Stage 1 Geomorphology Assessment

This document provides additional information relating to the construction of a Micro Hydro Scheme on the Nant Lluest, Treherbert, Rhondda Cynon Taff.

TGVHydro

TGVHydro are a not-for-profit Social Enterprise. The Green Valleys Community Interest Company, a community-owned social enterprise that helps communities across Wales reduce their carbon emissions, solely owns TGVHydro Ltd.

TGVHydro Ltd

CRiC
Beaufort Street
Crickhowell,
Powys
NP8 1BN

Tel: 07969 137719
Email: info@tgvhydro.co.uk

Non-technical Summary:

This small-scale hydropower scheme, with a depleted reach of 440m, proposes an intake structure of up to 133mm in height (to base of HOF notch, 200mm height to weir crest) above the existing level to enable the structures to operate in accordance with the published hydropower good practice guidelines. The watercourse is dominated by exposed bedrock shelves within the upper section of the depleted reach, bedrock continues within the lower section of the depleted reach where it becomes overlaid with a mixture of cobble sizes. The depleted reach contains a series of natural falls throughout reach ranging from 0.5m – 3+m. The gradient of the depleted reach is approximately 14.3% and has resulted in very limited opportunities for natural in stream sedimentation or vegetation.

TGVHydro propose to install an intake for a micro hydro scheme within an easily accessibly section of the watercourse, within close proximity to an existing access. From the intake the scheme proposes to run a pipe for approximately 500m, on the nearby track east of the watercourse for the entirety of the pipe line route to the turbine house. (See Figure 1, additional site plans have also been submitted as part of the supplementary information for this hydropower application).

The stream progresses south and is flanked by mature and semi-mature trees throughout the depleted reach. With sections of the middle reach being incised with steep gullies and well sheltered by the surrounding vegetation making this section of the watercourse generally inaccessible. This proposal seeks a peak abstraction of 70.0 l/s and is proposing a HOF of Q95 (9.0 l/s) and abstraction of 70% of the flows above HOF (a 70/30 split).

We have followed NRWs guidance notes for geomorphology micro hydropower assessments, Stage 1. We have to point out however that some of the requirements for photographs have not been able to be completed due to direct stream access being too unsafe due to the incised nature of the terrain or the downstream locations beyond our permitted access. We have done as much as is reasonably possible given the site constraints.

Location of Images and Figures

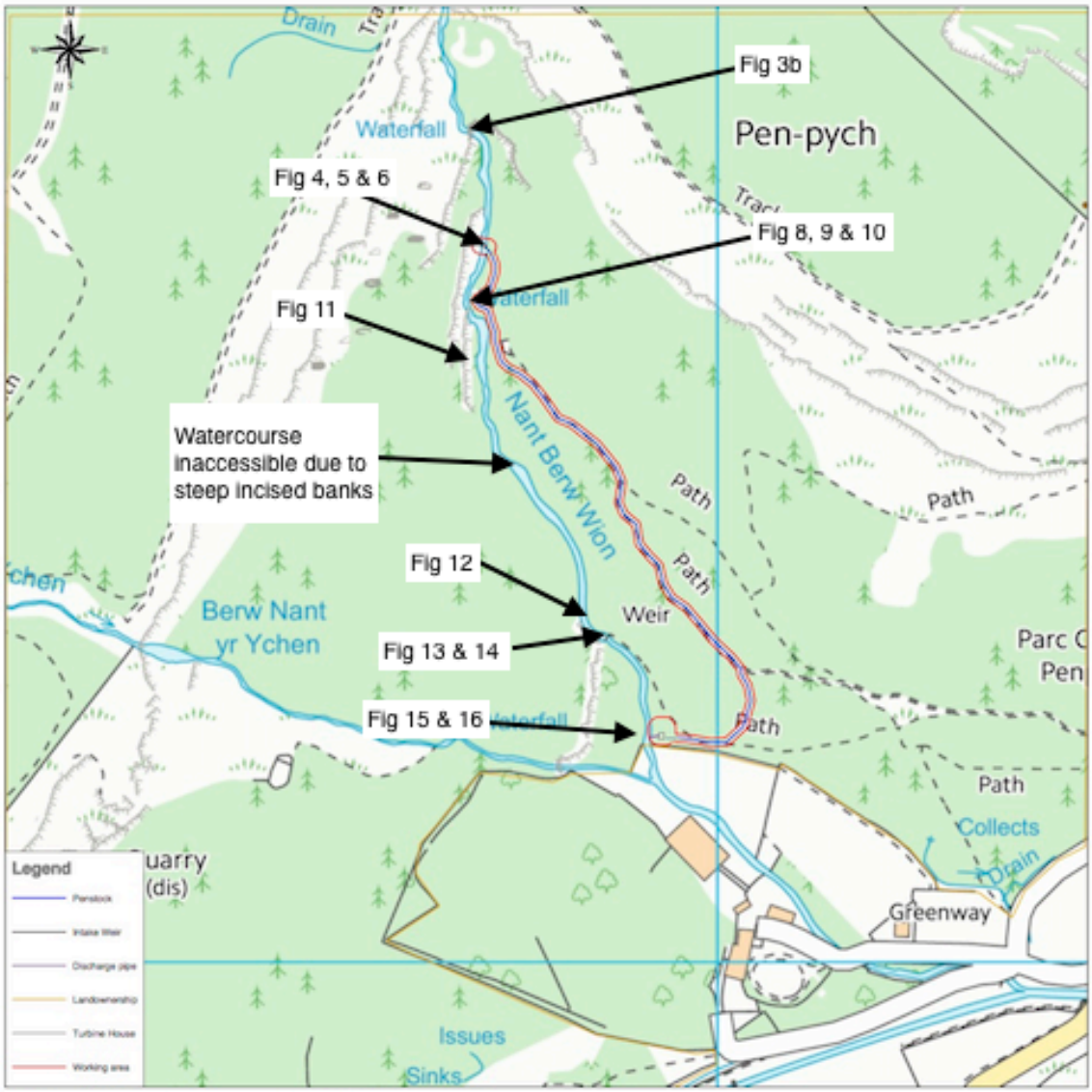

Figure 1: Nant Lluest- Location plan of all referenced images and photos (NTS)

Overview of Site Geology

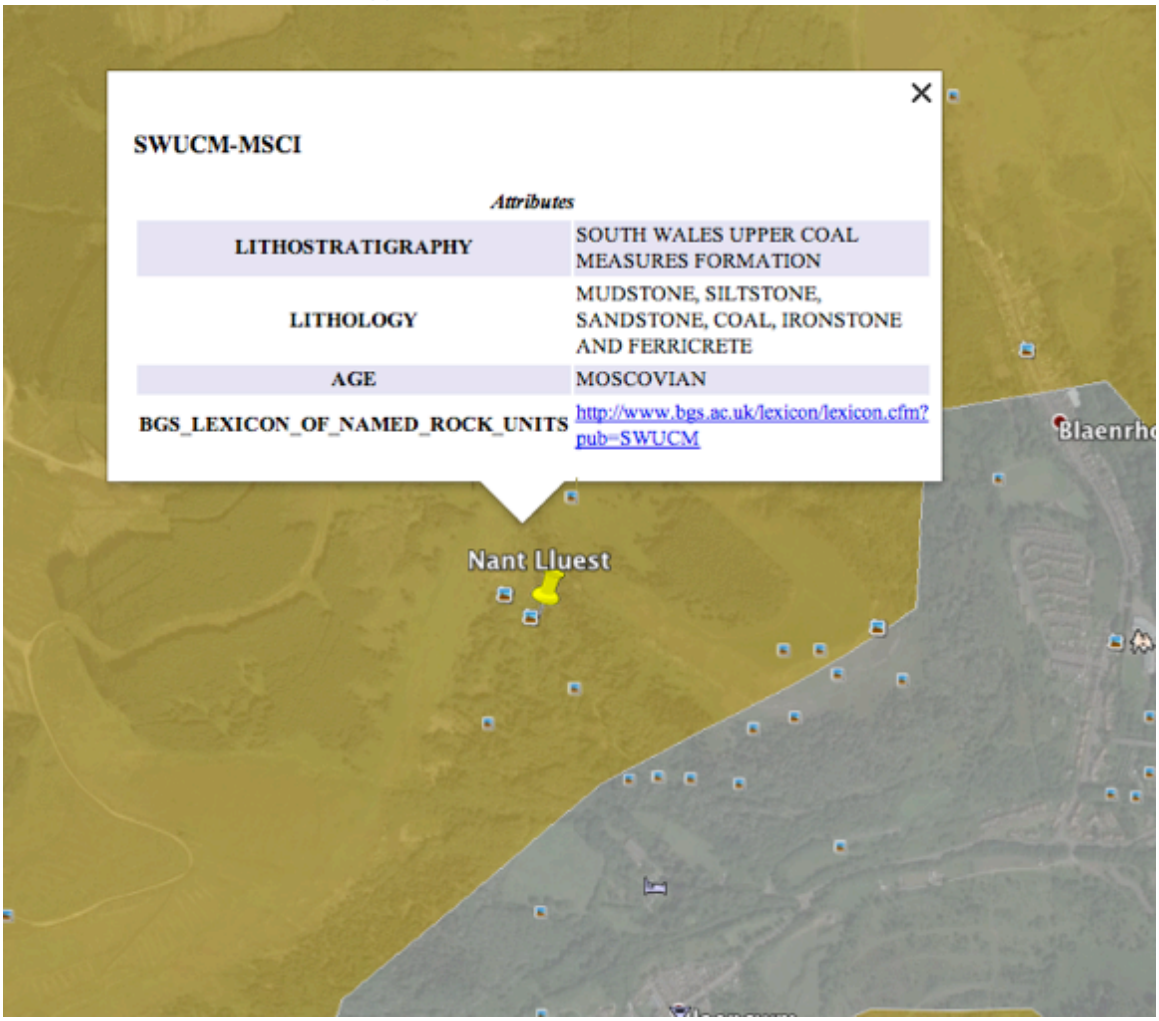

Figure 2: Bedrock geology of the area around the watercourse of Nant Lluest. Proposed Intake Location marked.

The underlying solid bedrock geology is mostly sandstone formations; the immediate stream valley supports a dominance of exposed bedrock.

Scheme Vital Statistics

Length of depleted reach: 440m

Scheme head:	62m (from intake to discharge – not mechanical head)	
NGR:	Intake:	SS 91833 99536
	Discharge:	SS 91950 99165
Gradient:	14.3%	
Head line flow:	75.0 l/s (Qmean)	
Output:	32.9 kW (peak power)	

Height of Intake (existing): 363.000m AOD
Height of Intake Weir Crest (proposed): 363.200m AOD
Height of proposed Discharge: 301.000m AOD

Site Photographs

Catchment area and upstream of Intake

***Fig 3a**: Showing the aerial view of intake and section of catchment area.*

***Fig 3b**: View of section of catchment area upstream of intake, looking towards signification fall and open access land flanked with forestry.*

Intake Location

Fig 4, 5 (u/s) & 6 (d/s): *Intake location, 3.2m wide channel, watercourse is dominated by bedrock, both banks are well vegetated promoting a stable environment (SS 91833 99536).*

Fig 7 (u/s): *Photo illustration of the scale of the impoundment works at the intake location (SS 91833 99536).*

Fig 8, 9 (u/s) & 10 (d/s): *Intake location, 3m wide channel, watercourse is dominated by bedrock, both banks are well vegetated promoting a stable environment (SS 91825 99495).*

Fig 11 (d/s): *Stream bed is still dominated by bedrock, due to the incised nature of the terrain within this locality (which extended for the majority of the middle reach) it was not possible to obtain photos of the stream bed. The steep incised watercourse banks are both well vegetated promoting a stable environment (SS 91824 99439)*

Fig 12 (u/s): *Watercourse is dominated by bedrock, both banks are well vegetated promoting a stable environment (SS 91909 99267)*

Fig 13 (u/s) & 14 (d/s): *Watercourse at historical weir location, the bed is dominated by bedrock shelves overlaid with smaller cobbles in section of this locality (SS 91918 99252)*

Fig 15 (u/s) & 16 (d/s): *Discharge location: Streambed of mixed cobble sizes (SS 91955 99150)*

Intake Details and Sediment Retention

The proposed Intake structure for the scheme on watercourse is to be cast from concrete. The highest point of the intake will rise above the existing bedrock by 200mm (intake structure of up to 133mm in height (to base of HOF notch, 200mm height to weir crest)). We anticipate that this small increase in height will have a small impact on this immediate area of watercourse (3.2m wide) in terms of sediment transfer through this watercourse. However, due to the presence of the HOF notch extending 67mm below the weir crest this leaves the potential for sediment retention to peak at approximately 89 litres in volume (0.089m3). We do not believe that this potential for sediment entrainment over long periods would occur as higher periods of flow will likely flush this out, as evidenced by similar falls within the depleted reach.

Significance of Impact

We believe that the small-scale weir will not cause any significant impact. However, we have proposed an intake design of minimal possible height and width to reduce both the scale of the impoundment and the potential to cause impact. The streambed stratum at the point of abstraction is exposed bedrock.

Retention of Sediment

The intake requires the creation of a small impoundment in order to function properly. Over a period of years there is therefore the potential for up to 0.089m^3 of sediment to be retained (this is a theoretical maximum although the HOF notch would not enable this quantity to ever be retained). At HOF notch crest level the total possible retention of water or sediment is calculated as 0.044 m^3 as the height of the impoundment is only required to allow the creation of a HOF notch. Taken in the context of the watercourses natural sedimentary processes and the downstream presence of large scale falls and bedrock exposures we do not believe that the retention of sediment would have any measurable impact on the wider watercourse status as measured by the WFD and any long term impact would not be possible to measure or quantify.

Impact of Flow Regime on Erosion and Deposition

The hydro scheme will affect the levels of water flow throughout the depleted reach. The HOF of Q95 and maximum abstraction of 75.0 l/s (Qmean) alongside a 70/30% split will result in zero difference in naturally occurring low flows and a

limited change to higher flows. It is accepted that sedimentology deposition generally occurs in low flows (which are unchanged by the proposals) and that sediment transfer occurs in the higher flows (which are not changed to any significant level) and we therefore conclude that the scheme will have no meaningful impact on erosion or deposition within the depleted reach, and consequently will have no measurable impact on the current status of the watercourse.

Discharge

A drain sump will be incorporated into the slab directly beneath the turbine unit. This sump will discharge the water passing through the turbine unit to the stream channel through 2 x 450 mm diameter plastic twin-wall Agripipe. The end of the pipe will be screened with a 10mm s/s mesh and the pipes will be surrounded by a combination of loose stones and boulders fixed into a concrete slab. The pipe will stop short of the stream and discharge onto an existing bedrock shelf that will dissipate energy as it enters the watercourse.

Construction

All efforts will be undertaken to minimise the potential impact on sedimentology during the construction phase.

Conclusion

A small-scale short-term impact may well occur as result of the small impoundment weir being built but will be limited through utilizing the proposed methodologies.

Although the watercourse has not been formally assessed in line with the WFD it is considered to potentially have a status of up to 'moderate'.

TGVHydro are confident that the potential status of the watercourse will not be significantly affected by the proposed hydro scheme.