

# Cwm y Foel Reservoir, Croesor

## Reservoir Render Repair 2025



## Drain-down Operation Procedure

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The following procedure is to be followed for lowering the water level in Cwm y Foel reservoir below the normal operating range to facilitate the render repair to the bottom section of the dam structure.

### Introduction

To comply with the Reservoir Act 1975, Cwm y Foel (dam and associated infrastructure) must be adequately maintained to satisfy the Supervising Engineer's (SE) recommendations. The SE has identified that the upstream face of the dam requires patch render repairs to limit seepage through the dam body.

To facilitate this render repair work, the water level at the reservoir must be reduced sufficiently low to allow the erection of a scaffold to gain access to the lower section of the wall. The water level can be drawn down by using the generating unit or a scour valve, which is a branch off the main delivery pipeline downstream of the dam, to a minimum level of 440.20m AoD under normal operating procedure. Below 440.20m AoD, the water level can only be reduced by operating the reservoir drain valve (manual operation) located upstream of the dam.

This document has been prepared as part of the application for discharge consent from Natural Resource Wales.

### Location

1. Cwm y Foel reservoir is located 3.0km north east of Croesor village.
2. The location of the reservoir's scour valve is:
  - Ordnance Survey grid reference: SH 654 466
  - [www.what3words.com](http://www.what3words.com): hindered.thinnest.incursion

### Reservoir Data

- The reservoir's undertaker is RWE Generation UK plc.
- The reservoir is owned by Brondanw Estate.
- The Supervising Engineer (under The Reservoir Act 1975) is Michael Jack, RWE Generation UK plc
- Cwm y Foel Reservoir is classified as a high risk reservoir under The Reservoirs Act 1975.
- The reservoir feeds Croesor hydroelectric power station. The normal operating water level in the reservoir is from 440.80m AoD to 442.65m AoD.
- Cwm y Foel Reservoir has a capacity of 48,000 m<sup>3</sup> at top water level.
- Cwm y Foel Reservoir is fed by water from the Llynau Diffwys to the east and the surrounding catchment.
- Spill occurs at 442.65m AoD.
- The inlet to the penstock is a 1200mm Ø bellmouth tundish (with screen), set at 440.20m AoD connected to a 355mm ID pipe.
- Under normal conditions, once the reservoir water has reached below the rim of the 1200mm bellmouth tundish (442.2m AoD), compensation water continues to discharge through a 73mm diameter hole lower down in the tundish.
- There is a single outlet pipe through the dam that runs to the power station of 300mm ID. The invert level of this pipe is 436.79m AoD at the dam.
- There is 355mm ID low level reservoir drain branch pipe directly off the inlet pipe upstream of the dam. Note that there isn't a separate low level scour pipe through the dam for this reservoir.
- Immediately downstream of the dam, there is a branch off the penstock that discharges water via a scour valve.
- The scour pipe discharges into the watercourse taking the compensation & spillway flow (unnamed tributary to the Afon Croesor).

- The pipeline isolation valve, reservoir drain valve and the scour branch valve are exercised bi-annually as part of the maintenance regime. This is done with the reservoir water level within its normal operating range.
- The water is approximately 0.5m deep adjacent to the intake structure at water level of 438.8m AoD.
- The intake structure is formed of masonry wing walls to each side of the intake pipe with stop logs to the upstream face protect the intake tundish and the scour inlet. These stoplogs hold back any silt that accumulates in the lowest point of the reservoir. Refer to figures 1 & 11 below.
- The approximate max volume of the space around the intake pipe enclosed by the wing walls and the stoplog 'silt barrier' is 10m<sup>3</sup>.
- The approximate volume of water to be drained from 440.8m to 438.8m AoD is 5,500m<sup>3</sup>
- The maximum rate of discharge when generating at Croesor Power House from penstock pipe is 0.25m<sup>3</sup>/s.
- The maximum rate of discharge from the scour branch off the inlet pipe is 0.09 m<sup>3</sup>/s (90 ltr/s).
- The compensation flow via the 150mm Ø branch off the inlet pipe is 0.025m<sup>3</sup>/s (25 ltr/s).

#### Programme & Procedure – Typically commencing April 2025

1. Work to commence in period of forecasted dry weather
2. 1 - 4 weeks in advance of works – Reduce reservoir level to minimum normal operating level (440.20m AoD) by opening the downstream scour valve. This will draw the top water in the reservoir down through the tundish.
3. 1 - 4 weeks in advance of works – transport the required materials, scaffold etc. to the dam location by helicopter and the settlement and silt tanks at the station.
4. Day 1 – Site mobilisation.
5. Day 2-3 – With the penstock isolated at the dam, at the turbine house, remove a removable section of penstock and replace with a control valve and extend with a 6" wire armoured hose via the tailrace to a flat laydown area outside the station building. Connect the hose to a settlement tank and a 5000 l silt trap tank connected in series.
6. With the penstock connected to the silt tank and flow controlled by a valve at the station, gradually open the reservoir drain valve to discharge the initial flush of potentially silty water from the space around the intake pipe enclosed by the wing walls and the stoplog 'silt barrier'. Monitor the quality of the water discharging into and from the silt trap. Adjust flow-rates as necessary.
7. Monitor volume of water trapped by silt trap, empty silt trap as necessary to skip for disposal.
8. Day 4 & 5 Once the water arriving at the silt trap runs clear; at the dam, isolate the pipeline flow and switch the flow to discharge via the scour valve downstream of the dam. Keep monitoring the water flow and water quality at dam. If water quality diminishes, close scour valve and revert to discharging through silt trap via penstock to the station until water runs clear. Drain water in dam to a level of 438.8. As reservoir water reaches this level, adjust valve opening so that discharge flow rate matches any reservoir incoming flow.
9. Day 6 & 7 - Erect scaffold in front of dam wall structure & around intake grill.
10. Day 8 & 9 - Remove loose render to upstream face of the dam wall by hand and collect in helicopter bag ready for removal and disposal off site.
11. Day 10 – Repair weld steel grills to intake structure.
12. Day 10 – 12 – Apply render repair to all affected areas.
13. Day 13 & 14 – Dismantle scaffold and prepare laydown area.
14. Day 14 - Close reservoir drain valve, isolate pipeline.
15. Day 15 – At turbine house, disconnect 3" hose and remove from the tailrace and reinstate removable section of penstock.
16. Day 15 - Demobilise, using helicopter lifts at dam and vehicles at station to remove all plant, materials and waste.
17. After day 15 – Once reservoir re-filled - return to service.



Extracts from RWE drawings

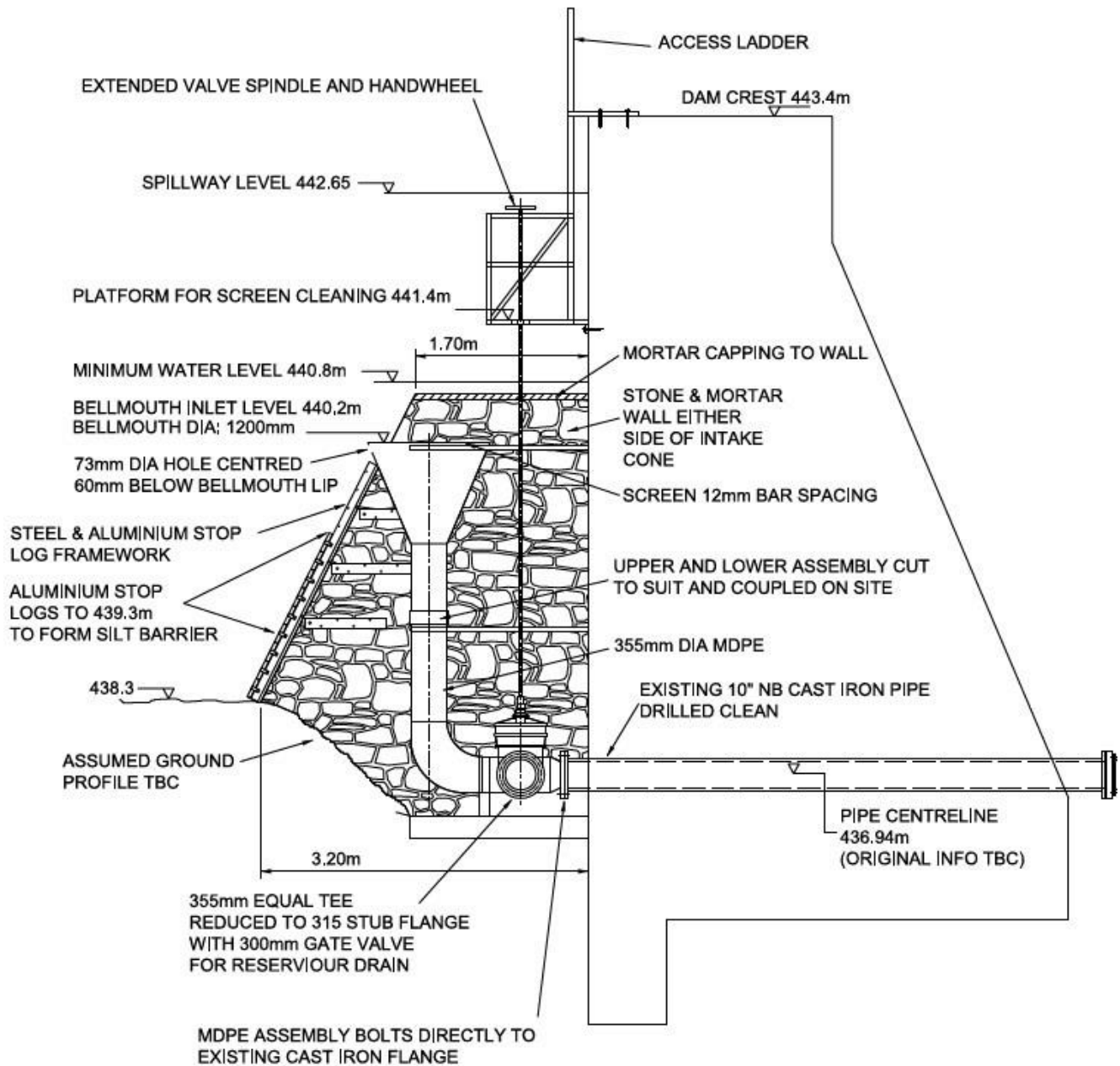


Figure 1 - Extract from RWE drawing number CR/009/CIVIL/004 showing cross section of intake structure.

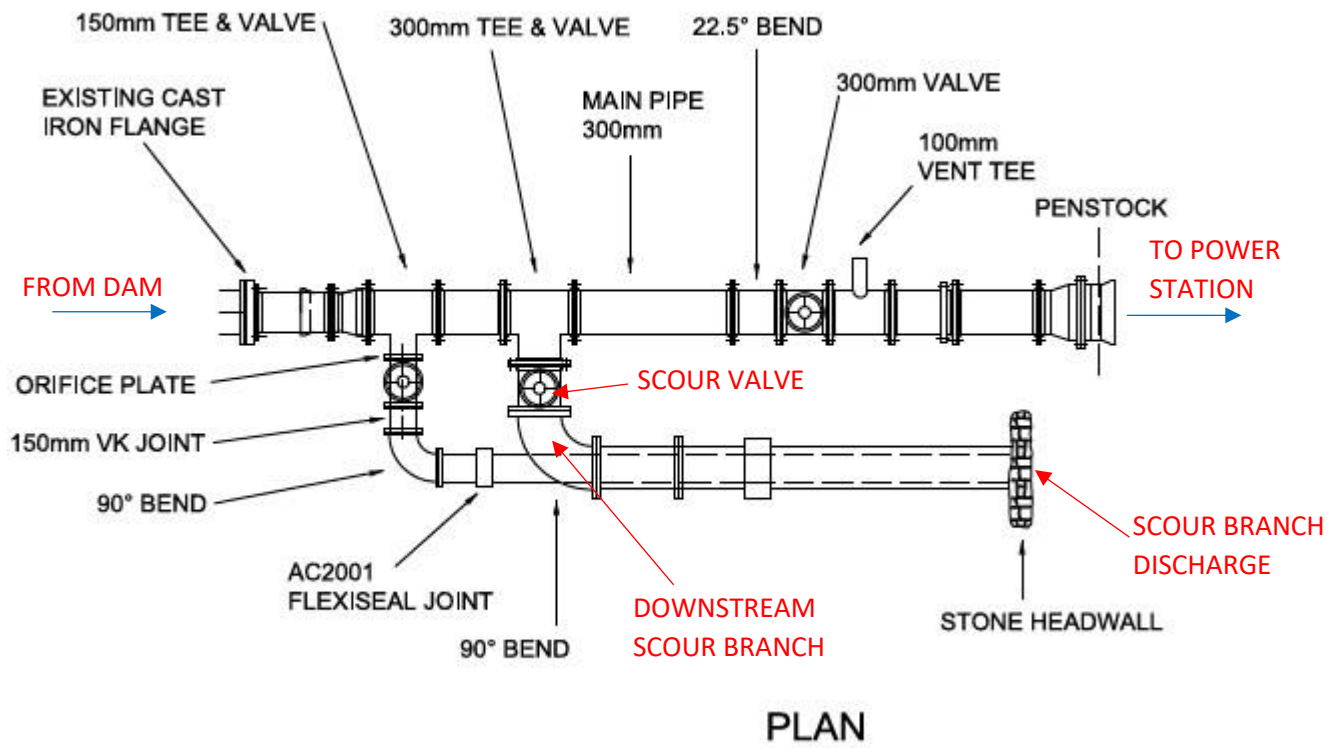


Figure 2 -Extract from RWE drawing number CR/009/CIVIL/004 showing plan of pipeline at Cwm y Foel Reservoir downstream of dam with scour and compensation flow discharge branches.

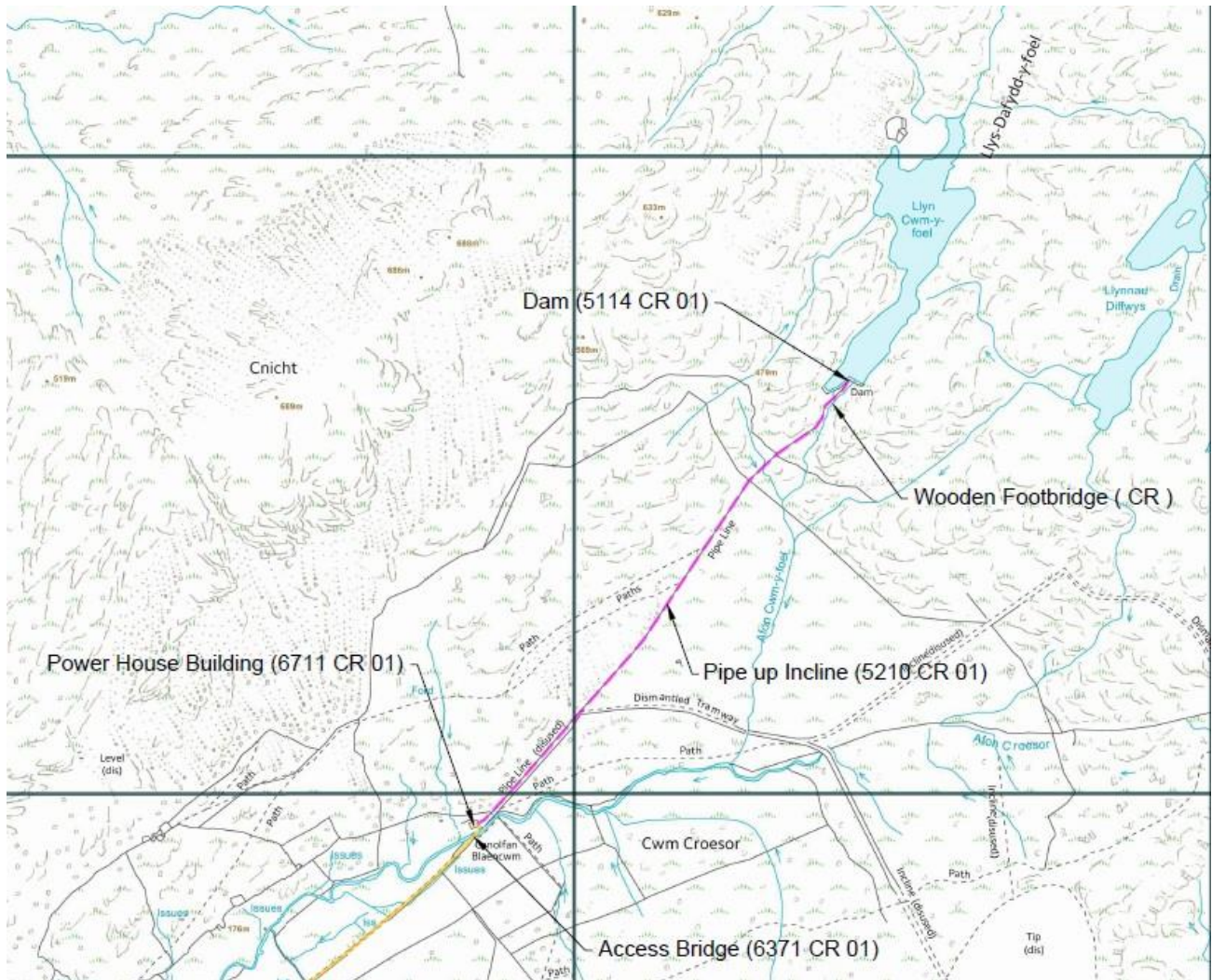


Figure 3 - Extract from RWE drawing number CR/009/CIVIL/030 showing plan of Cwm y Foel Reservoir

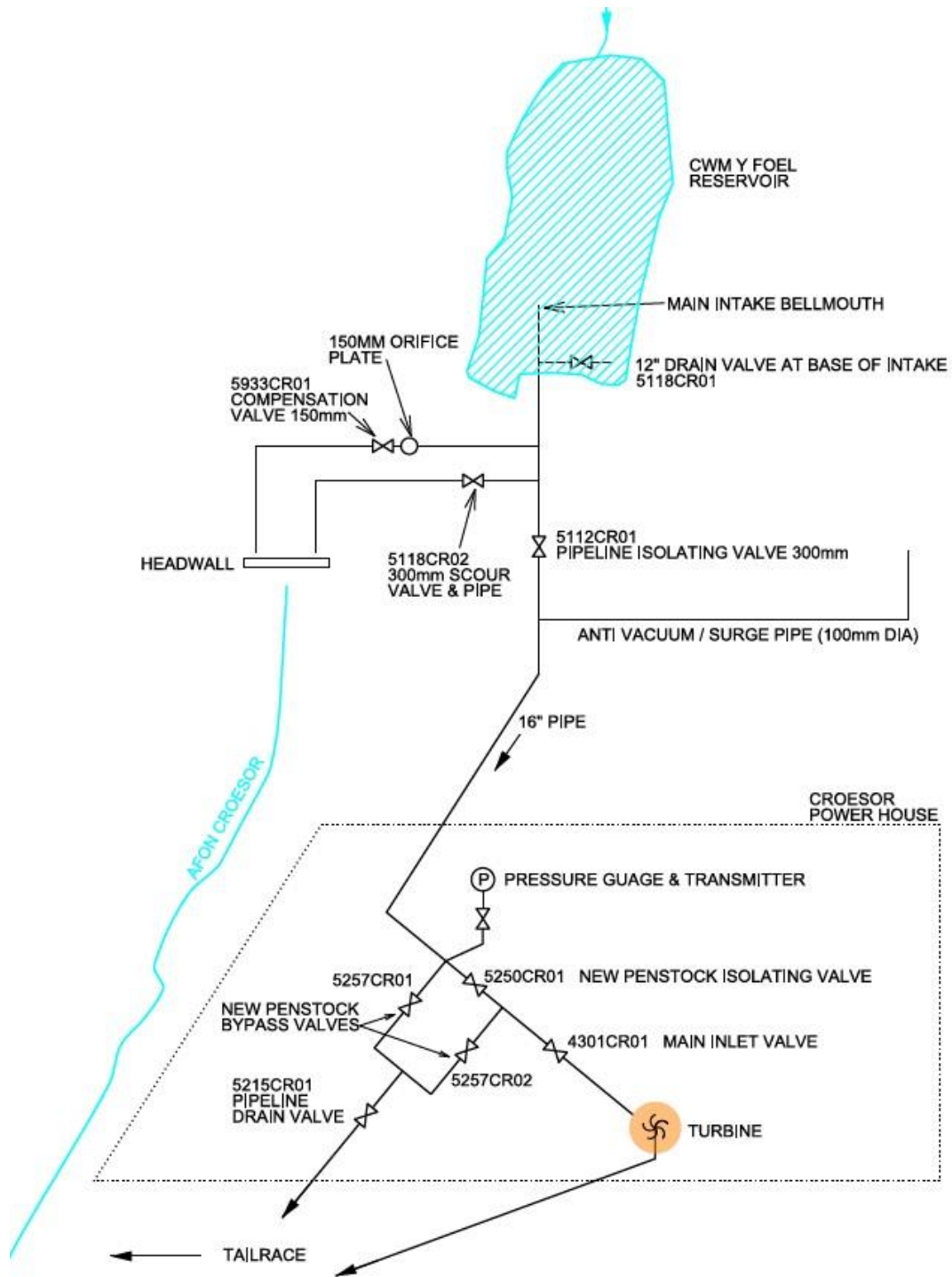


Figure 4 - Extract from RWE drawing number CR/009/GWS/005 showing a schematic of Cwm y Foel Reservoir valves



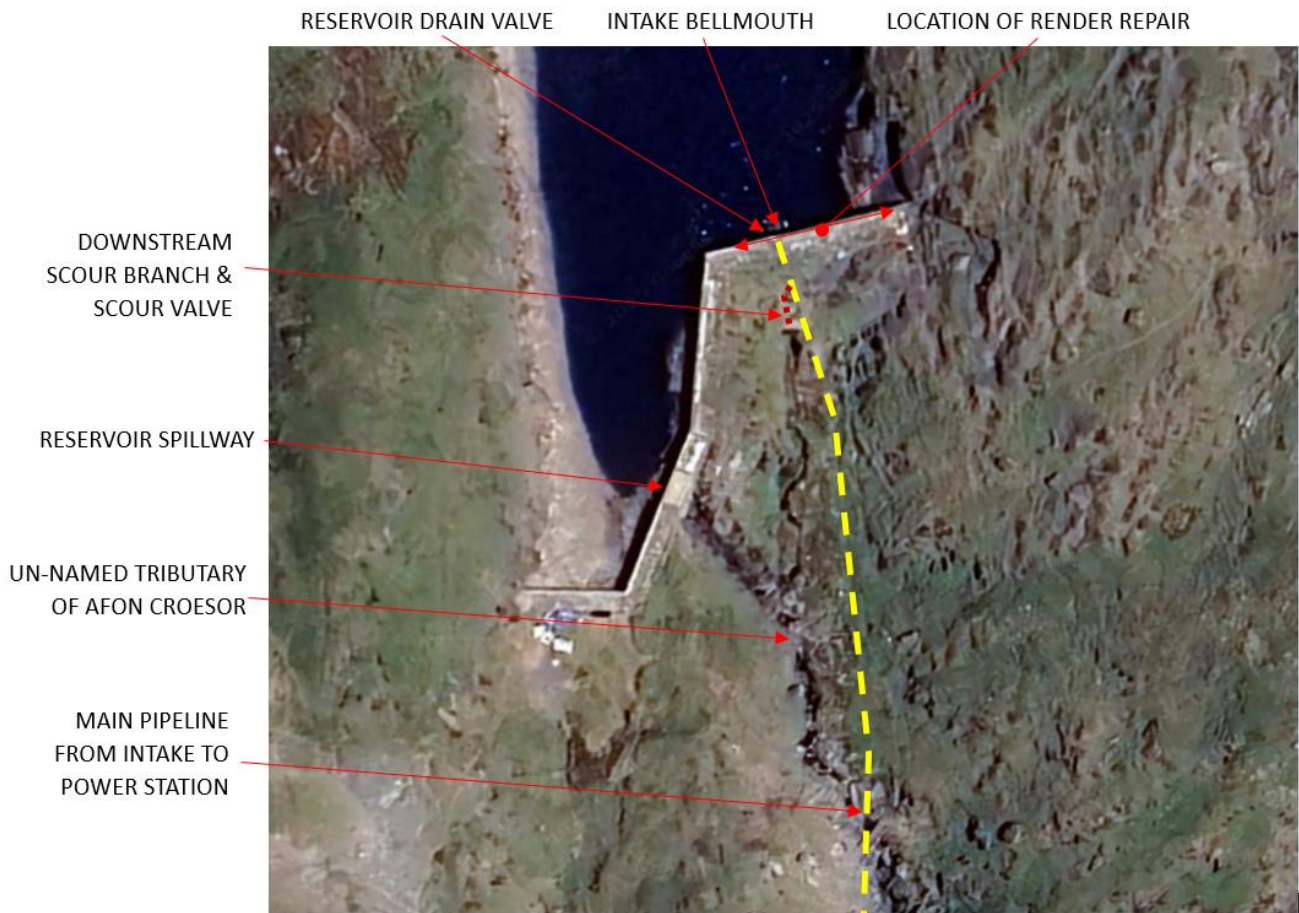


Figure 5 – Location of key features at dam





Figure 6 – Location of key features at power station



## Photographs



Figure 7 – South view of Cwm y Foel reservoir, with water at minimum operational level



Figure 8 – East view of Cwm y Foel reservoir, with water at minimum operational level





Figure 9 – West view of Cwm y Foel reservoir, water at minimum operational level



Figure 10 – South view of Cwm y Foel reservoir, water at minimum operational level





Figure 11 – Historic photograph of tundish, wing walls and silt stop logs



Figure 12 – North view of Cwm y Foel reservoir, near full capacity





Figure 13 – West view of Cwm y Foel reservoir, near full capacity

**1. Background Information**

<b>Plant Item/Location</b>	Cwm y Foel Reservoir – Render Repair	<b>Date:</b>	13/12/2024
<b>Title of Assessment / work activity:</b>	Cwm y Foel Reservoir Scour Operation – Environmental Risks	<b>Name of person conducting assessment:</b>	Sion Salisbury

					2. Risk Assessment				
Identify and list Hazards		Hazard Effects	Severity	Likelihood	Risk Rating	List Risk Mitigation /Control Measures	Severity	Likelihood	Risk Rating
1	Scour valve or reservoir drain valve stuck open	Loss of control of water level, uncontrolled downstream silt deposit. Fish stock washed down.	3	2	6 / Medium	Both scour valve and drain down valves well maintained with regular operating regime to test and prove functionality.  Either upstream reservoir drain valve or downstream main intake or scour valve available to stop flows should it be required.	3	1	3 / Low
2	Excessive head of water acting on water in scour pipe	Discharge rates cause scouring damage downstream	3	1	3 / Low	Scour branch discharges water to a watercourse at the same location that receives the reservoir spill flows. Max flowrate that scour branch can discharge is an order of magnitude less than the flowrate the watercourse regularly receives from spill flows.  Monitor long range weather forecast, if period of heavy rain approaching then delay work.  Discharge from scour branch is to watercourse carrying the compensation flow	3	1	3 / Low
3	Not enough water for fish	Loss of fish	3	4	12 / Medium	Well planned activity, including confirming sufficient remaining water volume at required water level (0.5m deep) prior to commencement of work.  Well briefed and experienced operatives to operate scour valve. Instructed in job card package (including in RAMS).  Water level regularly monitored throughout the operation. Valve adjusted to balance reservoir inflow with scour discharge to maintain stable water level after drawing down.	3	1	3 / Low



					2. Risk Assessment				
Identify and list Hazards		Hazard Effects	Severity	Likelihood	Risk Rating	List Risk Mitigation /Control Measures	Severity	Likelihood	Risk Rating
						Flow of water through outlet pipe will be significantly less than seen through the pipe during normal operation via the turbines thus minimising risk of fish being drawn in.			
4	Silt discharged downstream of scour	Loss of habitat due to excess silt in river bed	3	5	15/ High	<p>Initial flush of water through reservoir drain valve to be passed down penstock to station where it can be intercepted and passed through settlement tank and silt tank to remove gross solids.</p> <p>Only once any accumulated silt in the intake chamber have been removed (evidenced by water running clear), will water be discharged via the downstream scour valve.</p> <p>Visual monitoring of water quality at all stages.</p> <p>Reservoir drain valve in intake is down stream of stoplogs which protect against silt slumping into valve chamber. Original timber silt barrier replaced in 2019 with a robust stainless steel barrier.</p> <p>Well briefed and experienced operatives to operate scour valve with monitoring of water quality at discharge point throughout the day.</p>	3	1	3 / Low

**1. Severity** - Evaluate the consequences of a risk occurring according to the ratings in the top row

Descriptor	Level	Definition
<b>Negligible</b>	<b>1</b>	No environmental harm
<b>Minor</b>	<b>2</b>	Minor, insignificant environmental harm to a small area
<b>Medium</b>	<b>3</b>	Some environmental harm, limited to a small area
<b>Major</b>	<b>4</b>	Major pollution event across large area and resulting in environmental harm to several species.
<b>Severe</b>	<b>5</b>	Sever loss of fish or habitat due to significant pollution event

**3. Risk Matrix** – Using the matrix calculate the level of **risk** by finding the intersection between the likelihood and the consequences

Likelihood	Severity				
	Insignificant	Minor	Moderate	Major	Severe
<b>Almost Certain</b>	Low	Medium	Medium	High	High
<b>Very Likely</b>	Low	Low	Medium	High	High
<b>Likely</b>	Low	Low	Medium	Medium	Medium
<b>Unlikely</b>	Low	Low	Low	Low	Medium
<b>Very Unlikely</b>	Low	Low	Low	Low	Low

**2. Likelihood** - Evaluate the likelihood of an incident occurring according to the ratings in the left hand column

Descriptor	Level	Definition
<b>Very Unlikely</b>	<b>1</b>	May occur somewhere, sometime (“once in a life time / once in a hundred years”)
<b>Unlikely</b>	<b>2</b>	May occur somewhere within the Department over an extended period of time
<b>Likely</b>	<b>3</b>	May occur several times across the Department or a region over a period of time
<b>Very Likely</b>	<b>4</b>	May be anticipated multiple times over a period of time May occur once every few repetitions of the activity or event
<b>Almost Certain</b>	<b>5</b>	Prone to occur regularly. It is anticipated for each repetition of the activity of event

#### 4. Risk Level/Rating and Actions

Descriptor	Definition
<b>High:</b>	Intolerable Risk , action essential. A high risk
<b>Medium:</b>	Tolerable Risk with permission of Natural Resource Wales
<b>Low</b>	Tolerable . A low risk without the requirement of permission / consent from Natural Resource Wales

**Appendix A – NRW Environmental permit: Part B6 –  
new bespoke water discharge activity:  
Environment Management System**



## **Introduction**

This appendix has been prepared to satisfy Natural Resource Wales' requirements as part of the application for an environmental permit: Part B6 – new bespoke water discharge activity and groundwater (point source) activity for the lowering of the Cwm y Foel Reservoir's water level below normal operational limits by operating the scour valve.

## **Type of Treatment Plant**

Cwm y Foel Reservoir is an inland water reservoir with the sole purpose of storing and discharging rainwater for use in a hydroelectric power generation capacity.

There is no effluent or wastewater treated or produced.

## **Infrastructure Plan**

Refer to the following drawings:

CR/009/CIVIL/030	Civils Assets Map
CR/009/CIVIL/004	Elevation of Intake
CR/009/GWS/005	Cwm y Foel Reservoir Valve & Flow Schematic

## **Maintenance plans & records**

The scour valve and reservoir drain valve are exercised every 6 months to fulfil RWE Generation UK plc's legal duties under the Reservoir's Act 1975. This operation is recorded in the Supervising Engineer's bi-annual report.

## **Monitoring plans & records**

The lowering of the reservoir below its normal operating minimum level of 440.2m AoD (to facilitate the repair work to the render to the upstream face of the dam structure) is not a routine procedure and is considered a one-off requirement. During the drain down RWE will follow the monitoring procedure.

In summary, a team of operatives will be monitoring the drain down operation during the period that the water level is reduced from the normal operating level to a low level to allow the works to be undertaken. The operatives will also monitor the draining operation when any water is being released to maintain water levels at the low reservoir level.

There will be a 24 hour on-call team available to attend site if an emergency call is raised by a member of the public. The emergency number is noted on signage at the Cwm y Fowl reservoir. The number is manned 24 hours.

The operatives will be required to keep a record of their time, date and action completed (i.e. altering the scour valve by number of turns etc.).

## **Training Requirements**

All RWE operatives are fully trained in operating the scour valve and are all very experienced. All operatives having a minimum of a decade of working at Dolgarrog Power Station.

### **Complaints Record**

The Control Room telephone number is noted on signage at the reservoir. All calls made to the emergency number is handled by RWE's operatives. The emergency number is manned 24 hours a day. Any incidents (either safety or environmental) are recorded in "RITAS", RWE's internal recording software. Each and all incidents are circulated to the management team who will allocate resources as required. In the event of an emergency the station manager will be informed immediately and suitable steps taken, refer to the Emergency Plan Management Document for further guidance.

### **Accident management plan**

Refer to the following document:

RWEGUK\_WP\_EAP001 Hydro Emergency Plan Management Document.