4.0 Technical Specifications

Riffle 1

30m long x 11m wide x 1m deep x 1.8 (tonnes / density) / 2 = 297 tonnes of gravel, 165m^3 volume. A channel will be left approx 1m deep at the LHB side of the riffle to allow passage of EA weed cutting boat.

Note: The density figure of 1.8 tonnes is an industry standard. The total is divided by 2 to take into account the overall shape of the riffle.

Spoil heap 1

30m long x 7m wide x 1m high x 1.8 (tonnes/density) = 378 tonnes

Calculation of available gravel from spoil heap 1

The dredging out of the original gravel riffles took place several decades ago. During this time the clean gravel has accumulated fine, silts sands and organic mater (soil etc…) post deposition on the bank.

With this in mind a methodology has been attempted to work out the available gravel from the total volume of material in the spoil heap. This will enable a more accurate way of ordering any extra gravel required to complete each riffle.

It must be stated that this is ‘rough science’ and will give an approximate figure of the quantities and weights of materials involved. However, it will enable a more accurate bill of quantities to be produced, one that is less reliant on total ‘guesstimates’.

This is an innovative technique, and thus a certain amount of experimental development will be required. An appropriate safety margin will be built in to the final quantity needed to provide a contingency if available gravel from the spoil heap has been under calculated. If this figure over calculated the less gravel will need to be delivered to site thus saving on the overall projected costs.

5 random test digs were taken from the spoil heap. These were weighed in each case to a 10 litre capacity. Weights were then taken (A). The spoil was then sieved in the river to remove fines and organic matter, then re-weighed (B). From this a percentage gravel to original spoil was calculated (C), and averaged out over the number of test digs.

Gravel in the spoil heaps is of good mixed sizes ranging from 10mm – 70mm+. this material is suitable for barbell spawning requirements.

100 / A x B = C - e.g. 100 / 29.5 x 9.5 = 32%

Test Dig	Original Weight (lbs) (A)	Sieved Weight (lbs) (B)	% of Original Weight (C)
1	29.5	9.5	32%
2	31.5	9.5	30%
3	36.0	18.0	50%
4	37.5	21.0	56%
5	32.5	15.5	48%
		Average % / 5	**43%**

Therefore assuming an approx availability of 43% gravel from the total weight of the spoil heap of 378 tonnes, we are left with 163t of useable gravel.

This leaves a deficit of 134 tonnes of gravel needing to be imported to site to complete the riffle. To this a margin of error of around +20% should be added, bringing the figure to 160 tonnes.

As the gravel in the spoil heaps is good spawning substrate it is recommended that imported gravel should be used as a central core on which to place the finer material over. This will also reduce costs.

This material should be whole stone reject 100-175mm and costs in the region of £10.30 per tonne delivered +VAT (as of Sept 2002)

Therefore the quantity & cost of gravel for Riffle 1 is 160 tonnes x £10.30 = £1648.00

Riffle 1 - Two Stage Channel

As per guidance in EA memo dated 29th May 2002, and subsequent site meeting on the 26th March 2003, a two stage channel will be excavated to compensate for any loss of channel capacity.

Dimensions of the 2-stage channel are: 50m long (10m u/s &d/s of riffle) and to a width of 2.5m and height of 1.5m. This adequately takes into account recommendations made by the EA to widen the 11m channel by 115% (1.65m)

This removes a volume of 187.50m^3
The volume of gravel required for riffle 1 is 165m^3

All excavated material will be deposited along the field hedge boundary.

Riffle 2

22m long x 10m wide x 1m deep x 1.8 (tonnes / density) / 2 = 198 tonnes, 110m^3 volume.
A channel will be left approx 1m deep at the LHB side of the riffle to allow passage of EA weed cutting boat.

Spoil heap dimensions.

29m long x 4.5m wide x 1m high x 1.8(tonnes/density) = 234 tonnes

Calculation of available gravel from spoil heap 2.

Test Dig	Original Weight (A)	Sieved Weight (B)	% of Original Weight (C)
1	36.5	21.0	58%
2	34.0	18.0	53%
3	36.0	18.0	50%
4	34.0	15.5	45%
		Average % / 4	**52%**

Note: only 4 test digs as a smaller heap

Therefore available weight of gravel from spoil heap 2 is 234/100 x 52% = 122 t
Gravel required for Riffle 2 is 198t leaving a deficit of 76t of gravel to be imported to complete the job.

Using the contingency figure of +20% this figure rises to 91tonnes.

Total cost of delivered gravel to be imported for Riffle 2 is:
91t x £10.30 = £937.30 + VAT

Riffle 2 - Two Stage Channel

As per guidance in EA memo dated 29th May 2002, and subsequent site meeting on the 26th March 2003, a 2-Stage channel will be excavated to compensate for any loss of channel capacity.

Dimensions of the 2-stage channel are: 42m long (10m u/s &d/s of riffle) and to a width of 2.0m and height of 1.5m. This adequately takes into account recommendations made by the EA to widen by 115% (1.5m) of the original channel width (10m).

This removes a volume of 126m^3
The volume of gravel required for riffle 2 is 110m^3
All excavated material will be deposited along the field hedge boundary.

Riffle 3

30m long x 11m wide x 1m deep x 1.8 (tonnes/density) / 2 = 297 tonnes, 165m^3 volume.
A channel will be left approx 1m deep at the LHB side of the riffle to allow passage of EA weed cutting boat.

There is no available spoil heap, and thus all gravel required will need to be imported to site.

Construction of the riffle should be split into two levels.

1) **Spawning substrate**

   This needs to be approx 35cm in depth and well mixed in sizes ranging from 5 -40mm+.

   This size of substrate facilitates deposition and development of eggs by species such as barbel, chub, dace and brown trout.

2) **Core layer**

   The riffle can be 'keyed in' by using larger and cheaper whole stone reject gravel, as this is below the depth need by the above species of fish to successfully spawn on.

Therefore the following quantities are required:

Spawning substrate

30m long x 11m wide x 0.35m deep x 1.8 (tonnes/density) / 2 = 90 tonnes

Core layer

30m long x 11m wide x 65cm deep x 1.8 (tonnes/density) / 2 = 207 tonnes.

Costs and quantities of Riffle 3.

90t (5-40mm+) x £14 per t = £1260 + VAT

207t (reject) x £10.30 per t + £2132 + VAT

Total cost £3392 +VAT (including delivery) – including VAT £3985.60

Riffle 3 - Two Stage Channel

As per guidance in EA memo dated 29th May 2002, and subsequent site meeting on the 26th March 2003, a 2-Stage channel will be excavated to compensate for any loss of channel capacity.

Dimensions of the 2-stage channel are: 50m long (10m u/s &d/s of riffle) and to a width of 3.5m and height of 1.0m. This adequately takes into account recommendations to widen the channel by 115% (1.65m)

This removes a volume of 175m^3
The volume of gravel required for riffle 3 is 165m^3

All excavated material will be deposited along the field hedge boundary.

Summary of quantities & costs of imported gravel for all three riffles

Riffle 1

160 tonnes (reject) @ £10.30 pt = £1648.00

Riffle 2

91tonnes (reject) @ £10.30 pt = £937.30

Riffle 3

207 tonnes (reject) @ £10.30 pt = £2132
90 tonnes (5-40mm) @ £14 pt = £1260

Totals

Reject – 340 tonnes = £3502
(5-40mm) - 90 tonnes = £1260

Total Cost £5977.30 +VAT - Including VAT = £7023.32

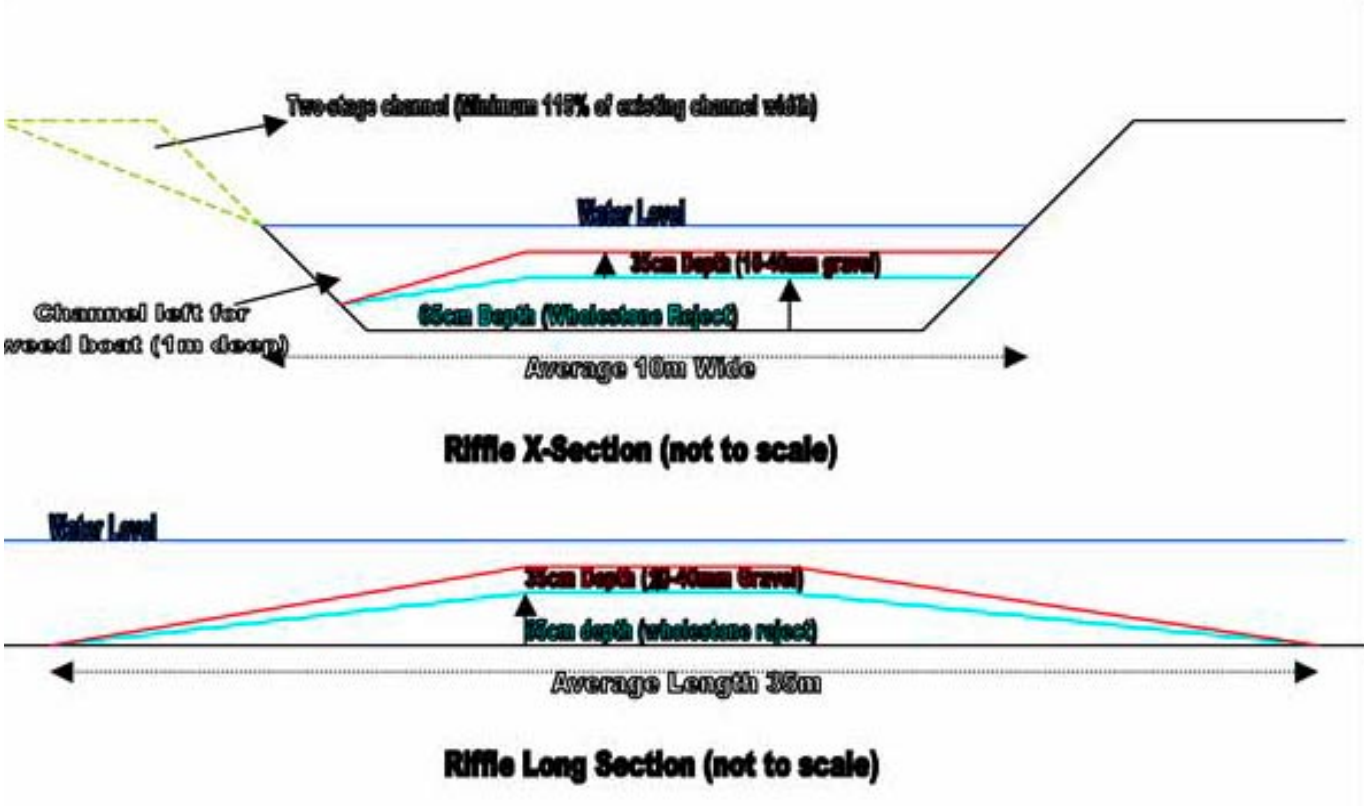

Diagram 1 – Riffle X & Long section drawings

(See appendix 1 for schematic diagram of riffles)

Cattle Drink Riffle and Faggot Specification

Length: 10m
Width: 7m
Depth: 0.5m
Length of Post & Rail Fencing: 21m
Gravel for Drink: 35m^3 x 1.8t per m^3 = 63.3t
Material to be excavated from drink: 35m3 x 1.8t per m3 = 63.3t
Gravel for Top-dressing riffle: 25.5m^3 x 1.8t per m^3 = 45.9t
Material to be excavated as 2-stage channel to a minimum 115% of channel width and 5m u/s & d/s.

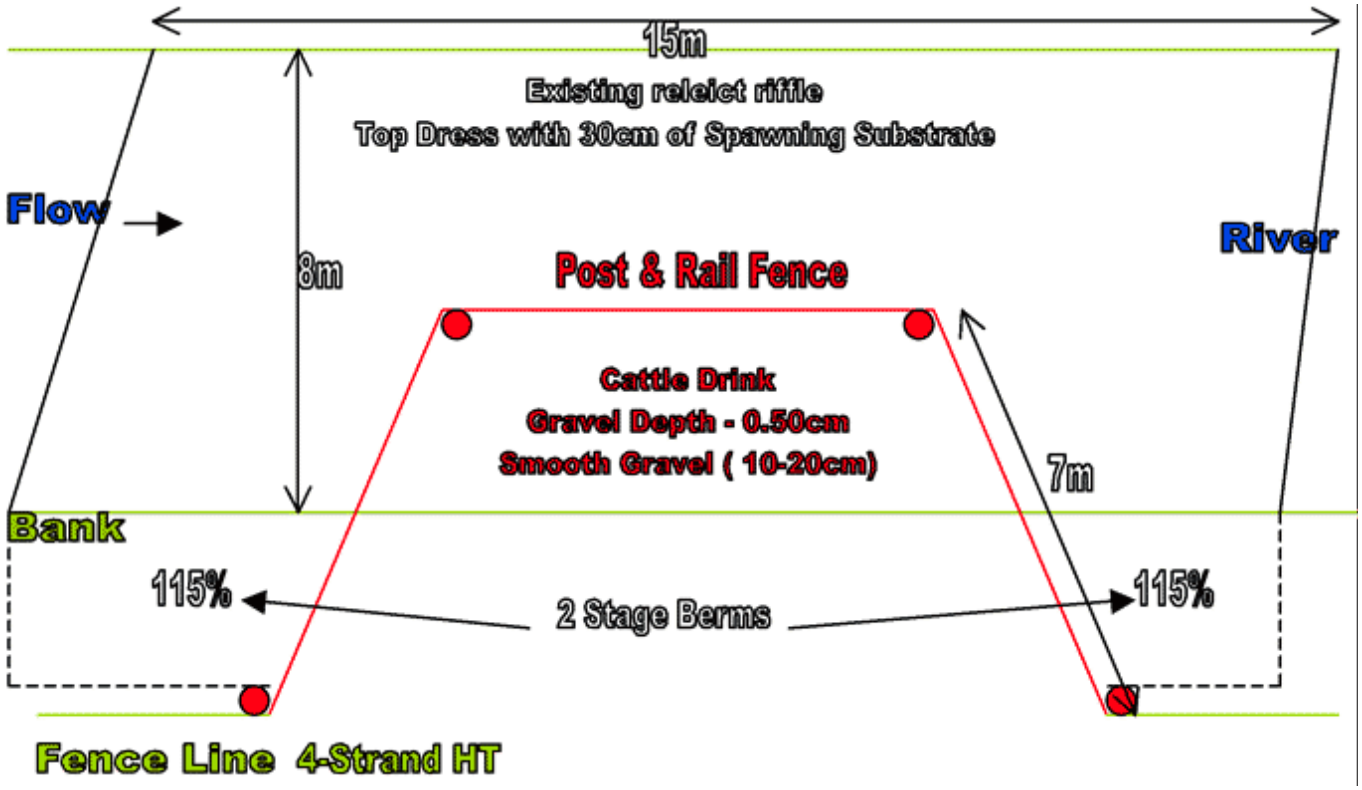

Diagram 2 - Cattle drink. (not to scale)

Brushwood Faggots

Faggots are approx 2m long x 50cm wide. They will be placed in a line following that of the active deposition of sands along a length of 15m by 2m wide. Depending on the nature of the river bed faggots will be staked onto the ground using pointed alder poles or angle iron, every 1m.

(See appendix1 for schematic diagram of cattle drink and narrowing)
Off-River Refuge Specifications

Two dykes to be slubbed-out to a width of 4m to a depth of approx 1m. Slubbings will be spread thinly adjacent to the dykes.

At 10m dyke to be gradually widened out to approx 10m wide to create shallow pool area. Pools are to be approx 25m long. Spoil to be taken from one bank to allow excavator to work back on itself. At finish of pool continue slubbing out dyke for a further 10m.

Both slubbed out dykes and pools to be fenced and planted with clumps of native trees and bushes, such as alder, willow and blackthorn. All plantings will be over 10m from the river bank, thus not requiring Agency LD Consent. Material to be spread thinly adjacent to dykes.

Voles are not present in either dyke, as at present habitat quality is poor.

Estimated material to be slubbed out from dykes.

Two Refuges = 440m^3
Two Dykes:72m^3

(See Appendix 1 for volume calculation sketches)

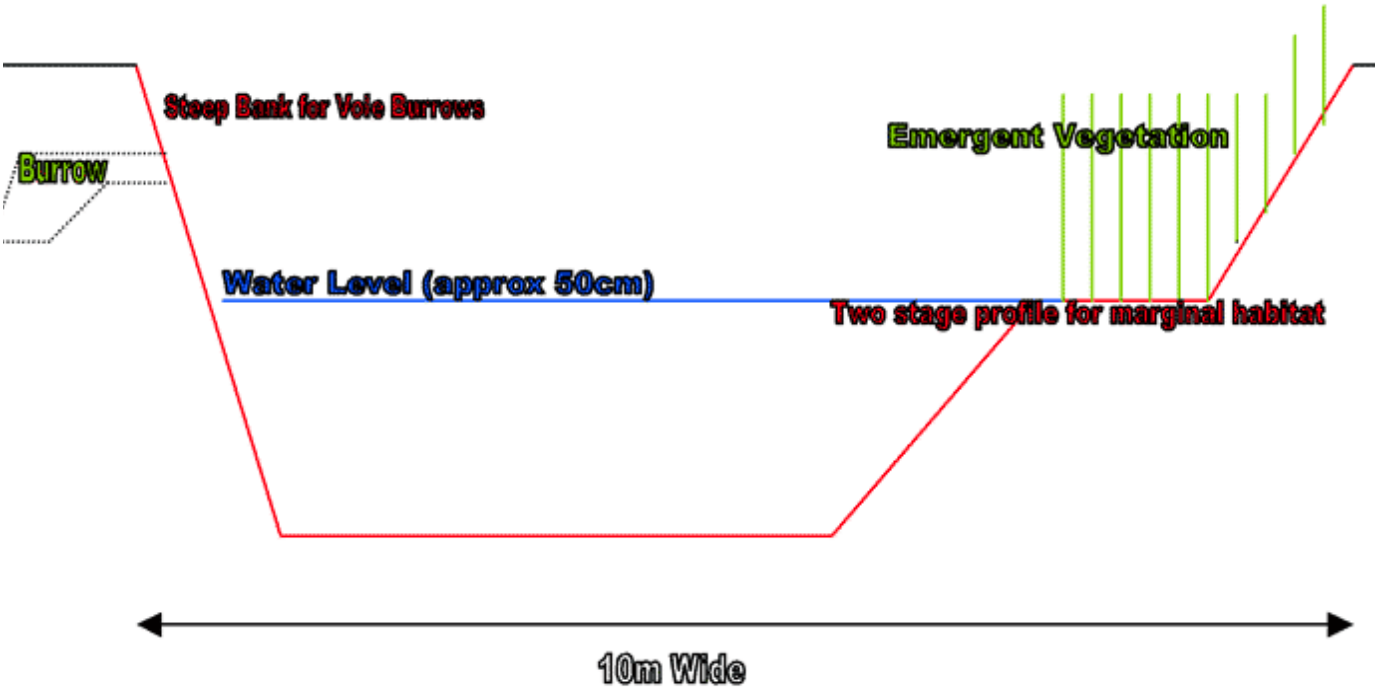

Diagram 3 - Off-River refuge profile (not to scale)

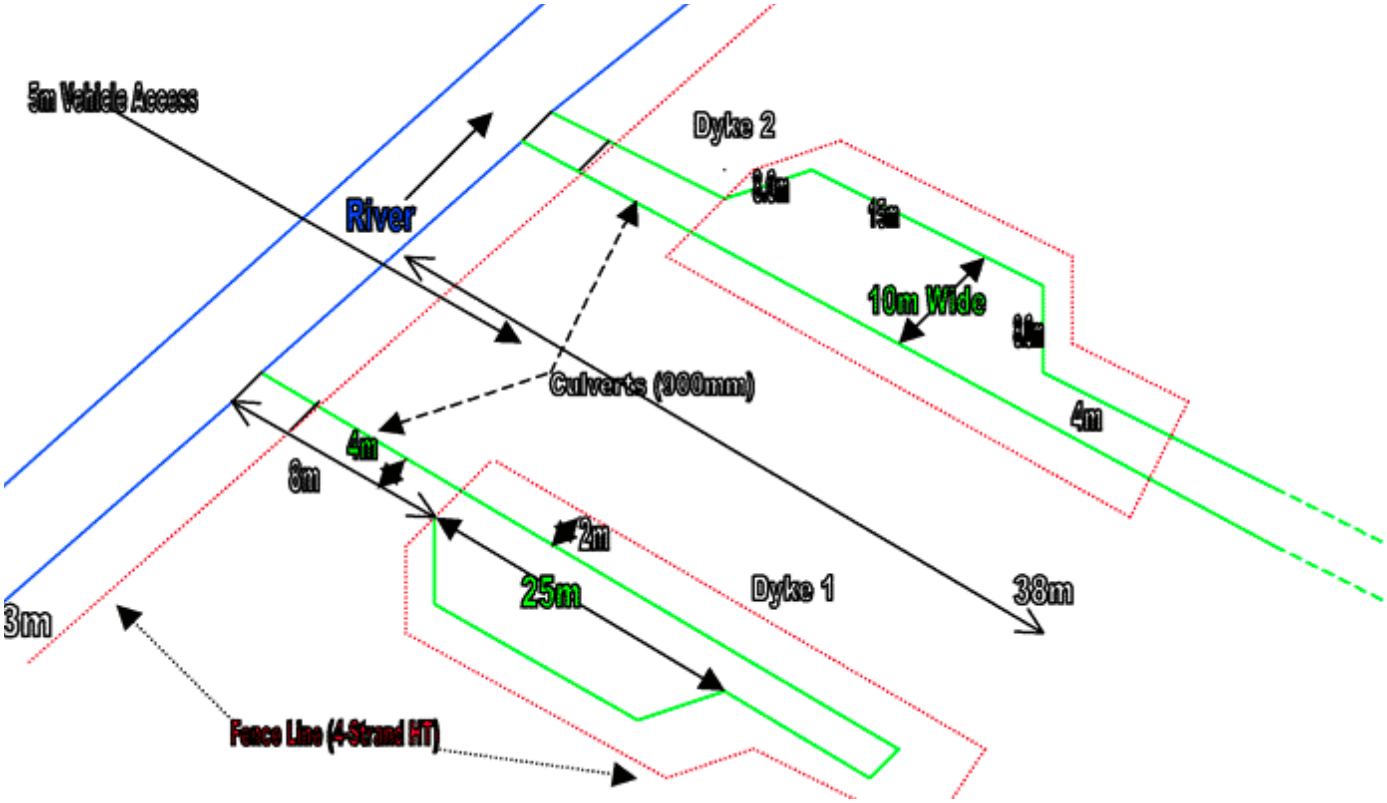

Diagram 4 – Off-river refuges plan. (see drawing for more detail & fencing spec)

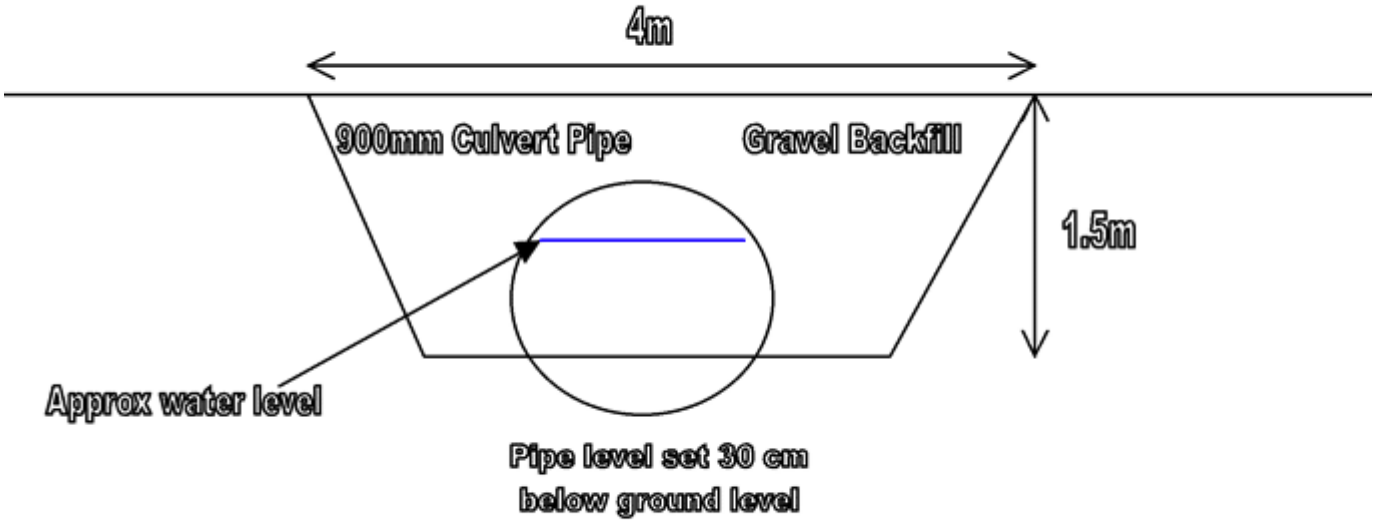

Diagram5 – X-Section of Off-River refuge Culvert

River bank fencing specification

Fencing needs to be 4 strand galvanised high tensile, interspaced at regular intervals with straining posts, set 3m back from the bank edge.

The riverbank fencing component of the project is 436m of single bank fencing.

The fencing requirements for the dykes & refuges is approx 85m per feature.

Therefore the total stock fencing requirement is 436m+85m+85m = 670m

There will be a need for 5 stiles placed at strategic locations to aid angler access

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