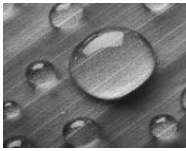


ELEMENTS ENERGY

**Plas Farm Hydro
Scheme**

**Construction
Environmental
Management Plan
(CEMP)**

**Hydropower Consultancy &
Development**



Document Control

Scheme Name: Plas Farm
Client Name: Richard Bowen
Client Address: Cilybebyll, Swansea

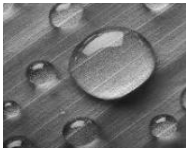
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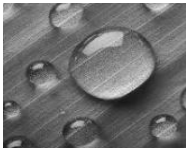


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Plase Farm Hydro
CEMP

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1 Summary

This environmental management plan (EMP) describes the procedures required to safeguard the environment during the construction and operation phases of a proposed micro hydro scheme at Plas Farm.

2 General Description of Works

The layout is shown in the drawing Plas Farm General Layout RevA 27.02.24 and the works consist of the following:

- A small intake structure on the face of a waterfall, incorporating a Coanda screen with 1.3mm apertures and stilling chamber.
- A pipeline of HDPE plastic pipe running from the intake down to the turbine house on the West side of the watercourse. The pipeline is 600m long. The pipeline is mainly buried with the odd section overground where trees are present.
- A wood clad turbine house building with a pitched roof, enclosing the hydroelectric turbine, generator, and control panel.
- A 10m long, discharge pipe with a screen with 25mm spacing, and an outfall, in the form of a mortared stone cascade, to return water to the beck at the rear of the powerhouse.
- A buried electrical cable from the turbine enclosure to the Cilybebyll Manor connection point.

3 Duration of Works

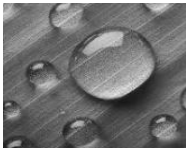
It is estimated that the works will take 4 months to complete. However, the weather could have a significant impact on the length of time required on site. The preferred approach for schemes of this scale is to hold back on construction during very wet periods in order to avoid degrading the working area.

4 Timing of the work

The works will take place throughout the winter of 2024 to enable project completion by the end of February.

5 Outline Method

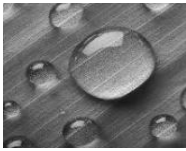
1	Site Preparation
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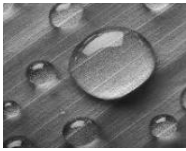
1.1	Set up compound area including storage and welfare in the designated area
1.2	Install signage and fencing as required
1.3	Silt protection measures to be implemented
1.4	Consolidate access route for excavator to intake.
2	Intake Construction The intake is to be a Coanda screen intake pre fabricated screen. Work to install the intake will only commence when water levels are low and no heavy rain is forecast.
2.1	Use Ø375mm twin-wall pipe (or similar) with sandbags, visqueen and plastic sheeting to create a temporary diversion from natural stream crest upstream of works. The flow will be returned to the beck in a rocky section where the risk of the flow disturbing the river bed is minimal.
2.2	Place straw bales & terram downstream of works to catch any displaced sediment
2.3	Any remaining water below the diversion point will be pumped out and returned to the stream via a silt trap and/ or discharged over grass: whichever is necessary to ensure that no silt from the working area enters the watercourse.
2.4	If required, remove bedrock using heavy duty battery SDS chisel or pecker, attached to excavator, to form stable bedrock base for weir to sit on; depth of excavation will be commensurate with the integrated sump
2.7	Wire-brush bedrock to remove slime and allow good bond with concrete
2.8	Pour blinding layer/ sump base slab
2.9	Drill and chem-set steel rebar into base slab
2.10	Form timber shuttering around rebar to required dimensions/ design of weir wall
2.11	Prepare concrete on ply board laid on terram; to contain spillages this will be done on level ground away from riverbank within compound area.
2.12	Transport prepared concrete to weir
2.13	Cast pre fab screen/sump NOTE - Check weather forecast and only proceed with placement of concrete if three clear dry days ahead – this is to prevent washout of works in spate flows.
2.15	All tools are to be washed in a specially dug pit away from the river.
2.16	Allow minimum three days for concrete to cure before removing any diversion works.



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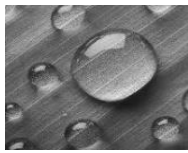
3	Pipeline
3.1	Deliver pipe to site
3.2	Place sections of pipe along route using winches within woodland and where pipe is buried in fields pipe can be moved around by excavator, tracked dumber or tractor.
3.3	Pipeline is to be installed in stages working up from the powerhouse
3.4	Most of the pipeline is through fields outside of the woodland. Here pipe is to be butt welded in to long strings and rolled into a pre prepared trench. Extent of pipe bedding dependant on ground conditions.
3.5	At bends, which will be formed by the natural flexibility of the pipe material, the pipe should be buried with at least 600mm cover to help restrain thrust forces. Particular attention should be paid to the outside of bends.
3.6	Pipe route through these fields is to have a soil strip with top soil set aside along the route. Trench is then dug and each string of pipe installed. Joining of strings can be done with electrofusion couplers.
3.7	Signal cable to be laid along pipe route. Cable to be covered in slit trench or similar
3.8	Pipeline in woodland is to be overground and pulled into place by an excavator outside of the woodland or bog area. No large machinery to enter the woodland or bog, hand tools only within these areas.
4	Powerhouse The powerhouse is designed around a concrete floor slab which underlies both the pipe and the turbine. The building will be of reinforced concrete & block work construction with larch timber facing and a pitched roof. The turbine will discharge into a concrete sump, with a tailrace made from 225mm twin-wall pipe or similar. Care will be taken to prevent runoff flushing excavated material into the watercourse.
4.1	Mark out powerhouse and tailrace
4.2	Excavate foundation trenches, sump and upper trench for tailrace
4.3	Cast wall footings and floor of sump
4.4	Install tailrace pipe
4.5	Construct formwork for sump around first section tailrace pipe, and formwork for turbine bed frame. Include anchor block, floor drain and cable ducts (as will be shown in engineering drawings)



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4.6	Cast sump walls and main floor slab, with starter bars for anchor block. Slab to have slight fall to allow drainage into floor drain, and apron to slope away from building
4.7	Build up block walls, leaving cut-out for anchor block, and including ventilation notches at top and bottom of southern gable end
4.8	Fit wooden A-frames and rafters, clade with slate to complete the roof
4.9	Fit baffle boxes over ventilation notches
4.10	Fit doors and rainwater goods as appropriate
5	Tailrace & outfall
5.1	Use steel piles or sandbags/visqueen to form barrier around outfall to isolate works from watercourse
5.2	Dig remaining trench for tailrace pipe to watercourse
5.3	Install tailrace pipe
5.5	Fit Outfall screen (stainless steel with 30mm spacing)
5.6	Backfill pipe trench (selected backfill to avoid damage)
6	Electro-mechanical installation
6.1	Deliver turbine/generator, control panel and ancillaries to site, unload onto concrete apron and use rollers to move into powerhouse lifting area
6.2	Fit turbine and generator in place, align, bolt down and grout in
6.3	Fix main inlet valve support to concrete, and check alignment/ positioning of unit
7	Connect & restrain pipe
7.1	Pipe to be flushed with intake screen in place to remove debris from pipe (small stones etc.)
7.2	Cut pipe to length, and fit reducer with stub pipe to suit turbine inlet; reducer to be located within anchor block, at upstream end
7.3	Connect pipe to turbine inlet using VJ coupling or similar, ensuring 5-10mm gap between flange and end of pipe
7.4	Construct formwork for anchor block, fixing pipe securely to prevent suspension in concrete
7.5	Pour anchor block



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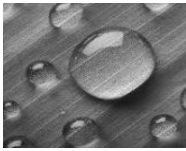
7.6	Backfill around block
8	Electrical Installation & Power Cabling
8.1	Install control cabinet
8.2	Connect generator, actuator and sensor cables; install local power and lights
8.3	Connect signal cable from intake
8.6	DNO to complete installation of substation and HV cable within the substation room of the powerhouse.
8.7	Powerhouse fuses to be fitted by DNO following electrical installation
8.8	Warning tape to be placed in trench; cover depth and other details to be specified by DNO
8.9	Install intake level sensor(s) under intake screen
9	Final civils, making good
9.1	Stone face powerhouse
9.2	Final pumping out and clearing of working area prior to removal of diversions; all silt water to be pumped out of working area
9.3	Remove waste and excess materials
9.5	Remove sediment from any traps; fill and reinstate turf
10	Commissioning
10.1	System commissioning as per turbine supplier instructions

6 Watercourse Pollution (Construction)

A potential issue relevant to the proposed works includes contamination of the watercourse with concrete and/ or silt, fuel or oil spillages and disposal of waste (both solid and liquid). If a pollution incident occurs, we will contact Natural Resources Wales immediately (Incident number is 24hrs a day **0300 065 3000**). Immediate remedial action will include halting construction work and reinforcing all measures in place to prevent pollution as outlined below.

Relevant pollution prevention guidelines will be followed, including:

- PPG 01 "General guide to the prevention of pollution"
- PPG 05 "Works in, near or liable to affect watercourses"



- PPG 06 “Working at construction and demolition sites”

6.1 Concrete

Any fresh concrete or cement entering the watercourse has the potential to kill fish, and this poses the greatest environmental risk for this project. Great care will be taken at all stages of the work to prevent concrete or cement entering the watercourse.

6.1.1 *Transportation and Storage of concrete*

The volume of concrete required will be approximately 10m³ at the intake and 25m³ at the powerhouse. Concrete will likely be delivered to site pre-mixed for the powerhouse and mixed on site for the intake. It will then either be tipped into the formwork or shovelled by hand. It must be ensured that any spillages that occur during transportation do not enter the river.

Cement will be stored off the ground (e.g. on pallets or boards) and covered from wind and rain. Concrete will be mixed in a sheltered area to avoid dry cement being blown around; this will be done well away from the river, in an area with no risk of runoff entering the watercourse.

6.1.2 *Concrete pouring*

Placing concrete at the intake poses the greatest risk of spillage/ leakage into the watercourse. As the majority of the intake work will be in or adjacent to the stream bed, the river will be diverted well away from the formwork, and the surrounding areas de-watered and protected from runoff in the event of rain. Plywood sheeting will be placed around the areas being poured in order to collect any spillage.

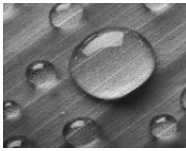
Concrete casting will only be carried out in dry conditions – a full local forecast will be obtained daily, and concrete only poured if dry weather is forecast for at least three days. This will minimise the risk of washout before the concrete is cured.

6.1.3 *Washing of equipment*

A small pit will be dug well away from the river, to contain wash water and allow cement/ concrete to be settled out. All equipment will be washed in this pit. Once the cement has cured the pit can be filled in.

6.2 Silt

Silt, although not as harmful as concrete, can have an adverse effect on the riverine environment and all efforts will be made to prevent silt entering the watercourse. The penstock route maintains a close proximity to the derogated watercourse and the majority of slopes where run off will travel lead directly to the watercourse. To protect the derogated reach the below measures will be implemented prior to works commencing. The site manager will be responsible for ensuring that the silt protection measures are functioning adequately and requesting further enhancement or maintenance of the measures from the project manager if necessary.



6.2.1 *Intake working area and pipeline first 100m down from intake*

As this section has the penstock being buried at its closest position to the watercourse, mitigation measures must be suitably stringent. A line of silt fencing comprised of geotextile membrane fixed to posts in the ground will border the downhill side of the easement to the downstream side of the intake compound, additionally secondary straw bale barriers will be placed further down the slopes, towards the Gill where water collects, to further trap sediment.

6.2.2 *Easement*

Where the easement requires fluming of a minor tributary, bale lines will be placed on the downhill side of the easement in an appropriate configuration to catch the natural run off from the easement and topography at these locations. Further silt fence lines will be installed downstream as further mitigation.

Further sections of silt fencing will be placed on the downhill side of the easement at regular intervals and where topography dictates water is likely to collect and run into the watercourse.

At the lower end of the penstock easement, prior to the powerhouse compound, an interception trench will be dug to catch any remaining run off traveling down the access track/penstock route. The trench will discharge into a silt bag and bale set up which will act to still and filter the water before it discharges downhill.

6.2.3 *Powerhouse Compound*

A bale lined silt fence will be placed between the watercourse and the powerhouse working area, extending upstream and downstream confluence. Should this area be inundated, the excess water will be pumped back uphill to the silt bag to filter.

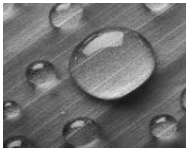
6.2.4 *Penstock*

To prevent excessive run off from the installation of the pipe the pipe will be installed in 100m sections only. That is a 100m length trench will be excavated and prepared for the pipe and signal cable, and at the downstream end of each section straw bales will be placed to trap run off. 8 sections of HDPE pipe will be butt welded together into a single string and lifted into the trench. Each section of trench will then be refilled prior to moving onto the next section.

When the pipe must pass through a wet flush or under/over a tributary puddle flanges will be welded into the pipe to prevent water from travelling down the pipe route rather than its natural route.

6.2.5 *Excavated material*

Excavated materials can be a large source of mobilised sediment under wet conditions and so any excavated material will be stored away from the watercourse on geotextile membrane and will be covered in the event of heavy rain.



6.3 Fuel & Oil

Fuel or oil entering the watercourse can kill fish, invertebrates and plants and contaminate any downstream abstractions. They will not be allowed to enter the river.

Fuel storage and spill kits (including drip trays) will be located within the compound at the powerhouse location, which will be locked when the site is unattended. In the event of a fuel spillage, a clean-up operation will commence immediately using materials on site. Fuel storage will comply with the Control of Pollution (Oil Storage) Regulations 2001.

6.3.1 Storage

All oil and fuel containers will be placed in suitable containment bunds well away from the river. The bund volume will be at least 110% of the storage container. Large-scale storage of fuel will not be required or permitted on site. The site compound will be used for storage this is well away from drainage to watercourses.

6.3.2 Refuelling vehicles or equipment

Any refuelling or oiling is to be carried out well away from river. Suitable containers and funnels will be used to avoid spillage, and drip trays or absorbent material will be placed beneath equipment while filling.

6.3.3 Leakage

Machinery (plant, generators, pumps etc.) and any fuel storage facilities must be checked daily to ensure there are no oil leaks.

A clean up kit will be available on site to absorb and contain any spillages.

6.4 Waste water and waste disposal

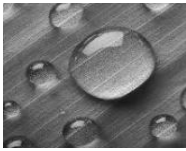
The site welfare facilities will generate waste water from toilets and washbasins; these are to be fitted with a waste water collection tank that can be pumped clean by a registered operator for removal and treatment at a local water treatment works.

While we do not envisage us moving or making contact with any type of controlled waste in this project, we note that this should be removed from site by a registered waste carrier to an appropriately licensed site or company.

Copies of all waste disposal licences and waste transfer documents will be filed on site and available for inspection.

7 Watercourse Pollution (Operation)

The turbine uses sealed bearings which operate in the dry inside the powerhouse and can be lubricated by grease-gun. The turbine casing is sealed to the powerhouse floor, preventing any leakage in the powerhouse from reaching the turbine sump. In addition, biodegradable grease will be used for the bearings.



8 Noise Pollution

8.1 Construction noise

Noise from machinery and equipment will be minimised to reduce the effect on wildlife and amenity of neighbours.

8.1.1 Plant machinery noise

There will be 24 weeks of excavator work across the site. There will also be noise from general access and transportation of materials.

8.1.2 Other machinery noise

Generators, pumps and other machinery will be switched off when not in use. Such machinery will not be required to run continuously, and will not operate outside the hours of 8am to 6pm except during the period immediately after the intake weir is cast, when pumps will keep the working area dry through the night.

8.2 Operation noise

During the design phase, careful attention has been given to the mitigation of noise. Concerns are often raised during the planning stage of a hydro scheme about potential noise impacts, though in practice it has been proven that they can be minimised via design. The ambient noise of the scheme will be limited by the following:

- Turbine house built from breeze block walls faced with local stone
- Insulated roof
- Ventilation vents will be baffled on the inside to control noise emissions.

This scheme is of a similar size and design to other schemes we have built, where the same measures have been proven to mitigate noise emissions from the turbine building.

9 Ecology

9.1 Consideration of specific fauna during construction phase

9.1.1 Otter/Badger

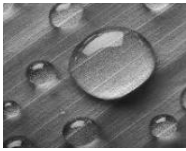
No hazards will be left overnight and all holes will be covered or fitted with escape routes

9.1.2 Bats

No lighting will be used on the site at night after 6pm as this could disturb foraging bats

9.1.3 Breeding birds

Care will be taken to avoid disturbing breeding birds.



10 Visual Impact

10.1 Powerhouse

The powerhouse will be clad in larch cladding and slate roof . In appearance the building will look like a small barn such as are found throughout the area.

10.2 Pipeline

The pipeline will be buried in a shallow trench throughout, and will not be visible.

10.3 Reinstatement

The banks, pipeline route and surrounding areas will be reinstated as appropriate, with excavations re-turfed and reseeded if required.

11 Planning Condition

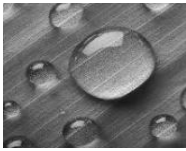
Condition 4 Wording (in blue):

No development, including site clearance, shall commence until a Construction Environmental Management Plan (CEMP) has been submitted to and approved in writing by the Local Planning Authority. The CEMP shall include:

o Construction methods: details of materials, how waste generated will be managed; o General Site Management: details of the construction programme including timetable, details of site clearance; details of site construction drainage, containments areas, appropriately sized buffer zones between storage areas (of spoil, oils, fuels, concrete mixing and washing areas) and any watercourse or surface drain. Any water that comes into contact with wet concrete must be treated as contaminated and must not be allowed to discharge into any watercourse.

The above is covered in Section 4, page 3 (timings of works) and Section 6.3.1 and 6.4 page 10 (waste and mixing areas etc) where it is confirmed as appropriate.

o CEMP Masterplan: details of the extent and phasing of development; location of landscape and environmental resources; design proposals and objectives for integration and mitigation measures.



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The above is covered in Section 2 and Section 5 , pages 3 -11 where it is confirmed as appropriate.

o Resource Management: details of fuel and chemical storage and containment; details of waste generation and its management; details of water consumption, wastewater and energy use

The above is covered in Section 6.3.1 and 6.4 page 10 (waste and mixing areas etc) where it is confirmed as appropriate. Water consumption and energy use is minimal at this development.

o Pollution Prevention: demonstrate how relevant Guidelines for Pollution Prevention and best practice will be implemented, including details of emergency spill procedures and incident response plan.

The above is covered in Section 6 pages 7-10 (Pollution Prevention) where it is confirmed as appropriate.

o Details of the persons and bodies responsible for activities associated with the CEMP and emergency contact details

Covered in opening paragraph of Section 6 page 7 (NRW, with incident number included)

The approved CEMP shall be implemented as approved during the site preparation and construction phases of the development.

Reason:

In the interests of ecology and biodiversity and to ensure necessary management measures are agreed and implemented for the protection of the environment during construction and to accord with Policy SP15 of the adopted Neath Port Talbot Local Development Plan.