

# WILD TROUT TRUST

**Project Proposal**

**Borrow Beck, R Lune**

**([GB112072071770](https://www.gov.uk/guidance/112072071770))**

**Prof J Grey ([jgrey@wildtrout.org](mailto:jgrey@wildtrout.org)), May 2025**



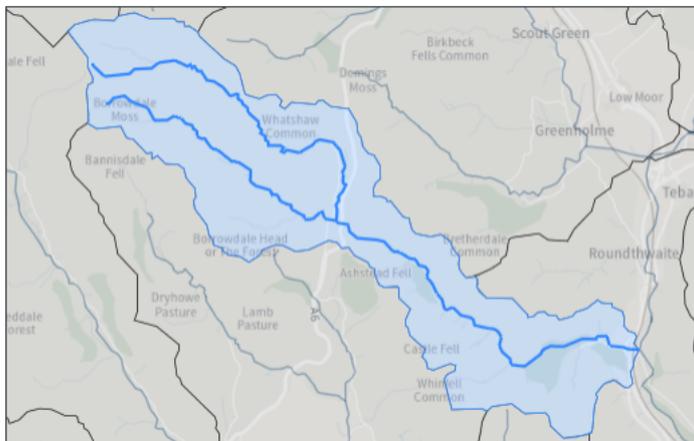
## 1.0 Introduction

The following is a brief report based upon observations during a walkover of specific reaches of Crookdale Beck (Borrow Beck waterbody), and from subsequent desk-based studies. It was carried out by Prof J Grey at the request of Simon Stainer for the Penrith to Kendal project (P2K) to assess feasibility of habitat improvements and better functionality along the channel and adjacent riparian zone.

Throughout the report, normal convention is applied with respect to bank identification, i.e. left bank (LB) or right bank (RB) whilst looking downstream. Upstream and downstream references are often abbreviated to u/s and d/s, respectively, for convenience. A series of images is used to exemplify ideas generated during the walkover. Some site-specific detail is given in the legend for each figure, and more generic information can be found in the summary following on.

Under the Water Framework Directive, the Borrow Beck Waterbody is designated as achieving Good Ecological Status. However, it should be noted that the hydromorphological elements were deemed 'Not High'.

### Borrow Beck Water Body Good ecological status



#### Get Borrow Beck data

- [Download water body \(Shapefile\)](#)
- [Download water body \(GeoJSON\)](#)
- [Download classifications \(CSV\)](#)
- [Download site classifications \(CSV\)](#)
- [Download investigations \(CSV\)](#)
- [Download challenges \(CSV\)](#)
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#### Related links

- [Plan maps on ArcGIS online](#)
- [Flood risk management plans](#)

### Attributes

<b>Water Body ID</b> GB112072071770	<b>Water Body Type</b> River	<b>Hydromorphological designation</b> not designated artificial or heavily modified	<b>NGR</b> NY5796701908
<b>Catchment area</b> 2626.804 ha	<b>Length</b> 23.829 km	<b>Catchment area</b> 26.268 km2	<b>Surveillance Water Body</b> No

<https://environment.data.gov.uk/catchment-planning/WaterBody/GB112072071770>

Comparison to the first 1830s Ordnance Survey maps (available via the National Library of Scotland) indicated that the channel had already been straightened and realigned to the side of the floodplain – see maps below. There was evidence of recent modifications to the northernmost section where the extant channel was straighter, but also some evolution of the extant channel in the mid reaches to a more sinuous course. The LiDAR data hint at a much more dynamic channel, both spatially and temporally, with multiple paleochannels across the entire floodplain – see Fig 6 later.



Map from 1830s Ordnance Survey (RH panel) as compared to the extant satellite view of the channel.

## 2.0 Proposals

### ***Crookdale Beck channel (NY 55172 05422 u/s to NY 55301 04839 d/s)***

The u/s limit of examination of the main channel was effectively at a ford crossing point which was in a very poor state of repair. It appeared to have been bolstered with concrete additions at several points in its history. As observed (Fig 1), it was significantly undermined and will no doubt fail again shortly. It presented a barrier to fish passage for the majority of flow conditions, with a headloss of  $\sim 0.7\text{m}$  and a shallow skim of fluming flow across the concrete, and restricting access to  $>5\text{km}$  of potential habitat u/s.



**Fig 1. A ford (u/s limit, NY 55172 05422), which was in a very poor state of repair and undermined, presented a substantial barrier to free fish passage and natural sediment transport.**

- Ideally, the structure should be removed if there is no requirement for it, especially considering there was a clear-span bridge  $\sim 225\text{m}$  u/s.
- Full removal would reinstate free fish passage and sediment transport, as well as helping to renaturalise the channel with no on-costs or maintenance.
- A possible though sub-optimal fish passage solution could be to re-purpose large boulders from bank revetment d/s to create a rock-ramp but this would be extremely difficult to engineer in such a way to resist becoming unstable, being outflanked, or simply the finer material washed out from it. The three are not mutually exclusive and hence it is a poor option as compared to full removal.

Around 65m d/s of the ford (at NY 55222 05375), there was an offtake situated on the RB (Fig 2). Presumably, this was a United Utilities asset but should be assessed as to whether it is still required / functional. Almost opposite, there was evidence of concrete & revetment within the channel to the LB, potentially in an attempt to steer and maintain the channel away from the footings of the nearby pylons. A full service check of the area would be required before any works commenced.



**Fig 2. Assumed United Utilities offtake at NY 55222 05375 and proximity of high voltage powerlines.**



**Fig 3. Looking u/s from NY 55299 05070 at the over-capacity channel, exposed boulders and heavily grazed sward.**

At the time of the visit, after a prolonged dry spring, the water level was extremely low within the over-capacity channel which comprised mostly large cobble and boulder substrate (Figs 2&3). Livestock grazing had reduced the riparian vegetation to an extremely short sward and was hampering colonisation and consequent stabilisation of deposition bars. Hence, the channel was extremely exposed and at severe risk of warming. Evidence of historical and more recent dredging of substrate to bolster existing boulder revetment and realigned embankments and maintain the straightened course has reduced the channel to a trapezoidal gutter in cross-sectional profile and the substrate was homogeneously distributed as a consequence – see Fig 4.

In particular, around NY 55311 05004 just to the south (d/s) of the main field boundary, there was a substantial length of boulder revetment keeping the channel pinned to the LHS of the floodplain – see Fig 5. Reference to LiDAR-derived models of the terrain (Fig 6) demonstrate exactly how spatially and temporally dynamic the channel should be within the reach under consideration.

- The simplest, least disruptive and probably most natural approach would be to remove the ‘shackles’ of the boulder revetment, especially to the RB, thereby reconnecting the channel to the floodplain – see Fig 6.
- Much of the stone and boulder observed within the revetment and embankments was clearly fluvial in origin and would have been dredged from the channel at the time of realignment.

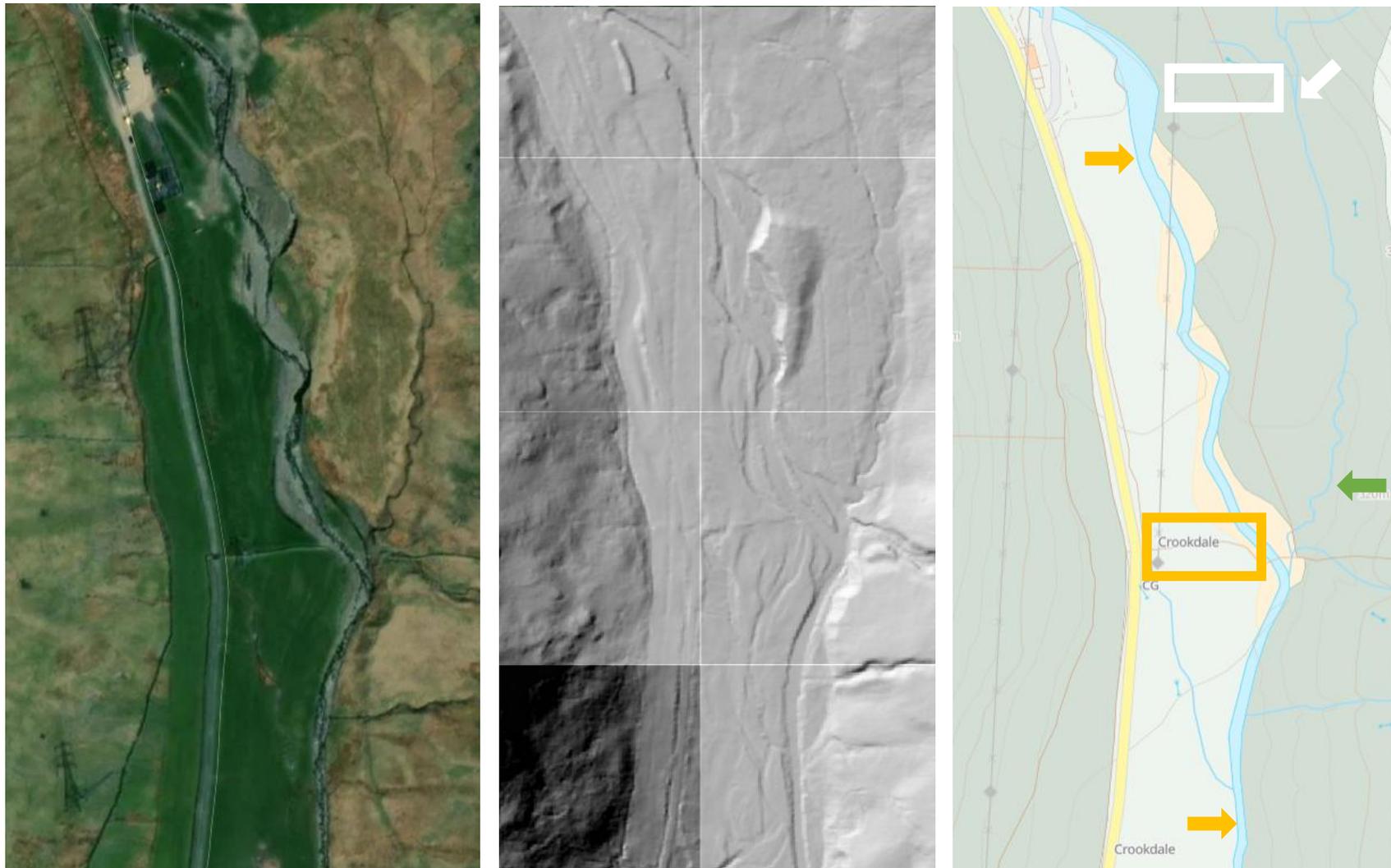
- Returning that boulder and cobble to the channel, either as a dispersed matrix to subtly bed-raise or in more defined clusters to accentuate sinuosity would be essential to aid restoration of natural function and floodplain reconnection.
- Another option might be to remove the cross-valley walling (NY 55269 05063), returning the stone to the channel, but leaving the footings to impede spate flow – see Fig 6.
- Combined with replacing sheep with cattle (and shifting to a low-density, conservation-style grazing regime), should allow for a much more diverse riparian flora to develop and help to colonise deposition bars, increasing hydraulic roughness, physical habitat diversity, biodiversity, and resilience.
- There should be ample stone material within the revetment to bolster defences around any pylon legs if required.



**Fig 4. U/s & d/s from NY 55298 04886, the realigned, straightened channel pinned to the eastern side of the valley was extremely exposed and provided little habitat heterogeneity.**



**Fig 5. Looking u/s from NY 55311 05004 where the channel had been realigned to the eastern side of the floodplain and pinned there by large boulder revetment in the RB.**



**Fig 6. Satellite, LiDAR & Magic representation of the reach of Crookdale Beck (Borrow Beck). Orange arrows delineate the length of RB from which boulder revetment could be removed. Orange rectangle denotes cross valley walling which should be removed except that section to protect the pylon. White arrow marks the start of drainage channels within the wetland to the east which could be blocked repeatedly or potentially just once near to the green arrow. White rectangle denotes potential for a shallow reconnection between the extant channel and the wetland to accommodate spate flow.**

Naturally steep channels of smaller tributaries flowing from the eastern side of the valley were clearly highly erosive in nature, as evidenced by the coarse substrate at the confluence – see Fig 7. There was also evidence of slippage, likely exacerbated by livestock: grazing reducing sward diversity and depth of root matrix within the soils; and the direct physical impact of trampling / traversing.

- Changes to the livestock regime should see a rapid change in the riparian structure.
- Augmented planting of these ghylls with scrubby tree species would further accelerate recovery.



**Fig 7. Naturally steep tributary entering the mainstem at NY 55303 04954 exhibiting evidence of land slippage because of poor root structure in the heavily grazed sward.**

To the southern end of the reach, and to the west of the main channel, there was a spring or diverted tributary that may once have been a paleochannel but has since been dredged into a narrow, uniform drain (Fig 8).

- It should be a relatively simple task to return stone into the drain from the dredging spoil banks on either side to rewet the entire area, either via a stage-zero approach, or to block the drain channel at irregular intervals and potentially reprofile the banks in between to form a series of shallow ephemeral pools which should increase the biodiversity potential immediately.



**Fig 8. To the southern end of the site at NY 55245 04817, a spring or small tributary adjacent to the road had been dredged to increase drainage.**

***Eastern wetland: NY 55302 05405 u/s to NY 55352 05100 d/s***

The wetland to the eastern side of the valley was considered separately. Substantial in area, parts of it were drained with straight gutters but the wetter parts exhibited good biodiversity potential.

- With a more detailed topographic survey and some exploratory excavations, it may be possible to identify paleochannel connection between the extant channel and the wetland – see white rectangle on Fig 6.
- If a paleochannel connection is found, then there is potential to create a shallow channel between the two which would accommodate spate flow from the Crookdale Beck into the wetland during extreme events.
- Otherwise, within the wetland, any formalised drainage channels should be blocked.
- A low impact approach, rather than running plant through sensitive wetland habitat, might be to identify key pinch points towards the southern end (green arrow on Fig 6) where a low bund could be introduced to drown out all the drainage network u/s.

### **3.0 Recommendations & prelim estimate of costs**

- Review all options proposed here considering flood modelling data generated for the wider project.
- Possible costs for more focussed topographic survey around proposals ~£2000
- Early engagement with utilities providers to assess services and access constraints.
- The entirety of the Borrow Beck catchment is considered ordinary watercourse and should require a land drainage consent from the local council. Indicative costs – drawing up application(s) 4 days min plus fee = £1450-2000 dependent upon elements
- Groundworks for Crookdale Beck channel should be relatively simple – plant & dumper to move spoil ~10 days – local rate ~£700 per day all in = £7000
- Additional costs might incl removal of ford (1 day) @ £700 or creation of rock ramp (3 days) @ £2100
- Wetland drain blocking (2 days) @ £1400
- WTT CO time to oversee groundworks with contractor = £3600-4550
- Issues to contend with – services.

#### **4.0 Acknowledgement**

The Wild Trout Trust would like to thank the Environment Agency for partial support of this Project Proposal, in part funded through monies from rod licence sales. The advice and recommendations in this report are based solely on the expert and impartial view of WTT's conservation team.

#### **5.0 Disclaimer**

This report is produced for guidance; 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 guidance made in this report.

Legal permissions must be sought before commencing work on site. These are not limited to landowner permissions but will also involve regulatory authorities such as the Environment Agency – and any other relevant bodies (e.g. Natural England and Forestry Commission) or stakeholders. Alongside permissions, risk assessment and adhering to health and safety legislation and guidance is also an essential component of any interventions or activities in and around your watercourse.