Advisory Visit

Afon Rhiw, Powys

September 2012

Introduction

This report is the output of a site visit undertaken by Tim Jacklin of the Wild Trout Trust to the Afon Rhiw / River Rhiew, at Lower House, near Berriew, Powys on 6th September, 2012. Comments in this report are based on observations on the day of the site visit and discussions with Mr. Woodruff (landowner), Mike Morris (Senior Projects Manager, Severn Rivers Trust) and Jason Jones (Fisheries Officer, Environment Agency Wales).

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.

1.0 Catchment / Fishery Overview

The Rhiw rises on the eastern slopes of the Cambrian Mountains and flows eastwards. Its two headwater arms join near New Mills, then the river runs alongside the B4390, through Manafon, Pant-y-ffridd and Berriew before joining the River Severn.

The Rhiw comprises three waterbodies as identified by the Water Framework Directive: the north (GB109054049470) and south (GB109054049350) arms of the upper river and the main stem from the confluence of the latter to the Severn (GB109054049410). All three waterbodies are currently in the category of overall good ecological status and the details for the section visited are shown below.

Waterbody ID	GB109054049410
Waterbody Name	Afon Rhiw (conf N and S arm) to conf R Severn
Management Catchment	Severn Uplands
River Basin District	Severn
Typology Description	Mid, Small, Siliceous

Hydromorphological Status	Not Designated A/HMWB
Current Ecological Quality	Good Status
Current Chemical Quality	Good
2015 Predicted Ecological Quality	Good Status
2015 Predicted Chemical Quality	Good
Overall Risk	At Risk
Protected Area	Yes
Number of Measures Listed (waterbody level only)	-
Ecological elements (*fish*, *invertebrates*) are currently described as *good* status, supporting elements (water quality) are all *high* status, and supporting conditions (*quantity and dynamics of flow* and *morphology*) are categorised as *supports good*.	

The section of river inspected was at Lower House, upstream of Pant-y-ffridd, between grid references SJ1375102602 (upstream) and SJ1468402884 (downstream), a length of approximately 1.4 km. The river here has been fished by Mr. Woodruff since the 1970s and he has catch records which show a large reduction in the numbers of trout caught, from in the order of hundreds per season in the 70s and 80s to single figures now. The largest trout recorded was 1lb 2oz and a 10oz fish was regarded as a good one. Grayling and chub used to be present but are reported to be absent now and formerly large shoals of minnows much reduced. Hatches of fly and the abundance of sub-surface invertebrates (e.g. caddis larvae) are also described as being much poorer than in the past.

A general reduction in water levels and the depth of the river was described by Mr. Woodruff. Formerly deep pools and glides were described which are now much shallower and in-filled with coarse river sediment. This is discussed in the next section.

Salmon run the Rhiw and it is used as an indicator river for the species by the Environment Agency. Redd counting used to be carried out here.

Land use in the catchment appears to be largely grazing and grass production for sheep and cattle. There are no statutory conservation designations (SAC, SSSI) affecting the section of river inspected.

2.0 Habitat Assessment

The section was walked in a downstream direction. The Rhiw has a moderately steep gradient of approximately 1 in 280 or 0.36% over the section inspected. The bed substrate is predominantly coarse sediment (cobble and gravel) and in-stream habitat is largely shallow glides and riffles (Photos 1, 3, 5), with a dearth of deeper pools (only three noted over the whole section).

In contrast to other parts of the river (as observed on the day and on aerial photography), considerable lengths of the section inspected had a much wider river channel (bank-full width) and contained large gravel bars and islands, comprising coarse gravel (Photos 2-5). In these areas, active bank erosion was taking place.

The accumulations of coarse sediment and bank erosion could be indicative of either an increase in supply of the sediment from upstream, a local disturbance to the channel which has promoted the formation of the gravel bars and islands, or a combination of the two. Increased coarse sediment supply does appear to be a factor; in the 1970s, extensive land drainage works took place in the upper Rhiw catchment, shortly after which there was an unusually large summer spate (David Blench, pers. comm.). This resulted in the shallowing of many former pools and glides throughout the middle and lower river, which were in-filled by gravel and cobbles and have remained so since.

Upstream reaches are described as having lots of exposed bedrock and being poor for salmonid spawning in this respect (Jason Jones, pers. comm.), which could also be an indication of increased sediment transport rates from these higher gradient areas. The changed hydrology resulting from upland drainage would result in shorter, higher intensity spates and lower base-flow water levels between times, as described by Mr. Woodruff.

Photo 1 Glide indicating how base flow water levels are reported to be much lower than 30 years ago; typically they would have covered all the exposed bed substrate. Very good low cover is present over the water on the far bank.

Photo 2 Former deep pool area now filled with large quantities of coarse sediment. Bank erosion and tree loss occurring on the outside bank.

Photo 3 Top of the gravel seam (arrow) indicates the former bed level of the river and that down-cutting and subsequent lateral erosion may have occurred as a result of changed hydrology and/or channel shortening (meander cut-off).

Photo 4 Vegetated gravel island

Photo 5 Over-wide, shallow channel with coarse sediment deposition and bank erosion. Lack of cover and depth makes this a poor habitat for salmonids.

Photo 6 Slumping banks and loss of trees and bank stability – ultimately this will lead to channel widening and a scenario similar to Photo 5. Retention of submerged woody debris (below dashed line) and packing of bank (arrow) with the remainder (plus bay-leaved willow bundles) will help to retain stability (if protected from grazing).

Inspection of aerial photography (Google Earth) suggests that channel changes in the immediate vicinity may also be a contributory factor. There are two areas on this section where meanders have been cut-off thus shortening and steepening the river channel (Fig 1). This can often cause rivers to cut downwards and there is some evidence of this here, where the former river bed level is evident in eroding banks. Following down-cutting, the river can then erode laterally (to form a new floodplain level), possibly undermining trees and reducing bank stability, and leading to an over-wide channel prone to coarse sediment deposition.

If possible, it would be beneficial to have a fluvial geomorphologist give an opinion on the cause of the changes to the Rhiw, taking into account changes in hydrology, sediment transport and channel morphology. This may also inform management options for improving the river. It could be a good project for a student in this discipline.

The above changes are likely to have affected trout habitat in a number of ways. Increased bank erosion reduces the amount of valuable “shaggy” marginal habitat, which provides cover and holding spots for fish. The reduced amount of deeper water in pools and glides is a direct reduction in adult habitat. The reduced water levels during low water conditions leads to a proportional reduction in the wetted area of the channel, and thus shallow water habitats for fry and parr, although this may be offset by formerly deeper adult habitat, as the abundance of juvenile salmonids is reported to be good. If the WFD classification of good status for fish is based upon juvenile salmonid abundance, it may not reflect the reduced adult abundance suggested by angling catches. If appropriate data are available, it would be interesting to contrast fish length-frequency distributions from contemporary and historic fishery surveys.

There were a number of examples of woody debris in the river channel and it appears the management approach to this is generally to leave it in place. This is a very good approach as it provides numerous habitat benefits, but it needs to be balanced with the need to retain bank stability (see below). The tree-lined sections of the river provided good bank stability and excellent cover in the form of sunken tree roots and trailing branches. There were many bay-leaved willows (*Salix pentandra*) present, which is a low-growing, bushy species valuable for providing low cover over the water.

There were a number of examples of leaning and collapsed trees (Photo 6) where the down-cutting and lateral erosion described above is undermining the root systems. If left unchecked, the loss of trees will greatly reduce the bank's resistance to erosion leading to channel widening and shallowing, like the areas in Photo 5. In these open sections of river, the shallow, exposed water provides poor trout habitat and will hold few fish of any life-stage. It is therefore important to try and prevent the loss of trees (see recommendations); where this has already occurred it is recommended that soft revetment techniques are used to stabilise the banks and provide some dense marginal cover for juvenile trout and salmon. These areas must be subsequently fenced to exclude livestock (including sheep) and trees encouraged to establish; this is vital if long-term bank stability is to be achieved.

Himalayan balsam is present and this invasive species needs to be controlled. It out-competes native vegetation leading to a monoculture, but being an annual plant, dies back in winter leaving bare banks exposed to erosion. Along with the changed hydrology of the Rhiw described above, this exacerbates bank erosion. Control can be achieved by spraying large stands with glyphosate (EA consent required), then following up with hand pulling. Severn Rivers Trust may have information on initiatives for catchment-scale control. Grazing animals exert a degree of control on balsam, but unrestricted grazing of the banks conflicts with the aim of re-establishing trees and bank stability.

In some of the long, shallow glide areas it may be possible to install some woody debris structures such as log flow deflectors and tree kickers, which will provide some depth and flow diversity (see recommendations).

Figure 1 Aerial view of the reach showing sections of former meander (dashed lines); the left meander is shown as cut-off on an 1886 map, whereas the right meander is still shown as river channel on a 1984 map. The lighter areas indicate the extent of coarse substrate deposition and contrast with the narrower, tree-lined sections typical of much of the rest of the catchment.

3.0 Recommendations

There appear to have been gross changes to the hydrology and sediment transport regime of the Rhiw in the last four decades. The following reach-scale recommendations can only be seen as "sticking plaster" solutions, treating the symptoms rather than the cause of the problems. Identification and quantification of the changes to catchment-scale processes by a fluvial geomorphologist is recommended; tackling them will then be a matter for catchment-based interests, statutory bodies and the local community. The current "good" WFD status will not assist this process, as funding for river improvement works is being prioritised for those waterbodies currently at less than "good".

Areas where the following recommendations are appropriate are marked on Figure 2.

Stabilise areas where trees may be lost. Trim the collapsed trees (Photo 6) and pack the bank behind the root mass with woody debris and willow bundles. Coppice leaning trees and use to make tree kickers (see appendix).

Use soft revetment (see appendix) against the eroding banks indicated in areas in Figure 2.

Fence the river banks to create a generous margin between the river and agricultural land; this should be sufficiently wide (10m) to allow trees to regenerate. The fence should exclude all livestock including sheep (see appendix).

Control Himalayan balsam. Large stands can be sprayed with glyphosate to bring plant numbers down to a manageable level for hand pulling. Control measures should be carried out each year before the plant flowers and seeds (usually in July). Consent for herbicide use alongside rivers must be obtained (www.environment-agency.gov.uk/homeandleisure/wildlife/31350.aspx).

Install log flow deflectors and tree kickers on shallow glide sections to increase flow and depth diversity (see appendix).

Please note: 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.

Figure 2 Red lines = soft revetment; yellow lines = fencing; 1 = Photo 6; 2 = tree kickers; 3 = log deflectors and tree kickers

4.0 Making it Happen

Flood Defence Consent from the Environment Agency (or local authority if non-main river) is required. Preparation and submission would require approximately 2 man days and processing of the consent can take two calendar months. An approximate bill of quantities is provided below for the cost of the works.

The Wild Trout Trust can provide advice and assistance with the preparation of the consents. We may also be able to provide a practical visit to demonstrate some of the techniques recommended (e.g. tree kickers, the work recommended in Photo 6). The more involved and expensive soft revetment would require the use of plant and materials as indicated below.

5.0 Bill of Quantities

Recommendations possible on WTT Practical Visit:

- Six tree kickers
- Six log flow deflectors
- Bank revetment associated with Photo 6

Labour and materials provided by WTT.

Travel and accommodation costs (estimated £500) provided by the recipient.

Further works requiring additional funding:

Soft bank revetment				
Source materials and transport to site. Assumes conifer trees and hawthorn trees can be sourced on site at Lower House and a total of 150m of bank (three 50-m sections) to be treated.				
Tree felling / forwarding	Chainsaw operative	£350/day*	2 days	700
	Forwarder and operator hire	£350/day*	2 day	700
Installation	360-excavator and operator hire	£450/day*	3 days	1350
	Plant Delivery/Recovery	£400*		400
Materials	Rebar	75 x 2m pieces	@ £10 each*	750
VAT 20%	On above			780

Project management	Site supervision	£350/day	3 days	1050
	Travel / accom	Est £300		300
Sub-total				6030
Contingency 10%				603
Total				**6633**

* Steel prices fluctuate widely – need to obtain quote at time of project.
Savings to above may be possible if plant use can be provided in kind by recipient.

Fencing costs

Approximately 1000m fencing at £6.50 / metre	£6500
Plus gates and drinking points	£3500
Total	£10,000 Plus VAT

6.0 Acknowledgement

The Wild Trout Trust would like to thank the Environment Agency for the support which made this visit possible.

7.0 Disclaimer

Appendix

- Tree kickers are whole trees which are anchored to a single secure point on the river bank and pushed parallel to the bank by the flow (Photo 7). The WTT have installed many such features on high energy river such as the Rhiw, by fixing the felled tree either to its own stump, or to the exposed roots of other riparian trees, using cabled steel wire (Photos 8, 9).

Photo 7 Tree kicker on River Ceiriog near Chirk.

Photo 8 Cutting and drilling

Photo 9 Fixing with cable

- Soft revetment. This technique is not only suitable for reducing excessive erosion rates but provides superb juvenile salmonid habitat. It is vital that treated areas are fenced well back from the bank edge to prevent livestock access and allow trees to establish.

Afon Dulas (before)

Afon Dulas (during installation). A Wye & Usk Foundation project. (Photos courtesy of Simon Evans)

Conifer top revetment against an eroding bank on the River Manifold, Staffs. Note adjacent wide fenced margin which has also been planted with willow slips.

- Log flow deflectors can be fixed to the river bed using steel rebar. They should be angled upstream to deflect flows to the centre of the channel (see below and Photo 10).

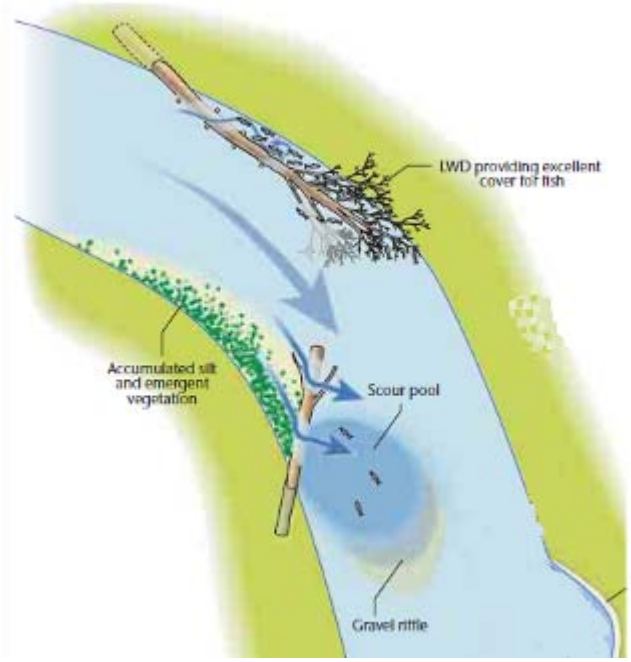
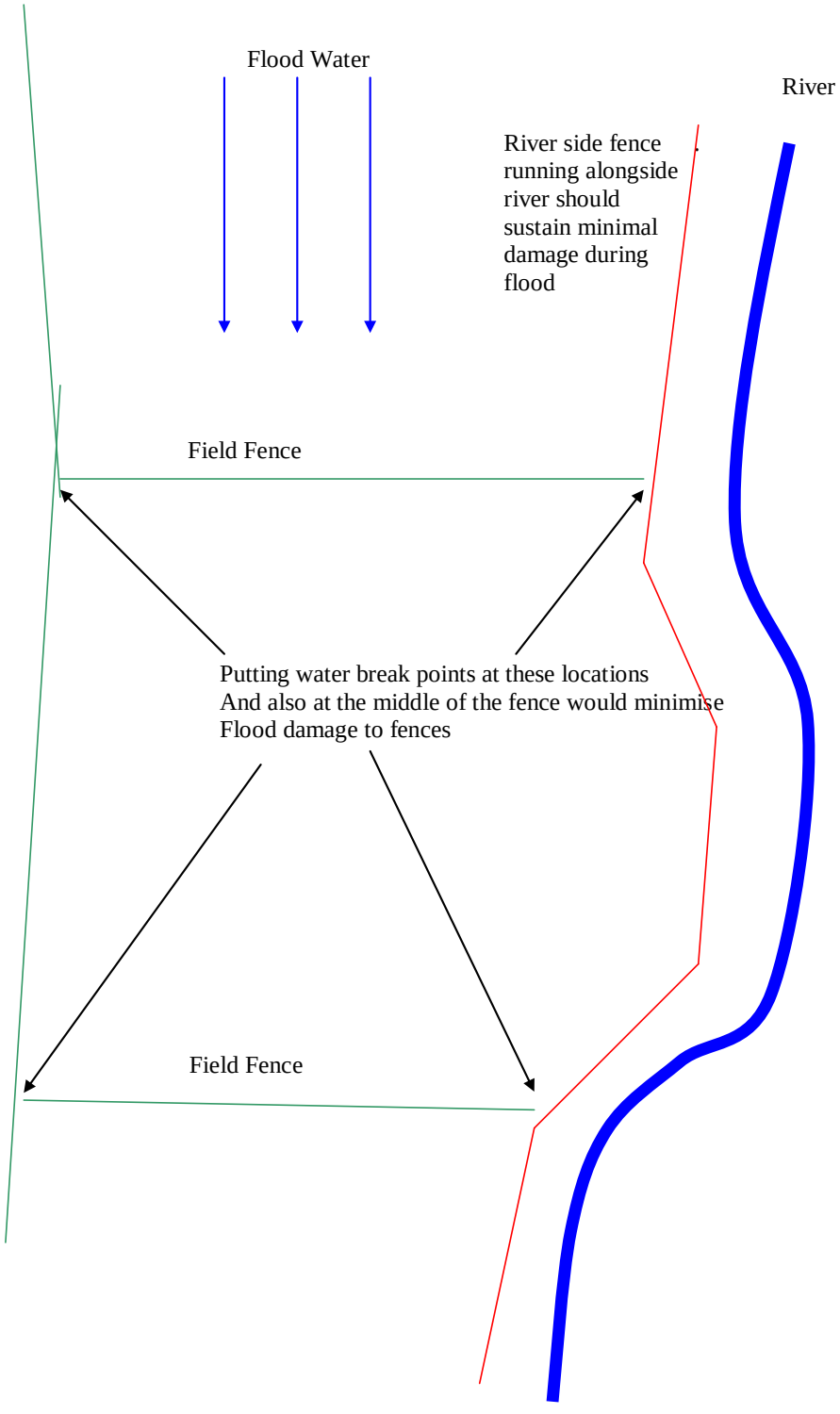
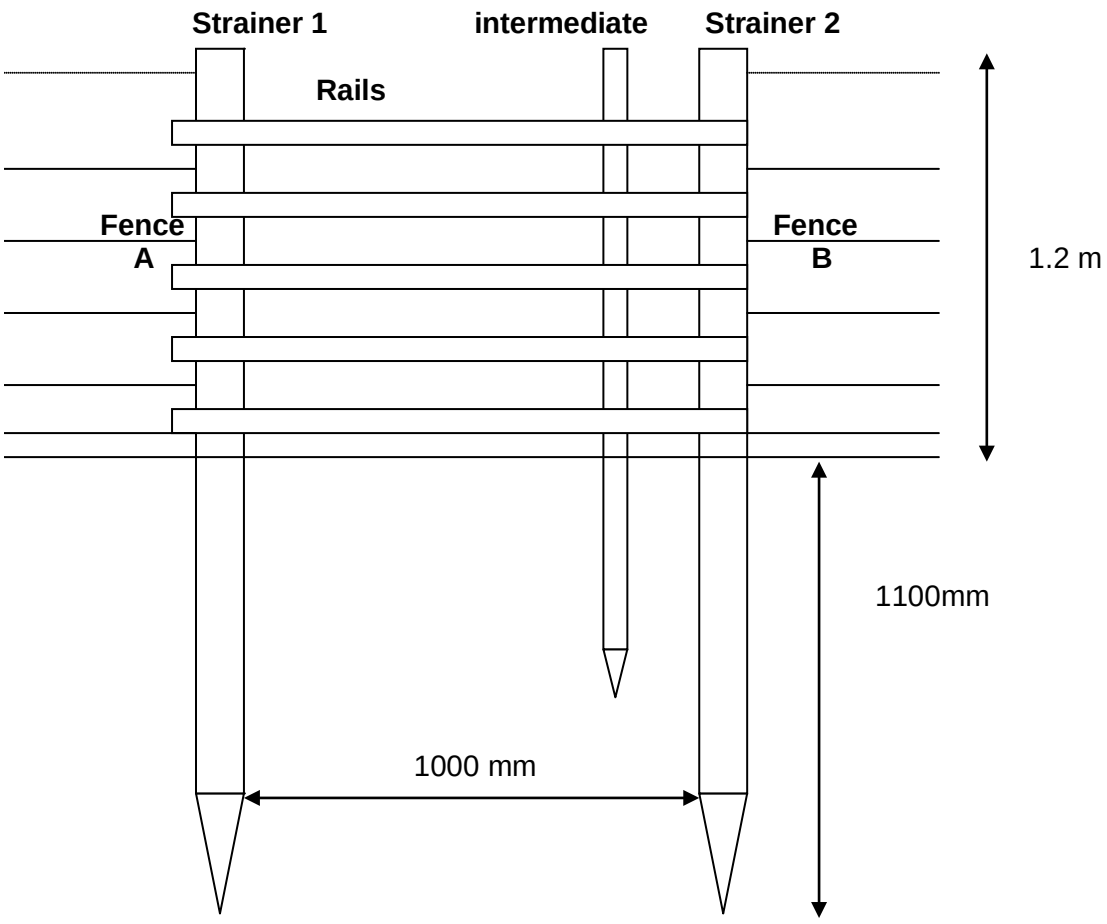


Photo 10 Log deflector installed on the River Ceiriog.

River-side fencing – guidance (courtesy of Will Cleasby, Eden Rivers Trust). See also WTT Upland Rivers Habitat Manual (www.wildtrout.org Library)



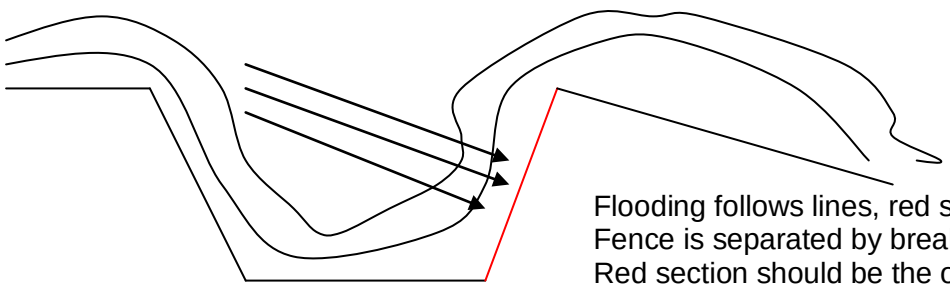
Details for setting up water break points to separate one fence into two



Water Break Point:

- Straining posts 1 and 2 set at approx 1m apart
- Intermediate post set 200mm of strainer 2
- Rails are nailed to strainer 1 and intermediate post
- Rails sit flush to strainer 2 but not attached to it

Example:



Flooding follows lines, red section of Fence is separated by break points. Red section should be the only one To replace after flooding

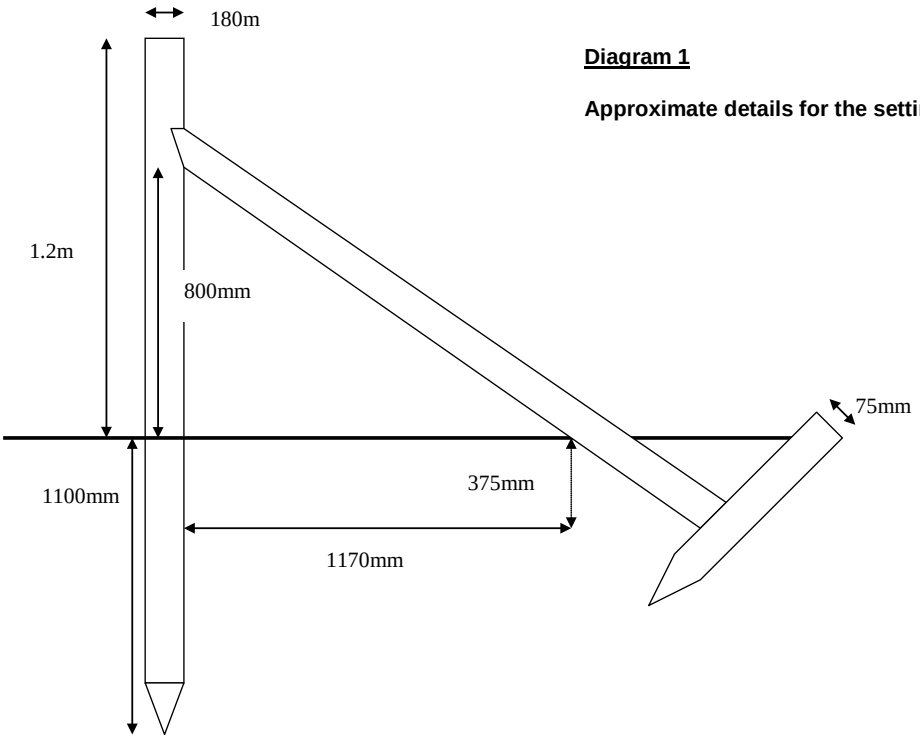


Diagram 1

Approximate details for the setting up of the strainer

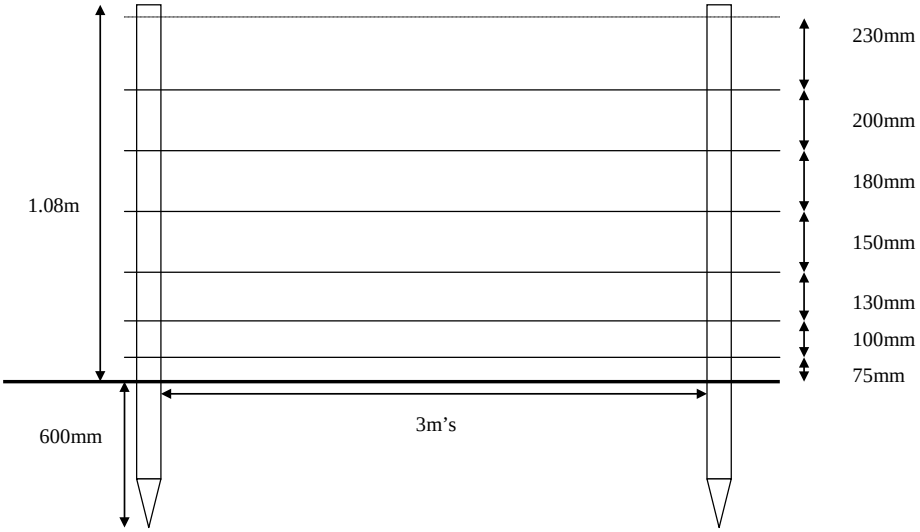


Diagram 1

HIGH TENSILE.

6 STRAND HIGH TENSILE
1 STRAND BARBED WIRE

High tensile wire (diagram 1)

- Shall not be less than 1.06m high from ground to top wire.
- Wire shall be galvanised (BS4102), 3.15 mm diameter.
- Straining Posts shall be 180mm minimum top diameter x 2.4m's to be driven into the ground.
- Strainers to be set at centres not exceeding 50m's.
- Turning posts shall be 155mm top diameter x 2.1m's. May be pointed and driven to 900mm into the ground.
- Struts shall be 120mm dia x 2.1m long and notched into the straining post at an angle no greater than 45 degrees. Allow two struts for strainer/turner where angle is less than 135 or one bisecting the angle where the internal angle is greater than 135.
- Intermediate post shall be 75 - 100mm dia x 1700mm to be driven to 450mm. To be set at no more than 3 m intervals.
- Galvanised steel radisseurs to be used to tighten strands.