Nant Mithil Energy Park, Powys.
PEDW DNS Application Ref: DNS CAS-01907-D7Q6Z1.

CPRW-ReThink Chapter 8 on

Hydrology & Flood Risk

Water Resource Associates

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Nant Mithil Windfarm, Powys: Review of Application Documents Relating to Hydrology and Flood Risk.

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February 2026
Technical Note Relating to Application Documents

Background

Water Resource Associates (WRA) was engaged by the Campaign for the Protection of Rural Wales to review documents associated with the planning application for the proposed windfarm development at Nant Mithil, near Builth Wells, Powys. This technical note includes a review of the documents submitted as part of the application which relate to hydrology and flood risk, with particular emphasis on the potential impacts on the River Wye Special Area of Conservation (SAC) which is in close proximity to the development site.

Documents Reviewed

The documents reviewed for this current study were downloaded from the PEDW website. These are listed below with the filename shown in brackets and a summary of the contents. Throughout this current report the documents are referred to by their number and title, rather than the filename. The review did not represent all of the environmental documents submitted with the application but focussed on those which were pertinent to hydrology. These documents are all submitted as part of the Final Application.

1. Environmental Statement Non-Technical Summary by Land Use Consultants, dated November 2024 (*2024-12-20 - ES - Environmental Statement - Non-Technical Summary copy.pdf*). 57 pages.

2. Environmental Statement Chapter 11 Hydrology, Hydrogeology, and Geology (including peat) by Land Use Consultants, dated November 2024 (*2025-03-07 - ES Vol 01 - Written Statement.pdf*). 142 pages plus 9 figures.

3. Flood Consequence Assessment by Aqua Terra Consulting dated November 2024 (*2024-12-20 - ES Vol 03 - Appendix 11.01 - Flood Consequence Assessment.pdf*). 31 pages..

4. Outline Drainage Strategy by Aqua Terra Consulting dated November 2024. (*2024-12-20 - ES Vol 03 - Appendix 11.02 - Outline Drainage Strategy. pdf*) 47 pages.

5. Geological and Ground Conditions Desk Study by Aqua Terra Consulting dated November 2024. (*2024-12-20 - ES Vol 03 - Appendix 11.03 - Geological and Ground Conditions Desk Study_A.pdf*). 153 pages.

6. Geological and Ground Conditions Desk Study by Aqua Terra Consulting dated November 2024. (*2024-12-20 - ES Vol 03 - Appendix 11.03 - Geological and Ground Conditions Desk Study_B.pdf*). 87 pages.

7. Water Resources Assessment by Aqua Terra Consulting dated November 2024. (*2024-12-20 - ES Vol 03 - Appendix 11.05 - Water Resources Assessment.pdf*). 58 pages.

8. Water Framework Directive Assessment Aqua Terra Consulting dated November 2024. (*2024-12-20 - ES Vol 03 - Appendix 11.08 - Water Framework Directive Assessment.pdf*). 38 pages.

9. Outline Soil Management Plan by Aqua Terra Consulting dated November 2024. (*2024-12-20 - ES Vol 03 - Appendix 11.04 - Outline Soil Management Plan.pdf*). 45 pages.

10. Preliminary Slope Stability Assessment Aqua Terra Consulting dated November 2024. (*2024-12-20 - ES Vol 03 - Appendix 11.06 - Preliminary Slope Stability Assessment.pdf*). 33 pages.

The first two documents being the Environmental Statement (ES) were included to ensure the treatment of hydrology was given appropriate attention within the application. The figures associated with document 2 were the following:

Figure 11.1: Study area
Figure 11.2: Flood risk zones
Figure 11.3: Water features
Figure 11.4: Groundwater dependent terrestrial ecosystems
Figure 11.5: Private water supplies
Figure 11.6: Published geology – Superficial Geology
Figure 11.7: Published geology – Bedrock Geology
Figure 11.8: Long undisturbed soil
Figure 11.9: UXO risk zones

Documents 3 to 10 were all listed as appendices in the ES where specific details relating to hydrology were included. The ES also referred to an unexploded ordinance report which was not part of the review as it was deemed not relevant to hydrology and outside of the area of expertise. Documents 5 and 6 the Geological and Ground Conditions Desk Study were from the same report but split into two files presumably to make downloading easier. The reason why this document is considerably longer than others with a total number of pages at 240, is because it includes an Envirocheck report. This is an environmental data service which consultants often use as a desk-based screening study. A few companies offer this service whereby a search radius around the site centroid is interrogated for a full range of environmental information from published sources such

as the Ordnance Survey, British Geological Survey and Natural Resources Wales. Much of the information is in the public domain and freely available, the data service provides a convenient platform for pulling all the data together and providing a consistent format for reporting.

Environmental Statement Summary and Introduction

Given the large volume of material, the review of the application documents listed concentrated on information relating to hydrology and flood risk. Overall, the text in all documents is well written as a report and not formatted as an abbreviated bullet point style with every sentence numbered. This way, a more thorough narrative is provided giving more confidence in the findings. Also, much of the reported information recommended further detailed studies however such studies should have been already undertaken as part of a Final Application.

Document 1(The ES summary) provides background information on the development in relation to planning policy, justification for the development and identifies the key environmental concerns. In terms of the hydrology this is included as a design criteria:

"Protecting the Site's hydrological regime, including peatland hydrology, and the interaction of this with the hydrological regime of the Site's surroundings, with particular focus on the site setting, within the catchments of the River Wye/Afon Gwy SAC;"

Further on in Document 1, a separate section is included on the hydrology, hydrogeology and geology. This summarises the work which has been undertaken at the site to provide an understanding of the existing (baseline) conditions and the impacts associated with the proposed development in terms of the both the construction and operation. The general requirement is that the development including the turbines, borrow pits, sub-stations and temporary compounds will be 50m from any watercourses and 250m away from private water supplies. Other components such as the access tracks and cabling will be unable to meet this requirement and the documents states there will be eight watercourse crossings to accommodate these.

Document 2, Chapter 11 of the ES, is based on the scoping of potential impacts the development may have on the hydrology, hydrogeology and geology following the policy and legislative guidelines for the development and includes a table showing the issues raised by statutory consultees relating to hydrology, and the responses or action to be taken. Many of the responses refer to the contents of other documents numbers 3 to 10 where the issues are addressed.

The document then provides some background to the study area although this is only a small section and it refers to the maps presented in the Figures listed above. There is no map showing the location of the site in relation the River Wye catchment and Special Area of Conservation (SAC) as shown in Figure 1 of this report. The section has series of scoping exercises looking at

the impacts of construction and operational activities on a range of receptors and identifying what mitigation actions should be implemented. It also includes the potential impacts on particular features which are also included in a series of tables.

The work undertaken here is generally thorough – however, the document would benefit from having maps showing the location of the proposed site in relation to the River Wye catchment, the SAC and SSSIs. This is shown in Figure 1 which highlights the extensive areas covered by the River Wye SAC.

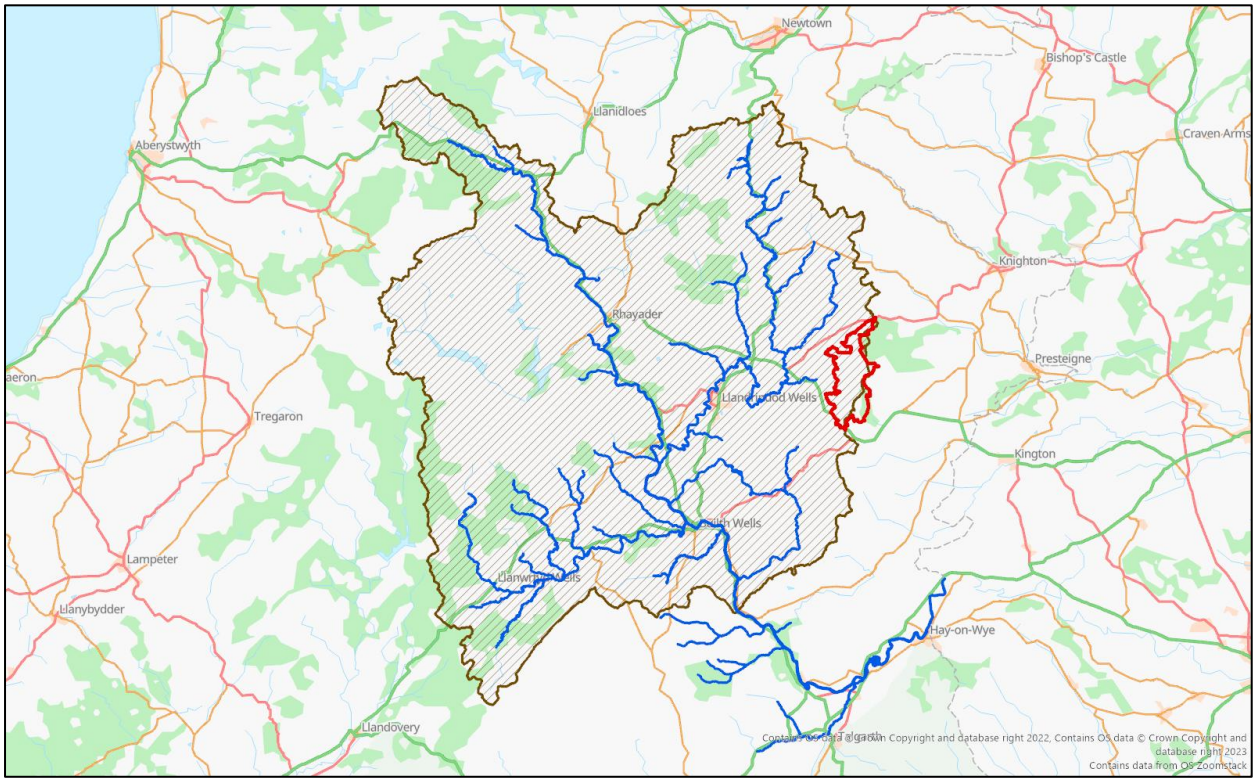

Figure 1. The River Wye catchment at Erwood shaded in brown with the River Wye SAC in blue and the development site outlined in red (Background Map OS GB Cartographic Scale 1:300,000).

There is no map showing the extent of the buffers as stipulated from document 1. Using the information provided on the site layout, mapped locations of watercourses from OS data and information obtained giving the locations of water supplies from document 8, a new map was generated for this report which depicts the components of the development and the buffers in Figure 2. The location of turbine 24 is not meeting the imposed buffer distance as this falls within the 250m buffer for water sources. Likewise the sub-station extent, buried cable and access tracks near turbines 1 and 6 also encroach within a water source buffers. These water sources are identified as high risk in Figure 11.5. Document 2 also notes the presence of The Mithil Brook and Cwm Blithus Site of Special Scientific Interest (SSSI) within the development site. This designation is based on the geological character of the site, and the document has identified how the activities should be undertaken to maintain a good exposure of the features. The SSSI is shown

in Figure 3 taken in February 2025 during fieldwork at the site. The maps included in Figures 11,1-11.9 would benefit by having the location of the SSSI clearly marked.

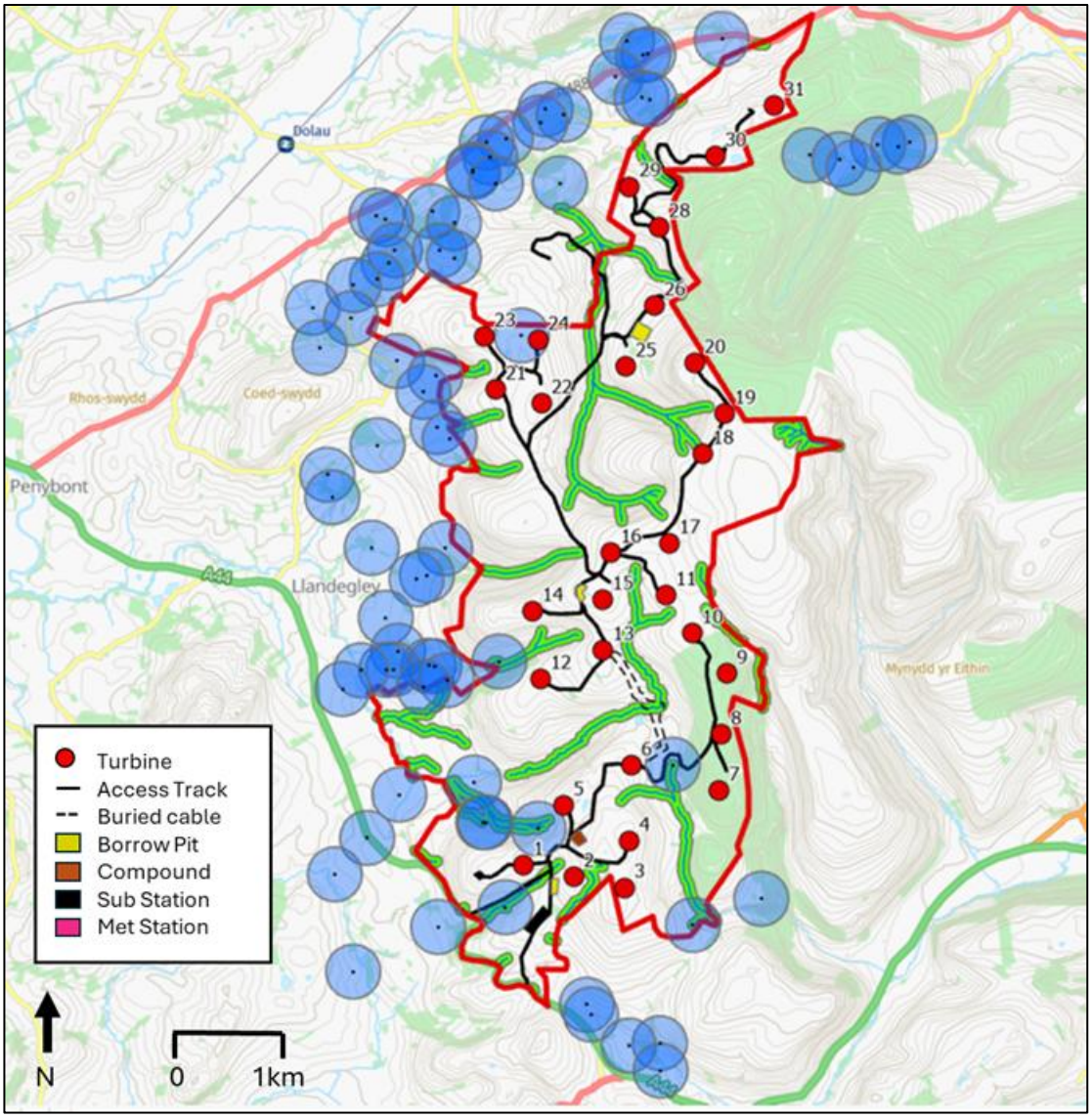

Figure 2. 50 m watercourse buffers shown in green and 250m PWS buffers shown in blue in relation to the proposed development site (red outline) and turbine locations.

Figure 3. The Mithil Brook and Cwm Blithus SSSI.

Comments on Other Application Documents

Documents 3 to 9 covered particular aspects in more detail. Often these recommended further work to be undertaken to accompany the design process such as infiltration testing, channel surveys and water quality monitory. However such work should have already been undertaken and the results included in these Final Application documents. The documents all have a similar introduction section giving background details on the site location and the nature of the proposed development. Some have more detail including photos of the site. The following points are raised to highlight areas of concern.

Flood Consequence Assessment

Document 3, the Flood consequence assessment, describes part of the site being within the Radnor Forest SSSI, but it does not mention the Mithil Brook and Cwm Blithus SSSI which was raised in Chapter 11 of the ES. The document would benefit from having both of these areas marked on the figures, and there should be consistency as to how the SSSI's are described in this document and the ES Chapter.

Information is missing on the background hydrology. There is a written description of the watercourses and a map of these around the development site, but there are no maps showing the local catchment areas. The area to the east of the development site marginally falls outside of the

Wye Catchment at Erwood, and the text in Document 3 describes some of the site draining to the River Lugg to the north and east.

The information presented on historical flooding in Document 3 is lacking and is dismissed simply that according to NRW data the site has not experienced any historical flooding. This is a very misleading statement given that there are numerous watercourses across the site and as with any natural watercourse there would be times when the flows are severe and flood conditions are experienced. At the very least, the consultants could have shown the historical record from the River Wye, gauged at Erwood just 4km south of the development area, as shown in Figure 4. During times when the River Wye is in flood it is likely that the headwater streams within the development site would also have been affected. Other sources of information would be to consult the British Hydrological Society chronology of hydrological events database and the British Rainfall Digital Archive.

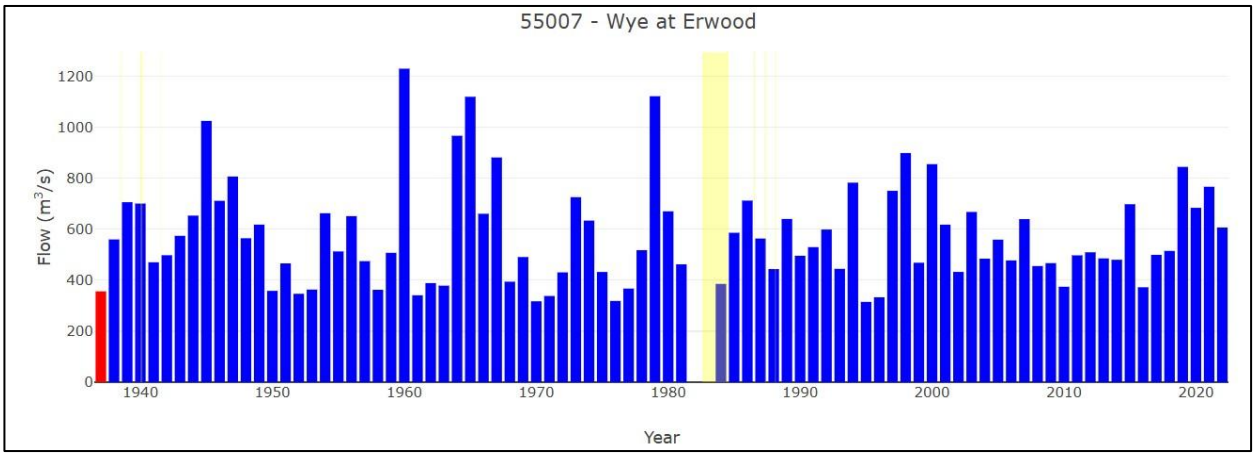

Figure 4. Annual maximum flows on the River Wye at Erwood from the National River Flow Archive.

Overall Document 3 classifies the flood risk from all sources as low for the proposed development, however it is noted that parts of the development close to the existing watercourses, namely the water course crossings, will be at risk. The document includes the following text *"Where watercourse crossings are required (e.g. for access tracks) these should be appropriately designed for all storm durations and intensities so as not to increase flood risk on and off Site."* and identifies that this aspect is dealt with in Document 4, the Outline Drainage Strategy.

Outline Drainage Strategy

Document 4 considers the drainage strategy and design for the new tracks, watercourse crossings, substation and turbine platforms, but nothing is mentioned for the construction compound. Overall few details are given relating to the drainage design. The text only states that interceptor drains will be used for managing the surface water from the turbine substation hardstanding, infiltration trenches will be used along the new access tracks, and a permeable crushed stone and gravel sub-

base will be used at the substation. These measures are however dependent on the infiltration capacity of the soil which will be confirmed from infiltration testing. It is important that the testing is undertaken during the winter period to ensure it represents saturated conditions. All of the designs should be supported by calculations to demonstrate the adequate storage capacity for the design rainfall.

The document used the correct approach for estimating the greenfield flows at the site with the ReFH2 software, although the report text states this was done for a 50ha plot and scaled down. There are no further details of the ReFH2 application in the document, and parameter files, locations of the delineated catchments, and the model output should be included for completeness, and to enable a local authority model review, as an appendix. It is common practice to also present the output from the ReFH2 software as a hydrograph for the greenfield (rural) and the developed site (urban) scenarios including an allowance for climate change. The required attenuation storage, to ensure the peak greenfield flow is not exceed under the developed site conditions can then be calculated.

A review of the model parameters is necessary as the surface runoff is particularly sensitive to the antecedent conditions at the site. From experience in dealing with numerous flooding incidents following storm Bert in November 2024, it was found that the flows in small streams were much greater than those predicted by the ReFH2 for the 100-year flood, despite the storm Bert rainfall being only around 10-year event. The reason for the flooding was due to the continued wet weather over the Autumn making the soils saturated and flows in streams already at a high level, and then the additional rainfall from storm Bert. A comparison of design rainfall with historical rainfalls observed near the site would be useful in terms of validation.

Tables 4.3 and 4.4 are confusing in that they give the design 100-year 6-hour duration rainfall and the associated greenfield and developed site runoff volume plus the volume for a climate change scenario. The climate change scenario should be based on an increase in 40% to the rainfall used in the ReFH2, hence the column for the runoff volume from climate change should not be from the current 100-year 6-hour duration rainfall.

The greenfield runoff and storage volume requirements are missing however for the new access tracks. Given that these will extend over many km (see Figure 2) they will produce a considerable amount of surface runoff. Access tracks are present in the current land use of the development site, and these will often act as a conduit for overland flow during wet conditions due to the compacted surface from vehicle transport (Figure 4). Excavating infiltration trenches either side of any new tracks may not be possible given the steepness of the terrain and space restrictions with other types of land use. A typical track formation figure is shown in the appendix (Figure 4.10), but this has the infiltration trench on the upslope side of the track so the majority of the track surface runoff would flow away from the trench. Drawings of indicative water crossing designs are also provided in Figure 4.11.

The gradient of the tracks is also something which should be given more attention in relation to the hydrology as with a steeper gradient there will be a fast flow of water and infiltration would be minimal. Figure 2 also shows the contours at 10m intervals on the background OS map. The route taken by the tracks in some places is very steep. For example, between turbines 22 and 25 the route goes across the gradient up some 80m of altitude in just 450m, an average of 17% as shown in Figure 5. With a fast flow of water along access tracks used by heavy machinery there will also be a considerable potential for erosion. Document 4 has stated that check dams would be put in place along the infiltration trenches although their design would need to be informed by estimates of sediment erosion from hydrological modelling. A programme of maintenance is included within Table 4.8 of the document. Although not related to hydrology there is the question whether they would actually be feasible for the heavy machinery required for the turbine installation.

Figure 5. An existing track/bridle way in the north of the development site close to the proposed location of turbine 29.

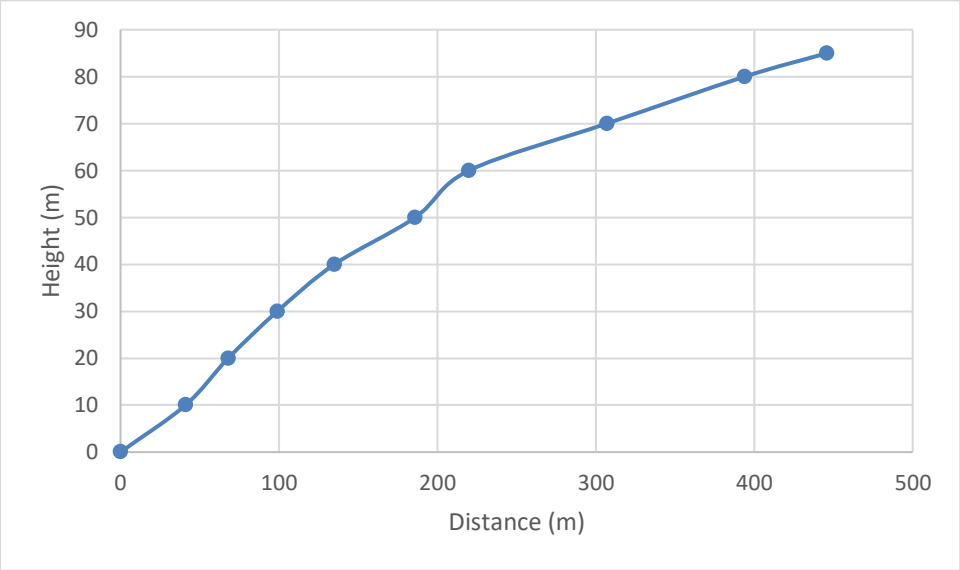

Figure 6. The change in height with distance for a steep section of the new access road between turbines 22 and 25.

There is very little detail on the actual designs due to the fact that the report submitted is only an outline drainage design, which is insufficient detail for a Final Application.

Geological and Ground Conditions Desk Study

The content of Documents 5 and 6 have already been noted in relation to the large number of pages taken up by the Envirocheck report. The only aspect relating to hydrology which has not been covered in Documents 3 and 4 is the information on the groundwater. Document 5 states that Natural Resources Wales and the BGS have classified the bedrock geology beneath the Site as a Secondary A aquifer, meaning "*permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers*". The vulnerability of the aquifer is given as high, hence the 250m buffer around the local water supplies which has been used for siting of the development features as shown in Figure 2.

Water Resources Assessment

Document 7, the Water Resources Assessment builds on the information given in the ES in relation to the impact of the development of the water resources of the site and surrounding area both in terms of the importance to the environment and as a source of water for human activities. This includes more detail on the locations of different water features such as mapped locations of springs and flushes around the site and considering the impact of the development on groundwater dependent terrestrial ecosystems.
The document includes lists of all the water sources, as used for the map in Figure 2, and for each of these the risk of the development and mitigation measures are given in tabulated form.

Water Framework Directive Assessment

Document 8 lists the water bodies which could be impacted and gives an assessment of their current status, in terms of ecology, chemistry, regimes and morphology which is mostly classified as good to high apart from the Mithil Brook which has a moderate status. A key is missing which would be useful to show the classification terms high, good, moderate, poor and bad. The document has some clearer maps showing the different catchment boundaries intersecting the development site and the river crossing locations. It would be desirable to have the same maps in other documents notably the ES chapter, flood consequences assessment and drainage strategy. Information from other sections is repeated, such as the table of water sources and the potential impact.

The document also summarises the Construction Environmental Management Plan which is included as an appendix to the ES with measures to control sediment erosion and transport from the site in the construction phase, proper storage for chemicals during construction, site worker accommodation and provision of sanitation, and the management and removal of waste materials. A scoping section is included which identifies potential impacts on the watercourses and mitigation measures to ensure the status is maintained.

The document does not include any programmes of monitoring to further identify the baseline conditions and to ensure that the status is being maintained during construction and the operational phases. This may be included in another document, but is something which is commensurate with such a large development in a sensitive environment so should be a prominent component of the applications documents.

Outline Soil Management Plan

Document 9 is slightly different in terms of the topic relating to soil rather than water. This document is a welcome and worthwhile addition as it acknowledges the problems associated with the development through the stripping and disruption of the soil. The key requirement which has already been noted in the ES is to avoid areas with more than 0.3m depth of peat. Estimates of the actual soil volumes to be stripped are given, guidelines are listed to minimise any deleterious impacts such as works avoiding periods of heavy rain or immediately following heavy rain, and information on how to store and handle the soil is provided. A table is included showing the erosion risk (Table 5-1), it is noted that the term run-off in this table applies to the physical process of surface runoff, not the quantity which is given in hydrology as part of the annual water balance. The appendix with information from Cranfield University provides useful information on the risks associated with iron pan podzols which are found over the development site.

Preliminary Slope Stability Assessment

Document 10 is a report of the landslide risk at the site including fieldwork to measure and monitor slope stability. This is only marginally relating to hydrology in terms of the impact which water may have on increasing the instability of slopes through lubrication and how active landslips may have affected the hydrology. For the second point the fieldwork noted how springs have formed along the toe of a historic landslip. Other consultants specialising in landslides would be required to give a full critical review of this section.

Summary

A review has been undertaken of the application documents for the Nant Mithil windfarm development which relate to hydrology. Overall, the applicant's consultants (LUC and Aqua Terra) have provided well written and thorough descriptions of the potential issues. However, throughout the 10 separate documents which have been reviewed there is a limited use of mapping to demonstrate the location of the development in relation to sensitive designated sites (e.g. The River Wye SAC and SSSIs) and some important maps are not used across many documents. There are some areas of concern as listed below:

1. Maps should be provided by the applicant's consultants showing the defined buffer zones around all vulnerable features (water courses, GWDTEs and PWS) in relation to all aspects of the development (turbines, access roads, sub-station, cabling, storage areas and borrow pits). It appears from our assessment that some of the development lies within the proposed buffers;
2. Information on historical flooding is missing.
3. Details of the hydrological modelling used to estimate the greenfield flow from the site should be presented.
4. More details and clearer thinking should be included in the outline drainage strategy in relation to access tracks. The example drawing of the infiltration trench alongside the access track has this on the upslope side which would be ineffective in dealing with the track surface runoff.
5. The impact of the topography and in particular how construction activities will be undertaken on steep slopes needs to be assessed.
6. There are currently no documents with details of water quality monitoring to identify baseline conditions and to monitor for any changes during construction and operation.

These areas of concern along with the more detailed studies which are recommended in the reviewed documents should have been included in the Final Application for examination. It is not appropriate to address these concerns as conditions after planning has been granted.