Tarland Burn – Non-technical Summary June 2023

Introduction

The Tarland Development Group commissioned a study to explore and develop potential restoration measures along 3.5 km of the Tarland Burn, between Tarland and Coull in Aberdeenshire. The aim was to improve the function and structure of the burn, in order to enhance conditions for wildlife both in the channel, on the banks and on the floodplain. A feasibility phase took place between February and March 2023, with a design phase following in April – June. The work was delivered by cbec eco-engineering and Walking-the-Talk, supported by project partners The MacRobert Trust, Dee Catchment Partnership (James Hutton Institute) and RSPB Scotland. The project was funded by the Scottish Government's Nature Restoration Fund, managed by NatureScot.

Collecting information on burn morphology (physical structure) and the wider site[1]

A review of data relating to the study site and wider catchment was followed by two site surveys. The first survey recorded the physical structure of the burn (looking at processes such as bank erosion and flow types) and identified factors affecting the health of the burn (e.g. channel straightening, bridges, bank protection and reduced vegetation cover). The second survey collected high-precision elevation data on which modelling would be based. The latter also confirmed that there is an 11.33 m drop in elevation between the bed of the channel at Tarland Bridge and Coull Bridge – information useful for guiding what measures are and are not appropriate for this site.

Assessing existing flood patterns within the study site

The physical structure of channels affects flow patterns within a burn. For example, water can flow through a straightened channel very quickly, increasing flooding downstream. In comparison, a natural meandering channel slows and reduces the force of the flow, and encourages flow to spill out onto the surrounding floodplain, reducing the risk of flooding downstream.

An initial computer model was used to identify the main areas of flooding under current conditions, for different flood events, to determine where the burn is most disconnected from its floodplain. This information helped to guide where certain measures would, or would not, be appropriate.

Identifying site-appropriate restoration measures

Site-appropriate restoration measures were identified, including:

- adding large wood to the burn to encourage sediment storage and provide in-channel habitat;
- widening the burn corridor and reprofiling the banks to create more space for the burn;
- realigning the channel to a more meandering course, with adjacent wetland areas;
- installing logs and brash ('leaky log jams') in selected tributaries to help slow the flow;
- all of the above combined to form a vision of 'full restoration'.

A 'do nothing' approach was also included, to represent the current conditions of the site as a baseline, but with cessation of any ongoing maintenance activities within the burn corridor.

Assessing the benefits of restoration work

The potential restoration measures were assessed against a number of criteria to consider the benefits offered and the risks. Benefits included those associated with improvements to the health and function of the burn, habitat and wildlife (e.g. salmon), flood risk, climate change resilience, carbon

[1] Assessments were based on available data and the extensive experience of the project team and stakeholders in delivering similar river restoration projects.

storage and community recreational value. Risks included impact on infrastructure (e.g. roads, utilities), impact on farming practices, disruption during construction, and cost and complexity. Measures were compared to each other to determine which could offer the greatest benefit. This was a broad-scale comparison, not a detailed evaluation.

First community event – to assess restoration measures

A drop-in community event was held on 30th March 2023 to allow local residents to view and discuss the potential restoration measures. Fifty two responses were received during and after the event. Feedback was collated, allowing the points raised to be considered as the project progressed to design.

Stakeholder engagement

A meeting was held on 6th April 2023, attended by key members of the regulating bodies as well as other technical stakeholders such as the Dee fishery board, and the James Hutton Institute The meeting covered many aspects of the project. The group was supportive of the restoration proposal in principle, with impacts on flood risk and the Special Area of Conservation (SAC) being discussed in detail. A summary of the meeting has been provided on the project webpage.

Additional surveys

In April 2023, surveyors collected high-resolution elevation data across the site, to be used as a base for developing designs. Additionally, a Preliminary Risk Assessment (PRA) of ground conditions and contamination was undertaken, with a report produced that identifies and provides detail of the conditions of the ground within the study site, as well as potential sources of pollution. Recommendations for future sampling/investigations are detailed within the final PRA and project report.

Design development

Following the outcomes of the feasibility study and related community and stakeholder engagement, it was agreed that the initial design would include the full suite of measures presented as being feasible at the site. The design approach used aims to restore natural processes as much as possible within the current constraints (e.g. setting, utilities, bridges) at the site. To do this, the design takes into account factors such as valley setting, the flow of the burn, and the wider processes occurring within surrounding sections of the burn and current drainage systems. In doing so, this creates a design that is sustainable, requiring little to no longer term management. The opinions and concerns raised during the community event were also considered during the development of the design and adjustments made as appropriate.

Modelling of the design

A computer model was run to simulate what happens to flow from both the burn and its tributaries under different sizes of flood event. This allowed comparison of the flooding expected under the current conditions with flooding predicted for the design, to clearly illustrate the effects of the proposals on flood risk at the site. The model calculates the depth and speed of any water from the burn, that stays within the channel or overtops into surrounding areas.

The model considered four individual flood events, ranging in scale from a flood that has at least a 50% chance of occurring or being exceeded each year, to one that has a 0.5% chance of a flood of this size or greater occurring each year. Surface water is not accounted for within the model, however, all water that would enter the site from the burn and tributaries is represented.

Key findings from the current conditions and design modelling exercise include:

- The outputs of the existing conditions model show less floodwater than expected in both Tarland village and the fields within the restoration site. It was not expected that the existing conditions model would look like the flooding observed in the area, rather, the model was used to predict any additional flooding that would result from the changes to the channel. As a result of the limited flooding identified, a second model was then run for the section of burn upstream of Tarland Bridge. This included partial blockages within the channel (mimicking debris which is often moved downstream during flood events). The outputs of this second model showed a greater level of flooding in Tarland, providing evidence that such blockages are a contributing factor, at least during the smaller floods, by causing the flow to overtop the banks.
- The outputs showed that whilst the current design does not increase flood risk within Tarland village, it does result in greater flooding of some fields within the restoration site.
- Although not modelled, surface water run-off is also a likely factor in flooding, as is evidenced by the Scottish Environment Protection Agency's (SEPA's) pluvial flood maps (available online) and flood mapping presented within the ground investigation PRA. At the downstream end of the site near Coull Bridge, as well as blockages in the burn, standing surface water in the adjacent fields (resulting from rainfall and run-off), is a likely cause of flooding. When the burn and ditches are running high, water in these downstream fields cannot drain away. Although the designs do not aim to tackle flooding issues associated with surface water, wetland areas have been located purposefully in those areas of lowest lying ground that are known to flood most frequently, to make use of these wetter areas of the site in a productive way.

The initial model maps (i.e. not including those with the blockages) were presented at a second community event as summarised below, have been included in an initial flood risk assessment (FRA) and can be used to guide where further changes to the designs will be required.

Second community event – presentation of the proposed design

A second, drop-in type event was held between Tuesday 27th June and Sunday 2nd July. This provided the chance for local community members to view the design proposals and model outputs. Members of the project group attended at intervals to provide an opportunity for questions to be answered. Remaining concerns raised at the event included a perceived lack of similarity between the model outputs and flooding observed in the area. This meant that concerns remained relating to flooding of some fields within the site boundary, field drainage, as well as in Tarland village. Therefore communication of the meaning of the model results is of critical importance to avoid misunderstanding of the outputs.

Final outputs and recommended next steps

The work undertaken during the course of the project is summarised in a detailed feasibility and design report, with accompanying design drawings. The designs can be adjusted (using both the model output and community, MacRobert Trust and farmer feedback) to guide the required changes to achieve delivery of a healthier burn and floodplain environment that enhances native wildlife and provides better access and recreational opportunities, without there being significant impact on farmland.