☐	Mature island(s)	☑	☐	☐
Smooth flow	☐	☐	☑	Unvegetated side bar(s)	☐	☑	☐
No perceptible flow	☑	☐	☐	Vegetated side bar(s)	☐	☑	☐
No flow (dry)	☑	☐	☐	Unvegetated point bar(s)	☐	☑	☐
Marginal deadwater	☑	☐	☐	Vegetated point bar(s)	☑	☐	☐
Eroding cliff(s)	☐	☐	☑	*Unvegetated silt deposit(s)	☑	☐	☐
Stable cliff(s)	☐	☑	☐	*Discrete unvegetated sand deposit(s)	☑	☐	
				*Discrete unvegetated gravel deposit(s)	☐	☑	

SITE REF.

RIVER HABITAT SURVEY: TEN SPOT-CHECKS

Page 2 of 4

Spot-check 1 is at: upstream end ☑ downstream end ☐ of site (tick one box)

E PHYSICAL ATTRIBUTES

(to be assessed across channel within 1m wide transect)

When boxes 'bordered', only one entry allowed	1 GPS	2	3	4	5	6 GPS	7	8	9	10	GPS
LEFT BANK	Ring EC or SC if composed of sandy substrate										
Material NV, BE, BO, CO, GS, EA, PE, CL, CC, SP, WP, GA, BR, RR, TD, FA, EI	NV	NV	EA	EA	EA	EA	EA	GS	GS	EA	
Bank modification(s) NK, NO, RS, RI, PC(B), BM, EM	NK	NK	NO	NO	NO	NO	NO	NO	NO	NO	
Marginal & bank feature(s) NV, NO, EC, SC, PB, VP, SB, VS, NB	NV	NV	EC	PB	EC	NO	EC	PB	SB	NO	
CHANNEL	GP- ring either C or P if predominant										
Channel substrate NV, BE, BO, CO, GP, SA, SI, CL, PE, EA, AR	AR	NV	SI	CO	GP	CO	CO	CO	CO	CO	SO & GP
Flow-type NV, FF, CH, BW, UW, CF, RP, UP, SM, NP, DR	NV	NV	SM	SM	SM	SM	SM	SM	RP	SM	
Channel modification(s) NK, NO, CV, RS, RI, DA, FO	CV	NK	NO	NO	NO	NO	NO	NO	NO	NO	
Channel feature(s) NV, NO, EB, RO, VR, MB, VB, MI, TR	NV	NV	NO	NO	NO	NO	NO	NO	NO	NO	
For braided rivers only: number of sub-channels											
RIGHT BANK	Ring EC or SC if composed of sandy substrate										
Material NV, BE, BO, CO, GS, EA, PE, CL, CC, SP, WP, GA, BR, RR, TD, FA, EI	NV	NV	EA	EA	GS	EA	EA	EA	EA	EA	
Bank modification(s) NK, NO, RS, RI, PC(B), BM, EM	NK	NK	NO	NO	NO	NO	NO	NO	NO	NO	
Marginal & bank feature(s) NV, NO, EC, SC, PB, VP, SB, VS, NB	NV	NV	EC	EC	VS	EC	SB	SC	EC	EC	

Enter channel substrate(s) not occurring as predominant in spot-checks but present in >1% of whole site.

F BANKTOP LAND-USE AND VEGETATION STRUCTURE

(to be assessed over a 10m wide transect)

Land-use: choose one from BL, BP, CW, CP, SH, OR, WL, MH, AW, OW, RP, IG, TH, RD, SU, TL, IL, PG, NV

	1	2	3	4	5	6	7	8	9	10
LAND-USE WITHIN 5m OF LEFT BANKTOP	SU	BL	BL	BL	BL	BL	BL	BL	BL	BL
LEFT BANKTOP (structure within 1m) B/U/S/C/NV	B	NV	C	C	C	C	V	C	C	C
LEFT BANK-FACE (structure) B/U/S/C/NV	NV	NV	U	S	S	S	U	S	S	S
RIGHT BANK-FACE (structure) B/U/S/C/NV	NV	NV	U	U	S	U	S	S	S	S
RIGHT BANKTOP (structure within 1m) B/U/S/C/NV	B	NV	C	C	C	C	S	C	C	C
LAND-USE WITHIN 5m OF RIGHT BANKTOP	SU	BL	BL	BL	BL	BL	BL	BL	BL	BL

G CHANNEL VEGETATION TYPES

(to be assessed over a 10m wide transect: use E (≥ 33% area), ✓ (present) or NV (not visible))

	1	2	3	4	5	6	7	8	9	10	
None (✓) or Not Visible (NV)	NV	NV	✓	✓	✓	✓	✓	✓	✓	✓	
Liverworts/mosses/lichens	NV	NV									✓
Emergent broad-leaved herbs	NV	NV									
Emergent reeds/sedges/rushes/grasses/horsetails	NV	NV									
Floating-leaved (rooted)	NV	NV									
Free-floating	NV	NV									
Amphibious	NV	NV									
Submerged broad-leaved	NV	NV									
Submerged linear-leaved	NV	NV									
Submerged fine-leaved	NV	NV									
Filamentous algae	NV	NV									

Use end column for overall assessment over 500m, including types not occurring in spot-checks (use ✓, E or NV)

Unable to access Spot check 2. due to access issues.

SITE REF. | **RIVER HABITAT SURVEY : DIMENSIONS AND INFLUENCES** | Page 4 of 4

L CHANNEL DIMENSIONS (to be measured at one location on a straight uniform section, preferably across a riffle)

LEFT BANK		CHANNEL		RIGHT BANK	
Banktop height (m)	0.75	Bankfull width (m)	5	Banktop height (m)	1.5
Is banktop height also bankfull height? (Y or N)	Y	Water width (m)	2	Is banktop height also bankfull height? (Y or N)	N
Embanked height (m)	—	Water depth (m)	0.15	Embanked height (m)	—

If trashline lower than banktop, indicate: height above water (m) = — width from bank to bank (m) = —

Bed material at site is: consolidated ☐ unconsolidated (loose) ☑ unknown ☐

Location of measurements is: riffle ☐ other ☑ (state) COBBLED SECTION.

M FEATURES OF SPECIAL INTEREST (Use ✓ or E (> 33% length) *record even if <1%

None	☑	Very large boulders (>1m)	☐	Backwater(s)	☐	Marsh(es)	☐
Braided channels	☐	*Debris dam(s)	☐	Floodplain boulder deposits	☐	Flush(es)	☐
Side channel(s)	☐	*Leafy debris	☐	Water meadow(s)	☐	Natural open water	☐
*Natural waterfall(s) > 5m high	☐	Fringing reed-bank(s)	☐	Fen(s)	☐		
*Natural waterfall(s) < 5m high	☐	Quaking bank(s)	☐	Bog(s)	☐	Others (state)	☐
Natural cascade(s)	☐	*Sink hole(s)	☐	Wet woodland(s)	☐		

N CHOKED CHANNEL (tick one box)

Is 33% or more of the channel choked with vegetation? No ☑ Yes ☐

O NOTABLE NUISANCE PLANT SPECIES (Use ✓ or E (> 33% length) *record even if <1%

	bankface	banktop to 50m		bankface	banktop to 50m
None ☑ *Giant hogweed	☐	☐	*Himalayan balsam	☐	☐
*Japanese knotweed	☐	☐	*Other (state).....	☐	☐

P OVERALL CHARACTERISTICS (Circle appropriate words, add others as necessary)

Major impacts: landfill - tipping - litter - sewage - pollution - drought - abstraction - mill - dam - road - rail - industry - housing mining - quarrying - overdeepening - afforestation - fisheries management - silting - waterlogging - hydroelectric power

Evidence of recent management: dredging - bank mowing - weed cutting - enhancement - river rehabilitation - gravel extraction - other (please specify)

Animals: otter - mink - water vole - kingfisher - dipper - grey wagtail - sand martin - heron - dragonflies/damselflies

Other significant observations: if necessary use separate sheet to describe overall characteristics and relevant observations

Signal crayfish in watercourse - burrows in bank

Q ALDERS (tick one box in each of the two categories) *record even if <1%

*Alders? None ☐ Present ☑ Extensive ☐ | *Diseased Alders? None ☑ Present ☐ Extensive ☐

R FIELD SURVEY QUALITY CONTROL (✓ boxes to confirm checks)

- Have you taken at least two photos that illustrate the general character of the site and additional photos of any weirs/ sluices and major/intermediate structures across the channel? ☑
- Have you completed all ten spot-checks and made entries in all boxes in E & F on page 2? ☑
- Have you completed column 11 of section G (and E if appropriate) on page 2? ☑
- Have you recorded in section C the number of riffles, pools and point bars (even if 0) on page 1? ☑
- Have you given an accurate (alphanumeric) grid reference for spot-checks 1, 6 and end of site (page 1)? ☑
- Have you stated whether spot-check 1 is at the upstream or downstream end of the site (top of page 2)? ☑
- Have you cross-checked your spot-check and sweep-up responses with the channel modification indicators given on page 2 of the spot-check key? ☑

RIVER HABITAT SURVEY 2003 VERSION: SITE HEALTH AND SAFETY ASSESSMENT

Site Number[1]:	Site Ref: LDB_S1	River Name: LONGDIKE BURN	Date: 02/08/17
Grid References/Co-ordinates:	Spot 1[2]: NZ 17838 97169	Mid-site: NZ 17840 97326	End of site[2]: NZ 18051 97412
Surveyor Name: SMCGRIGAN		Accredited Surveyor Code: FIAD23.	

[1] Leave blank if new site [2] Optional

Weather Conditions: OVERCAST WITH SUNNY INTERVALS / SHOWERS

Flow Conditions: NORMAL.

Site details: (enter comments or circle if applicable and give details)	Risk Level (Low/Mod/High)
Access and Parking: PARKING ON LAYBY ON ROAD + ACCESS THROUGH (entry & exit) FIELDS. (ACCESS ARRANGED W. LANDOWNER)	LOW
Conditions: comment on ground stability, footing, exposure/remoteness	LOW
Obstacles/Hazards: ~~fencing~~, ~~stiles~~, ~~dense vegetation~~, ~~steep bank~~ Marginal areas heavily vegetated, obscures steep banks.	MOD.
Occupied/~~Unoccupied~~: people, livestock, animals Rough pasture / unoccupied	LOW
Activities/Land-use: ~~agriculture~~, ~~woodland~~, residential, industrial, construction, recreational	LOW.
Risk if lone-working N/A	LOW.

IF THERE ARE ANY HIGH RISKS OR MORE THAN THREE MODERATE RISKS DO NOT CONTINUE WITH THE SURVEY.

Weil's Disease (*Leptospirosis*)

Instructions to card holders

1. As infection may enter through breaks in the skin, ensure that any cut, scratch or abrasion is thoroughly cleansed and covered with a waterproof plaster.
2. Avoid rubbing your eyes, nose and mouth during work.
3. Clean protective clothing, footwear and equipment etc. after use
4. After work, and particularly before taking food or drink, wash hands thoroughly.
5. Report all accidents and/or injuries, however slight.
6. Keep your card with you at all times.

Lyme Disease

1. Dress appropriately with skin covered up.
2. Regularly inspect for ticks when in the field.
3. Check for, and remove, any ticks as soon as possible after leaving the site.
4. Seek medical attention if bitten by a tick.

RIVER HABITAT SURVEY 2003 Version — Page 1 of 4

A FIELD SURVEY DETAILS

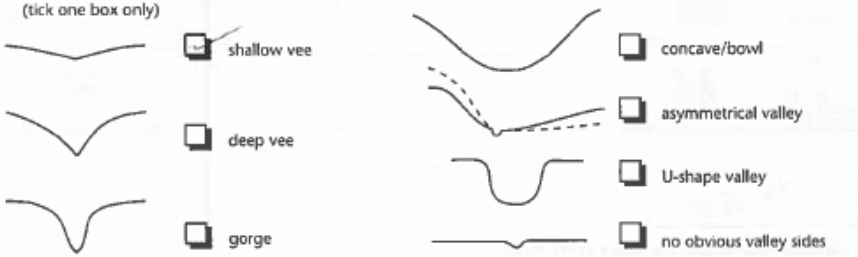
Site Number: (leave blank if new site)
Site Reference: LDB_S1
Spot-check 1 Grid Ref: NZ 17838 97169
Spot-check 6 Grid Ref: NZ 17840 97326
End of site Grid Ref: NZ 18051 97412
Reach Reference:
River name: LONG DIKE BURN
Date 02/08/2017 Time: 11:00
Surveyor name: S MCGRIGAN
Accredited Surveyor code: FIAD23

Is the site part of a river or an artificial channel? River ☑ Artificial ☐
Are adverse conditions affecting survey? No ☑ Yes ☐
If yes, state .....
Is bed of river visible? barely or not ☐ partially ☑ ±entirely ☐
Is health and safety assessment form attached? Yes ☐ No ☐
Number of photographs taken: 8
Photo references: LDB_S1_001_008
Site surveyed from: left bank ☑ right bank ☑ channel ☑

☐ When options shown with 'shadow boxes', tick one box only
LEFT banks determined by facing downstream RIGHT

B PREDOMINANT VALLEY FORM (within the horizon limit) (tick one box only)

(tick one box only)



- ☑ shallow vee
- ☐ deep vee
- ☐ gorge
- ☐ concave/bowl
- ☐ asymmetrical valley
- ☐ U-shape valley
- ☐ no obvious valley sides

Distinct flat valley bottom? No ☑ Yes ☐
Natural terraces? No ☑ Yes ☐

C NUMBER OF RIFFLES, POOLS AND POINT BARS (enter total number in boxes)

Riffle(s) •••	3	Unvegetated point bar(s)	0
Pool(s) ••••	4	Vegetated point bar(s)	0

D ARTIFICIAL FEATURES (indicate total number of occurrences of each category within the 500m site)

If none, tick box ☐

	Major	Intermediate	Minor		Major	Intermediate	Minor
Weirs/sluices	0	0	0	Outfalls/ intakes	0	0	0
Culverts	• 1			Fords	0	0	0
Bridges	0	0	•• 2	Deflectors/ groynes/croys	0	0	0
Other - state							

Is channel obviously realigned? No ☐ Yes, <33% of site ☑ ≥33% of site ☐
Is channel obviously over-deepened? No ☐ Yes, <33% of site ☑ ≥33% of site ☐
Is water impounded by weir/dam? No ☑ Yes, <33% of site ☐ ≥33% of site ☐

SITE REF.

RIVER HABITAT SURVEY: TEN SPOT-CHECKS

Page 2 of 4

Spot-check 1 is at: upstream end ☑ downstream end ☐ of site (tick one box)

E PHYSICAL ATTRIBUTES (to be assessed across channel within 1m wide transect)

When boxes 'bordered', only one entry allowed	1 GPS	2	3	4	5	6 GPS	7	8	9	10	GPS
LEFT BANK	Ring EC or SC if composed of sandy substrate										
Material NV, BE, BO, CO, GS, EA, PE, CL, CC, SP, WP, GA, BR, RR, TD, FA, RI	EA	EA	EA	EA	EA	NV	EA	EA	EA	EA	
Bank modification(s) NK, NO, RS, RI, PC(B), BM, EM	NO	NO	NO	NO	RS	NK	RS	RS	RS	RS/RI	
Marginal & bank feature(s) NV, NO, EC, SC, PB, VP, SB, VS, NB	EC	VS.	EC	EC	NO	NV	NO	NO	VS	NO	
CHANNEL	GP- ring either G or P if predominant										
Channel substrate NV, BE, BO, CO, GP, SA, SI, CL, PE, EA, AR	CO	CO	SA	G(P)	CO	NV	CO	CO	G(P)	G(P)	SA BO SI G(P)
Flow-type NV, FF, CH, BW, UW, CF, RP, UP, SM, NP, DR	SM	RP	SM	RP	SM	NV	SM	RP	RP	SM	
Channel modification(s) NK, NO, CV, RS, RI, DA, FO	NO	NO	NO	NO	RS	CV	RS	RS	RS	RS	
Channel feature(s) NV, NO, EB, RO, VR, MB, VB, MI, TR	NO	NO	NO	NO	NO	NV	NO	NO	NO	NO	
For braided rivers only: number of sub-channels											
RIGHT BANK	Ring EC or SC if composed of sandy substrate										
Material NV, BE, BO, CO, GS, EA, PE, CL, CC, SP, WP, GA, BR, RR, TD, FA, RI	EA	EA	EA	EA	EA	NV	EA	EA	EA	EA	
Bank modification(s) NK, NO, RS, RI, PC(B), BM, EM	NO	NO	NO	NO	RS	NK	NO	NO	NO	NO	
Marginal & bank feature(s) NV, NO, EC, SC, PB, VP, SB, VS, NB	NO	EC	EC	EC	NO	NV	NO	NO	NO	NO	

Enter channel substrate(s) not occurring as predominant in spot-checks but present in >1% of whole site.

F BANKTOP LAND-USE AND VEGETATION STRUCTURE (to be assessed over a 10m wide transect)

Land-use: choose one from BL, BP, CW, CP, SH, OR, WL, MH, AW, OW, RP, IG, TH, RD, SU, TL, IL, PG, NV

		1	2	3	4	5	6	7	8	9	10
LAND-USE WITHIN 5m OF LEFT BANKTOP		SH.	SH	SH	SH	SH	SU	SU	SU	SU	SU
LEFT BANKTOP (structure within 1m)	B/U/S/C/NV	S	S	C	S	S	B	S	S	S	U
LEFT BANK-FACE (structure)	B/U/S/C/NV	S	S	S	S	S	NV	S	S	S	S
RIGHT BANK-FACE (structure)	B/U/S/C/NV	S	S	S	S	S	NV	S	S	C	C
RIGHT BANKTOP (structure within 1m)	B/U/S/C/NV	S	S	S	S	S	B	C	C	C	C
LAND-USE WITHIN 5m OF RIGHT BANKTOP		SH	SH	SH	SH	SH	SU	BL	BL	BL	BL

G CHANNEL VEGETATION TYPES (to be assessed over a 10m width transect: use E (≥ 33% area), ✓ (present) or NV (not visible))

None (✓) or Not Visible (NV)						NV					
Liverworts/mosses/lichens						NV					
Emergent broad-leaved herbs				✓		NV	✓	✓	✓		
Emergent reeds/sedges/rushes/grasses/horsetails	✓	✓	✓	✓	✓	NV	✓	✓	✓		
Floating-leaved (rooted)						NV					
Free-floating						NV					
Amphibious						NV					
Submerged broad-leaved						NV					
Submerged linear-leaved						NV					
Submerged fine-leaved						NV					
Filamentous algae	✓	✓				NV		✓	✓	✓	

Use end column for overall assessment over 500m, including types not occurring in spot-checks (use ✓, E or NV)

SITE REF.

RIVER HABITAT SURVEY : 500m SWEEP-UP

Page 3 of 4

H LAND-USE WITHIN 50m OF BANKTOP (Use ✓ (present) or E (≥ 33% banklength))

	L	R		L	R
Broadleaf/mixed woodland (semi-natural) (BL)	✓	E	Natural open water (OW)		
Broadleaf/mixed plantation (BP)			Rough/unimproved grassland/pasture (RP)	E	E
Coniferous woodland (semi-natural) (CW)			Improved/semi-improved grassland (IG)		
Coniferous plantation (CP)			Tall herb/rank vegetation (TH)		
Scrub & shrubs (SH)			Rock, scree or sand dunes (RD)		
Orchard (OR)			Suburban/urban development (SU)	E	✓
Wetland (e.g. bog, marsh, fen) (WL)			Tilled land (TL)		
Moorland/heath (MH)			Irrigated land (IL)		
Artificial open water (AW)			Parkland or gardens (PG)		
			Not visible (NV)		

I BANK PROFILES (Use ✓ (present) or E (≥ 33% bankength))

Natural/unmodified	L	R	Artificial/modified	L	R
Vertical/undercut	E	✓	Resectioned (reprofiled)	E	✓
Vertical with toe			Reinforced - whole		
Steep (>45°)	✓	E	Reinforced - top only	✓	
Gentle			Reinforced - toe only	✓	
Composite			Artificial two-stage		
Natural berm			Poached bank		
			Embanked		
			Set-back embankment		

J EXTENT OF TREES AND ASSOCIATED FEATURES (*record even if <1%)

TREES (tick one box per bank)

	Left	Right
None	☐	☐
Isolated/scattered	☐	☐
Regularly spaced, single	☐	☐
Occasional clumps	☐	☐
Semi-continuous	☑	☑
Continuous	☐	☐

ASSOCIATED FEATURES (tick one box per feature)

	None	Present	E (≥33%)
Shading of channel	☐	☐	☑
*Overhanging boughs	☐	☑	☐
*Exposed bankside roots	☐	☑	☐
*Underwater tree roots	☐	☑	☐
Fallen trees	☐	☑	☐
Large woody debris	☐	☑	☐

K EXTENT OF CHANNEL AND BANK FEATURES (tick one box for each feature) (*record even if <1%)

	None	Present	E(≥33%)		None	Present	E (≥33%)
*Free fall flow	☑	☐	☐	Exposed bedrock	☑	☐	☐
Chute flow	☑	☐	☐	Exposed boulders	☐	☑	☐
Broken standing waves	☑	☐	☐	Vegetated bedrock/boulders	☑	☐	☐
Unbroken standing waves	☑	☐	☐	Unvegetated mid-channel bar(s)	☑	☐	☐
Rippled flow ****	☐	☑	☐	Vegetated mid-channel bar(s)	☐	☑	☐
*Upwelling	☑	☐	☐	Mature island(s)	☑	☐	☐
Smooth flow *****	☐	☐	☑	Unvegetated side bar(s)	☑	☐	☐
No perceptible flow	☑	☐	☐	Vegetated side bar(s)	☐	☑	☐
No flow (dry)	☑	☐	☐	Unvegetated point bar(s)	☑	☐	☐
Marginal deadwater	☑	☐	☐	Vegetated point bar(s)	☑	☐	☐
Eroding cliff(s) *****	☐	☐	☑	*Unvegetated silt deposit(s)	☑	☐	☐
Stable cliff(s)	☑	☐	☐	*Discrete unvegetated sand deposit(s)	☑	☐	
				*Discrete unvegetated gravel deposit(s)	☑	☐	

SITE REF.

RIVER HABITAT SURVEY : DIMENSIONS AND INFLUENCES Page 4 of 4

L CHANNEL DIMENSIONS (to be measured at one location on a straight uniform section, preferably across a riffle)

LEFT BANK		CHANNEL		RIGHT BANK	
Banktop height (m)	1.5	Bankfull width (m)	7	Banktop height (m)	2.
Is banktop height also bankfull height? (Y or N)	Y	Water width (m)	3.75	Is banktop height also bankfull height? (Y or N)	N
Embanked height (m)	/	Water depth (m)	0.05	Embanked height (m)	/

If trashline lower than banktop, indicate: height above water (m) = / width from bank to bank (m) = /

Bed material at site is: consolidated ☐ unconsolidated (loose) ☑ unknown ☐

Location of measurements is: riffle ☑ other ☐ (state)

M FEATURES OF SPECIAL INTEREST Use ✓ or E (≥ 33% length) *record even if <1%

None	☑	Very large boulders (>1m)	☐	Backwater(s)	☐	Marsh(es)	☐
Braided channels	☐	*Debris dam(s)	☐	Floodplain boulder deposits	☐	Flush(es)	☐
Side channel(s)	☐	*Leafy debris	☐	Water meadow(s)	☐	Natural open water	☐
*Natural waterfall(s) > 5m high	☐	Fringing reed-bank(s)	☐	Fen(s)	☐	Others (state)	☐
*Natural waterfall(s) < 5m high	☐	Quaking bank(s)	☐	Bog(s)	☐		
Natural cascade(s)	☐	*Sink hole(s)	☐	Wet woodland(s)	☐		

N CHOKED CHANNEL (tick one box)

Is 33% or more of the channel choked with vegetation? No ☑ Yes ☐

O NOTABLE NUISANCE PLANT SPECIES Use ✓ or E (≥ 33% length) *record even if <1%

	bankface	banktop to 50m		bankface	banktop to 50m
None ☐					
*Giant hogweed	☐	☐	*Himalayan balsam	☑	☐
*Japanese knotweed	☐	☐	*Other (state).....	☐	☐

P OVERALL CHARACTERISTICS (Circle appropriate words, add others as necessary)

Major impacts: landfill - tipping - litter - sewage - pollution - drought - abstraction - mill - dam - road - rail - industry - housing - mining - quarrying - overdeepening - afforestation - fisheries management - silting - waterlogging - hydroelectric power

Evidence of recent management: dredging - bank mowing - weed cutting - enhancement - river rehabilitation - gravel extraction - other (please specify)

Animals: otter - mink - water vole - kingfisher - dipper - grey wagtail - sand martin - heron - dragonflies/damselflies

Other significant observations: if necessary use separate sheet to describe overall characteristics and relevant observations

Caravan park on LHS in D/S section of survey area.

Q ALDERS (tick one box in each of the two categories) *record even if <1%

*Alders?				*Diseased Alders?			
None	☐	Present	☑	None	☑	Present	☐
Extensive	☐			Extensive	☐		

R FIELD SURVEY QUALITY CONTROL (✓ boxes to confirm checks)

- Have you taken at least two photos that illustrate the general character of the site and additional photos of any weirs/ sluices and major/intermediate structures across the channel? ☑
- Have you completed all ten spot-checks and made entries in all boxes in E & F on page 2? ☑
- Have you completed column 11 of section G (and E if appropriate) on page 2? ☑
- Have you recorded in section C the number of riffles, pools and point bars (even if 0) on page 1? ☑
- Have you given an accurate (alphanumeric) grid reference for spot-checks 1, 6 and end of site (page 1)? ☑
- Have you stated whether spot-check 1 is at the upstream or downstream end of the site (top of page 2)? ☑
- Have you cross-checked your spot-check and sweep-up responses with the channel modification indicators given on page 2 of the spot-check key? ☐

RIVER HABITAT SURVEY 2003 VERSION: SITE HEALTH AND SAFETY ASSESSMENT

Site Number[1]:	Site Ref: LDB – S2	River Name: LONGDIKE BURN	Date: 01 / 08 / 17
Grid References/ Co-ordinates:	Spot 1[2]: NZ 18056 96711	Mid-site: NZ 18033 96875	End of site[2]: NZ 17880 97029
Surveyor Name: S MCGROGAN		Accredited Surveyor Code: FA023	
[1] Leave blank if new site.		[2] Optional	

Weather Conditions: SUNNY WITH CLOUDY INTERVALS

Flow Conditions: NORMAL

Site details: (enter comments or circle if applicable and give details)	Risk Level (Low/Mod/High)
Access and Parking: PARKING IN LAYBY + walking to site (entry & exit) Land is cut through and can be long	MOD.
Conditions: comment on ground stability, footing, exposure/remoteness	LOW.
Obstacles/Hazards: fencing, stiles, dense vegetation, steep bank	LOW
Occupied/Unoccupied: people, livestock, animals Agri / Woodland.	LOW
Activities/Land-use: agriculture, woodland, residential, industrial, construction, recreational	LOW
Risk if lone-working N/A	LOW

IF THERE ARE ANY HIGH RISKS OR MORE THAN THREE MODERATE RISKS DO NOT CONTINUE WITH THE SURVEY.

Weil's Disease (*Leptospirosis*)

Instructions to card holders

1. As infection may enter through breaks in the skin, ensure that any cut, scratch or abrasion is thoroughly cleansed and covered with a waterproof plaster.
2. Avoid rubbing your eyes, nose and mouth during work.
3. Clean protective clothing, footwear and equipment etc. after use
4. After work, and particularly before taking food or drink, wash hands thoroughly.
5. Report all accidents and/or injuries, however slight.
6. Keep your card with you at all times.

Lyme Disease

1. Dress appropriately with skin covered up.
2. Regularly inspect for ticks when in the field.
3. Check for, and remove, any ticks as soon as possible after leaving the site.
4. Seek medical attention if bitten by a tick.

RIVER HABITAT SURVEY 2003 Version — Page 1 of 4

A FIELD SURVEY DETAILS

Site Number: (leave blank if new site)

Site Reference: LDB – S2

Spot-check 1 Grid Ref: NZ 18056 96711

Spot-check 6 Grid Ref: NZ 18033 96875

End of site Grid Ref: NZ 17880 97029

Reach Reference:

River name: LONGDIKE BURN

Date 01 / 08 / 2017 Time: 14:00

Surveyor name: S MCGROGAN

Accredited Surveyor code: FA023.

Is the site part of a river or an artificial channel? River ☑ Artificial ☐

Are adverse conditions affecting survey? No ☑ Yes ☐

If yes, state ....

Is bed of river visible? barely or not ☐ partially ☑ ±entirely ☐

Is health and safety assessment form attached? Yes ☐ No ☐

Number of photographs taken: 8

Photo references: LDB – S2 – 001 – 008

Site surveyed from: left bank ☑ right bank ☑ channel ☑

☐ **When options shown with 'shadow boxes', tick one box only**

LEFT **banks determined by facing downstream** **RIGHT**

B PREDOMINANT VALLEY FORM (within the horizon limit) (tick one box only)

(tick one box only)

☑ shallow vee	☐ concave/bowl
☐ deep vee	☐ asymmetrical valley
☐ gorge	☐ U-shape valley
	☐ no obvious valley sides

Distinct flat valley bottom? No ☑ Yes ☐ — Natural terraces? No ☑ Yes ☐

C NUMBER OF RIFFLES, POOLS AND POINT BARS (enter total number in boxes)

Riffle(s)	3	Unvegetated point bar(s)	2
Pool(s)	5	Vegetated point bar(s)	0

D ARTIFICIAL FEATURES (indicate total number of occurrences of each category within the 500m site)

If none, tick box ☐

	Major	Intermediate	Minor		Major	Intermediate	Minor
Weirs/sluices	0	0	0	Outfalls/intakes	0	0	0
Culverts	1			Fords	0	0	0
Bridges	0	0	1	Deflectors/groynes/croys	0	0	0.
Other - state							

Is channel obviously realigned?	**No** ☐	**Yes, <33% of site** ☑	**≥33% of site** ☐
Is channel obviously over-deepened?	**No** ☐	**Yes, <33% of site** ☑	**≥33% of site** ☐
Is water impounded by weir/dam?	**No** ☑	**Yes, <33% of site** ☐	**≥33% of site** ☐

SITE REF.

RIVER HABITAT SURVEY: TEN SPOT-CHECKS

Page 2 of 4

Spot-check 1 is at: upstream end ☑ downstream end ☐ of site (tick one box)

E PHYSICAL ATTRIBUTES (to be assessed across channel within 1m wide transect)

When boxes 'bordered', only one entry allowed	1 GPS	2	3	4	5	6 GPS	7	8	9	10	GPS
LEFT BANK	Ring EC or SC if composed of sandy substrate										
Material NV, BE, BO, CO, GS, EA, PE, CL, CC, SP, WP, GA, BR, RR, TD, FA, BI	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	
Bank modification(s) NK, NO, RS, RI, PC(B), BM, EM	NO	NO	NO	NO	NO	NO	RS	NO	NO	NO	
Marginal & bank feature(s) NV, NO, EC, SC, PB, VP, SB, VS, NB	NO	SB	NO	EC	EC	EC	NO	EC	VS	EC	
CHANNEL	GP- ring either G or P if predominant										
Channel substrate NV, BE, BO, CO, GP, SA, SI, CL, PE, EA, AR	CO	CO	CO	G(P)	CO	CO	CO	CO	G(P)	CO	Bo SA SI
Flow-type NV, FF, CH, BW, UW, CF, RP, UP, SM, NP, DR	SM	SM	UW	SM	SM	SM	SM	SM	SM	UW	
Channel modification(s) NK, NO, CV, RS, RI, DA, FO	NO	NO	NO	NO	NO	NO	RS	NO	NO	NO	
Channel feature(s) NV, NO, EB, RO, VR, MB, VB, MI, TR	NO	RO	NO	NO	NO	NO	NO	NO	MB	NO	
For braided rivers only: number of sub-channels											
RIGHT BANK	Ring EC or SC if composed of sandy substrate										
Material NV, BE, BO, CO, GS, EA, PE, CL, CC, SP, WP, GA, BR, RR, TD, FA, BI	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	
Bank modification(s) NK, NO, RS, RI, PC(B), BM, EM	NO	NO	NO	NO	NO	NO	RS	NO	NO	NO	
Marginal & bank feature(s) NV, NO, EC, SC, PB, VP, SB, VS, NB	SB	EC	NO	NO	EC	EC	NO	NO	EC	PB	

Enter channel substrate(s) not occurring as predominant in spot-checks but present in >1% of whole site.

F BANKTOP LAND-USE AND VEGETATION STRUCTURE (to be assessed over a 10m wide transect)

Land-use: choose one from BL, BP, CW, CP, SH, OR, WL, MH, AW, OW, RP, IG, TH, RD, SU, TL, IL, PG, NV

LAND-USE WITHIN 5m OF LEFT BANKTOP		BL	BL	BL	BL	BL	BL	SH	BL	SH	SH
LEFT BANKTOP (structure within 1m)	B/U/S/C/NV	C	C	C	C	C	C	C	C	C	C
LEFT BANK-FACE (structure)	B/U/S/C/NV	C	C	C	C	B	U	C	S	C	C
RIGHT BANK-FACE (structure)	B/U/S/C/NV	C	C	C	C	U	C	U	S	S	S
RIGHT BANKTOP (structure within 1m)	B/U/S/C/NV	C	C	C	C	C	C	C	C	C	C
LAND-USE WITHIN 5m OF RIGHT BANKTOP		BL	BL	BL	BL	BL	BL	SH	SH	SH	SH

G CHANNEL VEGETATION TYPES (to be assessed over a 10m wide transect, use E (≥ 33% area), ✓ (present) or NV (not visible))

None (✓) or Not Visible (NV)						✓		✓			
Liverworts/mosses/lichens		✓	✓	✓	✓					✓	
Emergent broad-leaved herbs											✓
Emergent reeds/sedges/rushes/grasses/horsetails			✓				✓		✓		
Floating-leaved (rooted)											
Free-floating											
Amphibious											
Submerged broad-leaved											
Submerged linear-leaved											
Submerged fine-leaved											
Filamentous algae	✓										

Use end column for overall assessment over 500m, including types not occurring in spot-checks (use ✓, E or NV)

SITE REF.

RIVER HABITAT SURVEY : 500m SWEEP-UP

Page 3 of 4

H LAND-USE WITHIN 50m OF BANKTOP (Use ✓ (present) or E (≥ 33% banklength))

	L	R		L	R
Broadleaf/mixed woodland (semi-natural) (BL)	E	E	Natural open water (OW)		
Broadleaf/mixed plantation (BP)			Rough/unimproved grassland/pasture (RP)	E	E
Coniferous woodland (semi-natural) (CW)			Improved/semi-improved grassland (IG)		
Coniferous plantation (CP)			Tall herb/rank vegetation (TH)		
Scrub & shrubs (SH)	✓	✓	Rock, scree or sand dunes (RD)		
Orchard (OR)			Suburban/urban development (SU)		
Wetland (e.g. bog, marsh, fen) (WL)			Tilled land (TL)		
Moorland/heath (MH)			Irrigated land (IL)		
Artificial open water (AW)			Parkland or gardens (PG)		
			Not visible (NV)		

I BANK PROFILES (Use ✓ (present) or E (≥ 33% banklength))

Natural/unmodified	L	R	Artificial/modified	L	R
Vertical/undercut			Resectioned (reprofiled)		
Vertical with toe			Reinforced - whole		
Steep (>45°)	E	E	Reinforced - top only		
Gentle			Reinforced - toe only		
Composite			Artificial two-stage	✓	
Natural berm			Poached bank		
			Embanked		
			Set-back embankment		

J EXTENT OF TREES AND ASSOCIATED FEATURES (*record even if <1%)

TREES (tick one box per bank)	Left	Right
None	☐	☐
Isolated/scattered	☐	☐
Regularly spaced, single	☐	☐
Occasional clumps	☐	☐
Semi-continuous	☑	☑
Continuous	☐	☐

ASSOCIATED FEATURES (tick one box per feature)	None	Present	E (≥33%)
Shading of channel	☐	☐	☑
*Overhanging boughs	☐	☑	☐
*Exposed bankside roots	☐	☑	☐
*Underwater tree roots	☐	☑	☐
Fallen trees	☐	☑	☐
Large woody debris	☐	☑	☐

K EXTENT OF CHANNEL AND BANK FEATURES (tick one box for each feature) (*record even if <1%)

	None	Present	E (≥33%)		None	Present	E (≥33%)
*Free fall flow	☑	☐	☐	Exposed bedrock	☑	☐	☐
Chute flow	☑	☐	☐	Exposed boulders	☐	☑	☐
Broken standing waves	☑	☐	☐	Vegetated bedrock/boulders	☑	☐	☐
Unbroken standing waves	☐	☑	☐	Unvegetated mid-channel bar(s)	☑	☐	☐
Rippled flow	☑	☐	☐	Vegetated mid-channel bar(s)	☐	☑	☐
*Upwelling	☑	☐	☐	Mature island(s)	☑	☐	☐
Smooth flow	☐	☐	☑	Unvegetated side bar(s)	☐	☑	☐
No perceptible flow	☑	☐	☐	Vegetated side bar(s)	☐	☑	☐
No flow (dry)	☑	☐	☐	Unvegetated point bar(s)	☐	☑	☐
Marginal deadwater	☑	☐	☐	Vegetated point bar(s)	☑	☐	☐
Eroding cliff(s)	☐	☐	☑	*Unvegetated silt deposit(s)	☑	☐	☐
Stable cliff(s)	☑	☐	☐	*Discrete unvegetated sand deposit(s)	☑	☐	
				*Discrete unvegetated gravel deposit(s)	☑	☐	

SITE REF.

RIVER HABITAT SURVEY : DIMENSIONS AND INFLUENCES Page 4 of 4

L CHANNEL DIMENSIONS (to be measured at one location on a straight uniform section, preferably across a riffle)

LEFT BANK		CHANNEL		RIGHT BANK	
Banktop height (m)	1.75	Bankfull width (m)	12	Banktop height (m)	2
Is banktop height also bankfull height? (Y or N)	Y	Water width (m)	3	Is banktop height also bankfull height? (Y or N)	N
Embanked height (m)	/	Water depth (m)	0.15	Embanked height (m)	/

If trashline lower than banktop, indicate: height above water (m) = / width from bank to bank (m) = /

Bed material at site is: consolidated ☐ unconsolidated (loose) ☑ unknown ☐

Location of measurements is: riffle ☑ other ☐ (state)

M FEATURES OF SPECIAL INTEREST Use √ or E (≥ 33% length) *record even if <1%

None	☑	Very large boulders (>1m)	☐	Backwater(s)	☐	Marsh(es)	☐
Braided channels	☐	*Debris dam(s)	☐	Floodplain boulder deposits	☐	Flush(es)	☐
Side channel(s)	☐	*Leafy debris	☐	Water meadow(s)	☐	Natural open water	☐
*Natural waterfall(s) > 5m high	☐	Fringing reed-bank(s)	☐	Fen(s)	☐	Others (state)	☐
*Natural waterfall(s) < 5m high	☐	Quaking bank(s)	☐	Bog(s)	☐		
Natural cascade(s)	☐	*Sink hole(s)	☐	Wet woodland(s)	☐		

N CHOKED CHANNEL (tick one box)

Is 33% or more of the channel choked with vegetation? No ☑ Yes ☐

O NOTABLE NUISANCE PLANT SPECIES Use √ or E (≥ 33% length) *record even if <1%

	bankface	banktop to 50m		bankface	banktop to 50m
None ☑					
*Giant hogweed	☐	☐	*Himalayan balsam	☐	☐
*Japanese knotweed	☐	☐	*Other (state).....	☐	☐

P OVERALL CHARACTERISTICS (Circle appropriate words, add others as necessary)

Major impacts: landfill - tipping - litter - sewage - pollution - drought - abstraction - mill - dam - road - rail - industry - housing mining - quarrying - overdeepening - afforestation - fisheries management - silting - waterlogging - hydroelectric power

Evidence of recent management: dredging - bank mowing - weed cutting - enhancement - river rehabilitation - gravel extraction - other (please specify)

Animals: otter - mink - water vole - kingfisher - dipper - grey wagtail - sand martin - heron - dragonflies/damselflies

Other significant observations: if necessary use separate sheet to describe overall characteristics and relevant observations

Q ALDERS (tick one box in each of the two categories) *record even if <1%

*Alders?		*Diseased Alders?	
None	☐	None	☑
Present	☑	Present	☐
Extensive	☐	Extensive	☐

R FIELD SURVEY QUALITY CONTROL (✓ boxes to confirm checks)

Have you taken at least two photos that illustrate the general character of the site and additional photos of any weirs/ sluices and major/intermediate structures across the channel?	☑
Have you completed all ten spot-checks and made entries in all boxes in E & F on page 2?	☐
Have you completed column 11 of section G (and E if appropriate) on page 2?	☐
Have you recorded in section C the number of riffles, pools and point bars (even if 0) on page 1?	☑
Have you given an accurate (alphanumeric) grid reference for spot-checks 1, 6 and end of site (page 1)?	☐
Have you stated whether spot-check 1 is at the upstream or downstream end of the site (top of page 2)?	☐
Have you cross-checked your spot-check and sweep-up responses with the channel modification indicators given on page 2 of the spot-check key?	☑

APPENDIX D: MACROPHYTES RAW DATA AND LEAFPACS OUTPUTS

Macrophyte Field Sheet

River	NAITOS DEAN	Site:	U/S A1
Surveyor	SNC + EM		
NGR top	NU 14249 04969	Date	31/7/17
NGR bottom	NU 14417 05062		
Start time		Finish Time	
% Wadeable	25 %	Total % cover of macrophytes	75

Width (m) %	<1	100	1-5	
5-10	10-20		>20	
Depth (m) %	<0.25	35	0.25-0.5	50
	0.5-1	15	>1	

Record the estimated percentage for each of the following:

Substrate %	Peat		Silt/clay	30
	Sand	5	Pebbles/gravel	30
	Boulder/cobble	15	Bedrock	
Habitats %	Pool		Run	30
	Riffle	10	Slack	60
Shading %	Left Bank		Right Bank	
	None	10	None	20
	Broken	30	Broken	80
	Dense	20	Dense	

Clarity %	Clear	90
	Turbid	10
	Cloudy	

Bed Stability %	Solid/firm		Stable	
	Unstable	25	Soft/sinking	75

Photo No/ Ref	U/s	D/s

% Cover of Filamentous Algae	15

Notes/Comments:
Heavily overgrown by riparian vegetation + trees
INNS = Himalayan Balsam present

Macrophyte taxa
You must record ALL macrophytes you encounter in the 100m stretch and identify them to species level.

Notes / actions
Suffix sp* - Make every effort to identify these taxa to species level, either in the field or using specimens back in the lab. You may need to confirm the identification with colleagues or Nigel Holmes. Make a record for each unknown species and label them 'Species x: 1', 'Species x: 2' etc. You will need to enter each different species you find as a separate record (with a species cover value) on BIOSYS.
Specimen required – these taxa are particularly difficult to identify to species level and you must be certain of a correct identification to record them. Record the site, date, recorder, possible identity and supporting notes. You may need to have it verified by an independent expert and preserve it in your reference collection.
Rare - taxa which are likely to be found in <1% of surveys.

MTR taxa
Taxa which appear in the original MTR manual are shown in bold. BIOSYS can be used to extract an MTR score in the interim and information for the WFD, as we move to one method and an extended taxa list for all survey purposes.

The Species Cover Value (SCV) classes are:

1	<0.1%	6	10-25%
2	0.1 -1%	7	25 -50%
3	1 – 2.5%	8	50 – 75%
4	2.5 – 5%	9	> 75%
5	5 – 10%		

MACROALGAE

Taxa (Synonym)	Species Cover Value - 9 pt scale	Notes / action
Batrachospermum sp(p.)		
Chara sp* e.g. vulgaris		Specimen (s) required
Cladophora aegagropila		
Cladophora glomerata/ Rhizoclonium hieroglyphicum **Blanketweed agg.**	5	
Unidentified unbranched filamentous non-slimy green algae (i.e. unbranched, non-slimy green algae excl. Cladophora / Vaucheria/ Hydrodictyon		
Hildenbrandia rivularis		
Hydrodictyon reticulatum		
Lemanea sp(p.) e.g. fluviatilis		
Nitella sp*		specimen(s) required
Nostoc sp*		specimen(s) required
Blue-green algal film / pells (Phormidium / Lyngbya sp (p)		
Enteromorpha intestinalis (Ulva flexuosa / intestinalis)		
Vaucheria sp(p.)		
Zygnematalean (Slimy, unbranched, fil algae)		

BRYOPHYTES

Taxa (Synonym)	SCV	Notes / action
Amblystegium fluviatile (Hygroamblystegium fluviatile)		
Amblystegium (Hygroamblystegium) tenax		
Blindia acuta		
Brachythecium plumosum		
Brachythecium rivulare		
Brachythecium rutabulum		
Bryum pseudotriquetrum		
Calliergon cuspidatum		
Chiloscyphus polyanthos		
Cinclidotus fontinaloides		
Cratoneuron filicinum		
Dichodontium flavescens/pellucidum		
Dichodontium palustris **(Dicranella palustris)**		
Fissidens sp* e.g. rufulus/ crassipes		specimen (s) required
Fontinalis antipyretica		
Fontinalis squamosa		
Hygrohypnum luridum		
Hygrohypnum ochraceum		
Hyocomium armoricum		
Jungermannia sp* e.g. atrovirens		specimen (s) required
Leptodyctium riparium **(Amblystegium riparium)**		
Marsupella sp* emarginata		specimen (s) required
Nardia sp* compressa		specimen (s) required
Octodiceras fontanum		
Orthotrichum rivulare		
Palustriella commutata (Cratoneuron commutatum)		
Pellia endivilifolia	4	
Pellia epiphylla		
Philonotis sp.* e.g. fontana		specimen (s) required
Platyhypnidium riparioides **(Rhynchostegium riparioides)**		
Polytrichum commune		
Racomitrium aciculare		
Riccardia sp* chamaedryfolia / multifida		specimen (s) required
Riccia fluitans		
Scapania sp* e.g. undulata		specimen (s) required
Schistidium rivulare		
Sphagnum sp* e.g. denticulatum		specimen (s) required
Thamnobryum alopecurum		

LICHENS

Taxa (Synonym)	SCV	Notes / action
Dermatocarpon sp(p)*		specimen(s) required

VASCULAR PLANTS

Taxa (Synonym)	SCV	Notes / action
Azolla filiculoides		
Equisetum fluviatile		
Equisetum palustre •	2	
Acorus calamus		
Alisma lanceolatum		
Alisma plantago-aquatica		
Apium inundatum		
Apium nodiflorum •	6	
Berula erecta		
Bidens cernua		
Bidens tripartita		
Bolboschoenus maritimus		Rare
Butomus umbellatus		
Callitriche hamulata		
Callitriche hermaphroditica/truncata		specimen(s) required
Callitriche obtusangula		
Callitriche stagnalis/platycarpa/obtusangula		specimen(s) required
Caltha palustris		
Carex acuta		
Carex acutiformis		
Carex aquatilis		
Carex elata		
Carex paniculata		
Carex riparia		
Carex rostrata		
Carex vesicaria		
Catabrosa aquatica		
Ceratophyllum demersum		
Cicuta virosa		Rare
Eleocharis palustris		
Eleogiton fluitans		
Elodea canadensis		
Elodea nuttallii		
Glyceria fluitans agg		i.e. any SMALL Glyceria (NOT maxima)
Glyceria maxima •	2	
Groenlandia densa		
Hippuris vulgaris		
Hottonia palustris		Rare
Hydrocharis morsus-ranae		Rare
Hydrocotyle ranunculoides		Rare
Hypericum elodes		Rare
Iris pseudacorus		

VASCULAR PLANTS.........continued

Taxa (Synonym)	SCV	Notes / action
Juncus articulatus		
Juncus bulbosus		
Lemna gibba		
Lemna minor		
Lemna minuta		
Lemna trisulca		
Littorella uniflora		
Lobelia dortmanna		
Lotus pedunculatus		
Lythrum salicaria		
Mentha sp*		specimen(s) required
Mentha aquatica		
Menyanthes trifoliata		
Mimulus sp./hybrid		specimen(s) required
Montia fontana		
Myosotis sp(p).		acceptable if non-flowering
Myosotis laxa		
Myosotis scorpioides		
Myosoton aquaticum		
Myriophyllum alterniflorum		
Myriophyllum spicatum		
Nuphar lutea		
Nymphaea alba		
Nymphoides peltata		
Oenanthe aquatica		
Oenanthe crocata		
Oenanthe fistulosa		
Oenanthe fluviatilis		
Persicaria amphibia		
Persicaria hydropiper		
Phalaris arundinacea		
Phragmites australis •	2	
Potamogeton alpinus		
Potamogeton berchtoldii		
Potamogeton crispus		
Potamogeton filiformis		Rare
Potamogeton friesii		Rare
Potamogeton gramineus		
Potamogeton lucens		
Potamogeton natans		
Potamogeton nodosus		
Potamogeton obtusifolius		Rare
Potamogeton pectinatus		
Potamogeton perfoliatus		
Potamogeton polygonifolius		
Potamogeton praelongus		
Potamogeton pusillus		
Potamogeton trichoides		Rare
Potamogeton x olivaceus		
Potamogeton x salicifolius		
Potentilla palustris		
Potentilla erecta		

VASCULAR PLANTS ....continued

Taxa (Synonym)	SCV	Notes / action
Ranunculus sp (R. sect Batrachian sp or hybrid indet)		excluding circinatus, omiophyllus, hederaceus
Ranunculus aquatilis		Record only if classic characteristics
Ranunculus aquatilis var. diffusus **(R.trichophyllus)**		
Ranunculus circinatus		
Ranunculus flammula		
Ranunculus fluitans		Record only if classic characteristics
Ranunculus hederaceus		
Ranunculus omiophyllus		
Ranunculus peltatus		Record only if classic characteristics Rare
Ranunculus penicillatus subsp. penicillatus		Record only if classic characteristics
Ranunculus penicillatus subsp. Pseudofluitans var pseudofluitans		Record only if classic characteristics
Ranunculus penicillatus subsp pseudofluitans var vertumnus		Record only if classic characteristics
Ranunculus sceleratus		
Rorippa amphibia		
Rorippa nasturtium-aquaticum agg. •	7	
Rorippa palustris		
Rumex hydrolapathum		
Sagittaria sagittifolia		
Schoenoplectus lacustris		
Scirpus sylvaticus		
Sium latifolium		Rare, though common W.Ireland & fen WFD waterbodies
Sparganium angustifolium		
Sparganium emersum		
Sparganium erectum		
Spirodela polyrhiza		
Triglochin palustris		
Typha angustifolia		
Typha latifolia		
Utricularia sp(p.)		Rare - specimen(s) required
Veronica anagallis-aquatica		
Veronica beccabunga •	7	
Veronica catenata		
Veronica catenata x anagallis-aquatica (or parents indet)		
Veronica scutellata		
Viola palustris		
Zannichellia palustris		

Additional species	Comments
* If you go further in your identification than the category on the list above e.g. Spirogyra, on BIOSYS you must enter the category on the list that it comes from e.g Zygnematalean.	
Angelica sylvestris	Conocephalum conicum
Juncus effusus	Scrophularia auriculata
Epilobium hirsutum	
Impatiens glandulifera	

Additional comments on the survey

Much of the channel is heavily overgrown making access difficult.

Macrophyte Field Sheet

River	LOW BIRCH BURN	Site:	SITE 2
Surveyor	SMS + BM		
NGR top	NZ 1843 4841	Date	1/8/17
NGR bottom	NZ 1794 4843		
Start time		Finish Time	
% Wadeable	60 %	Total % cover of macrophytes	1

Width (m) %	<1		1-5	65	
5-10 30	10-20	5	>20		
Depth (m) %	<0.25		0.25-0.5	80	
	0.5-1	15	>1	5	

Record the estimated percentage for each of the following:

Substrate %	Peat		Silt/clay	5
	Sand	40	Pebbles/gravel	45
	Boulder/cobble	30	Bedrock	
Habitats %	Pool	25	Run	60
	Riffle	10	Slack	5
Shading %	Left Bank		Right Bank	
	None	10	None	
	Broken	80	Broken	85
	Dense	10	Dense	15

Clarity %	Clear	5
	Turbid	75
	Cloudy	

Bed Stability %	Solid/firm		Stable	10
	Unstable	80	Soft/sinking	10

Photo No/ Ref	U/s	D/s

% Cover of Filamentous Algae	1

Notes/Comments:
High turbidity + heavy shading throughout

Macrophyte taxa
You must record ALL macrophytes you encounter in the 100m stretch and identify them to species level.

Notes / actions
Suffix sp* - Make every effort to identify these taxa to species level, either in the field or using specimens back in the lab. You may need to confirm the identification with colleagues or Nigel Holmes. Make a record for each unknown species and label them 'Species x: 1', 'Species x: 2' etc. You will need to enter each different species you find as a separate record (with a species cover value) on BIOSYS.
Specimen required – these taxa are particularly difficult to identify to species level and you must be certain of a correct identification to record them. Record the site, date, recorder, possible identity and supporting notes. You may need to have it verified by an independent expert and preserve it in your reference collection.
Rare - taxa which are likely to be found in <1% of surveys.

MTR taxa
Taxa which appear in the original MTR manual are shown in bold. BIOSYS can be used to extract an MTR score in the interim and information for the WFD, as we move to one method and an extended taxa list for all survey purposes.

The Species Cover Value (SCV) classes are:

1	<0.1%	6	10-25%
2	0.1 -1%	7	25 -50%
3	1 – 2.5%	8	50 – 75%
4	2.5 – 5%	9	> 75%
5	5 – 10%		

MACROALGAE

Taxa (Synonym)	Species Cover Value - 9 pt scale	Notes / action
Batrachospermum sp(p.)		
Chara sp* e.g. vulgaris		Specimen (s) required
Cladophora aegagropila		
Cladophora glomerata/ Rhizoclonium hieroglyphicum **Blanketweed agg.**	1	
Unidentified unbranched filamentous non-slimy green algae (i.e. unbranched, non-slimy green algae excl. Cladophora / Vaucheria/ Hydroclictyon		
Hildenbrandia rivularis		
Hydrodictyon reticulatum		
Lemanea sp(p.) e.g. fluviatilis		
Nitella sp*		specimen(s) required
Nostoc sp*		specimen(s) required
Blue-green algal film / pads (Phormidium / Lyngbya sp (p))		
Enteromorpha intestinalis (Ulva flexuosa / intestinalis)		
Vaucheria sp(p.)		
Zygnemataleaan (Slimy, unbranched, fil algae)		

BRYOPHYTES

Taxa (Synonym)	SCV	Notes / action
Amblystegium fluviatile (Hygroamblystegium fluviatile)		
Amblystegium (Hygroamblystegium) tenax		
Blindia acuta		
Brachythecium plumosum		
Brachythecium rivulare		
Brachythecium rutabulum		
Bryum pseudotriquetrum		
Calliergon cuspidatum		
Chiloscyphus polyanthos		
Cinclidotus fontinaloides		
Cratoneuron filicinum		
Dichodontium flavescens/pellucidum		
Dichodontium palustris **(Dicranella palustris)**		
Fissidens sp* e.g. rufulus/ crassipes		specimen (s) required
Fontinalis antipyretica		
Fontinalis squamosa		
Hygrohypnum luridum		
Hygrohypnum ochraceum		
Hyocomium armoricum		
Jungermannia sp* e.g. atrovirens		specimen (s) required
Leptodyctium riparium **(Amblystegium riparium)**		
Marsupella sp* emarginata		specimen (s) required
Nardia sp* compressa		specimen (s) required
Octodiceras fontanum		
Orthotrichum rivulare		
Palustriella commutata (Cratoneuron commutatum)		
Pellia endiviifolia	1	
Pellia epiphylla		
Philonotis sp.* e.g. fontana		specimen (s) required
Platyhypnidium riparioides **(Rhynchostegium riparioides)**		
Polytrichum commune		
Racomitrium aciculare		
Riccardia sp* chamaedryfolia / multifida		specimen (s) required
Riccia fluitans		
Scapania sp* e.g. undulata		specimen (s) required
Schistidium rivulare		
Sphagnum sp* e.g. denticulatum		specimen (s) required
Thamnobryum alopecurum		

LICHENS

Taxa (Synonym)	SCV	Notes / action
Dermatocarpon sp(p)*		specimen(s) required

VASCULAR PLANTS

Taxa (Synonym)	SCV	Notes / action
Azolla filiculoides		
Equisetum fluviatile		
Equisetum palustre		
Acorus calamus		
Alisma lanceolatum		
Alisma plantago-aquatica		
Apium inundatum		
Apium nodiflorum		
Berula erecta		
Bidens cernua		
Bidens tripartita		
Bolboschoenus maritimus		Rare
Butomus umbellatus		
Callitriche hamulata		
Callitriche hermaphroditica/truncata		specimen(s) required
Callitriche obtusangula		
Callitriche stagnalis/ platycarpa/obtusangula		specimen(s) required
Caltha palustris		
Carex acuta		
Carex acutiformis		
Carex aquatilis		
Carex elata		
Carex paniculata		
Carex riparia		
Carex rostrata		
Carex vesicaria		
Catabrosa aquatica		
Ceratophyllum demersum		
Cicuta virosa		Rare
Eleocharis palustris		
Eleogiton fluitans		
Elodea canadensis		
Elodea nuttallii		
Glyceria fluitans agg		i.e. any SMALL Glyceria (NOT maxima)
Glyceria maxima		
Groenlandia densa		
Hippuris vulgaris		
Hottonia palustris		Rare
Hydrocharis morsus-ranae		Rare
Hydrocotyle ranunculoides		Rare
Hypericum elodes		Rare
Iris pseudacorus		

VASCULAR PLANTS.....continued

Taxa (Synonym)	SCV	Notes / action
Juncus articulatus		
Juncus bulbosus		
Lemna gibba		
Lemna minor		
Lemna minuta		
Lemna trisulca		
Littorella uniflora		
Lobelia dortmanna		
Lotus pedunculatus		
Lythrum salicaria		
Mentha sp*		specimen(s) required
Mentha aquatica		
Menyanthes trifoliata		
Mimulus sp./hybrid		specimen(s) required
Montia fontana		
Myosotis sp(p.)		acceptable if non-flowering
Myosotis laxa		
Myosotis scorpioides		
Myosoton aquaticum		
Myriophyllum alterniflorum		
Myriophyllum spicatum		
Nuphar lutea		
Nymphaea alba		
Nymphoides peltata		
Oenanthe aquatica		
Oenanthe crocata		
Oenanthe fistulosa		
Oenanthe fluviatilis		
Persicaria amphibia		
Persicaria hydropiper		
Phalaris arundinacea		
Phragmites australis		
Potamogeton alpinus		
Potamogeton berchtoldii		
Potamogeton crispus		
Potamogeton filiformis		Rare
Potamogeton friesii		Rare
Potamogeton gramineus		
Potamogeton lucens		
Potamogeton natans		
Potamogeton nodosus		
Potamogeton obtusifolius		Rare
Potamogeton pectinatus		
Potamogeton perfoliatus		
Potamogeton polygonifolius		
Potamogeton praelongus		
Potamogeton pusillus		
Potamogeton trichoides		Rare
Potamogeton x olivaceus		
Potamogeton x salicifolius		
Potentilla palustris		
Potentilla erecta		

VASCULAR PLANTS .....continued

Taxa (Synonym)	SCV	Notes / action
Ranunculus sp (R. sect Batrachian sp or hybrid indet)		excluding circinatus, omiophyllus, hederaceus
Ranunculus aquatilis		Record only if classic characteristics
Ranunculus aquatilis var. diffusus (R.trichophyllus)		
Ranunculus circinatus		
Ranunculus flammula		
Ranunculus fluitans		Record only if classic characteristics
Ranunculus hederaceus		
Ranunculus omiophyllus		
Ranunculus peltatus		Record only if classic characteristics Rare
Ranunculus penicillatus subsp. penicillatus		Record only if classic characteristics
Ranunculus penicillatus subsp. Pseudofluitans var pseudofluitans		Record only if classic characteristics
Ranunculus penicillatus subsp pseudofluitans var vertummus		Record only if classic characteristics
Ranunculus sceleratus		
Rorippa amphibia		
Rorippa nasturtium-aquaticum agg.		
Rorippa palustris		
Rumex hydrolapathum		
Sagittaria sagittifolia		
Schoenoplectus lacustris		
Scirpus sylvaticus		
Sium latifolium		Rare, though common W.Ireland & fen WFD waterbodies
Sparganium angustifolium		
Sparganium emersum		
Sparganium erectum		
Spirodela polyrhiza		
Triglochin palustris		
Typha angustifolia		
Typha latifolia		
Utricularia sp(p.)		Rare - specimen(s) required
Veronica anagallis-aquatica		
Veronica beccabunga		
Veronica catenata		
Veronica catenata x anagallis-aquatica (or parents indet)		
Veronica scutellata		
Viola palustris		
Zannichellia palustris		

Additional species	Comments

* If you go further in your identification than the category on the list above e.g. Spirogyra, on BIOBYB you must enter the category on the list that it comes from e.g Zygnematalean.

Additional comments on the survey

Macrophyte Field Sheet

River	Low Dike Burn	Site:	Site 1
Surveyor	SMC + EMN		
NGR top	NU 13855 99380	Date	2/8/17
NGR bottom	NU [illegible]		
Start time		Finish Time	
% Wadeable	100	Total % cover of macrophytes	

Width (m) %	<1		1-5	100
5-10	10-20		>20	
Depth (m) %	<0.25	65	0.25-0.5	35
	0.5-1		>1	

Record the estimated percentage for each of the following:

Substrate %	Peat		Silt/clay	10
	Sand		Pebbles/gravel	30
	Boulder/cobble	60	Bedrock	
Habitats %	Pool	10	Run	65
	Riffle	20	Slack	5
Shading %	Left Bank		Right Bank	
	None	25	None	
	Broken	65	Broken	10
	Dense	10	Dense	20

Clarity %	Clear	
	Turbid	100
	Cloudy	

Bed Stability %	Solid/firm		Stable	
	Unstable	100	Soft/sinking	

Photo No/ Ref	U/s	D/s

% Cover of Filamentous Algae	10

Notes/Comments:
Note – high turbidity.

Macrophyte taxa
You must record ALL macrophytes you encounter in the 100m stretch and identify them to species level.

Notes / actions
Suffix sp* – Make every effort to identify these taxa to species level, either in the field or using specimens back in the lab. You may need to confirm the identification with colleagues or Nigel Holmes. Make a record for each unknown species and label them 'Species x: 1', 'Species x: 2' etc. You will need to enter each different species you find as a separate record (with a species cover value) on BIOSYS.
Specimen required – these taxa are particularly difficult to identify to species level and you must be certain of a correct identification to record them. Record the site, date, recorder, possible identity and supporting notes. You may need to have it verified by an independent expert and preserve it in your reference collection.
Rare - taxa which are likely to be found in <1% of surveys.

MTR taxa
Taxa which appear in the original MTR manual are shown in bold. BIOSYS can be used to extract an MTR score in the interim and information for the WFD, as we move to one method and an extended taxa list for all survey purposes.

The Species Cover Value (SCV) classes are:

1	<0.1%	6	10-25%
2	0.1 -1%	7	25 -50%
3	1 – 2.5%	8	50 – 75%
4	2.5 – 5%	9	> 75%
5	5 – 10%		

MACROALGAE

Taxa (Synonym)	Species Cover Value - 9 pt scale	Notes / action
Batrachospermum sp(p.)		
Chara sp* e.g. vulgaris		Specimen (s) required
Cladophora aegagropila		
Cladophora glomerata/ Rhizoclonium hieroglyphicum **Blanketweed agg.**	1	
Unidentified unbranched filamentous non-slimy green algae (i.e. unbranched, non-slimy green algae excl. Cladophora / Vaucheria/ Hydrodictyon		
Hildenbrandia rivularis		
Hydrodictyon reticulatum		
Lemanea sp(p.) e.g. fluviatilis		
Nitella sp*		specimen(s) required
Nostoc sp*		specimen(s) required
Blue-green algal film / pelts (Phormidium / Lyngbya sp (p)		
Enteromorpha intestinalis (Ulva flexuosa / intestinalis)		
Vaucheria sp(p.)		
Zygnemataleae (Slimy, unbranched, fil algae)		

BRYOPHYTES

Taxa (Synonym)	SCV	Notes / action
Amblystegium fluviatile (Hygroamblystegium fluviatile)		
Amblystegium (Hygroamblystegium) tenax		
Blindia acuta		
Brachythecium plumosum		
Brachythecium rivulare		
Brachythecium rutabulum		
Bryum pseudotriquetrum		
Calliergon cuspidatum		
Chiloscyphus polyanthos		
Cinclidotus fontinaloides		
Cratoneuron filicinum		
Dichodontium flavescens/pellucidum		
Dichodontium palustris (**Dicranella palustris**)		
Fissidens sp* e.g. rufulus/ crassipes		specimen (s) required
Fontinalis antipyretica		
Fontinalis squamosa		
Hygrohypnum luridum		
Hygrohypnum ochraceum		
Hyocomium armoricum		
Jungermannia sp* e.g. atrovirens		specimen (s) required
Leptodyctium riparium (**Amblystegium riparium**)		
Marsupella sp* emarginata		specimen (s) required
Nardia sp* compressa		specimen (s) required
Octodiceras fontanum		
Orthotrichum rivulare		
Palustriella commutata (Cratoneuron commutatum)		
Pellia endiviifolia		
Pellia epiphylla		
Philonotis sp.* e.g. fontana		specimen (s) required
Platyhypnidium riparioides (**Rhynchostegium riparioides**)		
Polytrichum commune		
Racomitrium aciculare		
Riccardia sp* chamaedryfolia / multifida		specimen (s) required
Riccia fluitans		
Scapania sp* e.g. undulata		specimen (s) required
Schistidium rivulare		
Sphagnum sp* e.g. denticulatum		specimen (s) required
Thamnobryum alopecurum		

LICHENS

Taxa (Synonym)	SCV	Notes / action
Dermatocarpon sp(p)*		specimen(s) required

VASCULAR PLANTS

Taxa (Synonym)	SCV	Notes / action
Azolla filiculoides		
Equisetum fluviatile		
Equisetum palustre		
Acorus calamus		
Alisma lanceolatum		
Alisma plantago-aquatica		
Apium inundatum		
Apium nodiflorum		
Berula erecta		
Bidens cernua		
Bidens tripartita		
Bolboschoenus maritimus		Rare
Butomus umbellatus		
Callitriche hamulata		
Callitriche hermaphroditica/truncata		specimen(s) required
Callitriche obtusangula		
Callitriche stagnalis/platycarpa/obtusangula		specimen(s) required
Caltha palustris		
Carex acuta		
Carex acutiformis		
Carex aquatilis		
Carex elata		
Carex paniculata		
Carex riparia		
Carex rostrata		
Carex vesicaria		
Catabrosa aquatica		
Ceratophyllum demersum		
Cicuta virosa		Rare
Eleocharis palustris		
Eleogiton fluitans		
Elodea canadensis		
Elodea nuttallii		
Glyceria fluitans agg		i.e. any SMALL Glyceria (NOT maxima)
Glyceria maxima		
Groenlandia densa		
Hippuris vulgaris		
Hottonia palustris		Rare
Hydrocharis morsus-ranae		Rare
Hydrocotyle ranunculoides		Rare
Hypericum elodes		Rare
Iris pseudacorus		

VASCULAR PLANTS.....continued

Taxa (Synonym)	SCV	Notes / action
Juncus articulatus		
Juncus bulbosus		
Lemna gibba		
Lemna minor		
Lemna minuta		
Lemna trisulca		
Littorella uniflora		
Lobelia cortmanna		
Lotus pedunculatus		
Lythrum salicaria		
Mentha sp*		specimen(s) required
Mentha aquatica		
Menyanthes trifoliata		
Mimulus sp./hybrid		specimen(s) required
Montia fontana		
Myosotis sp(p)		acceptable if non-flowering
Myosotis laxa		
Myosotis scorpioides -	2	
Myosoton aquaticum		
Myriophyllum alterniflorum		
Myriophyllum spicatum		
Nuphar lutea		
Nymphaea alba		
Nymphoides peltata		
Oenanthe aquatica		
Oenanthe crocata		
Oenanthe fistulosa		
Oenanthe fluviatilis		
Persicaria amphibia		
Persicaria hydropiper		
Phalaris arundinacea -	3	
Phragmites australis		
Potamogeton alpinus		
Potamogeton berchtoldii		
Potamogeton crispus		
Potamogeton friformis		Rare
Potamogeton friesii		Rare
Potamogeton gramineus		
Potamogeton lucens		
Potamogeton natans		
Potamogeton nodosus		
Potamogeton obtusifolius		Rare
Potamogeton pectinatus		
Potamogeton perfoliatus		
Potamogeton polygonifolius		
Potamogeton praelongus		
Potamogeton pusillus		
Potamogeton trichoides		Rare
Potamogeton x olivaceus		
Potamogeton x salicifolius		
Potentilla palustris		
Potentilla erecta		

VASCULAR PLANTS .....continued

Taxa (Synonym)	SCV	Notes / action
Ranunculus sp. (R. sect Batrachian sp. or hybrid indet)		excluding circinatus, omiophyllus, hederaceus
Ranunculus aquatilis		Record only if classic characteristics
Ranunculus aquatilis var. diffusus (R.trichophyllus)		
Ranunculus circinatus		
Ranunculus flammula		
Ranunculus fluitans		Record only if classic characteristics
Ranunculus hederaceus		
Ranunculus omiophyllus		
Ranunculus peltatus		Record only if classic characteristics Rare
Ranunculus penicillatus subsp. penicillatus		Record only if classic characteristics
Ranunculus penicillatus subsp. Pseudofluitans var pseudofluitans		Record only if classic characteristics
Ranunculus penicillatus subsp pseudofluitans var vertumnus		Record only if classic characteristics
Ranunculus sceleratus		
Rorippa amphibia		
Rorippa nasturtium-aquaticum agg.		
Rorippa palustris		
Rumex hydrolapathum		
Sagittaria sagittifolia		
Schoenoplectus lacustris		
Scirpus sylvaticus		
Sium latifolium		Rare, though common W.Ireland & fen WFD waterbodies
Sparganium angustifolium		
Sparganium emersum		
Sparganium erectum -		
Spirodela polyrhiza		
Triglochin palustris		
Typha angustifolia		
Typha latifolia		
Utricularia sp(p.)		Rare - specimen(s) required
Veronica anagallis-aquatica		
Veronica beccabunga		
Veronica catenata		
Veronica catenata x anagallis-aquatica (or parents indet)		
Veronica scutellata		
Viola palustris		
Zannichellia palustris		

Additional species	Comments

* If you go further in your identification than the category on the list above e.g. Spirogyra, on BIOSYS you must enter the category on the list that it comes from e.g.Zygnematalean.

Additional comments on the survey

Water Body	Minto's Dean	Long Dike Burn (site 1)	Long Dike Burn (site 2)
SAMPLE_DATE	31-Jul-17	02-Aug-17	01-Aug-17
RMNI	8.06	7.60	7.55
NTAXA	2	1	1
NFG	2	1	1
ALG	7.5	0.05	0.05
Slope (m/km)	9.345794393	3.7	3.7
Distance to source (km)	0.79	8.3	8
Source_altitude (m)	67	131	131
Alkalinity (CaCO3 mg/L)	93.4124	117.0998	110.6978
country	GB	GB	GB
method	1	1	1
log_slope1	1.014763843	0.672097858	0.672097858
log_dist1	0.252853031	0.968482949	0.954242509
log_source_alt	1.832508913	2.120573931	2.120573931
log_alk	1.975029038	2.072249162	2.048044619
Expected RMNI score	5.494	6.061	6.017
Expected Number Taxa	6.51	7.53	7.53
Expected Number Functional Groups	4.30	4.89	4.89
raw RMNI EQR	0.431	0.609	0.616
raw NTAXA EQR	0.307	0.133	0.133
raw NFG EQR	0.465	0.204	0.204
raw ALG EQR	0.925	1.000	1.000
adjusted RMNI EQR	0.301	0.499	0.506
minimum diversity EQR	0.307	0.133	0.133
adjusted diversity EQR	0.185	-0.020	-0.020
adjusted ALG EQR	0.602	1.000	1.000
interimEQR	0.262	0.326	0.331
weight_alg	0.822	0.979	0.975
final_EQR	0.262	0.326	0.331
CLASS	***Poor***	***Poor***	***Poor***
final_ EQR capped	0.262	0.326	0.331
n	1	1	1
SE	*0.088485706*	*0.089105033*	*0.08906907*
trsfd mean	-1.033639516	-0.727732548	-0.704243856
trasfd error	0.457204665	0.405729406	0.40230711
	0.220447023	0.052355684	0.045074126
	0.915428548	0.786820591	0.771507146
	0.999174092	0.997379556	0.997085126
	0.99999994	0.999999905	0.999999898
Bad	22.0	5.2	4.5
Poor	69.5	73.4	72.6
Mod	8.4	21.1	22.6
Good	0.1	0.3	0.3
High	0.0	0.0	0.0

APPENDIX E: MACROINVERTEBRATE TAXA LIST

Taxa	River Coquet		River Lyne		Longdike Burn 1		Longdike Burn 2 (sample 1)		Longdike Burn 2 (2nd sample)	Earsdon Burn		Floodgate Burn		Fenrother Burn	Minto's Dean		Minto's Dean Tributary	Shieldhill Burn	Shieldhall Burn Trib	Back Burn Trib		Thirston Burn Trib
	23/05/17	03/10/17	22/05/17	03/10/17	25/05/17	02/10/17	24/05/17	02/10/17	24/05/17	24/05/17	02/10/17	22/05/17	03/10/17	25/05/17	23/05/17	03/10/17	23/05/17	25/05/17	25/05/17	23/05/17	03/10/17	24/05/17
Agabus sp.	0	3	0	0	0	0	0	0	0	0	0	3	0	9	0	0	0	0	0	0	0	0
Agapetus fuscipes	0	0	0	0	0	7	0	2	0	11	0	0	0	0	0	1	0	0	0	40	0	0
Agapetus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alainites muticus	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anabolia nervosa	0	0	0	0	7	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0
Anacaena globulus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0
Ancylus fluviatilis	2	3	0	1	0	20	3	3	2	2	0	0	0	0	0	1	0	0	0	0	0	0
Asellidae	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asellus aquaticus	0	0	3	1	6	2	0	2	1	0	0	42	5	0	0	0	0	0	2	0	0	0
Atherix ibis	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Athripsodes albifrons	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Athripsodes bilineatus	0	0	0	0	2	0	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Athripsodes sp.	5	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Baetidae	56	0	0	0	0	0	255	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0
Baetis buceratus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Baetis rhodani	4	6	0	5	0	13	0	21	0	2	23	0	1	0	1	2	0	0	0	3	0	0
Baetis scambus/fuscatus	29	0	0	0	1	0	7	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0
Baetis sp.	0	3	0	0	0	2	21	0	0	31	0	3	0	0	1	0	0	0	0	0	0	0

Taxa	River Coquet		River Lyne		Longdike Burn 1		Longdike Burn 2 (sample 1)		Longdike Burn 2 (2nd sample)	Earsdon Burn		Floodgate Burn		Fenrother Burn	Minto's Dean		Minto's Dean Tributary	Shieldhill Burn	Shieldhall Burn Trib	Back Burn Trib		Thirston Burn Trib
	23/05/17	03/10/17	22/05/17	03/10/17	25/05/17	02/10/17	24/05/17	02/10/17	24/05/17	24/05/17	02/10/17	22/05/17	03/10/17	25/05/17	23/05/17	03/10/17	23/05/17	25/05/17	25/05/17	23/05/17	03/10/17	24/05/17
Baetis vernus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
Beraea pullata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Beraeodes minutus	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Caenis rivulorum	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Centroptilum luteolum	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Ceratopogonidae	1	0	0	0	1	0	0	0	1	0	1	2	0	0	6	1	2	0	0	0	0	10
Chaetopteryx villosa	0	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	0
Chironomidae	13	4	788	21	79	21	52	41	23	530	128	1052	15	6116	18	8	483	495	740	16	1	81
Crangonyx pseudogracilis	0	0	2	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Culicidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Curculionidae	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0
Cyrnus trimaculatus	0	0	1	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Dicranota sp.	0	0	0	0	9	14	0	4	0	0	23	0	2	0	5	0	7	0	0	0	0	0
Dinocras cephalotes	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dixa sp.	0	0	0	5	0	0	0	0	0	0	0	0	1	0	0	4	0	0	0	0	0	0
Dixa submaculata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0
Drusus annulatus	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Dugesia lugubris/polychroa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Dytiscidae	0	0	0	0	0	0	0	0	0	1	3	0	0	1	0	0	2	0	0	0	0	0
Ecdyonurus dispar	0	6	0	1	0	3	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ecdyonurus insignis	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Taxa	River Coquet		River Lyne		Longdike Burn 1		Longdike Burn 2 (sample 1)		Longdike Burn 2 (2nd sample)	Earsdon Burn		Floodgate Burn		Fenrother Burn	Minto's Dean		Minto's Dean Tributary	Shieldhill Burn	Shieldhall Burn Trib	Back Burn Trib		Thirston Burn Trib
	23/05/17	03/10/17	22/05/17	03/10/17	25/05/17	02/10/17	24/05/17	02/10/17	24/05/17	24/05/17	02/10/17	22/05/17	03/10/17	25/05/17	23/05/17	03/10/17	23/05/17	25/05/17	25/05/17	23/05/17	03/10/17	24/05/17
Ecdyonurus sp.	48	4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Ecdyonurus torrentis	0	0	0	0	2	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ecdyonurus venosus	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elmidae	0	0	0	0	0	0	26	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Elmis aenea	1	0	0	0	25	33	40	56	4	22	1	2	3	0	26	39	0	0	0	2	1	0
Elodes sp.	0	0	0	2	1	0	0	0	0	0	4	0	33	0	28	38	0	0	0	0	0	0
Eloeophila sp.	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Empididae	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0
Ephemera danica	0	0	0	0	9	0	7	0	7	0	0	0	0	0	0	1	0	0	0	0	0	0
Ephemera sp.	0	1	0	0	5	1	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Erpobdella octoculata	0	2	0	0	0	0	0	0	0	0	0	3	1	1	0	0	0	0	0	0	0	0
Erpobdellidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0
Gammarus pulex	11	25	0	5	27	125	56	118	2	136	142	16	10	2	39	61	0	0	0	214	96	0
Glossiphonia complanata	0	1	0	1	3	1	2	1	2	2	0	9	4	1	0	1	0	0	0	0	0	0
Goera pilosa	0	0	0	0	4	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gyrinidae	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Habrophlebia fusca	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0
Halesus radiatus	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Haliplus sp.	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Helobdella stagnalis	0	0	0	0	1	0	0	0	1	0	10	0	0	0	0	1	1	0	0	0	0	4
Helophorus aequalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	2

Taxa	River Coquet		River Lyne		Longdike Burn 1		Longdike Burn 2 (sample 1)		Longdike Burn 2 (2nd sample)	Earsdon Burn		Floodgate Burn		Fenrother Burn	Minto's Dean		Minto's Dean Tributary	Shieldhill Burn	Shieldhall Burn Trib	Back Burn Trib		Thirston Burn Trib
	23/05/17	03/10/17	22/05/17	03/10/17	25/05/17	02/10/17	24/05/17	02/10/17	24/05/17	24/05/17	02/10/17	22/05/17	03/10/17	25/05/17	23/05/17	03/10/17	23/05/17	25/05/17	25/05/17	23/05/17	03/10/17	24/05/17
Helophorus brevipalpis	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	3	0	0	0
Helophorus grandis	0	0	0	0	0	0	0	0	0	1	2	0	2	1	0	0	0	0	1	0	0	0
Helophorus sp.	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0
Heptageniidae	77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydracarina	0	0	0	0	1	0	0	2	3	5	2	41	0	2	0	2	0	0	0	0	0	0
Hydraena gracilis	0	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Hydrobius fuscipes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Hydropsyche angustipennis	0	0	0	10	0	0	0	0	0	0	12	1	6	0	0	0	0	0	0	0	0	0
Hydropsyche instabilis	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydropsyche pellucidula	1	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydropsyche siltalai	25	6	0	0	0	10	5	22	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Ibisia marginata	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ilybius fuliginosus	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Ilybius sp.	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Isoperla grammatica	10	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Lepidoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
Lepidostoma hirtum	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leptophlebiidae	0	1	11	2	13	0	0	1	44	12	0	0	0	0	13	0	0	0	0	4	0	0
Leuctra fusca	0	2	0	0	0	2	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leuctra geniculata	4	0	0	0	7	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Leuctra nigra	6	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0

Taxa	River Coquet		River Lyne		Longdike Burn 1		Longdike Burn 2 (sample 1)		Longdike Burn 2 (2nd sample)	Earsdon Burn		Floodgate Burn		Fenrother Burn	Minto's Dean		Minto's Dean Tributary	Shieldhill Burn	Shieldhall Burn Trib	Back Burn Trib		Thirston Burn Trib
	23/05/17	03/10/17	22/05/17	03/10/17	25/05/17	02/10/17	24/05/17	02/10/17	24/05/17	24/05/17	02/10/17	22/05/17	03/10/17	25/05/17	23/05/17	03/10/17	23/05/17	25/05/17	25/05/17	23/05/17	03/10/17	24/05/17
Leuctra sp.	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Limnephilidae	0	2	1	0	0	0	0	0	0	10	0	1	0	0	0	1	0	0	0	11	1	0
Limnephilus lunatus	0	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	1
Limnius volckmari	34	19	0	0	10	18	22	6	2	19	2	0	0	1	0	0	0	0	0	0	1	0
Limoniidae	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	1	0	0
Lumbricidae	0	4	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	0	0	0	0	0
Lymnaeidae	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Lype reducta	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
Melampophylax mucoreus	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Micropterna lateralis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Micropterna sequax	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	2	0	0
Muscidae	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mystacides azurea	0	0	0	0	15	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Nebrioporus elegans	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nematomorpha	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nemoura cambrica/erratica	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nemouridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0
Nemurella pictetii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	12	0	0
Neolimnophila sp.	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Nigrobaetis niger	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Odontocerum albicorne	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Oligochaeta	9	18	75	17	1	9	32	8	11	65	157	206	3	562	10	25	5	206	152	1	26	105

Taxa	River Coquet		River Lyne		Longdike Burn 1		Longdike Burn 2 (sample 1)		Longdike Burn 2 (2nd sample)	Earsdon Burn		Floodgate Burn		Fenrother Burn	Minto's Dean		Minto's Dean Tributary	Shieldhill Burn	Shieldhall Burn Trib	Back Burn Trib		Thirston Burn Trib
	23/05/17	03/10/17	22/05/17	03/10/17	25/05/17	02/10/17	24/05/17	02/10/17	24/05/17	24/05/17	02/10/17	22/05/17	03/10/17	25/05/17	23/05/17	03/10/17	23/05/17	25/05/17	25/05/17	23/05/17	03/10/17	24/05/17
Oreodytes sanmarkii	2	0	0	0	7	2	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oribati	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0
Ostracoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Oulimnius sp.	0	3	0	0	3	5	0	3	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Oulimnius tuberculatus	0	0	0	0	1	3	19	7	1	3	0	0	0	0	0	0	0	0	0	0	0	0
Pacifastacus leniusculus	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paraleptophlebia sp.	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pediciidae	0	0	0	0	0	0	18	0	0	33	0	48	0	0	0	0	0	0	0	2	1	0
Perla bipunctata	6	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pisidium sp.	0	0	12	1	4	1	2	2	2	39	0	3	2	317	4	2	1	64	6	11	3	61
Platambus maculatus	0	1	0	0	0	1	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Plectrocnemia conspersa	0	0	0	0	0	1	0	0	0	2	0	0	0	0	0	1	0	0	0	2	0	0
Polycelis felina	0	0	0	0	0	8	0	2	0	0	0	0	0	0	1	0	0	0	0	455	95	0
Polycelis nigra/tenuis	0	0	0	0	0	0	0	0	0	0	0	12	3	0	0	0	0	0	0	0	0	7
Polycelis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Polycentropodidae	0	0	0	0	3	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0
Polycentropus flavomaculatus	6	0	0	1	13	0	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Potamophylax cingulatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	5	0	0
Potamophylax latipennis	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Potamopyrgus antipodarum	6	3	34	0	15	24	28	25	3	19	0	539	51	185	575	65	2	1	30	720	139	2150
Prosimulium sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Psychodidae	0	0	0	0	1	0	0	0	0	1	12	4	2	0	1	0	3	14	38	0	0	0

Taxa	River Coquet		River Lyne		Longdike Burn 1		Longdike Burn 2 (sample 1)		Longdike Burn 2 (2nd sample)	Earsdon Burn		Floodgate Burn		Fenrother Burn	Minto's Dean		Minto's Dean Tributary	Shieldhill Burn	Shieldhall Burn Trib	Back Burn Trib		Thirston Burn Trib
	23/05/17	03/10/17	22/05/17	03/10/17	25/05/17	02/10/17	24/05/17	02/10/17	24/05/17	24/05/17	02/10/17	22/05/17	03/10/17	25/05/17	23/05/17	03/10/17	23/05/17	25/05/17	25/05/17	23/05/17	03/10/17	24/05/17
Ptychoptera sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Ptychopteridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0
Radix balthica	1	0	0	0	0	0	1	3	0	4	2	2	1	32	0	0	0	1	0	0	0	32
Rhithrogena semicolorata	34	17	0	0	0	0	30	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Rhyacophila dorsalis	6	2	0	1	1	4	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhyacophila sp.	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scirtidae	0	0	0	0	0	0	0	0	0	4	0	2	0	0	0	0	0	0	0	2	6	0
Sericostoma personatum	2	0	0	0	6	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Serratella ignita	69	0	4	0	88	0	229	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0
Sigara dorsalis	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silo pallipes	1	0	0	0	0	1	12	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Simuliidae	0	0	0	0	0	0	0	0	0	0	0	86	0	0	0	0	0	0	0	0	0	0
Simulium sp.	0	2	0	0	0	7	9	117	0	0	0	0	0	0	6	0	0	0	0	0	0	0
Simulium vernum	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	1	0
Stratiomyiidae	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0
Succineidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	158	0	0	0
Tinodes waeneri	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0
Tipula sp.	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0
Tipulidae	0	0	0	0	0	0	0	1	0	1	3	0	10	0	0	0	1	0	0	0	1	4
Velia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0
Veliidae	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	0	0	2	0	0

APPENDIX F: PSYM FIELD SHEETS

lat 55.23731053
long -1.707 34908

Pond PSYM Fieldsheet

Site and sample details

Site name: POND A5 Code No. ______ Grid ref. (NZ) 18708 93718
Recording format: (SU)345 678 or (41)345 678

Location: ______

Site access details: pre-arranged with landowner

Survey date: 14/08/17 Surveyor: SMC + EM

Notes: heavily choked with potamogeton natans.

Environmental data

Altitude (m)	103	pH	5.4
Shade: % pond overhung	1	% emergent plant cover	5
Inflow (absent = 0, present = 1)	1	Pond area (m²)	300
% of pond margin grazed	0		

Sketch of pond

Pond base: categorise into one of three groups: 1=0%-32%, 2=33%-66%, 3=67%-100%

Clay/silt	3	Sand, gravel, cobbles		Bed rock	
Peat		Other			

MACROINVERTEBRATE LIST

Group 1 taxa (BMWP:10)	ASPT	OM	Cole.
Siphlonuridae			
Heptageniidae			
Leptophlebiidae			
Ephemerellidae			
Potamanthidae			
Ephemeridae			
Taeniopterygidae			
Leuctridae			
Capniidae			
Perlodidae			
Perlidae			
Chloroperlidae			
Aphelocheiridae			
Phryganeidae			
Molannidae			
Beraeidae			
Odontoceridae			
Leptoceridae			
Goeridae			
Lepidostomatidae			
Brachycentridae			
Sericostomatidae			
No. of taxa	0		

Group 2 taxa (BMWP:8)	ASPT	OM	Cole.
Astacidae			
Lestidae			
Calopterygidae (Agriidae)			
Gomphidae			
Cordulegasteridae			
Aeshnidae			
Corduliidae			
Libellulidae			
Philopotamidae			
Psychomyiidae			
No. of taxa	0	0	

Group 3 taxa (BMWP:7)	ASPT	OM	Cole.
Caenidae			
Nemouridae			
Rhyacophilidae (Glossomatidae)			
Polycentropodidae	✓		
Limnephilidae			
No. of taxa	1		

Group 4 taxa (BMWP:6)	ASPT	OM	Cole.
Neritidae			
Viviparidae			
Ancylidae (Acroloxidae)			
Hydroptilidae			
Unionidae			
Corophiidae			
Gammaridae (Crangonyctidae)			
Platycnemididae			
Coenagriidae	✓	✓	
No. of taxa	1	1	

Group 5 taxa (BMWP:5)	ASPT	OM	Cole.
Planariidae (Dugesiidae)			
Dendrocoelidae			
Mesoveliidae			
Hydrometridae			
Gerridae			
Nepidae			
Naucoridae			
Notonectidae	✓		
Pleidae			
Corixidae	✓		
Haliplidae	✓		✓
Hygrobiidae			
Dytiscidae (Noteridae)	✓		✓
Gyrinidae			
Hydrophilidae (Hydraenidae)	✓		✓
Dryopidae			
Elmidae			
Hydropsychidae			
Tipulidae	✓		
Simuliidae			
No. of taxa	6		2

Group 6 taxa (BMWP:4)	ASPT	OM	Cole.
Baetidae	✓		
Sialidae	✓	✓	
Piscicolidae			
No. of taxa	2	1	

Group 7 taxa (BMWP:3)	ASPT	OM	Cole.
Valvatidae			
Hydrobiidae (Bithyniidae)			
Lymnaeidae	✓		
Physidae			
Planorbidae	✓		
Sphaeriidae	✓		
Glossiphoniidae	✓		
Hirudinidae			
Erpobdellidae	✓		
Asellidae	✓		
No. of taxa	5		

Group 8 taxa (BMWP:2)	ASPT	OM	Cole.
Chironomidae	✓		
No. of taxa	1		

Group 9 taxa (BMWP:1)	ASPT	OM	Cole.
Oligochaeta	✓		
No. of taxa	1		

TOTAL NO. OF TAXA	12		
TOTAL BMWP SCORE			
ASPT			
NO. OF OM TAXA		2	
NO. COLEOPT. TAXA			2

Cladocera
Dixidae
Culicidae
Hydracarina
Scirtidae

Plant recording sheet (score through each species present)

RS = Rarity Score, TRS = Trophic Ranking Score

RS	TRS	Emergent plants
1		Achillea ptarmica
1		Acorus calamus
1		Agrostis canina
1	LP	Agrostis stolonifera
32		Alisma gramineum
2		Alisma lanceolatum
1	9	Alisma plantago-aquatica
2		Alopecurus aequalis
4		Alopecurus borealis
1		Alopecurus geniculatus
2		Anagallis tenella
2		Andromeda polifolia
1		Angelica archangelica
1		Angelica sylvestris
2		Apium graveolens
1	10	Apium nodiflorum
32		Apium repens
2		Baldellia ranunculoides
2	10	Berula erecta
2		Bidens cernua
1		Bidens connata
1		Bidens frondosa
2		Bidens tripartita
2		Blysmus compressus
2		Bolboschoenus maritimus
2*		Butomus umbellatus
2		Calamagrostis canescens
2		Calamagrostis epigejos
8		Calamagrostis purpurea
8		Calamagrostis stricta
16		Calamagrostis scotica
1		Calla palustris
1	7	Caltha palustris
1		Cardamine amara
1		Cardamine pratensis
2		Carex acuta
1	10	Carex acutiformis
4		Carex appropinquata
2		Carex aquatilis
2		Carex curta
2		Carex diandra
1		Carex disticha
1		Carex echinata
2	10	Carex elata
4		Carex elongata
1		Carex flacca
1		Carex hostiana
2		Carex laevigata
2	4	Carex lasiocarpa
2	4	Carex limosa
1	5	Carex nigra
1		Carex oedocarpa
1		Carex otrubae
1		Carex panicea
2	10	Carex paniculata
1		Carex pendula
2	10	Carex pseudocyperus
1		Carex pulicaris
1	10	Carex riparia
1	5.5	Carex rostrata
2		Carex spicata
2		Carex vesicaria
1		Carex viridula
16		Carex vulpina
1		Carex sp.
2		Catabrosa aquatica
4		Cicuta virosa
2		Cirsium dissectum
1		Cirsium palustre
2		Cladium mariscus
1		Conium maculatum
1		Crassula helmsii
1		Crepis paludosa
16		Cyperus fuscus
4*		Cyperus longus
2		Dactylorhiza sp (undet.)
32		Damasonium alisma
1		Deschampsia cespitosa
2		Drosera anglica
1		Drosera [illegible]
1		Drosera capensis
2		Drosera intermedia
1		Drosera rotundifolia
16		Dryopteris cristata
2		Eleocharis acicularis
8		Eleocharis austriaca
2		Eleocharis multicaulis
1	LP	Eleocharis palustris
2		Eleocharis quinqueflora
2		Eleocharis uniglumis
2		Epilobium alsinifolium
2		Epilobium anagallidifolium
1		Epilobium brunnescens
1		Epilobium ciliatum

RS	TRS	
1		Epilobium hirsutum
1		Epilobium obscurum
1		Epilobium palustre
1		Epilobium parviflorum
2		Epilobium tetragonum
2		Epipactis palustris
1	LP	Equisetum fluviatile
1		Equisetum palustre
1		Erica tetralix
1	2.5	Eriophorum angustifolium
16		Eriophorum gracile
2		Eriophorum latifolium
1		Eriophorum vaginatum
1		Eupatorium cannabinum
1		Filipendula ulmaria
2		Galium boreale
8		Galium constrictum
1		Galium palustre
2		Galium uliginosum
1		Geum rivale
2		Glyceria declinata
1	LP	Glyceria fluitans
1	10	Glyceria maxima
3		Glyceria notata
1		Gnaphalium uliginosum
1	LP	Hydrocotyle vulgaris
2		Hypericum elodes
1		Hypericum tetrapterum
4		Hypericum undulatum
2		Impatiens capensis
1		Impatiens glandulifera
4*		Impatiens noli-tangere
1	LP	Iris pseudacorus
1		Isolepis setacea
1		Juncus acutiflorus
1		Juncus articulatus
1		Juncus bufonius agg.
1	5.5	Juncus bulbosus
2		Juncus compressus
1		Juncus conglomeratus
1	LP	~~Juncus effusus~~
2		Juncus foliosus
1		Juncus inflexus
32		Juncus pygmaeus
2		Juncus subnodulosus
4		Lathyrus palustris
32		Leersia oryzoides
32		Liparis loeselii
1		Lotus pedunculatus
1		Luzula luzuloides
2		Luzula sylvatica
1		Lychnis flos-cuculi
1		Lycopus europaeus
1		Lysimachia nummularia
1		Lysimachia nemorum
4		Lysimachia thyrsiflora
2		Lysimachia vulgaris
16		Lythrum hyssopifolium
2		Lythrum portula
1		Lythrum salicaria
1	7.3	Mentha aquatica
16		Mentha pulegium
1	5.3	Menyanthes trifoliata
1		Mimulus guttatus
1		Mimulus luteus
16		Minuartia stricta
1		Molinia caerulea
1		Montia fontana
1	7.7	Myosotis laxa
1	9	Myosotis scorpioides
1		Myosotis secunda
4		Myosotis stolonifera
1		Myosotis sp (undet.)
2		Myosoton aquaticum
1		Myrica gale
1		Narthecium ossifragum
2		Oenanthe aquatica
1		Oenanthe crocata
2		Oenanthe fistulosa
2		Oenanthe fluviatilis
2		Oenanthe lachenalii
2		Oenanthe pimpinelloides
4		Oenanthe silaifolia
2		Osmunda regalis
2		Parnassia palustris
1		Pedicularis palustris
1	10	Persicaria hydropiper
1		Persicaria maculosa
2		Persicaria minor
4		Persicaria mitis
1		Petasites hybridus
1		Petasites japonicus
4		Peucedanum palustre
1	8.5	Phalaris arundinacea

RS	TRS	
1	7.3	Phragmites australis
4	5.5	Pilularia globulifera
2		Pinguicula lusitanica
1		Pinguicula vulgaris
1		Potentilla erecta
1	5.3	Potentilla palustris
1		Pulicaria dysenterica
16		Pulicaria vulgaris
1		Ranunculus ficaria
1	LP	Ranunculus flammula
2	10	Ranunculus hederaceus
2*		Ranunculus lingua
2		Ranunculus omiophyllus
32		Ranunculus ophioglossifolius
32		Ranunculus reptans
1	10	Ranunculus sceleratus
2		Rhynchospora alba
4		Rhynchospora fusca
2		Rorippa amphibia
8		Rorippa islandica
2	10	Rorippa microphylla
1	10	Rorippa nasturtium-aquaticum
1	10	Rorippa (undet.)
1		Rorippa palustris
2	10	Rumex hydrolapathum
2		Rumex maritimus
2		Rumex palustris
1		Sagina procumbens
1		Sagittaria subulata
2		Samolus valerandi
2	7.7	Schoenoplectus lacustris
32		Schoenoplectus pungens
2		Schoenoplectus tabernaemontani
32		Schoenoplectus triqueter
16		Schoenus ferrugineus
2		Schoenus nigricans
16		Scorzonera humilis
1		Scrophularia auriculata
1		Scutellaria galericulata
1		Senecio aquaticus
1		Senecio fluviatilis
32		Senecio paludosus
4		Sium latifolium
1	10	Solanum dulcamara
4		Sonchus palustris
1	8.5	~~Sparganium erectum~~
1		Stachys palustris
2		Stellaria palustris
1		Stellaria uliginosa
1		Symphytum officinale
16		Teucrium scordium
2		Thalictrum flavum
4		Thelypteris palustris
2		Tofieldia pusilla
1		Trichophorum cespitosum
1		Triglochin palustre
2	10	Typha angustifolia
1	8.5	Typha latifolia
2		Valeriana dioica
1		Vallisneria spiralis
1		Veronica anagallis-aquatica
1	10	~~Veronica beccabunga~~
2		Veronica catenata
1	5.5	Veronica scutellata
1		Veronica sp. (undet.)
1		Viola palustris
32		Viola persicifolia
1		Unknown exotic

RS	TRS	Floating-leaved plants
1		Azolla filiculoides
2		Hydrocharis morsus-ranae
1		Hydrocotyle ranunculoides
2		Lemna gibba
1	9	~~Lemna minor~~
1		Lemna minuta
1	10	Lemna trisulca
4		Luronium natans
1		Menyanthes trifoliata
1		Nuphar advena
2	8.5	Nuphar lutea
4	7	Nuphar pumila
2*	6.7	Nymphaea alba
1		Nymphaea sp. (exotic)
4*		Nymphoides peltata
1	9	Persicaria amphibia
1	LP	~~Potamogeton natans~~
1	3.7	Potamogeton polygonifolius
2		Riccia fluitans
2		Ricciocarpus natans
2		Spirodela polyrhiza
4		Wolffia arrhiza

* = uncommon species often introduced to sites (see Preston et al. 2002 for details), if so score species as 1.

RS	TRS	Submerged plants
2	6.3	Apium inundatum
1		Aponogeton distachyos
1		Cabomba caroliniana
2		Callitriche brutia
1	6.3	Callitriche hamulata
2	8.5	Callitriche hermaphroditica
2		Callitriche obtusangula
2		Callitriche platycarpa
1	7.3	Callitriche stagnalis
4		Callitriche truncata
1		C. stagnalis/platycarpa agg.
1		C. hamulata/brutia agg.
1		Callitriche sp. (undet.)
2	10	Ceratophyllum demersum
2		Ceratophyllum submersum
2	7.3	Chara sp.
1		Egeria densa
4	7	Elatine hexandra
4		Elatine hydropiper
2		Eleogiton fluitans
1		Elodea callitrichoides
1	7.3	Elodea canadensis
1	10	Elodea nuttallii
8		Eriocaulon aquaticum
1	6.5	Fontinalis antipyretica
2		Groenlandia densa
2	7.7	Hippuris vulgaris
2		Hottonia palustris
4		Isoetes echinospora
2	5	Isoetes lacustris
1		Lagarosiphon major
2	6.7	Littorella uniflora
2	5	Lobelia dortmanna
8		Ludwigia palustris
1	6.7	Myriophyllum alterniflorum
1		Myriophyllum aquaticum
2	9	Myriophyllum spicatum
4		Myriophyllum verticillatum
4		Najas flexilis
2	6.7	Nitella sp.
2		Oenanthe fluviatilis
16		Potamogeton acutifolius
2	5.5	Potamogeton alpinus
2	7.5	Potamogeton berchtoldii
4		Potamogeton coloratus
4		Potamogeton compressus
1	10	Potamogeton crispus
16		Potamogeton epihydrus
4	10	Potamogeton filiformis
2	10	Potamogeton friesii
2	7	Potamogeton gramineus
2	10	Potamogeton lucens
8		Potamogeton nodosus
2	8	Potamogeton obtusifolius
1	10	Potamogeton pectinatus
2	7.3	Potamogeton perfoliatus
2	8.5	Potamogeton praelongus
2	9	Potamogeton pusillus
8		Potamogeton rutilus
4	10	Potamogeton trichoides
2	10	Ranunculus aquatilis
2	10	Ranunculus baudotii
2	10	Ranunculus circinatus
2		Ranunculus fluitans
2	7	Ranunculus peltatus
2	8.5	Ranunculus penicillatus
2	8.5	Ranunculus trichophyllus
16		Ranunculus tripartitus
1		Ranunculus sp. (undet.)
1		Sagittaria latifolia
1		Sagittaria rigida
2		Sagittaria sagittifolia
2	4	Sparganium angustifolium
1	10	Sparganium emersum
2		Sparganium natans
1	2.5	Sphagnum sp.
4*		Stratiotes aloides
2	4	Subularia aquatica
		Tolypella sp.
2		Utricularia australis
2	4	Utricularia intermedia
2	4	Utricularia minor
2	5	Utricularia vulgaris
1		Vallisneria spiralis
2	10	Zannichellia palustris

	Number of emergent & submerged species
	Number of uncommon species (with a rarity score of 2 or more)
	Trophic Ranking Score

LP = species exhibiting little nutrient preference

55 27704062°
-1.72461318°

Pond PSYM Fieldsheet

Site and sample details

Site name: Pond A17 — Code No. — Grid ref. (NZ) 17604 98184 (Recording format: (SU)345 678 or (41)345 678)

Location:

Site access details: [illegible]

Survey date: 15/08/17 — Surveyor: SMC + EM

Notes: Pond in woodland burial site, by airfield

Environmental data — **Sketch of pond**

Altitude (m): 60 — pH: 6.1

Shade: % pond overhung: 10 — % emergent plant cover: 75

Inflow (absent = 0, present = 1): 1 — Pond area (m^2): 400

% of pond margin grazed: 0

Pond base: categorise into one of three groups: 1=0%-32%, 2=33%-66%, 3=67%-100%

Clay/silt: 3 — Sand, gravel, cobbles: 1 — Bed rock:
Peat: — Other:

MACROINVERTEBRATE LIST

Group 1 taxa (BMWP 10) — ASPT, OM, Cole.
Siphlonuridae, Heptageniidae, Leptophlebiidae, Ephemerellidae, Potamanthidae, Ephemeridae, Taeniopterygidae, Leuctridae, Capniidae, Perlodidae, Perlidae, Chloroperlidae, Aphelocheiridae, Phryganeidae, Molannidae, Beraeidae, Odontoceridae, Leptoceridae, Goeridae, Lepidostomatidae, Brachycentridae, Sericostomatidae
No. of taxa

Group 2 taxa (BMWP 8)
Astacidae, Lestidae, Calopterygidae (Agriidae), Gomphidae, Cordulegasteridae, Aeshnidae ✓ ✓, Corduliidae ✓ ✓, Libellulidae, Philopotamidae, Psychomyiidae
No. of taxa

Group 3 taxa (BMWP 7) — ASPT, OM, Cole.
Caenidae, Nemouridae, Rhyacophilidae (Glossosomatidae), Polycentropodidae, Limnephilidae
No. of taxa

Group 4 taxa (BMWP 6)
Neritidae, Viviparidae, Ancylidae (Acroloxidae), Hydroptilidae, Unionidae, Corophiidae, Gammaridae (Crangonyctidae) ✓, Platycnemididae, Coenagriidae ✓ ✓
No. of taxa

Group 5 taxa (BMWP 5)
Planariidae (Dugesiidae) ✓, Dendrocoelidae, Mesoveliidae, Hydrometridae, Gerridae ✓, Nepidae ✓, Naucoridae, Notonectidae ✓, Pleidae, Corixidae ✓, Haliplidae ✓ ✓, Hygrobiidae, Dytiscidae (Noteridae) ✓ ✓, Gyrinidae ✓ ✓, Hydrophilidae (Hydraenidae) ✓ ✓, Dryopidae, Elmidae, Hydropsychidae, Tipulidae, Simuliidae
No. of taxa

Group 6 taxa (BMWP 4) — ASPT, OM, Cole.
Baetidae ✓, Sialidae, Piscicolidae
No. of taxa

Group 7 taxa (BMWP 3)
Valvatidae, Hydrobiidae (Bithyniidae), Lymnaeidae ✓, Physidae, Planorbidae ✓, Sphaeriidae, Glossiphoniidae ✓, Hirudinidae, Erpobdellidae ✓, Asellidae ✓
No. of taxa

Group 8 taxa (BMWP 2)
Chironomidae ✓
No. of taxa

Group 9 taxa (BMWP 1)
Oligochaeta ✓
No. of taxa

TOTAL NO. OF TAXA
TOTAL BMWP SCORE
ASPT
NO. OF OM TAXA
NO. COLEOPT. TAXA

Dixidae
Veliidae
Hydracarina

[illegible] mexicana variegata
Crassula helmsii ✗
Lagarosiphon major ✗

Plant recording sheet (score through each species present) — RS = Rarity Score, TRS = Trophic Ranking Score

RS	TRS	Emergent plants	RS	TRS		RS	TRS		RS	TRS	Submerged plants
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

INNS ✗ (beside Emergent plants list)
✗ INNS (beside Submerged plants list)

Floating-leaved plants

Number of emergent & submerged species
Number of uncommon species (with a rarity score of 2 or more)
Trophic Ranking Score

55.25099939°
-1.70918983°

Pond PSYM Fieldsheet

Site and sample details

Site name: POND A6 — Code No.: — Grid ref.: (NZ) 18585 95240
Recording format: (SU)345 678 or (41)345 678

Location:
Site access details: Pri - managed
Survey date: 15/08/17 — Surveyor: SMC + EM
Notes: Heavily choked with P. natans + P. [illegible]

Environmental data

Altitude (m): 77 — pH: 6.2
Shade: % pond overhung: 1 — % emergent plant cover: 30
Inflow (absent = 0, present = 1): 1 — Pond area (m²): 250
% of pond margin grazed: 75

Sketch of pond

Pond base: categorise into one of three groups: 1=0%-32%, 2=33%-66%, 3=67%-100%
Clay/silt: 3 — Sand, gravel, cobbles: 1 — Bed rock:
Peat: — Other:

MACROINVERTEBRATE LIST

Group 1 taxa (BMWP 10) — ASPT / OM / Cole
Siphlonuridae, Heptageniidae, Leptophlebiidae, Ephemerellidae, Potamanthidae, Ephemeridae, Taeniopterygidae, Leuctridae, Capniidae, Perlodidae, Perlidae, Chloroperlidae, Aphelocheiridae, Phryganeidae, Molannidae, Beraeidae, Odontoceridae, Leptoceridae, Goeridae, Lepidostomatidae, Brachycentridae, Sericostomatidae
No. of taxa

Group 2 taxa (BMWP 8)
Astacidae, Lestidae, Calopterygidae (Agriidae), Gomphidae, Cordulegasteridae, Aeshnidae, Corduliidae, Libellulidae, Philopotamidae, Psychomyiidae
No. of taxa

Group 3 taxa (BMWP 7) — ASPT / OM / Cole
Caenidae, Nemouridae, Rhyacophilidae (Glossosomatidae), Polycentropodidae, Limnephilidae
No. of taxa

Group 4 taxa (BMWP 6)
Neritidae, Viviparidae, Ancylidae (Acroloxidae), Hydroptilidae, Unionidae, Corophiidae, Gammaridae (Crangonyctidae), Platycnemididae, Coenagrionidae ✓ ✓
No. of taxa

Group 5 taxa (BMWP 5)
Planariidae (Dugesiidae), Dendrocoelidae, Mesoveliidae, Hydrometridae ✓, Gerridae ✓, Nepidae ✓, Naucoridae, Notonectidae ✓, Pleidae, Corixidae ✓, Haliplidae, Hygrobiidae, Dytiscidae (Noteridae) ✓ ✓, Gyrinidae ✓ ✓, Hydrophilidae (Hydraenidae) ✓ ✓, Dryopidae, Elmidae, Hydropsychidae, Tipulidae, Simuliidae
No. of taxa

Group 6 taxa (BMWP 4) — ASPT / OM / Cole
Baetidae ✓, Sialidae ✓ ✓, Piscicolidae
No. of taxa

Group 7 taxa (BMWP 3)
Valvatidae, Hydrobiidae (Bithyniidae), Lymnaeidae, Physidae, Planorbidae, Sphaeriidae ✓, Glossiphoniidae ✓, Hirudinidae, Erpobdellidae ✓, Asellidae ✓
No. of taxa

Group 8 taxa (BMWP 2)
Chironomidae ✓
No. of taxa

Group 9 taxa (BMWP 1)
Oligochaeta ✓
No. of taxa

TOTAL NO. OF TAXA
TOTAL BMWP SCORE
ASPT
NO. OF OM TAXA
NO. COLEOPT. TAXA

Culicidae
Chaoboridae
Dixidae
Hydracarina

Plant recording sheet (score through each species present)

RS = Rarity Score. TRS = Trophic Ranking Score

RS	TRS	Emergent plants
1		Achillea ptarmica
1		Acorus calamus
1		Agrostis canina
1	LP	Agrostis stolonifera
32		Alisma gramineum
2		Alisma lanceolatum
1	9	Alisma plantago-aquatica
2		Alopecurus aequalis
4		Alopecurus borealis
1		Alopecurus geniculatus
2		Anagallis tenella
2		Andromeda polifolia
1		Angelica archangelica
1		Angelica sylvestris
1		Apium graveolens
1	10	Apium nodiflorum
32		Apium repens
2		Baldellia ranunculoides
2	10	Berula erecta
2		Bidens cernua
1		Bidens connata
1		Bidens frondosa
2		Bidens tripartita
2		Blysmus compressus
2		Bolboschoenus maritimus
5*		Butomus umbellatus
2		Calamagrostis canescens
2		Calamagrostis epigejos
8		Calamagrostis purpurea
8		Calamagrostis stricta
16		Calamagrostis scotica
1		Calla palustris
1	9	Caltha palustris
1		Cardamine amara
1		Cardamine pratensis
2		Carex acuta
1	10	Carex acutiformis
4		Carex appropinquata
2		Carex aquatilis
2		Carex curta
2		Carex diandra
1		Carex disticha
1		Carex echinata
2	10	Carex elata
4		Carex elongata
1		Carex flacca
1		Carex hirta
2		Carex laevigata
2	4	Carex lasiocarpa
2	4	Carex limosa
1	5	Carex nigra
1		Carex otrubae
1		Carex panicea
1		Carex paniculata
2	10	Carex paniculata
1		Carex paradoxa
2	10	Carex pseudocyperus
1		Carex pulicaris
1	10	Carex riparia
1	8.5	Carex rostrata
2		Carex spicata
2		Carex vesicaria
1		Carex viridula
16		Carex vulpina
1		Carex sp.
2		Catabrosa aquatica
4		Cicuta virosa
2		Cirsium dissectum
1		Cirsium palustre
2		Cladium mariscus
1		Conium maculatum
1		Crassula helmsii
1		Crepis paludosa
16		Cyperus fuscus
4*		Cyperus longus
2		Dactylorhiza sp. (undet.)
32		Damasonium alisma
1		Deschampsia cespitosa
2		Drosera anglica
1		Drosera [illegible]
1		Drosera capensis
2		Drosera intermedia
1		Drosera rotundifolia
16		Dryopteris cristata
2		Eleocharis acicularis
8		Eleocharis austriaca
2		Eleocharis multicaulis
1	LP	Eleocharis palustris (struck through)
2		Eleocharis quinqueflora
2		Eleocharis uniglumis
2		Epilobium alsinifolium
2		Epilobium anagallidifolium
1		Epilobium brunnescens
1		Epilobium ciliatum

RS	TRS	
1		Epilobium hirsutum
1		Epilobium obscurum
1		Epilobium palustre
1		Epilobium parviflorum
2		Epilobium tetragonum
2		Epipactis palustris
1	LP	Equisetum fluviatile
1		Equisetum palustre
1		Erica tetralix
1	2.5	Eriophorum angustifolium
16		Eriophorum gracile
2		Eriophorum latifolium
1		Eriophorum vaginatum
1		Eupatorium cannabinum
1		Filipendula ulmaria
2		Galium boreale
8		Galium constrictum
1		Galium palustre
2		Galium uliginosum
1		Geum rivale
2		Glyceria declinata
1	LP	Glyceria fluitans (struck through)
1	10	Glyceria maxima
2		Glyceria notata
1		Gnaphalium uliginosum
1	LP	Hydrocotyle vulgaris
1		Hypericum elodes
1		Hypericum tetrapterum
4		Hypericum undulatum
2		Impatiens capensis
1		Impatiens glandulifera
4*		Impatiens noli-tangere
1	LP	Iris pseudacorus
1		Isolepis setacea
1		Juncus acutiflorus
1		Juncus articulatus
1		Juncus bufonius agg
1	5.5	Juncus bulbosus
2		Juncus compressus
1		Juncus conglomeratus
1	LP	Juncus effusus
2		Juncus foliosus
1		Juncus inflexus
32		Juncus pygmaeus
2		Juncus subnodulosus
4		Lathyrus palustris
32		Leersia oryzoides
32		Liparis loeselii
1		Lotus pedunculatus
1		[illegible]
2		Luzula sylvatica
1		Lychnis flos-cuculi
1		Lycopus europaeus
1		Lysimachia nummularia
1		Lysimachia nemorum
4		Lysimachia thyrsiflora
2		Lysimachia vulgaris
16		Lythrum hyssopifolium
2		Lythrum portula
1		Lythrum salicaria
1	7.5	Mentha aquatica
16		Mentha pulegium
1	5.5	Menyanthes trifoliata
1		Mimulus guttatus
1		Mimulus luteus
16		Minuartia stricta
1		Molinia caerulea
1		Montia fontana
1	7.7	Myosotis laxa
1	9	Myosotis scorpioides
1		Myosotis secunda
4		Myosotis stolonifera
1		Myosotis sp. (undet.)
2		Myosoton aquaticum
1		Myrica gale
1		Narthecium ossifragum
2		Oenanthe aquatica
1		Oenanthe crocata
2		Oenanthe fistulosa
2		Oenanthe fluviatilis
2		Oenanthe lachenalii
2		Oenanthe pimpinelloides
4		Oenanthe silaifolia
2		Osmunda regalis
1		Parnassia palustris
1		Pedicularis palustris
1	10	Persicaria hydropiper
1		Persicaria maculosa
2		Persicaria minor
4		Persicaria mitis
1		Petasites hybridus
1		Petasites japonicus
4		Peucedanum palustre
1	8.5	Phalaris arundinacea

RS	TRS	
1	7.3	Phragmites australis
4	5.5	Pilularia globulifera
2		Pinguicula lusitanica
1		Pinguicula vulgaris
1		Potentilla erecta
1	5.3	Potentilla palustris
1		Pulicaria dysenterica
16		Pulicaria vulgaris
1		Ranunculus ficaria
1	LP	Ranunculus flammula
2	10	Ranunculus hederaceus
2*		Ranunculus lingua
2		Ranunculus omiophyllus
32		Ranunculus ophioglossifolius
32		Ranunculus reptans
1	10	Ranunculus sceleratus
2		Rhynchospora alba
4		Rhynchospora fusca
2		Rorippa amphibia
8		Rorippa islandica
2	10	Rorippa microphylla
1	10	Rorippa nasturtium-aquaticum
1	10	Rorippa (undet.)
1		Rorippa palustris
2	10	Rumex hydrolapathum
2		Rumex maritimus
2		Rumex palustris
1		Sagina procumbens
1		[illegible]
2		Samolus valerandi
2	7.7	Schoenoplectus lacustris
32		Schoenoplectus pungens
2		Schoenoplectus tabernaemontani
32		Schoenoplectus triqueter
16		Schoenus ferrugineus
2		Schoenus nigricans
16		[illegible]
1		Scrophularia auriculata
1		Scutellaria galericulata
1		Senecio aquaticus
1		Senecio fluviatilis
32		Senecio paludosus
4		Sium latifolium
1	10	Solanum dulcamara
4		Sonchus palustris
1	8.5	Sparganium erectum (struck through)
1		Stachys palustris
2		Stellaria palustris
1		Stellaria uliginosa
1		Symphytum officinale
16		Teucrium scordium
2		Thalictrum flavum
4		Thelypteris palustris
2		Tofieldia pusilla
1		Trichophorum cespitosum
1		Triglochin palustre
2	10	Typha angustifolia
1	8.5	Typha latifolia
2		Valeriana dioica
1		[illegible]
1		Veronica anagallis-aquatica
1	10	Veronica beccabunga
2		Veronica catenata
1	5.5	Veronica scutellata
1		Veronica sp. (undet.)
1		Viola palustris
12		Viola persicifolia
1		Unknown emergt

Floating-leaved plants

RS	TRS	
1		Azolla filiculoides
2		Hydrocharis morsus-ranae
1		Hydrocotyle ranunculoides
2		Lemna gibba
1	9	Lemna minor (struck through)
2		Lemna minuta
3	10	Lemna trisulca
4		Luronium natans
1		Menyanthes trifoliata
2		Nuphar advena
2	8.5	Nuphar lutea
4	7	Nuphar pumila
2*	6.7	Nymphaea alba
1		Nymphaea sp. (cultivar)
2*		Nymphoides peltata
1	9	Persicaria amphibia (struck through)
1	LP	Potamogeton natans (struck through)
1	3.7	Potamogeton polygonifolius (struck through)
2		Riccia fluitans
2		Ricciocarpus natans
2		Spirodela polyrhiza
4		Wolffia arrhiza

* = uncommon species often introduced to sites (see Preston et al. 2002 for details): if so score species as 1

RS	TRS	Submerged plants
2	6.5	Apium inundatum
1		Aponogeton distachyos
1		Cabomba caroliniana
2		Callitriche brutia
1	6.3	Callitriche hamulata
2	8.5	Callitriche hermaphroditica
2		Callitriche obtusangula
2		Callitriche platycarpa
1	7.3	Callitriche stagnalis
4		Callitriche truncata
1		C. stagnalis/platycarpa agg
1		C. hamulata/brutia agg
1		Callitriche sp. (undet.)
2	10	Ceratophyllum demersum
2		Ceratophyllum submersum
2	7.5	Chara sp.
1		Egeria densa
4	7	Elatine hexandra
4		Elatine hydropiper
2		Eleogiton fluitans
1		Elodea callitrichoides
1	7.3	Elodea canadensis
1	10	Elodea nuttallii
8		Eriocaulon aquaticum
1	6.5	Fontinalis antipyretica
2		Groenlandia densa
2	7.5	Hippuris vulgaris
2		Hottonia palustris
4		Isoetes echinospora
2	5	Isoetes lacustris
1		Lagarosiphon major
2	6.7	Littorella uniflora
2	5	Lobelia dortmanna
8		Ludwigia palustris
1	6.7	Myriophyllum alterniflorum
1		Myriophyllum aquaticum
2	9	Myriophyllum spicatum
4		Myriophyllum verticillatum
4		Najas flexilis
2	6.2	Nitella sp.
2		Oenanthe fluviatilis
16		Potamogeton acutifolius
2	5.5	Potamogeton alpinus
2	7.3	Potamogeton berchtoldii
4		Potamogeton coloratus
4		Potamogeton compressus
1	10	Potamogeton crispus
16		Potamogeton epihydrus
4	10	Potamogeton filiformis
2	10	Potamogeton friesii
2	7	Potamogeton gramineus
2	10	Potamogeton lucens
8		Potamogeton nodosus
2	8	Potamogeton obtusifolius
8	10	Potamogeton pectinatus (struck through)
2	9.3	Potamogeton perfoliatus
2	8.5	Potamogeton praelongus
2	9	Potamogeton pusillus
8		Potamogeton rutilus
4	10	Potamogeton trichoides
2	10	Ranunculus aquatilis
2	10	Ranunculus baudotii
2	10	Ranunculus circinatus
2		Ranunculus fluitans
2	7	Ranunculus peltatus
2	8.5	Ranunculus penicillatus
2	8.5	Ranunculus trichophyllus
16		Ranunculus tripartitus
1		Ranunculus sp. (undet.)
1		Sagittaria latifolia
1		Sagittaria rigida
2		Sagittaria sagittifolia
2	4	Sparganium angustifolium
1	10	Sparganium emersum
2		Sparganium natans
1	2.5	Sphagnum sp.
4*		Stratiotes aloides
2	6	Subularia aquatica
		Tolypella sp.
2		Utricularia australis
2	4	Utricularia intermedia
2	4	Utricularia minor
2	5	Utricularia vulgaris
1		Vallisneria spiralis
2	10	Zannichellia palustris
		Number of emergent & submerged species
		Number of uncommon species (with a rarity score of 2 or more)
		Trophic Ranking Score

LP = species exhibiting little nutrient preference

Pond PSYM Fieldsheet

Site and sample details

Site name: POND A15 — Code No. — Grid ref. (NZ) 18057 97368

Recording format: (SU)345 678 or (41)345 678

Location

Site access details

Survey date: 15/08/17 — Surveyor: SMC + EM

Notes

Environmental data

Altitude (m): 56 — pH: 7.5

Shade: % pond overhung: 10 — % emergent plant cover: 5

Inflow (absent = 0, present = 1) — Pond area (m²): 2000

% of pond margin grazed: 0

Sketch of pond

Pond base: categorise into one of three groups: 1=0%-32%, 2=33%-66%, 3=67%-100%

Clay/silt: 2 — Sand, gravel, cobbles: 2 — Bed rock

Peat — Other

MACROINVERTEBRATE LIST

Group 1 taxa (BMWP 10) ASPT OM Cole.

Siphlonuridae, Heptageniidae, Leptophlebiidae, Ephemerellidae, Potamanthidae, Ephemeridae, Taeniopterygidae, Leuctridae, Capniidae, Perlodidae, Perlidae, Chloroperlidae, Aphelocheiridae, Phryganeidae, Molannidae, Beraeidae, Odontoceridae, Leptoceridae ✓, Goeridae, Lepidostomatidae, Brachycentridae, Sericostomatidae

No. of taxa

Group 2 taxa (BMWP 8)

Astacidae, Lestidae, Calopterygidae (Agriidae), Gomphidae, Cordulegasteridae, Aeshnidae, Corduliidae, Libellulidae, Philopotamidae, Psychomyiidae

No. of taxa

Group 3 taxa (BMWP 7) ASPT OM Cole.

Caenidae, Nemouridae, Rhyacophilidae (Glossosomatidae), Polycentropodidae, Limnephilidae ✓

No. of taxa

Group 4 taxa (BMWP 6)

Neritidae, Viviparidae, Ancylidae (Acroloxidae), Hydroptilidae, Unionidae, Corophiidae, Gammaridae (Crangonyctidae) ✓, Platycnemididae, Coenagriidae ✓ ✓

No. of taxa

Group 5 taxa (BMWP 5)

Planariidae (Dugesiidae) ✓, Dendrocoelidae, Mesoveliidae, Hydrometridae, Gerridae ✓, Nepidae, Naucoridae, Notonectidae ✓, Pleidae, Corixidae ✓, Haliplidae ✓ ✓, Hygrobiidae, Dytiscidae (Noteridae) ✓ ✓, Gyrinidae, Hydrophilidae (Hydraenidae), Dryopidae, Elmidae, Hydropsychidae, Tipulidae, Simuliidae

No. of taxa

Group 6 taxa (BMWP 4) ASPT OM Cole.

Baetidae ✓, Sialidae ✓, Piscicolidae

No. of taxa

Group 7 taxa (BMWP 3)

Valvatidae, Hydrobiidae (Bithyniidae) ✓, Lymnaeidae ✓, Physidae ✓, Planorbidae ✓, Sphaeriidae ✓, Glossiphoniidae ✓, Hirudinidae, Erpobdellidae, Asellidae ✓

No. of taxa

Group 8 taxa (BMWP 2)

Chironomidae ✓

No. of taxa

Group 9 taxa (BMWP 1)

Oligochaeta ✓

No. of taxa

TOTAL NO. OF TAXA

TOTAL BMWP SCORE

ASPT

NO. OF OM TAXA

NO. COLEOPT. TAXA

Ceratopogonidae
Dixidae
Argulus

Plant recording sheet (score through each species present) — RS = Rarity Score, TRS = Trophic Ranking Score

RS	TRS	Emergent plants	RS	TRS		RS	TRS		RS	TRS	Submerged plants
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Floating-leaved plants

55.26787159°
-1.71710968°

Pond PSYM Fieldsheet

Site and sample details

Site name: Pond A14 Code No. Grid ref. (NZ) 18081 92126
Recording format: (SU)345 678 or (41)345 678

Location
Site access details
Survey date: 15/08/17 Surveyor: SMC + EM
Notes

Environmental data

Altitude (m): 61
pH: 7.5
Shade: % pond overhung: 25
% emergent plant cover: 75
Inflow (absent = 0, present = 1): 1
Pond area (m^2): 700
% of pond margin grazed: [illegible]

Sketch of pond N

Pond base: categorise into one of three groups: 1=0%-32%, 2=33%-66%, 3=67%-100%

Clay/silt: 3 Sand, gravel, cobbles: 1 Bed rock
Peat Other

MACROINVERTEBRATE LIST

Group 1 taxa (BMWP 10) ASPT OM Cole
Siphlonuridae
Heptageniidae
Leptophlebiidae
Ephemerellidae
Potamanthidae
Ephemeridae
Taeniopterygidae
Leuctridae
Capniidae
Perlodidae
Perlidae
Chloroperlidae
Aphelocheiridae
Phryganeidae
Molannidae
Beraeidae
Odontoceridae
Leptoceridae
Goeridae
Lepidostomatidae
Brachycentridae
Sericostomatidae
No. of taxa

Group 2 taxa (BMWP 8)
Astacidae
Lestidae
Calopterygidae (Agriidae)
Gomphidae
Cordulegasteridae
Aeshnidae
Corduliidae
Libellulidae
Philopotamidae
Psychomyiidae
No. of taxa

Group 3 taxa (BMWP 7) ASPT OM Cole
Caenidae
Nemouridae
Rhyacophilidae (Glossosomatidae)
Polycentropodidae
Limnephilidae
No. of taxa

Group 4 taxa (BMWP 6)
Neritidae
Viviparidae
Ancylidae (Acroloxidae)
Hydroptilidae
Unionidae
Corophiidae
Gammaridae (Crangonyctidae) ✓
Platycnemididae ✓ ✓
Coenagriidae
No. of taxa

Group 5 taxa (BMWP 5)
Planariidae (Dugesiidae)
Dendrocoelidae
Mesoveliidae
Hydrometridae
Gerridae ✓
Nepidae
Naucoridae
Notonectidae ✓
Pleidae
Corixidae ✓
Haliplidae ✓ ✓
Hygrobiidae
Dytiscidae (Noteridae) ✓ ✓
Gyrinidae ✓ ✓
Hydrophilidae (Hydraenidae) ✓ ✓
Dryopidae
Elmidae
Hydropsychidae
Tipulidae
Simuliidae
No. of taxa

Group 6 taxa (BMWP 4) ASPT OM Cole
Baetidae ✓
Sialidae ✓ ✓
Piscicolidae
No. of taxa

Group 7 taxa (BMWP 3)
Valvatidae
Hydrobiidae (Bithyniidae) ✓
Lymnaeidae
Physidae ✓
Planorbidae ✓
Sphaeriidae ✓
Glossiphoniidae ✓
Hirudinidae
Erpobdellidae
Asellidae ✓
No. of taxa

Group 8 taxa (BMWP 2)
Chironomidae ✓
No. of taxa

Group 9 taxa (BMWP 1)
Oligochaeta ✓
No. of taxa

TOTAL NO. OF TAXA
TOTAL BMWP SCORE
ASPT
NO. OF OM TAXA
NO. COLEOPT. TAXA

Cladocera
Chaoboridae
Dixidae

Plant recording sheet (score through each species present) RS = Rarity Score, TRS = Trophic Ranking Score

RS	TRS	Emergent plants	RS	TRS		RS	TRS		RS	TRS	Submerged plants
[illegible]											

Floating-leaved plants

* = uncommon species often introduced to sites (see Preston et al. 2002 for details of so-so or species in †)

TP = species exhibiting little nutrient preference

APPENDIX G: FISH SURVEY SHEETS

JACOBS Electric fishing Field Sampling Form

PROJECT Name and Description	A1		
Project Number	B2104700	Site Name	Long Dyke Burn
Reason for sample (i.e. pollution survey/ monitoring etc.)	Baseline	Site Reference (subsites etc.)	LB1
Date	20/7/17	Grid Reference	
Time	09:50	SPA (any change?)	N/A
Survey lead	E. Maxwell	Other Staff (initials)	JM, LB, AP
Survey Methodology	Fully quant.	Kit type - Number	E-fish/WFC4 (E-fish circled)
Upstream stop net		Downstream stop net	
Grid reference NZ 17 892 97249	Photograph ref:	Grid reference NZ 18002 NG 97336	Photograph ref:

SITE DETAILS		SITE DETAILS	
Voltage (v) / ampere (a) Pulse frequency (Hz)	145v/1.4a	Overhanging cover (%)	15%
Net Type / Mesh size / Length / depth (m)	Small stop nets at U/S and D/S	Macrophyte species (if known) Submerged Emergent Bankside	None
Run length (m)	100	Flow (m/s) (Dry/ No flow/ Low/ Normal/ High/ Spate	Normal
Average River Width (m)	2		
Average Water Depth (m)	30cm	Conductivity (ms/cm)	434
Average Bed Depth (m)	0.01	Temperature (°C)	15.4
Surface area (m^2)	200 m^2	Weather	Cloudy/overcast
Dissolved Oxygen (%)	—	Salinity	—
pH	—	Turbidity (Clear/ Slight/ Moderate/ High)	Moderate
Substrate (%) Bedrock/ Boulders/ Cobbles/ Pebbles/ Gravel/ Sand/ Silt/ Clay	Gravel 25% Sand 30% Pebbles 30% Silt 5% Cobbles 10%	Shade (None/ Light/ Moderate/ Heavy)	Moderate
Channel Details (Rubbish/ Oil Film/ Oil Deposit/ Depositing/Eroding)	—	OTHER COMMENTS	

HABITAT (%) (Riffle/ Pool/ Run/ Glide/ Slack/ Ditch/ Waterfall/ Cascade/ Rapid)	Riffle 10% Run 40% Glide 30% Pool 20%	Bank Structure (Bare/ Uniform/ Simple/ Complex)	Complex
LAND USAGE (woodland type/ urban development/ rough or improved pasture/ roads and railways etc)	Woodland RB Caravan Site LB	Photographs	
OTHER COMMENTS	Otter spraint found in the middle of the run.		

JACOBS Electric fishing Field Sampling Form

PROJECT Name and Description	A1.		
Project Number	B2104700	Site Name	Mintos Dean
Reason for sample (i.e. pollution survey/ monitoring etc.)	BASELINE	Site Reference (subsites etc.)	MD
Date	18/07/17	Grid Reference	—
Time	17:20	SPA (any change?)	—
Survey lead	Bronwyn Maxwell	Other Staff (initials)	LB, JMc + AP
Survey Methodology	single run	Kit type - Number	E-fish/WFC4 (E-fish circled)
Upstream stop net		Downstream stop net	
Grid reference NU 1398 00939	Photograph ref:	Grid reference NU 14570 0943	Photograph ref:

SITE DETAILS		SITE DETAILS	
Voltage (v) / ampere (a) Pulse frequency (Hz)	135V 1a.	Overhanging cover (%)	80%.
Net Type / Mesh size / Length / depth (m)	No Nets	Macrophyte species (if known) Submerged Emergent Bankside	None
Run length (m)	100m	Flow (m/s) (Dry/ No flow/ Low/ Normal/ High/ Spate	Low.
Average River Width (m)	0.75		
Average Water Depth (m)	0.1	Conductivity (ms/cm)	542
Average Bed Depth (m)	—	Temperature (°C)	17.4
Surface area (m^2)	75 m^2	Weather	Sunny.
Dissolved Oxygen (%)	—	Salinity	—
pH	—	Turbidity (Clear/ Slight/ Moderate/ High)	Clear.
Substrate (%) Bedrock/ Boulders/ Cobbles/ Pebbles/ Gravel/ Sand/ Silt/ Clay	20% [illegible] 20% [illegible] 20% [illegible]	Shade (None/ Light/ Moderate/ Heavy)	Moderate.
Channel Details (Rubbish/ Oil Film/ Oil Deposit/ Depositing/Eroding)	—	OTHER COMMENTS	—

HABITAT (%) (Riffle/ Pool/ Run/ Glide/ Slack/ Ditch/ Waterfall/ Cascade/ Rapid)	Ditch 98%. Run 2%.	Bank Structure (Bare/ Uniform/ Simple/ Complex)	Simple.
LAND USAGE (woodland type/ urban development/ rough or improved pasture/ roads and railways etc)	Woodland.	Photographs	
OTHER COMMENTS	Himalayan Balsam. No fish caught.		

JACOBS

Electric fishing Field Sampling Form

PROJECT Name and Description	A1		
Project Number	B2104700	**Site Name**	Back Burn Trib
Reason for sample (i.e. pollution survey/ monitoring etc.)	BASELINE	**Site Reference (subsites etc.)**	BBT
Date	[illegible]	**Grid Reference**	–
Time	16:50	**SPA (any change?)**	–
Survey lead	CM	**Other Staff (initials)**	[illegible]
Survey Methodology	[illegible]	**Kit type - Number**	E-fish/WFC4
Upstream stop net	[illegible]	**Downstream stop net**	
Grid reference [illegible]	Photograph ref:	**Grid reference** NU17580 00548	Photograph ref:

SITE DETAILS		**SITE DETAILS**	
Voltage (v) / ampere (a) Pulse frequency (Hz)	100V 0.9 A	Overhanging cover (%)	80%
Net Type / Mesh size / Length / depth (m)	None.	Macrophyte species (if known) Submerged Emergent Bankside	None.
Run length (m)	100m	Flow (m/s) (Dry/ No flow/ Low/ Normal/ High/ Spate	low.
Average River Width (m)	0.5		
Average Water Depth (m)	0.1	Conductivity (ms/cm)	694
Average Bed Depth (m)	0.5	Temperature (°C)	12.9
Surface area (m^2)	$50m^2$	Weather	[illegible]
Dissolved Oxygen (%)	–	Salinity	–
pH	–	Turbidity (Clear/ Slight/ Moderate/ High)	clear.
Substrate (%) Bedrock/ Boulders/ Cobbles/ Pebbles/ Gravel/ Sand/ Silt/ Clay	Sand 35% Gravel 35% Pebbles 25% Boulders 1%	Shade (None/ Light/ Moderate/ Heavy)	Heavy
Channel Details (Rubbish/ Oil Film/ Oil Deposit/ Depositing/Eroding)	None.	**OTHER COMMENTS**	

HABITAT (%) (Riffle/ Pool/ Run/ Glide/ Slack/ Ditch/ Waterfall/ Cascade/ Rapid)	5% Riffle 95% Glide	**Bank Structure** (Bare/ Uniform/ Simple/ Complex)	Simple.
LAND USAGE (woodland type/ urban development/ rough or improved pasture/ roads and railways etc)	Woodland.	**Photographs**	
OTHER COMMENTS	None caught.		

JACOBS

Electric fishing Field Sampling Form

PROJECT Name and Description	A1		
Project Number	B2104700	**Site Name**	River LYNE
Reason for sample (i.e. pollution survey/ monitoring etc.)	BASELINE	**Site Reference (subsites etc.)**	RL
Date	18/07/17	**Grid Reference**	–
Time	14:00	**SPA (any change?)**	–
Survey lead	Evonne Maxwell	**Other Staff (initials)**	LB, JMc, AP
Survey Methodology	FULLY QUANT	**Kit type - Number**	E-fish/WFC4
Upstream stop net		**Downstream stop net**	
Grid reference NZ18652 91665	Photograph ref:	**Grid reference** NZ 18678 91655	Photograph ref:

SITE DETAILS		**SITE DETAILS**	
Voltage (v) / ampere (a) Pulse frequency (Hz)	150V 1.5A	Overhanging cover (%)	10%
Net Type / Mesh size / Length / depth (m)	Large Stop net	Macrophyte species (if known) Submerged Emergent Bankside	None.
Run length (m)	100	Flow (m/s) (Dry/ No flow/ Low/ Normal/ High/ Spate	low
Average River Width (m)	3m		
Average Water Depth (m)	0.1 m	Conductivity (ms/cm)	512
Average Bed Depth (m)	0.02 m	Temperature (°C)	14.6
Surface area (m^2)	$300m^2$	Weather	Bright, sunny
Dissolved Oxygen (%)	–	Salinity	–
pH	–	Turbidity (Clear/ Slight/ Moderate/ High)	clear.
Substrate (%) Bedrock/ Boulders/ Cobbles/ Pebbles/ Gravel/ Sand/ Silt/ Clay	50% Bedrock 20% Sand S/S [illegible] 10% cobble [illegible] 10% boulder	Shade (None/ Light/ Moderate/ Heavy)	Heavy.
Channel Details (Rubbish/ Oil Film/ Oil Deposit/ Depositing/Eroding)	Eroding	**OTHER COMMENTS**	

HABITAT (%) (Riffle/ Pool/ Run/ Glide/ Slack/ Ditch/ Waterfall/ Cascade/ Rapid)	60% Pool 35% Glide. 5% riffle.	**Bank Structure** (Bare/ Uniform/ Simple/ Complex)	simple
LAND USAGE (woodland type/ urban development/ rough or improved pasture/ roads and railways etc)	Woodland	**Photographs**	4 x 16:14
OTHER COMMENTS			

JACOBS — Electric fishing Field Sampling Form

PROJECT Name and Description	A1		
Project Number	B2104700	**Site Name**	Flood gate by
Reason for sample (i.e. pollution survey/ monitoring etc.)	BASELINE	**Site Reference (subsites etc.)**	FGB
Date	19/7/17	**Grid Reference**	—
Time	15:00	**SPA (any change?)**	N/A
Survey lead	EM	**Other Staff (initials)**	LB JM AP
Survey Methodology	Spot check	**Kit type - Number**	E-fish/WFC4
Upstream stop net		**Downstream stop net**	
Grid reference NZ 18596 91258	Photograph ref:	**Grid reference** NZ 18756 91288	Photograph ref:

SITE DETAILS		**SITE DETAILS**	
Voltage (v) / ampere (a) Pulse frequency (Hz)	100 v / 13a 50 %	Overhanging cover (%)	10 %
Net Type / Mesh size / Length / depth (m)	No Nets	Macrophyte species (if known) Submerged Emergent Bankside	—
Run length (m)	100	Flow (m/s) (Dry/ No flow/ Low/ Normal/ High/ Spate	Normal
Average River Width (m)	0.7		
Average Water Depth (m)	0.1	Conductivity (ms/cm)	707
Average Bed Depth (m)	0.05	Temperature (°C)	
Surface area (m^2)	30m²	Weather	Overcast / Sl.
Dissolved Oxygen (%)	—	Salinity	—
pH	—	Turbidity (Clear/ Slight/ Moderate/ High)	Moderate
Substrate (%) Bedrock/ Boulders/ Cobbles/ Pebbles/ Gravel/ Sand/ Silt/ Clay	Silt. Sand - 40% 10% Clay - 40% Gravel - 10%	Shade (None/ Light/ Moderate/ Heavy)	Moderate
Channel Details (Rubbish/ Oil Film/ Oil Deposit/ Depositing/Eroding)	Eroding	**OTHER COMMENTS**	—

HABITAT (%) (Riffle/ Pool/ Run/ Glide/ Slack/ Ditch/ Waterfall/ Cascade/ Rapid)	Ditch 70% Pool 30%	**Bank Structure** (Bare/ Uniform/ Simple/ Complex)	Uniform
LAND USAGE (woodland type/ urban development/ rough or improved pasture/ roads and railways etc)	R+L Improved pasture	**Photographs**	
OTHER COMMENTS	Poor quality ditch with Pool at upstream point		

JACOBS — Electric fishing Field Sampling Form

PROJECT Name and Description	A1		
Project Number	B2104700	**Site Name**	LONGDIKE BOX A
Reason for sample (i.e. pollution survey/ monitoring etc.)	BASELINE	**Site Reference (subsites etc.)**	LB2
Date	19/7/17	**Grid Reference**	—
Time	09:45	**SPA (any change?)**	—
Survey lead	EVONNE MARWICK	**Other Staff (initials)**	LB JM AP
Survey Methodology	FULLY QUANT	**Kit type - Number**	~~E-fish/WFC4~~
Upstream stop net		**Downstream stop net**	
Grid reference NZ 19164 96888	Photograph ref:	**Grid reference** NZ 19128 96968	Photograph ref:

SITE DETAILS		**SITE DETAILS**	
Voltage (v) / ampere (a) Pulse frequency (Hz)	1Amp.	Overhanging cover (%)	60
Net Type / Mesh size / Length / depth (m)	Large Stop net	Macrophyte species (if known) Submerged Emergent Bankside	NONE
Run length (m)	100m	Flow (m/s) (Dry/ No flow/ Low/ Normal/ High/ Spate	Low
Average River Width (m)	3m		
Average Water Depth (m)	0.3 (0.1 - 0.8)	Conductivity (ms/cm)	420
Average Bed Depth (m)	0.05	Temperature (°C)	15.4
Surface area (m^2)	300m²	Weather	Overcast
Dissolved Oxygen (%)	—	Salinity	—
pH	—	Turbidity (Clear/ Slight/ Moderate/ High)	Slight/Moderate
Substrate (%) Bedrock/ Boulders/ Cobbles/ Pebbles/ Gravel/ Sand/ Silt/ Clay	Sand 30 Boulder 5 Gravel 20 Pebble 20 Cobble 25	Shade (None/ Light/ Moderate/ Heavy)	Moderate
Channel Details (Rubbish/ Oil Film/ Oil Deposit/ Depositing/Eroding)	—	**OTHER COMMENTS**	

HABITAT (%) (Riffle/ Pool/ Run/ Glide/ Slack/ Ditch/ Waterfall/ Cascade/ Rapid)	Pool 25 Riffle 5 Glide 30 Run 40	**Bank Structure** (Bare/ Uniform/ Simple/ Complex)	Complex
LAND USAGE (woodland type/ urban development/ rough or improved pasture/ roads and railways etc)	Rough Pasture	**Photographs**	
OTHER COMMENTS	Brown water made deeper areas difficult to fish Lots of Minnows		

APPENDIX H: EXPOSED RIVERINE SEDIMENT FIELD SHEET

APPENDIX D
Environmental Variables for the ERS survey

A. Field Survey Details

Site name .....
River ..RIVER COQUET.....
Grid Ref .....
Date Set ..03/08/17.....
Sampler Name ..SMC + EB.....
Bank (tick one) Left [ ] Right [ ] Channel [✓]

B. Impoundment for navigation (tick one)

No [✓] Yes [ ] Don't know [ ]

Impoundment for other purposes (tick one)
No [✓] Yes [ ] Don't know [ ]

C. ERS attributes

Substrate

Estimated % of each subsrtate on the ERS

Boulder (>256mm) ..60.....
Cobble (64-256) ..25.....
Pebble (16-64mm) ..10.....
Gravel (2-16mm) ..5.....
Sand (0.063-2mm) ..—.....
Silt (0.004-0.063mm) ..—.....
Organic matter ..—.....

Vegetation

Vegetation structure (B=bare, S=Simple, C=complex) on ERS ..S.....
Estimated vegetation cover on ERS ..85.....

D. ERS Dimensions (at time of installation)

Length ..22.....metres
Width ..7.....metres

E. Land use next to ERS (tick if present)

Broadleaf/mixed woodland [✓]
Coniferous plantation [ ]
Moor/Heath [ ]
Scrub/Rough [ ]
Bog, Marsh, Fen [ ]
Grazed improved/semi-improved grass [ ]
Ungrazed improved/semi-improved grass [ ]
Arable land [ ]

Is land behind grazed by cattle?
No [✓] Yes [ ] Don't know [ ]

F. Bank Profile above ERS (tick one)

Natural / unmodified [✓]
Artificial / modified [ ]

G. ERS Profile

ERS Profile type (tick if present)
F= Flat (nearly) [✓]
G=Gentle [ ]
S=Steep (>10 degrees) [ ]

H. ERS Topography (Tick one)

Simple (no channels) [ ]
Humped (Back channel present) [✓]
Complex (braided) [ ]

I. ERS Habitat Heterogeneity [2]
(1=low, 2=medium, 3=high)

J. ERS Disturbance

ERS Grazing [1]
(1=low, 2=medium, 3=high)

ERS Trampling [1]
(1=low, 2=medium, 3=high)

ERS extraction (gravel poaching) [1]
(1=low, 2=medium, 3=high)

K. Extend of Shade
Percentage of ERS Shaded ..5.....

L. Hibernation Potential
Presence of grass tussocks and deadwood high on ERS or on adjacent bank
(0=none, 1=Isolated, 2=in some quantity, 3=abundant)

Grass on ERS [1]
Grass on Bank [2]
Dead Wood on ERS [0]
Dead Wood on Bank [3]

Hibernation potential (overall) [1]
(1=low, 2=medium, 3=high)

M. Bank above ERS dimensions (m)

Bankfull height ..1.....
Bank Height (if different) ..20.....
Embanked Height ..✓.....

N. Evidence of Recent Management (tick box(es))

Banks
None [✓]
Resectioning [ ]
Bank Mowing [ ]
Enhancement [ ]

Channel
None [✓]
Resectioning [ ]
Bank Mowing [ ]
Enhancement [ ]

O. Recreation (tick)

Evidence of Fishing [✓]
Presence of boats [ ]

P. Comments

No pitfall traps set.

This document is also available on our website at **www.gov.uk /highways**

If you have any enquiries about this document A1inNorthumberland@highwaysengland.co.uk or call **0300 470 4580***.

*Calls to 03 numbers cost no more than a national rate call to an 01 or 02 number and must count towards any inclusive minutes in the same way as 01 and 02 calls.
These rules apply to calls from any type of line including mobile, BT, other fixed line or payphone. Calls may be recorded or monitored.

Registered office Bridge House, 1 Walnut Tree Close, Guildford GU1 4LZ
Highways England Company Limited registered in England and Wales number 09346363