

**RPS**

**MID WALES CONJOINED PUBLIC INQUIRY**

**ELECTRICITY ACT 1989  
(SECTIONS 36, 37, 62(3) & SCHEDULE 8),  
TOWN & COUNTRY PLANNING ACT 1990 (SECTION 90)**

**APPLICATION BY FFERM WYNT LLAITHDDU CYF  
AT LLAITHDDU, COUNTY OF POWYS**

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**Note on Hydrology**

**A reply to Dr Harvey J E Rodda's concerns**

**Neil Bagley**

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# 1 Introduction

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- 1.1 My name is Neil Bagley. I am a Technical Director RPS Health Safety and Environment with over 16 years of experience in the water environment field having worked both as a regulator and consultant. I hold a first degree in Geography (B.Sc – Sheffield) and masters degree in Water Resources Technology and Management (M.Sc (Eng).- Birmingham).
- 1.2 Prior to joining RPS I worked for the Environment Agency in the Water Resources team involved with licencing of groundwater abstraction licences and groundwater quality issues including review of planning applications and recommending conditions. From the Environment Agency I moved to CL Associates and then Weeks (becoming Bureau Veritas) where I worked on a range of projects within the water environment field including production of surface water management plans, EIA management (airport and road related projects) and risk assessments.
- 1.3 Whilst at RPS I have been involved with a broad range of EIA projects and have specialised in the Flood Risk and Water Quality aspects of these projects. In this time I have developed a flood risk screening tool used by Landmark Information Group and managed numerous flood risk assessment/Flood Consequences assessment projects for sites in high risk areas to low risk areas. EIA projects where I have managed the Water Resource/Quality and Flood Risk chapters have included a number of large energy related schemes including wind farms.
- 1.4 I currently run a team of environmental consultants, hydrologists and hydrodynamic modellers providing advice/input into strategic level flood modelling projects and development/energy related projects across England and Wales.
- 1.5 I prepared the Supplementary Environmental Information (SEI) and Water Quality Management Plan (WQMP) reports submitted in June 2013.

## 2 Rebuttal

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### Background

- 2.1 Further to the submission of the SEI and WQMP the Alliance have submitted a Proof of Evidence. The proof relates solely to the hydrology content of Llaithddu Environmental Impact Assessment and SEI. Further to the submission of the Alliance Proof of Evidence authored by Dr Harvey J E Rodda PhD MCIWEM regarding Hydrology we provide the following rebuttal statement.
- 2.2 The Alliance Proof is presented as a critique of the Llaithddu assessment rather than providing additional evidence. Two main features are noted, firstly that a number of comments relate to the quality of data presentation rather than the accuracy of the data itself and secondly the Proof identifies where further details would be required at the design stage to ensure the suggested mitigation techniques would be effective rather than noting that such techniques are not considered appropriate.
- 2.3 Furthermore it is noted that a Statement of Common Ground (SOCG) has been agreed with Natural Resources Wales (NRW). This document provides a platform to develop the additional measures that Dr Rodda's Proof appears to relate to. The document states that:
- As set out in CCWs letter dated 7 September 2012 that it should be possible to conclude the project will have no adverse effect on the integrity of the site and SAC if suitable conditions are attached to the project to ensure that the necessary measures are in place to avoid adverse effects on the integrity of the SAC.
  - Appendix 1 contains a conditions relating to the submission and agreement of Water Quality Management and Monitoring, a Construction Method Statement and Construction Environmental Management Plan.
  - It is agreed that the imposition of these conditions will ensure that sufficient measures are in place to monitor and safeguard the water quality in the River Wye catchment during construction.

### Responses

- 2.4 The Proof of Dr Rodda is split into three main sections:
- Baseline Conditions;
  - Potential Impacts; and
  - Mitigation Measures.

The key points raised in each of these sections are presented below and a response provided.

## Baseline Conditions

*i) The catchment and sub catchments draining the study area are poorly mapped, maps should include the main catchment boundaries of the wider area, sub-catchment boundaries for streams originating from the study area, the detailed topography, and flow pathways to identify the drainage network not mapped on the 1:25,000 OS maps;*

- 2.5 The key watercourses have been presented in the RPS documentation. The absence of graphical representation of the smaller un-mapped tributaries is not considered to be detrimental to the assessment as the impact and influence of these smaller tributaries and (other flow routes such as overland flow) is taken into account throughout the assessment.

*ii) Mapped information on soils and geology is also lacking, which could be presented together with the catchment boundaries;*

- 2.6 The EIA provided information on both underlying soils and geology soils. Absence of graphical representation of this information is not considered to be detrimental to the assessment undertaken.

*iii) The description of the hydrological regime is lacking and the descriptions of seasonal rainfall patterns are incorrect. Data should be presented on characteristic rainfall, runoff, and flows;*

- 2.7 Tabular presentation of precise flow data or rainfall data is not considered necessary to provide a robust assessment. The magnitude of likely changes in run-off is well demonstrated by the limited extent of land which is physically altered by the proposed scheme as presented in the SEI. Detailed rainfall data, including extreme events has been used within the run-off assessments made using the WinDes software. This allows the details referenced in Dr Rodda proof to be included within the assessment.

*iv) Water quality information for rivers needs to be explained, more detail is required on existing pollution sources, ground water quality information is missing;*

- 2.8 Current potential sources of contamination on the site are considered to be related to forestry and agricultural activity typical of such rural upland areas. Groundwater quality and surface water quality is typically obtained from the Environment Agency (now Natural Resources Wales) for such assessments. The most current NRW data was presented in the SEI. The collection of accurate site specific baseline data has been proposed as part of the water quality management plan.

*v) The hydrological impacts of peat are not fully explained in terms of water storage and potential water quality issues;*

- 2.9 Whilst it is acknowledge that peat can play a significant role in upland hydrology both in terms of water storage and quality the development layout has been developed through significant consultation with CCW (now NRW) to ensure micro-siting of

turbine locations minimises peat disruption. The volume of peat noted (20,000m<sup>3</sup>) is located across the site, it is also identified to be thin (typically no more than 0.1 m) where removed and its loss is considered to have a negligible impact on flood flows.

*vi) The risk of flooding at the site is not properly explained, no reference is made to historical events, predicted extreme rainfalls, or the characteristics of flooding;*

- 2.10 The risk of flooding on the site is limited by both the small size of watercourse and the relatively steep /upland nature of topography. The level of detail is therefore considered commensurate with the associated risk. The level of description is also considered to be commensurate with the requirements of Technical Advice Note 15: Development and Flood Risk (TAN15) for a site located outside Flood Zone A (Considered to be at little or no risk of fluvial flooding). The risk of flooding which could, without mitigation, increase the risk off site is addressed through the surface water management aspects, as per standard flood consequences assessment practise.

*vii) The reason for the quoted value for limiting surface runoff (10 l/s/ha) need to be explained, since this is very low even under natural conditions given the high rainfall, impermeable geology and steep topography of the site.*

- 2.11 It is acknowledged that natural (or greenfield) run-off rates would be considerably in excess of 10 l/s/ha for most storm events. NRW (formerly the Environment Agency) typically stipulate a post development rate which they would like site drainage to be restricted to. In this case they have stipulated 10l/s/ha. Dr Rodda's proof correctly state that this would require significant attenuation to achieve this rate. Significant attenuation is proposed in the Water Quality Management Plan and as such the development may actually contribute to a marginal reduction in down stream flood risk during more extreme flood events.

*viii) Overall more use should be made of maps, photos and diagrams to help explain the existing conditions.*

- 2.12 The style of presentation is often a personal/company preference.

### Potential Impacts

*i) The overall impact of the construction and operation of the development has not been assessed in terms of the changes to the hydrology of the area;*

- 2.13 The changes in run-off characteristics has been assessed within the submitted documentation and appropriate mitigation proposed where potential adverse impacts identified. It is also noteworthy that features noted to be of concern in the Proof, such as borrow pits are identified as already being present (Figure 5) on the site with no apparent concern about existing impacts.

*ii) Use should be made of hydrological modelling to consider the impact of both extreme events and effects over longer durations;*

- 2.14 WinDes modelling has been used to assess the rainfall run-off environment. This uses detailed rainfall data and assesses a range of storm durations and intensities to ensure the worst case (critical storm) in terms of run-off is assessed. This process ensures that a statistically relevant rainfall data set is used. WinDes is industry standard software and is considered to provide a robust approach to addressing changes in run-off characteristics. This modelling approach also considers the impact of climate change in terms of increasing rainfall rates within the modelling process.

*iii) Modelling will predict the flows and volumes of water and to consider the impact of key pollutants such as eroded sediment;*

- 2.15 The WinDes modelling process has allowed run-off volumes to be predicted and suitable attenuation measures to be proposed. As part of the detailed design of these systems standard design guides such as CIRIA SUDS documentation will be used to ensure that sediment is suitable controlled. The use of appropriate conditions to regulate such control has been accepted by NRW.

*iv) The location of components of the new development such as roads and buried cables in relation to the natural flow pathways should be considered;*

- 2.16 Small local changes inflow routes can be anticipated as part of any such scheme and appropriate mitigation is proposed. No particularly sensitive hydrological features have been identified on site so such impacts are not considered to be significant. The overall impact of the development (with particular reference to the downstream SSSI and River Wye SPA) are assessed in sufficient detail and mitigation would be provided as per the SOCG with CCW.

*v) There is no assessment of the specific impacts on the aquatic ecosystem;*

- 2.17 Any impacts to the aquatic ecosystem would be principally be driven by changes in water quality. Mitigation has been proposed to address water quality concerns.

*vi) There are no assessments on of the impact of the development on low flows.*

- 2.18 The loss of the peat resources is identified as a potential cause of low flows by Dr Rodda. The volume of peat loss is considered to be low and where removal is proposed tends to be present in a thin layer. In the context of the site and wider catchment this is not considered to be significant in terms of loss of base flow ie water that provide the majority of flow during drier spells. The attenuation systems proposed are also more likely to encourage percolation of water to ground and as such would contribute to maintaining base flow.

#### Mitigation Measures

*i) There is no discussion on the use of mitigation measures to reduce the impact of increased flows during storm events;*

2.19 This issue is addressed in the Water Quality Management Plan. As noted above it is anticipated that run-off from the development would be restricted to 10 l/s/ha which would be a significant reduction from pre development peak storm run-off rates and will as such provide a contribution to a reduction in local flood risk.

*ii) Reference to standard guidelines is mentioned but no specific details are given;*

2.20 Appropriate documents including CIRIA guidance will be referenced during the design process. The CIRIA SUDS Manual (C697) would form the main reference document. CIRIA have also announced a proposed update to this document (RP992). Should this update be available this would form the main reference document.

*iii) Baseline water quality monitoring requires a longer period than just 2 months in order to ensure natural seasonal variations are identified;*

2.21 Details of the monitoring programme have not yet been agreed with NRW.

*iv) A description of the potential contamination sources and pollutant concentrations for the water quality monitoring is required;*

2.22 Details of the monitoring programme have not been agreed with NRW. The exact schedule of analysis would be agreed at that time. The schedule of analysis would be based on providing a robust background data set along with being able to identify contamination associated with the wind farm.

*v) The use of swales to attenuate surface runoff and erosion from access roads is put forward but without knowledge of the design requirements;*

2.23 The monitoring plan is intended to provide concepts only. The delivery team/contractor would be responsible for detailed design of the mitigation measures through consultation with NRW. It is unlikely that swales would be required along the full length of the access tracks and the designs of final mitigation measures would draw on more detailed information noted by Dr Rodda.

*vi) Plans showing the locations of swales are not provided;*

2.24 The monitoring plan is intended to provide concepts only. The delivery team/contractor would be responsible for detailed design of the mitigation measures.

*vii) Detailed plans and descriptions of attenuation basins should be provided;*

2.25 The monitoring plan is intended to provide concepts only. The delivery team/contractor would be responsible for detailed design of the mitigation measures.

*viii) Calculation of swale storage volumes requires further explanation;*



- 2.26 The information presented regarding swales is not intended to be design drawings. The delivery team/contractor would be responsible for detailed design of the mitigation measures. The total storage volume is intended to provide sufficient attenuation to reduce maximum run-off rates to 10 l/s/ha as per NRW requirements.

*ix) Simulation of the attenuation features using drainage modelling software is not explained;*

- 2.27 WinDes is industry standard drainage and SUDS design software. The drainage model has calculated a provisional estimate of the required attenuation volumes. Detailed design (and hence simulations) would be undertaken by the delivery team in consultation with NRW.

*x) The simulations do not use the recommended rainfall increase to account for the uncertainties due to climate change.*

- 2.28 The WinDes calculations used 20% climate change allowance. The level of climate change allowance for rainfall is not specified in Technical Advice Note 15: Development and Flood Risk. Specific climate change allowance is identified in the NPPF Technical Guidance (English equivalent guidance). This is based on the anticipated lifespan of the development and the 20% used above is in accordance with these requirements.

### 3 Conclusions

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- 3.1 The Proof of Dr Harvey Rodda has provided a critique of the hydrology related documentation provided for the Llaithddu site. No comments have been made regarding the other sites subject to Public Inquiry.
- 3.2 A number of the observations made in the proof relate to presentational matters which are not considered to have an impact on the suitability of the assessment provided, the conclusions made or the mitigation measures proposed.
- 3.3 The proof provides a number of suggestions as to where additional information would be required to support the detailed design of the proposed mitigation measures. It is anticipated that CCW would recommend conditions to ensure such action are taken. NRW have also signed a SOCG agreeing that this approach is suitable.
- 3.4 The Proof provides no additional evidence to suggest that the proposed wind farm would have a significant impact on the hydrological environment.