NB Hydro Services

Erw Faethlon Micro Hydropower Scheme

Supporting Information for NRW Licence Applications

Title	Erw Faethlon Micro Hydropower Scheme Supporting Information for NRW Licence Applications	
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1 Contents

2 General

2.1 Introduction

This document forms part of a planning application for a micro hydro system on land at Erw Faethlon Farm, Tywyn, Gwynedd, LL36 9HY. The proposed scheme will include a new small intake structure, pipeline and turbine house and outfall. The farm includes a butchery business, processing meat from the farm for direct sale. This means there are high electricity bills and this scheme will greatly aid the financial and environmental sustainability of this family farm.

An application for the relevant water abstraction and impoundment licences is being submitted to Natural Resources Wales (NRW). This document is to provide supporting information.

An application for planning permission for the project was made to Eryri NPA on 14th December 2023 with reference PP-12609632.

2.2 Associated Documents

The following documents should be read in conjunction with this Design and Access Statement:

Ref	Name	Originator
ERW/SP03 Rev A	Location Plan	NB Hydro Services
ERW/SP01 Rev A	Site Plan	NB Hydro Services
ERW/INT01 Rev A	Intake General Arrangement	NB Hydro Services
ERW/TH01 Rev A	Turbine House General Arrangement	NB Hydro Services
	Ecological Survey	Gritten Ecology
	Outline Method Statement	NB Hydro Services
	Flow Calculations Spreadsheet	NB Hydro Services

Table 1 – Associated Documents

3 Project Description

3.1 Site Location

The site is located on a small, un-named stream that flows through Erw Faethlon Farm, approximately 4km to the south east of Tywyn. This is a small very steep stream which flows into the Afon Dyffryn Gwyn.

The proposed intake site is at grid reference SN 63033 99339

The general area of the site and catchment area of the intake is shown on Figure 1 below.

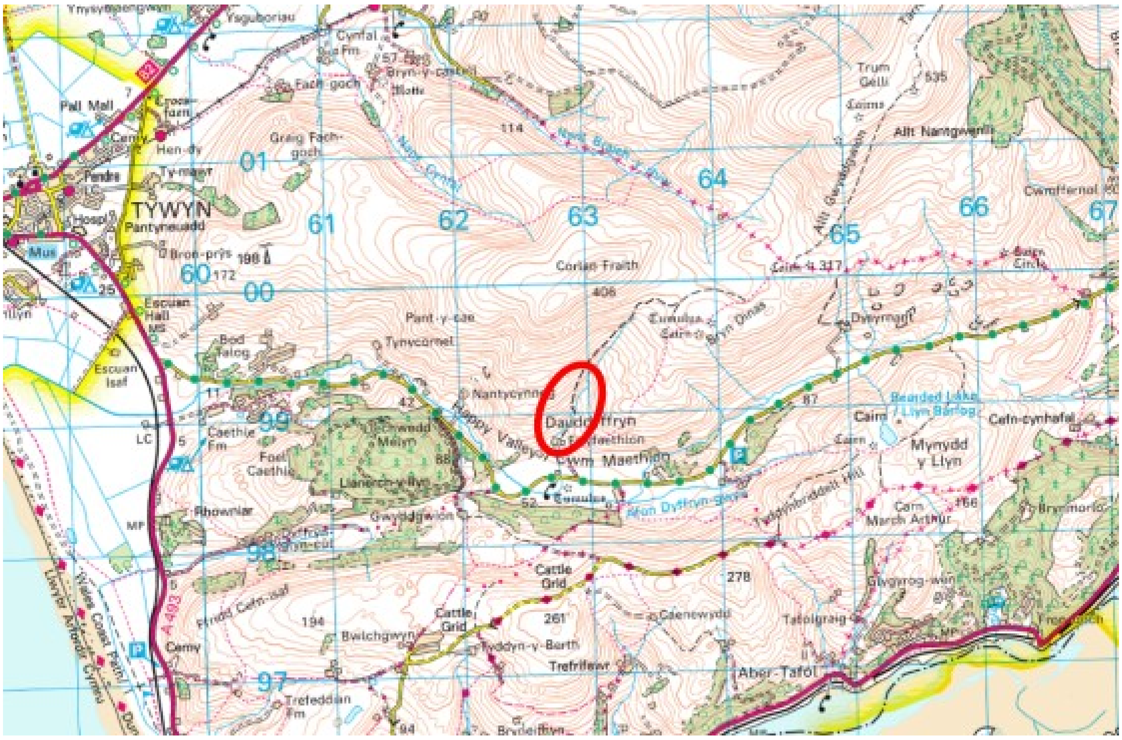

Figure 1 – Scheme location (red)

3.2 Layout

The proposed layout is shown on Figure 2 below. This is also shown on the Site Plan Drawing.

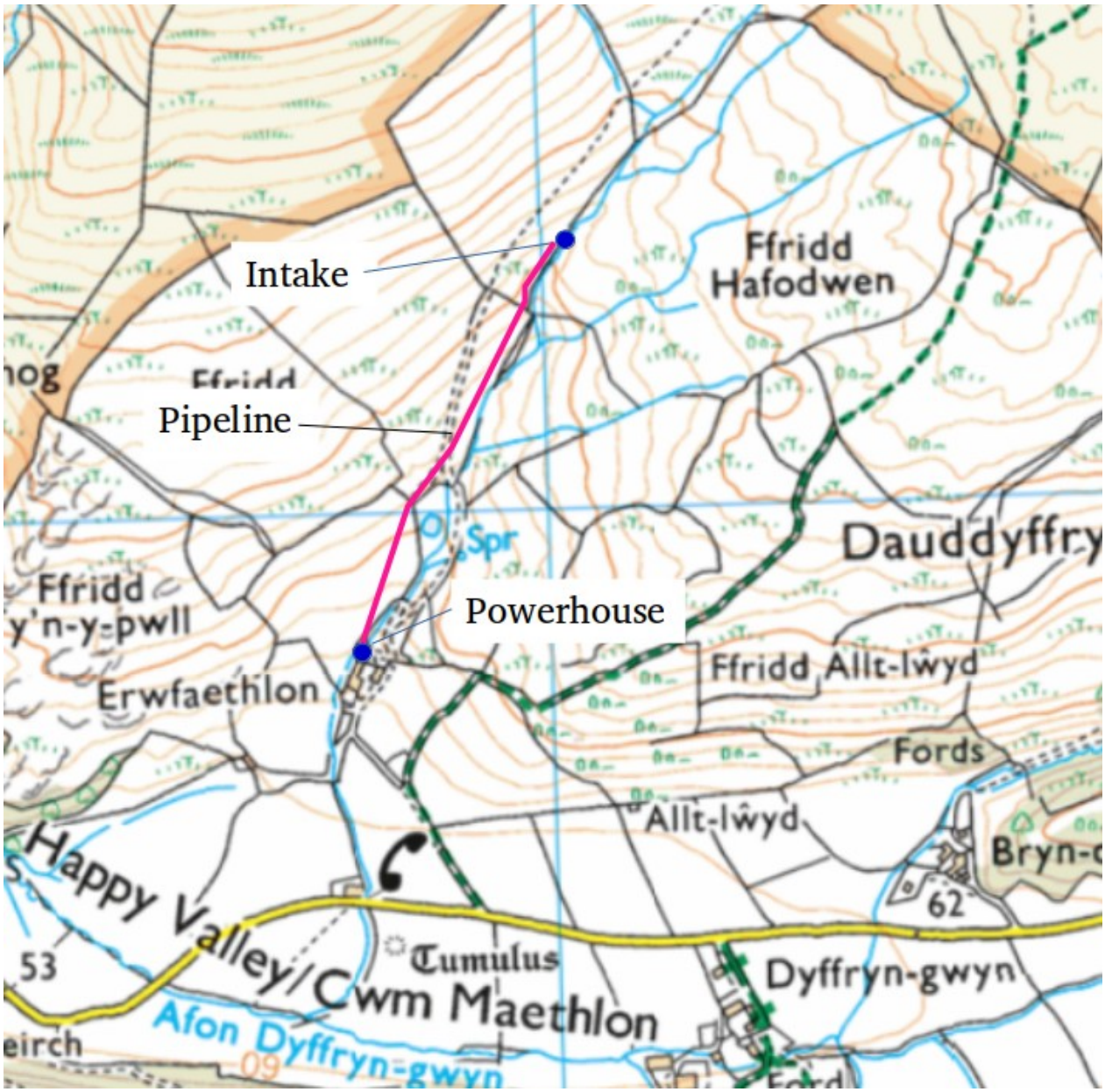

Figure 2 – Erw Faethlon Hydro Proposed Layout

As shown in the figure, the project will involve the diversion of water from the stream using an intake at SN 63033 99339. A pipeline (or penstock) will transfer the water down the hill to a powerhouse (or shed) at the farm compound, adjacent to the meat unit. Inside this small building the water will pass through a turbine causing it to rotate. The turbine will be connected to a generator which will turn the kinetic energy into electrical energy to be used on site. Excess electricity will be sold to the grid. The water will exit beneath the floor of the powerhouse and return to the stream.

3.3 Intake

The proposed location of the intake is shown in Figure 3 below with a staff showing the approximate level of the proposed weir crest.

Figure 3 – Proposed intake location

In order to minimise maintenance and potential prevent ingress of fish, an overshot ‘Coanda’ intake is proposed. It will be approximately 0.5m high and approximately 0.5m wide. The new impoundment will cause a pool to be created upstream reaching approximately 3m upstream.

The intake is designed to provide the ‘hands off flow’ down the stream prior to abstracting water from the stream with a slot or orifice set below the level of the Coanda sill.

The intake will have the following features:

- The maximum bar spacing considered would be 10mm however 2mm is the likely choice.
- The lowest part of the weir crest is a notch to provide the Hands Off Flow (HOF) by purely passive means.
- There will be a length of weir crest at a similar level as the Coanda crest in order to facilitate the flow split (between hydro and river) by purely passive means
- A removable board will allow the area upstream of the weir to be drawn down to allow maintenance of the weir
- A valve will allow the pipeline to be isolated
- A chain eel pass
- A plunge pool below the weir

The structure will be constructed in such a way that no works are carried out in the flowing watercourse. ie. the stream will always be diverted before any work is carried out as described in the Outline Method Statement.

The widths and levels of the different notches are shown on the Intake General Arrangement drawing. The method of calculation is shown on the Flow Calculations Spreadsheet on the sheet named ‘Flow Split Calculations’

3.4 Penstock

The penstock is the pipeline which transports the water between the intake and the powerhouse. The penstock will be approximately 580m long and will be polyethylene 180mm external diameter. There are 2 main sections of the penstock route.

3.4.1 Section A

Section A of the penstock is 90m long across a damp area of field. The pipe will be laid on the surface to minimise ecological impact as recommended by the scheme ecologist. The route is shown in Figure 4 below. As recommended by the ecologist, this area will be fenced off to allow trees to regenerate as an ecological enhancement.

Figure 4 – Section A of the penstock route (red) and the beginning of section B (blue)

3.4.2 Section B

Section B is approximately 490m long and go across two open fields. The pipe will be buried with approximately 500mm minimum cover.

Figure 5: Pipeline section B lower upper field

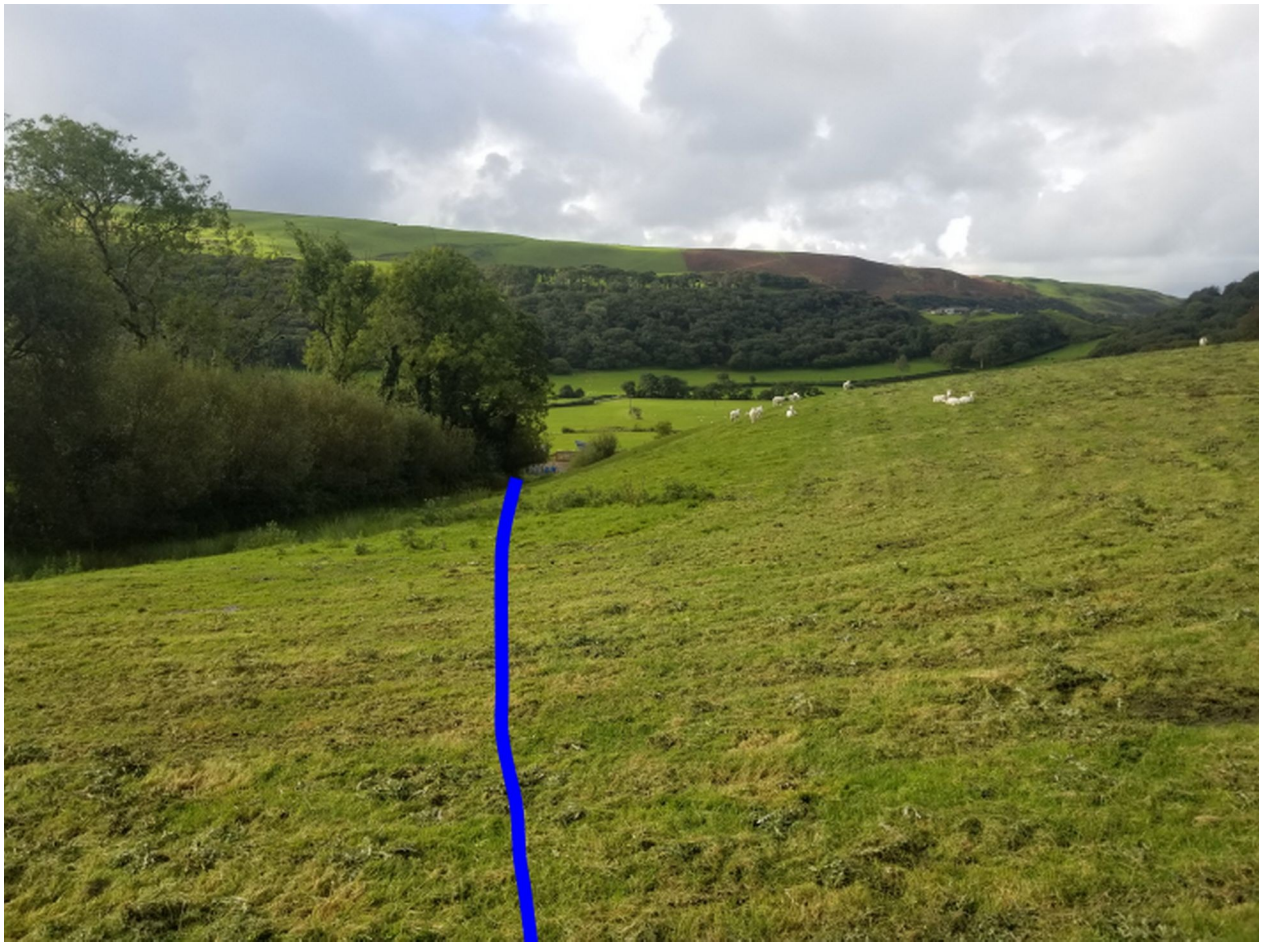

Figure 6: Pipeline section B lower field

There is a short section of unsurfaced track between the two fields. A the bottom of the lower field the pipeline will pass through the hedge and across the stream to the turbine house. The ecological report includes more photos of the pipeline route.

3.5 Turbine House

The turbine house will house the turbine, generator and control system. The proposed turbine is the Turgo turbine where the water passes a nozzle (spear valve) and is fired at high pressure onto ‘spoons’ mounted on the rim of the turbine runner (rotating wheel). The turbine can adjust automatically to the available flow by actuating the spear valve. A valve will be installed on the pipe immediately upstream of the turbine to allow it to be isolated for maintenance. The control system will automatically control the turbine allowing it to start up and shut down without human input and will automatically disconnect in the event of a fault.

The turbine house will be located behind the meat unit and spanning across the stream. It’s location is shown in Figure 7 below. The immediate foreground has the meat unit (with black downpipe). The dark green mesh structure houses

refrigeration pumps for the meat unit and the structure visible behind that is the pig shed. The stream can be just seen beneath brambles passing to the right of the pig shed.

Figure 7 – Turbine house location

The turbine house will be approximately 2.5m x 2.5m in size and a single storey high. A simple concrete block construction clad with rendered walls is proposed with a slate roof. It will have a concrete base on which to mount the turbine above the stream

3.6 Outfall

There will be no outfall structure as such. The water will simply drop out through the turbine house floor slab back into the river. A 40mm mesh screen will prevent anything coming up from below and into contact with the runner of the turbine.

3.7 Access

Access to the site will be by existing public and private roads and tracks. No new temporary or permanent access works will be required.

3.8 Grid Connection

The turbine house will be immediately adjacent to the existing farm meat unit. The hydro scheme will connect to the existing electrical infrastructure in the unit by means of a cable.

3.9 Technical Characteristics

Some key variables related to the performance of the scheme are shown in Table 2 below.

Elevation of intake weir	155m AOD
Elevation of turbine house	74m AOD
Gross Head	81m
Catchment Area	0.6km^2
Mean Flow in Watercourse	15 l/s
Scheme Rated Flow	15 l/s (the mean flow, Zone 3 abstraction regime)
Minimum Turbine Flow	1.5 l/s
Pipeline length	580m
Pipe size	180mm
Length of deprived reach	610m
Drop along deprived reach	81m
Deprived reach slope	1:7.5
Proposed Hands Off Flow (HOF)	2 l/s (Q95)
Proposed Flow Take (above HOF)	70% (Zone 3 abstraction regime)
Scheme Rating	9kW
Annual Energy Yield	30,000 kWh/year
Carbon dioxide emissions offset	5930 kg/year

Table 2 - Design Parameters and Energy Yield

4 Environmental Considerations

4.1 Designated Areas

A designated area search has been carried out across the development site and is shown in Figure 8 below.

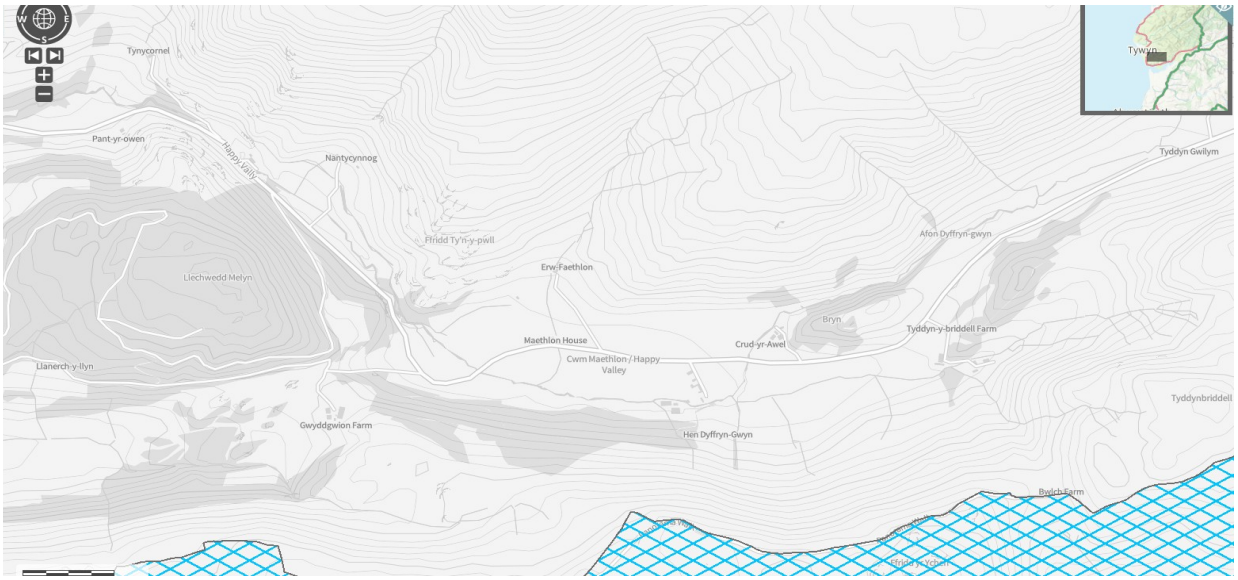

Figure 8 – Designated area search

This search shows that there are no designations at or close to the site.

4.2 Ecology

Environmental surveys of the initial proposed site and deprived reach were carried out by Gritten Ecology and the report is included with the planning submission. Surveys were carried out for the vegetation along the penstock route and stream, as well as for otters, water voles badgers, birds, bats and invasive non-native species;

Further information can be obtained on the various surveys from the report however no major impacts were identified and the report concludes:

“In conclusion, the site for the proposed HEP is of very low ecological interest and no significant environmental impacts are foreseen”

4.3 Effect on Flow Regime

The effect of the abstraction on the flow duration curve has been modelled and is shown in Figure 9 below. This uses modelled flows from ‘Low Flows’ software. The flow modelling is included in the Flow Calculations Spreadsheet on the ‘Flow Modelling’ sheet.

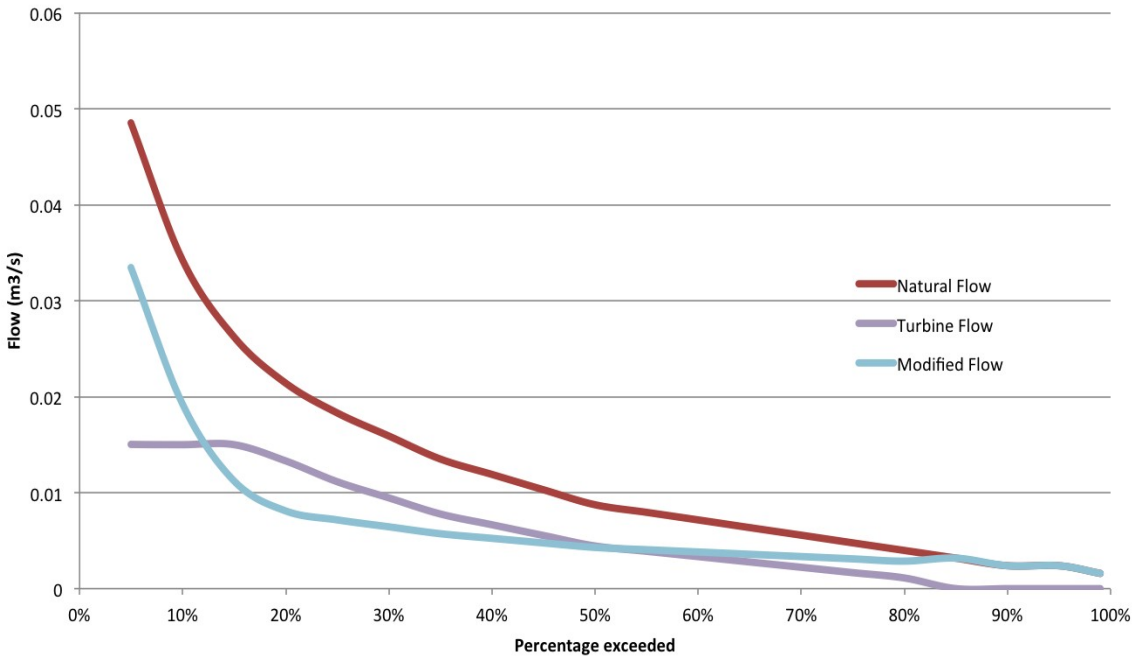

Figure 9 – Effect on Flow regime

It can be seen that for the driest 15% of the year, the flow in the stream will be unaffected as no water will be abstracted. For the medium flows (70% of the time), the flow will be reduced based on the flow take of 70% above the Hands Off Flow and the turbine will be abstracting at part flow. For approximately 15% of the time the turbine will be abstracting the rated flow and the flow take will be less than 70%, amounting to a small fraction during high flow periods.

4.4 Noise

The turbine house will be of block construction with a slate roof, both features which will reduce noise output compared to more lightweight construction options. It is not expected that noise from the turbine house will be significantly greater than that of the fast flowing stream itself.

4.5 Flooding

The NRW Flood Risk Map for the area is shown in Figure 10 below.

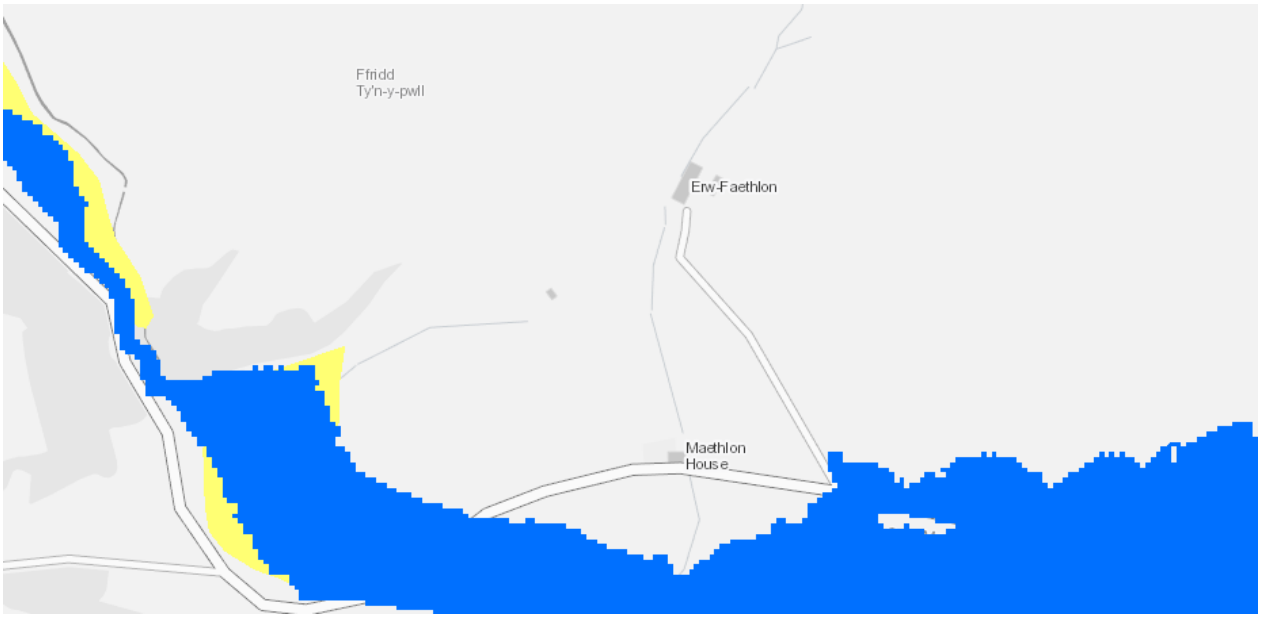

Figure 10 – Flood Map

This clearly shows that the entire area of the development site is in Zone A, considered to be at little or no risk of fluvial or coastal/tidal flooding. Furthermore there are no buildings between the intake and outfall which could be affected by the development. Therefore it can be clearly stated that the scheme will have no impact on flooding and no further formal flood assessment work is proposed.