



Advisory Visit

River Cray, London Borough of Bexley on behalf of
Thames21

11th and 12th August (supplemental visit 17th October), 2008



1.0 Introduction

This report is the output of site visits undertaken by Paul Gaskell of the Wild Trout Trust on the River Cray, London Borough of Bexley on 11th and 12th August 2008 (with an additional visit undertaken by Paul Gaskell and Andy Thomas of the Wild Trout Trust on 17th October 2008). Comments in this report are based on observations during the site visits and discussions with Ashe Hurst, head river keeper for Thames21 (<http://www.thames21.org.uk/>) a registered charity devoted to cleaning up and preserving London's waterways.

The charity has a mixed voluntary and full-time workforce that carry out habitat maintenance and improvement works in partnership with British Waterways, Environmental Campaigns (ENCAMS; who run Keep Britain Tidy), Environment Agency, Port of London Authority and Thames Water.

Normal convention is applied throughout the report with respect to bank identification, i.e. the banks are designated left hand bank (LHB) or right hand bank (RHB) whilst looking downstream.

2.0 Fishery Overview

The River Cray is a small chalkstream tributary of the River Darent (which is also known as the River Darent or Dartford Stream), flowing in a roughly north-easterly direction from Orpington to join the Darent below Vitbe Mill sluice near Crayford. The downstream limit of the Thames21 water extends all the way to the Darent (and subsequently the Thames). The upper limit is just below the A20 at Foots Cray, approximately 8 km of river.

The river supports stocks of mixed coarse fish including chub, dace, roach, pike and perch as well as large numbers of bullhead. There is little evidence of recruitment or presence of brown trout in the Cray and no stocking of trout is currently undertaken. Coarse anglers catch large chub, pike and perch using bait whilst dace, chub and pike are also regularly taken using fly fishing methods. There are some isolated reports of barbel captures in one particular stretch of the lower river. Captain Bligh and Lord Nelson are both reputed to have fished the river prior to its decline through industrialisation.

Electrofishing surveys in 1996 did not record a single salmonid fish, however, a series of stocking events (of mixed coarse fish, brown and rainbow trout) were carried out between 1978 and 1989. The presence of trout during electro-fishing surveys of the 1970s and 1980s seems to be entirely dependent on stocking with farm-reared fish. The current absence of trout, dating from at least 1996, indicates that such introductions were not successful in establishing self-sustaining salmonid populations.

3.0 Habitat Assessment

The Fishery can be sensibly divided into three main sections according to typical habitat.

- i. From the upper boundary (at the outflow of a SSSI lake managed by Kent Wildlife trust) downstream of the A20 at Foots Cray; through Five Arches business park; Foots Cray meadows and as far as the lake at Five Arches bridge forms the first section "**A20 to Five Arches**".
- ii. The next section "**Five Arches to Bexley**" runs from Five Arches bridge down to Bexley village.
- iii. the final section "**Bexley to Vitbe**" running from Bexley village to Vitbe Sluice.

This simple classification is used to constrain comments that apply within each section. Before considering such section-specific comments though, it is worth noting some general factors that apply to the river as a whole.

3.1 General observations

Throughout the watercourse, water quality appears to be very good, with dense hatches of caddisflies (various species) and even some late mayflies (*Ephemera danica*) observed during the August visit. Turning rocks revealed large numbers of shrimp (*Gammarus sp.*), caseless caddis (*Rhyacophila sp.*), olive mayflies (*Baetis* and *Ephemerella spp.*) amongst other organisms typical of a healthy chalkstream. Also, on visual inspection, populations of coarse fish now appear to be very good (in contrast to disappointing results from formal surveys carried out in the 1970s and 1980s).

There are a number of notable barriers to upstream movement of fish (including the weir forming the lake at Five arches, the weir in Crayford town

and the Vitbe sluice). There are plans to install a fish pass on the Vitbe sluice – which is significant since sea trout (*Salmo trutta*) are beginning to be caught in the tidal section of the Cray below this barrier.

It is heartening to find that approximately 80% of the river is in the hands of local councils who are receptive to habitat management and conservation. For example Thames21, through Ashe, has been very successful in establishing infrequently mown buffer strips of vegetation up to 6m wide along the river. As a result, along with herbaceous vegetation and wild flowers such as red campion (*Silene dioica*), the banks support populations of water vole (*Arvicola amphibius*) in many sections. There are frequent sightings of grass snakes (*Natrix natrix*), adders (*Vipera berus*), slow worms (*Anguis fragilis*), egrets (*Egretta garzetta*), herons (*Ardea cinerea*), kingfishers (*Alcedo atthis*) and sparrowhawks (*Accipiter nisus*) at many points along the Cray. Thames21 also run an ongoing control programme to eliminate invasive plant species including Himalayan balsam (*Impatiens glandulifera*), Japanese knotweed (*Fallopia spp.*) and giant hogweed (*Heracleum mantegazzianum*). As a final confirmation of the Cray as a valuable green corridor, there are few problems with excessive bank erosion and Thames21's tireless work has reversed previous problems with fly tipping.

3.2 Specific comments

A20 to Five Arches: This section could support good areas of high quality spawning gravels and also displays areas of active geomorphology. This is particularly true in the upper reaches in the region of the Coca Cola factory (photo 1 and cover page photo). Here, there are examples of pronounced scour on the outside and deposition of gravel on the inside of gentle meanders. In addition, there are mid-channel gravel bars and excellent instream submerged macrophyte growth. Even though the stream is a relatively small watercourse at this point, many good sized (1lb plus) chub were shoaled up in scour holes. The instream conditions here have the potential to provide excellent quality spawning, juvenile and adult trout habitat, with some simple instream restoration work.

Riparian vegetation is generally varied in the upper (Coca cola factory) region although there was quite a large stand of Japanese knotweed which is earmarked for eradication (photo 2). A mixture of herbaceous, low scrub and

mature tree species form an interesting and well structured riparian community in this reach.



Photo 1: Varied geomorphology, riparian and instream vegetation



Photo 2: Large stands of Japanese knotweed on LHB and RHB

The next accessible section of stream below the uppermost (Coca cola) reach is at the Five Arches business park. Here there is a mixture of shallow riffles and glides; with the latter habitat being generally more extensive. The channel tends to be constrained to a relatively straight course and is walled on the RHB for the length of the business park (photo 3). However, good instream macrophyte growth and mature bankside trees provide juvenile and adult trout habitat (photos 3 and 4). There is less spawning habitat in this reach; although potential for habitat occurs in patches. The main problem being that hard water has caused concretion of potential spawning gravels. Concreted gravels can be physically broken down and cleaned during restoration work. In addition, it would be expected that this reach could be subsidised with fish spawned upstream.



Photo 3: Walled section of RHB along with instream macrophyte growth in Five Arches business park



Photo 4: Adult chub sheltering beneath overhanging willow branches in Five Arches business park

Below the Five arches business park, the river runs through Foots Cray meadows (photos 5) and forms an impounded lake upstream of the Five arches bridge (photo 6).



Photo 5: Fooths Cray meadows nature reserve



Photo 6: Lake (left) and bridge/weir of Five Arches Bridge (bypass culvert is present in the area where children are playing in the right hand picture)

Below the lake, the river continues to flow through Footh Cray meadows before joining section two at the "green bridge". It is at the green bridge that the last remaining potential problem sewage outfall discharges into the Cray (photo 7). However, its influence appears to be confined to a short section of river. Potential may exist for reedbed treatment here.



Photo 7: Last remaining problem effluent discharge on the Cray.

Naturally, the lake and riverine habitats in this section should be considered separately. First of all, the lake actually displays a surprising amount of exposed gravel, although it is reported to be silting up considerably in many areas (especially around the vegetated islands). There are potential plans to de-silt the lake and use the resultant material to consolidate the existing islands. The other significant consideration regarding the lake is, as previously noted, the barrier to longitudinal movement of fish caused by the weir beneath the bridge. Ashe reported that there may be potential to make this weir passable and noted a missed opportunity when automatic sluice/flood overflow culverts that bypass the weir were installed recently (concrete culvert just visible on the left hand side of the rightmost picture in photo 6). There may be potential to improve the availability of cover for both adult and juvenile trout in the lake system. Such cover, coupled with the

respite from the current experienced in the river, could make a valuable contribution to trout and other juvenile fish by acting as a (relatively) safe nursery area. The resident pike population, of course, necessitate the provision of cover and physical refuges in order for this value to be realised.

The main river in this section tends to be characterised by long shallow glides of relatively uniform depth (of only a few inches; photo 8). Compared to other reaches, even when light penetration to the stream is ample, there is very little submerged macrophyte growth. This is in contrast to the generally vigorous growth of *Ranunculus spp.* present in the upper half to two thirds of the river. The river is apparently subject to fairly extensive abstraction and the effects of this may be contributing to the lack of geomorphological activity in this reach. It is also possible that the extensive public access to these wide, shallow reaches (coupled with the lower flow and very shallow water) may hinder the establishment of *Ranunculus*. Its general absence is, however, puzzling. There is very little erosion of the banks here from public access and the LHB margin is typically revetted by low woven hazel spiling. Due to the relatively slow and shallow flow, the gravel here suffers in some areas from infiltration by fine sandy material (photo 8).



Photo 8: wide shallow gravelly glides in Foots Cray Meadows. Bankside trees are reflected in the water surface and show the absence of submerged macrophytes in the presence of good light penetration

There is also evidence of previous efforts to encourage more variable flow and scour (flow deflector; photo 9). However, such flow deflectors are



Photo 9: Previously installed upstream facing flow deflector (RHB) in Foots Cray Meadows. This particular structure is probably too small to noticeably influence flow heterogeneity and scour.

probably too small to generate much effect. A potentially more effective option may be the installation of longer flow deflectors that are paired together facing upstream. The ideal solution, of course, would be to narrow the channel; although there is likely to be resistance to doing this for continuous extensive reaches of the river. However, locally narrowed pinch points at regular intervals would provide much needed gravel-cleaning flow. Ashe noted, for this reach and others, the problems of having any objects instream that can potentially be moved or removed by the public. Therefore, any measures to introduce more flow heterogeneity must be securely fixed in place.

Overall, subject to sufficient percolation of water through the gravels present in the riverine reaches of this section, there is potentially a very large area of habitat in this section that could successfully incubate salmonid eggs. In order to function as spawning habitat though, it would be desirable to increase the amount of low-level cover for breeding adult fish. In addition, some losses of eggs and redds may be caused by dog access to the water

during the breeding season (although disturbance will be less than that experienced during summer/outside the breeding season).

Five Arches to Bexley: Below the green bridge the river narrows, deepens and runs through land belonging to Kelsey's Farm. It is likely that this section has been modified to produce a more deeply incised and narrower channel (photo 10; left). In addition, with the presence of an ornamental pond, the attendant concrete modification and straightening of the channel is evident (photo 10; right). The riparian vegetation is much denser in this section and probably provides a good buffer to high summer temperatures. In the future, some rotational coppicing or pollarding may be appropriate to maintain an appropriate light/shade balance.



Photo 10: Narrower channel (left) and concrete modifications to channel (right)

This section is generally deeper, more slowly flowing and contains more fine sandy/silty substrates that reaches upstream. The flow in front of the ornamental ponds is also influenced by a low weir; forming a deeper and wider pool section.

Just below this section (but above Bexley village) the flow again widens to take on a more typical chalkstream appearance. Gravels and *Ranunculus* replace the silty substrate. There is some (minimal) localised bank poaching at a horse drink, but this is confined to a very restricted area via temporary fencing (photo 11). Some very dense hatches of caddis were observed here during the site visit. In this area (and Bexley village) there were also some late *E. danica* females laying eggs at the time of the visit.

Again, within this reach there is suitable habitat for all brown trout (*S. trutta*) lifestages. The silty/deeper sections would support large adult fish whilst the gravelly/*Ranunculus* dominated sections could be made suitable for spawning, juvenile and adult salmonids with the cleaning of gravel substrate. As with all previous sections, there is a general lack of large woody debris (LWD) in the channel.



Photo 11: Fenced off horse-drink in gravel/*Ranunculus* dominated section

This section then flows into Bexley village at Clarendon Mews (photo 12). Here Ashe reported some sandy sediment accumulation due to building work adjacent to the river. However, in spite of this, dense instream macrophyte growth and a variety of depths and substrate sizes were apparent at this location within the village. The result is a very attractive pool habitat that would be suitable for a wide variety of coarse and salmonid fish.



Photo 12: Varied pool at Clarendon Mews in Bexley village

Bexley to Vitbe: In general, below Bexley village, there is an increasing dominance of habitat that is suitable for coarse fish and grayling. Flows tend to deepen and slow and, for the most part, are suitable only for adult trout. For the purposes of this report (which is primarily concerned with potential for wild trout populations) a little less detail is reported for this section as a whole. However, some important aspects in relation to migratory trout and the presence of wild trout in urban centres are highlighted. **It should be noted that all photographs on this section were taken after torrential overnight rainfall and are uncharacteristically coloured and at a higher level.** Below Bexley village the river passes through St. Mary's recreation ground where the average depth increases to around knee-height (photo 13; left). There are sandy inputs into this reach below a quarry and this combines with a more sedate flow to produce typical coarse fish habitat. An example of this habitat is evident at the confluence with the river Shuttle (photo 13; right).



Photo 13: Deeper flow with less submerged macrophyte growth (left) and confluence of River Shuttle and Cray at the A2 road bridge (right).

Downstream of the A2, the river passes through Hall Place (Bexley Council and Bexley Heritage). Here the river is extensively modified and straightened as it passes through ornamental grounds. The bank tends to be mown right to the margin of the river (photo 14; left). In addition, an impassable weir is in place on this section. Further downstream, below the heavily modified channel; there is an attractive shaded reach with some varied flow which looks like prime grayling habitat (photo 14; right). Along this section there are some very large and fast growing willows that are actively managed under the riparian owners' instruction.



Photo 14: Modified ornamental section (left) and downstream shaded/more variable section (right)

Continuing downstream to Crayford town section; the whole reach is an excellent coarse fishery (and hugely improved from the 1970s and 1980s). A section of land in Crayford close to the old Tannery is owned by Sainsbury's on the RHB. In addition, there are plans for a housing development on the LHB. In terms of salmonid populations, the most significant feature in this reach is the large weir (photo 15) and making this passable would be a very desirable outcome. The housing development and/or Sainsbury's may be a source of funds to achieve this.



Photo 15: Weir at Crayford (in high flow conditions)

The other significant feature in this reach, with particular reference to Trout in the Town, is the enhancement work already undertaken in the Crayford town centre park. Between the two bridges that delimit the park, Thames21 have installed 120 tonnes of gravel and approximately a ton of rock (photo 16). In combination with their litter removal campaign, this has produced a valuable urban green space with the potential to support adult salmonid fish. It may even be possible for some salmonid spawning recruitment to take place in this stretch. Some possible future improvements are suggested in the Recommendations section that follows.



Photo 16: Crayford town centre park that has already undergone habitat enhancement work by Thames21.

Downstream of Crayford town centre, there is a long canalised reach (photo 17) previously degraded by horrendous amounts of fly tipping and car dumping. The impact that Thames21 and Ashe have had in reversing this scenario is exemplary. This is particularly important in urban areas, where local communities can see that river corridors are valued green space and not landfill.



Photo 17: Section of the Cray that was previously seriously degraded by refuse tipping

The final significant factor on the lower reaches of the Cray in terms of wild *S. trutta* populations is the large (20 feet high) sluice that determines the current tidal limit of the Cray (photo 18; left). There is some (uncertain) potential for a fish pass to be fitted here. This would be particularly timely as there are now a handful of reports (up to five) of local anglers catching sea trout (*S. trutta*) below the sluice (photo 18; right).



Photo 18: Vitbe sluice (left) and the tidal reaches of the Cray below (right)

4.0 Recommendations

Initial works should concentrate on establishing a self-sustaining population of wild trout on the upper reaches of the river (A20 to Coca cola factory). Here habitat works should be carried out in order to provide prime spawning, juvenile and adult habitat for wild trout. A source of wild parr will be sought in order to kickstart a population here. Specific measures would include:

- Clean gravels (20 – 40 mm) to be imported to restoration section
- Existing concreted gravels broken out and cleaned
- Flow deflectors installed to maintain clean, well-sorted gravels and promote scour (WTT to advise on design)
- Use of LWD and riparian vegetation management to provide low-level overhead cover for fish

This work could be delivered, in part, by a WTT Practical Visit (PV; see section 5.1).

Only when superb habitat quality has been achieved should a restorative stocking be contemplated in this headwater reach. To this end:

- WTT to liaise with EA in sourcing suitable wild parr
- WTT to arrange suitable health checks for source population
- WTT to advise on permissions and paperwork required for collection and stocking of wild parr

Subsequently, suitable reaches downstream of this headwater population could be tackled. Issues and targeted actions for particular reaches are highlighted in the following paragraphs.

Predatory chub, pike and (to a lesser extent) perch mean that refuge habitat for juvenile trout is of paramount importance. Actions would include ensuring the presence of:

- Good stands of *Ranunculus*
- Brush bundle refuges
- Large Woody Debris (see below)

Refuges are especially important in the lake above Five Arches bridge.

In all reaches the lack of Large Woody Debris (LWD) should be tackled by deliberate introductions of logs into the channel. Such debris creates flow variability and increases the diversity of physical habitat and has additional benefits in terms of nutrient cycling. Techniques include:

- Pollarding/coppicing trees
- Fixing the arisings in the river channel (trunks or brushwood bundles) using wooden stakes or metal rebar and wire.
- “Hinging” bankside trees into the river channel (trees to be felled should be only cut through for 75% of their diameter and then pushed into the river (Fig. 1)).

Hinging maintains a firm fixing to the tree stump and in many cases, allows the tree to continue growing. It may be possible, with landowner permission, to use this technique in areas such as Crayfoot Meadows and Hall Place.

Trees should be fixed into the channel bed at an upstream facing direction or parallel to the bank to avoid scouring of the banks. The secure fixing of all material in the channel is particularly important as a counter-measure to vandalism in urban areas with extensive public access.



Figure 1: Hinged LWD on the River Derwent (Co. Durham)

Particularly in the section directly below Five Arches Bridge, narrowing as many sections as possible of this reach using felled trees/willow spiling and back-filling with brushings is strongly advised. Paired

upstream-facing flow deflectors (Fig. 2) should also be considered. These would need to be of sufficient length to produce a “pinching” of the current in the centre of the channel. In this way, scour would be concentrated in the middle of the channel and greater variety in depth would be produced (as well as continual re-sorting of the substrate gravels).



Figure 2: Paired upstream facing flow deflectors generating mid channel scour

Additional variety could be generated by suitable boulders. It may be possible to install boulders (of sufficient size to resist movement by the public) to produce scour and more varied flow (Fig. 3)

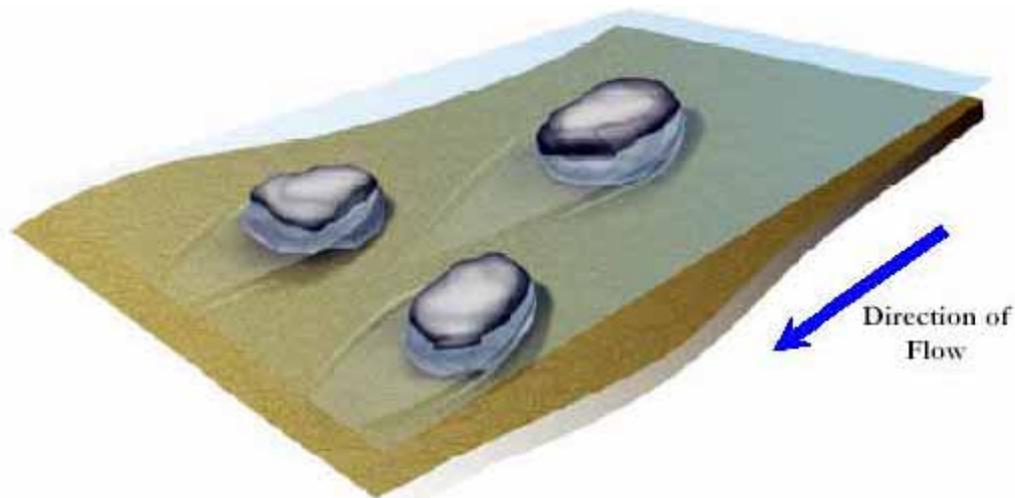


Figure 3: Boulders placed to produce variation in stream bed via localised scour (Copyright Ontario Streams)

Continuing control and eradication of invasive plant species is very important. This is particularly true for Japanese knotweed (*Fallopia spp.*) and Himalayan balsam (*Impatiens glandulifera*). These plants out-compete other riparian vegetation and then die back in winter leaving bare soil. This bare soil is highly susceptible to erosion and leads to large inputs of fine particulate material – potentially clogging valuable spawning gravels.

Crayford town park section could benefit from low-level overhead cover provided by secure installation of coir rolls planted with wild flowers. These could potentially be housed within structurally sound baskets bolted to the concrete channel wall to resist vandalism. Again, where possible, LWD (coupled with interpretive signage in the park) should be securely installed in the town section.

Establish reed-bed to treat problem sewage outfall. Potential funding could be solicited from Thames Water (see also section 5.2). As well as planting the bed, tree canopy would need to be locally thinned to provide sufficient light.

Water quality monitoring using invertebrate communities is a valuable safeguard for streams and rivers. To this end WTT recommends that fisheries, river management and conservation groups register their interest in taking part in the Riverfly Partnership monitoring and training initiative. The initiative is aimed primarily at helping fishing clubs to monitor and help conserve the environment. More details can be found on www.riverflies.org and by contacting Bridget Peacock at riverflies@salmon-trout.org

It is a legal requirement that all the works to the river require written Environment Agency (EA) consent prior to undertaking any works, either in-channel or within 8 metres of the bank. This consent will require an Environmental Impact Assessment to be undertaken and it is important that species of conservation interest at this site are considered, including water voles. The EA Biodiversity department can provide advice on this and incorporating biodiversity enhancements into the project.

5.0 Making it Happen

5.1 Wild Trout Trust assistance

This report makes a series of recommendations that will improve both the biodiversity and status of the wild trout in this reach of the Cray. The AV

represents phase 1 of a potential 4 phase package of WTT assistance. At this point it is worth discussing restoration plans with a suitably qualified contractor to get approximate project costs, before requesting Phase 2, a worked-up WTT project proposal. Before this happens it is strongly recommended that contact is made with the Fisheries/ Biodiversity and Development Control functions of the local Environment Agency to arrange a 'pre-application meeting'. Pre-application meetings are extremely useful to help scope out design work and to take into consideration any issues that could affect proposed works. Local Natural England staff should also be invited to any pre-application meetings to cover any protected species and habitats issues.

The worked-up proposal should provide all the necessary information for the completion of a land drainage consent application. This legal consent from the Environment Agency must be obtained in writing before works can commence. Consents can take up to six weeks to process. It is proposed that the WTT attends the pre-application meeting before commencing a detailed project specification / proposal.

On successful completion of phase two of the project, an application can be made (Phase 3) for seed-corn funding to kick-start the project. Typically this is between £1000-2000.

Further funding should be sought from the Environment Agency Fisheries Project budget, emphasising Thames21's concurrence with the National Trout and Grayling Strategy's aims of habitat improvement and protection of wild brown trout stocks.

Physical works could be yet further kick-started with the assistance of a WTT 'Practical Visit' (PV) (Phase 4). The WTT will fund the cost of labour (two-man team) and materials. Recipient clubs will be expected to cover travel and accommodation expenses of the advisers. The use of specialist plant will be by separate negotiation.

Wet-work advisers will demonstrate one or more of the following techniques that are appropriate to the site.

- Tree management (coppice, pollard, sky-lighting)
- Tree Planting
- Fencing (Installation & Repair)

- Stream Narrowing (Faggots, Coir Rolls, Spiling, Islands)
- Flow Deflectors
- Introduction of spawning substrate
- Gravel Jetting
- Introduction / Management of Woody Debris

Note: Recipients of the programme must have received a WTT AV and have obtained the appropriate consents from the Environment Agency, Natural England, etc, prior to arrangements being made to undertake the PV.

Applications for all the above should be made via projects@wildtrout.org

5.2 Widening the project and finding funding

There are a number of possibilities for extending this project to a wider area, building partnerships with other local organisations and involving the local community in looking after the river.

- Thames21 is already highly successful in recruiting local youth volunteers which, on occasion, come through the probationary service. This could also be extended to local conservation action groups.
- Ashe's current angling coaching for coarse fishing could be extended to include fly fishing for mixed coarse and trout quarry.
- There may be scope for other community involvement in Sidcup, Bexley and Crayford with a river improvement project. There are a number of schools in the area, so there could be potential for a Trout in Classroom project. In the future, Trout in the Town is also hoping to develop techniques to enable "Mayfly in the Classroom" to be established; which is appropriate to the Cray.
- Denise Ashton is the Wild Trout Trust's Sponsorship and Communications officer and should be involved in exploring the possibilities associated with this project. Denise will receive a copy of this report.

6.0 Disclaimer

This report is produced for guidance only and should not be used as a substitute for full professional advice. Accordingly, no liability or responsibility for any loss or damage can be accepted by the Wild Trout Trust as a result of any other person, company or organisation acting, or refraining from acting, upon comments made in this report.