BONWM HYDROPOWER SCHEME

CONSTRUCTION METHODOLOGY : TEMPORARY INTAKE WORKS

Introduction

This document summarises the working methodology for the temporary works related to the intake structure for the 100kW Bonwm mini-hydro project.

The temporary and permanent works have been approved under an Ordinary Watercourse Consent, ref: DCC2021LD125, and the impoundment license application included a provision for temporarily diverting the stream with a bund in order to construct the licensed impoundment (ref. WA/067/0005/0028).

A site layout drawing and a design drawing (covering both temporary and permanent works) are appended, together with site photographs and montages of the proposed works. The intake location is at Grid Ref. SJ 09885 42370 at the base of a steep waterfall where there is an abundance of exposed bedrock on which to found the structure.

Sizing and Flow management

The mean flow of the stream at the intake location has been assessed to be 0.077m³/sec, and the 0.1 percentile flow to be 1.0m³/sec. The height and location of the proposed bund to be constructed have been chosen to ensure that a flood flow in excess of 20 times Mean Flow (1.55m³/sec) will be diverted away from the works before reaching the top of the bund.

As indicated on Figure 3, the diverted flow will cascade ~ 5m down a solid bedrock surface to reach the pool below, along a defined route hollowed out by previous flood flows.

Note that inspection of the reach above the waterfall indicates that high flows already overspill the normal banks of the stream and take a route to the west of the waterfall, such that a proportion of the stream bypasses the waterfall itself during these extreme flow conditions and will not reach the bunded area.

Flow calculation: as indicated on Figure 1, the minimum size of overspill for the diverted flow can be conservatively modelled by a weir crest 1.5m wide overspilling by 0.75m. The Weir Equation yields a flow rate of 1.55m³/sec.

Scope of Works

The general scope of the temporary works will cover:

Preliminaries

- Fencing and signage: The area encompassing vehicle movements will be fenced off from both directions, with appropriate signage.
- Tree-feeling: Arrange for a certified forestry contractor to fell and remove the essential trees required to provide access to the intake area: these have been assessed (with NRW Forestry) to be 3 trees for only working at the intake, plus an additional 10 trees for the pipe-route down to the forestry track below (hence it may prove most efficient to remove all 14 trees in advance of the temporary works). These will be cut to the specified lengths and stacked ready for NRW removal and sale.

Temporary Works

The temporary works will divert the stream away from the working location to provide dry working conditions in all stream flows. Following consultation with NRW Fisheries (Richard Pierce), the stream diversion would be achieved as follows:

- Construct a temporary bund formed as a solid stone and cement wall, tied into the bedrock. The location is illustrated in the photos of Figure 1 to Figure 3, and the appended design drawing.
- The bund will divert the entire stream to the west of the intake area (a route that the stream currently uses during higher flows). This route drops the flow into the pool below the bedrock shelf on which the intake structure is located.
- A small pump in the pool immediately downstream of the bund (but still above the intake works) would deal with any remaining runoff from the cliff above, discharging into the pool beneath the intake.
- The bund will be constructed within a day during low flow conditions, using sand-bags supported by an electric pump to divert the stream to the west to create dry working conditions.

Bund Removal

- After the permanent works have been completed, isolate the bund again using sand-bags and remove the bund in sections by hammer-drill.
- This would be followed by a full clean up and removal of waste materials before removing the sand-bag protection and allowing the stream to reach the completed hydropower intake.

Silt trap

- As a further back-up precaution, a silt trap will be installed across the stream just above the road crossing 80m downstream of the intake location. This is an easily accessible location as depicted in the photo of Figure 4.
- The silt trap would be a combination of straw bales and geo-textile membrane, held in place with timber. The silt trap would be removable in the event of high river conditions being forecast, to ensure it is not swept away.
- Note that this silt trap is still 750m upstream of the location agreed by NRW as the ‘maximum limit of salmon accessibility’ into the Nant Lechog.
- The silt trap will be inspected on a daily basis, and adjusted and maintained as necessary.
- Spare materials will be kept on site (sandbags, timber, straw bales, geotextile fabric, plastic sheeting).

Environmental Protection

The work is being undertaken in a watercourse located within managed forestry certified to the UKWAS standard (for sustainable woodland management). This section summarises the environmental protection measures and good-practice principles to be employed during construction of the scheme.

Measures to avoid pollution

- The good practice guidelines issued by the Environment Agency (PPG5 - *Works and Maintenance in or Near Water*) will be followed. In addition, the guidance in *Managing Forest Operations to Protect the Water Environment (Chapter 8 - sediment pollution and spillages)* will also be adhered to. These 2 document have been used to specify the measures below.
- Disturbance to vegetation and the watercourse will be kept to the minimum practicable.
- Siltation or turbidity of the watercourse during the works will be prevented by diverting the stream using sand-bags and plastic sheeting so that the construction of the temporary bund can take place in dry conditions.
- In addition, a silt trap will be installed downstream to capture any inadvertent siltation.
- If a sediment problem is identified, operations will be suspended and the source of the sediment traced and stopped. The stream will be allowed to clear before re-commencing work.
- If substantial sediment enters the watercourse, NRW will be notified immediately and advice sought on any further measures required.
- No construction activities will be attempted if high flows are present or imminent: specifically, concrete or cement works will not be started unless the flow in the stream is less than approximately 200 litres/sec (2.5 x mean flow) and 3 days of dry weather are forecast.
- When working in or near the watercourse, extreme care will be taken at all times to prevent pollution and the mobilisation of silt and sediment during construction works.
- Materials to be set down on polythene sheeting, away from the watercourse.
- All mechanised plant on site will use bio-degradable hydraulic oil.
- All re-fuelling of plant and machinery will take place away from the water course and drip trays will be used.
- All fuels will be stored in bunded tanks at least 10m from the watercourse.
- All on-site vehicles will carry spillage mats, and drip trays will be placed under all static items, e.g. pumps. Cement will be stored in waterproof conditions away from the watercourse.
- Any fuel spillage will be isolated, removed using absorbent materials, then disposed of into plastic bags.
- Cabs will be equipped with spill kits to contain and absorb any spillages (protective gloves, absorbent material, plastic bags).
- The importance of correct storage procedures for fuels, oils, construction materials and chemicals will be stressed to all site personnel.
- All waste generated during site operations will be removed to the set-down area and stored securely in appropriate containers.

BONWM HYDRO INTAKE WORKS - SITE PICTURES

Figure 1 : Bund location from West bank

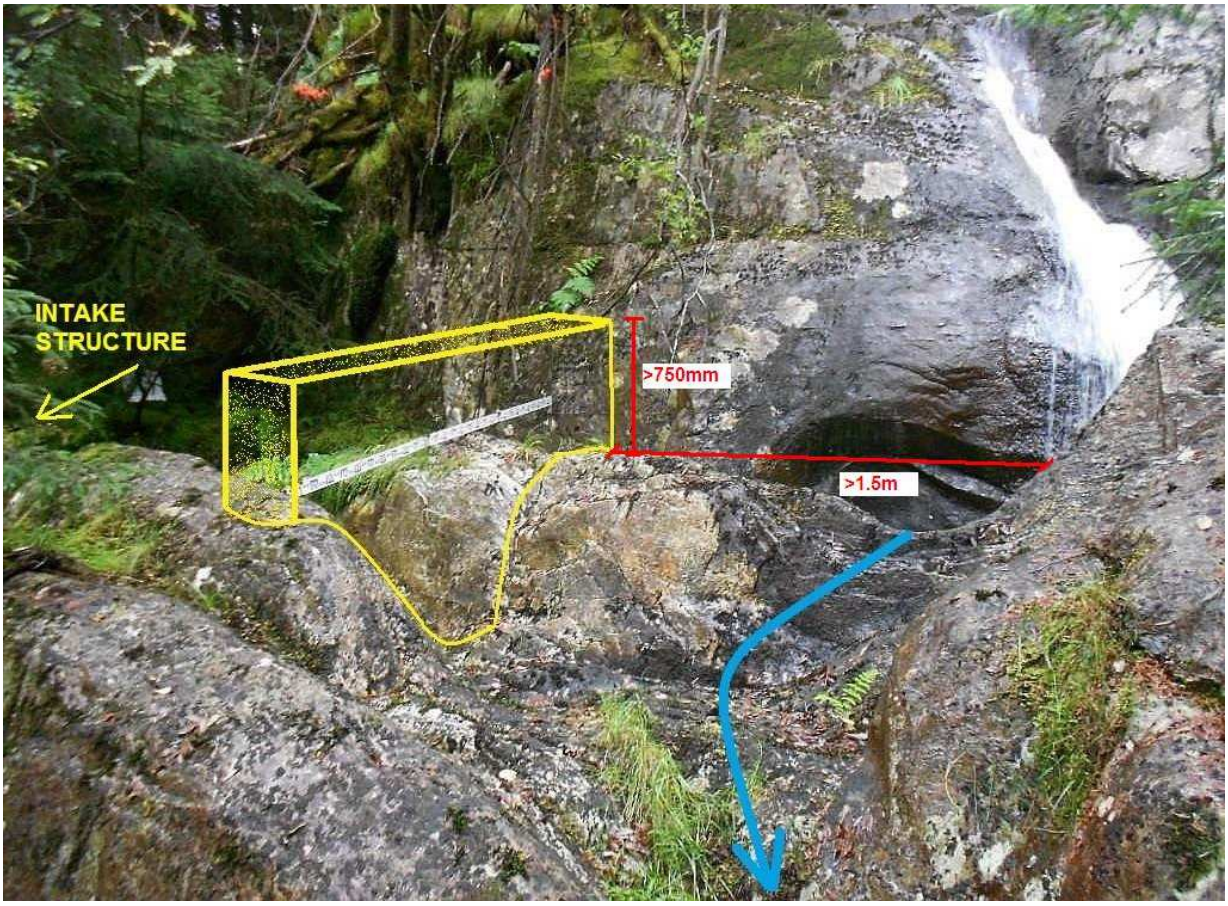

Figure 2 : Bund location from East bank

Figure 3 : Flow diversion around the intake area

Figure 4 : Silt trap location

Figure 5 : Location of the Permanent Intake Structure, which will be fully de-watered by the temporary bund