

# **Kintore Hydrogen Plant Fish Habitat Assessment and Freshwater Pearl Mussel Survey**



**December 2023**

# CONTROL SHEET

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## EXECUTIVE SUMMARY

EnviroCentre Limited was commissioned by William Summerlin on behalf of Statera Energy Ltd to conduct a Fish Habitat Assessment and Freshwater Pearl Mussel (FWPM) survey of a stretch of the River Don in association with the site known as Kintore Hydrogen Plant, in land south of Kintore, to inform development of a Hydrogen electrolysis plant.

The aim of the fish habitat assessment and FWPM survey was to establish the ecological baseline in terms of spawning and sheltering habitats present for fish, suitable habitat for FWPM and to identify the potential impacts of works on fish and FWPM habitat within the River Don.

There was no habitat within the surveyed area deemed suitable for supporting FWPM populations.

Overall, the River Don have good sheltering, foraging and residing habitat for salmonids (salmon and trout). However, limited spawning habitat is present in the section surveyed. More suitable spawning habitat may be present upstream of the area surveyed.

The stretch of the River Don surveyed generally lacked overhanging trees, which results in a lack of shading. Shading of the water decreases exposure to excessive temperatures, which can have detrimental effects on juvenile development, survival rates and reduce migration. Therefore, planting and natural regeneration along the watercourses would provide additional sheltering and foraging opportunities for a range of species.

The River Don also provides suitable habitat for eel and lamprey (limited spawning and ammocete), these species and the habitats they reside in should be considered during works.

Giant hogweed was noted within the site where the Silver Burn joins the River Don and 500m downstream of the site boundary.

Potential impacts of the proposed development, in the absence of any mitigation include:

- Pollution to River Don during construction and operation.
- Increase in nutrients in the River Don reducing water quality for fish and FWPM.
- Sedimentation and/ or reduction in sediment supply downstream impacting and FWPM.
- Depending on the design of the intake or outfall, fish may become entrapped in the equipment.
- Direct injury or mortality of fish during any instream works.
- Further spread of INNS giant hogweed and *Ranunculus*.

General good practice mitigation measures are recommended and include:

- Design of the intake and outflow pipelines should be done in reference to Scottish Environmental Protection Agency (SEPA) guidance and agreed in advance.
- A Construction Environmental Management Plan (CEMP) and pollution prevention plans should be devised prior to works commencing on site.
- Where practicable, avoid conducting activities during times when fish are breeding/ smolting.
- Biosecurity measure should be put in place prior and after any in river works.
- An Environmental/ Ecological Clerk of Works (Env/ ECoW) should be appointed during works.

Opportunities for habitat enhancements within the project may include:

- Restoring riparian corridor of the River Don with native species, as trees lacking along bank.
- Inclusion of woody debris in the River Don to improve habitats and water quality for fish and FWPM.

Removal of large boulders as part of bank modification to allow a more natural flow regime and where required replace with green bank supports.

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# 1 INTRODUCTION

## 1.1 Terms of Reference

EnviroCentre Limited was commissioned by William Summerlin on behalf of Statera Energy Ltd to conduct a Fish Habitat Assessment and Freshwater Pearl Mussel (*Margaritifera margaritifera*) survey a stretch of the River Don in association with the site known as Kintore Hydrogen Plant, in land south of Kintore, to inform development of a Hydrogen electrolysis plant.

## 1.2 Background

A Preliminary Ecological Appraisal (PEA) was undertaken in May 2023<sup>1</sup> of the whole site boundary by EnviroCentre, where the watercourses on and associated with the site were assessed as offering suitability for fish and freshwater pearl mussels. Most watercourses (Park Burn, Dewsford Burn, Tuach Burn and Silver Burn) were scoped out for further assessment due to being narrow or canalised, with low flows, the presence of culverts and large sections flowing underground limiting fish access (and therefore freshwater pearl mussel), however, the River Don was considered suitable for fish and freshwater pearl mussel and therefore targeted surveys were recommended.

## 1.3 Scope of Report

The aim of the fish habitat assessment and freshwater pearl mussel (FWPM) survey was to establish the ecological baseline in terms of spawning and sheltering habitats present for fish, suitable habitat for FWPM and to identify the potential impacts of works on fish and FWPM habitat within the River Don. The main objectives were as follows:

- Identify areas of suitable habitats for spawning and sheltering present along the River Don;
- Ascertain the presence of suitable habitat on the site for FWPM;
- Ascertain presence/absence of, and search for field evidence of, FWPM;
- Evaluate the site based on the habitats present and survey findings;
- Identify the potential impacts to fish spawning and sheltering habitats as well as FWPM;
- Make recommendations for any further survey and/or species licensing requirements;
- Identify measures to avoid, mitigate and/or compensate for the predicted effects associated with the proposed works; and
- Suggest opportunities to deliver ecological enhancement.

## 1.4 Project Description

The main elements of the development are the electrolysis plant, located west of Kintore 400 kV substation; a short underground electrical connection into the substation; an underground hydrogen export pipeline to a connection point on the existing high-pressure natural gas pipeline west of the A96; and underground water intake and discharge pipelines to the River Don. At the River Don, there will be intake and outfall structures on the south bank and a pumping station.

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<sup>1</sup> ECREP13628\_Kintore Hydrogen Plant PEA\_FinalV3

## 1.5 Site Description

The site is located south of Kintore, centred at National Grid reference: NJ 78276 14343, 91m above sea level. The site consists of a mosaic of agricultural land, grassland, scrub, trees, heathland, woodland, residential cottage, ruined building and horse steading. The site also includes parts of several watercourses including the River Don, Park Burn, Dewsford Burn, Tuach Burn and Silver Burn and a pond in the central region.

The site comprises three main areas and a series of thin corridors between and to the south of the three main areas. The site is bounded to the north by the B977, the Harthills plantation and agricultural fields, to the east by the River Don, and to the south and west by agricultural fields. The site is crossed by the B977 in the west and the A96 and the Rushlach in the east.

In the wider landscape, a mostly industrial area is found east of the site, the town of Kintore to the northeast and with the remaining surrounding landscape being dominated by woodland, pastures and agricultural land. Kintore Hydrogen Plant is located north west of the site, approximately 340m from the nearest site boundary.

## 1.6 Report Usage

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## 2 METHODS

All survey work was undertaken by experienced and competent ecologists, who are Full and Associate members of the Chartered Institute of Ecology and Environmental Management (CIEEM). The survey was designed using the methods and guidelines endorsed by NatureScot (NS)<sup>2</sup> and CIEEM<sup>3</sup>. This section provides details of the methods adopted.

Appendix A details site boundary and survey areas.

### 2.1 Desk Study

To anticipate the potential ecological sensitivities at the site, a desk study was conducted in advance of the Ecological Appraisal field survey, in May 2023 with additional resources checked in October 2023. The following sources were checked:

- A review of North East Scotland Biological Records Centre (NESBReC) for fish and FWPM data up to 2km of the site obtained in 2022.
- The National Biodiversity Network (NBN) Atlas of Scotland<sup>4</sup> for commercially available records of fish species within a 2km radius of the site and recorded within the past 10 years;
- Review of websites and other relevant sources online<sup>5 6 7 8 9</sup>;
- Review of SEPA 'Obstacles to fish migration' map data<sup>10</sup>; and
- A review of Joint Nature Conservation Committee Freshwater Pearl Mussel (*Margaritifera margaritifera*) (FWPM) distribution<sup>11</sup>.

### 2.2 Fish Habitat Survey

The Scottish Fisheries Co-ordination Centre (SFCC) fish habitat survey<sup>12</sup> is a method that was developed to assess habitat for juvenile Salmon and Trout. The information is used to evaluate habitat suitability in terms of water quality, shelter, territoriality, food and availability of spawning habitat. A walkover fish habitat survey was undertaken according to the SFCC guidelines referenced above alongside a modified Hedry and Gragg-Hine (1997)<sup>13</sup>, which requires the surveyor to map riparian vegetation, approximate channel dimensions, migration obstacles, and substrates to inform the quality and utilisation potential of different fish species and age classes.

The survey was undertaken on 18<sup>th</sup> October 2023 the air temperature was 10°C, conditions were calm and dry, with clear visibility. The water level in the River Don was low at the time of survey. The River Don was surveyed up to 100m upstream and 250m downstream of the site boundary, respectively, in 100m sections. Environmental variables were recorded:

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<sup>2</sup> <https://www.nature.scot/doc/freshwater-pearl-mussel-survey-protocol-use-site-specific-projects>

<sup>3</sup> [https://cieem.net/resource/monitoring-the-freshwater-pearl-mussel/?filter\\_resource\\_type=9&filter\\_topic=149](https://cieem.net/resource/monitoring-the-freshwater-pearl-mussel/?filter_resource_type=9&filter_topic=149)

<sup>4</sup> Available at:

<sup>5</sup> <https://www.aberdeenshire.gov.uk/leisure-sport-and-culture/fishing/>

<sup>6</sup> <https://www.fishingthefly.co.uk/river-don.html>

<sup>7</sup> <https://riverdon.org/>

<sup>8</sup> <https://jncc.gov.uk/jncc-assets/Art17/S1029-SC-Habitats-Directive-Art17-2019.pdf>

<sup>9</sup> <http://www.inveruriefloodingstudy.com/media/reports/PreliminaryEcologicalAssessment.pdf>

<sup>10</sup> <https://map.environment.gov.scot/sewebmap/?layers=obstaclesToFishMigration>

<sup>11</sup> <https://sac.jncc.gov.uk/species/S1029/>

<sup>12</sup> Scottish Fisheries Coordination Centre (SFCC). (2007). Electrofishing survey training course manual. MSS, Pitlochry, pp 1-64

<sup>13</sup> Hendry, K. & Cragg-Hine, D. (1997). Restoration of Riverine Salmon Habitats. Fisheries Technical Manual 4, Environment Agency, Bristol

- Depth
- Wet, bed and bank width
- Substrate size and percentage of each
- Silted (Y/N)
- Substrate compaction and stability
- Canopy cover (%)
- Bankside fish cover (%)
- General bankside status
  - Depth of riparian buffer zone
  - Grazing intensity, type of grazer and grazing exclusion
  - Predominant bankface and buffer zone vegetation
- Riparian zone
  - % overhanging boughs
  - Predominant type of overhanging trees
  - Predominant land use (up to 10m from banktop)
- Pollution points
- Obstacles
- Channel/bank modifications

Site locations and survey reaches are detailed in Appendix A.

## 2.3 FWPM Survey

The survey was undertaken by Douglas Blease, who holds a FWPM licence #245516, assisted by Jennifer Paterson on 18<sup>th</sup> October 2023 when conditions were still, dry, bright, cloud cover 40% and an average air temperature of 10°C. The flow of the River Don was low at the time of survey, with flow speed varying between low and moderate.

### 2.3.1 Habitat Appraisal

The habitats within the survey area were appraised to identify suitable, partially suitable or unsuitable conditions for FWPM to be present.

In general terms, FWPM prefer oligotrophic (low nutrient content) conditions with clear, well-oxygenated water which is 0.3-0.4m deep and 0.25-0.75m/s flowing over a moderate gradient<sup>14</sup>. The presence of FWPM populations is highly dependent on substrate composition, which ideally contains small sand patches stabilised amongst large stones or boulders. The suitability of a watercourse for FWPM also depends on the presence of host availability. Sea trout, brown trout and Atlantic salmon can all host FWPM larvae.

To assess the likelihood of FWPM occurring in this survey area, a visual evaluation of substrate characteristics at 100m intervals was undertaken using the Wentworth scale<sup>15</sup> and applying a percentage cover estimation of the following sediments:

- B – Bedrock (solid)
- Br – Boulders (>256mm)
- C – Cobbles (64 -256mm)
- P – Pebbles (4 – 64mm)

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<sup>14</sup> Skinner, A., Young, M. & Hastie, L. (2003). Ecology of the Freshwater Pearl Mussel. Retrieved from <http://www.snh.gov.uk/docs/B337911.pdf>

<sup>15</sup> Wentworth C.K. (1922). A scale grade and class terms for clastic sediments. *Journal of Ecology* 30, 377-392.



G – Gravel (2 – 4mm)  
CS – Coarse Sand (0.5 – 4mm)  
FS – Fine Sand (<0.5mm)  
S – Silt (tiny)

Further information regarding key river features was noted along the survey reach including: adjacent land use and bankside vegetation, the presence of in-channel vegetation or algal growth, watercourse dimensions (approximate width and depth) and flow description, with any notes regarding the presence of runs, riffles, glides and pools to aid the interpretation of the watercourse character and habitat suitability.

### **2.3.2 Freshwater Pearl Mussel Survey**

A methodical search from 500m downstream of the site boundary to 100m upstream of this location, was made for FWPM, using polarised glasses and a glass-bottomed bucket, with the aim of ascertaining the presence/absence of FWPM. In some places, especially where habitat was deemed suitable, substrate was lightly disturbed to search for deeper buried mussels or juveniles.

## **2.4 Disclaimer**

This survey provides a snapshot of habitats available during the time of survey on 18<sup>th</sup> October 2023.

## **2.5 Assessment Limitations**

### **2.5.1 Desk Study**

It should be noted that the desk study is limited by the reliability of third party information and the geographical availability of biological and/or ecological records and data. This emphasises the need to collate up-to-date, site-specific data based on field surveys by experienced surveyors. The absence of species from biological records cannot be taken to represent actual absence. Species distribution patterns should be interpreted with caution as they may reflect survey/reporting effort rather than actual distribution.

### **2.5.2 Field Survey**

Some sections of the River Don could not be safely accessed due to the depth (>1.5m in depth) of the water and the substrate type (soft sediment). These areas were instead walked via the bankside, however the flow in these areas were relatively slow and the as the bed substrate comprised predominantly fine sand or silt, with little pebbles, cobbles and boulders. Therefore, based on these observed conditions and its dismissal from physical search it was not considered to affect the survey findings or assessments for fish or FWPM.

## 3 RESULTS

Relevant Legislation is detailed in Appendix B, Photographs are detailed in Appendix C and Survey Forms are provided in Appendix D.

### 3.1 Fish

#### 3.1.1 Desk Study

No recent records of fish were returned from NESBReC or the NBN Atlas. However, historic records of Atlantic salmon (*Salmon salar*), brown trout (*Salmon trutta*), eel (*Anguilla Anguilla*), rainbow trout (*Oncorhynchus mykiss*), brook lamprey (*Lampetra planeri*), (*Phoxinus phoxinus*), three-spined stickleback (*Gasterosteus aculeatus*), gudgeon (*Gobio gobio*), pike (*Esox lucius*), roach (*Rutilus rutilus*), stone loach (*Barbatula barbatula*), flounder (*Platichthys flesus*) and perch (*Perca fluviatilis*) have previously been recorded within the a tributary of the River Don within 10km of the site<sup>16 17</sup>.

The River Don is known to still host a range of freshwater species, including Atlantic Salmon, sea trout, brown trout, eels and lamprey.

The beat map of the Kintore Angling Society for salmon, sea trout and brown trout stretches the length (and beyond) of the area of the River Don surveyed.

#### 3.1.2 Fish Habitat Survey

The River Don flows west to east through agricultural land (in the stretch surveyed) and in general is exposed, predominantly lacking shade from overhanging trees. However, the banks and bank tops in general are highly vegetated on the right hand bank, with more bare areas on the left-hand banks (Photograph 1). The banks are not undercut but have a high percentage of draped and marginal vegetation to provide shelter.

Flow conditions were low at the time of survey, with the water clear and flow speed slow-moderate (Photograph 2). The flow type was fairly consistent with run and deep glide dominating, with shallow glide and areas of still marginal and occasional pooling (deep and shallow) present throughout.

A range of substrates are present (silt, sand, gravel, pebble, cobble, and boulder) however, although gravel was present in the River Don, it was present in low volumes and therefore considered too small to be classed as providing suitable for spawning salmonids (Photograph 3).

In general, this stretch was considered unstable and uncompacted due to a general lack of inchannel vegetation apart from tenacious *Ranunculus* in the section along the site boundary of the site (Site Code: K005 and K006 in Appendix A and D). This section of the River Don also shows signs of modification via bankside erosion control boulders which has likely altered the natural flow of the watercourse in areas, resulting in changes to flows such that sand, gravel and pebbles do not settle amongst cobbles and boulders (Photograph 4).

Overall, it is considered the instream and bankside habitats would provide suitable habitat for resident populations of brown trout and salmon age classes. In addition, the cobble and boulder habitat

<sup>16</sup> Biological Records Centre (2023). Database for the Atlas of Freshwater Fishes. Occurrence dataset on the NBN Atlas

<sup>17</sup> Records provided by Biological Records Centre, accessed through NBN Atlas website (2023).

throughout the area surveyed would provide opportunities for eel. Lamprey may utilise some of the smaller gravel pockets for spawning, however this section has limited areas of ammocoete habitat (areas of silt, sand and organic detritus, often in still/marginal areas), but this may be present further upstream or downstream.

## **3.2 FWPM**

### **3.2.1 Desk Study**

There were no records of FWPM noted within the site or within the catchment area from NESBReC or NBN Atlas.

Although the River Don is within the range map<sup>8</sup> for FWPM none appear to have been recorded, but previous assessments undertaken upstream of the River Don (near Inverurie) consider the presence of FWPM within the River Don to be probable. This is due to some sections containing gravel substrates, with a generally fast flowing, clean river system with little input of nutrients and pollutants from surrounding fields and the presence of both salmon and trout located within the rivers. However, not the entire reach of the site was suitable for FWPM<sup>9</sup>.

### **3.2.2 Survey Results**

No FWPM, dead or alive, were observed during the survey.

Overall, the stretch of the River Don surveyed was assessed as suboptimal for FWPM due to the predominantly presence of instable substrate, particularly mobile sands and gravels. Areas of cobble, pebbles and boulders with coarse and fine gravels was also lacking throughout the majority of the site.

The inclusion of bankside erosion control boulders also likely alters the natural flow of the River Don in this stretch and likely results in changes to flows such that sand, gravel and pebbles do not settle amongst cobbles and boulders. Whilst in areas of very slow flow and shallow gradient, the substrate distinctly comprises silt and sands/ fine gravels suggesting that in times of spate the substrate is highly mobile except for boulders. This is further evidenced by a general lack of inchannel vegetation apart from tenacious *Ranunculus*. A small gravel and pebble area 500m downstream of the site boundary was considered to be the most suited for FWPM, however this was not found to contain any.

## **3.3 Other Observations**

Giant hogweed (*Heracleum mantegazzianum*) was identified within the site where the Silver Burn flows into the River Don and 500m downstream of the site boundary.

## 4 CONCLUSIONS AND RECOMMENDATIONS

### 4.1 Fish Habitat Assessment

Overall, the River Don have good sheltering, foraging and residing habitat for salmonids (salmon and trout). Suitable cover is important for providing shelter to young fish, allowing them sheltered foraging and safety from larger predators, ultimately allowing them to grow into reproductively spawning adults.

Limited spawning habitat is present in the section surveyed. More suitable spawning habitat may be present upstream of the area surveyed.

The proposed development includes underground water intake and discharge pipelines on the south bank and a pumping station. Intakes and outfalls can result in many impacts to the physical habitat (morphology) of rivers and in turn result in negative impacts to fish if not properly designed or mitigated.

The stretch of the River Don surveyed, in general lacked overhanging trees, which results in a lack of shading. Shading of the water decreases exposure to excessive temperatures, which can have detrimental effects on juvenile development, survival rates and reduce migration<sup>18</sup>. Therefore, planting and natural regeneration along the watercourses would provide additional sheltering and foraging opportunities for a range of species.

As the watercourses provide suitable habitat for eel and lamprey (spawning and ammocete), these species and the habitats they reside in considered during works.

### 4.2 FWPM Assessment

No evidence of FWPM was identified during the survey therefore the construction of a water intake and outflow in this section is not deemed to risk a direct negative effect on FWPM. A licence from NatureScot is therefore not required. Should the outflow further reduce water quality, then indirect impacts to potential FWPM in the wider ecosystem of the River Don could be expected.

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<sup>18</sup>[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/291742/scho1008boue-e-e.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/291742/scho1008boue-e-e.pdf)

## 5 POTENTIAL IMPACTS AND MITIGATION

### 5.1 Potential Impacts

Potential impacts associated with the proposed development, in the absence of any mitigation or sensitive design are detailed below:

- Pollution to River Don during construction (silt release) and operation (unforeseen leaks/treatment malfunctions/lack of water quality monitoring);
- Increase in nutrients in the River Don making water quality unsuitable for fish and FWPM and affecting the wider ecosystem;
- Indirect effects may occur to FWPM via direct effects to fish, who are an integral component of their lifecycle (dispersal);
- Sedimentation and/ or reduction in sediment supply downstream which can directly impact fish and FWPM;
- Depending on the design of the intake or outfall, fish may become entrapped in the equipment;
- Direct injury or mortality of fish during any instream works; and
- Further spread of INNS giant hogweed and *Ranunculus*.

### 5.2 General Good Practice Mitigation Recommendations

The following additional general good practice mitigation measures are recommended:

- Design of the intake and outflow pipelines should be done in reference to Scottish Environmental Protection Agency (SEPA) guidance<sup>19</sup>
- Approve a design with SEPA and relevant consultees which ensures robust water quality measures are implemented during construction and operation.
- Works should be undertaken to avoid the smolt run (April-mid-May) in order to avoid any direct impacts to migrating species.
- The working plan and programme should be shared with The River Don Trust who may conduct annual smolt monitoring nearby to avoid any clash during construction.
- The following recommendations should be included in a Construction Environmental Management Plan (CEMP) and pollution prevention plans should be devised prior to works commencing on site. In accordance with SEPA guidance the CEMP/PPP will:
  - Identify risks to waterways which will include but may not be limited to:
    - Run-off from material stockpiles;
    - Fuel and chemical storage/refuelling areas;
    - Leaking or vandalised equipment;
    - Sediment from bank/ embankment erosion;
  - Identify potential pollution pathways;
  - Demonstrate adherence to good working practices as detailed in current guidance:
    - GGP5: Works and maintenance in or near water;
    - PPG 6: Working at construction and demolition sites;
    - PPG 7: Safe Storage – The safe operation of refuelling facilities;
    - GPP21: Pollution and incident response planning; and
    - PPG22: Incident response – dealing with spills. (e.g. Guidance for Pollution Prevention

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<sup>19</sup> SEPA Engineering in the Water Environment Good Practice Guide: Intake and Outfalls (2019), available at: [https://www.sepa.org.uk/media/150984/wat\\_sg\\_28.pdf](https://www.sepa.org.uk/media/150984/wat_sg_28.pdf)

- A detailed method statement for works should be undertaken prior to works commencing, with considerations and mitigation, including:
  - Designing out in channel works wherever possible;
  - All plant machinery involved with in-channel works shall be clean and recently serviced;
  - All hydraulic hoses shall be subject to a daily inspection and any worn parts replaced prior to operating in or in proximity to the river;
  - Hydraulic oils used in plant machinery shall be bio-oil, rather than mineral based;
  - All plant machinery shall be accompanied with a spill kit;
  - A biosecurity plan would be required as the presence of *Ranunculus* in the channel could lead to the spread of an invasive plant species.
- Detail mitigation measures to be employed to minimise the risk of pollution which may include but not necessarily be limited to:
  - Secondary containment for chemicals such as fuels or oils and other building materials to be stored on an impermeable surface >10m from water.
  - Emergency spill procedures.
  - SEPA Pollution prevention hotline (0800 80 70 60) to be notified within 30 minutes in the event of an incident.
  - Use of appropriate and pragmatic sediment dispersal control measures where necessary to prevent sediment release during de-watering works.
  - Checks and maintenance of silt management systems should be undertaken regularly.
  - Any concrete used will be of a type specifically designed for use in water.
  - Plant, wheel and boot washing area to be >10m away from water on area of hardstanding with run-off collected and prevented from entering the watercourse.
  - Particular attention to be paid to wash off any concrete equipment.
  - All contractors on site to be made aware of the potential environmental impacts of the work, how to reduce or eliminate them and the emergency response plans should an incident arise.
- Timing and duration – Where practicable, avoid conducting activities during times when fish are likely to be breeding:
  - Atlantic salmon – spawning October-late February (mostly November-December)
  - Brown trout – spawning mid-October-early January
  - Brook lamprey – spawning April-June
  - River lamprey – spawning April-May
  - Sea lamprey – spawning May-July
- Biosecurity measure should be put in place (e.g. ‘Check, Clean, Dry’ protocol prior and after any in river works)<sup>20 21</sup>. Biosecurity measures may include:
  - Arrive with clean, dry footwear and equipment
  - CHECK – Before leaving a site
    - Visually check footwear, equipment and wheels for debris - plant and animal matter, small organisms, soil, seeds etc. and remove. Carry a basic biosecurity kit (brush and water) to help remove debris while on site.
    - Ideally rinse all your kit on site to ensure all debris is removed
  - CLEAN - Clean and wash footwear, clothing and equipment with appropriate disinfectants, ideally on site, where the washings should be left. If this is not possible bag your gear carefully and wash as soon as possible, but do not let the washings enter any watercourse or drains.
  - DRY - dry your kit and clothing thoroughly, some species can live weeks in damp, moist conditions.

<sup>20</sup> <https://www.invasivespecies.scot/biosecurity>

<sup>21</sup> <https://www.nonnativespecies.org/what-can-i-do/check-clean-dry/field-workers/>

- Chemical disinfection of pre-cleaned protective clothing and boots can be achieved by spraying or wiping with a solution containing a concentration of iodine at 250 mg/ltr, leaving for five minutes and then rinsing with uncontaminated water such as tap water. All surfaces exposed to chemical treatment should be washed down with tap water. Other chemicals such as caustic soda (sodium hydroxide) may also be used to treat equipment<sup>22</sup>.
- A suitably qualified ecologist should be appointed to audit and advise works acting as Environmental/ Ecological Clerk of Works (Env/ ECoW) on matters of protected species, vegetation removal, pollution prevention, biosecurity and to make a record of compliance for client and stakeholders;
- All construction activities in or near water have the potential to cause water pollution. This should be managed under SEPA Guidelines for Pollution Prevention (GPPs)<sup>23</sup> and may need to be timed to avoid sensitive periods for fish which are generally considered to be October to May inclusive.
- Temporary lights used during construction would need to be fitted with shades to prevent light spillage out-with the working area. Temporary lights should not illuminate the River Don.

### 5.3 Opportunities for Habitat Enhancements

Opportunities for habitat enhancements within the project may include:

- Restoring riparian corridor associated with the River Don as trees lacking along bank. Planting of native trees which are water tolerant is recommended;
- Inclusion of woody debris in the River Don to provide improved habitats and water quality for a range of species including fish and FWPM; and
- Removal of large boulders as part of bank modification to allow a more natural flow regime and where required replace with green bank supports.

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<sup>22</sup> [https://www.nonnativespecies.org/assets/Document-repository/keep\\_fish\\_disease\\_out\\_gyrodactylosis\\_Defra.pdf](https://www.nonnativespecies.org/assets/Document-repository/keep_fish_disease_out_gyrodactylosis_Defra.pdf)

<sup>23</sup> <https://www.sepa.org.uk/regulations/water/guidance/>

# APPENDICES



# **A SURVEY AREAS**



**Legend**

- Hydrogen Development Area
- Survey Extent
  - ↔ Full

Do not scale this map

**Client**  
Kintore Hydrogen Limited

**Project**  
Kintore Hydrogen Plant

**Title**  
Freshwater Pearl Mussel Survey Plan

**Status**  
**Final**

<b>Drawing No.</b> 376782-GIS009	<b>Revision</b> A	<b>Date</b> 07 Dec 2023
<b>Drawn</b> JEP	<b>Checked</b> DB	<b>Approved</b> DB

**Scale**  
1:3,000 @A3

Rev	Date	Amendment	Initials
A	24/08/23	Updated Site Boundary and INNS Data	JAS

8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA.  
T: 0141 341 5040 E: info@envirocentre.co.uk  
W: www.envirocentre.co.uk

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community



**Legend**

- Hydrogen Development Area
- Survey Extent
- ↔ 100m Sections

Do not scale this map

**Client**  
Kintore Hydrogen Limited

**Project**  
Kintore Hydrogen Plant

**Title**  
Fish Habitat Assessment Survey Plan

**Status**  
**Final**

<b>Drawing No.</b> 376782-GIS010	<b>Revision</b> A	<b>Date</b> 07 Dec 2023
<b>Drawn</b> JEP	<b>Checked</b> DB	<b>Approved</b> DB

**Scale**  
1:2,400 @A3

Rev	Date	Amendment	Initials
A	24/08/23	Updated Site Boundary and INNS Data	JAS

8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA.  
T: 0141 341 5040 E: info@envirocentre.co.uk  
W: www.envirocentre.co.uk

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

## B RELEVANT LEGISLATION

### Atlantic salmon

Atlantic salmon is protected under Annex II and V of the EC Habitats Directive, and the Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003. Atlantic salmon are also listed as a SBL priority species.

The following text relates to offences under the Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003.

Under Section 23, Subsection 1, Paragraphs (a) it is an offence to:

- *Knowingly take, injure or destroy young salmon (smolt, parr, fry, or alevin) and spawning beds.*

Under Section 23, Subsection 2, Paragraphs (a) and (b) it is an offence to:

- *Knowingly injure or disturb any salmon spawn; or*
- *Disturb any spawning bed or any bank or shallow in which the spawn of salmon may be.*

Under Section 23, Subsection 3 it is an offence to:

- *Obstruct or impede salmon in their passage to any such bed, bank or shallow during the annual close time.*

The life cycle of an Atlantic salmon involves migration from freshwater to saltwater during the smolting process, and back to freshwater to spawn as a mature adult: this is termed anadromous. In their freshwater phase they are found throughout the UK, particularly Scotland.

Spawning takes place in clean, silt free gravel nests, terms 'redds', between October and November. Once hatched (in spring), salmonid parr require clean, shallow, fast flowing (high oxygen saturation) waters; moving into deeper waters as they get older. During the freshwater phase, salmon feed on invertebrates. In Scotland, juvenile salmon usually remain in freshwater for 2-3 years.

### Brown/sea trout

Like many other freshwater fish, brown/sea (anadromous form) trout are protected from certain methods and seasons of exploitation, however do not receive extensive protection within conservation legislation. Brown/sea trout are, however, listed as a SBL priority species, and, like other salmonids, act as an important vector for the upstream migration of freshwater pearl mussel.

### European eel

The population of European eels has diminished by approximately 95% within the past 30 years, largely to the exploitation of juvenile eels (glass eels, elvers, and yellow eels) and consequently, appropriate legislation has been designed to reverse this trend. In 2007 the European Commission implemented Council Regulation (EC) No 1100/2007 to establish measures for the recovery of the stock of European eel, requiring member states to construct Eel management plans, limiting the exploitation of eels and maximising the migration capacity of rivers for eel. Eels are also listed in Appendix II of CITES and listed as a SBL priority species.

### River lamprey (*Lampetra fluviatilis*)

River lamprey are protected under Annexes II and V of the EU Habitats Directive, Appendix III of the Bern Convention, and are on the UKBAP Priority List. River lamprey migrate up rivers to spawn between April and May, sharing similar spawning habitat to salmonids.

### **Brook lamprey (*Lampetra planeri*)**

Brook lamprey are protected under Annex II of the EU Habitats Directive and Appendix III of the Bern Convention. Brook lamprey are the smallest of our native lamprey species, and unlike other lamprey they do not feed during their adult phase. Brook lamprey are entirely freshwater, although upstream/downstream migration within the river do occur. The metamorphosed adults migrate upstream in the autumn where they remain until spring, ready to spawn in nests created in gravel beds, similar to that used by salmonids (Maitland, 2003). Once hatched the ammocoete (larvae) drift down stream to burrow in silty sand and remain in the area for approximately six years (Maitland, 2003).

### **Sea lamprey (*Petromyzon marinus*)**

Sea lamprey are protected under Annex II of the EU Habitats Directive Appendix III of the Bern Convention and are on the UKBAP Priority List. Sea lamprey are the largest of the UKs native lamprey species and migrate up rivers to spawn spring and early summer after up to two years feeding parasitically at sea on marine fish. Sea lamprey spawn in gravel/cobble substrates, similar to that of salmonids (Maitland, 2003).

### **Freshwater pearl mussel**

Freshwater pearl mussel (FWPM) are given full protection under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended), making it an offence to intentionally or recklessly:

- kill, injure or take a wild invertebrate listed on Schedule 5;
- damage, destroy or obstruct access to any structure or place which such an animal uses for shelter or protection; and
- disturb such an animal when it is occupying a structure or place for that purpose.

It is also an offence to:

- possess or control, sell, offer for sale or possess or transport for the purpose of sale any live or dead invertebrate listed on Schedule 5 or any derivative of such an animal; and
- Knowingly causing or permitting any of the above acts to be carried out is also an offence.

## C PHOTOGRAPHS



Photograph 1: Vegetated banks along River Don in downstream section surveyed



Photograph 2: Vegetated banks continuing in upstream section surveyed



Photograph 3: Small gravel and pebble area at 500m downstream of site



Photograph 4: Large boulders which alter natural flow of River Don

# **D FISH HABITAT ASSESSMENT SURVEY FORMS**

**SFCC GENERAL ELECTROFISHING HABITAT SURVEY**

Eastings: 381582    Northing: 815444    Site code: K001    Date: 18/10/23

Widths (m)	At	Wet width	Bed width	Bank width
A - Upst.	0 metres	30	30	40
B	20m	25	25	40
C	40m	25	25	40
D	60m	22	22	35
E	80m	23	23	35
F	100m	23	23	35
G				
H				
I				
J - Downst.				

Site length (m): 100

Depths (cm)	<10	11-20	21-30	31-40	41-50	>50
Percent	0	0	20	30	20	30

Substrate	HO	SI	SA	GR	PE	CO	BO	BE	OB
Percent	0	0	30	60	10	0	0	0	0

[Definitions: HO v. fine org. matter; SI inorg. indiv. part. invisible; SA inorg. part. ≤2mm; GR inorg. part 2-16mm; PE inorg. part 16-64mm; CO inorg. part 64-256mm; BO inorg. part >256mm; BE cont. rock surface; OB wood barrels etc; cannot move]

Instream veg %: 0    Silted?: Y / (N)    Substrate: Stable / Unstable & Compacted / Partly / Uncompacted

Substrate Notes:

Flow	SM	DP	SP	DG	SG	RU	RI	TO
Percent	5	0	5	40	20	30	0	0

[Definitions: SM <10cm, still/eddy; smooth ap., silent; DP ≥30cm, slow/eddy, smooth ap., silent; SP <30cm, slow/eddy, smooth ap., silent; DG ≥30cm, mod/fast, smooth ap., silent; SG <30cm, mod/fast, smooth ap., silent; RU fast, unbroken waves, silent; RI fast, broken waves, audible; TO white water, noisy, substrate invisible]

Flow Speed m/s: 5    Flow Notes: slow flow

Bankside (%)	UC	DR	BA	MA	RT	RK	OTH
Left Bank	0	50	0	50	0	0	0
Right Bank	0	50	3	47	0	0	0

[Definitions: UC undercut banks; DR vegetation rooted in riparian zone, branch/leaves touch or almost touch surface; BA no cover or fish can't get to cover due to lack of water; MA veg rooted in stream bed/bank, excl. fully aquatic veg; RT cover provided by exposed roots; RK cover from rocks within bank structure; OTH other bankside cover.]

Total LB fish cover: 100 %    Total RB fish cover: 97 %

LB bankface veg: Bare / Uniform / Simple / Complex    RB bankface veg: Bare / Uniform / Simple / Complex

LB banktop veg: Bare / Uniform / Simple / Complex    RB banktop veg: Bare / Uniform / Simple / Complex

LB Overhang Boughs: 0 %    RB Overhang Boughs: 2 %    Canopy cover: 3 %

Bankside Notes: Crosses river bankface & create an eddy side

Landuse: (AR) / BL / CP / FW / GA / IG / IN / MH / NC / OR / OW / RD / RP / RS / SC / SU / TH / TL / WL

Team leader:    No. Staff:    Purpose: Inv / M / MSt / C / SAC / WFD / FI / Oth

Purpose Notes:

Equipment Type: BACK / GEN    Volts:    Amps: SMOOTH / PULSED

Manufacturer:    Model:    No. Anodes:    Ring diam.: cm

Stop Net: UP / DO / BO / NO    Capture Nets: HAND / BAN / OTH / COM    Effective fishing?: Y / N

Cond: μScm<sup>-1</sup>    Temp: °C    Time:    Water Level/Clarity: LO / ME / HI & CLR / COL

Survey Notes:

Salmon Access?: (Y) / N / S / ?    Trout Access?: (Y) / N / S / ?    Pollution?: Y / (N)

Access Notes:

Pollution Notes:

Stocking?: Y / (N) / ?    Salmon Stocked?: Y / (N) / ?    Trout Stocked?: Y / (N) / ?

Stocking Notes:

Photos & Ids?: (Y) / N



**SFCC GENERAL ELECTROFISHING HABITAT SURVEY**

Eastings: 381505      Northing: 815382      Site code: K002      Date: 18/10/23

Widths (m)	At	Wet width	Bed width	Bank width
A - Upst.	0 metres	24	24	40
B	20m	23	23	40
C	40m	22	22	40
D	60m	24	24	40
E	80m	27	27	40
F	100m	30	30	40
G				
H				
I				
J - Downst.				

Site length (m):  
100

Depths (cm)	<10	11-20	21-30	31-40	41-50	>50
Percent	0	0	0	30	30	40

Substrate	HO	SI	SA	GR	PE	CO	BO	BE	OB
Percent	0	10	10	30	35	10	5	0	0

[Definitions: HO v. fine org. matter; SI inorg. indiv. part. invisible; SA inorg. part. ≤2mm; GR inorg. part 2-16mm; PE inorg. part 16-64mm; CO inorg. part 64-256mm; BO inorg. part >256mm; BE cont. rock surface; OB wood barrels etc; cannot move]

Instream veg %: 0      Silted?: Y / N      Substrate: Stable / Unstable & Compacted / Partly / Uncompacted

Substrate Notes:

Flow	SM	DP	SP	DG	SG	RU	RI	TO
Percent	5	0	0	30	15	60	0	0

[Definitions: SM <10cm, still/eddy; smooth ap., silent; DP ≥30cm, slow/eddy, smooth ap., silent; SP <30cm, slow/eddy, smooth ap., silent; DG ≥30cm, mod/fast, smooth ap., silent; SG <30cm, mod/fast, smooth ap., silent; RU fast, unbroken waves, silent; RI fast, broken waves, audible; TO white water, noisy, substrate invisible]

Flow Speed m/s: 5      Flow Notes: Slow

Bankside (%)	UC	DR	BA	MA	RT	RK	OTH
Left Bank	0	50	0	50	0	0	0
Right Bank	0	50	0	50	0	0	0

[Definitions: UC undercut banks; DR vegetation rooted in riparian zone, branch/leaves touch or almost touch surface; BA no cover or fish can't get to cover due to lack of water; MA veg rooted in stream bed/bank, excl. fully aquatic veg; RT cover provided by exposed roots; RK cover from rocks within bank structure; OTH other bankside cover.]

Total LB fish cover: 100 %      Total RB fish cover: 100 %

LB bankface veg: Bare / Uniform / Simple / Complex      RB bankface veg: Bare / Uniform / Simple / Complex  
 LB banktop veg: Bare / Uniform / Simple / Complex      RB banktop veg: Bare / Uniform / Simple / Complex  
 LB Overhang Boughs: 0 %      RB Overhang Boughs: 0 %      Canopy cover: 0 %

Bankside Notes: Grasses either side of arable fields on banktop

Landuse: AR / BL / CP / FW / GA / IG / IN / MH / NC / OR / OW / RD / RP / RS / SC / SU / TH / TL / WL

Team leader:      No. Staff:      Purpose: Inv / M / MSt / C / SAC / WFD / FI / Oth

Purpose Notes:

Equipment Type: BACK / GEN      Volts:      Amps: SMOOTH / PULSED

Manufacturer:      Model:      No. Anodes:      Ring diam.: cm

Stop Net: UP / DO / BO / NO      Capture Nets: HAND / BAN / OTH / COM      Effective fishing?: Y / N

Cond: μScm<sup>-1</sup>      Temp: °C      Time:      Water Level/Clarity: LO / ME / HI & CLR / COL

Survey Notes:

Salmon Access?: Y / N / S / ?      Trout Access?: Y / N / S / ?      Pollution?: Y / N

Access Notes: very steep banks access difficult + very deep

Pollution Notes:

Stocking?: Y / N / ?      Salmon Stocked?: Y / N / ?      Trout Stocked?: Y / N / ?

Stocking Notes:

Photos & Ids?: Y / N

**SFCC GENERAL ELECTROFISHING HABITAT SURVEY**

Eastings: 381417    Northing: 815330    Site code: K003    Date: 18/10/23

Widths (m)	At	Wet width	Bed width	Bank width
A - Upst.	0 metres	24	24	40
B	20m	22	22	40
C	40m	22	22	40
D	60m	18	18	40
E	80m	20	20	40
F	100m	24	24	40
G				
H				
I				
J - Downst.				

Site length (m):  
100

Depths (cm)	<10	11-20	21-30	31-40	41-50	>50
Percent	10	10	10	20	20	30

Substrate	HO	SI	SA	GR	PE	CO	BO	BE	OB
Percent	0	10	10	30	35	10	5	0	0

[Definitions: HO v. fine org. matter; SI inorg. indiv. part. invisible; SA inorg. part. ≤2mm; GR inorg. part 2-16mm; PE inorg. part 16-64mm; CO inorg. part 64-256mm; BO inorg. part >256mm; BE cont. rock surface; OB wood barrels etc; cannot move]

Instream veg %: 0    Silted?: Y / N    Substrate: Stable / Unstable & Compacted / Partly / Uncompacted

Substrate Notes: BO = Bankside + tipped in 100m to stop erosion.

Flow	SM	DP	SP	DG	SG	RU	RI	TO
Percent	5	0	0	30	15	60	0	0

[Definitions: SM <10cm, still/eddy; smooth ap., silent; DP ≥30cm, slow/eddy, smooth ap., silent; SP <30cm, slow/eddy, smooth ap., silent; DG ≥30cm, mod/fast, smooth ap., silent; SG <30cm, mod/fast, smooth ap., silent; RU fast, unbroken waves, silent; RI fast, broken waves, audible; TO white water, noisy, substrate invisible]

Flow Speed m/s: 5    Flow Notes: slow-mod

Bankside (%)	UC	DR	BA	MA	RT	RK	OTH
Left Bank	0	90	0	10	0	0	0
Right Bank	0	90	0	10	0	0	0

[Definitions: UC undercut banks; DR vegetation rooted in riparian zone, branch/leaves touch or almost touch surface; BA no cover or fish can't get to cover due to lack of water; MA veg rooted in stream bed/bank, excl. fully aquatic veg; RT cover provided by exposed roots; RK cover from rocks within bank structure; OTH other bankside cover.]

Total LB fish cover: 100 %    Total RB fish cover: 100 %

LB bankface veg: Bare / Uniform / Simple / Complex	RB bankface veg: Bare / Uniform / Simple / Complex
LB banktop veg: Bare / Uniform / Simple / Complex	RB banktop veg: Bare / Uniform / Simple / Complex
LB Overhang Boughs: 0 %	RB Overhang Boughs: 0 %    Canopy cover: 0 %
Bankside Notes: Grass on banks, arable fields adjacent	
Landuse: AR / BL / CP / FW / GA / IG / IN / MH / NC / OR / OW / RD / RP / RS / SC / SU / TH / TL / WL	

Team leader:	No. Staff:	Purpose: Inv / M / MSt / C / SAC / WFD / FI / Oth.
Purpose Notes:		
Equipment Type: BACK / GEN	Volts:	Amps: SMOOTH / PULSED
Manufacturer:	Model:	No. Anodes:    Ring diam.: cm
Stop Net: UP / DO / BO / NO	Capture Nets: HAND / BAN / OTH / COM	Effective fishing?: Y / N
Cond: μScm <sup>-1</sup>	Temp: °C	Time:    Water Level/Clarity: LO / ME / HI & CLR / COL
Survey Notes:		

Salmon Access?: Y / N / S / ?    Trout Access?: Y / N / S / ?    Pollution?: Y / N

Access Notes:

Pollution Notes:

Stocking?: Y / N / ?    Salmon Stocked?: Y / N / ?    Trout Stocked?: Y / N / ?

Stocking Notes: Deeper walk at sections

Photos & Ids?: Y / N

# SFCC GENERAL ELECTROFISHING HABITAT SURVEY

Eastings: 381325      Northing: 815324      Site code: K004      Date: 18/10/23

Widths (m)	At	Wet width	Bed width	Bank width
A - Upst.	0 metres	18m	18m	40m
B	20m	20m	20m	40m
C	40m	22m	22m	40m
D	60m	22m	22m	40m
E	80m	22m	22m	40m
F	100m	24m	24m	40m
G				
H				
I				
J - Downst.				

Site length (m):  
100m

Depths (cm)	<10	11-20	21-30	31-40	41-50	>50
Percent	0	0	0	0	30	70

Substrate	HO	SI	SA	GR	PE	CO	BO	BE	OB
Percent	0	20	10	20	20	10	20	0	0

**Definitions:** HO v. fine org. matter; SI inorg. indiv. part. invisible; SA inorg. part. ≤2mm; GR inorg. part 2-16mm; PE inorg. part 16-64mm; CO inorg. part 64-256mm; BO inorg. part >256mm; BE cont. rock surface; OB wood barrels etc; cannot move

Instream veg %: 0      Silted?:  / N      Substrate: Stable / Unstable & Compacted / Partly / Uncompacted

Substrate Notes: BO = Bankside + tipped in rocks to stop erosion.

Flow	SM	DP	SP	DG	SG	RU	RI	TO
Percent	10	0	0	50	10	50	5	0

**Definitions:** SM <10cm, still/eddy; smooth ap., silent; DP ≥30cm, slow/eddy, smooth ap., silent; SP <30cm, slow/eddy, smooth ap., silent; DG ≥30cm, mod/fast, smooth ap., silent; SG <30cm, mod/fast, smooth ap., silent; RU fast, unbroken waves, silent; RI fast, broken waves, audible; TO white water, noisy, substrate invisible

Flow Speed m/s: 5      Flow Notes: S-m

Bankside (%)	UC	DR	BA	MA	RT	RK	OTH
Left Bank	0	0	0	50	0	0	0
Right Bank	0	50	0	50	0	0	0

**Definitions:** UC undercut banks; DR vegetation rooted in riparian zone, branch/leaves touch or almost touch surface; BA no cover or fish can't get to cover due to lack of water; MA veg rooted in stream bed/bank, excl. fully aquatic veg; RT cover provided by exposed roots; RK cover from rocks within bank structure; OTH other bankside cover.]

Total LB fish cover: 100%      Total RB fish cover: 100%

LB bankface veg: Bare / Uniform / Simple / Complex      RB bankface veg: Bare / Uniform / Simple / Complex  
 LB banktop veg: Bare / Uniform / Simple / Complex      RB banktop veg: Bare / Uniform / Simple / Complex  
 LB Overhang Boughs: 0%      RB Overhang Boughs: 0%      Canopy cover: 0%

Bankside Notes: above field river side

Landuse: (AR) / BL / CP / FW / GA / IG / IN / MH / NC / OR / OW / RD / RP / RS / SC / SU / TH / TL / WL

Team leader:      No. Staff:      Purpose: Inv / M / MSt / C / SAC / WFD / FI / Oth

Purpose Notes:

Equipment Type: BACK / GEN      Volts:      Amps: SMOOTH / PULSED

Manufacturer:      Model:      No. Anodes:      Ring diam.: cm

Stop Net: UP / DO / BO / NO      Capture Nets: HAND / BAN / OTH / COM      Effective fishing?: Y / N

Cond: μScm<sup>-1</sup>      Temp: °C      Time:      Water Level/Clarity: LO / ME / HI & CLR / COL

Survey Notes:

Salmon Access?:  / N / S / ?      Trout Access?:  / N / S / ?      Pollution?: Y /  N

Access Notes: deep water not good access

Pollution Notes:

Stocking?: Y /  N / ?      Salmon Stocked?: Y /  N / ?      Trout Stocked?: Y /  N / ?

Stocking Notes:

Photos & Ids?:  / N

**SFCC GENERAL ELECTROFISHING HABITAT SURVEY**

Eastings: 381238      Northing: 815331      Site code: K005      Date: 1P110125

Widths (m)	At	Wet width	Bed width	Bank width
A - Upst.	0 metres	20m	20m	40m
B	20m	20m	20m	40m
C	40m	23m	23m	40m
D	60m	25m	25m	40m
E	80m	20m	20m	60m
F	100m	18m	18m	40m
G				
H				
I				
J - Downst.				

Site length (m):  
100m

Depths (cm)	<10	11-20	21-30	31-40	41-50	>50
Percent	5	5	5	10	25	50

Substrate	HO	SI	SA	GR	PE	CO	BO	BE	OB
Percent	0	10	30	30	0	10	10	0	0

[Definitions: HO v. fine org. matter; SI inorg. indiv. part. invisible; SA inorg. part. ≤2mm; GR inorg. part 2-16mm; PE inorg. part 16-64mm; CO inorg. part 64-256mm; BO inorg. part >256mm; BE cont. rock surface; OB wood barrels etc; cannot move]

Instream veg %: 5      Silted?:  N      Substrate: Stable / Unstable & Compacted / Partly / Uncompacted

Substrate Notes: *Ranunculus in watercourse*

Flow	SM	DP	SP	DG	SG	RU	RI	TO
Percent	5	0	0	30	30	35	0	0

[Definitions: SM <10cm, still/eddy; smooth ap., silent; DP ≥30cm, slow/eddy, smooth ap., silent; SP <30cm, slow/eddy, smooth ap., silent; DG ≥30cm, mod/fast, smooth ap., silent; SG <30cm, mod/fast, smooth ap., silent; RU fast, unbroken waves, silent; RI fast, broken waves, audible; TO white water, noisy, substrate invisible]

Flow Speed m/s: 5      Flow Notes: *slow*

Bankside (%)	UC	DR	BA	MA	RT	RK	OTH
Left Bank	0	45	5	50	0	0	0
Right Bank	0	48	2	50	0	0	0

[Definitions: UC undercut banks; DR vegetation rooted in riparian zone, branch/leaves touch or almost touch surface; BA no cover or fish can't get to cover due to lack of water; MA veg rooted in stream bed/bank, excl. fully aquatic veg; RT cover provided by exposed roots; RK cover from rocks within bank structure; OTH other bankside cover.]

Total LB fish cover: 95 %      Total RB fish cover: 98 %

LB bankface veg: Bare / Uniform / Simple / Complex      RB bankface veg: Bare / Uniform / Simple / Complex  
 LB banktop veg: Bare / Uniform / Simple / Complex      RB banktop veg: Bare / Uniform / Simple / Complex  
 LB Overhang Boughs: 0 %      RB Overhang Boughs: 2 %      Canopy cover: 2 %

Bankside Notes:  
 Landuse: AR / BL / CP / FW / GA / IG / IN / MH / NC / OR / OW / RD / RP / RS / SC / SU / TH / TL / WL

Team leader:      No. Staff:      Purpose: Inv / M / MSt / C / SAC / WFD / FI / Oth

Purpose Notes:

Equipment Type: BACK / GEN      Volts:      Amps: SMOOTH / PULSED

Manufacturer:      Model:      No. Anodes:      Ring diam.: cm

Stop Net: UP / DO / BO / NO      Capture Nets: HAND / BAN / OTH / COM      Effective fishing?: Y / N

Cond:  $\mu\text{Scm}^{-1}$       Temp: °C      Time:      Water Level/Clarity: LO / ME / HI & CLR / COL

Survey Notes:

Salmon Access?:  / N / S / ?      Trout Access?:  / N / S / ?      Pollution?: Y /  / N

Access Notes:

Pollution Notes:

Stocking?: Y /  / N / ?      Salmon Stocked?: Y /  / N / ?      Trout Stocked?: Y /  / N / ?

Stocking Notes:

Photos & Ids?:  / N

**SFCC GENERAL ELECTROFISHING HABITAT SURVEY**

Eastings: 381174    Northing: 815255    Site code: K006    Date: 18/10/23

Widths (m)	At	Wet width	Bed width	Bank width
A - Upst.	0 metres	20m	20m	40m
B	20m	23m	23m	40m
C	40m	23m	23m	40m
D	60m	25m	25m	40m
E	80m	25m	25m	40m
F	100m	20m	20m	40m
G				
H				
I				
J - Downst.				

Site length (m):  
100m

Depths (cm)	<10	11-20	21-30	31-40	41-50	>50
Percent	15	20	15	15	15	20

Substrate	HO	SI	SA	GR	PE	CO	BO	BE	OB
Percent	0	0	10	10	30	30	20	0	0

[Definitions: HO v. fine org. matter; SI inorg. indiv. part. invisible; SA inorg. part. ≤2mm; GR inorg. part. 2-16mm; PE inorg. part 16-64mm; CO inorg. part 64-256mm; BO inorg. part >256mm; BE cont. rock surface; OB wood barrels etc; cannot move]

Instream veg %: 5    Silted?: Y / (N)    Substrate: Stable / Unstable & Compacted / Partly / Uncompacted

Substrate Notes: Ranunculus in stream

Flow	SM	DP	SP	DG	SG	RU	RI	TO
Percent	5	10	5	20	10	40	10	0

[Definitions: SM <10cm, still/eddy; smooth ap., silent; DP ≥30cm, slow/eddy, smooth ap., silent; SP <30cm, slow/eddy, smooth ap., silent; DG ≥30cm, mod/fast, smooth ap., silent; SG <30cm, mod/fast, smooth ap., silent; RU fast, unbroken waves, silent; RI fast, broken waves, audible; TO white water, noisy, substrate invisible]

Flow Speed m/s: m    Flow Notes: moderate

Bankside (%)	UC	DR	BA	MA	RT	RK	OTH
Left Bank	0	30	20	15	0	20	0
Right Bank	0	90	0	10	0	2	0

[Definitions: UC undercut banks; DR vegetation rooted in riparian zone, branch/leaves touch or almost touch surface; BA no cover or fish can't get to cover due to lack of water; MA veg rooted in stream bed/bank, excl. fully aquatic veg; RT cover provided by exposed roots; RK cover from rocks within bank structure; OTH other bankside cover.]

Total LB fish cover: 80%    Total RB fish cover: 90%

LB bankface veg: Bare / Uniform / Simple / Complex    RB bankface veg: Bare / Uniform / Simple / Complex

LB banktop veg: Bare / Uniform / Simple / Complex    RB banktop veg: Bare / Uniform / Simple / Complex

LB Overhang Boughs: 0%    RB Overhang Boughs: 2%    Canopy cover: 2%

Bankside Notes: arable fields  
Landuse: (A) / BL / CP / FW / GA / IG / IN / MH / NC / OR / OW / RD / RP / RS / SC / SU / TH / TL / WL

Team leader:    No. Staff:    Purpose: Inv / M / MSt / C / SAC / WFD / FI / Oth

Purpose Notes:

Equipment Type: BACK / GEN    Volts:    Amps: SMOOTH / PULSED

Manufacturer:    Model:    No. Anodes:    Ring diam.: cm

Stop Net: UP / DO / BO / NO    Capture Nets: HAND / BAN / OTH / COM    Effective fishing?: Y / N

Cond: μScm<sup>-1</sup>    Temp: °C    Time:    Water Level/Clarity: LO / ME / HI & CLR / COL

Survey Notes:

Salmon Access?: (Y) / N / S / ?    Trout Access?: (Y) / N / S / ?    Pollution?: Y / (N)

Access Notes:

Pollution Notes:

Stocking?: Y / (N) / ?    Salmon Stocked?: Y / (N) / ?    Trout Stocked?: Y / (N) / ?

Stocking Notes:

Photos & Ids?: (Y) / N

**SFCC GENERAL ELECTROFISHING HABITAT SURVEY**

Eastings: 381117      Northing: 815198      Site code: k007      Date: 18/10/23

Widths (m)	At	Wet width	Bed width	Bank width
A - Upst.	0 metres	24m	24m	40m
B	20m	24m	24m	40m
C	40m	27m	27m	40m
D	60m	25m	25m	40m
E	80m	20m	20m	40m
F	100m	20m	20m	40m
G				
H				
I				
J - Downst.				

Site length (m): 100m

Depths (cm)	<10	11-20	21-30	31-40	41-50	>50
Percent	5	10	10	25	25	25

Substrate	HO	SI	SA	GR	PE	CO	BO	BE	OB
Percent	0	10	15	20	20	30	15	0	0

[Definitions: HO v. fine org. matter; SI inorg. indiv. part. invisible; SA inorg. part. ≤2mm; GR inorg. part 2-16mm; PE inorg. part 16-64mm; CO inorg. part 64-256mm; BO inorg. part >256mm; BE cont. rock surface; OB wood barrels etc; cannot move]

Instream veg %: 10      Silted?: (Y) / N      Substrate: Stable / Unstable & Compacted / Partly / Uncompacted  
 Substrate Notes: Ranunculus

Flow	SM	DP	SP	DG	SG	RU	RI	TO
Percent	10	0	0	20	20	50	0	0

[Definitions: SM <10cm, still/eddy; smooth ap., silent; DP ≥30cm, slow/eddy, smooth ap., silent; SP <30cm, slow/eddy, smooth ap., silent; DG ≥30cm, mod/fast, smooth ap., silent; SG <30cm, mod/fast, smooth ap., silent; RU fast, unbroken waves, silent; RI fast, broken waves, audible; TO white water, noisy, substrate invisible]

Flow Speed m/s: mod      Flow Notes: moderate

Bankside (%)	UC	DR	BA	MA	RT	RK	OTH
Left Bank	0	40	20	20	0	20	0
Right Bank	0	50	5	40	0	5	0

[Definitions: UC undercut banks; DR vegetation rooted in riparian zone, branch/leaves touch or almost touch surface; BA no cover or fish can't get to cover due to lack of water; MA veg rooted in stream bed/bank, excl. fully aquatic veg; RT cover provided by exposed roots; RK cover from rocks within bank structure; OTH other bankside cover.]

Total LB fish cover: 60 %      Total RB fish cover: 90 %

LB bankface veg: Bare / Uniform / (Simple) / Complex      RB bankface veg: Bare / Uniform / Simple / Complex  
 LB banktop veg: Bare / Uniform / Simple / Complex      RB banktop veg: Bare / Uniform / Simple / Complex  
 LB Overhang Boughs: 3 %      RB Overhang Boughs: 0 %      Canopy cover: 3 %  
 Bankside Notes: arable fields  
 Landuse: (AR) / BL / CP / FW / GA / IG / IN / MH / NC / OR / OW / RD / RP / RS / SC / SU / TH / TL / WL

Team leader:      No. Staff:      Purpose: Inv / M / MSt / C / SAC / WFD / FI / Oth  
 Purpose Notes:  
 Equipment Type: BACK / GEN      Volts:      Amps: SMOOTH / PULSED  
 Manufacturer:      Model:      No. Anodes:      Ring diam.: cm  
 Stop Net: UP / DO / BO / NO      Capture Nets: HAND / BAN / OTH / COM      Effective fishing?: Y / N  
 Cond: μScm<sup>-1</sup>      Temp: °C      Time:      Water Level/Clarity: LO / ME / HI & CLR / COL  
 Survey Notes:

Salmon Access?: (Y) / N / S / ?      Trout Access?: (Y) / N / S / ?      Pollution?: Y / (N)  
 Access Notes:  
 Pollution Notes:  
 Stocking?: Y / (N) / ?      Salmon Stocked?: Y / (N) / ?      Trout Stocked?: Y / (N) / ?  
 Stocking Notes:  
 Photos & Ids?: (Y) / N

**SFCC GENERAL ELECTROFISHING HABITAT SURVEY**

Eastings: 381037      Northing: 815203      Site code: 100?      Date: 18/10/23

Widths (m)	At	Wet width	Bed width	Bank width
A - Upst.	0 metres	25	25m	40m
B	20m	18m	30m	40m
C	40m	15m	30m	40m
D	60m	20m	26m	40m
E	80m	22m	22m	40m
F	100m	24m	24m	40m
G				
H				
I				
J - Downst.				

Site length (m):  
100

Depths (cm)	<10	11-20	21-30	31-40	41-50	>50
Percent	0	10	10	20	30	30

Substrate	HO	SI	SA	GR	PE	CO	BO	BE	OB
Percent	0	15	15	20	15	15	20	0	0

**Definitions:** HO v. fine org. matter; SI inorg. indiv. part. invisible; SA inorg. part. ≤2mm; GR inorg. part 2-16mm; PE inorg. part 16-64mm; CO inorg. part 64-256mm; BO inorg. part >256mm; BE cont. rock surface; OB wood barrels etc; cannot move]

Instream veg %: 10      Silted?:  Y /  N      Substrate: Stable / Unstable & Compacted / Partly / Uncompacted

Substrate Notes: *Runways + canalised boulders along the banks.*

Flow	SM	DP	SP	DG	SG	RU	RI	TO
Percent	10	0	0	25	20	45	0	0

**Definitions:** SM <10cm, still/eddy; smooth ap., silent; DP ≥30cm, slow/eddy, smooth ap., silent; SP <30cm, slow/eddy, smooth ap., silent; DG ≥30cm, mod/fast, smooth ap., silent; SG <30cm, mod/fast, smooth ap., silent; RU fast, unbroken waves, silent; RI fast, broken waves, audible; TO white water, noisy, substrate invisible]

Flow Speed m/s:      Flow Notes:

Bankside (%)	UC	DR	BA	MA	RT	RK	OTH
Left Bank	0	53	5	35	2	5	0
Right Bank	0	50	20	30	0	0	0

**Definitions:** UC undercut banks; DR vegetation rooted in riparian zone, branch/leaves touch or almost touch surface; BA no cover or fish can't get to cover due to lack of water; MA veg rooted in stream bed/bank, excl. fully aquatic veg; RT cover provided by exposed roots; RK cover from rocks within bank structure; OTH other bankside cover.]

Total LB fish cover: 95%      Total RB fish cover: 80%

LB bankface veg: Bare / Uniform / Simple / Complex      RB bankface veg: Bare / Uniform / Simple / Complex

LB banktop veg: Bare / Uniform / Simple / Complex      RB banktop veg: Bare / Uniform / Simple / Complex

LB Overhang Boughs: 2%      RB Overhang Boughs: 0%      Canopy cover: 2%

Bankside Notes:

Landuse: AR / BL / CP / FW / GA / IG / IN / MH / NC / OR / OW / RD / RP / RS / SC / SU / TH / TL / WL

Team leader:      No. Staff:      Purpose: Inv / M / MSt / C / SAC / WFD / FI / Oth

Purpose Notes:

Equipment Type: BACK / GEN      Volts:      Amps: SMOOTH / PULSED

Manufacturer:      Model:      No. Anodes:      Ring diam.: cm

Stop Net: UP / DO / BO / NO      Capture Nets: HAND / BAN / OTH / COM      Effective fishing?: Y / N

Cond: μScm<sup>-1</sup>      Temp: °C      Time:      Water Level/Clarity: LO / ME / HI & CLR / COL

Survey Notes:

Salmon Access?:  Y /  N /  S / ?      Trout Access?:  Y /  N /  S / ?      Pollution?:  Y /  N

Access Notes:

Pollution Notes:

Stocking?: Y /  N / ?      Salmon Stocked?: Y /  N / ?      Trout Stocked?: Y /  N / ?

Stocking Notes:

Photos & Ids?:  Y /  N

**SFCC GENERAL ELECTROFISHING HABITAT SURVEY**

Easting: 380959 Northing: 815268 Site code: K009 Date: 18/10/23

Widths (m)	At	Wet width	Bed width	Bank width
A - Upst.	0 metres	30m	30m	40m
B	20m	25m	25m	40m
C	40m	18m	18m	40m
D	60m	20m	20m	40m
E	80m	22m	22m	40m
F	100m	25m	25m	40m
G				
H				
I				
J - Downst.				

Site length (m): 100m

Depths (cm)	<10	11-20	21-30	31-40	41-50	>50
Percent	0	0	10	20	25	45

Substrate	HO	SI	SA	GR	PE	CO	BO	BE	OB
Percent	0	15	20	30	10	15	10	0	0

[Definitions: HO v. fine org. matter; SI inorg. indiv. part. invisible; SA inorg. part. ≤2mm; GR inorg. part 2-16mm; PE inorg. part 16-64mm; CO inorg. part 64-256mm; BO inorg. part >256mm; BE cont. rock surface; OB wood barrels etc; cannot move]

Instream veg %: 0 Silted?: Y/N Substrate: Stable / Unstable & Compacted / Partly / Uncompacted

Substrate Notes:

Flow	SM	DP	SP	DG	SG	RU	RI	TO
Percent	0	5	0	25	15	55	0	0

[Definitions: SM <10cm, still/eddy; smooth ap., silent; DP ≥30cm, slow/eddy, smooth ap., silent; SP <30cm, slow/eddy, smooth ap., silent; DG ≥30cm, mod/fast, smooth ap., silent; SG <30cm, mod/fast, smooth ap., silent; RU fast, unbroken waves, silent; RI fast, broken waves, audible; TO white water, noisy, substrate invisible]

Flow Speed m/s: nxd Flow Notes: moderate

Bankside (%)	UC	DR	BA	MA	RT	RK	OTH
Left Bank	0	35	55	10	0	0	0
Right Bank	0	70	5	30	0	5	0

[Definitions: UC undercut banks; DR vegetation rooted in riparian zone, branch/leaves touch or almost touch surface; BA no cover or fish can't get to cover due to lack of water; MA veg rooted in stream bed/bank, excl. fully aquatic veg; RT cover provided by exposed roots; RK cover from rocks within bank structure; OTH other bankside cover.]

Total LB fish cover: 65% Total RB fish cover: 95%

LB bankface veg: Bare / Uniform / Simple / Complex	RB bankface veg: Bare / Uniform / Simple / Complex	
LB banktop veg: Bare / Uniform / Simple / Complex	RB banktop veg: Bare / Uniform / Simple / Complex	
LB Overhang Boughs: 0%	RB Overhang Boughs: 0%	Canopy cover: 0%
Bankside Notes: arable fields		
Landuse: AR / BL / CP / FW / GA / IG / IN / MH / NC / OR / OW / RD / RP / RS / SC / SU / TH / TL / WL		

Team leader:	No. Staff:	Purpose: Inv / M / MSt / C / SAC / WFD / FI / Oth
Purpose Notes:		
Equipment Type: BACK / GEN	Volts:	Amps: SMOOTH / PULSED
Manufacturer:	Model:	No. Anodes: Ring diam.: cm
Stop Net: UP / DO / BO / NO	Capture Nets: HAND / BAN / OTH / COM	Effective fishing?: Y / N
Cond: μScm <sup>-1</sup>	Temp: °C	Time: Water Level/Clarity: LO / ME / HI & CLR / COL

Survey Notes:

Salmon Access?: Y/N/S/? Trout Access?: Y/N/S/? Pollution?: Y/N

Access Notes:

Pollution Notes:

Stocking?: Y/N/? Salmon Stocked?: Y/N/? Trout Stocked?: Y/N/?

Stocking Notes:

Photos & Ids?: Y/N