Chapter 5- Hydrology

Glyn Taff Solar Farm – Environmental Statement

05/03/2025

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Neo Environmental Ltd	
Head Office - Glasgow: Wright Business Centre, 1 Lonmay Road, Glasgow G33 4EL T 0141 773 6262 E: info@neo-environmental.co.uk	**Bristol Office** Spaces 8th Floor The Programme Building Bristol BS1 2NB T: 01174 571 610 E: info@neo-environmental.ie
Warrington Office: Lakeview 600, Lakeside Drive Centre Park Square Warrington WA1 1RW T: 01925 661 716 E: info@neo-environmental.co.uk	**Rugby Office:** Valiant Suites, Lumonics House, Valley Drive, Swift Valley, Rugby Warwickshire CV21 1TQ T: 01788 297012 E: info@neo-environmental.co.uk
Ireland Office: C/O Origin Enterprises PLC, 4-6 Riverwalk, Citywest Business Campus Dublin 24, D24 DCW0 T: 00 353 (1) 5634900 E: info@neo-environmental.ie	**Northern Ireland Office:** 83-85 Bridge Street Ballymena, Co. Antrim BT43 5EN T: 0282 565 04 13 E: info@neo-environmental.co.uk

Prepared For:

Renantis UK Limited

Prepared By:

Russell Buckley MEnvSci MIEnvSc CEnv

	Name	Date
Edited By:		05/03/2025
Checked By:	Russell Buckley MEnvSci MIEnvSc CEnv	05/03/2025
	Name	**Signature**
Approved By	Russell Buckley	

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5. HYDROLOGY

Background

5.1. Neo Environmental Ltd has been appointed by Renantis UK Limited (the "Applicant") to undertake an Environmental Impact Assessment for a proposed solar farm (the "Proposed Development") on lands at Bryntail Farm, Bryn Tail Lane, Pontypridd (the "Application Site").

Development Description

5.2. Installation, operation and subsequent decommissioning of a renewable energy scheme comprising ground mounted photovoltaic solar arrays together with substation compound, transformer stations, internal access track, landscaping, biodiversity measures, boundary fencing, security measures, CCTV posts, monitoring house, storage containers access improvement and ancillary infrastructure. The solar arrays will have a combined capacity of up to 39.9MWp.

Site Description

5.3. The area of the Proposed Development (the "Application Site") lies at an elevation of approximately 140m – 330m AOD and covers a total area of c. 70.9 hectares. It is centred around Bryntail Farm at approximate National Grid Reference (NGR) E 309333, N 189800. It is south of Eglwysilan Road. The site extends west of Bryntail Farm and east of the Bryn Tail Lane. The site is within the administrative area of Rhondda Cynon Taf Council.

5.4. The site comprises 38 agricultural fields that are currently in use for livestock farming. It is on the east side of the Taff Valley c. 1.6 km east of Ynysangharad War Memorial Park. Access will be gained from the Bryn Tail Lane.

5.5. The site is adjacent to the Twyn Hywel Energy Park, a consented wind farm including 14 turbines (DNS/3272053).

INTRODUCTION

5.6. This chapter assesses the effects of the Proposed Development on drainage and flood risk. In particular, it considers the potential effects of:

- Flood risk;
- Surface water quality (watercourses [rivers and canals]; reservoirs, lakes and ponds; and wetlands);
- Flood risk management; and
- Land drainage.

5.7. The chapter has been written by KRS Enviro.

5.8. This chapter utilises the results of the Site specific Flood Consequence Assessment (FCA) prepared for the Proposed Development as a requirement of and in accordance with Technical Advice Note 15: Development and Flood Risk (TAN15), 2004.

5.9. This chapter of the ES is supported by the following Figures and Technical Appendices:

- Flood Consequence Assessment and Drainage Strategy (FRA and DS) that is presented in Annex 1: Volume 3.

5.10. The assessment covers the construction, operational and decommissioning phases of the Proposed Development and identifies aspects that have the potential to affect the existing baseline situation. The following issues have been considered:

- effects on surface water quality;
- changes to the natural drainage patterns;
- effects on base flows;
- effects on runoff rates and volumes;
- effects on erosion and sedimentation;
- effects on water resources; and
- effects on flooding and impediments to flow.

5.11. Where likely effects are predicted, their significance has been assessed taking into account measures incorporated into the design to mitigate or reduce the significance of these effects.

Additional mitigation measures are then outlined to reduce any outstanding significant effects with significance then assigned to any residual effects following the implementation of the additional mitigation measures.

Statement of Competence

5.12. This chapter was written by Keelan Serjeant BSc (Hons), MSc, MCIWEM who has over 20 years of experience in hydrology, flood risk and the planning process. He is a member of the British Hydrological Society and a Member of the Chartered Institute of Water and Environmental Management (CIWEM). He has written more than 1,000 Flood Risk Assessments / Flood Consequence Assessments and Environmental Statements and has taken training courses in the Flood Estimation Handbook (FEH), Urban Hydrology, SuDS, FRAs / FCAs, water quality and planning. He has successfully delivered both site and strategic assessments for a range of private and public sector clients nationwide including developers, planning consultants, architects, private individuals, local planning authorities and the Environment Agency.

Terms of Reference

5.13. Within this chapter the term 'study area' relates to both the Site and its nearby relevant hydrological features (extending at least to 2 km from the Site), including the catchments of local watercourses, surface water features and dependant habitats. It also includes hydrogeological features, including underlying geology, aquifers and nearby groundwater dependent features.

LEGISLATION, POLICY & GUIDANCE

5.14. The development has been assessed against existing national, regional and local policies and guidance. The assessment has been collated and considered based upon the following legislation, planning policy and guidance:

National Policies & Guidance

- EU Directive on the Assessment and Management of Flood Risks [2007/60/EC][1] implemented in Wales via the Flood and Water Management Act 2010[2] and the Flood Risk Regulations 2009[3];
- The Water Framework Directive [2000/60/EC][4] as implemented in Wales via the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017[5];
- The Groundwater Directive (GWD) (2006/118/EC)[6] as implemented by the Groundwater (Water Framework Directive) (Wales) Direction 2016 and Environmental Permitting (England and Wales) Regulations 2016.
- Future Wales – the National Plan 2040 (NP)[7].
- Planning Policy Wales 12th Edition (PPW), 2024[8].

[1] European Parliament (2007). Directive 2007/60/EC of the European Parliament and of the Council establishing a framework for the assessment and management of flood risks. Available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32007L0060

[2] UK Government (2010). Flood Water a Management Act 2010. Available at https://www.legislation.gov.uk/ukpga/2010/29/contents

[3] UK Government (2009). The Flood Risk Regulations 2009. Available at http://www.legislation.gov.uk/uksi/2009/3042/contents

[4] European Parliament (2000). Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy ("The Water Framework Directive"). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32000L0060.

[5] UK Government (2017). The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. Available at http://www.legislation.gov.uk/uksi/2017/407/contents/made

[6] European Parliament (2006). Directive 2006/118/EC of the European Parliament and of the Council establishing a framework for the protection of groundwater against pollution and deterioration ("The Water Framework Directive"). Available athttps://www.eea.europa.eu/policy-documents/groundwater-directive-gwd-2006-118-ec

[7] Ministry of Housing, Communities & Local Government, National Planning Policy Framework, Feb 2019. Available at https://gov.wales/sites/default/files/publications/2021-02/future-wales-the-national-plan-2040.pdf

[8] Wales Government, Planning Policy Wales 12th Edition, 2024, Available at https://www.gov.wales/planning-policy-wales

- Technical Advice Note 15: Development and Flood Risk (TAN15), 2004[9].
- Sustainable Drainage (SuDS) Statutory Guidance[10].
- Water Industry Act, 1991[11].
- Water Resources Act, 1991 as amended[12].
- Land Drainage Act, 1991[13].
- Water Act, 2003[14].

Regional & Local Policies & Guidance

- Rhondda Cynon Taf Council Local Development Plan 2006 - 2021[15]

Assessment of Relevant Policies, Guidance & Legislation

Flood and Water Management Act 2010

5.15. The legislative framework for flood and coastal risk management is set out principally in the Flood and Water Management Act 2010. The legislation endorses the principle of an integrated approach to water and drainage management. The intentions of the Act are summarised below:

- Deliver improved security, service and sustainability for people and their communities;
- Clarify responsibilities for managing all sources of flood risk;
- Protect essential water supplies by enabling water companies to control more non-essential uses of water during droughts;
- Modernise the law for managing the safety of reservoirs;

[9] Wales Government, Technical Advice Note 15: Development and Flood Risk, 2004 https://gov.wales/sites/default/files/publications/2018-09/tan15-development-flood-risk.pdf

[10] Welsh Government, Sustainable Drainage (SuDS) Statutory Guidance, 2019, Available at https://www.monmouthshire.gov.uk/app/uploads/2020/01/Statutory-Guidance.pdf

[11] Water Industry Act 1991, Available at https://www.legislation.gov.uk/ukpga/1991/56/contents

[12] Water Resources Act, 1991 as amended, Available at https://www.legislation.gov.uk/ukpga/1991/57/contents

[13] Land Drainage Act, 1991, Available https://www.legislation.gov.uk/ukpga/1991/59/contents

[14] Water Act, 2003, Available at https://www.legislation.gov.uk/ukpga/2003/37/contents

[15] Rhondda Cynon Taf County Borough Council (2011). Local Development Plan up to 2021 Adopted March 2011. Available at https://www.rctcbc.gov.uk/EN/Resident/PlanningandBuildingControl/LocalDevelopmentPlans/RelateddocumentsLDP20062021/AdoptedLocalDevelopmentPlan.pdf

- Encourage more sustainable forms of drainage in new developments through new arrangements for adoption and future operation of such features; and
- Make it easier to resolve misconnections to sewers.

Flood Risk Regulations 2009

5.16. The Flood Risk Regulations transpose the EC Floods Directive into domestic law and implement its provisions.

5.17. The aim of the European Floods Directive is to reduce and manage the risks that floods pose to human health, the environment, cultural heritage and economic activity. The directive sets out requirements for the UK Government (and all other European Union members) to assess and map flood risk from all major rivers. Preliminary Flood Risk Assessments (PFRAs) have been produced by all Lead Local Flood Authorities, with the flood mapping stage completed by 2013. By 2015, Flood Management Plans will need to be produced, focussing on flood prevention, protection and preparedness.

The EU Water Framework Directive 2000

5.18. The Water Framework Directive (WFD) 2000/60/EC is a European Union directive designed to improve and integrate the way water, from all sources, is managed throughout Europe. In the UK, much of the implementation work is undertaken by competent authorities such as the Environment Agency and Local Authorities. It came into force in December 2000 and was transposed into UK law in 2003 via the Water Environment (Water Framework Directive) (England and Wales) 2017 Regulations. Member States are required to achieve good chemical and ecological status for their inland and coastal waters by 2015.

The Groundwater Directive 2006

5.19. The Groundwater Directive (GWD) (2006/118/EC)[16] is a European Union law that protects groundwater from pollution and deterioration and was adopted into Welsh law in 2006.

Future Wales – the National Plan 2040 (NP)

5.20. Future Wales – the National Plan 2040 (NP)[17] is the national development framework, setting the direction for development in Wales to 2040. It is a development plan with a strategy for addressing key national priorities through the planning system, including sustaining and

[16] European Parliament (2006). Directive 2006/118/EC of the European Parliament and of the Council establishing a framework for the protection of groundwater against pollution and deterioration ("The Water Framework Directive"). Available athttps://www.eea.europa.eu/policy-documents/groundwater-directive-gwd-2006-118-ec

[17] Ministry of Housing, Communities & Local Government, National Planning Policy Framework, Feb 2019. Available at https://gov.wales/sites/default/files/publications/2021-02/future-wales-the-national-plan-2040.pdf

developing a vibrant economy, achieving decarbonisation and climate-resilience, developing strong ecosystems and improving the health and well-being of our communities.

5.21. Policy 8 (Flooding) states that "*the Welsh Government will work with Flood Risk Management Authorities and developers to plan and invest in new and improved infrastructure, promoting nature-based solutions as a priority*'. It goes on to state that '*it must be ensured that projects do not have adverse impacts on international and national statutory designated sites for nature conservation and the features for which they have been designated."*

Planning Policy Wales (PPW): Edition 12

5.22. Planning Policy Wales (PPW) Edition 12 was adopted by the Welsh Government in February 2024. This replaced the previously adopted PPW and sets out the land use planning policy for Wales. Chapter 6 of the PPW outlines the planning policy in relation to 'Distinctive and Natural Places'. With regards to water and flood risk, it states:

"The Welsh Government aims to secure the provision of water services whilst minimising adverse impacts on the environment, amenity, health and communities, in light of the consequences of climate change. Development which is poorly designed or badly located can exacerbate problems associated with resource depletion, exposure to surface water flooding and diffuse pollution. The planning system should:

- *protect and improve water resources by promoting and encouraging increased efficiency and demand management of water as part of new developments, particularly in those areas where water resources may be under pressure or may not be available and where failure of water quality standards needs to be addressed;*
- *ensure that the infrastructure networks, including nature-based solutions on which communities and businesses depend is adequate to accommodate proposed development, and takes into consideration the impacts of climate change, so as to minimise risk to human health and the environment and prevent pollution at source;*
- *ensure sustainable drainage systems are an integral part of design approaches for new development; and*
- *ensure the protection of the quantity and quality of surface and ground water supplies is taken into account as part of development proposals."*

Technical Advice Note 15 Development and Flood Risk (TAN15)

5.23. TAN15 (published in 2004) is being replaced by a new TAN15. The current TAN15 Development Advice Maps (DAMs)[18] are being replaced by a new Flood Map for Planning (FMfP)[19]. The existing documents will both be cancelled. These changes will come into effect in the near future.

5.24. TAN15 provides advice on matters including the use of DAMs and FMfP to determine flood risk issues, how to assess the flooding consequences of proposed development and action that can be taken through development plans and development control (management) procedures to mitigate flood risk when planning for new development.

5.25. TAN15 requires a detailed Flood Consequence Assessment (FCA) to be produced for all developments located within DAM zones C1 and C2. Flood Zone B only requires an FCA if site levels are below the extreme (0.1%) flood level (as defined in Technical Guidance TAN15, Figure 1).

5.26. The FMfP are defined as follows:

- Flood Zone 2 - Areas with 0.1% to 1% (1 in 1000 to 1 in 100) chance of flooding in a given year, including the effects of climate change.
- Flood Zone 3 - Areas with more than 1% (1 in 100) chance of flooding in a given year, including the effects of climate change.

5.27. The vulnerability classification of different development types is identified in Figure 2 of TAN15.

Sustainable Drainage (SuDS) Statutory Guidance

5.28. Sustainable drainage systems (SuDS) are designed to mimic natural drainage by managing surface water run-off as close to source as possible.

5.29. Schedule 3 of the Flood and Water Management Act (FWMA) 2010 requires surface water drainage for new developments to comply with mandatory National Standards for sustainable drainage (SuDS).

5.30. From January 7th 2019, all new developments of at least 2 properties or over 100m^2 of construction area will require sustainable drainage to manage on-site surface water. The Surface water drainage systems must be designed and built in accordance with the mandatory standards for sustainable drainage published by Welsh Government.

[18] Natural Resources Wales, Development Advice Map, Available at https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood_Risk/viewers/Flood_Risk/virtualdirectory/Resources/Config/Default&layerTheme=2

[19] Natural Resources Wales, Flood Map for Planning, Available at https://flood-map-for-planning.naturalresources.wales/

5.31. These systems must be approved by the local authority acting in its role as a SuDS Approval Body (SAB) before construction work begins. The SAB will have a duty to adopt compliant systems.

Water Industry Act 1991

5.32. The Water Industry Act relates to the supply of water and the provision of sewerage services and applies to all Sewerage Undertakers.

Water Resources Act 1991 as amended

5.33. The Water Resources Act relates to the National Rivers Authority, whose activities are now assumed by the Environment Agency (now Natural Resources Wales in Wales) and sets out the responsibilities of NRW in relation to water pollution, resource management, flood defence, fisheries, and in some areas, navigation. The Act regulates activities that may affect the water environment. Discharge to controlled waters is only permitted with the consent of NRW. An aim of the Act is to ensure that the polluter pays the cost of the consequences of their discharges. Under the Act, it is an offence to "*cause or knowingly permit poisonous, noxious or polluting matter or any solid waste to enter controlled waters*" unless it is covered by a consent to discharge issued by the Environment Agency. Failure to comply may result in a fine. This includes discharge to surface water drains.

Land Drainage Act 1991

5.34. The Land Drainage Act outlines the constitution of Internal Drainage Boards (IDB) and the powers of the National Rivers Authority (now Natural Resources Wales in Wales). It also includes a definition of watercourses; all rivers and streams and all ditches, drains, culverts, dykes, sewers (other than public sewers) and passages through which water flows.

Water Act 2003

5.35. The Water Act is an act whose provisions are mainly to amend other legislation, such as the Reservoirs Act 1975, Water Industry Act 1991 and the Water Resources Act 1991.

Rhondda Cynon Taf Council Local Development Plan 2006 - 2021

5.36. The Rhondda Cynon Taf Council Local Development Plan 2006 - 2021 (the "LDP") is the adopted plan at present. With the following policies being relevant to this ES chapter.

5.37. Policy AW2 – Sustainable Locations states "*In order to ensure that development proposals on non-allocated sites support the objectives of the plan, development proposals will only be supported in sustainable locations. Sustainable locations are defined as sites that:- …*

5. Do not permit highly vulnerable development and Emergency Services within Zone C2 floodplain. Within Zone C development will be permitted where it can be justified that: - a) It

is necessary to assist the regeneration of a Principal Town or Key Settlement including the key employment objectives, or where development involves a large brownfield site. b) he potential consequences of a flooding event have been considered and found to be acceptable in accordance with national guidance and meet the definition of previously developed land."

5.38. Policy AW8 – Protection and Enhancement of the Natural Environment states "*Rhondda Cynon Taf's distinctive natural heritage will be preserved and enhanced by protecting it from inappropriate development. Development proposals will only be permitted where:…*

2. There would be no unacceptable impact upon features of importance to landscape or nature conservation, including ecological networks, the quality of natural resources such as air, water and soil, and the natural drainage of surface water."

5.39. Policy AW10 – Environmental Protection and Public Health states *"Development proposals will not be permitted where they would cause or result in a risk of unacceptable harm to health and / or local amenity because of:…*

8. Flooding;
unless it can be demonstrated that measures can be taken to overcome any significant adverse risk to public health, the environment and / or impact upon local amenity."

CONSULTATION

5.40. Information regarding the current flood risk at the Site, local flood defences and flood risk has been obtained from Natural Resources Wales and is contained within **Figure 1.4: Annex 1 of Volume 3**.

METHODOLOGY

5.41. The approach to the assessment considers the significance of the likely effects upon the hydrological characteristics of the Site.

Study Area

5.42. The study area used for this assessment includes both the Site and its nearby relevant hydrological features (extending at least to 2 km from the Site), including the catchments of local watercourses, surface water features and dependant habitats. It also includes hydrogeological features, including underlying geology, aquifers and nearby groundwater dependent features.

Assessment Limitations

5.43. In the event that the Proposed Development proceeds with a layout different to the Site Layout Plans shown in **Figure 4: Volume 3**, a revised FCA may be required and subject to environmental reassessment. This would be subject to a scoping exercise at the appropriate time with the revised design details.

5.44. The assessment in this Chapter is reliant on the data presented in the FCA for the Proposed Development and information from Rhondda Cynon Taf Council as the Local Planning Authority (LPA), and as the Sustainable Drainage Approval Body (SAB) and Natural Resources Wales. Natural Resources Wales flood data can change over time. However, it is not considered that the above limitations would have a significant bearing on the outcome of this assessment.

Evaluation Methods

5.45. The following three criteria have been used in evaluating the significance of the effects of the Proposed Development:

- The sensitivity of the receiving water environment is assessed, as defined in **Table 5-1**.
- The magnitude of the effect has been evaluated, as defined in **Table 5-2**.
- The sensitivity of the receiving environment together with the magnitude of the effect defines the significance of the effect prior to application of mitigation measures as outlined within **Table 5-3**.

5.46. Professional judgement is used to assess the findings in relation to each of these criteria to give an assessment of significance for each effect. This approach has been used to inform the assessment of predicted effects.

5.47. The assessment takes into account any inherent mitigation measures to be applied in the implementation of the development proposals.

5.48. The significance of effects is determined by considering the magnitude of the effect against the sensitivity of the environmental feature. A matrix is used to combine magnitude and sensitivity to generate the overall level of the effect for each receptor, as illustrated in **Table 5-3**.

Table 5-1: Value / Sensitivity Assessment

Receptor Value / Sensitivity	Receptor Type
High	Receptor with a high quality and rarity, regional or national scale and limited potential for substitution / replacement. Inner Source Protection Zone (Zone 1). Site of Special Scientific Interest (SSSI) or Special Area of Conservation (SAC). Excellent water quality. Large scale industrial agricultural abstractions >1000 m^3/day within 2 km downstream, or abstractions for public drinking water supply. Designated salmonid fishery and / or salmonid spawning grounds present. Watercourse widely used for recreation, directly related to watercourse quality (e.g. swimming, salmon fishery etc.) within 2 km downstream. Conveyance of flow and material, main river >10 m wide. Land with more than 1% (1 in 100) chance of flooding in a given year, including the effects of climate change i.e. Flood Zone 3.
Medium	Receptor with a high quality and rarity, local scale and limited potential for substitution / replacement or receptor with a medium quality and rarity, regional or national scale and limited potential for substitution / replacement. Outer Source Protection Zone (Zone 2). Principal Aquifer.

	Good water quality. Large scale industrial agricultural abstractions 500-1000 m^3/day within 2 km downstream. Surface water abstractions for private water supply for more than 15 people. Designated salmonid fishery and / or cyprinid fishery. Watercourse used for recreation, directly related to watercourse quality (e.g. swimming, salmon fishery etc.). Conveyance of flow and material, main river >10 m wide. Land with more than 1% (1 in 100) chance of flooding in a given year, including the effects of climate change i.e. Flood Zone 3.
Low	Receptor with a medium quality and rarity, local scale and limited potential for substitution / replacement or receptor with a low quality and rarity, regional or national scale and limited potential for substitution / replacement. Total Catchment Source Protection Zone (Zone 3). Secondary Aquifer. Fair water quality. Industrial / agricultural abstractions 50-499 m^3/day within 2 km downstream. Designated cyprinid fishery or undesignated for fisheries - Occasional or local recreation (e.g. local angling clubs). Groundwater abstractions 50-500 m^3/day - Private water supplies present. Designated cyprinid fishery, salmonid species may be present and catchment locally important for fisheries. Watercourse not widely used for recreation, or recreation use not directly related to watercourse quality. Land with 0.1% to 1% (1 in 1000 to 1 in 100) chance of flooding in a given year, including the effects of climate change i.e. Flood Zone 2.
Negligible	Receptor with a low quality and rarity, local scale and limited potential for substitution / replacement. No Source Protection Zone. Unproductive Strata.

	Environmental equilibrium stable and resilient to changes that are greater than natural fluctuations, without detriment to its present character. Polluted / poor water quality. Industrial / agricultural abstractions < 50 m^3/day within 2 km downstream. Fish sporadically present or restricted, no designated fisheries; not used for recreation. Watercourse < 5 m wide. Area does not flood / is located in Flood Zone 1. Receptor heavily engineered or artificially modified and may dry up during summer months.

Impact Assessment Methods

5.49. Magnitude of impact, based on the change that the Proposed Development would have upon the resource / receptor, is considered within the range of high, medium, low, negligible. Consideration is given to scale, duration of impact / effect (e.g. for construction, short-term for 1-2 years, medium-term for 3-5 years, long-term for 5 years and greater, and permanent, dependent upon project timeframes) and extent of Proposed Development with reference to the definitions in Table 5-2.

Table 5-2: Magnitude of Impact

Magnitude	Description
High	**Adverse:** Increase in peak flood level (> 100 mm); loss of fishery; deterioration in surface water ecological or chemical WFD element status or groundwater or quantitative WFD element status. **Beneficial:** Creation of additional flood storage and decrease in peak flood level (> 100 mm), increase in productivity of size of fishery; improvement in surface water ecological or chemical WFD element status; improvement in groundwater qualitative or quantitative WFD element status.
Medium	**Adverse:** Increase in peak flood level (> 50 mm); partial loss of fishery; measurable decrease in surface water ecological or chemical quality or flow with potential for deterioration in surface waste WFD element status or groundwater or quantitative WFD element status. Reversible change in the yield or quality of an aquifer, such that existing users are affected, with potential for deterioration in WFD element status.

	Beneficial: Creation of additional flood storage and decrease in peak flood level (> 50 mm), measurable increase in surface water ecological or chemical quality or flow with potential for WFD element status to be improved. Measurable increase in the yield or quality of an aquifer, benefiting existing users, with potential for WFD element status to be improved. Improvement in groundwater qualitative or quantitative WFD element status.
Low	**Adverse:** Increase in peak flood level (> 10 mm); measurable decrease in surface water ecological or chemical quality or flow; decrease in yield or quality of aquifer, not affecting existing users or changing any WFD element status. **Beneficial:** Creation of flood storage and decrease in peak flood level (> 10 mm); measurable increase in surface water ecological or chemical quality; increase in yield or quality of aquifer not affecting existing users or changing any WFD element status. Measurable but limited change in a ground water supply reliability and quality.
Negligible	Negligible change to peak flood level (< +/- 10 mm); discharges to watercourse or changes to an aquifer which lead to no change in the attribute's integrity and / or in a ground water supply reliability and quality.

Significance of Effects

5.50. The predicted level of effect is based upon the consideration of magnitude of impact and sensitivity of the resource / receptor to come to a professional judgement of how important the effect is.

5.51. The sensitivity of the receiving environment together with the magnitude of the effect defines the level of the effect prior to application of additional mitigation measures, as outlined within Table 5-3.

5.52. Likely effects are therefore concluded to be of major, moderate, minor or negligible. The shaded boxes in Table 5-3 represent those effects that are considered to be significant in terms of the EIA Regulations.

Table 5-3: Level of Effect

Receptor Sensitivity	Magnitude of Effect			
	High	Medium	Low	Negligible
High	Substantial	Major	Moderate	Negligible

Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

BASELINE CONDITIONS

5.53. This section identifies the current drainage and flood risk conditions of the Site and the study area.

5.54. The sources of information used in this desktop study are listed in **Table 5-4**.

Table 5-4: Data Sources

Topic	Sources of Information
Topography	Ordnance Survey Maps Site topographic survey
Geology	British Geological Survey (BGS) Bedrock and Superficial Geological Mapping[20]
Hydrogeology	Natural Resources Wales online data Relevant scientific literature
Hydrology	Flood Estimation Handbook Webservice[21] National Soil Resource Institute Seascapes Map[22] Natural Resources Wales DAM and FMfP mapping Flood Consequence Assessment Rhondda Cynon Taf Council Preliminary Flood Risk Assessment (PFRA)[23] Rhondda Cynon Taf Council Strategic Flood Risk Assessment[24] Rhondda Cynon Taf Council Flood Risk Management Strategy[25]

[20] BGS Geology of Britain Map, Available at http://mapapps.bgs.ac.uk/geologyofbritain/home.html

[21] Flood Estimation Handbook Webservice, Available at https://fehweb.ceh.ac.uk/

[22] Cranfield Soil and Agrifood Institute, Soilscapes website. Available at http://www.landis.org.uk/soilscapes/

[23] Rhondda Cynon Taf County Borough Council (2011). Preliminary Flood Risk Assessment. Available at https://www.rctcbc.gov.uk/EN/Resident/ParkingRoadsandTravel/Roadspavementsandpaths/FloodAlleviation/RelatedDocuments/PreliminaryFloodRiskAssessment.pdf

[24] Rhondda Cynon Taf County Borough Council (2008), Strategic Flood Risk Assessment, Available at: https://www.rctcbc.gov.uk/EN/Resident/PlanningandBuildingControl/LocalDevelopmentPlans/LDPEvidenceBaseLibraryandAnnualMonitoringRe/RelateddocumentsEvidenceBase/EB59a.pdf

[25] Rhondda Cynon Taf County Borough Council, Local Flood Risk Management Strategy (2013) Available at: https://www.rctcbc.gov.uk/EN/Resident/ParkingRoadsandTravel/Roadspavementsandpaths/FloodAlleviation/RelatedDocuments/localfloodriskmanagementstrategyv1.pdf

	Rhondda Cynon Taf Council Flood Risk Management Plan[26]

Topography

5.55. A topographical survey was undertaken at the Site. The lowest point within the Site of 142 metres Above Ordnance Datum (m AOD) is in the southern corner of Field 30. The high point at 328 m AOD is located on the northeast boundary of Field 14. All fields slope down to the south and west across the Site.

Catchment Hydrology

5.56. The Site lies within the Severn River Basin District. Within this, the Site lies in the River Taf catchment.

5.57. The River Taf flows in a southeast direction and eventually discharges into the mouth of the River Severn approximately 18.7 km to the southeast of the Site.

5.58. The Site itself has a number of small watercourse / field drains, some of which eventually discharge into the River Taf through the local drainage network and other drains lead discharge into the Nant Lonydd. The Nant Lonydd eventually converges with the River Taf approximately 2.1 km to the southeast of the Site.

Rainfall

5.59. The Site is located within an area of high rainfall. The 1961-1990 Standard Average Annual Rainfall (SAAR) for the Site is 1519 mm per annum. The UK national average is 832 mm per annum.

Ground Conditions

5.60. The geological conditions of the Site were identified utilising the BGS Spatial Resources online geological mapping system. The Site is underlain by the Birthdir Member – mudstone, siltstone and sandstone and the Hughes Member – sandstone, siltstone and sandstone. The Birthdir Member was formed between 309.5 and 308 million years ago during the Carboniferous period. The Hughes Member was formed between 309.5 and 308 million years ago during the Carboniferous period. This is overlain by Till, Devensian – diamicton in some areas of the Site. The Till was formed between 116 and 11.8 thousand years ago during the Quaternary period.

[26] Rhondda Cynon Taf County Borough Council, Flood Risk Management Plan (2015) Available at: https://www.rctcbc.gov.uk/EN/Resident/ParkingRoadsandTravel/Roadspavementsandpaths/FloodAlleviation/RelatedDocuments/FloodRiskManagementPlanFinal.pdf

5.61. A borehole log located within 0.5 km of the Site confirms that drift is located down to 4.5 m with mudstone found until approximately 10 m deep.

5.62. The Soilscapes map has been utilised to obtain soil data. It classes the soil at the Site as f*reely draining slightly acid loamy soils over rocks' and 'Slowly permeable wet very acid upland soils with a peaty surface.*

5.63. According to the Wallingford Procedure 'Winter Rain Acceptance Potential' (WRAP) map[27], the soil classification for the Site is Class 3. This soil class has a Standard Percentage Runoff (SPR) of 0.37 and will likely provide average infiltration opportunities.

Hydrogeology

5.64. Where present the superficial aquifer is defined as a Secondary Undifferentiated Aquifer which is assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

5.65. The bedrock aquifer is defined as a Secondary A 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.

5.66. The Site is not located within a Source Protection Zones.

5.67. According to the BGS maps, the groundwater vulnerability across the Site is considered to be 'high'.

Licensed Discharges to Controlled Waters

5.68. There are no discharges of treated or untreated effluent to controlled waters under the Water Resources Act 1991 within 2 km of the Site.

Groundwater Abstractions

5.69. There are no licensed groundwater abstractions within 2 km of the Site, this is for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, between two points (line data) or a larger area.

[27] UK Sustainable Drainage and Guidance Tools. Greenfield Runoff Estimation for the Sites. Available at: http://www.uksuds.com/greenfieldrunoff_js.htm

Surface Water Abstractions

5.70. There are no licensed surface water abstractions within 2 km of the Site, this is for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, a stretch of watercourse or a larger area.

Potable Water Abstractions

5.71. There are no licensed potable water abstractions within 2 km of the Site, this is for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, a stretch of watercourse or a larger area.

Surface Water Quality

5.72. The WFD surface quality information is shown in **Table 5-5**.

Table 5-5: Surface Water Quality

Name	Location	Parameter	2016
Taff – confluence Rhondda Road to Castle Street	910 m W	Overall Rating	Moderate
		Chemical Rating	Fail
		Ecological Rating	Moderate

Groundwater Water Quality

5.73. The WFD groundwater quality information is shown in **Table 5-6**.

Table 5-6: Groundwater Quality

Name	Location	Parameter	2017
SE Valleys Carboniferous Coal Measures	On Site	Overall Rating	Poor
		Chemical Rating	Poor
		Ecological Rating	Good

Historic Flooding

5.74. The Natural Resources Wales recorded flood extents[28] shows that no part of the Site has been subject to flooding historically, with the closest area of historic flooding occurring along the River Taf to the south.

5.75. A review of the SFRA has confirmed that there are no specific records of flooding within the Site.

5.76. It is noted that the Rhydyfelin Flood Alleviation Scheme was completed in May 2013 to help reduce the risk of flooding to people and properties within Rhydyfelin. Further works have been completed along Bryn Tail Lane, Masefield Way and Cemetery Road to help alleviate the flooding impact upon Rhydyfelin and Glyntaff.

Flood Risk and Drainage

5.77. The FCA and DS, presented within **Annex 1: Volume 3**, provides the following summary:

5.78. *"Within the DAM and Flood Map for Planning, it shows the Site to be wholly situated within Flood Zone A and Flood Zone 1. Therefore, in accordance with TAN15, the Site is situated in an area that has less than 1 in 1000 (0.1%) (plus climate change) chance of flooding in a given year. of fluvial or tidal / coastal flooding. Consequently, a justification test is not required for this Proposed Development, however a Drainage Strategy will still be required to ensure that the Proposed Development will not increase flood risk elsewhere.*

5.79. *In addition to fluvial and coastal flood risk, NRW also provide surface water flood maps. This indicates areas across the Site, which appear to be restricted mainly to the field drains except for a small area of surface water flooding in Field 37 and 38.*

5.80. *Where the NRW map demonstrates areas of surface water risk, the topographical survey, as well as aerial maps, were studied to determine if there will indeed be surface water flooding within the Site. There is an area located within Field 33 and 35 that is at risk of surface water flooding which contains only solar panels. As the solar panels will be pile driven into the ground and raised to a height of at least 0.8m off the ground, it will not increase the flood risk elsewhere and will remain safely operational during time of a flood. Therefore, this would be appropriate and in line with the TAN15 guidance.*

5.81. *This soil class has a SPR of 0.37 which suggests that they provide excellent opportunity for infiltration. Prior to the detailed drainage design stage, which should be conditioned as part of any planning consent, infiltration testing will be undertaken in accordance with BRE 365. Should infiltration drainage not be appropriate, the drainage design will need be altered and discharge locations agreed with a revised limiting discharge rate appropriate to the drainage*

[28] Natural Resources Wales, Historic Flood Extents, Available at https://lle.gov.wales/catalogue/item/HistoricFl/?lang=en

design. A limiting discharge rate of 2 l/s would seem appropriate; however, this will be agreed with the council post consent when the detailed drainage design is being undertaken.

5.82. *It is proposed to construct soakaway channels / filter drains within the Site. The location of the channels has been chosen to intercept flows before they enter the existing drainage system surrounding the site.*

5.83. *The proposed soakaways will have an overall combined length of approximately 3,125m, with a base width of 0.5m, a 0.5m design depth and a 0.15m freeboard. They will be filled with crushed rock with a void ratio of 20%.*

5.84. *It will provide a total storage volume of approximately 156.25m^3. This is greater than the volume of additional runoff generated as a result of the impermeable buildings (60.0m^3). It is therefore considered that this adequately mitigates the increase in flow rates as a result of the minor increase in impermeable area and provides improvement.*

5.85. *By providing far more storage capacity than is required will improve the current flood concerns within the town of Rhydyfelin by ensuring the run-off rate has a net reduction thanks to the implementation of the drainage strategy.*

5.86. *Should infiltration drainage not be appropriate then the discharge point will be into the existing site field drainage close to each of the infiltration drains.*

5.87. *Additional drainage measures to be implemented on-site include the following:*

- ***Solar Panels:*** *current grass cover is to be retained or reinstated adjacent to and under panels in order to maximise bio-retention;*
- ***Access Tracks:*** *access tracks are to be unpaved and constructed from local stone. Temporary swales or similar shall be utilised to collect runoff from access tracks with discharge to ground through percolation areas. Where swales are utilised, frequent check dams formed from gravels and other excavated material should be undertaken; and*
- ***Transformer Stations:*** *the scale of these types of structures is unlikely to warrant a formalised drainage system. Runoff from this infrastructure and any associated hard standing should be directed to a percolation area for discharge to ground. Should surface water accumulate around any of these locations then a simple soakaway can be constructed to allow water soak into the underlying subsoils.*

5.88. *The FCA and DS has therefore demonstrated that the Proposed Development will* ***not increase flood risk*** *away from the Site during the construction, operation and decommissioning phases. The Proposed Development is therefore considered to be acceptable in planning policy terms."*

Environmentally Sensitive Sites

5.89. The Site is not located within a Nitrate Vulnerable Zone.

5.90. There are 75 Designated Ancient Woodlands within 2 km of the Site, with the nearest being located on the Site and there is 1 Local Nature Reserve within 2 km of the Site which is known as Craig-Yr-Hesg.

Recreation and Fisheries

5.91. There are no designated fishery waterbodies and/or watercourses used for recreation within 2 km of the Site.

POTENTIAL EFFECTS

5.92. This section identifies the receptors that might be affected and their associated level of sensitivity prior to the implementation of mitigation.

5.93. Based on the baseline conditions presented above, **Table 5-7** presents the sensitive receptors which have been considered in the following assessment, along with their sensitivity to change which is based on the general criteria outlined.

Table 5-7: Sensitive Receptors

Receptor	Medium	Sensitivity	Description
Flood Risk (all sources including river, surface water, groundwater, etc.)	Construction workers	Low	Flooding may impact upon construction workers, but their sensitivity is lowered as a result of their competency in their role as well as operating in teams and/or prescribed systems.
	Residents / users of the surrounding area	Medium	Residents / users of the surrounding areas generally have little awareness of flood risk and residents vulnerability is high given their presence overnight (via sleeping accommodation).
	Future site visitors (staff)	Low	The vulnerability is reduced as all buildings are located outside and above flood risk areas.
Watercourses	Water quantity / quality / supply	Medium	This would only be felt over short distance of the watercourses compared to the overall length of the watercourses. Water quality issues would also be diluted rapidly within the watercourses.

Construction Phase

5.94. Potential effects that may arise during the construction phase of the Proposed Development are outlined below.

Impact on Flood Risk - Construction Workers

5.95. The surface water drainage regime may be altered during this stage, as a result of new groundworks and the rate of runoff may potentially be altered as a result of new ground levels. It is expected that if there is groundwater encountered, it is likely to be in limited shallow quantities. Therefore, ground works and excavations are unlikely to affect drainage and associated potential flooding. Other potential sources of flooding have also been investigated and no significant issues have been identified. Additionally, on and off-site flood risk may increase due to increased runoff due to soil compaction on-site.

5.96. The sensitivity of construction workers to the risk of flooding is considered low. This is due to their presence on Site only during working hours, their awareness and training.

5.97. The probability of this occurring is unlikely, the extent is likely to be short, on a temporary basis and is likely to be reversible. The magnitude of impact is **medium** and therefore, without mitigation the increase in flood risk during construction is considered to have a **minor adverse** effect.

Impact on Flood Risk - Residents/Users of the Surrounding Area

5.98. The residents of the surrounding area may sleep in the area and lack the knowledge and understanding of the activities undertaken at the Site during construction works. However, there are very few residential properties or other properties within close vicinity of the Site that could be affected by flooding.

5.99. The rate of surface water runoff may be altered as a result of amended ground levels. Without the management of surface water runoff, there could be surface water flooding conveyed to the surrounding areas. A temporary increase in impermeable area across the Site could result in increased rates and volume of runoff that would not otherwise occur. However, any effect off Site would be mitigated by the distance therefore the sensitivity to the risk of flooding is considered medium.

5.100. The probability of this occurring is unlikely, the extent is likely to be short, on a temporary basis and is likely to be reversible. The magnitude of impact is **low** and therefore, without mitigation measures the increase in flood risk during construction is considered to have a **minor adverse** effect.

Watercourses - Water Quantity / Quality / Supply

5.101. The water environment and the flora and fauna that it supports may be adversely affected by excessive levels of fine sediment contained within surface water runoff originating from construction activities associated with the Proposed Development. Furthermore, the construction activities would involve the excavation and movement of soil/ground at the Site and therefore increase the potential for leaching of pollutants into surface water receptors.

5.102. Runoff laden with fine sediment is principally generated by rain falling onto land that has been cleared of any vegetation and the ground potentially compacted, preventing infiltration. Other potential sources of water containing high levels of fine sediment at the Site include runoff from material stockpiles, dewatering of excavations, mud on site and local access roads, and generated as part of the construction works themselves (e.g. vehicle washing).

5.103. Generally, excessive fine sediment in runoff is chemically inert and affects the water environment through smothering of riverbeds and plants, changing water quality (e.g. increased turbidity); consequently it can have physical impacts on aquatic organisms.

5.104. Without mitigation in place the watercourses would be susceptible to sediment laden water affecting water quality. Suspended fine sediment has the potential to effect fisheries and cause a measurable decrease in ecological and chemical quality on the nearby watercourses, although this would only be felt over short distance of the watercourses compared to the overall length of the watercourses. Suspended fine sediment would also be diluted rapidly within the watercourses.

5.105. A number of potentially polluting materials may be used during the construction phase. These include oils, diesels, fuels, hydraulic fluids, cement/concrete, heavy metals/ metalloids, bentonite, solvent/paints and flocculants etc. The accidental spillage of these may result in the contamination of surface water or groundwater.

5.106. The sensitivity of the receiving watercourses is medium. The probability of this occurring is likely, the extent is likely to be short, on a temporary basis and is likely to be reversible. The magnitude of impact is **medium** and therefore, without mitigation measures the increase inf flood risk during construction is considered to have a **moderate adverse** effect.

Operational Development

5.107. Potential effects that may arise during the operational phase of the Proposed Development are outlined below.

Impact on Flood Risk - Future Site Visitors (staff)

5.108. The surface water drainage regime may be altered during this stage, as a result of new groundworks and the rate of runoff may potentially be altered as a result of new ground levels.

5.109. Any alteration of ground levels or obstructions placed within areas considered to be at risk of flooding during operation therefore has the potential to increase flood risk to the Site and elsewhere. Additionally, on and off-site flood risk may increase due to increased runoff due to an increase in impermeable areas.

5.110. However, the Proposed Development will be located within DAM Zone A and FMfP Flood Zone 1 and a Drainage Strategy has been developed to manage the surface water runoff.

5.111. The sensitivity of visitors to the risk of flooding is considered to be low. This is due to their presence on Site only during working hours, their awareness and training.

5.112. The probability of this occurring is unlikely, the extent is likely to be short, on a temporary basis and is likely to be reversible. The magnitude of impact is **medium** and therefore, without mitigation the impact flood risk is considered to have a **minor adverse** effect.

Impact on Flood Risk - Residents/Users of the Surrounding Area

5.113. The residents of the surrounding area may sleep in the area and lack the knowledge and understanding of the activities undertaken at the Site during operation of the Site. However, there are few residential properties or other properties within close vicinity of the Site.

5.114. The rate of surface water runoff may be altered as a result of amended ground levels. Without the management of surface water runoff, there could be surface water flooding conveyed to the surrounding areas. An increase in impermeable area across the Site could result in increased rates and volume of runoff that would not otherwise occur. However, any effect off the Site would be mitigated by the distance therefore the sensitivity to the risk of flooding is considered to be low.

5.115. The incorporated mitigation measures noted above include those appropriate for climate change predictions.

5.116. The probability of this occurring is unlikely, the extent is likely to be short, on a temporary basis and is likely to be reversible. The magnitude of impact is **low** and therefore, without mitigation measures the increase inf flood risk is considered to have a **minor adverse** effect.

Watercourses - Water Quantity / Quality / Supply

5.117. A number of potentially polluting materials may be used during the operation of the Proposed Development. These include oils and hydraulic fluids. The accidental spillage of these may result in the contamination of surface water.

5.118. Other potential sources of pollution include oils and fuels from vehicles operating within the Site and also potential increases in suspended sediment loads from runoff from roads and hardstanding areas. The surface water drainage system will include petrol/oil interceptors and potentially proprietary treatment devices that would capture and retain sediment, oils and floatables from stormwater runoff.

5.119. Chemical spillages and suspended fine sediment have the potential effect fisheries and cause a measurable decrease in ecological and chemical quality on the nearby watercourses, although this would only be felt over short distance of the watercourses compared to the

overall length of the watercourses. Chemical spillages and suspended fine sediment would be diluted rapidly within the watercourses.

5.120. The sensitivity of the receiving watercourses is medium. The probability of this occurring is likely, the extent is likely to be short, on a temporary basis and is likely to be reversible. The magnitude of impact is **medium** and therefore, without mitigation measures the increase inf flood risk is considered to have a **moderate adverse** effect.

MITIGATION MEASURES

5.121. The Proposed Development has the potential to affect the hydrology and hydrogeology in the vicinity of the Site, impacting surface water runoff, groundwater levels, flow direction and quality.

5.122. The significance of any potential pollution or changes would be dependent on the nature of the incident, incorporated mitigation measures and sensitivity of the potential receptor.

Construction Phase

Procedures

5.123. The design and implementation of the construction works will be undertaken in accordance with ISO 14001 and industry and regulatory procedures. As such, it is envisaged that the following documents will be prepared and, where appropriate, agreed with the regulatory bodies:

- Outline Construction Environmental Management Plan (OCEMP);
- Drainage Strategy;
- Incidence Response Plan (IRP);
- Environmental training for personnel;
- Record keeping; and,
- The identification, mitigation and remediation of contaminated land.

5.124. The management of runoff during construction is included within the OCEMP (**Annex 2: Volume 3**). In summary, Pollution Prevention Guidance[29] (PPG), Natural Resources Wales

[29] GPP 1 Understanding your environmental responsibilities – good environmental practices (2020).

GPP 2 Above ground oil storage (2018).

GPP 3 Use and design of oil separators in surface water drainage systems (2020).

GPP 4 Treatment and disposal of wastewater where there is no connection to the public foul sewer (2017).

GPP 5: Works and maintenance in or near water (2018).

PPG 6 Working at construction and demolition sites (2012).

GPP 8 Safe storage and disposal of used fuels (2017).

guidance[30] and CIRIA guidance[31] states that the following methods of surface water management should be put in place during the construction phase to ensure pollution, sediment and erosion control.

5.125. Mitigation measures will be included as outlined within the OCEMP (Annex 2: Volume 3), this will incorporate a Drainage Plan which will include:

- 2 m working standoff from the drainage ditches and 5 m from a watercourse to be retained (excluding drainage works);
- Bunds will be used to prevent runoff entering watercourses;
- Compounds will have hard surfacing to prevent infiltration;
- Areas of localised contamination identified during the ground investigation will be remediated/removed as appropriate;
- A procedure will be put in place to manage previously unidentified contaminated ground that is encountered during the works; and,
- Any surplus soil arisings from levelling or excavation works that has visual or olfactory evidence of contamination will be stored in sheeted stockpiles placed on hardstanding or sheeting pending its removal or treatment.

5.126. The Drainage Strategy (Annex 1: Volume 3) proposes to construct soakaway channels/filter drains within the Site. The location of the channels has been chosen to intercept flows before

GPP 13 Vehicle washing and cleaning (2017).

GPP 20: Dewatering underground ducts and chambers (2018).

GPP 21 Pollution incident response planning (2021).

GPP 22 Dealing with spills (2018).

GPP 26 Safe storage - drums and intermediate bulk containers (2019).

[30] Natural Resources Wales Guidance 'Oil storage regulations for businesses' (2015).

Natural Resources Wales Guidance 'Manage water on land: guidance for land managers' (2015).

[31] CIRIA C502 Environmental Good Practice on Site.

CIRIA C532 Control of Water Pollution from Construction Sites.

CIRIA C753 The SuDS Manual.

they enter the existing drainage system surrounding the site. These will be in working order before the construction phase commences.

5.127. The proposed soakaways will have an overall combined length of approximately 3,125 m, with a base width of 0.5 m, a 0.5 m design depth and a 0.15 m freeboard. They will be filled with crushed rock with a void ratio of 20%.

5.128. It will provide a total storage volume of approximately 156.25 m^3. This is greater than the volume of additional runoff generated as a result of the impermeable buildings (60.0 m^3). It is therefore considered that this adequately mitigates the increase in flow rates as a result of the minor increase in impermeable area and provides improvement.

5.129. The size of this attenuation storage has been calculated such that the Proposed Development has the capacity to accommodate the 100-year rainfall event including a 25% increase in rainfall intensity that is predicted to occur as a result of climate change.

5.130. Due to the addition of the temporary construction compound during the construction phase, additional drainage measures will be implemented to help attenuate the increase in surface water flows. Runoff from these areas is anticipated to have high silt loading due to mobilised soils from excavated surfaces, fines from track aggregate and sludge due to traffic.

5.131. Hardstanding runoff will be directed to a swale on the compound's lowest boundary. This drainage scheme will be removed at the end of the construction stage and the area reinstated.

5.132. There is potential for the introduction of contaminated materials to the ground or groundwater due to incorrect storage or spillages of construction materials/fuels. Design of operational pollution prevention measures will be included in the final CEMP. Impacts due to incorrect storage and spillage will be mitigated by the following:

- Design of a drainage for the Site;
- Compounds will comprise hardstanding;
- Environmental training for all personnel;
- Designated re-fuelling areas on hardstanding with interceptor drainage, bunds, plant, nappies or similar;
- Spill kits will be readily available;
- Storage areas for materials will be identified; and,
- Deliveries will be planned in advance.

Excavated and Exposed Ground

5.133. To limit the volume of runoff reaching the exposed ground, runoff diversion or interception devices can be placed upstream. To help prevent pollution from entering a watercourse, silt fences, hay bales or stilling ponds can be placed downstream.

5.134. The extent of all excavations would be minimised as far as is reasonably practicable. During construction activities, surface water flows would be captured through a series of cut-off drains to prevent water entering excavations or eroding exposed surfaces. If dewatering of excavations is required, pumped discharges would be passed through a washout area, settlement/attenuation ponds and silt fences to capture sediments before release to a watercourse/drain.

Stockpiles

5.135. Stockpiles will be located away from a watercourse or site drainage system to prevent leaching of contaminants. Protective coverings will help prevent runoff stripping a stockpile. Concrete should also be stored to prevent release into drains/watercourses.

5.136. Topsoil/subsoil would be stored away from watercourses/drains and on flat lying land (minimum 20 m on flat land). Where this is not possible and it is to be stockpiled for longer than a two-week period, the material would, as soon as possible either be covered with geotextile mats, seeded to promote vegetation growth, or drainage provided to a suitable settlement area.

Plant and Wheel Washing

5.137. Plant wheel washing will take place in designated locations. The area will be tanked and will not be allowed to discharge into a watercourse or infiltrate to groundwater. Some proprietary vehicle washing systems offer a recycling facility, which filter and settle solids, with effluent being pumped back into the system. The solid waste materials from this process need to be treated as contaminated waste due to the high hydrocarbon content.

5.138. Mud deposits would be controlled at entry and exits to the Site using wheel washing facilities and/or road sweepers operating during earthworks or other times as considered necessary.

5.139. Tools and plant would be washed out and cleaned in designated areas within the Site compound where runoff can be isolated for treatment before discharge to surface water drainage under appropriate consent and/or agreement with Natural Resources Wales and / or the LPA, or otherwise removed from the Site for appropriate disposal at a licenced waste management facility.

Access Tracks

5.140. The access tracks will be constructed by stripping the topsoil and laying down a geotextile/geogrid. Crushed rock with a depth of 0.3 m will then be layered and compacted on to the geotextile/geogrid in order to establish the access and site tracks.

5.141. The access tracks will be designed so that the length is kept to a minimum, but still serves its purpose. The gradient will be shallow to prevent increasing runoff velocity and, if possible, bunds and/or discrete ditches constructed to intercept the runoff. Access tracks will be sprayed regularly to keep down dust.

5.142. The movement of construction traffic (to/from and between main construction areas) would be controlled via defined tracks and hardstanding areas.

Oils and Hydrocarbons

5.143. Simple measures can be taken to prevent oil and hydrocarbons becoming pollutants, such as:

- Maintenance of machinery and plant;
- Drip trays;
- Regular checking of machinery and plant for oil leaks;
- Correct storage facilities;
- Check for signs of wear and tear on tanks;
- Care with specific procedures when refuelling;
- Designated areas for refuelling;
- Emergency spill kit located near refuelling area;
- Regular emptying of bunds; and
- Tanks located in secure areas to stop vandalism.

5.144. In accordance with Natural Resources Wales PPGs, all fuel tanks on-site will have a bunded containment of a minimum of 110% fuel tank capacity. There would be no drainage point from the bunded catchment area and tamperproof taps/valves would be installed. All empty fuel containers or drums would be stored within a catchment area prior to their removal from the Site. Oil traps would be incorporated in pertinent drainage systems to prevent accidental

spillage being discharged into the surface runoff. Furthermore, spill kits would be stored at refuelling areas in the event of accidental spillage.

5.145. Best practice measures would be undertaken when refuelling plant and machinery. Where fuelling of large machinery is required, drip trays and absorbent mats or pellets would be utilised. General maintenance would also be undertaken in a designated area and similar contamination prevention measures would be adopted.

5.146. All runoff from the Site would be intercepted and treated to remove sediment, oils and other substances prior to discharge. As construction of the Proposed Development progresses the drainage system would be progressively implemented and would also include pollution prevention control systems.

Watercourses/Drainage Channels

5.147. The gradient of the proposed drainage channels has been carefully considered. If the gradient is made too flat, then the channel is likely to silt-up and reduce the flow capacity of the channel and prevent sediment travelling downstream. Alternatively, if the gradient is made too steep, this can increase erosion of the ditch banks which would result in an increase in the quantity of sediments which migrate downstream.

5.148. The watercourses will be monitored throughout the construction period to identify any enhanced scouring of the catchment surface. If sediment from disturbed ground was found to be excessively mobilised through the minor channels network, this would be mitigated by temporary sediment control measures (e.g. geotextiles/straw bales).

Operational Phase

5.149. Increasing the area of impermeable surface has the potential to increase surface water runoff rates and volumes. An increase in impermeable area across the Site could result in increased rates and volume of runoff that would not otherwise occur. A Drainage Strategy is proposed as part of the Proposed Development, details of which are contained in Annex 1: Volume 3.

5.150. The Drainage Strategy proposes to construct soakaway channels/filter drains within the Site. The location of the channels has been chosen to intercept flows before they enter the existing drainage system surrounding the site. These will be in working order before the construction phase commences.

5.151. The proposed soakaways will have an overall combined length of approximately 3,125 m, with a base width of 0.5 m, a 0.5 m design depth and a 0.15 m freeboard. They will be filled with crushed rock with a void ratio of 20%.

5.152. It will provide a total storage volume of approximately 156.25 m^3. This is greater than the volume of additional runoff generated as a result of the impermeable buildings (60.0 m^3). It

is therefore considered that this adequately mitigates the increase in flow rates as a result of the minor increase in impermeable area and provides improvement.

5.153. The size of this attenuation storage has been calculated such that the Proposed Development has the capacity to accommodate the 100-year rainfall event including a 25% increase in rainfall intensity that is predicted to occur as a result of climate change.

5.154. Storage and handling of fuels and oils at the Site would comply with the Environment Agency PPGs, Natural Resources Wales guidance and CIRIA guidance. Standard pollution prevention procedures to mitigate the risks to surface water quality would be implemented throughout operation of the Proposed Development. Examples of some of the measures that would be adopted at the Site are: bunded fuel storage; provision of spill kits etc.; and minimising the amount of exposed ground.

5.155. In accordance with Natural Resources Wales PPGs, all fuel tanks on-site shall have a bunded containment of a minimum of 110% fuel tank capacity. There would be no drainage point from the bunded catchment area and tamperproof taps/valves would be installed. All empty fuel containers or drums would be stored within a catchment area prior to their removal from the Site. Oil traps would be incorporated in pertinent drainage systems to prevent accidental spillage being discharged into the surface runoff. Furthermore, spill kits would be stored at refuelling areas in the event of accidental spillage.

5.156. Best practice measures would be undertaken when refuelling plant and machinery. Where fuelling of large machinery is required, drip trays and absorbent mats or pellets would be utilised. General maintenance would also be undertaken in a designated area and similar contamination prevention measures would be adopted.

5.157. There will be no detriment to the flood storage capacity of the Site. The overall direction of the movement of water will be maintained within the Proposed Development and surrounding area. The conveyance routes (flow paths) will not be blocked or obstructed. The Proposed Development will have no impact on the movement of floodwater across the Site. There will be no increase in the floodwater levels due to the Proposed Development. There will be no loss in flood storage capacity and no change in the on-site and off-site flood risk.

RESIDUAL EFFECTS

5.158. This section summarises the significance of the anticipated residual environmental effects, which are those that remain after all proposed mitigation measures are implemented for both scenarios. There will be no difference in the residual effects for both scenarios.

Construction Phase

Impact on Flood Risk - Construction Workers

5.159. The implementation of the mitigation measures will result in a negligible effect and **no significant residual effect.**

Impact on Flood Risk - Residents/Users of the Surrounding Area

5.160. The implementation of the mitigation measures will result in a negligible effect and **no significant residual effect.**

Watercourses - Water Quantity/Quality/Supply

5.161. The implementation of the mitigation measures will result in a negligible effect and **no significant residual effect.**

Operational Phase

Impact on Flood Risk - Future Site Visitors (staff)

5.162. The implementation of the mitigation measures will result in a negligible effect and **no significant residual effect.**

Impact on Flood Risk - Residents/Users of the Surrounding Area

5.163. The implementation of the mitigation measures will result in a negligible effect and **no significant residual effect.**

Watercourses - Water Quantity/Quality/Supply

5.164. The implementation of the mitigation measures will result in a negligible effect and **no significant residual effect.**

Decommissioning Effects

5.165. At the end of the operational period, including any extension, decommissioning will take place. This will entail dismantling and removing all the materials and equipment in order to reinstate the land back to its original condition.

5.166. As impacts relating to construction can also occur during decommissioning and likely be similar impacts in nature, a review of the recommendations set forth within the OCEMP (Annex 2: Volume 3) or similar document which supersedes this report should be reviewed prior to decommissioning and implemented where relevant.

CUMULATIVE EFFECTS

5.167. Table 5-8 shows the planning applications which have been assessed for cumulative impact which may have the potential to give rise to likely significant effects on surface water and flood risk.

5.168. The identified planning applications will discharge surface water runoff to a different catchment compared to the Proposed Development and is located far enough away to not pose a significant flood risk to the Proposed Development.

5.169. No developments have been identified which could give rise to likely significant environmental effects on surface water and flood risk for both scenarios.

Table 5-8: Planning Applications Assessed for Cumulative Effects

App. No.	Type of Development	Development Description	Distance (km)
Caerphilly County Borough Council			
DNS 8357463 23/0427/DNS/ 22/1272/DNS	Wind Farm	Construct and operate up to 14 wind turbines and associated infrastructure	0.01
23/0508/FULL	Residential	Erect residential development of 169 residential units and associated works	4.53
22/0072/FULL	Residential	Erect residential development of 153 No. units with new access, landscaping, drainage arrangements and associated works	1.87
23/0470/FULL	Infrastructure	Erect a synchronous condenser with ancillary infrastructure and associated works including access and landscaping, and a cable connection to the adjacent existing substation for the purpose of supplying grid stability to the National Grid as part of their pathfinder 3 initiative	3.41
23/0116/DNS	Solar Farm	Construct and operate a Solar Photovoltaic (PV) Farm - Development of National Significance	2.75

21/0855/FULL	Infrastructure	Install anemometer mast of up to 81.3 m high (including instruments) for 3 years, with associated security fencing	3.94
16/0385/FULL	Wind Farm	Erect a single wind turbine of up to 77 m tip height and associated infrastructure	1.73
Rhondda Cynon Taf County Borough Council			
24/1017/SSO	Wind Farm	8 turbines	5.50
23/0958/FUL	Residential	Proposed residential development of 20 no. dwellings,	3.50
DNS 3280378 22/1129/DNS	Wind Farm	To construct and operate a wind farm consisting of up to 7 wind turbines and associated infrastructure (Development of National Significance)	4.60
15/1635/FUL	Wind Farm	Erection of two wind turbines with a tip maximum height of 125 m, associated infrastructure, transformer cabin and access track, including access via the public highway and across Cribin Ddu Farm and Llwyncelyn Farm	4.46
20/0934/SSO	Residential	Screening Opinion for proposed to develop the site for a new, residential community comprising up to 110 dwellings in a mix of housing types and tenures.	4.37
08/1380/FUL	Quarry	Application for determination of conditions for mineral site. The Environmental Act 1995 (Section 96 and paragraph 9 of schedule 13).	1.71
21/1517/GREG	Education	New Welsh medium primary school, MUGA, sports field, car park, landscaping, and associated infrastructure works.	0.86

22/0425/GREG	Education	Provision of a new 3-16 'all through' school, demolition of some buildings and replacement, refurbishment of others, new staff car park, coach car park and pupil drop off, associated works.	1.53
22/1128/DNS	Solar Farm	Solar park, access and associated development (Development of National Significance)	2.71
18/1402/OUT	Residential	Outline application for residential development (All matters reserved save for access) with associated public open space, landscaping and other associated works	3.86
15/0777/FUL	Solar	Solar photovoltaic park, ancillary development and ecological enhancements	2.80
14/1014/FUL	Solar	Installation of a solar farm and associated infrastructure, including photovoltaic panels, mounting frames, inverters, transformers, substations,	4.44

SUMMARY & CONCLUSION

5.170. This impact assessment has considered the potential adverse impacts on the waterbodies at or near the Site from the Proposed Development. The principal risks during construction are considered to be the potential for excess fine sediment, hydrocarbons, chemicals polluting waterbodies and increase in surface water runoff volumes. This could be exacerbated by the extensive earthworks that would be required at the Site.

5.171. An FCA and DS (**Annex 1: Volume 3**) has been prepared to inform this Chapter of the ES. The FCA data supplied by Natural Resources Wales to assess the flood risk to the Site and the impact of the Proposed Development on flood risk.

5.172. Within the DAM and Flood Map for Planning, it shows the Site to be wholly situated within Flood Zone A and Flood Zone 1. Therefore, in accordance with TAN15, the Site is situated in an area that has less than 1 in 1000 (0.1%) (plus climate change) chance of flooding in a given year. of fluvial or tidal / coastal flooding. Consequently, a justification test is not required for this Proposed Development, however a Drainage Strategy will still be required to ensure that the Proposed Development will not increase flood risk elsewhere.

5.173. In addition to fluvial and coastal flood risk, NRW also provide surface water flood maps. This indicates areas across the Site, which appear to be restricted mainly to the field drains except for a small area of surface water flooding in Field 37 and 38.

5.174. Where the Natural Resources Wales map demonstrates areas of surface water risk, the topographical survey, as well as aerial maps, were studied to determine if there will indeed be surface water flooding within the Site. There is an area located within Field 33 and 35 that is at risk of surface water flooding which contains only solar panels. As the solar panels will be pile driven into the ground and raised to a height of at least 0.8m off the ground, it will not increase the flood risk elsewhere and will remain safely operational during time of a flood. Therefore, this would be appropriate and in line with the TAN15 guidance.

5.175. The Drainage Strategy ensures that a sustainable drainage solution can be achieved, which reduces the peak discharge rate to manage and reduce the flood risk posed by the surface water runoff from the Site as well as providing water quality benefits.

5.176. The Drainage Strategy proposes to construct soakaway channels/ filter drains within the Site. The location of the channels has been chosen to intercept flows before they enter the existing drainage system surrounding the site. These will be in working order before the construction phase commences.

5.177. It will provide a total storage volume of approximately 156.25 m^3. This is greater than the volume of additional runoff generated as a result of the impermeable buildings (60.0 m^3). It is therefore considered that this adequately mitigates the increase in flow rates as a result of the minor increase in impermeable area and provides improvement.

5.178. The size of this attenuation storage has been calculated such that the Proposed Development has the capacity to accommodate the 100-year rainfall event including a 25% increase in rainfall intensity that is predicted to occur as a result of climate change.

5.179. A range of pollution prevention and mitigation measures have been described that would adequately manage the flood risk and water quality/quantity during construction. The assessment concludes that the mitigation measures described would reduce the magnitude of impacts to a negligible level and would prevent significant adverse effects arising.

5.180. In terms of operational impacts, a series of mitigation measures are incorporated into the design to avoid potential adverse effects on flood risk and water quality/quantity. The assessment concludes that the mitigation measures described would reduce the magnitude of impacts to a negligible level and would prevent significant adverse effects arising.

5.181. The findings of this assessment have demonstrated that the development would not result in any significant residual adverse impacts on surface waters, groundwaters or flood risk.

5.182. A summary of the assessment is set out in Table 5-9 overleaf.

Table 5-9: Summary of Effects

Receptor	Medium	Sensitivity	Description of Potential Impact	Proposed Mitigation	Residual Effect	Significant / Not Significant
Construction Phase						
Flood Risk (all sources including river, surface water, groundwater, etc.)	Construction workers	Low	Minor Adverse	OCEMP, Drainage Strategy, IRP	Negligible	Not significant
	Residents / users of the surrounding area	Medium	Minor Adverse	OCEMP, Drainage Strategy, IRP	Negligible	Not significant
Watercourses	Water quantity / quality / supply	Medium	Moderate Adverse	OCEMP, Drainage Strategy, IRP	Negligible	Not significant
Operational Phase						
Flood Risk (all sources including river, surface water, groundwater, etc.)	Construction workers	Low	Minor Adverse	OCEMP, Drainage Strategy, IRP	Negligible	Not significant
	Residents / users of the surrounding area	Medium	Minor Adverse	OCEMP, Drainage Strategy, IRP	Negligible	Not significant
	Future site visitors (staff)	Low	Minor Adverse	OCEMP, Drainage Strategy, IRP	Negligible	Not significant

Watercourses	Water quantity / quality / supply	Medium	Moderate Adverse	OCEMP, Drainage Strategy, IRP	Negligible	Not significant