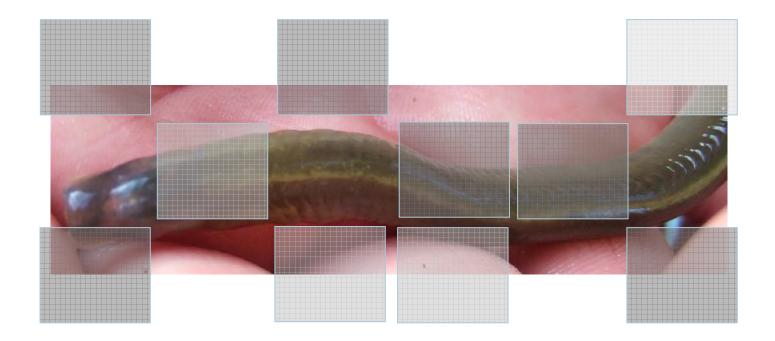


Lamprey Survey - River Almond and East Pow Burn September 2008



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1 INTRODUCTION

1.1 Background

- 1.1.1 AMEC Earth & Environmental (UK) Ltd. was contracted by Mouchel to undertake a lamprey survey in the River Almond and its tributary, East Pow Burn, within the village of Almondbank, Perthshire. The planning area of the proposed flood prevention scheme for the village of Almondbank lies within the Special Area of Conservation (SAC EU code UK0030312) of the River Tay and its two tributaries. Consequentially all planning activities within the SAC require an Environmental Impact Assessment (EIA) as governed by the European Union Directive 85/337/EEC (amended by the Council Directives 97/11/EC and 2003/35/EC) and in accordance with the Environmental Impact Assessment (Scotland) Regulations 1999.
- 1.1.2 Lampreys are an ancient group of aquatic vertebrates, often described as 'jawless fish'. The juvenile life stage remains buried in fine sediment depositions of rivers and streams. All three species of lamprey found in the United Kingdom brook lamprey (*Lampetra planeri*), river lamprey (*Lampetra fluviatilis*), and sea lamprey (*Petromyzon marinus*) are listed in Annex II and V of the EU Habitats and Species Directive (92/43/EC). Previous surveys have reported lampreys to be present in the River Tay and River Almond catchment (APEM 2004). All three of the lamprey species are listed in Annex II of the SAC description as a qualifying feature for the site selection (WEB Ref. 1). The presence of lamprey in the proposed flood defence scheme area would require an appropriate assessment of the potential effects of the design and construction activities on the lamprey population.
- 1.1.3 The aim of this study is to document the presence/absence of lampreys in the planning area of the proposed flood prevention scheme.

1.2 Ecology and Habitat Requirements of Lamprey

- 1.2.1 All three species of lamprey are found in UK rivers. The distribution of river and sea lamprey is limited to a line south of the Scottish Great Glen (Maitland & Campbell 1992). The latter are anadromous species, spawning in fresh water in spring / early summer. The freshwater larvae stage (referred to as an ammocoete) develop buried in fine sediments and filter organic particles from the surrounding interstitial space. After several years the larvae undergo a transformation process (metamorphosis); developing fully functional eyes and a mouth suction disc with teeth. Adult sea and river lamprey migrate back into the sea where they prey on smaller fish and mainly live as ectoparasites attached to larger fish with their mouth sucker.
- 1.2.2 Brook lamprey complete their entire life cycle in rivers and streams. Preferred spawning grounds are well aerated gravel beds whereas the larval stages are normally found in silt and sand dominated sediments with high organic content. This highlights the importance of a good connectivity between the habitats that lampreys require during the



different life stages, especially for the anadromous forms which migrate between freshand salt-water.

1.2.3 The larval stages of brook and river lampreys cannot be distinguished from sea lamprey larvae without laboratory analysis (Gardiner 2003). Only the brook-river lamprey group can be differentiated from sea lamprey larvae by skin pigmentation patterns and, in older larval stages, by the shape of their caudal fin.

1.3 Survey Conditions

1.3.1 The lamprey survey was carried out on 22/09/2008. Weather conditions were dry and warm with light cloud cover and temperatures around 14°C. Light showers during the week prior to the survey did not have an impact on the low water levels of the River Almond (see Figure 1 and 2 for Almondbank).

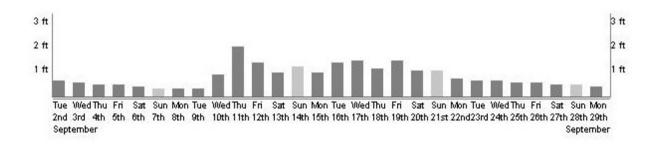


Figure 1: September water levels of the River Almond (WEB Ref. 2)

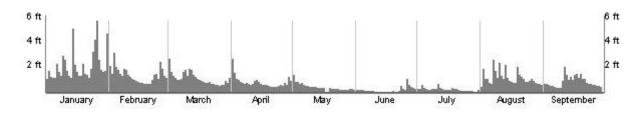


Figure 2: 2008 water levels of the River Almond (WEB Ref. 2)



2 SURVEY METHODOLOGY

2.1 Electrofishing

- 2.2.1 The survey was conducted following the recommendations by Harvey and Cowx (2003) using an Electracatch electrofishing module with 50 Hz pulsed DC power output (variable voltage). Depending on the accessibility of the survey site, a battery or generator powered electrofishing module was used (see Table 1). Both electrofishing modules were operated with a single copper cathode and a single round anode (30 cm in diameter).
- 2.2.2 Each 1 m2 sampling site was enclosed by a fine-meshed net to prevent the escape of lamprey once stunned. The predefined area was energised three times for two minutes with a pause of five minutes between each electrofishing cycle. In total five areas were surveyed (three in the River Almond, two in the East Pow Burn). Two samples were taken at each sampling station in close proximity to each other, but covering slightly different sediment types. Ammocoetes were removed from the enclosure, identified, measured and released into the river after the survey. To obtain exact length measurements of lamprey, the larvae would have required anaesthetisation. Such information was not required for this study and as such all length measurements in Appendix C are accurate to 1 cm.

2.2 Site Selection

- 2.2.1 The five sampling locations were selected during a walkover survey prior to electrofishing, which focused on fine sediment rich deposits along the River Almond and the East Pow Burn. Both rivers are discharge regulated and comprise bank and bed stabilizing measures like gabions, stone walls and concrete embankments. The embankments cause relatively homogenous flow patterns and restrict sedimentation. Consequently, few suitable habitats for ammocoetes were identified during the walkover survey. The selected sites were located in shallow areas behind gravel banks and dead wood, in wide, slowly flowing river sections (Figure 3 and Appendix B Site Photographs).
- 2.2.2 Sampling site coordinates were captured with a Garmin GPS MAP60CSx, accurate to \pm 5m.

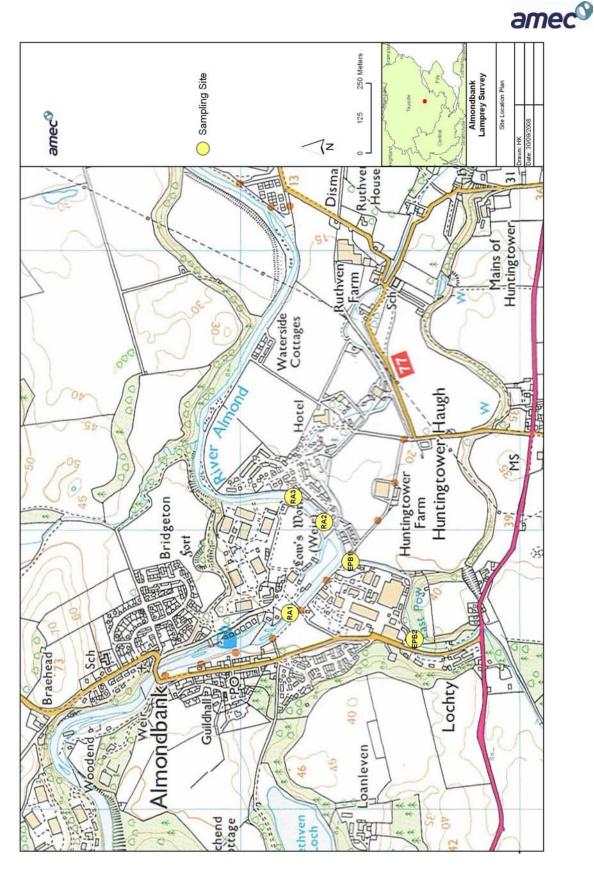


Figure 3: Sampling Locations. Two sub-samples were taken from each marked location (Ordnance Survey Copy Right Licence 100024961)



3 **RESULTS AND DISCUSSION**

Ammocoetes of river or brook lamprey (indeterminable within the field) were found in the River Almond and the East Pow Burn (Table 1).

| The sub-sa | imple was | taken withir | n a five metre distanc | e from sample no. 1. | |
|-------------------|-----------|--------------|------------------------|------------------------------------|---------------------|
| Sample ID | Easting | Northing | Battery/Generator | River/Brook | Conservation |
| | | | Powered Equip. | Lamprey Density (m ⁻²) | Status ¹ |
| River Almo | nd | | | | |
| RA1-1 | 306703 | 725821 | В | 3 | unfavourable |
| RA1-2 | | | В | 3 | unfavourable |
| RA2-1 | 307029 | 725699 | В | 0 | unfavourable |
| RA2-2 | | | В | 0 | unfavourable |
| RA3-1 | 307119 | 725809 | В | 0 | unfavourable |
| RA3-2 | | | В | 1 | unfavourable |
| East Pow B | urn | | | | |
| EPB1-1 | 306887 | 725604 | В | 0 | unfavourable |
| EPB1-2 | | | В | 0 | unfavourable |
| EPB2-1 | 306610 | 725375 | G | 4 | unfavourable |
| EPB2-2 | | | G | 10 | favourable |

Table 1: Abundance of Lampreys per Sampling Site

3.1 Site RA1

3.1.1 The site was situated ca. 40 m upstream from the footbridge across the River Almond. Low flow velocities and large deposits of coarse organic material, mainly branches and leaf material, have resulted in an optimal habitat for lamprey larvae. Three river/brook lamprey ammocoetes were found within the m2 at RA1-1 and the replicate site RA1-2 (Figure 4). The sampling site was 50% shaded by beech and willow branches (compare Appendix A – Survey Protocols).

¹ Harvey & Cowx (2003) provide a tentative abundance classification for lamprey larvae based on UK wide survey data for different stream types. Favourable conservation status for lamprey larvae (m⁻², optimal habitat): Sea lamprey 0.2, river/brook lamprey in chalk streams ≥5, in other UK stream types: river/brook lamprey ≥ 10 .





Figure 4: River/brook lamprey larvae. Left ventral, right dorsal view

3.2 Site RA2

3.2.1 RA2 was located approximately 30 m downstream from the Low's Work Weir in the River Almond. At this point emerging grass and shrub vegetation stabilises the fine sediments together with cobbles in an area of reduced flow speeds. No lamprey larvae were found at RA2-1 or RA2-2. The sampling location was only marginally shaded by overhanging willow branches.

3.3 Site RA3

3.3.1 The remaining footings of a former bridge across the River Almond at this point have resulted in fine sediment depositions and accumulations of dead wood along the left-hand bank. One river/brook lamprey larvae was found at RA3-2. RA3-1 did not reveal any lamprey larvae.

3.4 Site EPB1

3.4.1 The outfall of the East Pow Burn comprises a concrete river bed together with stone / concrete stabilised banks around the road bridge. Approximately 15 m upstream from the bridge where the bed reinforcement ends, a mixture of cobble stones and sandy sediments were sampled. Lamprey larvae were not found on either of the replicate sampling sites.

3.5 Site EPB2

3.5.1 Approximately 450 m upstream from the outfall of the East Pow Burn the river bank consists of sand and silt, stabilised by grass and cobbles. Broadleaved trees and shrubs



provide 80% shading. The two adjacent sampling sites revealed river/brook lamprey densities of four (EPB2-1) and ten larvae per m² (EPB2-2). The population density at EPB2-2 reflects a favourable conservation status for river/brook lamprey larvae according to Harvey & Cowx (2003). Although the outfall of the East Pow Burn into the River Almond is probably impassable for lampreys during medium/low water levels.

3.5.2 Figure 5 (February 2008, compare Figure 2) shows that this tributary to the River Almond is connected during high water levels, allowing adult lampreys to migrate between the two watercourses during these periods.



Figure 5: Outfall of East Pow Burn at high water level



4 SUMMARY AND RECOMMENDATIONS

- 4.1.1 During the electrofishing survey on 22/09/2008, river/brook lamprey larvae were recorded in the River Almond and East Pow Burn in the Almondbank area. Although the River Almond has relatively few suitable fine sediment habitats within the surveyed river section, ammocoetes were present at two out of the three sampling sites.
- 4.1.2 The highest river/brook lamprey densities were found in the East Pow Burn with 10 larvae per m2, representing a favourable conservation status.
- 4.1.3 The presence of the protected lamprey larvae will require special attention during the further planning and construction phases of the Almondbank flood prevention scheme, particularly as they are listed as a feature of interest within the River Tay SAC citation and will require further detailed consideration under the Conservation (Natural Habitats 7c.) Regulations 2000 and subsequent Scottish amendments.
- 4.1.4 Because lamprey larvae live buried in the river bed, they require a steady flow of fresh water through the interstitial porous space of the sediments. Construction activities like sheet piling and dewatering of the river bed and banks could have fatal consequences for the lamprey larvae. An appropriate assessment will be required in order to identify potential interference of the scheme with the lamprey habitat and provide mitigation advice.
- 4.1.5 Suitable mitigation measures should be implemented in the event that construction activities during the implementation of the flood defence scheme are likely to cause disturbance of the river sediments of the River Almond or the East Pow Burn. For example, potential habitats could be identified by a qualified biologist and lamprey larvae could then be removed from the sites using electrofishing equipment.
- 4.1.6 It is important to note that the proposed flood prevention scheme will have to consider the habitat requirements of lampreys, allowing for free passage in upstream and downstream direction (The Scottish Executive 2000) and maintain or improve the quality of the current habitat.



5 **REFERENCES**

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- 5.1.4 APEM 2004. Distribution of sea, brook and river lampreys on the River Tay. Scottish Natural.
- 5.1.5 Harvey & Cowx 2003: Monitoring the River, Brook and Sea Lamprey, *Lampetra fluviatilis, L. planeri* and *Petromyzon marinus*. Conserving Natura 2000 Rivers Monitoring Series No 5, English Nature, Peterborough.
- 5.1.6 Gardiner 2003: Identifying Lamprey. A field key for Sea, River and Brook Lamprey. Conserving Natura 2000 Rivers Conservation Techniques Series No. 4. English Nature, Peterborough.
- 5.1.7 Maitland & Campbell 1992: Freshwater Fishes of the British Isles. Harper Collins. London.
- 5.1.8 The Scottish Executive 2000: River Crossings and Migratory Fish: Design Guidance. The Scottish Executive. Edinburgh.
- 5.1.9 WEB Ref. 1: http://www.jncc.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030312
- 5.1.10 WEB Ref. 2: http://www.fishbritain.co.uk/Tay/RiverLevels14.asp



6 Appendix A – Survey Protocols

| | | | Site ł | nabita | at record | | | |
|---|--------------------------------------|--|---|---------------|--|------------------|--------------------------------|--------------|
| Site identification | | | Site c | ode 1 | 2A I | Catch | ment River A | human |
| Site name | | NGR 30 | | | r name River | | | |
| Riparian shading | | | 100/1000 | | 11104 | 1111111111 | | 20/00/ |
| What percentage of | | | urface of the | site is | overhung by rip | rian veget | ation? Estimat | e this |
| percentage, for the t | | | | | | | | |
| Deciduous trees & s | | | | erous | | | ceous vegetat | ion |
| Migratory access | | | 2 | | | | | |
| What is the accessit | oility | of the si | te ? | Salm | ion | Sea tro | out | |
| Always accessible | | | | × | | | K | |
| Sometimes accessibl | е | | | | | | | |
| Never accessible | | | | | | | | |
| Substrate embed | ded | ness | | | | | | |
| What is the degree | of su | ubstrate | embededdnes | s thro | ughout the site? | Tick one I | oox. | |
| | | High | | Med | | Low | X | |
| Flow conditions | | | | | | | | |
| Briefly describe the | prev | ailing flow | w conditions | (as ob | served at the tir | ne of the H | HABSCORE s | urvey). |
| Calum 6 | 0 | 2 100/0 | | | | | | |
| Upstream land-us | 0.0 | nsidera | tions | | | | | |
| What is the principa | | | | stream | of the site? Tick | appropria | te box(es). | |
| Moor / heathland | | 1 | ous woodland | 1 | Deciduous wo | | 1 | asture |
| Jrban development | | Rough | | X | Industrial land | | Arable land | |
| Tips / waste | | Other | | | | | | |
| rips / waste | | Ounci | | | | | | |
| | | | | | | | | |
| Potential impacts | | | | | | | | |
| | e an | y impacts | s at the site f | rom th | ne following sour | ces? Tick a | appropriate bo | ox(es). |
| Are there likely to b | e an | y impact: Stocki | | rom th | e following sour | | appropriate bo ion barriers | |
| Are there likely to b oH effects | | Stocki | | 1 | | Migrat | ·· · | ox(es). ∡ |
| Potential impacts Are there likely to b pH effects Habitat modification Other | | Stocki | ng | 1 | Pollution | Migrat | ion barriers | |
| Are there likely to b oH effects Habitat modification Other | × | Stocki River | ng engineering | × | Pollution | Migrat | ion barriers | |
| Are there likely to b oH effects Habitat modification Other Width and depth | prot | Stocki River | ng engineering ottom stop | × | Pollution Low flows | Migrat Flow r | ion barriers | |
| Are there likely to b oH effects Habitat modification Other Width and depth Record widths to the | prot | Stocki River | ng engineering ottom stop m and depths | net to the | Pollution Low flows e nearest 1.0cm | Higrat Flow r | ion barriers regulation | |
| Are there likely to b oH effects Habitat modification Other Width and depth Record widths to the Channel width | pro fe ne | Stocki River file at bo arest 0.1 | ng engineering ottom stop m and depths | net to the | Pollution Low flows | Higrat Flow r | ion barriers regulation | |
| Are there likely to b pH effects Habitat modification Other Width and depth Record widths to the Channel width Depth at ¹ /4 channel | prot e ne | Stocki River file at be arest 0.1 | ng engineering ottom stop m and depths | net to the | Pollution Low flows e nearest 1.0cm | Higrat Flow r | ion barriers regulation | |
| Are there likely to b pH effects Habitat modification | prot e ne widt | Stocki River file at be arest 0.1 | ng engineering ottom stop m and depths | net to the | Pollution Low flows e nearest 1.0cm | Higrat Flow r | ion barriers regulation | |
| Are there likely to b pH effects Habitat modification Other Width and depth Record widths to the Channel width Depth at 1/4 channel Depth at 1/2 channel | prot e ne widt | Stocki River file at be arest 0.1 | ng engineering ottom stop m and depths 10 0.6 1 | net to the | Pollution Low flows e nearest 1.0cm | Higrat Flow r | ion barriers regulation | |
| Are there likely to b bH effects Habitat modification Other Width and depth Record widths to the Channel width Depth at 1/4 channel Depth at 1/4 channel Depth at 3/4 channel Section dimension | prote ne widt | Stocki River file at bo arest 0.1 | ng engineering m and depths 10 0.6 1 0.6 | net to the | Pollution Low flows e nearest 1.0cm. | Migrat Flow r | e 0.4 m | |
| Are there likely to b bH effects Habitat modification Other Width and depth Record widths to the Channel width Depth at 1/4 channel Depth at 1/4 channel Depth at 3/4 channel Section dimension Record section lengt | prote ne widt | Stocki River file at bo arest 0.1 | ng engineering m and depths 10 0.6 1 0.6 | net to the | Pollution Low flows e nearest 1.0cm. | Migrat Flow r | e 0.4 m | |
| Are there likely to b bH effects Habitat modification Other Width and depth Record widths to the Channel width Depth at 1/4 channel Depth at 1/2 channel Depth at 3/4 channel Section dimension Record section length | prote ne widt | Stocki River file at bo arest 0.1 | ng engineering m and depths 10 0.6 1 0.6 | net to the | Pollution Low flows e nearest 1.0cm. | Migrat Flow r | e 0.4 m | |
| Are there likely to b bH effects Habitat modification Other Width and depth Record widths to the Channel width Depth at 1/4 channel Depth at 1/4 channel Depth at 3/4 channel Section dimension Record section length Section length Section width | prot e ne widt widt widt | Stocki River file at be arest 0.1 | ng engineering m and depths 10 0.6 1 0.6 | net to the | Pollution Low flows e nearest 1.0cm. | Migrat Flow r | e 0.4 m | |
| Are there likely to b pH effects Habitat modification Other Width and depth Record widths to the Channel width Depth at 1/4 channel Depth at 1/2 channel | prot e ne widt widt widt | Stocki River file at be arest 0.1 | ng engineering m and depths 10 0.6 1 0.6 | net to the | Pollution Low flows e nearest 1.0cm. | Migrat Flow r | e 0.4 m | |
| Are there likely to b oH effects Habitat modification Other Width and depth Record widths to the Channel width Depth at 1/4 channel Depth at 1/4 channel Depth at 3/4 channel Section dimension Record section length Section length Section width | prof e ne widt widt hs a | Stocki River file at bo arest 0.1 | ng engineering m and depths 10 0.6 1 0.6 | net to the | Pollution Low flows e nearest 1.0cm. | Migrat Flow r | e 0.4 m | |

| Absent | Scarce | , Common | Frequent | Dominant |
|--------|-----------|-----------------------|------------------------|-----------------|
| 0% | >0% & <5% | <u><</u> 5% & <20% | <u><</u> 20% & <50% | <u><</u> 50% |
| А | S | С | F | D |

What percentage of the stream bed area in each section is composed of the following substrate types? Enter A, S, C, F or D as appropriate (see above table).

Substrate category

| A | | | | | | | | | |
|---|--------|----------------------------|-----------------------|-----------------------|---|---|---|---|---|
| A | | | | | | | | | |
| A | | | | | | | | | |
| D | | | | | | | | | |
| Ŧ | | | | | | | | | |
| S | | | | | | | | | |
| | AAADFS | A A A D F S | A A D F S | A A D F S | A | A | A | A | A |

Flow

What percentage of the water surface area in each section is composed of the following flow types? Enter A, S, C, F or D as appropriate.

Flow category

| Cascade/torrential | A | | | | |
|--------------------------|---|--|--|--|---|
| Turbulent/broken deep | A | | | | Τ |
| Turbulent/broken shallow | A | | | | Τ |
| Glide/run deep | A | | | | |
| Glide/run shallow | S | | | | |
| Slack deep | D | | | | |
| Slack shallow | C | | | | Τ |

Sources of cover for >10 cm trout

What percentage of the stream bed area in each section could provide cover (for a >10 cm trout) in the form of submerged overhang, or overhang within 0.5 m of the water surface? Indicate the abundance of cover within the various categories listed below. For 'submerged vegetation' include all macrophytes, mosses and algae providing cover. Estimate as 0, 1, 2, 3, 4, 5, 10, 15, 20, 25 ... 100%.

Source of cover

| Submerged vegetation | A | | | | | |
|-------------------------|---|--|--|--|--|--|
| Boulders, cobbles, etc. | S | | | | | |
| Tree root systems | S | | | | | |
| Branches and logs | C | | | | | |
| Undercut banks | A | | | | | |
| Other submerged cover | S | | | | | |
| Overhang within 0.5 m | A | | | | | |
| Area of deep water | S | | | | | |

| | | Site ł | nabita | at record | | | | | | |
|---|---|--|-----------------------------------|--|----------|-------------|--------------|--------------------------|--------|----|
| Site identification | | Site c | ode 1 | RA2 | | Cate | chm | ient River Alu | rond | te |
| Site name | NGR 3 | 7023 77256.99 | | | Alm | | | | | |
| Riparian shading o What percentage of percentage, for the t | of the site the water | surface of the | site is | overhung by | riparia | ın veş | | | | |
| Deciduous trees & sl | hrubs 5 | Conif | erous | trees | | Her | bac | eous vegetat | ion | |
| Migratory access | | | | | | | | | | |
| What is the accessibility | ility of the | site ? | Salm | non | | Sea | | ut | | |
| Always accessible | | | X | | | | X | | | - |
| Sometimes accessible Never accessible | 9 | | | | | | | | | |
| | | | | | | | | | | |
| Substrate embedd What is the degree of | | embededdnes | s thro | ughout the s | ite? Tid | rk on | e h | ox | | |
| | High | | | lium | | Low | | X | | |
| Flow conditions | | | | | | | | | | |
| Briefly describe the p | orevailing fl | ow conditions | (as ob | served at the | time | of th | e H | ABSCORE s | urvey |). |
| Calua | 602 | 11000 | | | | | | | | |
| Calm Upstream land-use What is the principal | | | stream | of the site? | Tick ap | oprop | riat | e box(es). | | |
| Moor / heathland | Conife | rous woodland | | woodland \prec Improved past | | | | | | |
| Urban development | Rough | pasture | | Industrial la | | | | Arable land | | K |
| Tips / waste | Other | | | | | | • | | | |
| | | | | | | | | | | |
| Potential impacts Are there likely to be | e any impa | cts at the site f | rom th | ne following s | ource | s? Tic | k aj | opropriate bo | ox(es) | |
| Are there likely to be | e any impac | | rom th | ne following s Pollution | ource | 1 | | opropriate bo | ox(es) | |
| Are there likely to be pH effects | Stoc | | 1 | | 1 | Mig | rati | · · · | | |
| | Stoc | king | × | Pollution | 1 | Mig | rati | on barriers | | |
| Are there likely to be pH effects Habitat modification Other Width and depth p | Stoc Rive | king r engineering bottom stop | メ メ net | Pollution Low flows | × | Mig | rati | on barriers | | |
| Are there likely to be pH effects Habitat modification Other Width and depth p Record widths to the | Stoc Rive | king r engineering bottom stop | × × net s to th | Pollution Low flows e nearest 1.0 | cm. | Mig Flov | rati v re | on barriers egulation | | |
| Are there likely to be pH effects Habitat modification | Stoc Rive | king r engineering bottom stop Im and depths | × × net s to th | Pollution Low flows | cm. | Mig Flov | rati v re | on barriers egulation | | |
| Are there likely to be pH effects Habitat modification Other Width and depth p Record widths to the Channel width Depth at ¹ /4 channel w | Stoc Rive profile at e nearest 0. width | king r engineering bottom stop Im and depths | × × net s to th | Pollution Low flows e nearest 1.0 | cm. | Mig Flov | rati v re | on barriers egulation | | |
| Are there likely to be pH effects Habitat modification Other Width and depth p Record widths to the Channel width Depth at 1/4 channel w Depth at 1/2 channel w | Stoc Rive profile at nearest 0. width width | king r engineering bottom stop Im and depths 15 0.3 0.8 | × × net s to th | Pollution Low flows e nearest 1.0 | cm. | Mig Flov | rati v re | on barriers egulation | | |
| Are there likely to be pH effects Habitat modification Other Width and depth p Record widths to the Channel width Depth at 1/4 channel w Depth at 1/2 channel w Depth at 3/4 channel w | Stoc Rive profile at nearest 0 width width width | king r engineering bottom stop Im and depths 15 0.3 0.3 0.3 | × × net s to th Depte | Pollution Low flows e nearest 1.0 in cuclos | cm. | Mig Flov | m m | on barriers | | |
| Are there likely to be pH effects Habitat modification Other Width and depth p Record widths to the Channel width Depth at ¼ channel w Depth at ¼ channel w Depth at ¼ channel w Section dimensions Record section length | Stoc Rive profile at nearest 0 width width width | king r engineering bottom stop Im and depths 15 0.3 0.3 0.3 | × × net s to th Depte | Pollution Low flows e nearest 1.0 in cuclos | cm. | Mig Flov | m m | on barriers | | |
| Are there likely to be pH effects Habitat modification Other Width and depth p Record widths to the Channel width | Stoc Rive profile at nearest 0 width width width | king r engineering bottom stop Im and depths 15 0.3 0.3 0.3 | × × net s to th Depte | Pollution Low flows e nearest 1.0 in cuclos | cm. | Mig Flov | m m | on barriers | | |
| Are there likely to be pH effects Habitat modification Other Width and depth p Record widths to the Channel width Depth at ¼ channel w Depth at ¼ channel w Depth at ¼ channel w Section dimensions Record section length | Stoc Rive Profile at e nearest 0. width width width s ns and widt | king r engineering bottom stop Im and depths 15 0.3 0.3 0.3 | × × net s to th Depte | Pollution Low flows e nearest 1.0 in cuclos | cm. | Mig Flov | m m | on barriers | | |
| Are there likely to be pH effects Habitat modification Other Width and depth p Record widths to the Channel width Depth at 1/4 channel w Depth at 1/4 channel w Depth at 3/4 channel w Section dimensions Record section length Section length Section width | Stoc Rive Profile at e nearest 0. width width s ns and widt vidth | king r engineering bottom stop Im and depths 15 0.3 0.3 0.3 | × × net s to th Depte | Pollution Low flows e nearest 1.0 in cuclos | cm. | Mig Flov | m m | on barriers | | |

Substrate

| Absent | Scarce | Common | Frequent | Dominant |
|--------|-----------|-----------------------|------------------------|-----------------|
| 0% | >0% & <5% | <u><</u> 5% & <20% | <u><</u> 20% & <50% | <u><</u> 50% |
| A | S | C | F | D |

What percentage of the stream bed area in each section is composed of the following substrate types? Enter A, S, C, F or D as appropriate (see above table).

Substrate category

| A | | | | | | | | | | |
|---|--------|----------------------------|-------------|---|---|---|---|---|---|---|
| S | | | | | | | | | | |
| C | | | | | | | | | | |
| D | | | | | | | | | | |
| 5 | | | | | | | | | | |
| A | | | | | | | | | | |
| | ASUDSA | A S C D S A | A S C D S A | A | A | A | A | A | A | A |

Flow

What percentage of the water surface area in each section is composed of the following flow types? Enter A, S, C, F or D as appropriate.

Flow category

| Cascade/torrential | A | | | | |
|--------------------------|---|--|--|--|---|
| Turbulent/broken deep | Ŧ | | | | |
| Turbulent/broken shallow | D | | | | Γ |
| Glide/run deep | A | | | | |
| Glide/run shallow | Ć | | | | Γ |
| Slack deep | A | | | | |
| Slack shallow | S | | | | Γ |

Sources of cover for >10 cm trout

What percentage of the stream bed area in each section could provide cover (for a >10 cm trout) in the form of submerged overhang, or overhang within 0.5 m of the water surface? Indicate the abundance of cover within the various categories listed below. For 'submerged vegetation' include all macrophytes, mosses and algae providing cover. Estimate as 0, 1, 2, 3, 4, 5, 10, 15, 20, 25 ... 100%.

Source of cover

| Submerged vegetation | A | | | | | | |
|-------------------------|---|--|-------|--|--|-----------|--|
| Boulders, cobbles, etc. | D | | | | | | |
| Tree root systems | S | | | | | | |
| Branches and logs | A | | | | | | |
| Undercut banks | S | | | | | | |
| Other submerged cover | C | | | | | - · · · · | |
| Overhang within 0.5 m | A | | 1.1.1 | | | - : | |
| Area of deep water | S | | | | | | |

| Appendix 2. | H | ABSC | OR | E da | ta i | nput sh | eet | | | | |
|---|--------|-------------|----------|-----------|--------------|---------------|-----------|---------|-------|------------------|---------|
| | | | | Site h | abit | at record | | | | | |
| Site identification | | | | Site co | ode (| RA3 | | Cat | chm | ient River Alexe | and the |
| Site name | | NGR 30 | 2/19/7 | 25809 | Rive | er name Rive | es Alm | | | Survey date | |
| Riparian shading | | | /10// | | | | | | | | |
| What percentage of | | | irface o | of the s | ite is | overhung by | riparia | n ves | geta | tion? Estimate | e this |
| percentage, for the t | | | | | | | | | | | |
| Deciduous trees & s | hru | bs 10 | | Conife | erous | trees | | Her | bac | eous vegetati | on |
| Migratory access | | | | | | | | | | | |
| What is the accessib | oility | of the si | te ? | 2.5.2.2 | Saln | non | | Sea | tro | ut | |
| Always accessible | | | | | > | | | | × | | |
| Sometimes accessibl | e | | | | | | | | | | |
| Never accessible | | | | | | | | | | | |
| Substrate embede | ded | ness | | | | | | | | | |
| What is the degree | | 1 | embed | eddnes | | | site? Tic | | | | |
| | | High | | | Med | lium | | Low | / | X | |
| Flow conditions | | uiling flou | | | (aa ah | | | - 6 + h | | ARCORE | |
| Briefly describe the | | | | | | served at th | etime | of th | ен | ABSCORE SU | irvey). |
| 5/023 | fe | owing | 10 | stagno | and | | | | | | |
| Upstream land-us What is the principa | | | | ely ups | tream | of the site? | Tick ap | prop | oriat | e box(es). | |
| Moor / heathland | | Conifere | ous wo | odland | X | Deciduous | woodl | and | X | Improved pa | asture |
| Urban development | | Rough | pasture | 2 | Industrial l | | and | | | Arable land | X |
| Tips / waste | | Other | | | | | | | /~ | | |
| Potential impacts Are there likely to b | e an | y impacts | s at the | e site fr | om t | ne following | source | s? Tic | :k aj | opropriate bo | ox(es). |
| pH effects | | Stocki | ng | | × | Pollution | × | Mig | rati | on barriers | х |
| Habitat modification | × | River | engine | ering | X | Low flows | | Flov | w re | gulation | |
| Other | | | | | | | | | | | |
| Width and depth Record widths to the | • | | | | | e nearest 1.0 | Ocm. | | | | |
| Channel width | | | 12 | | De | oth at s | amplin | 9 5 | Site | 0.3m | |
| Depth at ¼ channel | wid | th | 0.6 | | | | / | 4 | | | |
| Depth at ½ channel | wid | th | 1 | | | | | | | | |
| Depth at ³ / ₄ channel | widt | th | 0.3 | | | | | | | | |
| Section dimension Record section lengt | | nd width | s to th | e neare | est 0. | m and dept | ths to t | he ne | eare | est I cm. | |
| Section length | | | | | | | | | | | |
| Section width | | | | | | | 1 | | | | |
| Depth at 1/4 channel | widt | :h | | | | | | | | | |
| Depth at ½ channel | | | | | | | | | - | | |
| Depth at ³ / ₄ channel | | | | | | | | | 1 | | |
| | - | | | | | | | | | | |

Substrate

| Absent | Scarce | Common | Frequent | Dominant |
|--------|-----------|-----------------------|------------------------|-----------------|
| 0% | >0% & <5% | <u><</u> 5% & <20% | <u><</u> 20% & <50% | <u><</u> 50% |
| A | S | С | F | D |

What percentage of the stream bed area in each section is composed of the following substrate types? Enter A, S, C, F or D as appropriate (see above table).

Substrate category

| Bedrock/artificial | A | | | | | |
|-------------------------------|---|------|--|--|-------|------|
| Boulders >25.6 cm | A | | | | | |
| Cobbles 6.4-25.6 cm | S | | | | | |
| Gravel/coarse sand 0.2-6.4 cm | D | | | | | |
| Fine sand/silt <0.2 cm | S | | | | | |
| Compacted clay | A | | | | | |
| | | | | | 1 | |

Flow

What percentage of the water surface area in each section is composed of the following flow types? Enter A, S, C, F or D as appropriate.

Flow category

| Cascade/torrential | A | | | |
|--------------------------|---|--|--|--|
| Turbulent/broken deep | A | | | |
| Turbulent/broken shallow | A | | | |
| Glide/run deep | C | | | |
| Glide/run shallow | A | | | |
| Slack deep | D | | | |
| Slack shallow | 3 | | | |

Sources of cover for >10 cm trout

What percentage of the stream bed area in each section could provide cover (for a >10 cm trout) in the form of submerged overhang, or overhang within 0.5 m of the water surface? Indicate the abundance of cover within the various categories listed below. For 'submerged vegetation' include all macrophytes, mosses and algae providing cover. Estimate as 0, 1, 2, 3, 4, 5, 10, 15, 20, 25 ... 100%.

| C | | |
|--------|-----|-------|
| Source | Ot. | cover |
| Source | 0 | COver |

| Submerged vegetation | 4 | | | | | |
|-------------------------|---|--|--|--|--|--|
| Boulders, cobbles, etc. | S | | | | | |
| Tree root systems | S | | | | | |
| Branches and logs | C | | | | | |
| Undercut banks | A | | | | | |
| Other submerged cover | Ś | | | | | |
| Overhang within 0.5 m | A | | | | | |
| Area of deep water | S | | | | | |

| | | | Site | habit | at record | | | | | | |
|--|----------------------------------|---|---|--|---|------------------|----------------------|------------------------|--|--------|--------------|
| Site identification | | | Site | code / | TPB1 | | Cat | chm | ent River, | Alum | nd/ |
| Site name | | NGR 30 | | | er name East | | | | | | |
| | | | 5001170000 | 1414 | I nume Last | 1000 | Dur | ~ | our rey duce | . 220 | <u>)</u> /// |
| Riparian shading What percentage of | | | urface of the | cito ic | overhung by | riparia | | anto | tion? Estima | ta thi | |
| percentage, for the t | | | | | | | | gela | | ue un | 3 |
| Deciduous trees & s | | | | ferous | | 030 07 | | bac | eous vegeta | ion | |
| Migratory access | | 10 | | | | | | | | | |
| What is the accessib | oility | of the si | te ? | Saln | non | | Sea | tro | ut | | |
| Always accessible | | | | | | | | | | | |
| Sometimes accessibl | е | | | | × | | | | X | | |
| Never accessible | | | | | | | | | | | |
| Substrate embede | | | | | | | | | | | |
| What is the degree | | 1 | embededdne | | | ite? Ti | | | OX. | | |
| | | High | | Med | ium X | | Lov | V | | | |
| Flow conditions | | | | (| | | | | ADCOORT | | |
| Briefly describe the | prev | ailing flow | w conditions | (as ob | served at the | time | of th | e H | ABSCORE | survey | /). |
| laminar | < | 0.2 u | ·/sec | | | | | | | | |
| Upstream land-us | e co | onsidera | tions | | | | | | | | |
| What is the principa | l lan | id-use im | mediately up | ostream | of the site? | Tick a | ppro | priat | e box(es). | | |
| Moor / heathland | | Conifere | ous woodlan | d 🗙 | Deciduous | wood | land | X | Improved p | bastur | e x |
| | | Rough pasture | | | | | | / | | | |
| Urban development | | Rough | pasture | × | Industrial la | nd | | | Arable land | | X |
| | | Rough Other | pasture | | Industrial la | Ind | | | Arable land | | X |
| Tips / waste | | | pasture | | Industrial la | Ind | | | Arable land | | × |
| Tips / waste Potential impacts | e an | Other | | × | | | | | | ov(es | |
| Tips / waste Potential impacts Are there likely to b | e an | Other y impacts | s at the site | from th | ne following s | ource | s? Tie | ck aj | opropriate b | |). |
| Tips / waste Potential impacts Are there likely to b pH effects | e an | Other y impacts Stocki | s at the site | from th | ne following s Pollution | ource | s? Tio | ck aj grati | opropriate b on barriers | ox(es |). |
| Tips / waste Potential impacts Are there likely to b pH effects Habitat modification | e an | Other y impacts Stocki | s at the site | from th | ne following s | ource | s? Tio | ck aj grati | opropriate b | |). |
| Urban development Tips / waste Potential impacts Are there likely to b pH effects Habitat modification Other | e an | Other y impacts Stocki | s at the site | from th | ne following s Pollution | ource | s? Tio | ck aj grati | opropriate b on barriers | |). |
| Tips / waste Potential impacts Are there likely to b oH effects Habitat modification Other Width and depth | pro | Other y impacts Stocki River | s at the site ng engineering ottom stop | from th | ne following s Pollution Low flows | source X X | s? Tio | ck aj grati | opropriate b on barriers | |). |
| Tips / waste Potential impacts Are there likely to b pH effects Habitat modification Other Width and depth Record widths to the | pro | Other y impacts Stocki River | s at the site ing engineering ottom stop m and depth | from th | ne following s Pollution Low flows | source X X | s? Tio | ck aj grati | opropriate b on barriers | |). |
| Tips / waste Potential impacts Are there likely to b oH effects Habitat modification Other Width and depth Record widths to the Channel width | prote ne | Other y impacts Stocki River file at be arest 0.1 | s at the site ng engineering ottom stop | from th | ne following s Pollution Low flows e nearest 1.0 | cm. | s? Tio Mig Flo | ck aj grati w re | opropriate b on barriers | |). |
| Tips / waste Potential impacts Are there likely to b oH effects Habitat modification Other Width and depth Record widths to the Channel width Depth at ¹ / ₄ channel | prote ne | Other y impacts Stocki River file at be arest 0.1 | s at the site ing engineering ottom stop m and depth | from th | ne following s Pollution Low flows e nearest 1.0 | cm. | s? Tio Mig Flo | ck aj grati w re | opropriate b on barriers egulation | |). |
| Tips / waste Potential impacts Are there likely to b oH effects Habitat modification Other Width and depth Record widths to the Channel width Depth at ¹ / ₄ channel | prote ne | Other y impacts Stocki River file at be arest 0.1 | s at the site ing engineering ottom stop m and depth 5 0.3 1 | from th | ne following s Pollution Low flows e nearest 1.0 | cm. | s? Tio Mig Flo | ck aj grati w re | opropriate b on barriers egulation | |). |
| Tips / waste Potential impacts Are there likely to b oH effects Habitat modification Other Width and depth Record widths to the Channel width Depth at 1/2 channel Depth at 1/2 channel | prote ne widt | Other y impacts Stocki River file at be arest 0.1 | s at the site ing engineering ottom stop m and depth | from th | ne following s Pollution Low flows e nearest 1.0 | cm. | s? Tio Mig Flo | ck aj grati w re | opropriate b on barriers egulation | |). |
| Tips / waste Potential impacts Are there likely to b oH effects Habitat modification Other Width and depth Record widths to the Channel width Depth at ¹ / ₄ channel Depth at ¹ / ₂ channel | prote ne widt | Other y impacts Stocki River file at be arest 0.1 | s at the site ing engineering ottom stop m and depth 5 0.3 1 | from th | ne following s Pollution Low flows e nearest 1.0 | cm. | s? Tio Mig Flo | ck aj grati w re | opropriate b on barriers egulation | |). |
| Fips / waste Potential impacts Are there likely to bo DH effects Habitat modification Other Width and depth Record widths to the Channel width Depth at 1/4 channel Depth at 1/4 channel Depth at 3/4 channel Depth at 3/4 channel | prote ne widt widt | Other y impacts Stocki River file at be arest 0.11 | s at the site ng engineering ottom stop m and depth 5 0.3 1 1.2 | from the fro | e nearest 1.0 | cm. | s? Tio | ck aj grati w re | opropriate b on barriers egulation | |). |
| Tips / waste Potential impacts Are there likely to both oH effects Habitat modification Other Width and depth Record widths to the Channel width Depth at 1/4 channel Depth at 1/4 channel Depth at 3/4 channel Depth at 3/4 channel Depth at 3/4 channel | prote ne widt widt | Other y impacts Stocki River file at be arest 0.11 | s at the site ng engineering ottom stop m and depth 5 0.3 1 1.2 | from the fro | e nearest 1.0 | cm. | s? Tio | ck aj grati w re | opropriate b on barriers egulation | |). |
| Fips / waste Potential impacts Are there likely to bo DH effects Habitat modification Other Width and depth Record widths to the Channel width Depth at 1/4 channel Depth at 1/4 channel Depth at 3/4 channel Depth at 3/4 channel Depth at 3/4 channel | prote ne widt widt | Other y impacts Stocki River file at be arest 0.11 | s at the site ng engineering ottom stop m and depth 5 0.3 1 1.2 | from the state of | e nearest 1.0 | cm. | s? Tio | ck aj grati w re | opropriate b on barriers egulation | |). |
| Tips / waste Potential impacts Are there likely to brocher Habitat modification Other Width and depth Record widths to the Channel width Depth at ¼ channel Depth at ¼ channel Depth at ¼ channel Depth at ¾ channel Depth at ¾ channel Depth at ⅔ channel | prote ne widt widt | Other y impacts Stocki River file at be arest 0.11 | s at the site ng engineering ottom stop m and depth 5 0.3 1 1.2 | from the state of | e nearest 1.0 | cm. | s? Tio | ck aj grati w re | opropriate b on barriers egulation | |). |
| Tips / waste Potential impacts Are there likely to b pH effects Habitat modification Other Width and depth Record widths to the Channel width Depth at 1/4 channel Depth at 1/4 channel Depth at 3/4 channel Section dimension Record section length Section length Section width | prote ne widt widt widt | Other y impacts Stocki River file at be arest 0.11 th th th th | s at the site ng engineering ottom stop m and depth 5 0.3 1 1.2 | from the state of | e nearest 1.0 | cm. | s? Tio | ck aj grati w re | opropriate b on barriers egulation | |). |
| Tips / waste Potential impacts Are there likely to b pH effects Habitat modification | profe ne widt widt widt | Other y impacts Stocki River file at be arest 0.11 th th th th | s at the site ng engineering ottom stop m and depth 5 0.3 1 1.2 | from the state of | e nearest 1.0 | cm. | s? Tio | ck aj grati w re | opropriate b on barriers egulation | |). |

Substrate

| Absent | Scarce | Common | Frequent | Dominant |
|--------|-----------|-----------------------|------------------------|----------|
| 0% | >0% & <5% | <u><</u> 5% & <20% | <u><</u> 20% & <50% | ≤50% |
| A | S | С | F | D |

What percentage of the stream bed area in each section is composed of the following substrate types? Enter A, S, C, F or D as appropriate (see above table).

Substrate category

| A | | | | | | | | | |
|---|--------|-------------|----------------------------|----------------------------|---|---|-----|---|---|
| S | | | | | | | | | |
| F | | | | | | | | | |
| D | | | | | | | | | |
| F | | | | | | | 100 | | T |
| A | | | | | | | | | |
| | ASFDFA | A S F D F A | A S F D F A | A S F D F A | A | A | A | A | A |

Flow

What percentage of the water surface area in each section is composed of the following flow types? Enter A, S, C, F or D as appropriate.

Flow category

| Cascade/torrential | A | | | | | |
|--------------------------|---|--|--|-------------|--|---|
| Turbulent/broken deep | A | | | | | Τ |
| Turbulent/broken shallow | A | | | 1. 1. 1. 1. | | T |
| Glide/run deep | S | | | | | |
| Glide/run shallow | C | | | | | |
| Slack deep | Ŧ | | | | | |
| Slack shallow | D | | | | | 1 |

Sources of cover for >10 cm trout

What percentage of the stream bed area in each section could provide cover (for a >10 cm trout) in the form of submerged overhang, or overhang within 0.5 m of the water surface? Indicate the abundance of cover within the various categories listed below. For 'submerged vegetation' include all macrophytes, mosses and algae providing cover. Estimate as 0, 1, 2, 3, 4, 5, 10, 15, 20, 25 ... 100%.

Source of cover

| Submerged vegetation | S | | | | | |
|-------------------------|---|------|--|------|------|-----|
| Boulders, cobbles, etc. | S | | | | | |
| Tree root systems | C | | | | | |
| Branches and logs | S | | | | | |
| Undercut banks | S | | | | | |
| Other submerged cover | 5 | | | | 48.1 | |
| Overhang within 0.5 m | S | | | | | |
| Area of deep water | F | | | | | 1.4 |

| | | Site h | abit | at record | | | | | | |
|--|--|--|--------|---|------------------------|-------------|------|---|---------|----|
| Site identification | | Site co | ode 🖉 | PB Z | | Cate | chm | ent River A | lunon | 4 |
| Site name | NGR 3 | 610 /72537 | Mar . | Contract of the second s | | | | | | - |
| | | \$10 72551- | 2 1414 | A Harrie 2407 | 1000 | DA | ~ | our vey dates | 0/0 | 10 |
| Riparian shading o What percentage of t | | urface of the e | ito is | overhung by | riporia | n vor | toto | tion? Estimate | a thic | |
| percentage, for the th | | | | | | | gela | cion: Estimati | e uns | |
| Deciduous trees & sh | • | | | | | | bac | eous vegetatio | on | |
| Migratory access | | | | | | | | | | |
| What is the accessibi | lity of the si | te ? | Salm | non | | Sea | tro | ut | 1.00 | |
| Always accessible | 1 | | | × | | | | | | |
| Sometimes accessible | | | × | | | | | × | | |
| Never accessible | | | | | | | | | | |
| Substrate embedd | edness | | | | | | | | | |
| What is the degree o | f substrate | embededdnes | s thro | ughout the si | ite? Tie | ck on | e b | ox. | | |
| | High | | Med | lium 🗸 | | Low | , | | | |
| Flow conditions | | | | | | | | | | |
| Briefly describe the p | revailing flow | w conditions (| (as ob | served at the | time | of th | e H | ABSCORE su | irvey) | • |
| laminar | 1021 | m ler c | | | | | | | | |
| Upstream land-use | | | | | | | | | | |
| What is the principal | | | tream | of the site? | Fick an | oprop | riat | e box(es). | | |
| Moor / heathland | 1 | ous woodland | 1 | | | | | · / | sture | × |
| Jrban development | Rough | Rough pasture | | ✓ Industrial la | | nd Arable | | Arable land | | , |
| | | | | industrial la | na | | | Al able latiu | | X |
| Tips / waste | Other | | | industrial la | na | | | Al able land | | X |
| • | Other | | | | na | | | | | X |
| Potential impacts | | | | | | s? Tic | k aj | | ox(es). | |
| Potential impacts Are there likely to be | | s at the site fr | | | | 1 | | | x(es). | |
| Potential impacts Are there likely to be pH effects | any impacts Stocki | s at the site fr | rom th | ne following s | ource | Mig | rati | opropriate bo | | |
| Tips / waste Potential impacts Are there likely to be pH effects Habitat modification Other | any impacts Stocki | s at the site fr | rom th | ne following s Pollution | ource | Mig | rati | opropriate bo on barriers | | |
| Potential impacts Are there likely to be oH effects Habitat modification Other Width and depth p | any impacts Stocki River | s at the site fr ng engineering ottom stop | rom th | Pollution Low flows | ource | Mig | rati | opropriate bo on barriers | | |
| Potential impacts Are there likely to be oH effects Habitat modification Other Width and depth p Record widths to the | any impacts Stocki River | s at the site fr ng engineering ottom stop m and depths | rom th | e nearest 1.0 | ource × × cm. | Mig Flov | rati | opropriate bo on barriers egulation | X | |
| Potential impacts Are there likely to be oH effects Habitat modification Other Width and depth p Record widths to the Channel width | any impacts Stocki River profile at be nearest 0.1 | s at the site fr ing engineering ottom stop m and depths | rom th | Pollution Low flows | ource × × cm. | Mig Flov | rati | opropriate bo on barriers egulation | X | |
| Potential impacts Are there likely to be oH effects Habitat modification Other Width and depth p Record widths to the Channel width Depth at 1/4 channel w | any impacts Stocki River rofile at be nearest 0.1 | s at the site fr ng engineering ottom stop m and depths | rom th | e nearest 1.0 | ource × × cm. | Mig Flov | rati | opropriate bo on barriers egulation | X | |
| Potential impacts Are there likely to be oH effects Habitat modification Other Width and depth p Record widths to the Channel width Depth at 1/4 channel w Depth at 1/2 channel w | any impacts Stocki River rofile at be nearest 0.1 vidth | s at the site fr ng engineering ottom stop m and depths 5 0.3 1 | rom th | e nearest 1.0 | ource × × cm. | Mig Flov | rati | opropriate bo on barriers egulation | X | |
| Potential impacts Are there likely to be oH effects Habitat modification Other Width and depth p Record widths to the Channel width Depth at 1/4 channel w Depth at 1/2 channel w | any impacts Stocki River orofile at be nearest 0.11 vidth vidth | s at the site fr ing engineering ottom stop m and depths | rom th | e nearest 1.0 | ource × × cm. | Mig Flov | rati | opropriate bo on barriers egulation | X | |
| Potential impacts Are there likely to be oH effects Habitat modification Other Width and depth p Record widths to the Channel width Depth at 1/4 channel w Depth at 1/4 channel w Depth at 3/4 channel w | any impacts Stocki River orofile at be nearest 0.11 vidth vidth | s at the site fr ng engineering ottom stop m and depths 5 0.3 1 1 1.2 | rom th | e nearest 1.0 | ource × × cm. | Mig Flov | v re | opropriate bo on barriers egulation | X | |
| Potential impacts Are there likely to be oH effects Habitat modification Other Width and depth p Record widths to the Channel width Depth at 1/4 channel w Depth at 1/2 channel w Depth at 3/4 channel w Section dimensions Record section length | any impacts Stocki River orofile at be nearest 0.11 vidth vidth | s at the site fr ng engineering ottom stop m and depths 5 0.3 1 1 1.2 | rom th | e nearest 1.0 | ource × × cm. | Mig Flov | v re | opropriate bo on barriers egulation | X | |
| Potential impacts Are there likely to be oH effects Habitat modification Other Width and depth p Record widths to the Channel width Depth at 1/4 channel w Depth at 1/4 channel w Depth at 3/4 channel w Depth at 3/4 channel w Depth at 3/4 channel w Depth at 3/4 channel w | any impacts Stocki River orofile at be nearest 0.11 vidth vidth | s at the site fr ng engineering ottom stop m and depths 5 0.3 1 1 1.2 | rom th | e nearest 1.0 | ource × × cm. | Mig Flov | v re | opropriate bo on barriers egulation | X | |
| Potential impacts Are there likely to be off effects Habitat modification Other Width and depth p Record widths to the Channel width Depth at 1/4 channel w Depth at 1/4 channel w Depth at 3/4 channel w Depth at 3/4 channel w Section dimensions Record section length fection length | any impacts Stocki River orofile at be nearest 0.11 vidth vidth s and width | s at the site fr ng engineering ottom stop m and depths 5 0.3 1 1 1.2 | rom th | e nearest 1.0 | ource × × cm. | Mig Flov | v re | opropriate bo on barriers egulation | X | |
| Potential impacts Are there likely to be pH effects Habitat modification | any impacts Stocki River orofile at be nearest 0.11 vidth vidth s and width | s at the site fr ng engineering ottom stop m and depths 5 0.3 1 1 1.2 | rom th | e nearest 1.0 | ource × × cm. | Mig Flov | v re | opropriate bo on barriers egulation | X | |

| Absent | Scarce | Common | Frequent | Dominant |
|--------|-----------|-----------------------|------------------------|-----------------|
| 0% | >0% & <5% | <u><</u> 5% & <20% | <u><</u> 20% & <50% | <u><</u> 50% |
| А | S | С | F | D |

What percentage of the stream bed area in each section is composed of the following substrate types? Enter A, S, C, F or D as appropriate (see above table).

Substrate category

| Bedrock/artificial | A | | | | | | |
|-------------------------------|---|---|--|------|--|--|--|
| Boulders >25.6 cm | S | | | | | | |
| Cobbles 6.4-25.6 cm | I | - | | | | | |
| Gravel/coarse sand 0.2-6.4 cm | T | | | | | | |
| Fine sand/silt <0.2 cm | F | | | | | | |
| Compacted clay | A | | | | | | |

Flow

What percentage of the water surface area in each section is composed of the following flow types? Enter A, S, C, F or D as appropriate.

Flow category

| Cascade/torrential | A | | | | |
|--------------------------|---|--|--|--|--|
| Turbulent/broken deep | Â | | | | |
| Turbulent/broken shallow | A | | | | |
| Glide/run deep | S | | | | |
| Glide/run shallow | C | | | | |
| Slack deep | Ŧ | | | | |
| Slack shallow | D | | | | |

Sources of cover for >10 cm trout

What percentage of the stream bed area in each section could provide cover (for a >10 cm trout) in the form of submerged overhang, or overhang within 0.5 m of the water surface? Indicate the abundance of cover within the various categories listed below. For 'submerged vegetation' include all macrophytes, mosses and algae providing cover. Estimate as 0, 1, 2, 3, 4, 5, 10, 15, 20, 25 ... 100%.

Source of cover Submerged vegetation S Boulders, cobbles, etc. S Tree root systems C Branches and logs S S Undercut banks Other submerged cover S S Overhang within 0.5 m Area of deep water F



7 Appendix B – Site Photographs

| Site | Image |
|-------|-------|
| RA1-1 | |
| RA1-2 | |



| Site | Image |
|-------|-------|
| RA2-1 | |
| RA2-2 | |



| Site | Image |
|-------|-------|
| RA3-1 | |



| Site | Image |
|-------|-------|
| RA3-2 | |



| Site | Image |
|--------|----------|
| EPB1-1 | <image/> |
| EPB1-2 | N.A. |
| EPB2-1 | |



| Site | Image |
|--------|-------|
| EPB2-2 | |



| No. of Larvae | RA1-1 | RA1-2 | RA2-1 | RA2-2 | RA3-1 | RA3-2 | EPB1-1 | EPB1-2 | EPB2-1 | EPB2-2 |
|------------------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|
| 1 | 10 | 15 | - | - | - | 15 | - | - | 6 | 10 |
| 2 | 8 | 8 | | | | | | | 12 | 6 |
| 3 | 7 | 12 | | | | | | | 14 | 8 |
| 4 | | | | | | | | | | 12 |
| 5 | | | | | | | | | | 12 |
| 6 | | | | | | | | | | 7 |
| 7 | | | | | | | | | | 8 |
| 8 | | | | | | | | | | 10 |
| 9 | | | | | | | | | | 12 |
| 10 | | | | | | | | | | 10 |

| 8 | Appendix C – Length of Lamprey Larvae in cm | |
|---|---|--|
|---|---|--|