Bute Energy

Aberedw Energy Park

Appendix 9.7:

Outline Water Quality Monitoring Plan

AQUA TERRA | CONSULTING

Appendix 9.7: Aberedw Energy Park: Outline Drainage Strategy

P24039_R9
June 2025

Document Control

Title

Appendix 9.7: Aberedw Energy Park: Outline Drainage Strategy

Client

LUC
On behalf of
Aberedw Energy Park Ltd

Reference

P24039_R7

Status

Final

Registered in England and Wales with Company No. 15820480 at 14 Museum Place, 4th Floor, Cardiff, Wales, CF10 3BH

Table of Contents

List of Tables

List of Figures

List of Appendices

1. Introduction

1.1. Instruction

Aqua Terra Consultants Ltd (Aqua Terra) has been instructed by Land Use Consultants Ltd (LUC; the Client) on behalf of Aberedw Energy Park Limited (the Applicant) to provide an Outline Water Quality Monitoring Plan (oWQMP) for the proposed Aberedw Energy Park near Builth Wells (the Site). Instruction to proceed in accordance with the Aqua Terra Technical Work Scope was confirmed by LUC sub-consultant agreement 12522.

1.2. Background

LUC is working on behalf of Aberedw Energy Park Limited (the Applicant) to undertake an Environmental Impact Assessment (EIA) culminating in an Environmental Statement (ES) to be submitted in support of an application for the Proposed Development.

This report constitutes an outline Water Quality Monitoring Plan that has been prepared to detail the baseline conditions on-Site with respect to water quality. This document outlines monitoring strategies, assessments and parameters to support the EIA and ensure the protection and management of water resources throughout the development lifecycle.

1.3. Scope of the Report

This document provides a framework to ensure the assessment and protection of water features on Site, including consideration of the following features:

- Groundwater and aquifers;
- Surface water, including watercourses and waterbodies;
- Water abstractions, including Private Water Supplies (PWSs);
- Groundwater dependent terrestrial ecosystems (GWDTEs), including peat hydrology and;
- Springs, seeps and flushes.

It details the proposed water quality monitoring to be undertaken including the sampling areas/ locations, methodologies, frequency, laboratory analysis and assessments to be undertaken.

It is intended that this document be agreed with Natural Resources Wales (NRW) in their role as environmental regulator prior to the commencement of baseline monitoring. This enables the environmental monitoring to progress on an assured footing throughout the construction phase.

Aqua Terra have compiled separate technical appendices in parallel to this report, namely:

- Appendix 9.2 - A Water Resource Assessment, which provides a summary of baseline water resources present on the Site.
- Appendix 9.3 - A Flood Consequence Assessment, which provides a baseline for flood risk and assesses the potential impact of the Proposed Development on flooding.

- Appendix 9.4 - An Outline Drainage Strategy, which summarises the baseline drainage conditions and assesses the potential impact that the Proposed Development may have on drainage.
- Appendix 9.5 – A Water Framework Directive Assessment, which determines if the proposed works will affect the environmental objectives of the Water Framework Directive (WFD) and River Basin Management Plan (RBMP).

These reports together provide the baseline assessment in support of the ES, and hence should be read in conjunction with this report and one another.

1.4. Limitations

This report relies in part on data collated from publicly available datasets and data sources, and from data collected on the Site by third parties. Aqua Terra has deployed reasonable skill and care in the collation and assessment of these data and provides comment on such data where considered necessary. However, Aqua Terra takes no responsibility for the veracity or accuracy of data gathered from external sources.

2. Context

2.1. Policy

The publication of the updated Planning Policy Wales (PPW) in February 2024 represents the most recent update to planning policy with regards to the environmental impact of development. Specific reference is made within it on the importance of water, both in the role it plays sustaining human society and its importance in underpinning green infrastructure and nature-based solutions.

- Paragraph 6.6.5 requires that development "*ensure the protection of the quantity and quality of surface and ground water supplies is taken into account as part of development proposals*".
- Paragraph 6.6.6 places importance on the role of the planning system in protecting water features, requiring that "the multiple benefits of protecting river corridors should be maximised. The identification of managed wetland and riparian buffer zones to improve water quality should be a key output of green infrastructure assessments".
- Chapter 6 of PPW also has some significant policy wording with reference to the role of groundwater in contributing to the health of soils. The WG response to the Twyn Hywel DNS application links PPW policy on soil to hydrology, highlighting the importance of hydrological function in sustaining irreplaceable habitats such as peatland.

2.2. Guidance

NRW have adopted the Environment Agency's (EA) approach to protecting groundwater. This is set out in the "Groundwater protection: Groundwater protection guides covering: requirements, permissions, risk assessments and controls" webpage (Environment Agency and Defra, 2017). This guidance sets out policy and general requirements placed upon developers and landowners to protect groundwater, and the features (such as drinking water abstractions, PWSs, springs and ecosystems) that it supports.

The WFD, as enacted by the Water Environment (WFD) England and Wales Regulations 2017 sets specific targets that must be achieved for water quality. NRW set out their work to meet these targets at the "Improving water quality" webpage (Natural Resources Wales, 2023) and on the Water Watch Wales website (Natural Resources Wales, 2022).

Wales does not have specific guidance on the interaction of wind farm developments and the water environment. In addition to the above general guidance, reference has also been made to guidance from Scotland on the matter, specifically the Land Use Planning System SEPA Guidance Note – Planning guidance on on-shore windfarm developments (SEPA 2017) and Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems (SEPA 2017a).

It is recognised that the Scottish planning regime is not directly mirrored in Wales, and that the Welsh environment differs from the Scottish in many ways. Notwithstanding this, these windfarm-

specific documents are considered helpful guidance for upland developments such as the Proposed Development.

2.2.1. Recent DNS statutory responses

Use of this guidance has been augmented with our experience of recent Decisions of National Significance (DNS) projects in Wales and the responses provided by NRW and Welsh Government (WG) to these. Recent amongst these examples is that of Twyn Hywel Energy Park. LUCs Statement of Common Ground (SoCG)recorded a process of consultation that has been undertaken with NRW in order to draft a SoCG for the Twyn Hywel project in preparation for DNS Hearing (Land Use Consultants, 2023) (Welsh Government, 2023). Matters of discussion were focussed on the following areas.

2.2.1.1. Groundwater

NRW stated that *"if dewatering is required for borrow pits or any other deep excavation works, the potential impacts of dewatering on controlled waters (the wider groundwater resources as well as private water supply receptors), and any proposed mitigation should be submitted with any full planning application"*. The project therefore set out embedded mitigation in the form of groundwater investigation, assessment and detailed mitigation, to be undertaken during pre-construction ground investigation. The project also set possible further mitigation options to ameliorate potentially unavoidable impacts, should they be determined necessary. In response to this, NRW requested that the same approach be extended to turbine base excavations. No challenge was made to the proposed approach, whereby groundwater investigation, assessment and mitigation design occur during the post consent, pre-commencement phase of works.

2.2.1.2. Private water supplies

NRW agreed with the proposed mitigation approach to possible impacts on PWSs, particularly the inclusion of potentially 'at-risk' PWSs in a water quality monitoring plan (WQMP).

2.3. Data Sources

The main sources of data utilised in this assessment are summarised below:

- Site development plans provided by LUC;
- Aberedw Energy Park Scoping Direction, PEDW, April 2024;
- Land Use Planning System SEPA Guidance Note - Planning guidance on on-shore windfarm developments (Scottish Environment Protection Agency, 2017)
- NRW flood risk data;
- LiDAR digital terrain model (DTM) data;
- Hydrological descriptor data from the Flood Estimation Handbook (FEH) website (UK Centre for Ecology & Hydrology, 2023);
- Private Water Supply information from Powys County Council;
- Ordnance Survey mapping; and,

- British Geological Survey (BGS) mapping data and borehole logs.

2.4. Surveys

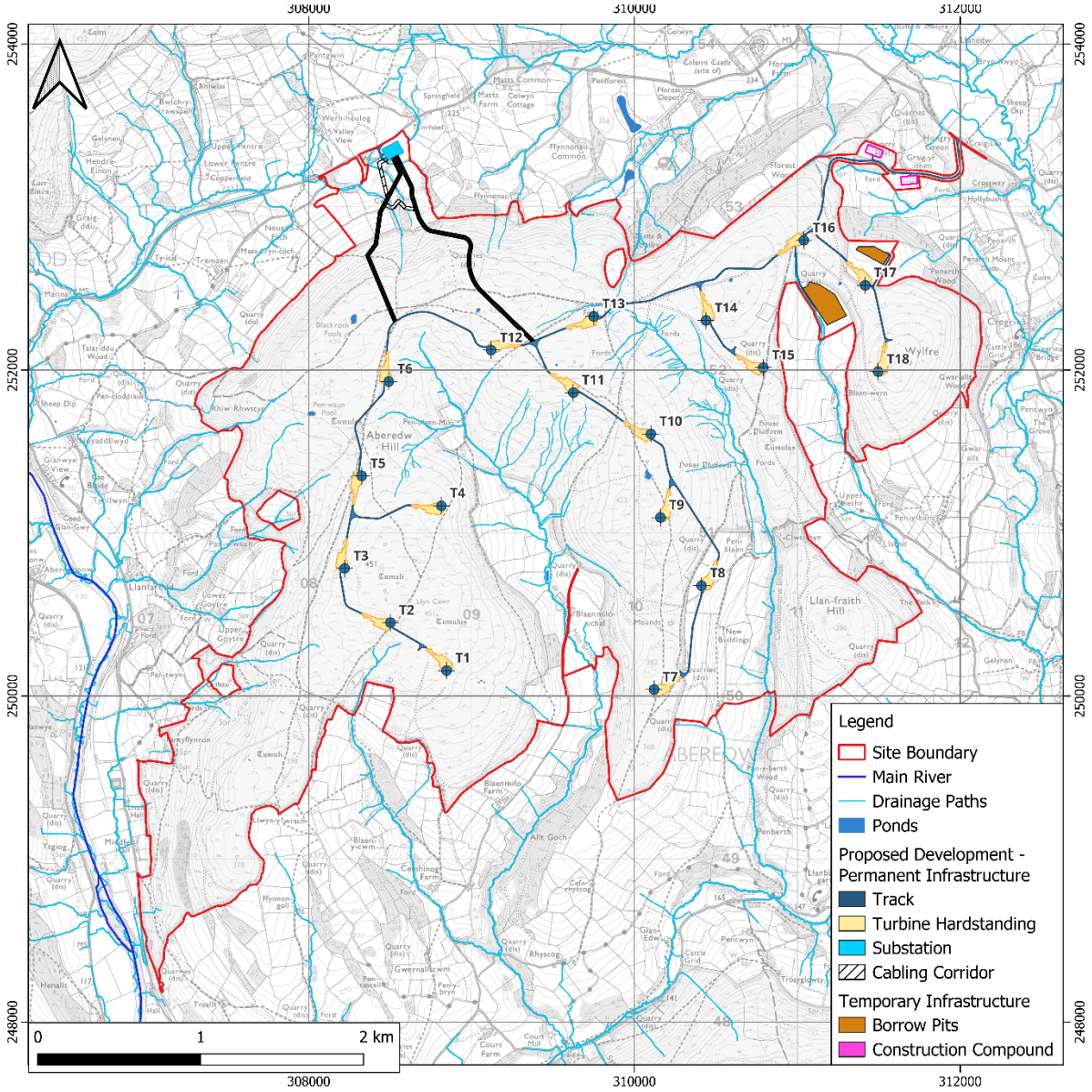
Multiple surveys have been conducted both on and off-Site to inform this report, namely:

- Desk based assessment of PWS and GWDTEs was undertaken, using a range of published data sources, including data obtained from Powys County Council (PCC) under a Freedom of Information (FOI) request.
- Phase 1 and Phase 2 peat surveys have been undertaken. Concurrently, an assessment of water features present on Site was also carried out. These surveys were conducted across four separate visits between 2023 and 2025.
- A survey to identify Water Features including GWDTEs was conducted in September 2023.

2.5. Proposed Development

The Proposed Development is described in detail in Chapter 4 of the ES. It comprises 18 wind turbines with associated permanent and temporary hardstandings, two borrow pit search areas, a substation and two temporary works compounds. **Error! Reference source not found.** shows the proposed layout of the permanent features on the Site, including turbines, substation and tracks.

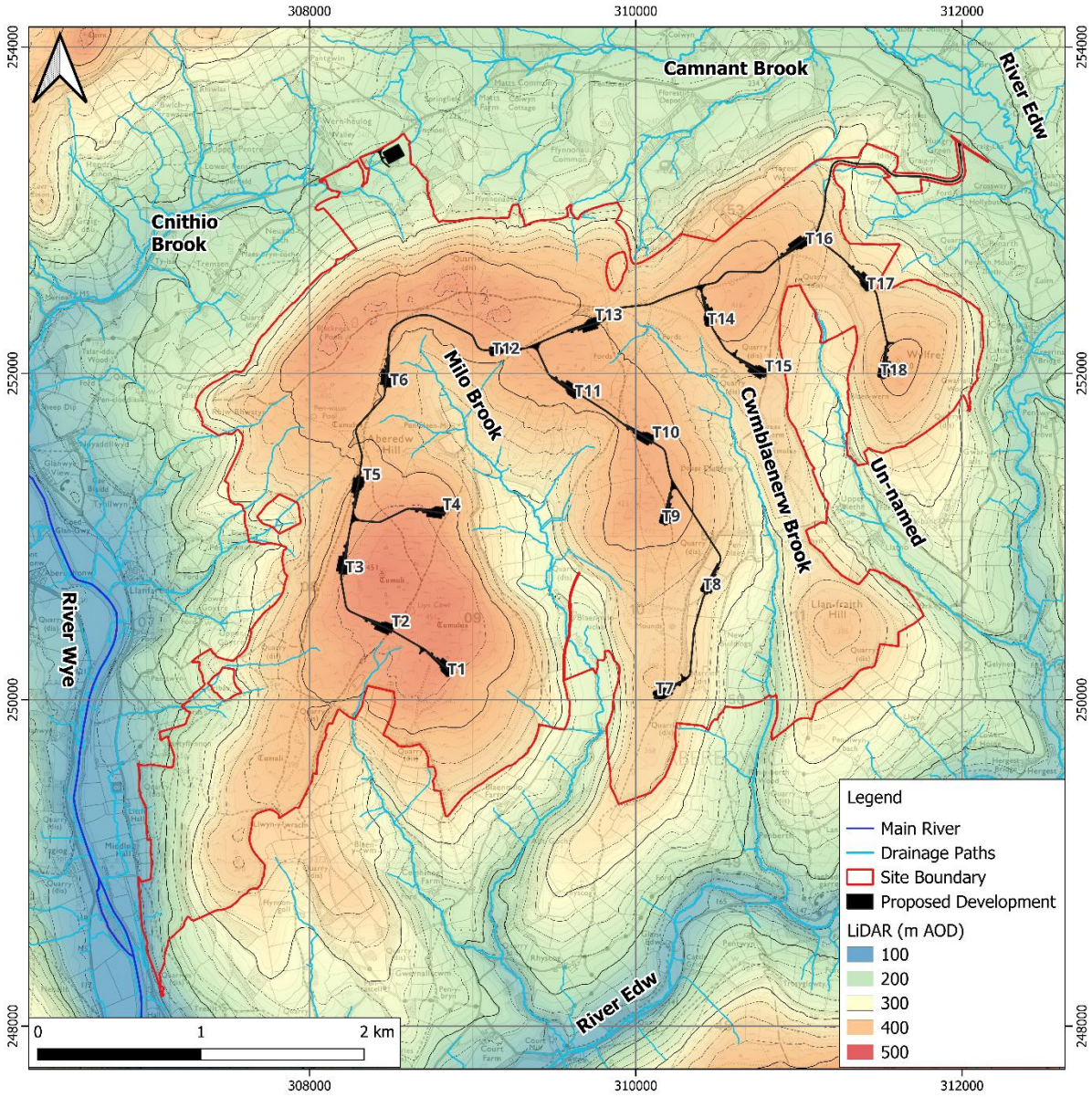
Figure 2-1 Proposed site layout



2.6. Topography

The Site is approximately 1,323 hectares in size, and the ground elevation falls from the peak elevations of the upland summits (at a maximum of approximately 451 m above Ordnance Datum (mAOD) to the lower elevations in the west (at the River Wye Valley) at approximately 130 mAOD. **Error! Reference source not found.** shows the latest 2020-22 LiDAR data, along with a detailed drainage network derived from the LiDAR data.

Figure 2-2 Site topography and principal water features



Registered in England and Wales with Company No. 15820480 at 14 Museum Place, 4th Floor, Cardiff, Wales, CF10 3BH

2.7. Hydrology

This section provides an overview of pertinent information regarding the water features present on Site. For full context the reader is directed to Appendix 9.3 of the ES: Water Resources Assessment.

The entire Site lies within the River Severn River Basin District, and the River Wye Management Catchment. Figure 2-2 shows surface water features in the vicinity of the Site. The River Wye is described as an internationally important habitat, reflected in its designation as a SSSI and SAC.

2.7.1. Ordinary Watercourses

There are numerous minor watercourses (Ordinary Watercourses) present within the Site boundary, the majority of which drain to the River Edw. A small area at the north of the Site is drained to the River Wye via Cnithio Brook and the western edge of the Site direct to the River Wye. The River Edw is a tributary of the River Wye, with the River Edw joining the River Wye 1.35km south of the Site in Aberedw.

During the numerous phases of fieldwork undertaken on site, a number of watercourses have been identified in addition to those marked on published mapping. These have been included as assumed Ordinary Watercourses. These watercourses have had a 50m buffer applied to them for consideration as a constraint during the design and assessment process.

At the time of the Phase 1 peat survey in May 2023, most watercourses on Site were dry, with the exception of Milo Brook and Cwmblaenerw Brook.

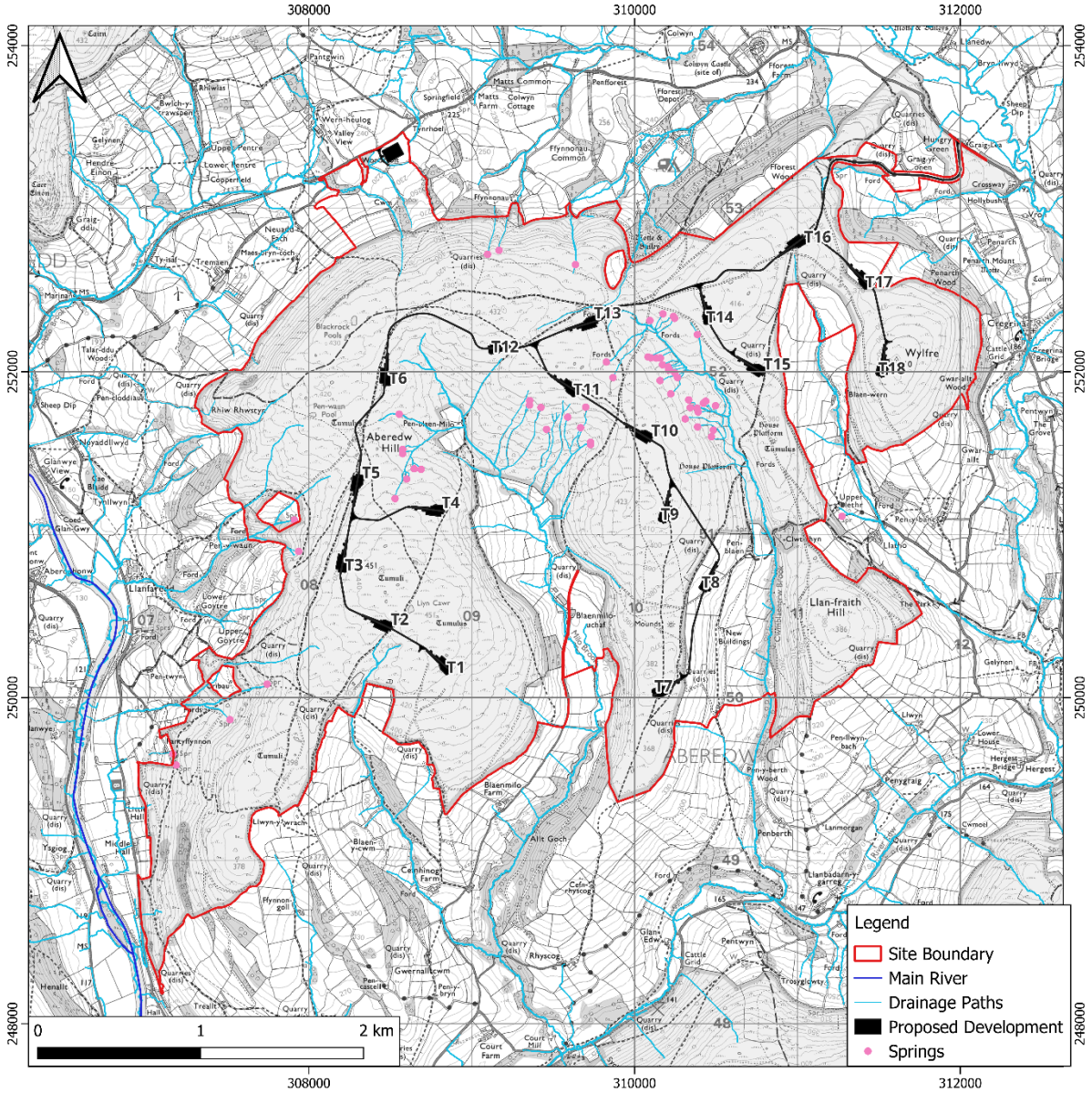
2.7.2. Springs

There are a number of springs and flushes along the hillsides and into the gullies of Aberedw Hill and Llan Fraith Hill that were noted during Site surveys. Figure 5-1 shows the location of springs and flushes identified during field surveys. The majority of the springs are located along the slopes of the two valleys that divide the Site between Llan-fraith and Aberedw Hills and feed the headwaters of the Cwmblaenerw Brook and Milo Brook. A further 5No. springs are located on the western edge of the Site and flow directly into the River Wye.

Where springs are associated with GWDTEs or PWS, an appropriate GWDTE buffer has been allowed for in the design and assessment process.

Where springs do not have an associated GWDTE, a 50m watercourse buffer has been applied in the design and assessment process.

Figure 2-3 Location of springs and flushes identified in the field survey



2.8. Water Framework Directive Catchments

The Site falls entirely within the Wye Management Catchment and the Ithon to Hay Operational Catchment. It drains to a series of four waterbodies within this catchment, discussed in turn below:

2.8.1. River Wye – Confluence of River Ithon to Scithwen Brook

The *River Wye confluence of River Ithon to Scithwen Brook*, drains the western most portion of the Site. It is described as 'Natural' with an overall status of 'Good'. The ecological status of the section is Good, and the chemical classification is High.

2.8.2. River Edw – Confluence of Clas Brook to confluence of River Wye

The *River Edw from confluence of Clas Brook to confluence of River Wye*, drains the majority of the centre and south of the Site. It is described as 'Natural' with an overall status of 'Good'. The ecological status is Good, and the chemical classification is High. The driving elements are Invertebrates and Morphology.

2.8.3. River Edw – Confluence of Camnant Brook to confluence of Clas Brook

The *River Edw from confluence of Camnant Brook to confluence of Clas Brook*, drains a very small portion of the east of the Site. It is described as 'Natural' with an overall status of 'Good'. The ecological status is Good, and the chemical classification is High.

2.8.4. Camnant Brook – Source to confluence of River Edw

The *Camnant Brook from source to confluence with the River Edw,* drains a small portion of the north east of the Site. It is described as 'Natural' and has an overall status of 'Good'. The ecological status is good, and the chemical status is High.

2.9. Hydrogeology and Groundwater

The Site falls wholly within the *Wye Uplands Lower Palaeozoic* Groundwater zone which has an overall classification of 'poor' driven by its Chemical status. Quantitative elements are all classified as good, including impact on surface waters, saline intrusions, GWDTEs and water balance. Chemical elements are also classified as good, with the exception of Chemical Dependent Surface Water Body Status. The Trend assessments are Moderate.

The Silurian Rocks beneath the Site are classified by NRW as a Secondary B aquifer. A Secondary B aquifer is defined as a '*predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering*'.

The BGS holds no records of borehole logs within the Site, however a few are located adjacent to the Site, both in the north and south.

The log for BGS borehole SO15SW1 located 670m to the northeast of the Site gives a depth to groundwater in the mudstone bedrock of 20m below ground level (bgl) in February 2023.

The superficial deposits within the Site (i.e. diamicton, also referred to as Glacial Till) are classified as an unproductive strata. Diamicton has a wide range of potential permeabilities, dependent on their local composition and connectivity.

The groundwater has been assigned a vulnerability rating of high over the majority of the Site area, with some areas classified as medium vulnerability.

2.10. Peat hydrogeology

BGS mapping indicates two small outcrops of peat on the Site, one across a small area of upland plateau at the peak of Aberedw Hill, and a second small patch on the upland plateau of the adjacent lobe of hill to the east (**Error! Reference source not found.**).

The peatland on Site has been mapped by Aqua Terra to a high accuracy, determining extent, depth and distribution of peatland, including any shallow peat and water features that may contribute to the hydrological functioning and health of peat bodies on and off Site. An initial 100 m grid of probe locations was undertaken across the Site in May 2023, totalling 875 peat probes. This was then augmented by a secondary probing exercise along the proposed infrastructure layout, with probe density varying from 50m to 10m dependent upon the likelihood of encountering peat, as discerned from the results of the initial 100m gridding exercise. The initial probing exercise identified that no peat (defined as organic soils greater than 30cm in thickness) was present. The depth of any peaty horizons recorded ranged from 4cm – 27cm, making it, by definition, a peaty loam.

One of the two areas of peaty loam was located on top of the plateau near T10 and T11. It corresponds with an area of bog mapped during the ecological habitat mapping that is situated on a saddle within the upland plateau. It is coincident with an area of peat present on BGS mapping and Peatland of Wales mapping, but was recorded as comprising peaty loam (<30cm) during Phase 1 and Phase 2 soil probing. This area of bog has been assessed as at low risk of being fed by groundwater, due to its elevated topographical position and lack of significant catchment. It is considered likely to be sustained as a bog due to a combination of flat topography and low permeability substrate. It is proposed to place a groundwater monitoring well within this area of bog.

The second was associated with the headwaters of Cwmblaenerw Brook, constrained to locations within close proximity to the watercourses at the base of the incised Cwmblaenerw valley. The proposed development is situated some 5om higher topographically from these areas of peaty loam. The only potential for interaction with the development is via the springs which feed the brook, most notably those that feed GWDTE C and GWDTE D (see Figure 2-4 below). Groundwater and surface water monitoring points are proposed along the Cwmblaenerw Brook and these are considered sufficient to monitor the hydrology of these areas of peaty loam also.

2.11. Groundwater Dependent Terrestrial Ecosystems

As part of the environmental surveys undertaken on Site, a number of have been identified. The process to define these GWDTEs is defined within Appendix 9.2 Water Resources Assessment and should be consulted for further context. Figure 2-4 details the location of the GWDTEs on Site.

2.12. Private Water Supplies

Data requests were submitted to Powys County Council (PCC) in order to obtain information on PWS surrounding the Site. Data was received in the form of a database of grid references and PWS type (well, spring, borehole).

Data was also obtained directly from those landowners involved in the Proposed Development, both via the disclosures made during contractual discussions, and by direct personal interview. As a result, a good dataset has been compiled.

PWSs that are located within 1.5km of the Site boundary, whose catchments are likely to at least partially be located within the development boundary are shown in Figure 2-5 below.

Figure 2-4 Location of verified GWDTEs and Proposed Cut/Fill locations (GWDTE B, C & D are assessed as requiring mitigation including monitoring)

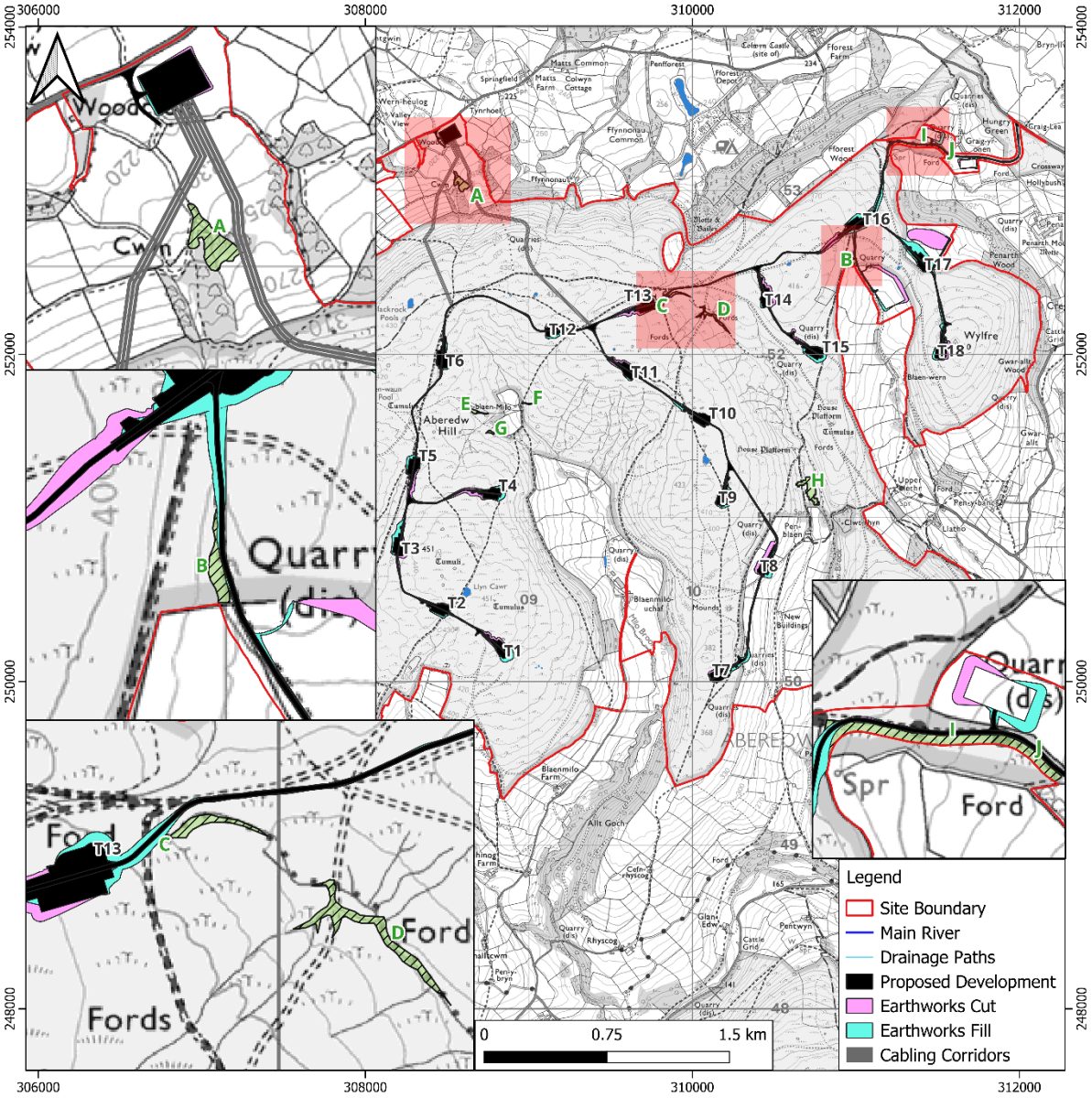
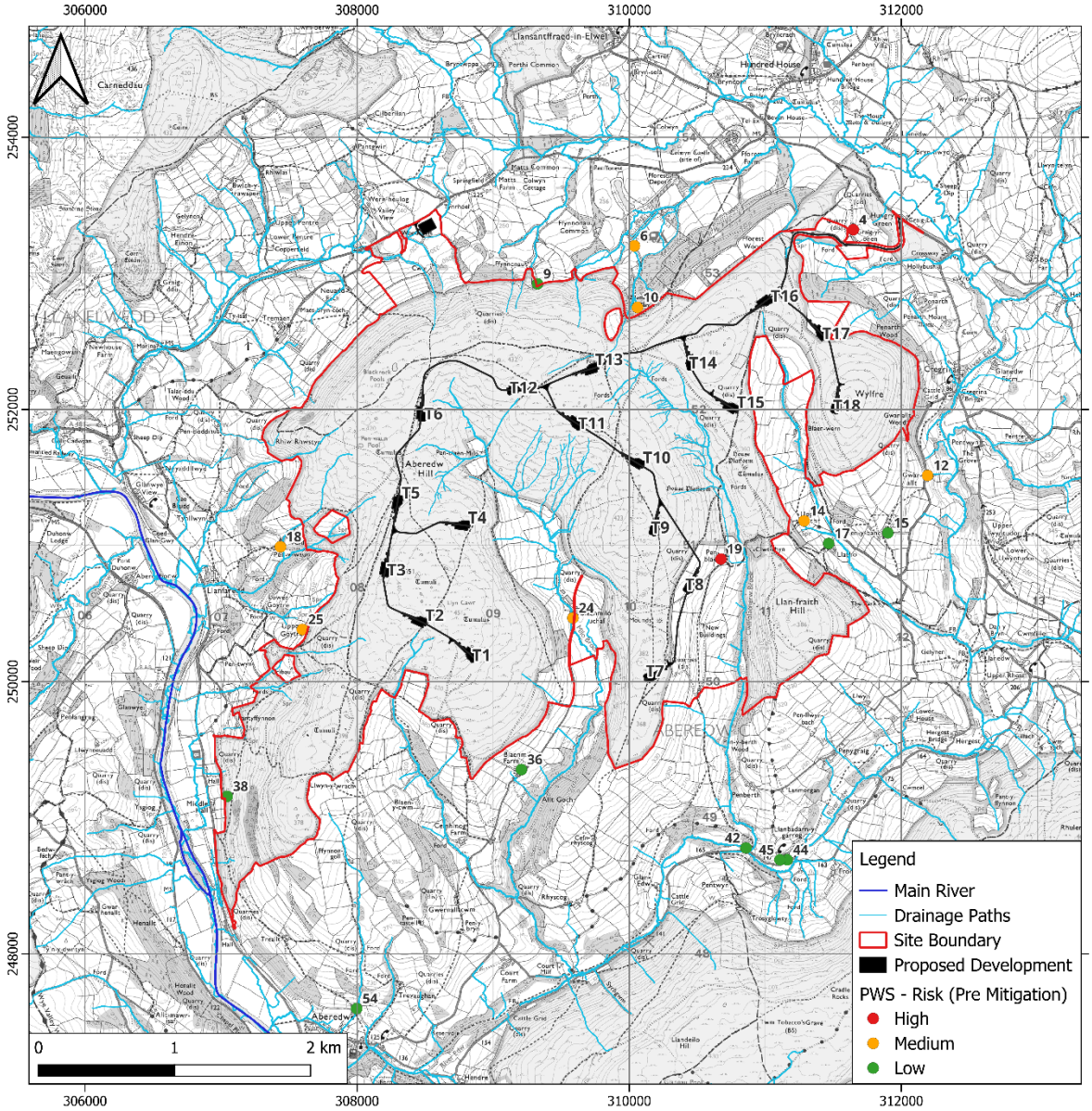


Figure 2-5 Location of high and moderate risk PWS on and around Site



3. Monitoring rationale and locations

3.1. Water monitoring scope

Error! Reference source not found. 3-1 below details the scope of water monitoring to be undertaken at each monitoring point.

Table 3-1 Scope of water monitoring for each proposed monitoring location

Location	NGR	Channel morphology	Field chemistry parameters	Laboratory chemistry analysis	Groundwater elevation	Surface water flow estimate
GW01	310975,252731		✓		✓	
GW02	309827,252347		✓		✓	
GW03	310263,252423		✓		✓	
GW04	311756,253219		✓		✓	
GW05	309659,251993		✓		✓	
GW06	308637,253032		✓		✓	
GW07	311219,253293		✓		✓	
P1	308845,250260		✓			
P2	308320,251616		✓			
P3	308284,251583		✓			
P4	308345,251494		✓			
P5	308295,251490		✓			
P6	309521,252029		✓			
P7	310008,251667		✓			
P8	310057,251671		✓			
PWS-a	312200,251506		✓	✓		
PWS-b	311789,253372		✓	✓		
PWS-c	310038,253165		✓	✓		

Location	NGR	Channel morphology	Field chemistry parameters	Laboratory chemistry analysis	Groundwater elevation	Surface water flow estimate
PWS-d	310069,252751		✓	✓		
PWS-e	311279,251151		✓	✓		
PWS-f	307449,251020		✓	✓		
PWS-g	310736,250887		✓	✓		
PWS-h	309570,250466		✓	✓		
SW01	307641,250414		✓		✓	✓
SW02	309471,252295		✓		✓	✓
SW03	309912,252519	✓	✓		✓	✓
SW04	309892,252377		✓		✓	✓
SW05	310359,252276		✓		✓	✓
SW06	310565,251839		✓		✓	✓
SW07	310689,251225		✓		✓	✓
SW08	310989,252567	✓	✓		✓	✓
SW09	311154,252201		✓		✓	✓
SW10	311303,251494		✓		✓	✓
SW11	308750,251643		✓			✓
SW12	308618,252060		✓			✓
SW13	309140,252027		✓		✓	✓
SW14	309590,251781		✓		✓	✓
SW15	308070,251335		✓		✓	✓
SW16	307919,250901		✓		✓	✓
SW17	308409,250313		✓			✓
SW18	308477,250271		✓			✓
SW19	309489,250874		✓			✓

3.1.1. Channel morphology

Due to the close location of the Proposed Development to a watercourse at SW03 and SW08, channel morphology will be assessed during each monitoring visit. Ideally, this will involve the use of georeferenced drone photogrammetry to capture detailed imagery, allowing for the assessment of changes in channel morphology, flow patterns, and vegetation over time. If drone photography is not feasible, high-resolution photographs taken from a suitable vantage point (fixed point photography) will serve as an alternative to document and monitor temporal changes in this sensitive area.

3.1.2. Field chemistry

Field chemistry shall be collected using a portable multi parameter probe. The monitoring equipment shall be rinsed thoroughly with deionised water in between sampling locations. The following parameters will be recorded:

- Air temperature;
- Water temperature;
- pH;
- Conductivity, and
- Total suspended solids

3.1.3. Laboratory chemical analysis

The chemical monitoring suite has been designed to provide a comprehensive analysis of water quality across the site, focusing on both common water quality parameters and potential contaminants of concern. The suite includes a range of dissolved metals, nutrients, hydrocarbons, and other key indicators to assess potential impacts from construction and operational activities. Table 9.2 outlines the determinands to be tested.

Water samples will be collected using a long-handled dipper to ensure access to the centre of the watercourse. Care will be taken to avoid contamination:

- Samples that come into contact with the bank, vegetation, or contain significant vegetation debris will be discarded and recollected.
- Samples will be immediately transferred to appropriate pre-labelled containers, stored in a temperature-controlled coolbox, and transported to the laboratory within 12 hours of collection to preserve integrity.
- The dipper will be thoroughly rinsed with de-ionised water between each sampling location to prevent cross-contamination.

Table 3-2 Chemical Laboratory Testing Suite

Determinand	
Antimony (dissolved)	Alkalinity (as $CaCO_3$)

Determinand	
Arsenic (dissolved)	Ammonia (NH_3)
Barium (dissolved)	Ammonium (NH_4^+)
Beryllium (dissolved)	Chloride
Boron (dissolved)	Cyanide - Total - Low Level
Cadmium (dissolved)	Dissolved Organic Carbon (DOC)
Chromium (dissolved)	Nitrate (as N03)
Copper (dissolved)	Nitrite (as N02)
Lead (dissolved)	PAH (USEPA16)
Mercury (dissolved)	pH
Molybdenum (dissolved)	Phenols - Total (monohydric) - Low Level
Nickel (dissolved)	Sulphate as SO_4
Selenium (dissolved)	TPH(CWG)
Zinc (dissolved)	TSS
	Dissolved Oxygen

3.1.3.1. Groundwater chemistry

Groundwater chemistry will be monitored using field parameters only.

If field parameters show significant deviation from baseline, samples will be obtained for submission for laboratory analysis.

If such sampling is required, it will necessitate purging the borehole using a low-flow pump, such as a peristaltic pump, or a bailer to remove stagnant water and collect a sample directly from the aquifer. Care would be taken to stabilise parameters such as pH, temperature, and conductivity before sample collection. All equipment, including pumps or bailers, would be decontaminated between boreholes to prevent cross-contamination, and samples would be transferred to appropriate containers for laboratory analysis.

3.1.4. Groundwater elevation

Collection of baseline groundwater elevation data will be undertaken at all GW monitoring points. This will be undertaken using hand-held dipmeters on a bi-monthly basis. Following the installation of groundwater monitoring wells and the initial recording of groundwater elevations, each GW monitoring point will be assessed to determine whether the groundwater elevations are within the

anticipated depth of influence of the proposed infrastructure. This will determine the monitoring approach for the remaining baseline period:

- Where groundwater is encountered within 5m (vertical) of the proposed base of cut (or 5m below ground level in areas of fill), groundwater dataloggers will be installed to record the detailed fluctuations in groundwater levels and response to rainfall events.
- Where groundwater in deeper than 5m below proposed base of cut/ ground level in areas of proposed fill, bi-monthly records of groundwater elevation will be collected using hand-held dipmeters.

3.1.5. Surface water observations and flow estimation

Collection of baseline surface water level monitoring will comprise the use of suitable flow and/ or gauge board assessment.

For each surface water monitoring point, the following details will be recorded at the time of monitoring to provide context for the water quality results:

- Weather conditions, including recent rainfall or dry periods.
- Evidence of recent watercourse management activities, such as ditch clearing or other maintenance.
- Any works being carried out in the vicinity during the construction phase.
- Observable flow characteristics, and any noticeable changes in flow within the watercourse.

3.2. Water Monitoring Frequency

3.2.1. Pre-Construction Baseline

In order to inform the subsequent construction phase monitoring, a well understood baseline data set is required. Pre-application discussions with NRW emphasised the importance of establishing comprehensive baseline conditions across all identified surface water features, GWDTEs, and PWSs. To understand seasonal fluctuations, it is considered a minimum 1 year-long monitoring period will be sufficient to characterise conditions on the Site.

During the 12 month baseline monitoring period, monitoring of all monitoring locations as shown in Table 3-1 will be undertaken on a bi-monthly basis, totalling six visits across the year. This will provide data on a full four seasons of site conditions.

3.2.2. Construction phase

NRW stipulates a minimum required quarterly frequency for water quality monitoring during a construction project. The construction phase is projected to last up to 15 months. Construction phase monitoring of the Monitoring Network will be undertaken bi-monthly during this period, with an estimated 7 monitoring rounds in total. This monitoring shall be undertaken on the same series

of monitoring points as was monitored during the baseline period. However, it is envisaged that not all locations will be monitored on every visit, due to the anticipated phased nature of the build programme. The requirement for monitoring at each location will be determined by whether there is construction activity within the catchment of that monitoring point.

3.2.2.1. Compliance monitoring

In addition to the regular water monitoring that will be undertaken by the Developer, the Main Contractor will be required (via the Construction Environmental Management Plan (CEMP)) to undertake regular monitoring of the water environment during the construction phase. This will be required both to document compliance with the CEMP, but also adherence to Ordinary Watercourse Consents and any other consent or permits that may be required to facilitate construction. The scope and frequency of this monitoring will be determined by the Main Contractor and agreed with both the Developer and any determining/ consenting authority. It is envisaged that this will comprise monitoring on at least a weekly frequency, increasing to daily inspections during periods of heavy/ prolonged rainfall and/or construction within the 50m watercourse buffer.

3.2.3. Operational Phase

Quarterly monitoring will be conducted during the first year of operation. This frequency allows for seasonal variability to be captured and ensures potentially delayed impacts from construction or operational activities are identified.

During this period, the same triggers and mitigating actions will remain available to address any adverse effects, should they occur.

After this year of establishment, the construction-phase monitoring will cease.

4. Reporting and Mitigation Process

4.1. Reporting and mitigation sequence

The following sequence of work will be undertaken in order to gather baseline and construction-phase data, and to feed this into the design and construction implementation on an iterative basis. The sequence of processes and flow of information is summarised in the flow diagram in .

4.1.1. Ground Investigation Report

A ground investigation will be undertaken in the early stages of the post-consent, pre-construction period, in order to inform detailed design. As part of this ground investigation, the following works will be undertaken;

- Drilling and installation of 10 groundwater monitoring wells.
- One round of groundwater and surface water monitoring in accordance with this document.

The resultant data will be included within the Ground Investigation Report (GIR). The GIR will be used to feed into the CEMP, the temporary works design and the permanent works design, including drainage design.

4.1.2. Interim baseline monitoring reports and defining trigger mechanisms

In initial three monitoring rounds will be undertaken in accordance with this document (two more following the initial ground investigation). Upon completion of the third round, and interim baseline report will be compiled. This will summarise the water quality, groundwater behaviour and surface water behaviour recorded during these three monitoring rounds.

This final report will consolidate data from the initial monitoring programme, evaluate any patterns or trends in water quality, water flow or groundwater behaviour and provide draft proposals for developing a trigger mechanism for use during the construction phase.

The report will include the following:

- A summary of Site conditions and ongoing activities.
- A record of all parameters tested at each monitoring point, both field and laboratory data.
- Complete laboratory analysis results undertaken by accredited laboratories under UKAS and, where applicable, MCERTS.
- Analysis comparing results to baseline conditions set out in the baseline report.
- An assessment of deviations and potential development-related effects on water quality.
- Recommendations for operational adjustments to mitigate identified deviations or deterioration in surface water or groundwater quality.

4.1.2.1. Trigger mechanisms

Initial data from baseline monitoring will be used to establish Site-specific thresholds for water quality, water flow and groundwater behaviour. These thresholds will act as trigger values to identify potential deviations from baseline conditions during construction and operational phases.

Until such time as the data has been collated, it is not possible to pre-determine triggers. Use of Environmental Quality Standard as triggers, for example, will not necessarily provide the early warning or environmental protection sought – e.g. if the baseline concentrations already exceed EQS, then using these as a trigger may not enable detection of impacts caused by the proposed development.

At this juncture, it is envisaged that triggers for action may comprise one, or a combination of;

- Absolute values (such as EQS, or absolute groundwater elevations, for example)
- Relative values (such as groundwater within +/- 5m of proposed depth of earthworks cut, for example), or;
- Statistical limits (such as % deviation from baseline pollutant concentrations, for example).

The interim baseline monitoring report will conclude with recommended proposed trigger mechanisms to be protective of each sensitive receptor. The report will be submitted to NRW for review.

4.1.3. Pre-construction final reports

4.1.3.1. Final baseline monitoring report

Upon completion of the sixth and final baseline monitoring round, a final monitoring report will be compiled. This report will represent an evolution of the interim report, encapsulating the full data series. It will present the final trigger mechanisms to be implemented during the construction phase, including due consideration of any comments provided by NRW following their review of the interim document.

4.1.3.2. CEMP

The baseline monitoring data will be used to refine and finalise the CEMP document and associated temporary works design. Critical interfaces between the sensitive environmental receptors and the proposed development will be addressed, both by the scope of temporary works design (for example silt management arrangements, temporary settlement ponds etc.) and management protocols (surface water management plan, for example).

4.1.3.3. Final drainage design

The baseline monitoring data will provide a critical component of the data feeding into the final design. This process will enable any critical interfaces between the sensitive water receptors and

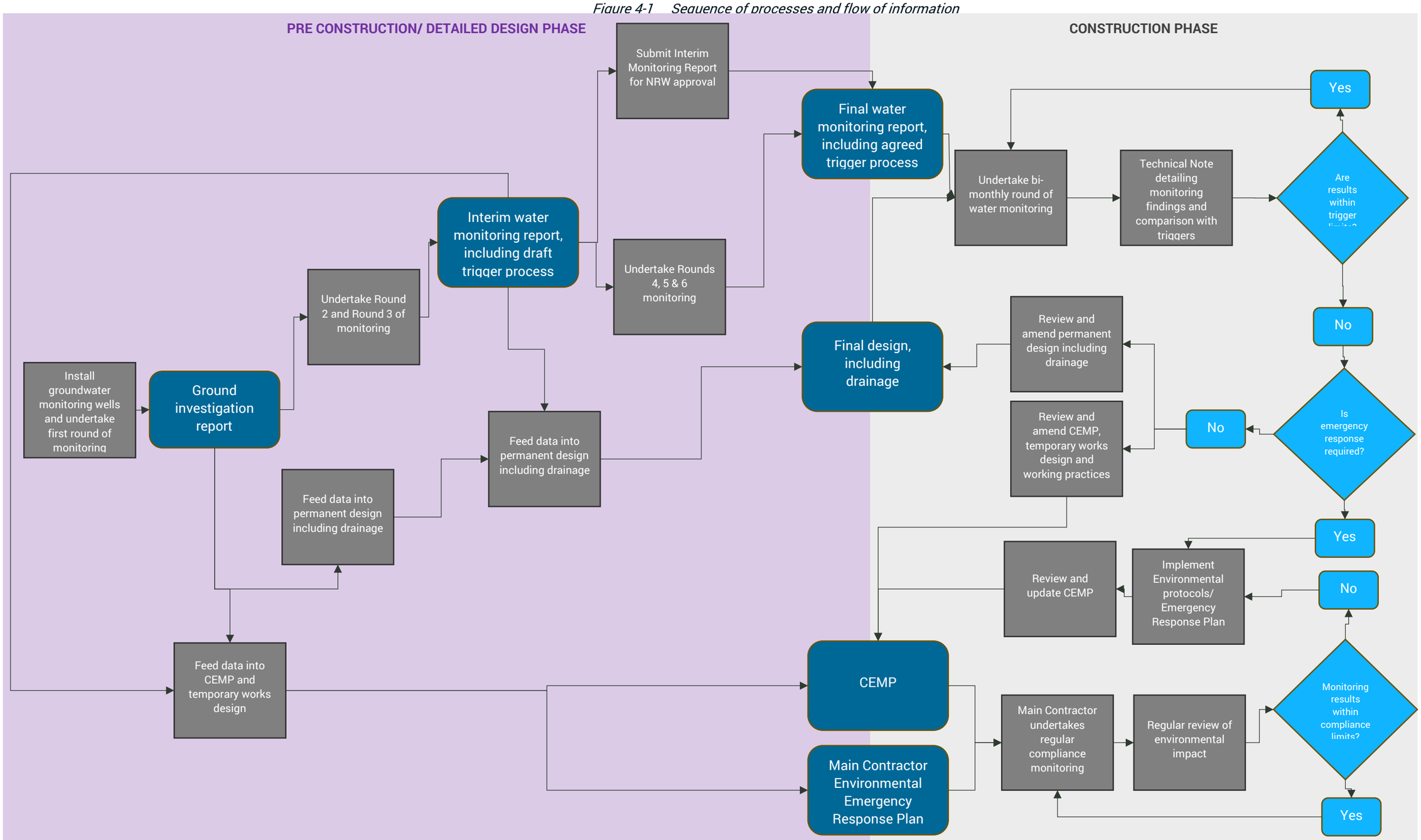
proposed development to be identified and suitably mitigated through design. An example may be the identification of shallow groundwater in an area of cut near to a GWDTE, which would in turn lead to bespoke drainage design in that area to ensure no significant interruption of baseflow towards that receptor.

4.1.4. Construction phase reporting

During the construction phase, a Technical Report will be compiled following each monitoring round. This document will be concise, providing a summary of the data collected and providing feedback on temporary works, construction processes and permanent design, such that any actual or potential adverse impact can be suitably addressed.

These Technical Notes will be used to facilitate an ongoing feedback loop from monitoring, to design to implementation.

Figure 4-1 Sequence of processes and flow of information



4.2. Pre-construction/ Detailed Design-phase mitigation

The use of the GIR, interim monitoring report and final monitoring report will enable baseline information on the water environment to embed mitigation into the evolving detailed design.

4.2.1. GWDTE and detailed design

Data collected during the baseline monitoring will be used to construct a hydrogeological conceptual model for groundwater connectivity between each moderate to high risk GWDTE and the Proposed Development. Groundwater elevations within 5m of the proposed cut depth (or within 5m of current ground level in areas of proposed fill) will trigger the need for bespoke detailed drainage design that must maintain baseflow to the GWDTE. This design may comprise a combination of;

- Micrositing to avoid potentially adverse effects if identified, if possible; and,
- detailed drainage design work to avoid adverse effects (e.g. by construction of through-track drainage
- detailed drainage design to minimise and if necessary mitigate effects (e.g. by constructing drainage to return groundwater captured in areas of cut back to the GWDTE).

Precise details on any such required mitigation cannot be provided at this juncture, other than in the demonstration that such an approach is feasible and implementable. The reader is directed to the Outline Drainage Strategy, for a demonstration of the feasibility of drainage mitigation at each of the five GWDTEs identified as at moderate to high risk of potential impact.

4.2.2. PWS and detailed design

Data collected during the baseline monitoring will be used to construct a hydrogeological conceptual model for groundwater connectivity between each moderate to high risk PWS and the Proposed Development. Where a feasible source-pathway-receptor connection is substantiated by the data collected, the data will be used to inform mitigation embedded within the design. This design may comprise a combination of;

- Micrositing to avoid potentially adverse effects if identified, if possible; and,
- detailed drainage design work to avoid adverse effects (e.g. by construction of through-track drainage)
- detailed drainage design to minimise and if necessary mitigate effects (e.g. by constructing drainage to return groundwater captured in areas of cut back to the PWS catchment, inclusion of swales and water treatment lagoons).

Precise details on any such required mitigation cannot be provided at this juncture, other than in the demonstration that such an approach is feasible and implementable.

4.2.3. Watercourse crossings and detailed design

Data collected during the baseline monitoring will be used to construct a hydro-geomorphological model for each watercourse crossing point. This in turn will be used to inform the engineering design of the crossing and an associated mitigation. Such embedded mitigation may include;

Mitigation groundwater connectivity between each moderate to high risk PWS and the Proposed Development.

- Micrositing to avoid potentially adverse effects if identified, if possible and/ or;

- Use of soft engineering in place of hard engineered structures;
- Use of bespoke watercourse crossing design.

4.3. Construction phase mitigation

4.3.1. Trigger Warnings

In the event that a trigger mechanism is activated, the following series of actions will be implemented:

- A detailed assessment will be conducted to determine the possible/ probable cause(s) and extent of the deviation.
- Mitigation measures will then be discussed, agreed upon with stakeholders (e.g., NRW), and implemented promptly.

The following paragraphs set out the range of mitigation measures available during the construction phase:

4.3.2. General mitigation options

The following range of general mitigating actions can be deployed as required:

- If the water quality exceed trigger warnings at the downstream monitoring point, additional monitoring of the catchment can be implemented to narrow down the potential issue using additional chemical testing of other monitoring points within the catchment.
- Adjustments to construction practices,
- enhanced sediment control measures, or
- additional containment systems to address specific water quality concerns.

4.3.3. PWS protection and mitigation

In addition to the above, the following actions are available to manage and mitigate risks to PWSs:

- strict prohibition of storage or transport of fuels, chemicals or other hazardous substances within at least 250 m of the PWS or the watercourse feeding it;
- detailed silt and run-off control measures in areas where infrastructure is within 250 m of a PWS or a watercourse feeding it;
- detailed emergency measures for deployment in the event of an accident or event that may risk release of pollutants.
- Replacement of the PWS with an alternative source. For example, were a spring supply to be affected by changes to surface water flows, a borehole supply could be provided which would be protected from such effect.
- Redrilling of a borehole supply to greater depth or to target a different strata.
- The addition of simple water treatment to the PWS (e.g. filtration, UV treatment). This could be implemented rapidly.
- The introduction of intervening measures to sever any pathway that has developed between the Proposed Development and the PWS (e.g. filtration, treatment and redirection of effected surface or groundwater). In all but the most unlikely of cases, such measures could be implemented immediately.

- Flushing of pipework and systems to purge of effected water. This could be implemented rapidly.

4.3.4. GWDTE protection and mitigation

In addition to the above, the following actions are available to manage and mitigate risks to PWSs:

- strict prohibition of storage or transport of fuels, chemicals or other hazardous substances within at least 250 m of the GWDTE or the watercourse feeding it;
- detailed silt and run-off control measures in areas where infrastructure is within 250 m of a GWDTE or a watercourse feeding it;
- detailed emergency measures for deployment in the event of an accident or event that may risk release of pollutants.
- The introduction of intervening measures to sever any pathway that has developed between the Proposed Development and the GWDTE (e.g. filtration, treatment and redirection of effected surface or groundwater). In all but the most unlikely of cases, such measures could be implemented immediately.

4.3.5. Environmental good practice

The process of construction-phase environmental management is a well understood and mature specialist discipline under good practice in construction. The Main Contractor will design and implement their own suitable environmental protection regime as part of their responsibilities, including the adherence to environmental quality requirements, and the requirements of any consents or permits.

Mitigation measures for sediment control, such as silt fencing, sediment traps, and phased earthworks, will be detailed in the detailed CEMP, which will be adopted and adapted by the Main Contractor.

The Main Contractor will be responsible for their own regular environmental monitoring and auditing, in tandem with the water monitoring framework set out herein, as illustrated in .

Registered in England and Wales with Company No. 15820480 at 14 Museum Place, 4th Floor, Cardiff, CF10 3BH

5. References

Aqua Terra. (2025). *Aberedw Energy Park: Flood Consequence Assessment.*

Aqua Terra. (2025). *Aberedw Energy Park: Outline Drainage Strategy.*

Aqua Terra. (2025). *Aberedw Energy Park: Water Resouces Assessment.*

Aqua Terra. (2025). *Aberedw Energy : Waterframe Directive Assessment.*

Environment Agency and Defra. (2017). *Groundwater protection: Groundwater protection guides covering: requirements, permissions, risk assessments and controls*. Retrieved August 30, 2023, from https://www.gov.uk/government/collections/groundwater-protection

Land Use Consultants. (2023). *Twyn Hywel Energy Park Developments of National Significance documents: 2023-11-07 - APP Further Inforamtion - 17.1 Appendix 8 - Engagement with NRW.* Retrieved from https://planningcasework.service.gov.wales/api/documents/download/A47878200?hash=09003622e5fdfe9895947b5a77ac67f9e185e6ed63f6ca91fff8b4240b156224

LUC. (2023). *Aberedw Energy Park Scoping Report.*

Natural Resources Wales. (2022). *Water Watch Wales*. Retrieved 11 29, 2023, from https://waterwatchwales.naturalresourceswales.gov.uk/en/

Natural Resources Wales. (2023, August 30). *Improving Water Quality*. Retrieved from https://naturalresources.wales/about-us/what-we-do/our-roles-and-responsibilities/water/improving-water-quality/?lang=en

Scottish Environment Protection Agency. (2017). *Land Use Planning System SEPA Guidance note 31. Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions.*

Scottish Environment Protection Agency. (2017). *Planning guidance on on-shore windfarm developments.*

SEPA. (2017a). *Land Use Planning System SEPA Guidance note 31. Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions.* Scottish Environment Protection Agency.

UK Centre for Ecology & Hydrology. (2023). *Flood Estimation Handbook Web Service*. Retrieved from https://fehweb.ceh.ac.uk/GB/map

Welsh Government. (2023, November 7). Letter to PEDW - The Developments of National Significance (Wales) Regulations 2016 - Response to Application DNS/3272053.

Appendix A Report conditions

Report Conditions

This report has been prepared by Aqua Terra Consulting Ltd. (Aqua Terra) in its professional capacity as soil and groundwater specialists, with reasonable skill, care and diligence within the agreed scope and terms of contract and taking account of the manpower and resources devoted to it by agreement with its client and is provided by Aqua Terra solely for the internal use of its client.

The advice and opinions in this report should be read and relied on only in the context of the report, taking account of the terms of reference agreed with the client. The findings are based on the information made available to Aqua Terra at the date of the report (and will have been assumed to be correct) and on current UK standards, codes, technology, and practices as at that time. They do not purport to include any manner of legal advice or opinion. New information or changes in conditions and regulatory requirements may occur in future, which will change the conclusions presented here.

Where necessary and appropriate, the report represents and relies on published information from third party, publicly and commercially available sources which is used in good faith of its accuracy and efficacy. Aqua Terra cannot accept responsibility for the work of others.

This report is confidential to the client. The client may submit the report to regulatory bodies, where appropriate. Should the client wish to release this report to any other third party for that party's reliance, Aqua Terra may, by prior written agreement, agree to such release, if it is acknowledged that Aqua Terra accepts no responsibility of any nature to any third party to whom this report or any part thereof is made known. Aqua Terra accepts no responsibility for any loss or damage incurred as a result, and the third party does not acquire any rights whatsoever, contractual, or otherwise, against Aqua Terra except as expressly agreed with Aqua Terra in writing. Aqua Terra reserves the right to withhold and/ or negotiate the transference of reliance on this report, subject to legal and commercial review.

Registered in England and Wales with Company No. 15820480 at 14 Museum Place, 4th Floor, Cardiff, CF10 3BH