



**Cyfoeth
Naturiol**
Cymru
**Natural
Resources**
Wales



**LIFEDeeRiver - Restoring one of the most regulated
rivers in Europe**
Free Flow Conference April 2024

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Agenda

- **Project Overview**
- **Outline Design overview**
- **Erbistock Weir Detailed Design**
- **Horseshoe Falls Detailed Design**
- **Work delivered so far**



LIFE Dee River Restoration Project overview

- **Co-ordinating beneficiary – Cyfoeth Naturiol Cymru / Natural Resources Wales**
- **Associated beneficiaries – Environment Agency, Eryri National Park & River Restoration Centre**
- **Co-financiers – Dwr Cymru**

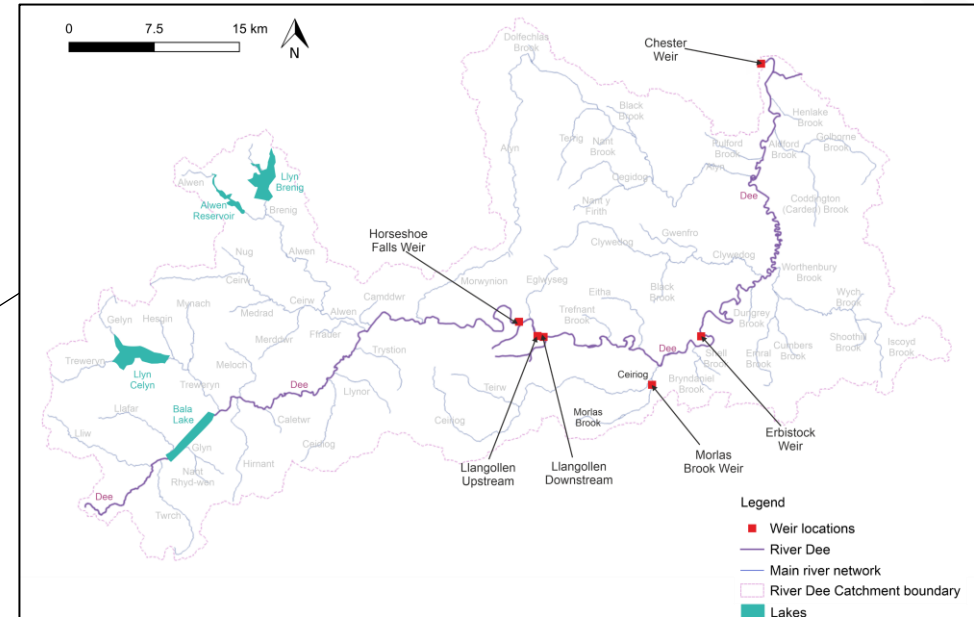


31 December 2025

£6.8m total project cost (£4m from EU).....currently over £7.5m and rising...



LIFE Dee River Restoration Project overview

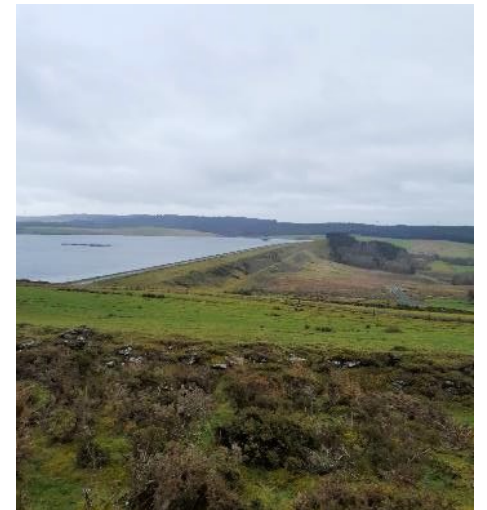


- Largest River in North Wales
- River Dee is designated as Special Area of Conservation (SAC)
- Restore ecological connectivity and fish passage
- Investigation into fish passage solutions at six obstructions (weirs)

LIFE Dee River Restoration Project overview



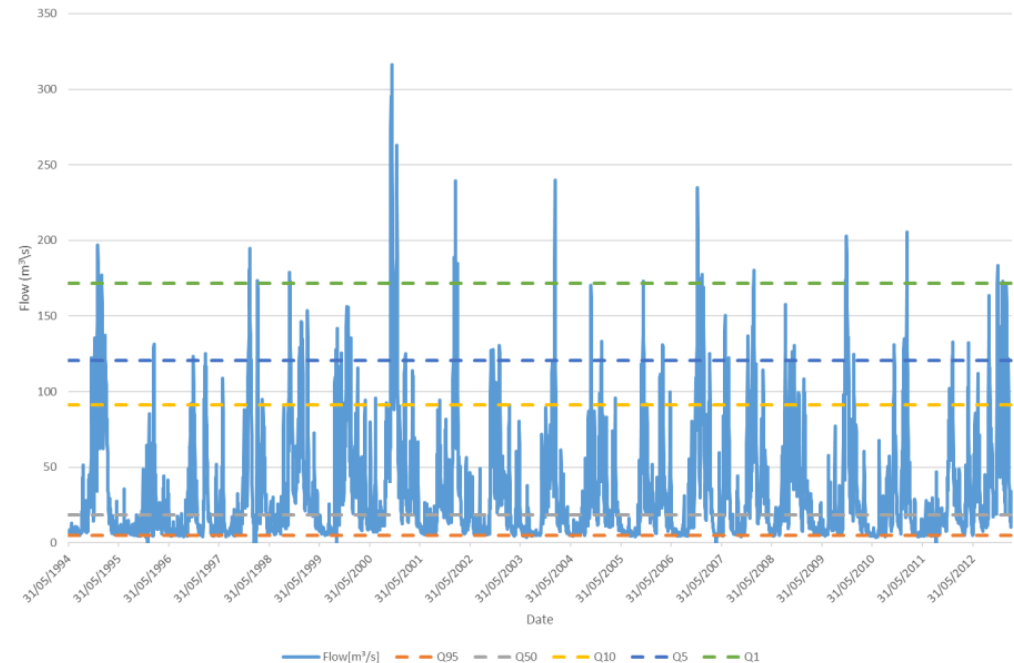
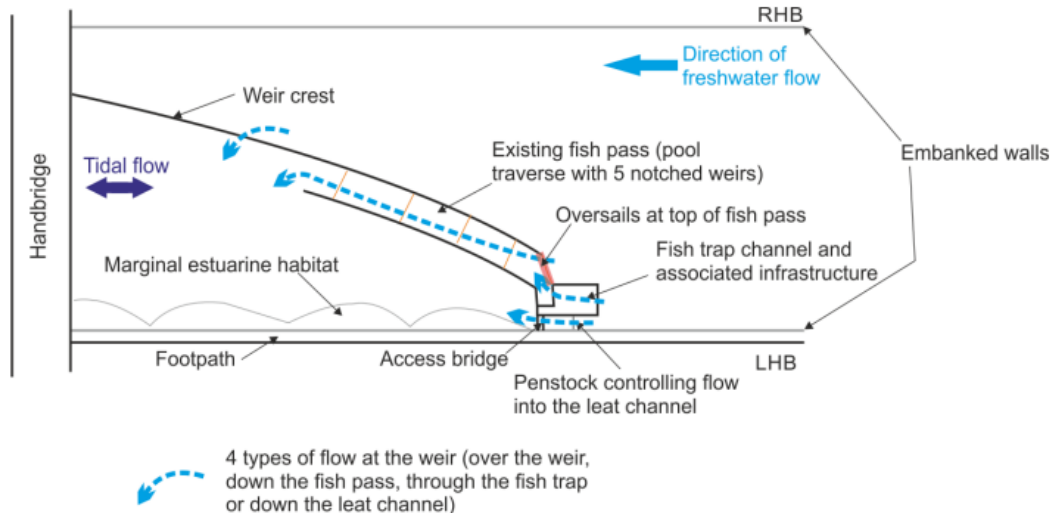
LIFE Dee River Restoration Project overview



2. Outline Design

Following steps were completed

- Developed the baseline (deskop review and site surveys) encompassing:
 - Topography/ bathymetry
 - Hydrology (typical flows and flood flows)
 - Geomorphological assessment and audit
 - Preliminary ecological appraisals
 - Contaminated land preliminary risk assessments
 - Heritage



2. Outline Design

Following steps were completed

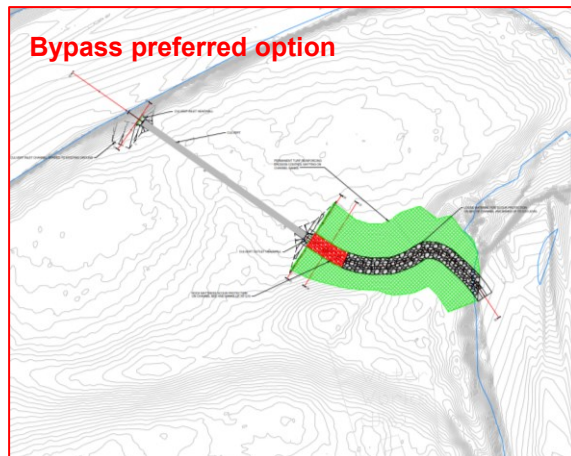
- Explored various flows important for fish passage, noting:
 - Design velocities in relation to fish species swimming abilities;
 - Design depths in relation to species requirements;
 - Volumetric energy dissipation;
 - Entrance attraction flow in terms of discharge volume, plume characteristics and location;
 - Entrance and within-structure hydraulic functionality relating to fish behaviour;
 - Any requirement for resting pools to ensure uninterrupted fish pass lengths are within relevant sustained and burst swimming capabilities.
- Additional analyses undertaken on a site specific basis, e.g. Water level analyses at Horseshoe Falls (long and wide weir sensitive to level changes, given Heritage importance and canal abstraction (also important for water company transfer)
- Design drawings produced

2. Outline design



2. Outline designs: Outcome by site

1. Horseshoe Falls Weir (proceeded to detailed design)



2. Llangollen Upstream Weir (built following outline design!)

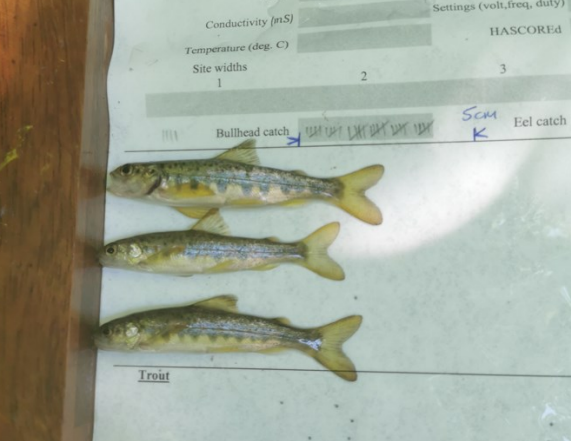


2. Outline designs: Outcome by site

3. Llangollen Downstream Weir (built following outline design!)



4. Morlas Brook Weir (built following outline design!)

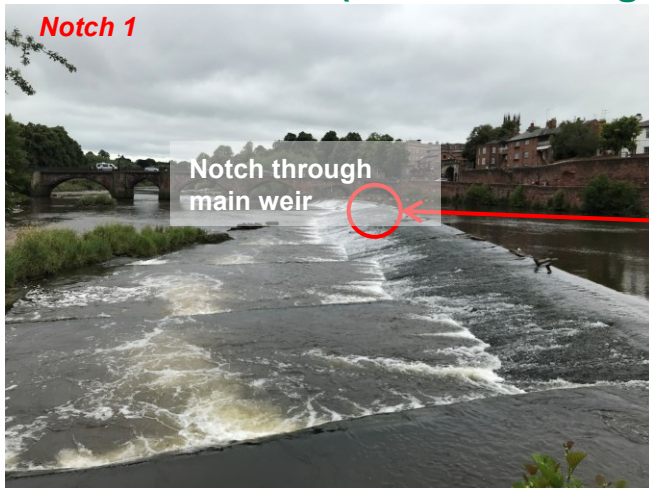


2. Outline designs: Outcome by site

5. Erbistock Weir (proceeded to detailed design)



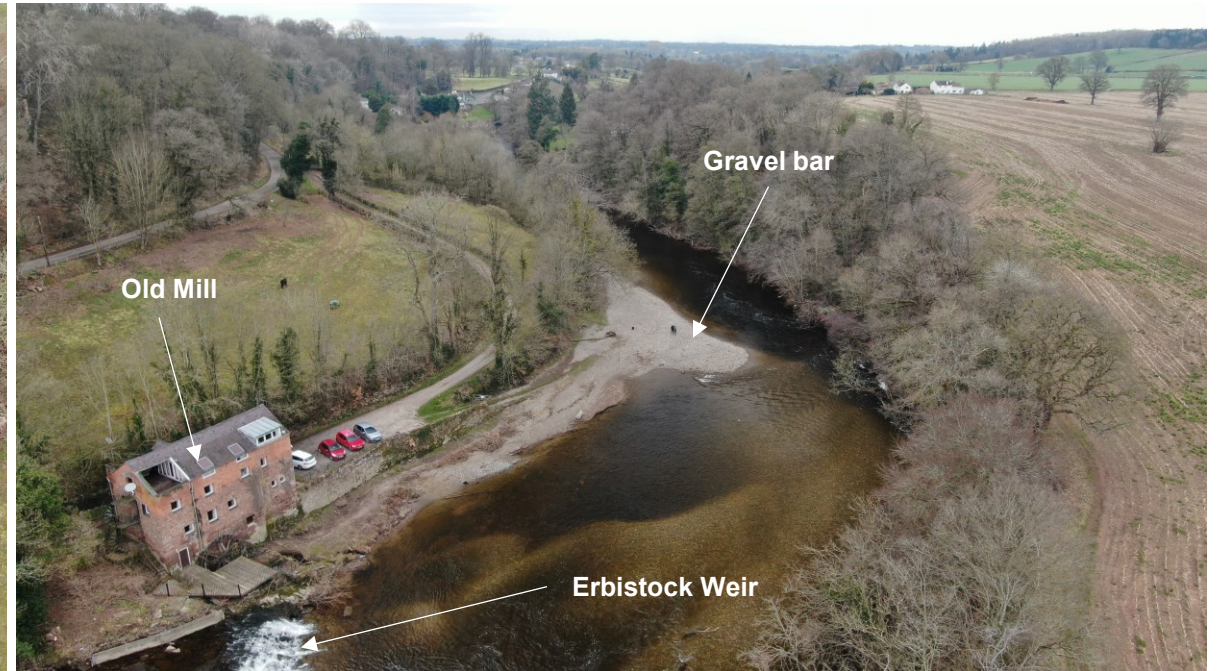
6. Chester Weir (built following outline design!)



3. Erbistock Weir

**Partial Removal
Detailed Design**

3. Erbistock Weir



Critical aspects:

- Excessive channel planform re-adjustment
- Requirement for bank stabilisation work following weir partial removal
- Potential changes to main gravel bar downstream (among the primary concerns of the stakeholder following engagement)
- Landowner keen interest at the site



Methodology:

- Site walkover
- Further survey including GI and sediment sampling
- Design iteration including hydraulic, geomorphic and design development
- Design package produced including drawings

3. Erbistock Weir

Results of sediment modelling

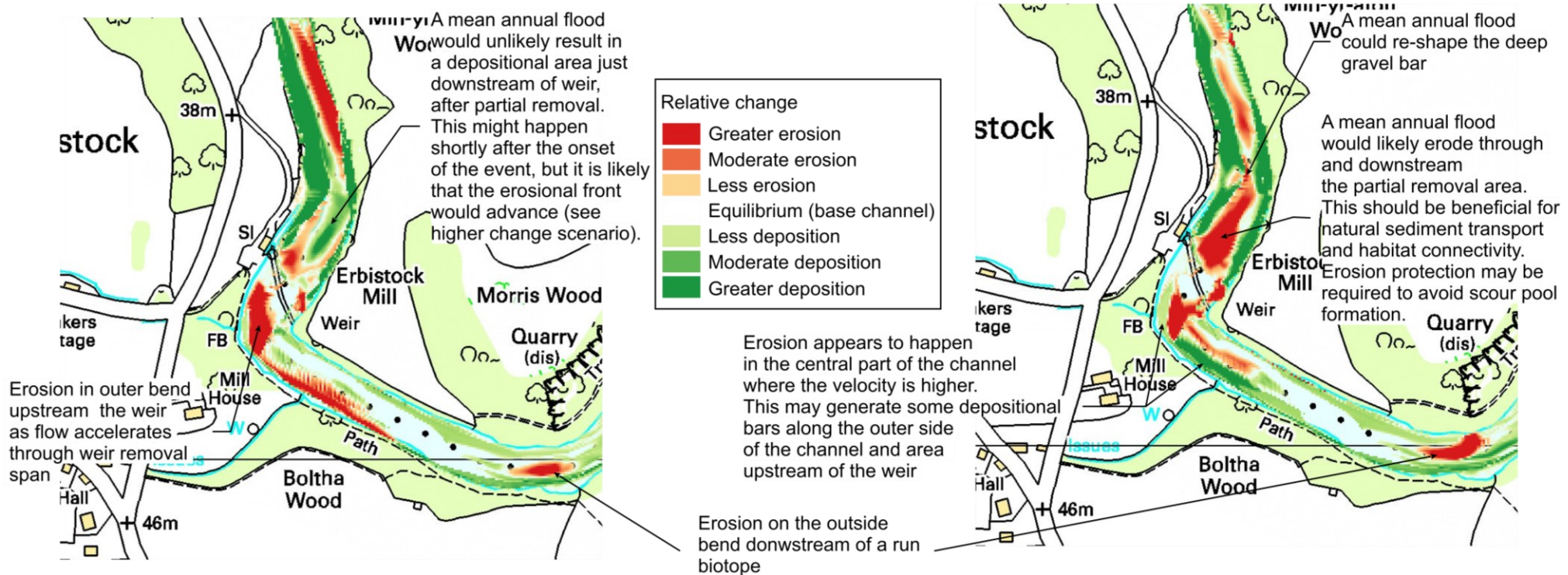
Relative not absolute change modelled

Flow channel and gravel bar downstream of weir likely to change

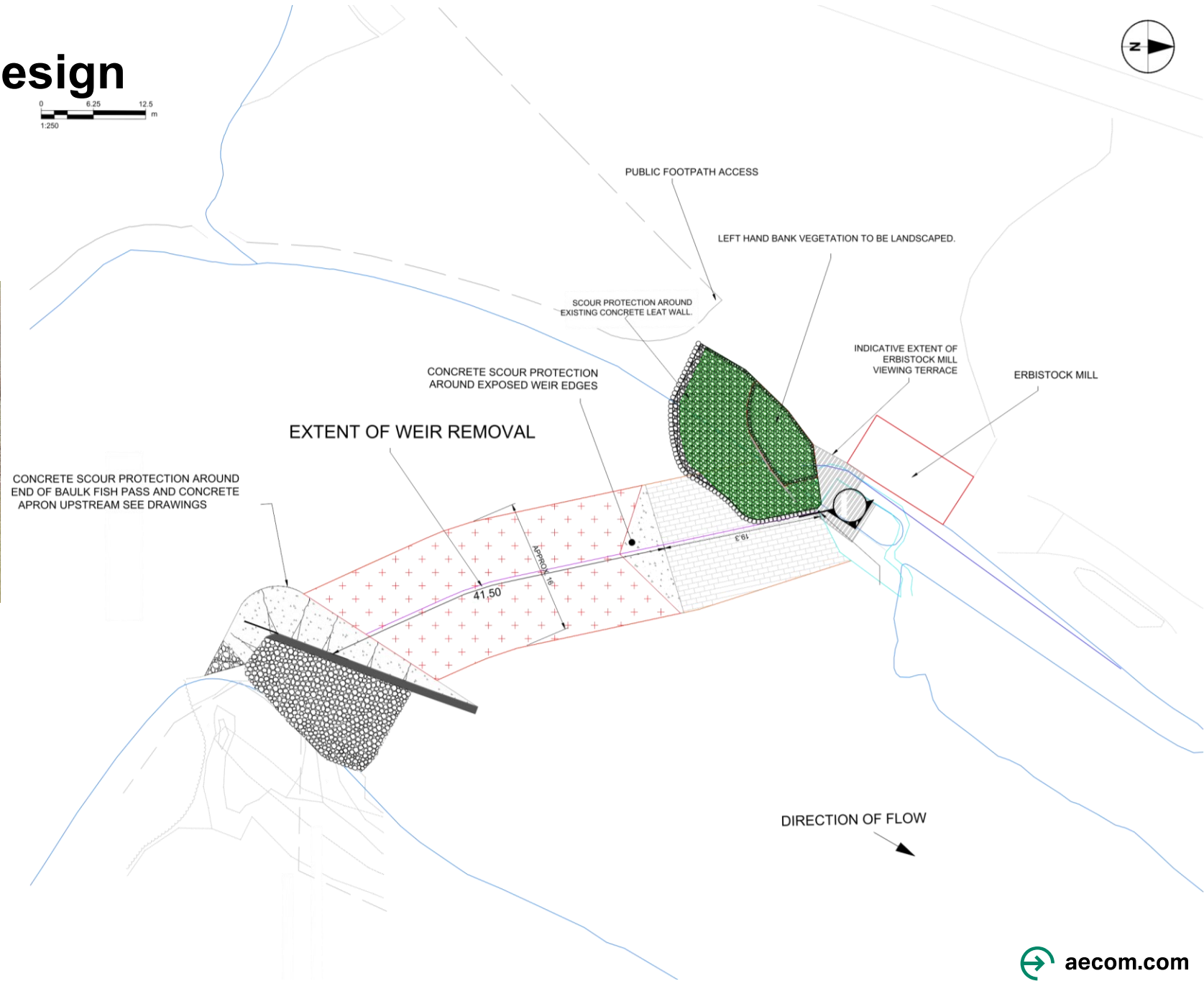
Velocities upstream will increase, with increased erosion predicted along left bank

Lower change scenario

Higher change scenario



3. Erbistock Weir: Final design

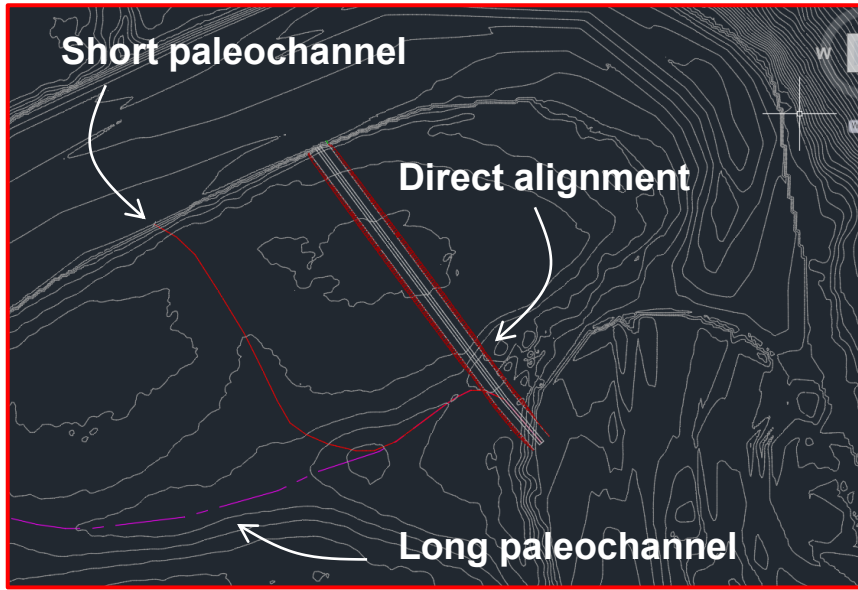


4. Horseshoe Falls

Bypass Detailed Design

4. Horseshoe Falls Weir

Final design: planform developed from outline design, noting landowner aspiration and Heritage considerations

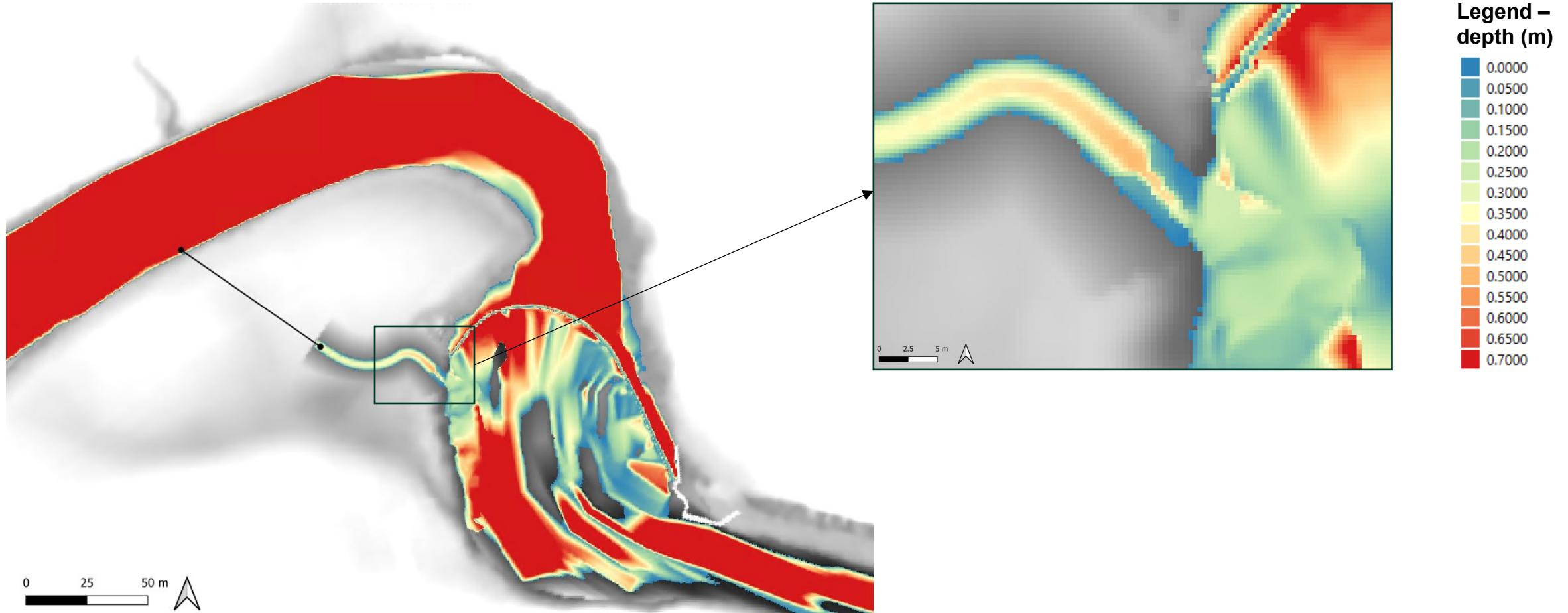


Options proposed:

- Direct alignment
 - Long paleochannel
 - **Short paleochannel**
- Fully culverted
- **Partially culverted**
- Open channel (with bridges or small culverts)

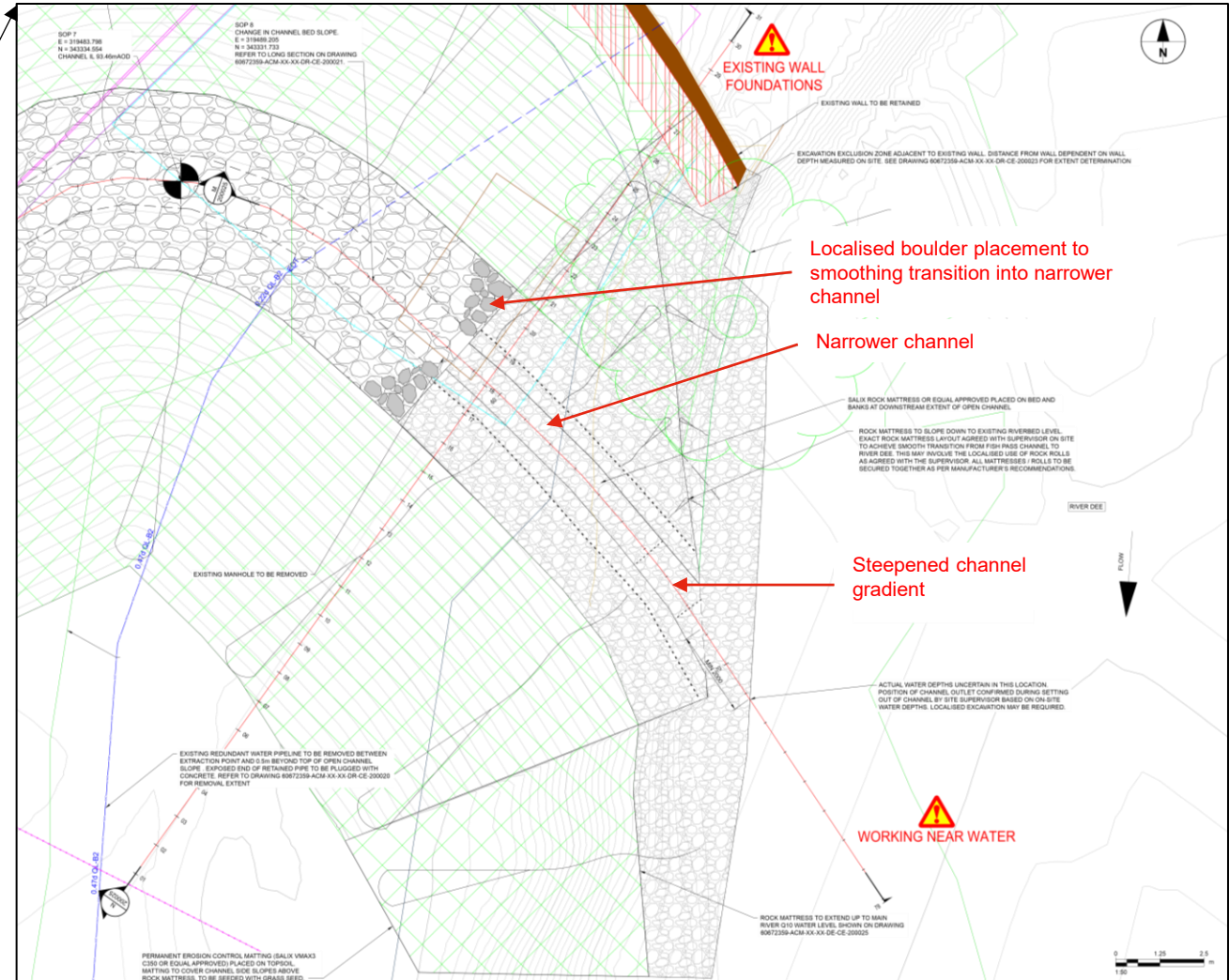
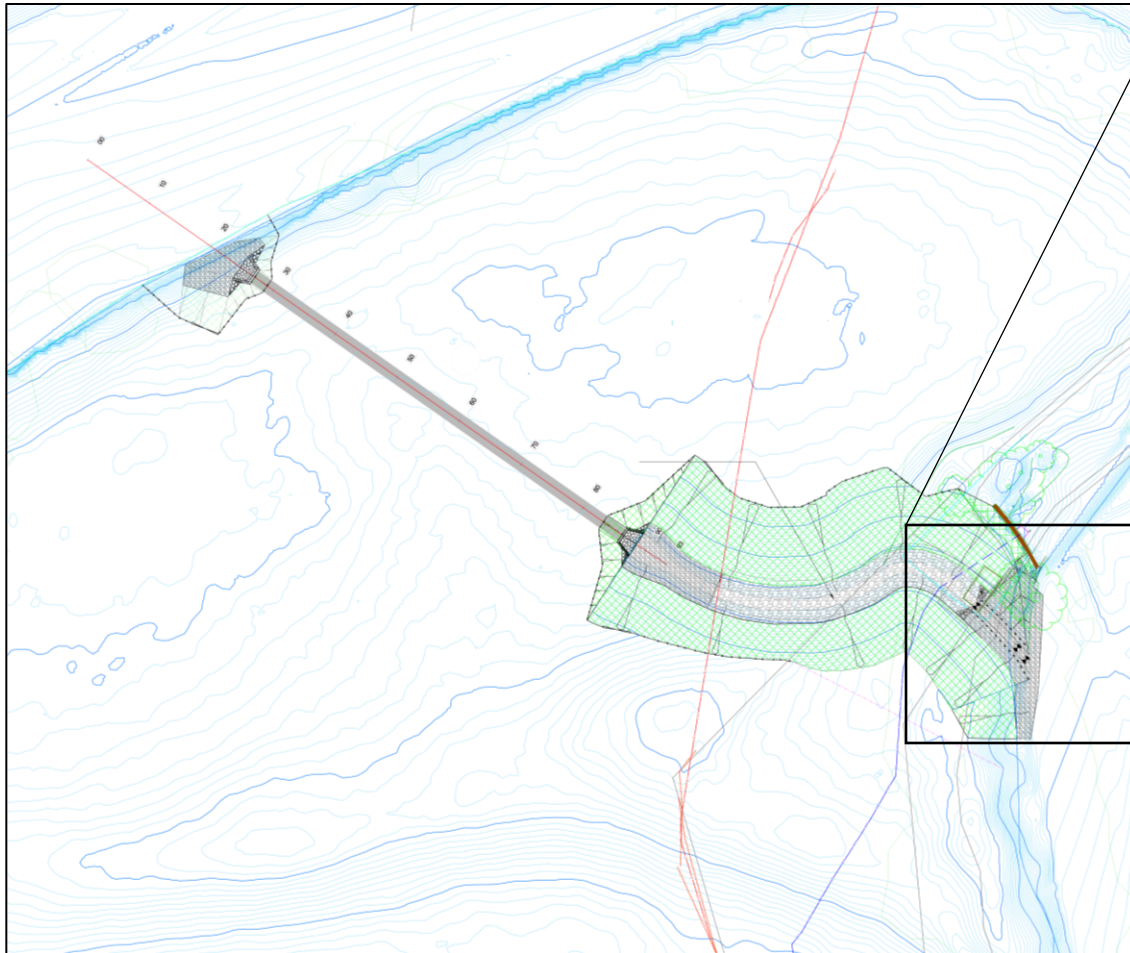
Design informed by modelling and ground investigation

4. Horseshoe Falls Weir: Modelling



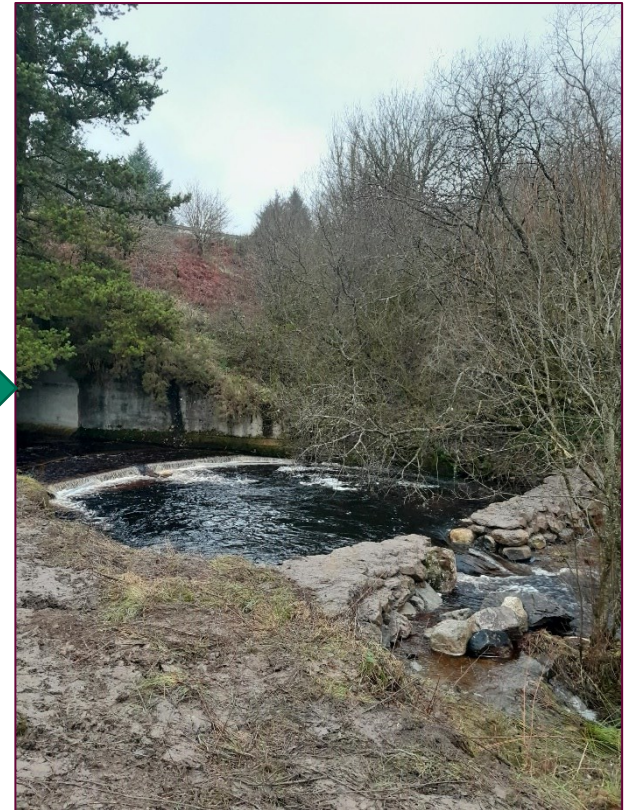
Example of water depth at Q_{50} conditions modelling results

4. Horseshoe Falls Weir: Final design overview



Work delivered so far

- 40km+ fencing completed
- 20,000 trees planted
- 9 barriers removed or altered
- 5,500 tonnes of boulders introduced
- Soft revetment installed



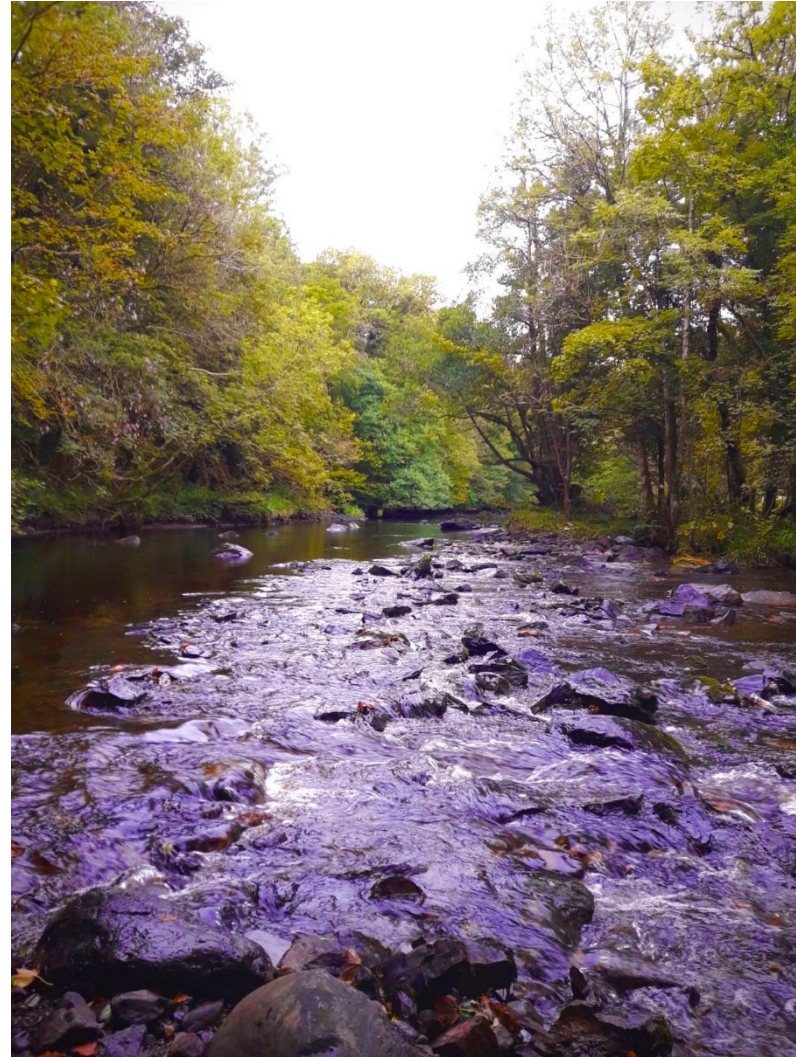
Results



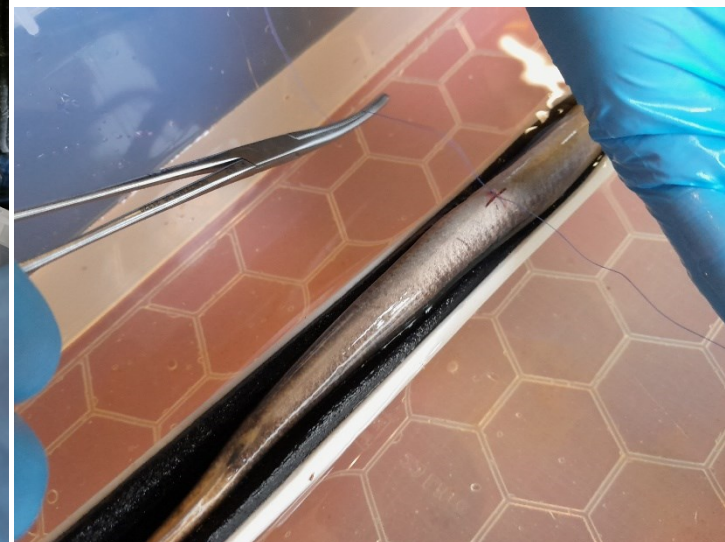
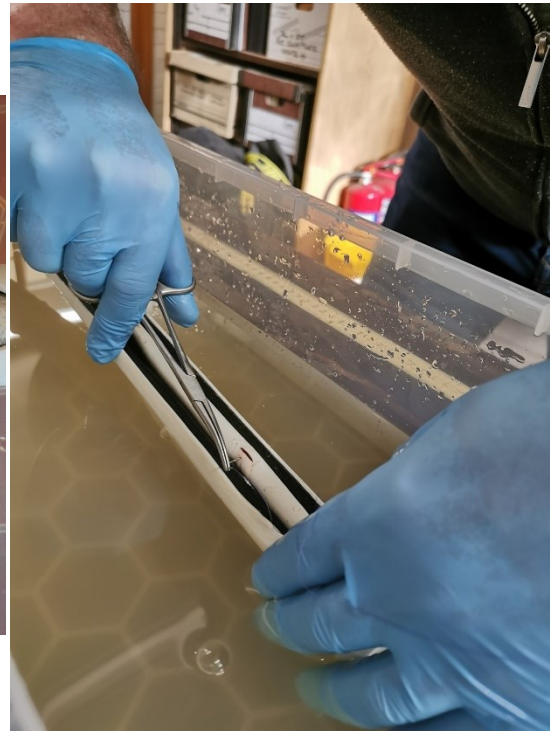
Tryweryn lower weir



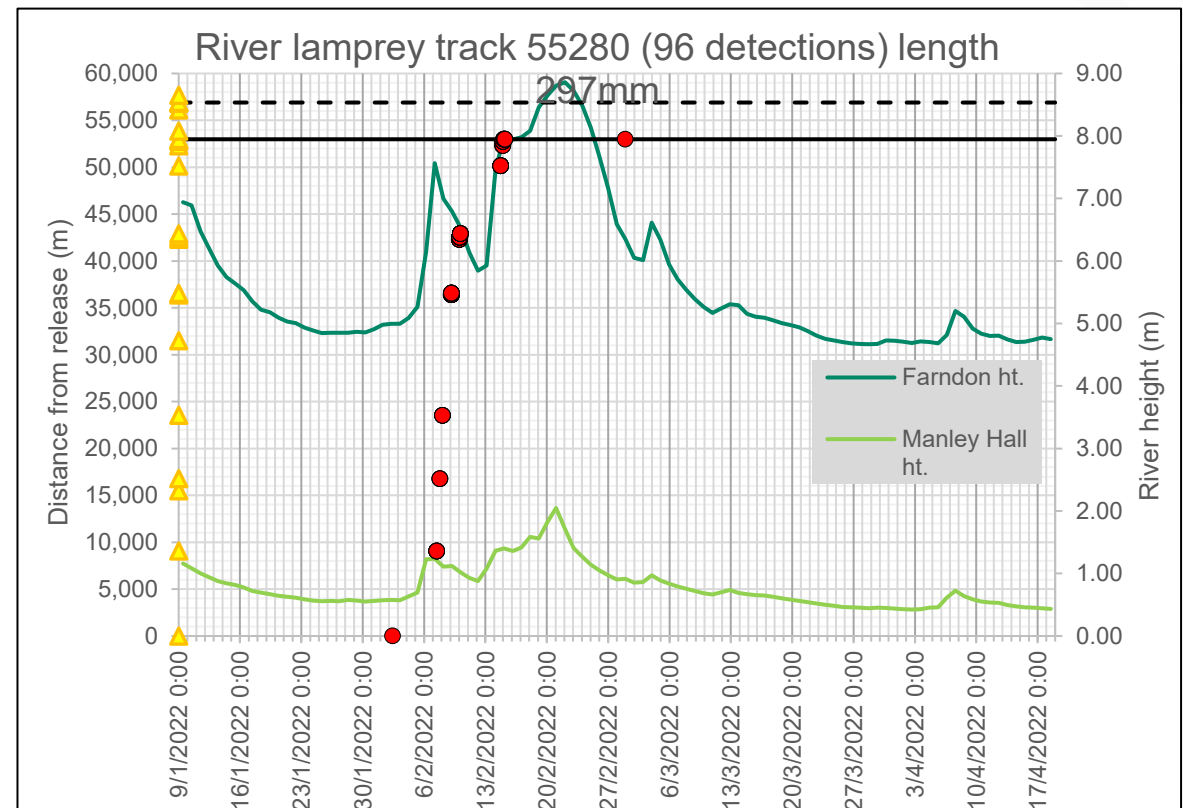
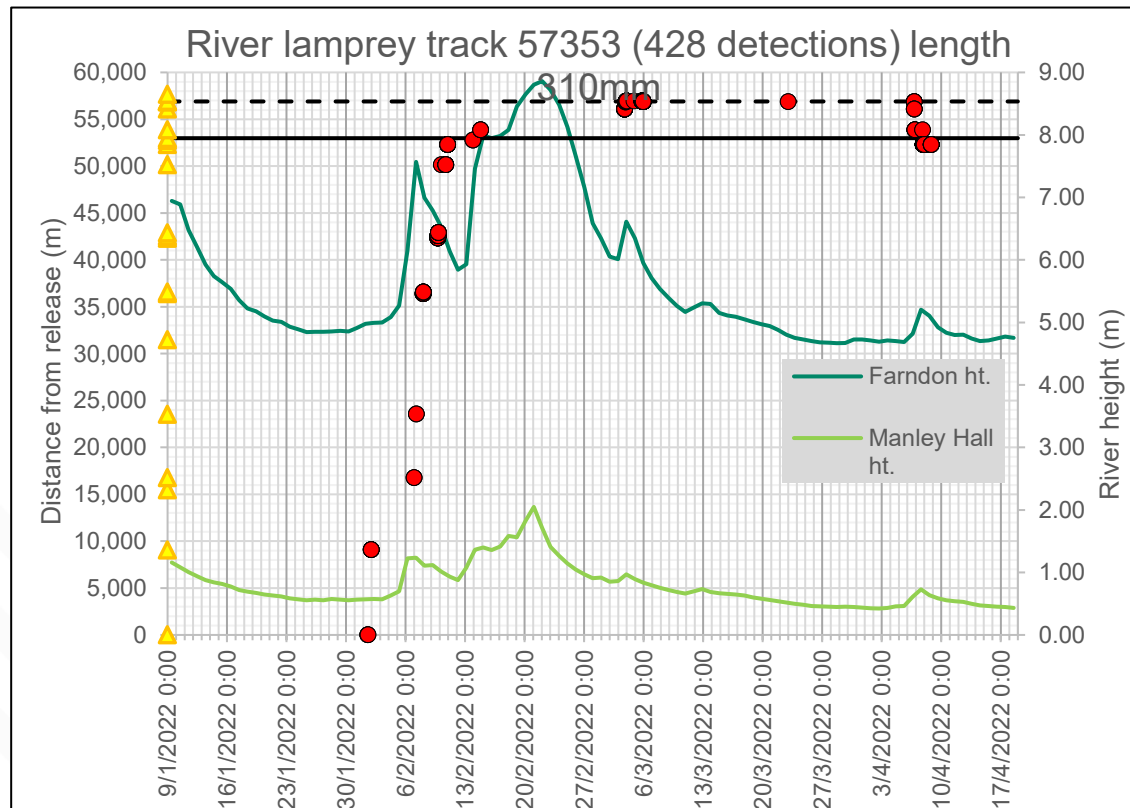
Tryweryn weir removal (2020)



Overall update of work



River lamprey tracks



Thank you / diolch yn fawr.



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