Awel y Môr Offshore Wind Farm

Category 6: Environmental Statement

Volume 3, Chapter 7: Hydrology, Hydrogeology and Flood Risk

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Contents

7 Hydrology, Hydrogeology and Flood Risk 14

7.1 Introduction 14

7.2 Statutory and policy context 15

7.2.1 European Legislation 16

7.2.2 National Legislation 17

7.2.3 Planning Policy 18

National Policy Statements 18

Planning Policy Wales 19

Technical Advice Note 15 19

Local Planning Policy 32

7.2.4 Other Relevant Guidance 33

7.3 Consultation and scoping 34

7.4 Scope and methodology 41

7.4.1 Study area 41

7.4.2 Baseline data 43

7.4.3 Designated sites 45

7.4.4 Assessment Methodology 45

7.5 Assessment criteria and assignment of significance 46

7.6 Uncertainty and technical difficulties encountered 55

7.7 Existing environment 55

7.7.1 General description and land use 56

7.7.2 Hydrological Setting 57

Rhyl Cut 58

Aberkinsey Drain 58

Glanffyddion Stream (Glanffyddion Cut) 58

Afon Clwyd 59

Clwyd Embankment Drain North and South 59

Gypsey Lane Drain 59

Beeches Drain (into Pont Robin Cut) 59
Tyddyn Isaf Drain 60
Sarn Drain 60
Pengwern Drain 60
Non-main river watercourses 60
Watercourse sensitivity 60
7.7.3 Geological and Hydrogeological Setting and Ground Conditions 63
Groundwater sensitivity 63
7.7.4 Flood Risk 65
Tidal and fluvial flood risk 65
Flood risk from other sources 67
Floodplain sensitivity 68
7.7.5 Water Quality 68
Onshore watercourses, near-shore coastal waters and the Clwyd transitional waters sensitivity 70
7.7.6 Discharge Consents 70
7.7.7 Abstractions 74
7.7.8 Temporal Change 74
7.7.9 Baseline Sensitivity 76
7.7.10 Evolution of the baseline 82
7.8 Key parameters for assessment 82
7.9 Mitigation measures 87
7.10 Environmental assessment: construction phase 92
7.10.1 Construction of cable route infrastructure 93
Potential environmental effects: Water quality 93
Impact on water quality of watercourses 95
Impact on near-shore coastal waters 95
Impact on groundwater quality 96
Potential environmental effects: Flood risk 96

7.10.2 Onshore Substation Construction 99
Potential environmental effects: water quality 99
Impact on watercourses 100
Impact on groundwater quality 100
Potential environmental effects: Flood risk 100
7.10.3 Trenchless Crossing Works 103
Potential environmental effects: Water quality 103
Impact on near-shore coastal water 105
Impact on water quality in watercourses 105
Impact on groundwater 106
Potential environmental effects: Flood risk 106
7.10.4 Landfall installation 109
Potential environmental effects: Water quality 109
Impact on near-shore coastal water 111
Impact on watercourses 111
Impact on groundwater 111
Potential environmental effects: Flood risk 112
7.11 Environmental assessment: operational phase 114
7.11.1 Permanent onshore ECC infrastructure 114
Potential environmental effects 114
Impact on environmental receptors 115
7.11.2 Onshore Substation 115
Potential environmental effects 115
Impact on flood risk 116
Impact on water quality 116
7.11.3 Permanent Landfall site infrastructure 117
Potential environmental effects 117
Impact on watercourses and floodplain 117
7.12 Environmental assessment: decommissioning phase 118
7.12.1 Decommissioning of onshore ECC 118

Potential environmental effects 118
Impact on all environmental receptors 119
7.12.2 Decommissioning of onshore substation 119
Potential environmental effects 119
Impact on all environmental receptors 120
7.13 Environmental assessment: cumulative effects 120
Further mitigation and future monitoring 124
7.14 Inter-relationships 124
7.15 Transboundary effects 125
7.16 Summary of effects 125
7.17 References 134

Figures

Figure 1: Hydrology, hydrogeology and flood risk study area 42
Figure 2: NRW Watercourses and Flood Zones. 61
Figure 3: NRW Watercourses and Flood Zones. 62
Figure 4: Bedrock Geology and Source Protection Zones 64

Tables

Table 1: Legislation and policy context. 21
Table 2: Summary of consultation relating to hydrology, hydrogeology and flood risk. 35
Table 3: Sensitivity/importance of the environment. 48
Table 4: Impact magnitude definitions. 51
Table 5: Matrix to determine effect significance. 54
Table 6: Route sections for the onshore ECC. 56
Table 7: Bathing Water status classification (NRW, 2021) 69
Table 8: Discharge consents within 500m of onshore AyM infrastructure 71
Table 9: Sensitivity values for potential receptors. 77
Table 10: Maximum design scenario. 83
Table 11: Mitigation relating to hydrology and flood risk 87

Table 12: Projects considered within the Hydrology, Hydrogeology and Flood Risk cumulative effect assessment. 121
Table 13: Summary of effects. 127

Glossary of terms

TERM	DEFINITION
The Applicant	Awel y Mor Offshore Wind Farm Limited
Cable Works TCC	Temporary construction compound associated with cable works
Development Consent Order	An order made under the Planning Act 2008 granting development consent for a Nationally Significant Infrastructure Project (NSIP) from the Secretary of State (SoS) for Business, Energy and Industrial Strategy (BEIS).
Order Limits	The extent of development including all works, access routes, TCCs and visibility splays.
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of the impact in question with the sensitivity of the receptor in question, in accordance with defined significance criteria.
ES	Environmental Statement (the documents that collate the processes and results of the EIA).
European sites	Sites designated for nature conservation under the Habitats Directive and Birds Directive, as defined in regulation 8 of the Conservation of Habitats and Species Regulations 2017 and regulation 18 of the Conservation of Offshore Marine Habitats and Species Regulations 2017. These include candidate Special Areas of Conservation, Sites of Community Importance, Special Areas of Conservation and Special Protection Areas.

Evidence Plan	A voluntary consultation process with specialist stakeholders to agree the approach to the Environmental Impact Assessment.
Export Cable Corridor (ECC)	The area(s) where the export cables will be located connecting Landfall to the OnSS and the OnSS to the existing National Grid Bodelwyddan substation.
Grid Connection Point	The point at which the ECC connects to the National Grid (i.e. the existing National Grid Bodelwyddan substation).
Impact	An impact to the receiving environment is defined as any change to its baseline condition, either adverse or beneficial, resulting from the activities associated with the construction, operation and maintenance, or decommissioning of AyM.
Joint Pit	An underground structure where sections of cable are joined within cable ducts.
Landfall	The Landfall denotes the location where the offshore export cables are brought ashore and jointed to the onshore export cables in Transition Joint Bays (TJBs).
Marine Licence	A licence administered under the Marine and Coastal Access Act 2009 for marine works by the Natural Resources Wales (NRW) Marine Licensing Team (MLT) on behalf of the Welsh ministers.
Maximum Design Scenario	The maximum design parameters of the combined project assets that result in the greatest potential for change in relation to each impact assessed.
Mitigation	Commitments made to reduce and/or eliminate the potential for significant effects to arise as a result of the project. Mitigation measures can be

	embedded (part of the project design) or secondarily added to reduce impacts through the assessment process.
Onshore Export Cable Corridor (Onshore ECC)	The proposed cable route which represents a corridor, typically 40 m to 60 m wide, within which the cable trenching, haul road and stockpiling areas associated with cable construction, will be undertaken and the cables will be installed.
Onshore Substation (OnSS)	Where the power supplied from the wind farm is adjusted (including voltage, power quality and power factor as required) to meet the UK System-Operator Transmission-Owner Code (STC) for supply to the existing National Grid Bodelwyddan substation.
OnSS Access Zone	The area which will contain the final OnSS access route (s) (both construction and operational). The route(s) of the construction and operational access within the OnSS Access Zone will be confirmed following detailed design (post consent).
OnSS Construction Area	The area in which the OnSS construction would take place. This area incorporates both the OnSS Footprint and areas of cut and fill required to construct the substation platform.
OnSS Footprint	The footprint for the final OnSS.
PEIR	Preliminary Environmental Information Report. The PEIR is written in the style of a draft Environmental Statement (ES) and forms the basis of statutory consultation. Following that consultation, the PEIR documentation is updated into the final ES that will accompany the applications for the Development Consent Order (DCO) and Marine Licence.

Abbreviations and acronyms

TERM	DEFINITION
AyM	The Awel y Môr Offshore Wind Farm Project.
AEP	Annual Exceedance Probability
aOD	above Ordnance Datum
AyM	Awel y Môr Offshore Wind Farm
CIRIA	Construction Industry Research and Information Association
CCBC	Conwy County Borough Council
CEA	Cumulative Effects Assessment
CMS	Construction Method Statement
CSO	Combined Sewer Overflow
DCC	Denbighshire County Council
Defra	Department for Environment, Food and Rural Affairs
OL	Order Limits
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment
ES	Environmental Statement
ETG	Expert Topic Group
FCA	Flood Consequence Assessment
FRA	Flood Risk Assessment
FRAP	Flood Risk Activity Permit
HDD	Horizontal Directional Drilling

TERM	DEFINITION
MDS	Maximum Design Scenario
MHWS	Mean High Water Springs
MLT	Marine Licensing Team
MLWS	Mean Low Water Springs
NPS	National Policy Statement
NRW	Natural Resources Wales
NSIP	Nationally Significant Infrastructure Project
NVZ	Nitrate Vulnerable Zone
OCoCP	Outline Code of Construction Practice
OnSS	Onshore Substation
PEIR	Preliminary Environmental Information Report
PPW	Planning Policy Wales
PWS	Private Water Supply
rBWD	Revised Bathing Waters Directive
SABP	St Asaph Business Park
SFCA	Strategic Flood Consequence Assessment
SPA	Special Protection Area
SPZ	Source Protection Zone
STC	System-Operator Transmission-Owner Code
TAN	Technical Advice Note
TCC	Temporary Construction Compound
TJB	Transition Joint Bay

TERM	DEFINITION
WFD	Water Framework Directive

Units

UNIT	DEFINITION
km	Kilometer
km^2	Square Kilometer
m	Meter
m^3	Cubic Meter

7 Hydrology, Hydrogeology and Flood Risk

7.1 Introduction

1 This chapter of the Environmental Statement (ES) presents the findings to date of the Environmental Impact Assessment (EIA) of the onshore elements of the Awel y Môr Offshore Wind Farm (AyM) relevant to hydrology, hydrogeology and flood risk. The onshore elements of AyM considered in this assessment are the Landfall area, the Onshore Export Cable Corridor (onshore ECC), the onshore substation (OnSS) and the connection to the existing National Grid Bodelwyddan substation located to the south of St Asaph Business Park (SABP). The assessment considers the construction, operation and maintenance, and decommissioning phases of AyM.

2 Further details on the onshore project infrastructure, installation methodologies and programme can be found in Volume 3, Chapter 1: Onshore Project Description (application ref: 6.3.1).

3 This chapter has been informed by the following ES chapters and technical reports:

- Volume 2, Chapter 2: Physical Processes (application ref: 6.2.2);
- Volume 2, Chapter 3: Marine Water and Sediment Quality (application ref: 6.2.3);
- Volume 3, Chapter 1: Onshore Project Description (application ref: 6.3.1);
- Volume 3, Chapter 5: Onshore Biodiversity and Nature Conservation (application ref: 6.3.5);
- Volume 3, Chapter 6: Ground Conditions and Land Use (application ref: 6.3.6);
- Volume 5, Annex 7.1: Onshore ECC Flood Consequence Assessment (application ref: 6.5.7.1);
- Volume 5, Annex 7.2: Onshore Substation Flood Consequence Assessment (application ref: 6.5.7.2);

- Volume 5, Annex 7.3 to Annex 7.6: Groundwater Risk Assessments (application ref: 6.5.7.3 to 6.5.7.6);
- Volume 4, Annex 3.1: Water Framework Directive Assessment (application ref: 6.4.3.1);
- Volume 5, Annex 5.1: Preliminary Ecological Assessment; and
- Outline Code of Construction Practice (application ref: 8.13).

4 This hydrology, hydrogeology and flood risk chapter:

- Describes the existing baseline established from desk studies, dedicated surveys and consultation;
- Outlines the potential environmental effects on hydrology, hydrogeology and flood risk arising from the onshore elements of AyM, based on the information gathered and the analysis and assessments undertaken to date and assesses whether they are significant (in EIA terms);
- Identifies any assumptions and limitations encountered in compiling the environmental information; and
- Highlights any necessary monitoring and/or mitigation measures which could prevent, minimise, reduce or offset the possible environmental effects identified at the relevant stage in the EIA process.

5 The effects considered in this chapter include those on hydrology, hydrogeology and surface water resources that form part of the onshore physical environment.

7.2 Statutory and policy context

6 This section identifies the legislation and policy that has informed the assessment of effects with respect to hydrology, hydrogeology and flood risk. Further information on policies relevant to the EIA and their status are provided in Volume 1, Chapter 2: Policy and Legislation (application ref: 6.1.2).

7 A summary of the legislation and policies of relevance to this assessment are provided in the sections below and in Volume 1, Chapter 2 (application ref: 6.1.2), together with an indication of where each requirement is addressed.

7.2.1 European Legislation

8 The following paragraphs describe European legislation insofar as it remains applicable in the consideration of hydrology, hydrogeology and flood risk within the UK following the UK's withdrawal from the European Union. Volume 1, Chapter 2 (application ref: 6.1.2), provides further information regarding the implications of the withdrawal from EU, including *inter alia* reference to the Environment (Amendment etc) (EU Exit) Regulations 2019.

9 The Water Framework Directive (2000/60/EC) (the WFD) provides the foundation for the protection of the UK's water environment. The WFD seeks to protect all elements of the water cycle and to enhance the quality of groundwater, surface waters, estuaries and coastal waters. The WFD is transposed and implemented within Wales through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. Volume 2, Chapter 3: Marine Water and Sediment Quality (application ref: 6.2.3) also makes reference to the WFD in assessment of the offshore water environment.

10 The Groundwater Directive (2006/118/EC, including amendments to Annex II detailed under Directive 2014/80/EU) (the GWD) is designed to combat groundwater pollution and sets out procedures for assessing quality of groundwater. Aspects of the GWD are transposed and implemented through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 and the Environmental Permitting (England and Wales) Regulations 2016.

11 The Floods Directive (2007/60/EC) requires assessment of all watercourses and coastlines to determine risk of flooding and action to take adequate and coordinated measures to reduce this flood risk. The Flood Risk Regulations 2009 transpose the EU Floods Directive into law in England and Wales.

12 The revised Bathing Water Directive (rBWD) (2006/7/EC) came into force in March 2006. The rBWD has been implemented in England and Wales via the Bathing Water Regulations 2013, with Bathing Waters classified against the standards set by the rBWD since 2015. The rBWD provides more stringent standards than the previous Directive and places an emphasis on providing information to the public.

7.2.2 National Legislation

13 The objectives of the directives discussed above that are relevant to this assessment are met through the following UK legislation, relevant to the protection of the water environment:

- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 transposes the WFD and aspects of the GWD into UK legislation;
- The Environmental Permitting (England and Wales) Regulations 2016 consolidate and replace the Environmental Permitting (England and Wales) Regulations 2010, which have been amended 15 times to date. The 2010 Regulations are still in force and are the main implementing regulations for the environmental permitting regime. The Environmental Permitting (England and Wales) Regulations 2016 also supersede and incorporate the Groundwater (England and Wales) Regulations 2009 which implemented Article 6 of the GWD, detailing measures to prevent or limit inputs of pollutants into groundwater;
- The Flood Risk Regulations 2009 transposes the Floods Directive into UK legislation and sets out requirements of Natural Resources Wales (NRW), the Environment Agency (EA), and local authorities in preparing assessments and mapping of flood risk for each river basin district in England and Wales;
- Flood and Water Management Act 2010 includes provision for the management of risk in connection with flooding and sets out requirements for sustainable drainage systems (SuDS) Approval Bodies (SABs) in preparing strategies for local flood risk management;
- The Water Resources Act 1991 regulates water resources, water quality and flood defence. The amended Regulations, Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009, make changes to the powers for carrying out anti-pollution works and serving notices;

- The Land Drainage Act 1991 and The Land Drainage Act 1994 set out requirements for maintenance of watercourses by riparian owners;
- Environment Act 1995 sets out roles and responsibilities for NRW; and
- The Private Water Supplies (Wales) Regulations 2017 transpose requirements of European Law on the quality of water intended for human consumption from private abstractions.

7.2.3 Planning Policy

14 Planning policy on offshore renewable energy Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to hydrology and flood risk, is contained in the National Policy Statements (NPSs) for Overarching Energy (EN-1, DECC 2011a), Renewable Energy Infrastructure (EN-3, DECC 2011b) and Electricity Networks Infrastructure (EN-5, DECC 2011c). The principal guidance policy for the proposals is that provided by the NPSs. Planning Policy Wales (PPW) and local development plan policies are also relevant considerations.

National Policy Statements

15 The NPSs identify a number of issues relevant to this chapter. The policies of particular relevance to hydrology, hydrogeology and flood risk from NPS EN-1 and NPS EN-3 are summarised in Table 1 below.

16 Guidance in relation to renewable energy projects is provided within NPS EN-3. For offshore wind farms, this document focuses primarily on the offshore elements of the Project. In relation to flood risk, NPS EN3 refers to NPS EN-1, Section 4.8 which is included at Table 1 below (paragraph 2.3.5).

17 Guidance in relation to the scope of assessment required is provided within NPS EN-3. Assessment should be undertaken for all stages of the lifespan of the proposed wind farm (paragraph 2.6.190).

18 Guidance specifically relating to onshore grid connections and climate change adaption is provided in NPS EN-5. In relation to flood risk, NPS EN-5 refers to NPS EN-1, Section 4.8 which is included at Table 1 below (paragraph 2.4.2).

19 In addition to the current NPS, draft NPSs were consulted upon between September and November 2021. The draft NPSs have been reviewed to determine the emerging expectations and changes from previous iterations of the NPSs. This includes the Draft Overarching NPS EN-1 (DECC, 2021a), Draft EN-3 (DECC, 2021b) and Draft EN-5 (DECC, 2021c). . No significant changes with regard to the assessment of onshore hydrology, hydrogeology or flood risk are noted in the draft NPS.

Planning Policy Wales

20 Planning Policy Wales (PPW) (Welsh Government, 2021) sets out the land use planning policies of the Welsh Government and includes a framework for ensuring that development is delivered sustainably whilst striving to improve social, economic and cultural well-being. Technical Advice Notes (TANs) have been developed to supplement PPW and to provide guidance on a number of key issues and sensitivities. Chapter 6.6 of PPW contains sections on development and flood risk and on SuDS.

21 PPW identifies that flood risk and avoidance of flood risk is a material consideration in land use planning. Further detail on how this is address is included at Table 1.

Technical Advice Note 15

22 Technical Advice Note (TAN) 15 (Welsh Assembly Government, 2004) provides technical guidance which supplements the policy set out in PPW in relation to development and flooding. The existing version was issued in 2004 and a review of the original guidance was carried out in 2017. Following this review an updated document was prepared by Welsh Government for public consultation. At the time of reporting, the new guidance is expected to be implemented in June 2023, which will follow the submission of the AyM application for development consent. Any changes to the planning guidance with respect to these proposals will remain under TAN15 in its current form, however the emerging changes have been reviewed as part of the assessment process.

23 Under TAN15, all of Wales has been divided into three flood zones, depending on an assessment of flood risk. Zone A is defined as at little or no risk of flooding while zone C represents high risk of flooding. Zone C is further subdivided into zones C1 and C2 indicating whether the area is defended or not. The overarching aim of TAN15 is to take a precautionary approach and direct development away from areas at high risk of flooding where possible. For sites within high risk areas, TAN15 requires application of the justification test, including an assessment of acceptability of consequences. Routing of the Onshore ECC and siting of OnSS has taken into consideration flood risk, with the OnSS located in an area of low flood risk and the Onshore ECC route minimising the crossing of land at risk of flooding where practical. The process for selecting the Onshore ECC route and position of the OnSS is summarised in Volume 1, Chapter 4: Site Selection and Alternatives (application ref: 6.1.4).

Table 1: Legislation and policy context.

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
NPS EN-1	Paragraph 4.8.6 requires that applicants for new energy infrastructure must take into account the potential impacts of climate change using the latest UK Climate Projections available at the time, in order to ensure that appropriate mitigation or adaptation measures have been identified for the estimated lifetime of the new infrastructure.	The characterisation of the flood risk baseline and future baseline has been established using the NRW Development Advice Map, the Denbighshire Strategic Flood Consequence Assessment and data from recent hydraulic models, which take into account climate change effects. This information is contained in Flood Consequence Assessment reporting: Volume 5, Annex 7.1: Onshore ECC Flood Consequence Assessment (application ref: 6.5.7.1); and Volume 5, Annex 7.2: Onshore Substation Flood Consequence Assessment (application ref: 6.5.7.2). Flood risk has been considered for the life of the development in Section 7.10, Section 7.11 and Section 7.12
NPS EN-1	Paragraph 5.7.4 requires that applications for energy projects of 1 hectare or greater in Zone A and all energy projects located in Zones B and C should be accompanied by a flood risk assessment (FRA). An FRA	Flood Consequence Assessment reporting undertaken in consultation with NRW and Denbighshire County Council (DCC), compliant to NPS EN-1, paragraph 5.7.5: Volume 5, Annex 7.1

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
	may also be required where there maybe flooding issues other than from rivers and the sea (for example from surface water), or where the Environment Agency (NRW), Drainage Board or other body have indicated that there may be drainage problems. The FRA should identify and assess the risks of all forms of flooding to and from the project and demonstrate how these flood risks will be managed, taking climate change into account. The minimum requirements for what should be included in an FRA are also outlined at paragraph 5.7.5 of NPS EN-1. Further guidance is signposted in Technical Advice Note 15 (TAN15) issued by the Welsh Assembly Government.	(application ref: 6.5.7.1); and Volume 5, Annex 7.2 (application ref: 6.5.7.2).
NPS EN-1	Paragraphs 5.7.7 - 5.7.8 require applicants to hold pre-application discussions with the Environment Agency [NRW in Wales] and	Consultation with NRW has been undertaken as part of the AyM Evidence Plan (Hydrology and Flood Risk Expert Topic Group (ETG)) process, as set out in

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
	any other relevant bodies. Any concerns in regard to flood risk should be discussed all reasonable steps to agree ways in which the proposal might be amended, or additional information provided, which would alleviate concerns.	Section 7.3. In addition, Statutory Consultation on AyM was undertaken between August and October 2021 and also in February 2022, with resulting feedback considered within this ES.
NPS EN-1	Paragraph 5.7.9 lists the requirements that the Secretary of State (SoS) should consider including where relevant: an FRA; application of the sequential test as part of the site selection; sequential approach at the site level to minimise risk; the proposal is in line with relevant local flood risk management strategies; priority has been given to the use of SUDs; and in flood risk areas the proposals are appropriately flood resilient and resistant to flooding.	In Wales, application of the Sequential Test is covered by the Justification Test under TAN15. A FCA for the onshore ECC, which includes the consideration of the 'justification test' as required by TAN15 is provided in Volume 5, Annex 7.1 (application ref: 6.5.7.1). The FCA for the OnSS shows the OnSS to be in a low risk flood area and as such this aspect of development is not subject to the Justification test. The FCA is provided in Volume 5, Annex 7.2 (application ref: 6.5.7.2. The OnSS design includes a SuDS based surface water drainage scheme which would manage rainfall runoff from the proposed substation and will

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
		not increase flood risk locally or in the wider area. This is provided in Volume 5, Annex 7.2 (application ref: 6.5.7.2). Principles for management of surface water during construction along the Onshore ECC are set out in the onshore ECC FCA, provided in Volume 5, Annex 7.1 (application ref: 6.5.7.1).
NPS EN-1	Paragraph 5.15.2 requires applicants to undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment where it is considered that a project could have effects on the water environment. Paragraphs 5.15.5 to 5.15.7 ask the SoS to ensure that proposals have regard for River Basin Management Plans (RBMP) and meets the requirements of the WFD.	The baseline environment (Section 7.7) is described for the hydrology, hydrogeology and flood risk study area. An assessment of the impacts on water quality, resources and physical characteristics is provided in Section 7.10, Section 7.11 and Section 7.12. The assessment of sensitivity for environmental receptors takes into consideration RBMPs and WFD status (Section 7.5 and Table 3).

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
Draft NPS EN-1	Paragraph 4.9.7 requires that applicants for new energy infrastructure must take into account the potential impacts of climate change using the latest UK Climate Projections and associated research available at the time, in order to ensure that appropriate mitigation or adaptation measures have been identified for the estimated lifetime of the new infrastructure.	The characterisation of the flood risk baseline and future baseline has been established using the NRW Development Advice Map, the Denbighshire Strategic Flood Consequence Assessment and data from recent hydraulic models, which take into account climate change effects. This information is contained in Flood Consequence Assessment reporting: Volume 5, Annex 7.1: Onshore ECC Flood Consequence Assessment (application ref: 6.5.7.1); and Volume 5, Annex 7.2: Onshore Substation Flood Consequence Assessment(application ref: 6.5.7.2). Flood risk has been considered for the life of the development in Section 7.10, Section 7.11 and Section 7.12
Draft NPS EN-1	Paragraph 5.8.6 requires that applications for energy projects of 1 hectare or greater in Zone A and all energy projects located in Zones B and C should be accompanied by a flood risk assessment (FRA). An FRA may also be required where there maybe	Flood Consequence Assessment reporting undertaken in consultation with NRW and Denbighshire County Council (DCC), compliant to NPS EN-1, paragraph 5.7.5: Volume 5, Annex 7.1 (application ref: 6.5.7.1); and Volume 5, Annex 7.2 (application ref: 6.5.7.2).

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
	flooding issues other than from rivers and the sea (for example from surface water), or where the Environment Agency (NRW), Drainage Board or other body have indicated that there may be drainage problems. The FRA should identify and assess the risks of all forms of flooding to and from the project and demonstrate how these flood risks will be managed, taking climate change into account. The minimum requirements for what should be included in an FRA are also outlined at paragraph 5.8.7 of Draft NPS EN-1. Further guidance is signposted in Technical Advice Note 15 (TAN15) issued by the Welsh Assembly Government.	
Draft NPS EN-1	Paragraphs 5.8.9 - 5.8.10 require applicants to hold pre-application discussions with the Environment Agency [NRW in Wales] and any other relevant bodies. Any concerns in	Consultation with NRW has been undertaken as part of the AyM Evidence Plan (Hydrology and Flood Risk Expert Topic Group (ETG)) process, as set out in Section 7.3. In addition, Statutory Consultation on

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
	regard to flood risk should be discussed all reasonable steps to agree ways in which the proposal might be amended, or additional information provided, which would alleviate concerns.	AyM was undertaken between August and October 2021 and also in February 2022, with resulting feedback considered within this ES.
Draft NPS EN-1	Paragraph 5.8.11 lists the requirements that the SoS should consider including where relevant: an FRA; application of the sequential test as part of the site selection; sequential approach at the site level to minimise risk; the proposal is in line with relevant local flood risk management strategies; priority has been given to the use of SUDs; in flood risk areas the proposals are appropriately flood resilient and resistant to flooding; that safe access/escape routes are included and land needed for future flood rick management is safeguarded.	In Wales, application of the Sequential Test is covered by the Justification Test under TAN15. A FCA for the onshore ECC, which includes the consideration of the 'justification test' as required by TAN15 is provided in Volume 5, Annex 7.1 (application ref: 6.5.7.1). The FCA for the OnSS shows the OnSS to be in a low risk flood area and as such this aspect of development is not subject to the Justification test. The FCA is provided in Volume 5, Annex 7.2 (application ref: 6.5.7.2. The OnSS design includes a SuDS based surface water drainage scheme which would manage rainfall runoff from the proposed substation and will not increase flood risk locally or in the wider area.

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
		This is provided in Volume 5, Annex 7.2 (application ref: 6.5.7.2). Principles for management of surface water during construction along the Onshore ECC are set out in the onshore ECC FCA, provided in Volume 5, Annex 7.1 (application ref: 6.5.7.1).
Draft NPS EN-1	Paragraph 5.16.2 requires applicants to undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment where it is considered that a project could have effects on the water environment. Paragraphs 5.16.7 to 5.16.9 ask the SoS to ensure that proposals have regard for River Basin Management Plans (RBMP) and meets the requirements of the WFD.	The baseline environment (Section 7.7) is described for the hydrology, hydrogeology and flood risk study area. An assessment of the impacts on water quality, resources and physical characteristics is provided in Section 7.10, Section 7.11 and Section 7.12. The assessment of sensitivity for environmental receptors takes into consideration RBMPs and WFD status (Section 7.5 and Table 3).
NPS EN-3	Paragraph 2.6.43 notes that where precise details of proposed developments are not	Where options exist, the maximum height or footprint (referred to as the Maximum Design Scenario) has

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
	known, the maximum potential adverse effects of the project should be considered.	been considered within this assessment as described in Section 7.8.
Draft NPS EN-3	Paragraph 2.58.8 notes that where precise details of proposed developments are not known, the maximum potential adverse effects of the project should be considered.	Where options exist, the maximum height or footprint (referred to as the Maximum Design Scenario) has been considered within this assessment as described in Section 7.8.
NPS EN-3	Paragraph 2.6.190 states that assessment should be undertaken for all stages of the lifespan of the proposed wind farm.	Environmental assessment has been undertaken for all stages of the lifespan of the proposed wind farm at Section 7.10, Section 7.11 and Section 7.12 for the construction, operation and decommissioning stages respectively.
PPW	Paragraph 6.6.22 states that planning authorities should adopt a precautionary approach of positive avoidance of development in areas of flooding from the sea or from rivers. Surface water flooding will affect choice of location and the	The site selection process for the above ground infrastructure (i.e. the OnSS), which has considered areas with flooding potential, is provided in Volume 1, Chapter 4, Site Selection and Alternatives (application ref: 6.1.4). The onshore cable will be buried and will not include any significant above

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
	layout and design of schemes and these factors	ground structures that will be susceptible to or that can influence flood risk. The site of the OnSS is in an area at low risk of flooding.
PPW	Paragraph 6.6.25 states that development should reduce, and must not increase, flood risk arising from river and/or coastal flooding on and off the development site itself.	The potential for the proposed onshore infrastructure associated with AyM to affect flood risk arising from river and/or coastal flooding is provided within the FCA for the onshore ECC provided in Volume 5, Annex 7.1 (application ref: 6.5.7.1); and the FCA for the OnSS provided in Volume 5, Annex 7.2 (application ref: 6.5.7.2).
PPW	Paragraph 6.6.26 states that development should ensure that, as well as not being at risk itself, it should be designed and constructed so as to remain operational even at times of flood, to result in no net loss of floodplain storage, to not impede water flows and to not increase flood risk elsewhere.	The potential for the proposed onshore infrastructure associated with AyM to affect flood risk arising from river and/or coastal flooding is provided within the FCA for the onshore ECC provided in Volume 5, Annex 7.1 (application ref: 6.5.7.1); and the FCA for the OnSS provided in Volume 5, Annex 7.2 (application ref: 6.5.7.2).

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
PPW	Paragraph 6.6.27 states that development should not cause additional run-off, which can be achieved by controlling surface water as near to the source as possible by the use of SuDS.	The potential for the proposed onshore infrastructure associated with AyM to cause additional run-off is provided within the FCA for the onshore ECC provided in Volume 5, Annex 7.1 (application ref: 6.5.7.1); and the FCA for the OnSS provided in Volume 5, Annex 7.2 (application ref: 6.5.7.2). The OnSS design includes a SuDS based surface water drainage scheme which would manage rainfall runoff from the proposed substation and will not increase flood risk locally or in the wider area.

Local Planning Policy

24 The Denbighshire County Council (DCC) Local Development Plan (LDP) 2006-2021 was adopted in 2013 and sets out the broad approach that will be taken in addressing DCC's development needs in a sustainable manner. It takes account of other local, regional and national policies, key issues facing DCC and the LDP Vision and objectives.

25 DCC is currently working to progress background technical evidence for its replacement LDP which will replace the current adopted LDP. The timetable for the replacement LDP has changed due to the Covid-19 and timing for adoption of this document is not known at the time of reporting.

26 LDP policies in the current adopted LDP that are of relevance to this chapter are summarised below:

- Policy RD 1 – Sustainable development and good standard design: States that development proposals will be supported within development boundaries provided that all the following criteria are met: ...
  - ... vi) Does not unacceptably affect the amenity of local residents, other land and property users or characteristics of the locality by virtue of increased activity, disturbance, noise, dust, fumes, litter, drainage, light pollution etc., and provides satisfactory amenity standards itself; and
  - ... xi) Satisfies physical or natural environmental considerations relating to land stability, drainage and liability to flooding, water supply and water abstraction from natural watercourse
- Policy VOE 6 – Water Management: States that all development will be required to eliminate or reduce surface water runoff from the site, where practicable. The runoff rates from the site should maintain or reduce pre-development rates.

27 Where appropriate, this chapter identifies sensitive receptors in relation to local residents, land and property users and assesses potential for impact in relation to these receptors. Surface water runoff and flood risk are assessed in the supporting onshore ECC FCA, Volume 5, Annex 7.1 (application ref: 6.5.7.1) and the OnSS FCA, Volume 5, Annex 7.2 (application ref: 6.5.7.2)

28 The DCC Strategic Flood Consequence Assessment (SFCA) identifies and maps flood risk at a borough-wide scale, including consideration of residual tidal flood risk associated with a breach of defences. The SFCA provides an appraisal of flood risk in Denbighshire County and presents recommendations on development and flood risk for the primary purpose of informing the LDP. This consideration is provided in the supporting onshore ECC FCA, Volume 5, Annex 7.1 (application ref: 6.5.7.1) and the OnSS FCA, Volume 5, Annex 7.2 (application ref: 6.5.7.2)

29 The OnSS design includes a surface water drainage scheme which would manage rainfall runoff from the proposed substation and will not increase flood risk locally or in the wider area. This approach is outlined in the supporting OnSS FCA, Volume 5, Annex 7.2 (application ref: 6.5.7.2).

7.2.4 Other Relevant Guidance

30 Relevant UK guidance on good practice for construction projects that will be referenced during assessment includes;

- Control of Water Pollution from Construction Sites (C532), Construction Industry Research and Information Association (CIRIA 2001);
- Environmental Good Practice on Site (C741), (CIRIA 2015a);
- Control of Water Pollution from Linear Construction Projects (C648), (CIRA 2006a);
- Control of Water Pollution from Linear Construction Projects: Site Guide (C649), (CIRA 2006b);
- NRW's Guidance for Pollution Protection – Works and maintenance in or near water, version 1.2, (NRW 2018); and
- The Suitable Drainage System (SuDS) Manual (C753), (CIRIA 2015b).

31 The CIRIA guidance provides environmental good practice for the control of water pollution arising from construction activities. It focuses on the potential sources of water pollution from within construction sites and the effective methods of preventing its occurrence.

32 The NRW guidance is part of a wider suite of guidance for pollution prevention (GPP) relating to environmental good practice. The full suite can be found on the NetRegs website (www.netregs.ork.uk).

33 The SuDS Manual incorporates the latest research, industry practice and guidance for design, delivery and maintenance of SuDS.

7.3 Consultation and scoping

34 To date, consultation with regards the scope of the hydrology, hydrogeology and flood risk assessment has been undertaken via the Scoping Report (Innogy, 2020) and via the AyM Evidence Plan (Hydrology and Flood Risk ETG) process. The ETG process has comprised discussions with DCC, Conwy County Borough Council (CCBC) and NRW.

35 A Scoping Opinion for AyM was sought from the SoS. The Scoping Opinion, which includes responses from NRW, DCC and CCBC, identifies areas of the assessment methodology for further consideration.

36 AyM statutory consultation, under Section 42 of the Planning Act 2008, ran from 31 August to 11 October 2021, a period of six weeks. A Preliminary Environmental Information Report (PEIR) was published as part of formal consultation which provided preliminary information on hydrology, hydrogeology and flood risk within Volume 3, Chapter 7: hydrology, hydrogeology and flood risk.

37 Further statutory consultation was undertaken in February 2022 on areas where the Order Limits (OL) extend beyond those included in the PEIR that were consulted on in Autumn 2021.

38 The baseline assessment to inform the ES was completed through a desk-study exercise, including data requests from and consultation with relevant statutory bodies. Consultation has been undertaken with NRW and DCC in relation to the scope of the hydrological assessment and to discuss any specific requirements for flood mitigation measures.

39 Table 2 below summarises the issues relevant to this chapter which have been highlighted by consultees and indicates, if possible, how these issues would be addressed.

Table 2: Summary of consultation relating to hydrology, hydrogeology and flood risk.

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
10th December 2019 Evidence Plan Meeting	NRW highlighted that data from existing flood models are available and can be interrogated to separate out risks from both coastal and fluvial flooding.	NRW and DCC data has been to inform emerging design, flood consequence assessment reporting and the assessment of effects on the water environment from any flood risk impacts identified. Section 7.4.2 sets out the baseline data that has been used.
July 2020 Scoping Opinion	The onshore hydrology, hydrogeology and flood risk assessment should include an assessment of potential changes to surface land use, runoff, hydrological recharge and for entrainment of pollutants to the water environment during the operational phase.	This is provided in Section 7.10 and Section 7.11 and Volume 4, Annex 3.1: WFD Assessment (application ref: 6.4.3.1)
July 2020 Scoping Opinion	The onshore hydrology, hydrogeology and flood risk assessment should include an assessment of potential construction impacts from accidental pollution;	This is provided in Section 7.10 which also informs Volume 4, Annex 3.1 (application ref: 6.4.3.1)

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
July 2020 Scoping Opinion	The onshore hydrology, hydrogeology and flood risk assessment should include an assessment on how existing drainage infrastructure will be affected by construction;	This is provided in Section 7.10 and Volume 5, Annex 7.1 (application ref: 6.5.7.1)
July 2020 Scoping Opinion	The onshore hydrology, hydrogeology and flood risk assessment should include further detail on designated sites with hydraulic connectivity to the study area;	This is provided in Section 7.4.3
July 2020 Scoping Opinion	The onshore hydrology, hydrogeology and flood risk assessment should include a description of how mitigation measures will be constructed, mitigate risk, and include a residual impact post implementation of the mitigation measure;	This is provided in Section 7.9, Section 7.10, Section 7.11 and Section 7.12
July 2020 Scoping Opinion	The onshore hydrology, hydrogeology and flood risk assessment should include: • A figure showing locations of aquifers and Special Protection Zones;	The location of aquifers and Source Protection Zones are shown in Figure 4 and described in Section 7.7.3.

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
	▲ A figure showing the location and dimensions of SuDS (if implemented); and ▲ A figure showing the location of Horizontal Directional Drilling (HDD), trenches, dewatering and piling.	The proposed location and details of potential SuDS proposals are provided in Volume 5, Annex 7.2 (application ref: 6.5.7.2). The final SuDS design, along with the details for dewatering, will be agreed with DCC and NRW through a Requirement of the DCO. There is potential for piling to be required during construction of the OnSS and also for a cofferdam to provide a dry working area for the Landfall trenchless crossing exit pits (should one be required). Potential trenchless crossing locations are described in Volume 3, Chapter 1 (application ref: 6.3.1) and shown in Figures 4 to 16 of that chapter as well as being listed in Volume 5, Annex 1.1: Crossing schedule. (application ref: 6.5.1.1)
1st Oct 2020 Evidence Plan Meeting	NRW highlighted that there would be value in reviewing the Point of Ayr to Pensarn Tidal	NRW and DCC data has been used to inform emerging design, flood

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
	Flood Risk Analysis 2017 and stated that Conwy CBC should also be able to advise on any updates to the Conwy Tidal Flood Risk Assessment.	consequence assessment reporting and the assessment of effects on the water environment from any flood risk impacts identified. Section 7.4.2 sets out the baseline data that has been used.
22nd March 2021 Evidence Plan Meeting	NRW highlighted that pressures on the Afon Clwyd relate to nutrients and pollution prevention measures will be required to minimise sediment disturbance.	This is provided in Section 7.10 which also informs Volume 4, Annex 3.1 (application ref: 6.4.3.1)
7th October 2021 Statutory Consultation response from DCC	The landfall site is close to existing sea defences, and the cable would need to be installed underneath it via HDD. The installation of the underground cable must not compromise sea defences.	The cables will be installed beneath the existing (and proposed) sea defences using trenchless crossing techniques such as HDD.
8th October 2021 Statutory Consultation response from NRW	NRWs preference would be for the Landfall to occur as far east as possible within the OL to be away from Rhyl pumping station	The cables will be installed using HDD or other trenchless crossing technique in this area and so will not affect the pumping station. The pumping station is located outside the onshore ECC as

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
		shown in Figure 4 of the Volume 3, Chapter 1: Project Description (application ref: 6.3.1)
8th October 2021 Statutory Consultation response from NRW	Clwyd transitional water and Prestatyn Bathing Water need to be included as part of the assessment.	This is provided in Section 7.7.5 and Section 7.7.9
8th October 2021 Statutory Consultation response from NRW	Any discharge consents and licenced private water supplies need to be included within the assessment.	This is provided in Section 7.7.6 and Section 7.7.7
8th October 2021 Statutory Consultation response from NRW and 22nd November 2021 email correspondence	A groundwater risk assessment should be completed for each major HDD crossing to ensure that all risks are assessed, and any mitigation measures are outlined and implemented during construction and operation	This is provided in Volume 5, Annex 7.3 to Annex 7.6 (application ref 6.5.7.3 to 6.5.7.6: Groundwater Risk Assessments
8th October 2021 Statutory Consultation response from NRW	Each main river crossing and crossing of associated flood defence infrastructure will	The draft DCO disapplies the Environmental Permitting (England and Wales) Regulations 2016 and Land Drainage Act 1991 for FRAP and

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
	be subject to the requirements of Flood Risk Activity Permits (FRAP) issued by NRW.	Ordinary Watercourse Consent (OWC). The Applicant will provide a final Construction Method Statement (CMS), an outline version of which is provided as Appendix 2 (application ref 8.13.2) of the outline CoCP (application ref 8.13)), in which it is proposed to include the final detailed design and approach to watercourse crossings. The Final CMS, will be submitted (as part of the final CoCP), to DCC in consultation with NRW, for agreement prior to construction, as secured in the DCO
8th October 2021 Statutory Consultation response from NRW	Stockpiles of excavated materials could also affect fluvial flood risk from main rivers and tidal flood risk, and not only block overland flow of surface water.	This is confirmed in Section 7.10.1

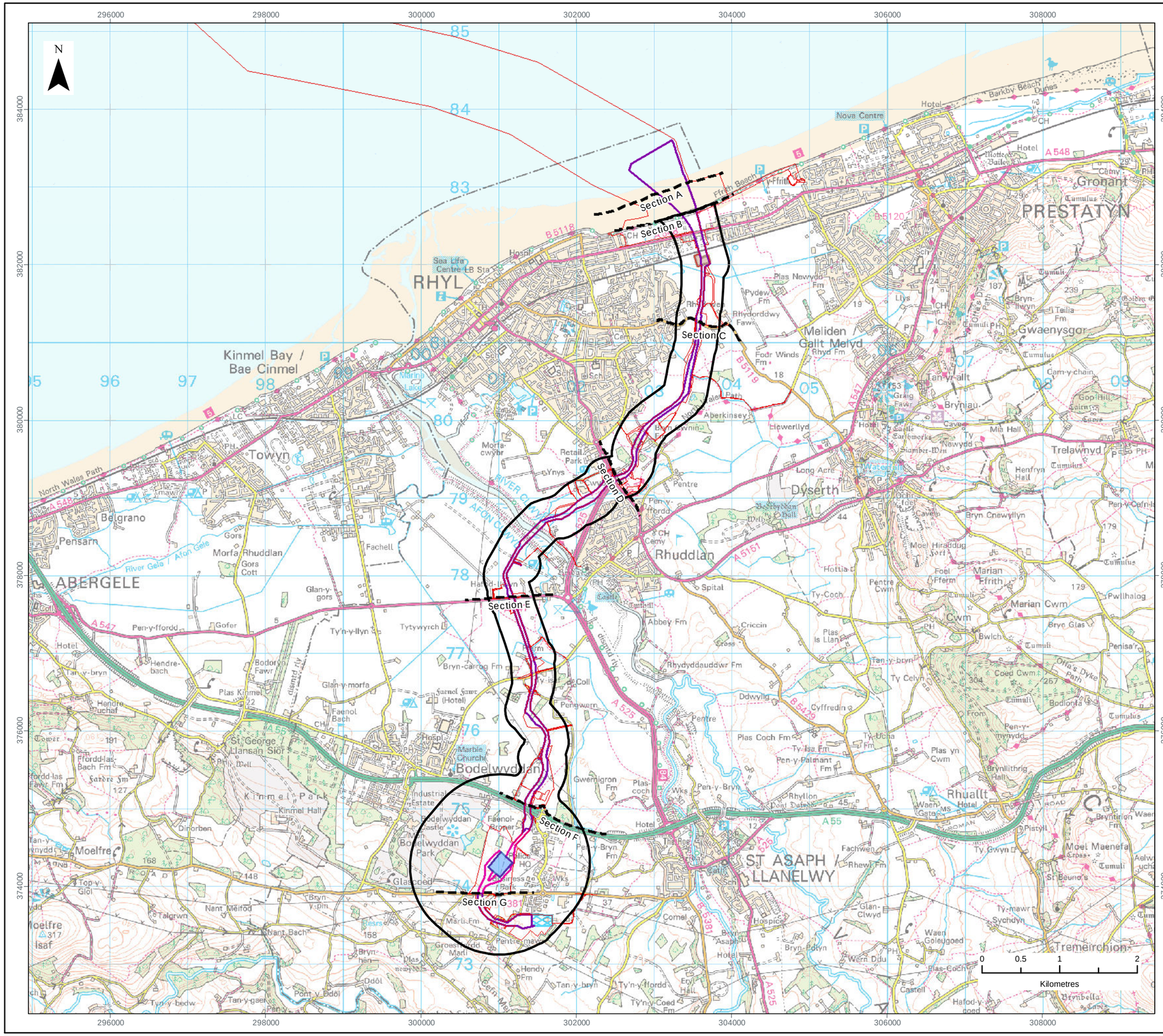
7.4 Scope and methodology

7.4.1 Study area

40 The hydrology, hydrogeology and flood risk study area is shown on Figure 1 and comprises the onshore elements of AyM (as described in Volume 3, Chapter 1 (application ref: 6.3.1)) from mean high-water spring (MHWS) to the National Grid Connection Point (located to the south of SABP), plus a 1 km buffer around the proposed OnSS, and a 250 m buffer around the Landfall and the onshore ECC (including access routes and TCC areas) as shown in Figure 1.

41 The buffer size used for the onshore ECC and OnSS study areas were chosen primarily to allow for refinement in final location and alignments of onshore infrastructure. A 250 m buffer distance is considered appropriate for data collection and assessment taking into account the nature of the development and likely zone of influence on hydrological receptors, including upstream and downstream catchments that are in hydrological continuity with the site. The study area and available data have been discussed and agreed with stakeholders and includes receptors downstream of the onshore elements of AyM which are considered to be in hydraulic continuity within the study area.

42 The 1 km buffer for the OnSS was selected due to the more intrusive construction works required for this element of the onshore works, to identify any potential receptors that might be affected by the proposed development. This includes receptors downstream of the OnSS which, based on professional judgement, are potentially in hydraulic continuity within the study area.



LEGEND

- Order Limits
- Onshore Cable Route Section Breaks
- Proposed Onshore Export Cable Corridor
- Proposed Substation Cable Corridor Zone
- Proposed Transition Joint Bay Construction Compound
- Proposed Onshore Substation (OnSS) Footprint
- Unlicenced Work Zone
- Hydrology, Hydrogeology and Flood Risk Study Area

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

HYDROLOGY, HYDROGEOLOGY & FLOOD RISK STUDY AREA

VER	DATE	REMARKS	Drawn	Checked
1	26/02/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 1

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:50,000	A3	ODN	British National Grid

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

P:\05356 - GoBe Consultants Ltd\00009 Awel y Mor\Tech\GIS\Dwgs\Wking\202201 Environmental Statement\Chapter 3.7 Hydrology and Flood Risk\05356.00009.0300.0 Hydrology Hydrogeology and Flood Risk Study Area.mxd

7.4.2 Baseline data

43 Baseline data with respect to hydrology, hydrogeology and flood risk has been taken from publicly available information and opensource data from a range of sources. The data review includes assessing the following:

- Lle Geo-Portal, Welsh Government and Natural Resources Wales (NRW):
  - Flood Zone (Flood Risk Assessment Wales Map) and Development Advice Map data relating to flood risk;
  - Spatial Flood Defence data and mapping;
  - Flood Warning and Flood Alert Areas;
  - Main Rivers;
  - Historic and active landfill sites;
  - Statutory and non-statutory environmental designations;
  - Water Framework Directive surface water and groundwater classification data; and
  - Groundwater Source Protection Zones (SPZ).
- British Geological Survey (BGS) GeoIndex mapping:
  - Geology – artificial ground, mining, superficial deposits, bedrock;
  - Borehole data; and
  - Aquifer designation and groundwater vulnerability.
- Department for Environment, Food and Rural Affairs (DEFRA) MAGIC website:
  - Statutory and non-statutory environmental designations.
- Cranfield Soil and Agrifood Institute Soilscapes map viewer:
  - Soil type and character.
- North West and North Wales Coastal Group:
  - North West England and North Wales Shoreline Management Plan SMP2.
- Denbighshire County Council:
  - Local Development Plan; and
  - Strategic Flood Consequence Assessment.
- Envirocheck Report, Order Number 271180872_1_1

44 Third party data from bodies such as DCC and NRW has been used to characterise the sensitivity of water features and identify any water dependent designated areas.

45 Reports prepared to support previous planning applications for other similar scale schemes in the local area have also been reviewed to inform this chapter. It is however noted that these reports would specifically relate to defined cable corridors or infrastructure locations and a significant period of time has elapsed since previous applications were submitted. Projects reviewed include:

- Gwynt y Môr Offshore Wind Farm;
- Burbo Bank Extension Offshore Wind Farm; and
- North Wales Wind Farm Connections.

46 Preparation of the ES has also included targeted data requests and consultation with a number of stakeholders and regulatory bodies. The information and data requested includes:

- NRW:
  - Flood modelling and mapping, flood defence asset information and flood event history;
  - Pumping station details and operational records for land drainage pump
  - Pumping stations in proximity to the onshore ECC; and
  - Licenced abstractions, surface water quality, WFD classification data, permitted activities and recorded pollution events.
- DCC:
  - Registered private water supplies in proximity to the onshore ECC;
  - Sustainable drainage guidance to meet SuDS Approval Body (SAB) requirements; and
  - Local flood event history.

47 A hydrology characterisation survey has been undertaken in order to confirm mapping and data provided by stakeholders. The survey included visual observation of all mapped water features within the study area and inspection of all field boundaries for unmapped drainage features.

7.4.3 Designated sites

48 There are no hydrologically designated sites within the study area. Watercourses designated for their ecological interest are identified in Volume 3, Chapter 5 (application ref: 6.3.5).

49 The Clwyd Estuary discharges to Liverpool Bay, which is designated as a Special Protection Area (SPA), downstream of the study area. The site qualifies under the Birds Directive (2009/147/EC) for a number of Annex 1 and migratory bird species. The Clwyd Estuary is crossed by the onshore ECC and has numerous watercourses within the study area which drain into the Clwyd Estuary channel. Liverpool Bay SPA therefore influences the assessment of sensitivity for the near-shore coastal waters which are included as an environmental receptor.

7.4.4 Assessment Methodology

50 There are no published guidelines or criteria for assessing and evaluating effects on hydrology or hydrogeology within the context of an EIA. The proposed assessment will therefore be based on a methodology derived from the Institute of Environmental Management and Assessment (IEMA) guidance. The methodology sets out a list of criteria for evaluating the environmental effects and is outlined in Volume 1, Chapter 3: EIA Methodology (application ref: 6.1.3).

51 Professional judgement and a qualitative risk assessment methodology has been used to assess the findings in relation to each of these criteria to give an assessment of significance for each potential impact.

52 As an impact assessment, this chapter does not explicitly consider the risk of flooding to the proposed development but does consider how the proposals may alter flood risk at the site and elsewhere. The flood risk to the proposed development is considered separately in the onshore ECC FCA provided in Volume 5, Annex 7.1 (application ref: 6.5.7.1); and the FCA for the OnSS provided in Volume 5, Annex 7.2 (application ref: 6.5.7.2).

53 A qualitative risk assessment methodology has been used to assess the significance of the potential effects associated with AyM. Two factors have been considered using this approach: the sensitivity of the receiving environment and the potential magnitude of impact, should that potential impact occur. This approach provides a mechanism for identifying the areas where site specific mitigation measures are required and for considering the effectiveness of mitigation measures proposed to manage the risk presented by AyM. This approach also allows effort to be focused on reducing risk where the greatest benefit may result.

54 Effects assessed as minor negative/ positive or less would be considered not significant in terms of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (EIA Regulations). If the assessment results in moderate or major negative/ positive effects, then this effect would be considered to be significant in EIA terms. The broad definitions of the terms used are set out in Volume 1, Chapter 3 (application ref: 6.1.3).

55 This approach provides a mechanism for identifying the areas where site specific mitigation measures will be required and for identifying mitigation measures appropriate to the risk presented by the development proposals. This approach also allows effort to be focused on reducing risk where the greatest benefit may result.

7.5 Assessment criteria and assignment of significance

56 The approach for determining the significance of effects is a two stage process that involves defining the sensitivity of the receptors and the magnitude of the impacts on those receptors. This section describes the criteria applied in this chapter to assign values to the sensitivity of receptors and the magnitude of potential impacts. Unless stated otherwise the terms used to define sensitivity and magnitude are based on those used in the Design Manual for Roads and Bridges (DMRB) methodology (DMBR 2009), which is described in more detail in Volume 1, Chapter 3 (application ref: 6.1.3).

57 The criteria for sensitivity used in this chapter are outlined in Table 3 below. Whilst a sensitivity category of ‘very high’ is proposed as a potential category for sensitivity criteria within the DMRB methodology, for the purposes of the assessment of hydrology, hydrogeology and flood risk effects, the categories within the range of ‘high’ to ‘negligible’ are considered to appropriately cover the potential receptors. Where a receptor could be placed within more than one category of value, professional judgement has been applied to determine which category is appropriate.

Table 3: Sensitivity/importance of the environment.

RECEPTOR SENSITIVITY/ IMPORTANCE	DESCRIPTION	RECEPTOR
High	High importance and rarity, national level and limited potential for substitution	Watercourses or water bodies of national importance. Watercourses or water bodies supporting highly sensitive abstractions. Watercourses or water bodies of good chemical status/ high ecological status and/ or high quality targets under the WFD. Watercourses, water bodies or floodplain with a designation for ecological/ conservation value (e.g. Liverpool Bay SPA). Aspects of the proposed development classified as 'highly vulnerable' to flood risk (under TAN15). Floodplains within Flood Risk Assessment Wales Map Flood Zone 3, which are narrow and where a small increase in volume results in a relatively large increase in flood levels. Public potable water supply from either surface or groundwater source. Aquifer is a Principal Aquifer providing regionally important potable water supply and classified as SPZ.

RECEPTOR SENSITIVITY/ IMPORTANCE	DESCRIPTION	RECEPTOR
Medium	Medium importance and rarity, district or regional level, limited potential for substitution	Watercourses or water bodies of district or regional importance. Watercourses or water bodies supporting moderately sensitive abstractions. Watercourses or water bodies of good chemical status/ moderate to good ecological status and/ or moderate to high quality targets under the WFD. Floodplains within Flood Risk Assessment Wales Map Flood Zone 2 with limited constraints to the watercourse. Private Water Supply (PWS) from a watercourse or water body for potable use or non-drinking water abstraction for agricultural use from either surface or groundwater source. Aquifer is a Principal Aquifer not designated as SPZ. Bathing water monitored waterbody.
Low	Low importance and rarity, local or district level	Watercourses or water bodies of local importance. Watercourses or water bodies supporting abstractions of limited sensitivity.

RECEPTOR SENSITIVITY/ IMPORTANCE	DESCRIPTION	RECEPTOR
		Watercourses or water bodies with a chemical water quality status classed as 'fail' or an ecological water quality status classed as 'poor' and/ or moderate quality targets under the WFD. Receptors classified as 'less vulnerable' to flood risk (under TAN15). Floodplains within Flood Risk Assessment Wales Map Flood Zone 1 or 2, where any floodplain is wide and a large increase in volume results in a small increase in flood levels. Aquifer is a Secondary A or Secondary B Aquifer.
Negligible	Very low importance and rarity, local level	Watercourses or water bodies of limited local importance. Watercourses or water bodies supporting no recorded abstractions. Watercourses or water bodies with a chemical water quality status classed as 'fail' and an ecological water quality status classed as 'poor', and/ or low quality targets under the WFD. Non-productive geology in terms of groundwater resource.

58 The criteria for magnitude of Impact used in this chapter are outlined in Table 4 below. Definitions of magnitude are based on those used in the Design Manual for Roads and Bridges (DMRB) methodology (DMBR 2009), which is described in more detail in Volume 1, Chapter 3 (application ref: 6.1.3).

Table 4: Impact magnitude definitions.

MAGNITUDE	DEFINITION
High	Long term or permanent loss of resource and/or quality and integrity of resource; likely to cause exceedance of statutory objectives and/or breaches of legislation; severe damage to key characteristics, features or elements (Adverse).
	Large scale or major improvement of resource quality; extensive restoration or enhancement; major long-term improvement of attribute quality (Beneficial).
	Changes to land within the OL resulting in an increase in runoff with flood potential and also significant changes to erosion and sedimentation patterns.
	Major changes to groundwater levels, flow regime and risk of groundwater flooding.
Medium	Loss of resource, but not adversely affecting the overall integrity; partial loss of/damage to key characteristics, features or elements with/without exceedance of statutory objectives or with/without breaches of legislation (Adverse).
	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial).

MAGNITUDE	DEFINITION
	Moderate changes to erosion and sedimentation patterns.
	Moderate changes to groundwater levels, flow regime and risk of groundwater flooding.
Low	Some measurable change in attributes, quality or vulnerability; reversible or minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (Adverse).
	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (Beneficial).
	Minor changes to erosion and sedimentation patterns.
	Minor changes to groundwater levels, flow regime and risk of groundwater flooding.
Negligible	Very minor or no loss or detrimental alteration to one or more characteristics, features or elements; impact of insufficient magnitude to affect the use/integrity (Adverse).
	Very minor or no benefit to or positive addition of one or more characteristics, features or elements; impact of insufficient magnitude to affect the use/integrity (Beneficial).
	No alteration or very minor changes with no impact to watercourses, hydrology, hydrodynamics, erosion and sedimentation patterns.

59 The significance of the effect upon hydrology, hydrogeology and flood risk is determined by correlating the potential magnitude of the impact and sensitivity of the receptor, as defined in the matrix presented at Table 5. This approach uses the term “beneficial” for an advantageous or positive effect on an environmental resource or receptor or “adverse”, for a detrimental or negative effect on an environmental resource or receptor. Where a range of significance is presented in Table 5, the final assessment for each effect is based upon expert judgement.

Table 5: Matrix to determine effect significance.

		SENSITIVITY			
		HIGH	MEDIUM	LOW	NEGLIGIBLE
ADVERSE MAGNITUDE	HIGH	Major	Major	Moderate	Minor
	MEDIUM	Major	Moderate	Minor	Negligible
	LOW	Moderate	Minor	Minor	Negligible
	NEGLIGIBLE	Minor	Minor	Negligible	Negligible
BENEFICIAL MAGNITUDE	NEGLIGIBLE	Minor	Minor	Negligible	Negligible
	LOW	Moderate	Minor	Minor	Negligible
	MEDIUM	Major	Moderate	Minor	Negligible
	HIGH	Major	Major	Moderate	Minor

Note: Effects of 'moderate' significance or greater are defined as significant with regards to the EIA Regulations 2017[i]

[i] The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

7.6 Uncertainty and technical difficulties encountered

60 The assessment is based on publicly available data obtained from NRW, DCC and commercial data supply companies, as well as additional information supplied from stakeholders during the scoping and consultation stages.

61 The assessment is limited by a lack of detailed information on:

- Flow data for all watercourses and drainage channels; and
- Water quality data for specific locations.

62 Overall a moderate to high level of certainty has been applied to the study. Where available, catchment data regarding water quality has been used to inform the assessment, with a hydrological site walkover undertaken for all NRW designated main river crossings within the study area. The information accessible in order to complete the assessment is considered sufficient to establish the baseline within the study area, therefore, there are no data limitations that would affect the conclusions of this assessment.

63 The Maximum Design Scenario (MDS) identified in Section 7.8 has been selected as that having the potential to result in the greatest effect on an identified receptor or receptor group. This scenario has been selected from the details provided in the project description (Volume 3, Chapter 1 (application ref: 6.3.1)). Effects of greater significance are not predicted to arise should any other development scenario to that assessed here be taken forward in the final design scheme, within the assessed boundaries.

7.7 Existing environment

64 This section provides a general description of the hydrological resources, flood risk and defines potential environmental receptors within the study area. Observations from the hydrology characterisation survey and desk study have been included where relevant.

65 The onshore ECC has been broken down into a number of indicative Route Sections which describe the route in relation to significant local features. The Route Sections are listed in Table 6 along with a short description defining the extent of each respective section.

Table 6: Route sections for the onshore ECC.

ROUTE SECTION – FULL NAME	DESCRIPTION
Route Section A – Intertidal Area	MHWS to MLWS
Route Section B – Intertidal to B5119	MHWS to B5119
Route Section C – B5119 to A525	Agricultural land to east and south of Rhyl – generally low lying and outside Food risk zones 2 & 3.
Route Section D: A525 to A547	Includes the Afon Clwyd crossing and associated HDD (or other trenchless crossing technique) works
Route Section E: A547 to A55	Agricultural land that is slightly more undulating near the A55
Route Section F: A55 to B5381 including OnSS	HDD (or other trenchless crossing technique) re-emergence for A55 crossing, OnSS access zones and OnSS to Glascoed Road (B5381)
Route Section G: B5381 to National Grid Connection	From Glascoed Road (B5381) to the National Grid substation

7.7.1 General description and land use

66 The coastal area at the proposed Landfall is between the relatively densely populated settlements of Rhyl and Prestatyn. Pedestrian footpaths are present directly adjacent to the beach, as is a golf course and caravan park. Man-made sea-defences including imported rocks are present, along with groynes which serve shingle and sand beaches.

67 Land use within the study area is predominantly agricultural, situated between the towns of Rhyl, Rhuddlan and St Asaph. The Afon Clwyd bisects the study area, flowing from St Asaph northward into Rhyl. A number of other NRW designated main rivers also cross or are present within the onshore ECC and the wider study area.

68 Land to the east and south of Rhyl is predominantly agricultural, low lying land with a network of drainage ditches. Hedgerows and woodland are relatively scarce and limited to field boundaries.

69 Land to the south west of the Clwyd crossing is predominantly agricultural, with relatively flat, low lying land within the Clwyd valley, close to the Clwyd Estuary. Further south, towards the A55 and beyond, land begins to rise with more undulating topography. Field boundaries are typically well established hedgerows and sometimes drystone walls. Woodlands and hedges are more common in this area.

7.7.2 Hydrological Setting

70 The Landfall site is located at Ffrith Beach, on the coastline between Rhyl and Prestatyn. The Irish Sea extends northwards from the coast.

71 The study area includes a number of catchments associated with NRW designated main rivers and ordinary watercourses. Definitions of these hydrological features are provided below and their locations are identified in Figure 2 and Figure 3:

- main rivers – watercourses where NRW has permissive powers over their management; and
- Ordinary watercourses – includes rivers, streams, ditches, drains which do not form part of a main river, managed by DCC

72 Several sections of the onshore ECC cross a main river, non-main or ordinary watercourses or drainage ditches. These crossings are listed in the Crossing Schedule (Volume 5, Annex 1.1 (application ref: 6.5.1.1).

73 A description of the hydrology and geomorphology of NRW main rivers within the study area is set out below:

Rhyl Cut

74 The Rhyl Cut is a main river watercourse that runs parallel to the coast from the outskirts of Prestatyn, taking flows from Prestatyn Gutter. The watercourse flows west across agricultural land to the south of the North Wales Main Line railway, through the centre of Rhyl and discharges to the Clwyd Estuary approximately 1.5 km upstream of the estuary mouth. The onshore ECC crosses the Rhyl Cut on agricultural land to the east of Rhyl, with an upstream catchment of approximately 6.5 km^2 from this point.

Aberkinsey Drain

75 Agricultural land to the south east of Rhyl is served by Aberkinsey Drain main river, which flows northwards from Glanffyddion Stream, through the east of Rhyl where it joins the Rhyl Cut (via Maes Gwilym Drain). The onshore ECC crosses Aberkinsey Drain on agricultural land to the south east of Rhyl, with a small upstream catchment of approximately 0.5 km^2 from this point.

Glanffyddion Stream (Glanffyddion Cut)

76 Glanffyddion Stream is a main river watercourse which drains land to the east of Rhuddlan, including Dyserth and land to the north of Caerwys. The watercourse flows from east to west and discharges to the Clwyd Estuary to the north west of Rhuddlan, approximately 700 m downstream of the A525 crossing of the Afon Clwyd. The onshore ECC crosses Glanffyddion Stream on agricultural land to the south west of Rhyl, approximately 350 m upstream of the confluence with the Afon Clwyd. The onshore ECC also crosses a smaller tributary of Glanffyddion Stream, the Glanffyddion Stream Old Loop, immediately upstream of the main channel. The Glanffyddion Stream has an approximate upstream catchment of 45 km^2 above the point where it crosses the onshore ECC.

Afon Clwyd

77 The Afon Clwyd is a main river and is the most significant watercourse within the study area, with an upstream catchment of over 700 km^2 upstream of the point where the onshore ECC crosses the Afon Clwyd. The catchment drains large areas of north Denbighshire, including the settlements of St Asaph, Denbigh and Ruthin; the Afon Elwy sub-catchment, which drains areas to the east of Conwy County; and the Afon Chwiler sub-catchment, which drains land to the west of Flintshire.

Clwyd Embankment Drain North and South

78 Two further main rivers are crossed by the onshore ECC at the Afon Clwyd crossing. These are drainage channels to the north east and south west of the Afon Clwyd channel and which operate as collector drains on the landward side of respective flood defences serving the Afon Clwyd. The drains both flow to the north west, parallel to the Afon Clwyd, and ultimately discharge into the Afon Clwyd downstream (Clwyd Embankment Drain North via Rhyl Cut and Clwyd Embankment Drain South via the Afon Gele).

Gypsey Lane Drain

79 Gypsey Lane Drain is not crossed by the onshore ECC but the upstream extent forms the boundary of a proposed TCC (Abergele Road North TCC). The drain is classed as main river and serves a small catchment which includes some highway drainage for the A547 Abergele Road and drainage of agricultural land to the north of the A457, adjacent to the Afon Clwyd. The drain discharges to the Clwyd Embankment Drain South (above) and forms part of the Afon Gele catchment.

Beeches Drain (into Pont Robin Cut)

80 Beeches Drain is a short section of main river which drains to the Afon Clwyd via Pont Robin Cut. The head of this main river channel connects to Sarn Drain and a proportion of flow from the upstream Sarn Drain catchment drains through Beeches Drain. The onshore ECC crosses Beeches Drain on agricultural land to the north east of Glan Clwyd Hospital, with an upstream catchment of approximately 5.5 km^2 from this point (including the upstream Sarn Drain catchment.

Tyddyn Isaf Drain

81 Tyddyn Isaf Drain is a main river tributary of Sarn Drain with a small upstream catchment that drains land including the area around the OnSS. The onshore ECC includes sections of Tyddyn Isaf Drain which may require consideration of HDD (or other trenchless crossing technique) in order to avoid the watercourse. Tyddyn Isaf Drain is situated along the eastern edge of the onshore ECC at the location of the northern end of the A55 crossing.

Sarn Drain

82 Sarn Drain is served by two main river tributaries, Sarn Drain East and Sarn Drain West. Both are parallel channels which flow north from the A55 before joining the main Sarn Drain channel. Downstream, Sarn Drain connects into Beeches Drain (above) and Sarn Cut which flows into the Afon Gele catchment. Although within the study area, this watercourse is not intersected by the onshore ECC or OnSS.

Pengwern Drain

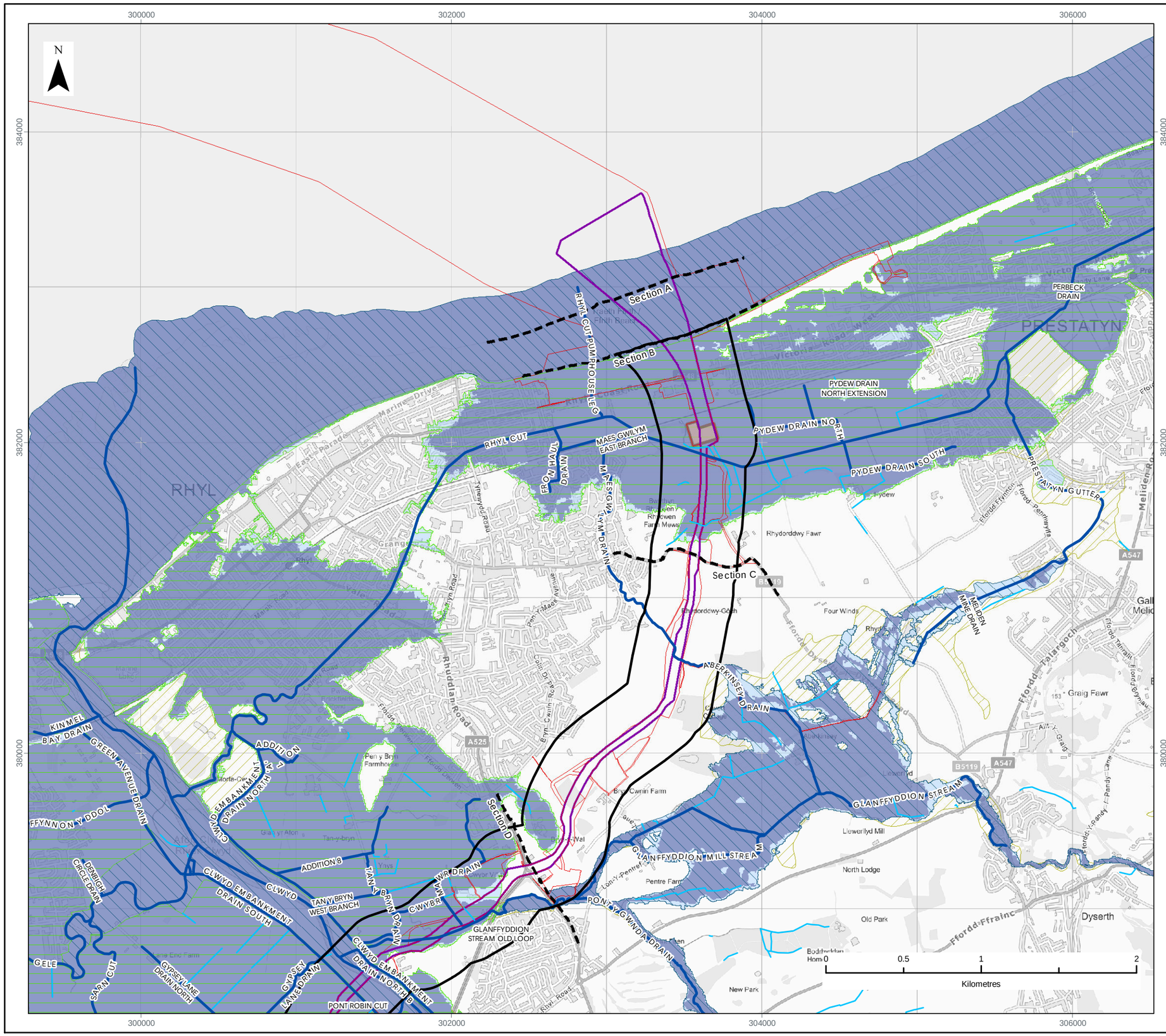
83 Pengwern Drain is a main river flowing from south to north to the east of the onshore ECC, passing along the boundary to the east of Princes Gorse woodland, north of the A55. The watercourse has upstream tributaries which include the existing National Grid substation and the proposed Grid Connection Point within their catchments. Pengwern Drain flows into Clwyd Estuary via Pont Robin Cut.

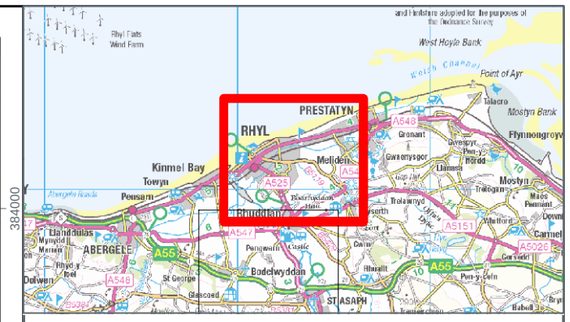
Non-main river watercourses

84 The study area crosses a number of existing field drains, ditches and irrigation channels. The majority of the surface water channels crossed are non-main river and form tributaries to the watercourses detailed above. These features are detailed in Figure 2 and Figure 3.

Watercourse sensitivity

85 Sensitivities have been assigned to all watercourses within the study area as defined in Table 9.





LEGEND

- Order Limits
- Onshore Cable Route Section Breaks
- Proposed Onshore Export Cable Corridor
- Proposed Transition Joint Bay Construction Compound
- Hydrology, Hydrogeology and Flood Risk Study Area
- NRW Main River
- Ordinary Watercourse
- Development Advice Map - Zone C1
- Development Advice Map - Zone C2
- Development Advice Map - Zone B
- Environment Agency Flood Zone 3
- Environment Agency Flood Zone 2

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

NRW WATERCOURSES AND FLOOD ZONES

VER	DATE	REMARKS	Drawn	Checked
1	26/02/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 2

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:25,000	A3	ODN	British National Grid

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

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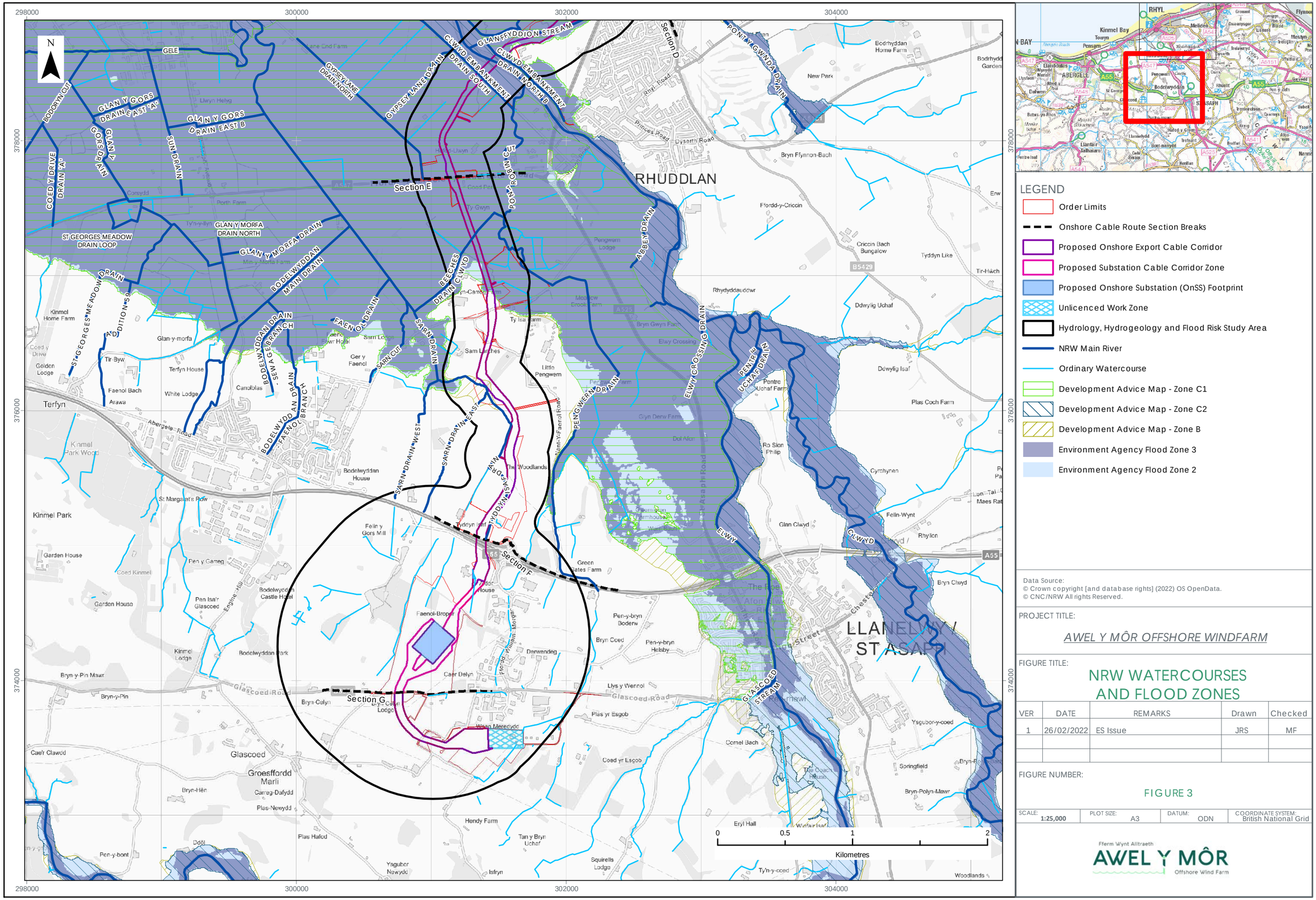

LEGEND

- Order Limits
- Onshore Cable Route Section Breaks
- Proposed Onshore Export Cable Corridor
- Proposed Substation Cable Corridor Zone
- Proposed Onshore Substation (OnSS) Footprint
- Unlicenced Work Zone
- Hydrology, Hydrogeology and Flood Risk Study Area
- NRW Main River
- Ordinary Watercourse
- Development Advice Map - Zone C1
- Development Advice Map - Zone C2
- Development Advice Map - Zone B
- Environment Agency Flood Zone 3
- Environment Agency Flood Zone 2

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

NRW WATERCOURSES AND FLOOD ZONES

VER	DATE	REMARKS	Drawn	Checked
1	26/02/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 3

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:25,000	A3	ODN	British National Grid

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

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7.7.3 Geological and Hydrogeological Setting and Ground Conditions

86 The geological setting of the AyM onshore infrastructure and ground conditions are described in detail within Volume 3, Chapter 6: Ground Conditions and Land Use (application ref: 6.3.6) with bedrock geology shown in Figure 4.

87 Groundwater beneath the Study Area is present within Principal bedrock aquifers of the Clwyd Limestone group, underlying part of the OnSS land and the onshore ECC between the OnSS and Grid Connection Point; and Kinnerton Sandstone Formation, underlying the onshore ECC from Landfall to immediately south of the A547 crossing. A 'Secondary A' bedrock aquifer is present within the mudstones of the Warwickshire Group which underlies the remaining onshore ECC and areas of the OnSS land.

88 All formations mentioned above form part of the Clwyd Permo-Triassic Sandstone WFD groundwater body.

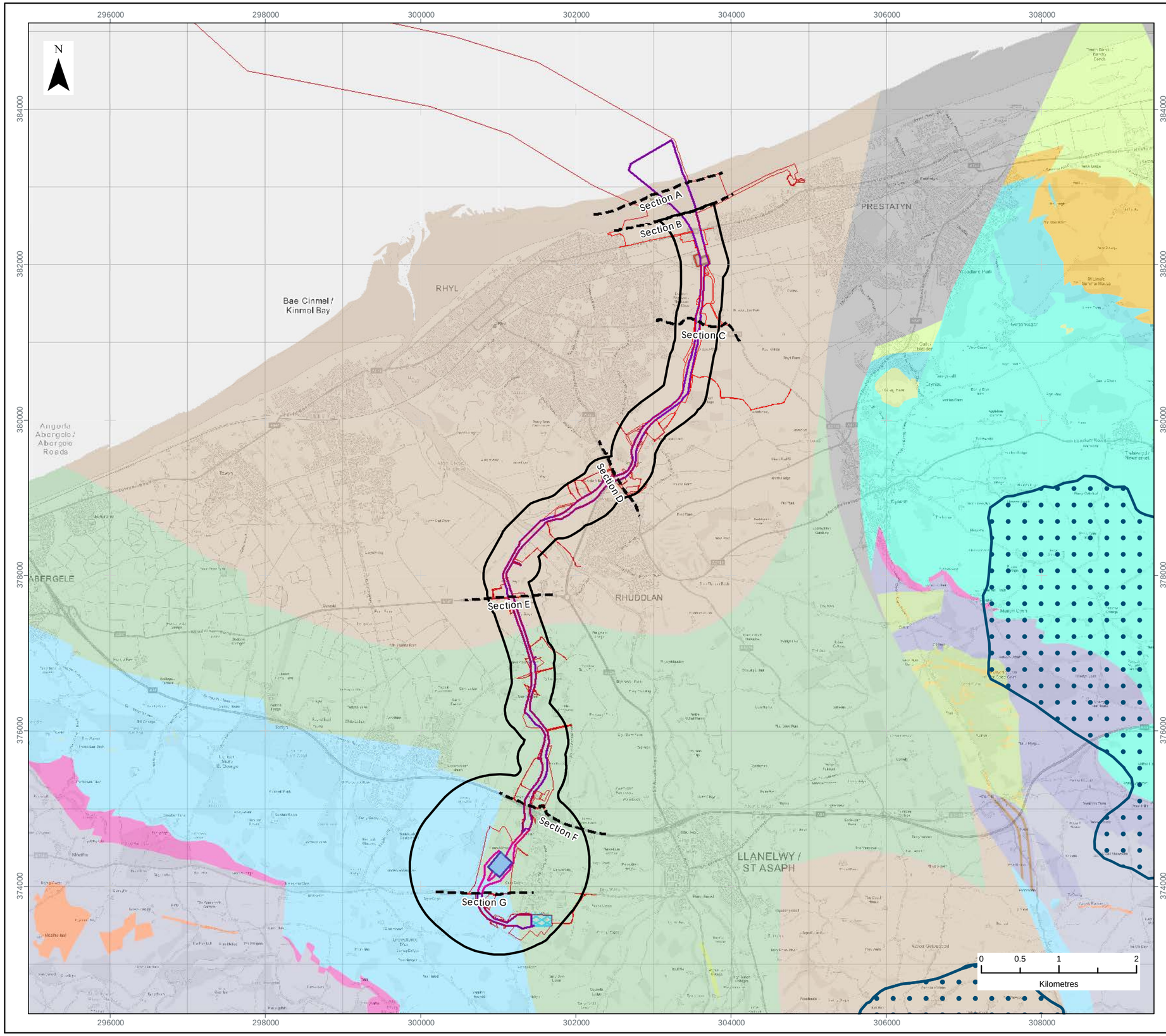
89 Inland superficial deposits underlying the study area comprise mainly of Tidal Flat Deposits, Devensian Diamicton Till and Glaciofluvial Deposits. These deposits are generally classed as Secondary (undifferentiated or Secondary A) aquifers.

90 Groundwater beneath the onshore ECC within the Kinnerton Sandstone Formation, from Landfall to the Afon Clwyd crossing, is considered susceptible to nitrate pollution from agricultural activities and is designated as a Nitrate Vulnerable Zone (NVZ).

91 No groundwater Source Protection Zones (SPZs) are noted within the study area.

Groundwater sensitivity

92 Sensitivities have been assigned to all groundwater bodies beneath the study area, as defined in Table 9.



LEGEND

- Order Limits
- Onshore Cable Route Section Breaks
- Proposed Onshore Export Cable Corridor
- Proposed Substation Cable Corridor Zone
- Proposed Transition Joint Bay Construction Compound
- Proposed Onshore Substation (OnSS) Footprint
- Unlicenced Work Zone
- Onshore Cable Route Section Breaks
- Source Protection Zone
- Hydrology, Hydrogeology and Flood Risk Study Area

Bedrock Geology

Kinnerton Sandstone Formation - Sandstone	Early Triassic
Clywd Limestone Group - Limestone	Carboniferous
Teilia Formation - Mudstone and Limestone, Interbedded	Carboniferous
Ffernant Formation - Mudstone, Siltstone and Sandstone	Carboniferous
Llanarmon Limestone Formation - Limestone	Carboniferous
Llanarmon Limestone Formation (Knoll Reef) - Limestone	Carboniferous
Pennine Coal Measures Group - Sedimentary Rock Cycles, Coal Measure Type	Carboniferous
Bowland Shale Formation - Mudstone	Carboniferous
Pentre Chert Formation	Devonian
Warwickshire Group - Mudstone, Siltstone and Sandstone	Devonian
Warwickshire Group - Sandstone	Devonian
Elwy Formation - Mudstone, Siltstone and Sandstone	Silurian
Elwy Formation - Sandstone	Silurian
Nantglyn Flags Formation - Mudstone and Siltstone	Silurian
Upper Mottled Mudstone Member - Mudstone	Silurian
Denbigh Grits Formation - Mudstone, Siltstone and Sandstone	Silurian
Denbigh Grits Formation - Sandstone	Silurian

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

BEDROCK GEOLOGY AND SOURCE PROTECTION ZONES

VER	DATE	REMARKS	Drawn	Checked
1	26/02/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 4

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:50,000	A3	ODN	British National Grid

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

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7.7.4 Flood Risk

Tidal and fluvial flood risk

93 The Landfall site is located at Ffrith Beach, on the coastline between Rhyl and Prestatyn. The MHWS level of the Irish Sea extends over the northern part of the beach area and is within the onshore ECC. The existing seawall along the coast, between the beach and Rhyl Golf Club, passes through the Landfall site. The seawall offers protection against tidal flooding to the land behind it, therefore the proportion of the Landfall site area which lies south of the seawall is considered to be within the defended tidal floodplain, as shown in Figure 2 (classified as flood zone C1 as defined in TAN15). It should be noted that cables will be installed using HDD or other trenchless crossing techniques in this area with the HDD/trenchless crossing entry points located to the south of the railway, and exist pits located at a point between MHWS and 1km seaward of MHWS. The height of the sea wall defences along this frontage is detailed in NRW spatial data as having an effective crest level of 7.23 m above Ordnance Datum (aOD). Based on extreme sea levels along this stretch of coastline, the defences are considered to currently offer adequate protection against tidal flooding however tidal flooding has occurred to properties in the vicinity of the landfall area (most notably in 2013). DCC are investigating and implementing coastal defence improvement schemes at Rhyl and Prestatyn which are designed to improve the level of protection afforded by defences.

94 The East Rhyl Coastal Defence Scheme is currently being implemented and finalised by DCC with a primary aim of reducing the risk of coastal flooding in the Garford Road area of East Rhyl (Planning Application 45/2018/1197). This scheme extends up to the edge of the Landfall area at Rhyl Golf Club, which is designated for floodplain storage during extreme conditions. The scheme is part of DCC's strategy for managing the potential impacts from climate change in future years and affording protection to residential and business areas in East Rhyl.

95 The Central Prestatyn Coastal Defence Scheme has examined options for replacing or improving the existing tidal defences serving Prestatyn. This includes the section of sea wall along the boundary of Rhyl Golf Club within the landfall area. A review of existing defences as part of the scheme has assessed this section of defences to be the area of most immediate concern. The preferred option includes a new earth embankment that is set back from the front-line defences, following the boundary of the golf course along the A548 Rhyl Coast Road. Flood water coming over the older front-line defences during a storm would be contained within the golf course area until it can discharge back to sea, following the storm event. The planning application for Central Prestatyn Coastal Defence Scheme was submitted in December 2021 Planning Application 45/2021/1248) and at the time of writing has not been determined.

96 As noted above, AyM will use HDD or trenchless crossing techniques to install cables beneath the Coastal Defence Scheme areas. The Applicant has been in dialogue with the developer of the Coastal Defence Scheme and DCC about the two schemes co-existing.

97 Large areas inland from the coastal defences, along the alignment of the onshore ECC are defined as being a Low risk of flooding from the sea classified as flood zone A as defined in TAN15 and Flood Zone 1 as defined in the Flood Risk Assessment Wales Map). Low risk is defined as areas which have a chance of flooding for tidal events ranging between 0.5% annual exceedance probability (AEP) and 0.1% AEP (1 in 200 chance to 1 in 1000 chance of flooding in any given year). This land is also shown in the Flood Risk Assessment Wales Map as benefitting from coastal defences.

98 The tidal defence breach modelling presented within the DCC SFCA suggests that the area of land in which the Landfall site is located would not be affected in the event of the modelled breach, however the Point of Ayr to Pensarn Tidal Flood Risk Assessment details a possible breach scenario in the coast defences adjacent to Garford Road in Rhyl. It is understood that the East Rhyl Coastal Defence Scheme will address this risk.

99 The onshore ECC contains land which is defined as being within tidal and fluvial floodplain, some of which is afforded protection by the coastal sea wall defences and defences along the course of the Clwyd Estuary. Land immediately north east (Figure 2) and south west (Figure 3) of the Clwyd Estuary and within the study area is defined as being at a Low risk of flooding from tidal sources and at Medium or High risk of flooding from fluvial sources as defined in the NRW Development Advice Map (DAM) and the Flood Risk Assessment Wales Map. Medium risk is defined as areas which have a chance of flooding for fluvial events ranging between 3.3% AEP and 1% AEP (1 in 30 chance to 1 in 100 chance of flooding in any given year). High risk is defined as areas which have a chance of flooding for fluvial events that is greater than 3.3% AEP. This land is also shown as benefitting from flood defences along the Afon Clwyd.

100 The Tidal Clwyd Flood Risk Management Strategy provides a commitment to continue to manage flood risk from the tidal section of the Clwyd and the open coastline. A recent (September 2021) review of the strategy indicates that while the current defences are providing an acceptable level of flood risk protection, climate change and projections of sea level rise suggest that increases in defence levels will be required in some areas by 2030 to maintain a minimum 200-year standard of protection. Future work may include setting back of flood defences at the point where the onshore ECC crosses the Afon Clwyd.

101 The OnSS location and immediate surrounding areas are outside of the fluvial and tidal floodplain (classified as flood zone A in TAN15).

Flood risk from other sources

102 Some land located to the south west of the Afon Clwyd (Route Section D) is also shown on NRW mapping to be potentially susceptible to flooding in the event of a failure of a reservoir. This risk is detailed as being associated with Llyn Aled and Llyn Aled Isaf reservoirs, both of which drain into the Afon Elwy catchment, over 30 km upstream of the Clwyd Estuary.

103 Given the predominantly agricultural, greenfield, nature of the land on which the OnSS land and onshore ECC are located, there is unlikely to be formal drainage infrastructure controlling runoff from these areas. During a rainfall event, surface water would infiltrate into the ground or, if the soil is saturated, flow over the surface in an uncontrolled manner, ponding in topographic lows or following the topographic slope into open drainage ditches/ streams or the main watercourse network.

104 All areas discussed as being potentially at risk of flooding are noted to be within areas served by NRW Floodline which provides Flood Warnings and Flood Alerts for potential fluvial or tidal flood events.

Floodplain sensitivity

105 Sensitivity has been assigned to the floodplains within the study area, as defined in Table 9.

7.7.5 Water Quality

106 Under the Western Wales River Basin Management Plan (RBMP) (NRW 2015), which was produced in accordance with the requirements of the WFD, the monitored watercourses and water bodies within the river basin area have been grouped into management catchments which are made up of smaller waterbody catchments. Each water body is classified based on assessment of monitored data for ecological criteria (possible categories of 'high'; 'good'; 'moderate'; 'poor'; or 'bad') and chemical criteria (possible categories of 'good'; or 'fail'), with an overall status classification based on these assessments.

107 The waterbody catchments assessed as part of the RBMP and which are within the study area include:

- Glanffyddion Cut – moderate overall, with moderate ecological status and good chemical status;
- Afon Gele – moderate overall, with moderate ecological status and good chemical status; and
- Pont Robin Cut – poor overall, with poor ecological status and good chemical status.

108 The coastal waters are also monitored as the North Wales coastal waterbody and the Clwyd transitional waterbody, both of which have moderate overall classification and moderate ecological status. With regard to chemical status, the North Wales coastal waterbody fails and the Clwyd transitional waterbody is classified as good.

109 NRW is responsible for monitoring bathing waters in Wales. Monitoring locations in close proximity to the study area include:

- Abergele (Pensarn),
- Kimmel Bay (Sandy Cove),
- Rhyl,
- Rhyl East,
- Marine Lake, Rhyl, and
- Prestatyn

110 The classification of the identified Bathing Waters, reported between 2017 and 2021, are presented below.

Table 7: Bathing Water status classification (NRW, 2021)

NAME	CLASSIFICATION				
	2021	2020	2019	2018	2017
Abergele (Pensarn)	Sufficient	Sufficient	Sufficient	Good	Good
Kinmmel Bay (Sandy Cove)	Good	Sufficient	Good	Good	Good
Rhyl	Sufficient	Good	Sufficient	Sufficient	Sufficient
Rhyl East	Good	Good	Good	Good	Good
Marine Lake, Rhyl	Sufficient	Sufficient	Sufficient	Good	Good
Prestatyn	Excellent	Excellent	Excellent	Excellent	Excellent

111 These results mean that the waters meet the criteria for the stricter UK guideline standards of the rBWD (see Volume 2, Chapter 3 (application ref: 6.2.3) and Volume 4, Annex 3.1 (application ref: 6.4.3.1) for further details).

112 A 'minor' pollution incident was recorded at the SABP involving the release of diesel oil to a tributary of Pengwern Drain in September 1997. A 'significant' pollution incident was recorded on the Rhuddlan Golf Course in 1993 involving the release of oils to a surface water drain.

Onshore watercourses, near-shore coastal waters and the Clwyd transitional waters sensitivity

113 Sensitivity has been assigned to all watercourses, near-shore coastal waters and the Clwyd transitional waters, as defined in Table 9.

7.7.6 Discharge Consents

114 Table 8 shows discharge consents are recorded within 500 m of the proposed onshore infrastructure.

Table 8: Discharge consents within 500m of onshore AyM infrastructure

PERMIT HOLDER	SOURCE	OUTFALL LOCATION WITH RESPECT TO DCO BOUNDARY	DISCHARGE TYPE	RECEIVING WATERBODY
Dwr Cymru	Ty Newydd pumping station	485 m west of landfall at Rhyl Golf Club	Sewage	Rhyl Cut
Dwr Cymru	Robin Hood Holiday Camp	On southern boundary of landfall at Rhyl Golf Club (noting cables will be installed using trenchless crossing techniques beneath the Golf Club and Holiday Camp)	Sewage – storm overflow	Rhyl Cut
Bodryddan Farming Company	Aberkinsey Caravan Park	25 m north of access track from Dyserth Road	Sewage – treated effluent	Aberkinsey Drain
Dwr Cymru	Ford Aber CSO	70 m south east of section D	Sewage – storm overflow	Glanfyddion Cut
Dwr Cymru	Lon Cwybr	75 m south east of section D	Sewage – storm overflow	Glanfyddion Cut

PERMIT HOLDER	SOURCE	OUTFALL LOCATION WITH RESPECT TO DCO BOUNDARY	DISCHARGE TYPE	RECEIVING WATERBODY
Dwr Cymru	Rhuddlan WWTW	75 m south east of section D and 30 m south west of access track	Sewage – storm overflow and treated effluent	Afon Clwyd
Dwr Cymru	Rhuddlan Network Tank CSO	20 m south west of access track	Sewage – storm overflow	Afon Clwyd
Pengwern College	Pengwern Hall	350 m east of Sarn Lane crossing	Sewage – treated effluent	Pont Robin Cut
Dwr Cymru	SABP pumping station	125 m east of A55 crossing	Sewage	Pengwern Drain
Dwr Cymru	Marli Glascoed STW	495 m south west of OnSS boundary	Sewage – treated effluent	Groundwater via infiltration
Dwr Cymru	Cwttir Lane pumping station	240 m north of Glascoed Road	Sewage – storm overflow	Pengwern Drain
Thales Optics Ltd	Thales Optics Ltd	265 m north of Glascoed Road	Trade discharge – site drainage	Pengwern Drain

PERMIT HOLDER	SOURCE	OUTFALL LOCATION WITH RESPECT TO DCO BOUNDARY	DISCHARGE TYPE	RECEIVING WATERBODY
Bryn Jones	Elwydale STP	365 m east of Glascoed Road junction	Sewage – treated effluent	Groundwater via infiltration

7.7.7 Abstractions

115 Surface water is abstracted from the Pengwern Drain at two locations to the west of St Asaph Road for spray irrigation (Route Section E). Water is also abstracted from a tributary of the Drain at the eastern edge of the Rhuddlan Golf Course, for spray irrigation.

116 Details of three licenced private water supply users were provided by DCC within 1.5 km of the onshore ECC:

- Borehole – NGR 303143, 381385
  Which permits drinking water for caravan park
  Route Section B
  365 m west of the onshore ECC
- Borehole – 300684, 377774
  Has previously been used to provide water for livestock
  Route Section D
  235 m west of the onshore ECC
- Borehole – 303212, 375145
  Which permits drinking water to a caravan park
  Route Section E
  1,300 m east of the onshore ECC

117 All three licensed private water supply sources are boreholes into underlying groundwater. The relative location of the boreholes to the onshore ECC mean that there is no risk of impact to these sources as receptors. The underlying groundwater bodies have been assigned sensitivities as environmental receptors in Table 9.

7.7.8 Temporal Change

118 Future climate change has the potential to have an impact on tidal, fluvial and surface water flood risk through the anticipated increase in sea level, river flows and levels and rainfall intensity.

119 The sea levels during extreme events along the coast close to the Landfall site, as provided NRW, are detailed in the onshore ECC FCA, provided at Volume 5, Annex 7.1 (application ref: 6.5.7.1). This includes the 0.5% Annual Exceedance Probability (AEP) (1 in 200 chance annually) and the 0.1% AEP (1 in 1,000 chance annually) events.

120 The risk of tidal flooding to the land behind the defences would remain the same over the life of AyM as the current defences and proposed improvements to coastal defences serving east Rhyl and Prestatyn would continue to protect the land throughout its anticipated lifetime. Given that the height of the sea wall defences along this frontage is greater than 7.0 m, the onshore ECC is considered to be protected against the 1,000 year event for at least the next 66 years (up to 2087). It should be noted that during operation, the installed cable would be buried underground and is not considered to be vulnerable to flooding.

121 The recommended national climate change allowances for peak river flow (Welsh Government 2016) suggest a 30% increase in peak river flow intensity up to the 2080s (2070 – 2115), which would be appropriate for the proposed lifespan of AyM. Increased peak river flow would potentially increase the frequency, extent or depth of flooding associated with fluvial flood events. Based on an assessment of the location and topography of the onshore ECC and OnSS land, the extent and shape of the present-day fluvial floodplain and the distance of the onshore ECC and OnSS to fluvial watercourses, it is considered unlikely that fluvial flood risk would increase over the lifetime of AyM.

122 The recommended national climate change allowance for peak rainfall intensity (Welsh Government 2017) recommends a precautionary approach of between 20% (central estimate) and 40% (upper end estimate) for peak rainfall intensity for the time horizon of the year 2070 to 2115 and between 5% (central estimate) and 10% (upper end estimate) for 2015 to 2039. It is recommended that peak rainfall intensities used in the assessment should be increased in line with this guidance for between 2015 and 2039 for the temporary works, and between 2070-2115 for the permanent works.

7.7.9 Baseline Sensitivity

123 Based on Table 3, sensitivity values have been assigned to potential receptors, as presented in Table 9. Overall, the watercourse receptors range in sensitivity from **low** to **medium**; the near-shore coastal waters of the Irish Sea are considered to have a **high** sensitivity; the floodplain within the study area is considered to be of a **low** sensitivity; and the groundwater bodies have a **high** or **medium** sensitivity. For the purpose of assessment, individual receptors may be grouped by type (e.g. all watercourses are assessed as a receptor against the potential for impact on water quality).

Table 9: Sensitivity values for potential receptors.

RECEPTOR	VALUE (SENSITIVITY)	JUSTIFICATION
Rhyl Cut	Low	Not assessed for ecological or chemical quality status under River Basin Management Plan/ WFD; Small watercourse of local importance.
Aberkinsey Drain	Low	Not assessed for ecological or chemical quality status under River Basin Management Plan/ WFD; Small watercourse of local importance.
Glanffyddion Cut	Medium	Assessed watercourse under River Basin Management Plan/ WFD; • Ecological quality status of moderate; • Chemical quality status of good; Moderate sized watercourse of district importance.
Afon Clwyd	Medium	Assessed watercourse under River Basin Management Plan/ WFD; • Upstream Afon Clwyd ecological quality status of moderate; • Chemical quality status of good; Medium sized watercourse of regional importance.

RECEPTOR	VALUE (SENSITIVITY)	JUSTIFICATION
Clwyd Embankment Drain North and South	Low	Not assessed for ecological or chemical quality status under River Basin Management Plan/ WFD; Small watercourses of local importance.
Gypsey Lane Drain	Low	Not assessed for ecological or chemical quality status under River Basin Management Plan/ WFD; Small watercourse of local importance.
Beeches Drain/ Pont Robin Cut	Medium	Assessed watercourse under River Basin Management Plan/ WFD; • Ecological quality status of poor; • Chemical quality status of good; Small watercourse of local importance.
Tyddyn Isaf Drain	Low	Not assessed for ecological or chemical quality status under River Basin Management Plan/ WFD; Small watercourse of local importance.
Sarn Drain	Low	Not assessed for ecological or chemical quality status under River Basin Management Plan/ WFD; Small watercourse of local importance.

RECEPTOR	VALUE (SENSITIVITY)	JUSTIFICATION
Pengwern Drain	Low	Not assessed for ecological or chemical quality status under River Basin Management Plan/ WFD; Small watercourse of local importance.
Various smaller drains and streams	Low	Not assessed for ecological or chemical quality status under River Basin Management Plan/ WFD; Small watercourses of local importance.
Near-shore coastal waters of the Irish Sea and the Clwyd transitional waters	High	Assessed water body under River Basin Management Plan/ WFD; • Coastal waters and transitional are classified as of ‘’moderate’ quality; • Bathing water quality at the mouth of the Clwyd Estuary; at Kinmel Bay; and at Rhyl and Rhyl East is classified as ‘sufficient’ to ’excellent’; Part of the Liverpool Bay/ Bae Lerpwl (Wales) Special Protection Area.
Areas of floodplain within the study area	Low	Large proportion of the study area is within flood zone A i.e. outside of the tidal and fluvial floodplain; The tidal and fluvial floodplain within the study area is located on land uses which are undeveloped with few buildings. There are no

RECEPTOR	VALUE (SENSITIVITY)	JUSTIFICATION
		urbanised areas within the areas of floodplain that are within the study area. All land uses are 'less vulnerable' e.g. agricultural and recreational land; The tidal and fluvial floodplain within the study area is relatively wide and accommodates a large volume of water relative to the volume potentially displaced/increased by the onshore infrastructure for AyM. It is considered to have a low sensitivity in terms of changes in flood levels and floodplain shape.
Clwyd Limestone group and Kinnerton Sandstone group Principal Aquifer	Medium	Groundwater is present within Principal bedrock aquifers underlying part of the OnSS land and the onshore ECC between the OnSS and Grid Connection Point; and from Landfall to immediately south of the A547 crossing. NVZ designated from Landfall to the Afon Clwyd crossing for the Kinnerton Sandstone Formation. No SPZ present beneath the Study Area.
Warwickshire Group Secondary A aquifer	Low	Groundwater is present within Secondary A bedrock aquifer which underlies the onshore ECC from land immediately south of the A547 crossing to the OnSS.

RECEPTOR	VALUE (SENSITIVITY)	JUSTIFICATION
Tidal Flat Deposits, Devensian Diamicton Till and Glaciofluvial Deposits	Low	Groundwater is potentially present, perched in superficial deposits underlying the onshore ECC. Groundwater bodies are classed as Secondary aquifers (undifferentiated or Secondary A).

7.7.10 Evolution of the baseline

124 The baseline will evolve over a period of time regardless of the AyM development. The most significant change with regard to hydrology, hydrogeology and flood risk will be due to climate change and the impact of this change on hydrological regimes and flooding. Guidance is provided by Welsh Government, as referenced in Section 7.7.8, with regard to the anticipated changes in rainfall intensity, peak river flows and increases in sea levels and coastal action. These climatic changes and subsequent impacts are predicted to take place based on national and global modelling.

125 The East Rhyl Coastal Defence scheme is currently being progressed by DCC and further plans for coastal defence improvement are being progressed which will include land at the existing Rhyl Golf Club being used for floodplain storage. These changes are part of DCC's strategy for managing the potential impacts from climate change in future years and affording protection to residential and business areas in east Rhyl.

126 It is assumed that NRW will continue to work towards improvements in WFD classification for water bodies within the study area. This work may include strategies which would see physical geomorphological changes to existing surface water features; changes in local land use to improve chemical water quality of runoff reaching monitored water bodies; and/or other schemes such as ecological improvement projects which could impact on existing surface water quality.

7.8 Key parameters for assessment

127 The MDS criteria identified in Table 10 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These criteria have been selected from the details provided in the onshore project description (Volume 3, Chapter 1 (application ref: 6.3.1)). Effects of greater significance are not predicted to arise should any other development scenario, based on details within the project design envelope, to that assessed here be taken forward in the final design scheme. The MDS takes into consideration designed-in mitigation as described in Section 7.9.

Table 10: Maximum design scenario.

POTENTIAL EFFECT	MAXIMUM ADVERSE SCENARIO ASSESSED	JUSTIFICATION
CONSTRUCTION		
Onshore ECC Increase in flood risk or change in water quality	For the assessment presented in this chapter, the Onshore Export Cable Corridor (onshore ECC) represents an approximate 40 m to 60 m wide cable corridor that is approximately 12 km in length to accommodate the greatest extent of disturbance.	The MDS includes the maximum number of cables anticipated (2 circuits each with 3 cables installed in separate ducts), installed within and assumes disturbance throughout the onshore ECC area therefore, the greatest area of land disturbance. Open trenching as a crossing option for smaller watercourse crossings has been considered in the assessment to represent the greatest potential for change to surface hydrology and effect on surface water or groundwater quality.
	Cables will be installed directly or in ducts, with installation undertaken in sections. The cables will be installed in one trench per circuit (maximum of 2 trenches for up to 2 circuits), with each trench up to 5 m wide and up to 2 m deep.	
	Nine TCC locations along the onshore ECC (Including OnSS and Landfall TCCs. Indicative maximum onshore ECC TCC area of 22,500 m^2.	
	Trenched crossing of smaller watercourses (see crossings register provided in Volume 5, Annex 1.1: Crossing Schedule (application ref: 6.5.1.1)).	

POTENTIAL EFFECT	MAXIMUM ADVERSE SCENARIO ASSESSED	JUSTIFICATION
OnSS Increase in flood risk or change in water quality	The OnSS includes the footprint of the substation infrastructure and development platform.	The MDS includes the maximum development footprint (temporary and permanent) and therefore the largest possible area of disturbance to surface water features.
	One TCC work areas is included to accommodate offices, welfare facilities, car parking, workshops and storage areas. Indicative maximum TCC area of 37,500 m^2 is assumed.	
HDD (or other trenchless crossing technique), works Increase in flood risk or change in water quality	HDD (or other trenchless crossing technique) crossings required for Landfall; larger surface watercourses; key roads; and some utility crossings.	HDD (or other trenchless crossing techniques) present a risk of indirectly contaminating surface watercourses or groundwater where there is hydraulic connection with surface runoff caused by spillages and the movement of excavated earth/ sediments.
	HDD TCCs would be located at each end of the crossing, requiring an associated TCC either with permeable surfacing, or suitable drainage where non permeable surfacing used.	
Landfall Increase in flood risk or change in water quality	HDD (or other trenchless crossing technique), for 3 bores (one per circuit and one spare) will be used from Landfall to cross the coastal flood defence line, A548 Rhyl Coast Road and North Wales Main Line railway.	The MDS includes the maximum number of cables anticipated at Landfall and for the TJB location. Therefore, the maximum working corridor required has been assessed.

POTENTIAL EFFECT	MAXIMUM ADVERSE SCENARIO ASSESSED	JUSTIFICATION
	The TJBs for connecting offshore to onshore cables will be located to the south of the North Coast railway line.	
	Temporary access will be required which will cross beach groynes.	
OPERATION		
OnSS Increase in flood risk	Permanent area of OnSS Footprint assumes an Air Insulated Switchgear (AIS) substation which has the greater footprint of 200 m x 250 m plus an operational access road. In the absence of detailed design, it has been assumed that the entire permanent footprint of the OnSS will be constructed of impermeable material.	The MDS for flood risk at the OnSS requires the largest footprint for design resulting in the largest possible area of disturbance and largest potential for impermeable ground cover.
Routine maintenance works affecting surface watercourses	Routine maintenance of the OnSS. Permanent onshore cables will be buried (apart from joint bay access points).	The MDS for water quality of main watercourses during operation is that chemicals and oils would be used in the routine maintenance of OnSS. The onshore ECC provides potential lateral pathways for water flow which could indirectly affect water quality.

POTENTIAL EFFECT	MAXIMUM ADVERSE SCENARIO ASSESSED	JUSTIFICATION
DECOMMISSIONING		
Change to flood risk at the OnSS	Removal of the OnSS including areas of hardstanding. Buried cables to be de-energized with the ends sealed and left in place to avoid ground disturbance. TJBs at Landfall to be left in place.	The MDS for flood risk on the surrounding environment during decommissioning is the removal of the OnSS. The change in surfacing and removal of attenuation storage associated with the OnSS could affect flood risk as it would take the natural environment a period of time to re-establish itself to provide natural attenuation.
Decommissioning works affecting surface watercourses	Removal of the OnSS including areas of hardstanding. Buried cables would be de-energized with the ends sealed and left in place to avoid ground disturbance. TJBs at Landfall to be left in place.	The MDS for water quality of watercourses during decommissioning is the removal of the OnSS. The onshore export cable remaining in situ provides potential lateral pathways for water flow which could indirectly affect water quality.
CUMULATIVE EFFECTS		
Effects on the water environment during construction	Overlap of construction phase with construction of nearby developments.	Overlapping construction phases would be the period of highest risk to the water environment due to receptors being

POTENTIAL EFFECT	MAXIMUM ADVERSE SCENARIO ASSESSED	JUSTIFICATION
		affected by more than one project.
Effects on flood risk during operation	Combined effect of increased areas of hardstanding	Combined effects of increased hardstanding could lead to increased potential for runoff.

7.9 Mitigation measures

128 Mitigation measures that were identified and adopted as part of the evolution of the project design (embedded into the project design) and that are relevant to hydrology, hydrogeology and flood risk are listed in Table 11. The mitigation includes embedded measures such as design changes and applied mitigation which is subject to further study or approval of details; these include avoidance measures that will be informed by pre-construction surveys, and necessary additional consents where relevant. The composite of embedded and applied mitigation measures apply to all parts of the AyM development works, including pre-construction, construction, O&M and decommissioning.'

Table 11: Mitigation relating to hydrology and flood risk.

PARAMETER	MITIGATION MEASURES
GENERAL	
Project design	Careful routing of the onshore ECC and design of key crossing points (sea defence structures, main rivers, non-main and ordinary watercourses, roads), including the use of HDD (or other trenchless crossing techniques) to avoid key areas of sensitivity.
CONSTRUCTION	
Construction Method Statement	The draft DCO disapplies the Environmental Permitting (England and Wales) Regulations 2016 and Land Drainage Act 1991 for FRAP and OWC.

PARAMETER	MITIGATION MEASURES
	A final Construction Method Statement (CMS) based on detailed design of the onshore elements of AyM will be submitted (as part of the final CoCP), to provide the final detailed design and approach to watercourse crossings and crossings beneath flood defences, for agreement by DCC, in consultation with NRW, prior to construction, as secured in the DCO. The crossing points would be specified to ensure that construction does not result in significant alteration to the hydrological regime or an increase in fluvial or tidal flood risk. An outline version of the CMS is provided as Appendix 2 (application ref 8.13.2) of the outline CoCP (application ref 8.13)), in which it is proposed to include the final detailed design and approach to water way crossings.
Surface water drainage	Development of the OnSS will result in the construction of low permeability surfacing, increasing the rate of surface water runoff from the site. A surface water drainage scheme is required to ensure the existing runoff rates to the surrounding water environment are maintained at pre-development rates. An outline surface water drainage scheme has been provided as part of the OnSS FCA (Volume 5, Annex 7.2 (application ref: 6.5.7.2)).
	The detailed (post-consent) design of the surface water drainage scheme would be based on a series of infiltration/soakaway tests carried out on site and the attenuation volumes outlined in the supporting OnSS FCA (Volume 5, Annex 7.2 (application ref: 6.5.7.2)). The tests will be undertaken prior to construction and in accordance with the BRE Digest 365 Guidelines in order to determine the suitability of ground for accepting a drainage discharge.
	Construction of the onshore ECC will require temporary management of surface water along the route. A surface water drainage scheme will be informed by detailed

PARAMETER	MITIGATION MEASURES
	design and provided as part of the final CoCP for approval by DCC prior to construction which forms a requirement of the DCO.
Flood Risk	Construction practices will incorporate measures to reduce the risk arising from flooding such as preparation of a flood response plan, permeable haul roads where practical, management of stockpiles and maintaining field drainage arrangements. Where non permeable surfaces are used for TCCs and haul roads, suitable drainage measures will be agreed with DCC via the surface water drainage schemes. All construction work will be undertaken in accordance with a Construction Method Statement (CMS) secured as part of the CoCP which forms a requirement of the DCO. An outline version of the CMS As Appendix 1 of the Outline Code of Construction Practice (CoCP) (application ref: 8.13.1) that sets out the principles to be followed when the final CMS is finalized and submitted for approval by DCC in consultation with NRW. The outline CMS sets out the flood management measures, which may be implemented by the Applicant and its contractors during construction
Pollution Prevention and Emergency Incident Response Plan (PPEIRP)	All construction work will be undertaken in accordance with a Pollution Prevention and Emergency Incident Response Plan (PPEIRP), secured as part of the CoCP which forms a requirement of the DCO. An outline version of the PPEIRP is provided as Appendix 6 of the CoCP (application ref: 8.13.6). The outline PPEIRP sets out the principles to be followed when the final PPEIRP is finalised that will include the following measures. Areas at risk of spillage, such as vehicle maintenance areas and hazardous substance stores (including fuel, oils, drilling fluids and chemicals) will be bunded and carefully sited to minimise the risk of hazardous substances

PARAMETER	MITIGATION MEASURES
	entering drainage systems or local watercourses. Bunds used to store fuel, oil etc. will have a 110% capacity. including pollution prevention measures, and emergency incident responses, which may be implemented by the Applicant and its contractors during construction.
Soil Management Plan	All construction work will be undertaken in accordance with a Soil Management Plan (SMP). An Outline Soil Management Plan (SMP) is provided as Appendix 4 to the outline CoCP (application ref: 8.13.4) an outline version of which is provided (application ref: 8.13). The outline SMP sets out the principles to be followed when the final SMP is finalised and agreed with DCC as part of the CoCP which forms a requirement of the DCO. The outline SMP provides details of mitigation measures and best practice handling techniques to safeguard soil resources by ensuring their protection, conservation and appropriate reinstatement during the construction of the onshore works. These measures will include guidance on earthworks and stockpiling in order to minimise potential entrainment of sediments to surface water features or increase in nitrogen loading to groundwater through infiltration.
Good practice	All construction work will be undertaken in accordance with the CoCP, an outline version of which is provided in the Outline Code of Construction Practice (application ref: 8.13) that sets out the principles to be followed when the final CoCP is finalised and secured as part of the CoCP which forms a requirement of the DCO. The CoCP will include good practice guidance including, but not limited to: ▲ Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors CIRIA (C532) (CIRIA 2001); ▲ CIRIA – SuDS Manual (C753) (CIRIA, 2015b);

PARAMETER	MITIGATION MEASURES
	• No discharge to main river watercourses will occur without permission from NRW (SuDS Manual); • Wheel washers, or alternative measures to minimise the transfer of detritus onto the highway, and dust suppression measures (such as those set out in the Air Quality Management Plan (application ref: 8.13.4), to be used as appropriate to prevent the migration of pollutants (SuDS Manual); • Regular cleaning of roads of any construction waste and dirt to be carried out (SuDS Manual); and • A construction method statement to be submitted for approval by the responsible authority (SuDS Manual). The above principles are included within the outline CoCP (application ref:8.13) that sets out the principles to be followed when the final CoCP is finalized and submitted to DCC for approval in consultation with NRW.
OPERATION	
General	The OnSS would contain potential pollutants which could include cooling oils, lubricants, fuels, greases, etc. The design, maintenance and operation of the facility would follow good practice in line with the prevailing future guidance and legislation with regard to measures such as the storage and management of potentially polluting substances, emergency spill response procedures, clean up and control of any potentially contaminated surface water runoff and routine inspection to prevent or contain leaks of any pollutants.
DECOMMISSIONING	
General	Decommissioning practices will incorporate measures similar to the construction phase, to prevent pollution and increased flood risk. These measures will include emergency spill response procedures, control of surface water and clean up and remediation of any contaminated soils. Exposed cables ducts will be sealed

PARAMETER	MITIGATION MEASURES
	with an appropriate water proofing material to mitigate flood risk or creation of preferential flow pathways.
	A decommissioning plan will be required by the DCO, to include protection of the water environment, based on guidance that will be appropriate at the time of decommissioning.

7.10 Environmental assessment: construction phase

129 The impacts of the onshore construction of AyM have been assessed on hydrology, hydrogeology and flood risk in the onshore study area. The impacts arising from the construction of AyM are detailed in Table 10 above, along which the MDS against which each construction phase impact has been assessed.

130 A description of the potential effect on hydrology, hydrogeology and flood risk receptors caused by each identified impact is given below. In general however, the environmental effects arising from the construction of AyM are temporary, as they only occur during the construction phase.

131 The Flood Consequence Assessments (Volume 5, Annex 7.1 (application ref: 6.5.7.1) and Annex 7.2(application ref: 6.5.7.2)) assess the effects of flood risk on the temporary works areas associated with the construction phase and demonstrate how the significance of these effects can be reduced to an acceptable level through mitigation measures.

7.10.1 Construction of cable route infrastructure

Potential environmental effects: Water quality

132 Several sections of the onshore ECC involve or require crossing a main river, non-main and ordinary watercourses or drainage ditches, as shown in Figure 2 and Figure 3 and listed in the Crossing Schedule (Volume 5, Annex 1.1 (application ref: 6.5.1.1)). Along its route, the cable passes through land which is within tidal and fluvial floodplain, some of which is afforded protection by the coastal sea wall defences and defences along the course of the Afon Clwyd, as shown in Figure 1.

133 Landfall HDD (or other trenchless crossing technique) exit pits may be located within the intertidal zone or the shallow subtidal. Depending on the final methodology and location, it may be necessary to install temporary cofferdams to prevent water intrusion to provide a dry working area and to retain drilling fluid.

134 The outline CoCP (application ref: 8.13) includes measures to ensure that procedures are in place in the event of flooding during the construction phase. As noted within the outline CoCP (application ref: 8.13) the measures will be secured through the provision of a flood response plan to be submitted in advance of construction and as required in the CMS within the CoCP. Through measures such as the ceasing of works, relocation or securing of materials and evacuation of workforce personnel, the outline CoCP (application ref: 8.13) will reduce the likelihood of construction activities resulting in incidents detrimental to water quality occurring in the event of flooding and reduce the magnitude of the impact of any such incidents.

135 The Pollution Prevention and Emergency Incident Response Plan (PPEIRP), an outline version of which is provided in Appendix 6 of the outline COCP (application ref: 8.13.6), includes measures to control runoff from the construction works. This could include, for example, sediment fences when working in proximity to open watercourses, containment of storage areas and treatment of any runoff from work areas or water from dewatering of trenches. Such measures would prevent the potential reduction in water quality associated with increased sediment loading affecting nearby tidal waters, fluvial watercourses or drainage ditches during onshore ECC construction works, especially during excavations or earthwork activities.

136 As set out in the outline PPEIRP (application ref 8.13.6), Stockpiling of excavated materials during earthworks would be temporary and would only be permitted in designated areas. Designated stockpile areas would be a minimum of 10 m from any open watercourse features. The potential for contaminants contained within the stockpiled materials to be leached into water bodies, resulting in a reduction in the quality of the receiving waters, would be reduced through the implementation of mitigation, discussed at Section 7.9 and mitigation measures proposed within the outline PPEIRP (application ref 8.13.6) and outline SMP (application ref 8.13.4) provided within the outline CoCP (application ref:8.13), including secondary containment of bulk storage areas.

137 The mitigation measures discussed at Section 7.9 includes the implementation of spill procedures and use of spill kits. These measures together with appropriate drainage systems and containment will minimise the potential for any reduction in water quality associated with spills or leaks of stored oils/ fuels/ chemicals or other polluting substances migrating into nearby water bodies.

138 The potential presence of ground contamination and the potential for this to migrate into underlying groundwater is considered in Volume 3, Chapter 6 (application ref: 6.3.6).

Impact on water quality of watercourses

139 For watercourses, it is predicted that the impact on water quality from the onshore ECC construction works direct pollution from spills would be direct and of an intermittent nature and of short duration.

140 The sensitivity of onshore watercourse receptors ranges from **low** to **medium** and the magnitude of impact with the controls in place is deemed to be **low** given the embedded mitigation in place and that any direct pollution from spills would be small. The significance of effect is therefore considered to be ***minor adverse***, which is not significant in EIA terms.

Impact on near-shore coastal waters

141 For the near-shore coastal water body and the Clwyd transitional waters, the impact on water quality from the onshore ECC construction works would be direct (landfall works only) and indirect (via onshore watercourses discharging to the coast) and of an intermittent nature and of short duration.

142 The sensitivity of the near shore water body is **medium.** Potential for water quality impacts from shore works is **negligible** as any excavations will only have potential to mobilise sands and any direct pollution from spills will be very small relative to the receiving environment.

143 The mechanism for water quality impacts on the near shore coastal water body from inland works will be indirect, via watercourses. These watercourses will reduce any potential impacts from sediment entrainment and spills through settlement and dilution respectively.

144 The magnitude of impact with controls in place is assessed to be **negligible**. The significance of effect on near shore coastal water is therefore considered to be ***minor adverse***, which is not significant in EIA terms.

Impact on groundwater quality

145 As confirmed in Volume 3, Chapter 6: Ground Conditions and Land use (application ref: 6.3.6), there are no known point sources of contamination within the study area, however, on a precautionary basis, there is the potential for limited contamination to exist as a result of previous land uses, including agriculture and the use of nitrogen-based fertilisers. Any contamination is likely to be localised in its extent given the sources of contaminants and the characteristics of the underlying geology.

146 Whilst there is the potential for the construction of the cable trench to introduce a pathway for contaminants the permeability of the underlying strata is likely to limit the migration of potential contaminants. Across some areas of the onshore ECC, the underlying superficial deposits are unlikely to contain significant quantities of groundwater, particularly near the surface. As a result, groundwater is unlikely to be encountered during the construction of the cable trenches given their shallow depth. Any groundwater seepage is likely to be minor and it would be managed in accordance with procedures set out in the outline CoCP (application ref:8.13). Given the depth of the superficial deposits, groundwater in the bedrock is unlikely to be affected.

147 Overall, it is predicted that the magnitude of impact will be **low** to **negligible** and direct, and of short duration. The sensitivity of the groundwater receptor is considered to be **medium** to **low**. Given the variable to low permeability of the superficial deposits, the effect will, therefore, be ***negligible*** to ***minor adverse***, which is not significant in EIA terms.

Potential environmental effects: Flood risk

148 Spills of bulk materials such as concrete or entrainment of stockpiled material from excavations during cabling works could result in watercourses or drainage ditches becoming restricted or blocked. This could impact flow regimes and could result in an increase in fluvial flood risk.

149 Implementation of the mitigation measures discussed at Section 7.9 and further measures which will be proposed within the outline CoCP (application ref: 8.13), would reduce the likelihood of construction activities resulting in spillage incidents occurring and will ensure that there is very limited chance of stockpiled material becoming entrained and entering watercourses. This would reduce the magnitude of impact of any such incident.

150 Large stockpiles of excavated/ construction materials could block overland flow of surface water during heavy rainfall events and could also affect the routing and extent of fluvial flood risk from main rivers or tidal flood risk. This could result in changes to existing hydrology and an increase in flood risk locally.

151 The laying of temporary surfacing material for the working area (which includes the corridor in which the access road, cable trench, excavated material and equipment are located) could result in a reduction in the permeability of the ground and therefore an increase in surface water flood risk. The small-scale nature of the construction works in relation to the overall size of the groundwater aquifer means there is negligible potential for impact on groundwater levels.

152 These effects will be mitigated through the appropriate siting of stockpiles, provision of gaps to allow passage of surface water and development of a drainage strategy. Therefore, the effects of construction on surface water flood risk would be largely mitigated through the measures proposed within the outline CoCP (application ref:8.13).

153 The onshore ECC crosses main rivers, ordinary watercourses and drainage ditches along its route. At any watercourse crossing there will be potential for the construction works associated with the crossing to increase fluvial flood risk through altering existing hydrological regime.

154 A final Construction Method Statement (CMS) based on detailed design of the onshore elements of AyM will be submitted (as part of the final CoCP), to provide the final detailed design and approach to water way crossings and crossings beneath flood defences, for agreement by DCC, in consultation with NRW, prior to construction, as secured in the DCO. The would be specified to ensure that construction does not result in significant alteration to the hydrological regime or an increase in fluvial or tidal flood risk.

155 An outline version of the CMS is provided as Appendix 2 (application ref 8.13.2) of the outline CoCP (application ref 8.13)), in which it is proposed to include the final detailed design and approach to water way crossings

156 Construction activities would be undertaken in accordance with the final CMS which would be specified to ensure that construction does not result in an increase in flood risk. The CMS would specify mitigation measures including emergency and contingency plans for flooding incidents which may affect the works. The CMS would specify the need for a minimum cover depth between the cable and hard bed level of the watercourse being crossed.

157 Overall, it is predicted that the impact on flood risk from construction of the onshore ECC (including crossing of watercourses) would be direct and of an intermittent nature and of short duration.

158 The sensitivity of the receptor (the fluvial and tidal floodplain) is considered to be **low** and the magnitude of impact is deemed to be **negligible**. The significance of effect would, therefore, be ***negligible adverse***, which is not significant in EIA terms.

7.10.2 Onshore Substation Construction

Potential environmental effects: water quality

159 As set out for the onshore ECC works above, implementation of the mitigation measures discussed at Section 7.9 and the measures proposed within the outline CoCP (application ref:8.13) would reduce the likelihood of construction activities associated with the OnSS from resulting in incidents detrimental to water quality occurring and reduce the magnitude of the impact of any such incidents.

160 The proposed measures would include controls to prevent the potential reduction in water quality associated with increased sediment loading (including potentially contaminated sediment) entering nearby fluvial watercourses or drainage ditches during construction works, especially during excavating works.

161 Materials excavated during construction works would be stockpiled temporarily in designated areas. All designated stockpile areas would be a minimum of 10 m from any open watercourse features. The potential for contaminants to be contained within the stockpiled materials that could be leached into nearby fluvial watercourses or drainage ditches is not considered likely as contaminated land from pre-existing ground conditions has been effectively ruled out of assessment in Chapter 6 Ground Conditions and Land Use (application ref: 6.3.6) as no contamination sources have been identified along the route. If required and where practical, where soil is to be stored for over 6 months it will be covered to minimise erosion or allowed to re-vegetate naturally.

162 The mitigation measures discussed at Section 7.9 and included in the outline CoCP (application ref: 8.13) includes the implementation of spill procedures and use of spill kits on site. This should prevent any potential reduction in water quality associated with spills or leaks of stored oils, fuels or chemicals used during the construction works migrating into nearby watercourses or drainage ditches.

163 The potential presence of ground contamination is considered in Volume 3, Chapter 6 (application ref: 6.3.6).

Impact on watercourses

164 Overall, it is predicted that the impact on water quality in watercourses would be direct and of an intermittent nature and of short duration.

165 The sensitivity of the receptors (receiving watercourses within the vicinity of the OnSS, including Tyddyn Isaf Drain and Sarn Drain) is **low** and the magnitude of impact is deemed to be **low**. The significance of effect would, therefore, be ***minor adverse***, which is not significant in EIA terms.

Impact on groundwater quality

166 The proposed OnSS site is in agricultural land use to date. DCC has no record of any potentially contaminative land use on the site and therefore, the probability of contamination is considered to be low. NRW has no data to suggest that the OnSS site has been affected by migration of potential contaminants from the adjacent SABP.

167 Overall, it is predicted that the impact on groundwater quality will be direct and of a continuous nature and of short duration.

168 The sensitivity of the groundwater receptor is considered to be **medium** to **low** and the magnitude is deemed to be **negligible**. The effect will, therefore, be ***negligible*** to ***minor adverse***, which is not significant in EIA terms.

Potential environmental effects: Flood risk

169 Spills of bulk materials such as concrete or entrainment of stockpiled material from excavations during OnSS construction could result in watercourses or drainage ditches becoming restricted or blocked. This could impact flow regimes and could result in an increase in localised fluvial flood risk.

170 Implementation of the mitigation measures discussed at Section 7.9 and further measures which will be proposed within the outline CoCP (application ref: 8.13), would reduce the likelihood of construction activities resulting in spillage incidents occurring and will ensure that there is very limited chance of stockpiled material becoming entrained to potentially enter watercourses. This would reduce the magnitude of impact of any such incidents.

171 Large stockpiles of excavated/ construction materials could block overland flow of surface water during heavy rainfall events and result in changes to existing surface water hydrology and an increase in surface water flood risk.

172 The laying of temporary surfacing material for access roads, TCC areas any designated stockpile areas could result in a reduction in the permeability of the ground and therefore an increase in surface water flood risk. The small-scale nature of the construction works in relation to the overall size of the groundwater aquifer means there is negligible potential for impact on groundwater levels.

173 These effects would be mitigated through the appropriate siting of stockpiles, provision of gaps to allow passage of surface water and development of a drainage strategy as set out in Table 11. Therefore, the effects of construction on surface water flood risk would be largely mitigated through the measures proposed within the outline CoCP (application ref: 8.13).

174 The OnSS construction area (including land for access road options) will disturb existing surface water drainage features (ordinary watercourses) which may require diversion.

175 A final Construction Method Statement (CMS) based on detailed design of the onshore elements of AyM will be submitted (as part of the final CoCP), to provide the final detailed design and approach to the diversion of water features, for agreement by DCC, in consultation with NRW, prior to construction, as secured in the DCO. The would be specified to ensure that construction does not result in significant alteration to the hydrological regime or an increase in fluvial or tidal flood risk.

176 An outline version of the CMS is provided as Appendix 2 (application ref 8.13.2) of the outline CoCP (application ref: 8.13)), in which it is proposed to include the final detailed design for any diversion of water features.

177 Any diversion or alteration to existing watercourse features would be undertaken in accordance with the final CMS which would be specified to ensure that works do not result in an increase in flood risk. The final CMS would specify mitigation measures including emergency and contingency plans for flooding incidents which may affect the works.

178 The proposed OnSS is within an area that is at a low risk of fluvial (and tidal) flooding. The activities carried out during construction phase would not impede floodplain flows arising from a tidal or fluvial flood event or reduce floodplain storage.

179 It is predicted that the impact on flood risk in this regard would be direct and of an intermittent nature and of short duration.

180 The sensitivity of the receptor (the fluvial floodplain is considered to be **low** and the magnitude of impact is deemed to be **negligible**. The significance of effect would therefore be ***negligible adverse***, which is not significant in EIA terms.

181 A TCC area would be used during construction of the OnSS. This would be in addition to the land required for the OnSS and would be used to store plant and equipment whilst construction is being undertaken. The TCC would not be located within the floodplain.

182 Overall, it is predicted that the impact on flood risk from the OnSS TCC would be direct and of an intermittent nature and of short duration.

183 The sensitivity of the receptor (the fluvial floodplain) is considered to be **low** and the magnitude of impact is deemed to be **negligible**. The significance of effect would therefore be ***negligible adverse***, which is not significant in EIA terms.

7.10.3 Trenchless Crossing Works

Potential environmental effects: Water quality

184 As set out for the onshore ECC works above, implementation of the mitigation measures discussed at Section 7.9 and the measures proposed within the outline CoCP (application ref: 8.13) would ensure that the potential for incidents detrimental to water quality occurring is minimised and would reduce the magnitude of the impact of any such incidents. As agreed through consultation with NRW, a Groundwater Risk Assessment (application ref: 6.5.7.3 to 6.5.7.6) has been carried out at four main crossing points that will require HDD (or other trenchless crossing technique).

- Landfall and coastal defences crossing
- A525 crossing
- Afon Clwyd crossing
- A55 crossing

185 These reports are included at Volume 5, Annex 7.3 to Annex 7.6: Groundwater Risk Assessments (application refs: 6.5.7.3 to 6.5.7.6). the risk assessments found that the various watercourses in the study area are not considered to be groundwater dependent due to the low permeability of the overlying superficial deposits which act as a confining layer above the bedrock aquifers. Assessment of potential impact of the works on groundwater levels, flow and quality and surface water quality confirms that the potential impact on levels and flows is considered to be negligible or low.

186 The Final CoCP will also include a flood response plan to ensure that procedures are in place in the event of flooding during any HDD (or other trenchless crossing technique), activity. In the event of a flood warning being received for an area where trenchless crossing works are taking pace, any trenchless crossing activity would be stopped and where possible, all sensitive equipment or plant would be relocated from the risk area and material secured. Workforce personnel would be evacuated from the work area until any such warning was over. These measures will reduce the likelihood of construction activities resulting in incidents detrimental to water quality occurring in the event of flooding and reduce the magnitude of the impact of any such incidents.

187 Materials excavated during initial excavations or during trenchless crossing works would be stockpiled temporarily in designated areas. All designated stockpile areas would be a minimum of 10 m from any open watercourse features where practicable. The potential for contaminants to be contained within the stockpiled materials that could be leached into nearby fluvial watercourses or drainage ditches is not considered likely as contaminated land from pre-existing ground conditions has been effectively ruled out of assessment in Chapter 6 Ground Conditions and Land Use (application ref: 6.3.6) as no contamination sources have been identified along the route. If required and where practical, where soil is to be stored for over 6 months it will be covered to minimise erosion or allowed to re-vegetate naturally.

188 The potential presence of ground contamination is considered in Volume 3, Chapter 6 (application ref: 6.3.6).

189 The proposed measures would include controls, as set out in the outline PPEIRP (application ref: 8.13.6), to prevent the potential reduction in water quality associated with increased sediment loading (including potentially contaminated sediment) and with spills or leaks of oils, fuels or drilling fluids used during the trenchless crossing works migrating into nearby fluvial or tidal watercourses or drainage ditches during construction works, especially during excavation earthworks and management of spoil from drilling.

Impact on near-shore coastal water

190 The mechanism for water quality impacts on the near shore coastal water body from inland trenchless crossing activity will be via watercourses.

191 The mechanism for water quality impacts on the near shore coastal water and the Clwyd transitional waters from inland trenchless crossing activity will be via watercourses, which will serve to reduce impacts from sediment entrainment and spills through settlement and dilution respectively.

192 The sensitivity of the near shore water body is **high.** The magnitude of impact with controls in place is assessed to be **negligible**. The significance of effect on near shore coastal water is therefore considered to be ***Minor adverse***, which is not significant in EIA terms.

Impact on water quality in watercourses

193 For inland watercourses along the onshore ECC the impact on water quality from the trenchless crossing works would be direct and of an intermittent nature and of short duration.

194 The sensitivity of the receptors range from is **low** to **medium** and the magnitude of impact is deemed to be **low**. The significance of effect on watercourses would, therefore, be ***Minor adverse***, which is not significant in EIA terms.

195 The trenchless crossing proposed for landfall and the coastal defences is assessed under Section 7.10.4. For crossings where trenchless crossing may be used, land use has primarily been agricultural, and no land uses with potential sources of contamination in the vicinity of the trenchless crossing works have been identified. However the potential for localised contaminants as a result of run-off from the adjacent road or work areas has been considered.

196 Measures in the outline PPEIRP (application ref 8.13.6) provided as part of the outline CoCP (application ref 8.13) will be implemented to avoid accidental spillages and run-off from the trenchless crossing works.

Impact on groundwater

197 Where groundwater is encountered it will be sensitive to accidental spillages and runoff from the trenchless crossing works. Measures in the PPEIRP (application ref 8.13.6) provided as part of the outline CoCP (application ref 8.13) to control the storage and use of materials and chemicals would be implemented, which would limit the magnitude of impact.

198 The magnitude of the impact would be **low** to **negligible**. The importance/sensitivity of the underlying groundwater is **medium** to **low**, therefore, the significance of the effect on local groundwater quality is assessed to be ***negligible*** to ***minor adverse***, which is not significant in EIA terms.

Potential environmental effects: Flood risk

199 Spills of bulk materials such as concrete or entrainment of stockpiled material from excavations or spoil from drilling during trenchless crossing works could result in watercourses or drainage ditches becoming restricted or blocked. This could impact flow regimes and could result in an increase in fluvial flood risk.

200 Implementation of the mitigation measures discussed at Section 7.9 and further measures which will be proposed within the outline CoCP (application ref:8.13), would reduce the likelihood of construction activities resulting in spillage incidents occurring and will ensure that there is very limited chance of stockpiled material becoming entrained and entering watercourses. This would reduce the magnitude of impact of any such incident.

201 Large stockpiles of excavated/ construction materials could block overland flow of surface water during heavy rainfall events and result in changes to existing surface water hydrology and an increase in surface water flood risk.

202 The laying of temporary surfacing material for the trenchless crossing working areas could result in a reduction in the permeability of the ground and therefore an increase in surface water flood risk. The small-scale nature of the construction works in relation to the overall size of the groundwater aquifer means there is negligible potential for impact on groundwater levels.

203 These effects would be mitigated through the appropriate siting of stockpiles, provision of gaps to allow passage of surface water and development of a drainage strategy. Therefore, the effects of construction on surface water flood risk would be largely mitigated through the measures proposed within the outline CoCP (application ref: 8.13).

204 The proposed trenchless crossing works will be used to cross existing flood defences and a number of main river channels along the onshore ECC. At any watercourse crossing there will be potential for the trenchless crossing works associated with the crossing to increase fluvial flood risk through altering the existing hydrological regime.

205 A final Construction Method Statement (CMS) based on detailed design of the onshore elements of AyM will be submitted (as part of the final CoCP), to provide the final detailed design and approach to water way crossings and crossings beneath flood defences, for agreement by DCC, in consultation with NRW, prior to construction, as secured in the DCO. The would be specified to ensure that construction does not result in significant alteration to the hydrological regime or an increase in fluvial or tidal flood risk.

206 An outline version of the CMS is provided as Appendix 2 (application ref: 8.13.2) of the outline CoCP (application ref: 8.13)), in which it is proposed to include the final detailed design and approach to water way crossings

207 Trenchless crossings would be undertaken in accordance with the final CMS which would be specified to ensure that construction does not result in an increase in flood risk. The CMS would specify mitigation measures including emergency and contingency plans for flooding incidents which may affect the works. The CMS would specify the need for a minimum cover depth between the cable and hard bed level of the watercourse being crossed.

208 Overall, it is predicted that the impact on tidal and fluvial flood risk from trenchless crossings would be direct and of an intermittent nature and of short duration.

209 The sensitivity of the receptor (the fluvial and tidal floodplain) is considered to be **low** and the magnitude of impact is deemed to be **negligible**. The significance of effect would therefore be ***negligible adverse***, which is not significant in EIA terms.

210 Trenchless crossing compounds would be used during the construction phase, which would be used to store plant and equipment whilst trenchless crossing works are being undertaken. There is potential for the TCCs to be located within the fluvial or tidal floodplain and therefore a FCA for these elements has been produced (Volume 5, Annex 7.1 (application ref: 6.5.7.1)).

211 The FCA identifies appropriate mitigation measures to ensure that the flood risk associated with the TCCs is minimised to an acceptable level, including a flood warning service in the event of a potential flood threat to the area in which the TCC is located.

212 Overall, it is predicted that the impact on flood risk associated with trenchless crossing TCCs would be direct and of an intermittent nature and of short duration.

213 The sensitivity of the receptor (fluvial and tidal floodplain) is considered to be **low** and the magnitude of impact is deemed to be **negligible**. The significance of effect would therefore be ***negligible adverse***, which is not significant in EIA terms.

7.10.4 Landfall installation

Potential environmental effects: Water quality

214 As set out for the onshore ECC works above, implementation of the mitigation measures discussed at Section 7.9 and the measures proposed within the outline CoCP (application ref: 8.13) would reduce the likelihood of onshore construction activities resulting in incidents detrimental to tidal water quality occurring and reduce the magnitude of the impact of any such incidents. Potential impacts to water quality associated with the 'offshore' construction works, from mean high water springs to the array, will be mitigated through the application of a Project Environmental Management Plan which will be secured in the Marine Licence(s); please refer to Volume 2, Chapter 3 (application ref: 6.2.3) for further information. Commitments for works in the intertidal zone secured through the Marine Licence(s) will reflect principles for Landfall works in the outline CoCP (application ref:8.13), subject to liaison with NRW and DCC. Assessment of potential impact on water quality from release of sediments or contaminants to near-shore coastal waters is covered in Volume 2, Chapter 3 (application ref: 6.2.3). No significant impacts are predicted from sediment or contaminant release.

215 Stockpiling of materials during earthworks would be temporary and would only be permitted in designated areas. The potential for contaminants contained within the stockpiled materials or associated with spills or leaks of stored oils, fuels or chemicals becoming mobilised into tidal waters, would be reduced through the implementation of mitigation, discussed at Section 7.9 and mitigation measures proposed within the outline CoCP (application ref:8.13).

216 Should a tidal flood event associated with extreme sea levels occur whilst construction works are in progress, there is the potential for stored materials (e.g. stockpiled soils and excavated material) to be mobilised by the floodwaters and washed into coastal waters, potentially resulting in a reduction in local tidal water quality.

217 The Final CoCP will include measures such as a flood response plan to ensure that procedures are in place in the event of flooding during the construction phase. Through measures such as the ceasing of works, relocation or securing of materials and evacuation of workforce personnel the outline CoCP (application ref: 8.13) will reduce the likelihood of construction activities resulting in incidents detrimental to water quality occurring in the event of flooding and reduce the magnitude of the impact of any such incidents.

218 The potential volume and concentration of any contaminated water entering tidal waters as a result of construction activities is considered to be low compared to that of the receiving tidal waters. The mitigation measures discussed at Section 7.9 includes the implementation of spill procedures and use of spill kits. These measures will minimise the potential for any reduction in water quality associated with spills or leaks migrating into tidal waters.

219 No potential sources of contamination have been identified from former land uses at Landfall and therefore, the probability of mobilising existing contaminants in the vicinity is considered unlikely. The onshore cable would be installed by HDD (or other trenchless crossing technique) under the sea defences and dunes. Assessment of the trenchless crossing activity is detailed at Section 7.10.3. A compound would be established at the TJB working area, with another TCC located either near Garford Road or Fergusson Avenue associated with the exit pit works within the beach area, which are likely to incorporate storage areas for fuels and chemicals. As a result, there is the potential for contaminants to be released as a result of accidental spillage or inappropriate storage and therefore, potentially affect the underlying groundwater. The underlying superficial geology is classified as a Secondary A Aquifer and therefore, is of medium sensitivity however the quality of the groundwater is likely to be affected with elevated levels of salinity, which may reduce its importance/sensitivity to medium to low. The implementation of the PPEIRP as part of the CoCP would control the storage and use of fuels and chemicals within the compounds and therefore, reduce the likelihood of contamination occurring. Any risk of increased salinity to groundwater will be localised and small.

Impact on near-shore coastal water

220 The mechanism for water quality impacts on the near shore coastal water body from inland trenchless crossing activity will be via watercourses.

221 The sensitivity of the near shore water body is **high**. Potential for water quality impacts from shore works is **negligible** as any excavations is likely to only have potential to mobilise sands and any direct pollution from spills will be very small relative to the receiving environment. The significance of effect on near shore coastal water is therefore considered to be ***minor adverse***, which is not significant in EIA terms.

Impact on watercourses

222 For inland watercourses along the onshore ECC the impact on water quality from the trenchless crossing works would be direct and of an intermittent nature and of short duration.

223 The sensitivity of the watercourse receptors range from is low to **medium** and the magnitude of impact is deemed to be **low**. The significance of effect on watercourses would, therefore, be ***minor adverse***, which is not significant in EIA terms.

Impact on groundwater

224 For the Landfall trenchless crossing which includes the railway, potentially contaminated materials may have been used in the construction of the railway line and from management operations, however, the potential contaminants are likely to be localised to the railway corridor and therefore, are unlikely to be mobilised as a result of the trenchless crossing.

225 The superficial deposits are classified as a Secondary Undifferentiated Aquifer of low sensitivity and are up to 25 m thick. Given the depth and heterogeneous nature of these deposits, the major groundwater resource within the Kinnerton Sandstone is unlikely to be directly affected. Shallow perched groundwater may be encountered during trenchless crossing works.

226 It is predicted that the magnitude of impact of trenchless crossing mobilising contaminants at the landfall crossing will be **low**, direct and of a continuous nature and of short duration.

227 The sensitivity of the groundwater receptor is considered to be **medium** to **low**. The effect will, therefore, be ***minor adverse***, which is not significant in EIA terms.

228 Overall, it is predicted that the impact on groundwater will be direct and of a continuous nature and of short duration.

229 The sensitivity of the groundwater receptor is considered to be **medium** to **low** and the magnitude is deemed to be **low**. The effect will, therefore, be ***minor adverse***, which is not significant in EIA terms.

230 The potential presence of ground contamination is considered in Volume 3, Chapter 6 (application ref: 6.3.6).

Potential environmental effects: Flood risk

231 The laying of temporary surfacing material for the Landfall access road, TCCs and any designated stockpile area could result in a reduction in the permeability of the ground and therefore an increase in surface water flood risk. The increase in surface water runoff volume arising on the impermeable areas is likely to be relatively minor and would discharge directly to tidal waters. The effect of these works on flood risk is assessed in more detail in the onshore ECC FCA (Volume 5, Annex 7.1 (application ref: 6.5.7.1)). The small-scale nature of the construction works in relation to the overall size of the groundwater aquifer means there is negligible potential for impact on groundwater levels from any reduction in infiltration.

232 Overall, it is predicted that the impact on surface water flood risk would be direct and of an intermittent nature and of short duration.

233 The sensitivity of the receptor (the fluvial and tidal floodplain) is considered to be **low** and the magnitude of impact is deemed to be **negligible**. The significance of effect would therefore be ***negligible adverse***, which is not significant in EIA terms.

234 Export cables will be installed by trenchless crossing techniques, passing beneath the coastal flood defences, A548 Rhyl Coast Road and North Wales Main Line railway, with offshore cables connecting to onshore cables at the TJBs. The potential impact from impairment of the coastal defence structure would result in an increase in tidal flood risk.

235 A final Construction Method Statement (CMS) based on detailed design of the onshore elements of AyM will be submitted (as part of the final CoCP), to provide the final detailed design and approach to water way crossings and crossings beneath flood defences, for agreement by DCC, in consultation with NRW, prior to construction, as secured in the DCO. The would be specified to ensure that construction does not result in significant alteration to the hydrological regime or an increase in fluvial or tidal flood risk.

236 An outline version of the CMS is provided as Appendix 2 (application ref 8.13.2) of the outline CoCP (application ref: 8.13)), in which it is proposed to include the final detailed design and approach to water way crossings

237 Construction activities would be undertaken in accordance with the final CMS which would be specified to ensure that construction does not result in an increase in flood risk. The CMS would specify mitigation measures including emergency and contingency plans for flooding incidents which may affect the works.

238 Overall, it is predicted that the impact on tidal flood risk would be direct and of an intermittent nature and of short duration.

239 The sensitivity of the receptor (the fluvial and tidal floodplain) is considered to be **low** and the magnitude of impact is deemed to be **negligible**. The significance of effect would therefore be ***negligible adverse***, which is not significant in EIA terms.

7.11 Environmental assessment: operational phase

240 The impacts of the operation and maintenance of the onshore elements of AyM have been assessed on hydrology, hydrogeology and flood risk in the study area. The impacts arising from the operation of AyM are detailed in Table 10 above, along which the MDS against which each operational phase impact has been assessed.

241 A description of the potential effect on hydrology, hydrogeology and flood risk receptors caused by each identified impact is given below.

242 The onshore ECC FCA and OnSS FCA (Volume 5, Annex 7.1 (application ref: 6.5.7.1) and Volume 5, Annex 7.2 (application ref: 6.5.7.2)) assesses the effects of flood risk on the permanent infrastructure associated with the operational phase and demonstrate how the significance of these effects can be reduced to an acceptable level through mitigation measures.

7.11.1 Permanent onshore ECC infrastructure

Potential environmental effects

243 The onshore cables would be buried underground. Full restoration of land above the cables, including trenchless crossing working areas, would be included in the construction phase, ensuring that the former land use is retained. There would be some minor increase in impermeable surfacing associated with the onshore ECC, arising from permanent access routes required for inspection and maintenance of the onshore cable. There is a potential increase in surface water flood risk from these areas due to the greater volume and rate of runoff arising from reduced infiltration potential to ground. The small-scale nature of the reduced infiltration potential in relation to the overall size of the groundwater aquifer means there is negligible potential for impact on groundwater levels.

244 Appropriate surface water drainage measures would be implemented to mitigate against the potential increase in surface water flood risk by ensuring that runoff from the access routes is restricted to acceptable rates (to be agreed with DCC through a DCO Requirement for Surface Water drainage details, based upon detailed design, to be approved prior to the commencement of works) or passes to tidal waters, thereby not increasing surface water flood risk. Infiltration-based SUDS techniques would be considered where feasible to achieve this.

Impact on environmental receptors

245 Overall, it is predicted that the impact from the onshore ECC on flood risk and water quality would be direct and of a continuous nature and of medium to long duration.

246 The sensitivity of the receptors (watercourses; near-shore coastal waters; and floodplain) ranges from **low** to **medium** and the magnitude of impact is deemed to be **negligible**. The significance of effect would therefore be ***minor*** *or* ***negligible adverse***, which is not significant in EIA terms.

7.11.2 Onshore Substation

Potential environmental effects

247 The development of the OnSS and permanent access route would result in an increase in impermeable surfacing. The maximum footprint of the OnSS Footprint would be 200 m by 250 m. Through the introduction of impermeable surfacing associated with the OnSS building and access track, there is a potential increase in surface water flood risk due to the greater volume and rate of runoff arising from reduced infiltration potential to ground. The small-scale nature of the reduced infiltration potential in relation to the overall size of the groundwater aquifer means there is negligible potential for impact on groundwater levels.

248 Appropriate surface water drainage, as outlined in the OnSS FCA and outline drainage strategy (Volume 5, Annex 7.2, application ref: 6.5.7.2)) would be implemented to mitigate against the potential increase in surface water flood risk. Surface water drainage measures would be implemented to ensure that runoff from the site is managed and restricted to rates agreed with DCC, thereby not increasing surface water flood risk. A range of feasible SUDS techniques could be used to achieve this, e.g. infiltration features or surface water detention areas, and the outline drainage strategy within the OnSS FCA shows how such attenuation could be accommodated within the OL.

Impact on flood risk

249 The OnSS is within flood zone A, i.e. outside of the tidal and fluvial floodplain. There would be no effect on the fluvial or tidal floodplain (and therefore no effect on flood risk) associated with the OnSS during the operational phase.

250 Overall, it is predicted that the impact on flood risk to the OnSS would be direct and of a continuous nature and of medium to long duration.

251 The sensitivity of the receptor (the floodplain) is considered to be **low** and the magnitude of impact is deemed to be **negligible**. The significance of effect would therefore be ***negligible adverse***, which is not significant in EIA terms.

Impact on water quality

252 The OnSS would contain potential pollutants which could include cooling oils, lubricants, fuels, greases, etc. The design, maintenance and operation of the facility would be undertaken in line with good practice and include routine inspections to prevent or contain leaks of any pollutants. Any such maintenance would follow good practice in line with the prevailing future guidance and legislation (as mentioned in Table 11), which would include specific measures to minimise the risk of a pollution event, thereby mitigating against the potential for these contaminants to migrate into the local drainage ditch network and/or groundwater and cause a reduction in water quality.

253 Overall, it is predicted that the impact on water quality would be direct and of a continuous nature and of medium to long duration.

254 The sensitivity of the receptors (watercourses) is considered to range from **low** to **medium** and the magnitude of impact is deemed to be **negligible**. The significance of effect would therefore be ***minor or negligible adverse***, which is not significant in EIA terms.

7.11.3 Permanent Landfall site infrastructure

Potential environmental effects

255 The Landfall site would include TJBs and a temporary working area. Following construction, the temporary working area would be restored to its former condition. TJBs would be buried leaving a manhole structure at the surface that would be a maximum of 20 m x 5 m in footprint. Therefore, the only risk in terms of flooding and water quality would be any access routes required for inspection and maintenance of these features.

256 Adequate surface water drainage measures would be agreed with DCC (via a DCO Requirement for surface water drainage details to be submitted and approved prior to works commencing). Such measures would be implemented in accordance with measures defined within the CMS provided within the CoCP, to mitigate against this potential risk by ensuring that runoff from the access routes is restricted to acceptable rates (to be agreed with DCC) or passes to tidal waters, thereby not increasing surface water flood risk. A range of feasible SUDS techniques could be used to achieve this, e.g. infiltration features or surface water detention areas.

Impact on watercourses and floodplain

257 Overall, it is predicted that the impact on flood risk and water quality would be direct and of a continuous nature and of medium to long duration.

258 The sensitivity of the receptors (watercourses; near-shore coastal waters; and floodplain) ranges from **low** to **medium** and the magnitude of impact is deemed to be **negligible**. The significance of effect would therefore be ***minor or negligible adverse*** which is not significant in EIA terms.

7.12 Environmental assessment: decommissioning phase

259 During decommissioning phase, the impacts on hydrology, hydrogeology and flood risk will be similar to those assessed for the construction phase. Good practice measures (similar to those identified within the CoCP) would be employed during decommissioning and would be agreed with statutory authorities at the time of decommissioning through a decommissioning plan.

260 The significance of effects associated with the temporary impacts on water quality and flood risk would be ***minor*** *or* ***negligible adverse***, as assessed in the construction phase detailed above, which is not significant in EIA terms.

261 Post-decommissioning, the long-term effects of the decommissioned the onshore elements of AyM are described below.

7.12.1 Decommissioning of onshore ECC

Potential environmental effects

262 Details surrounding the decommissioning phase are yet to be fully clarified. In addition, it is also recognised that policy, legislation and local sensitivities evolve, which will limit the relevance of undertaking an assessment at this stage. Nevertheless, decommissioning activities are not anticipated to exceed the construction phase worst case criteria assessed, given forecast improvements to air quality, and the potential for onshore ducts to remain *in situ* with only the cable removed which would see a reduction in impacts and resulting level of significance in comparison to the assessment of construction effects.

263 Decommissioning activities are expected to occur for up to 3 years – however this will be driven primarily by offshore works. Landfall infrastructure is expected to be left *in situ* where appropriate, to abate potential future impacts. However, this will be reviewed over the design life of AyM, and adapt to local sensitivities, policy, and legalisation.

264 The decommissioning methodology would be finalised nearer to the end of the lifetime of AyM, to be in line with current guidance, policy and legislation. Any such methodology would be agreed with the relevant authorities and statutory consultees. The DCO includes a requirement to submit a written scheme of decommissioning 6 months before decommissioning starts.

Impact on all environmental receptors

265 Overall, it is predicted that the impact of the decommissioned onshore ECC on flood risk and water quality in the maximum adverse scenario (i.e. TJBs left in situ) would be direct and of a continuous nature and of medium to long duration.

266 The sensitivity of the receptors (watercourses; near-shore coastal waters; and floodplain) ranges from **low** to **medium** and the magnitude of impact is deemed to be **negligible**. The significance of effect would, therefore, be ***minor or negligible adverse***, which is not significant in EIA terms.

7.12.2 Decommissioning of onshore substation

Potential environmental effects

267 It is anticipated that the OnSS would be gradually dismantled on site with certain infrastructure removed for recycling or reuse. Following this, the area is likely to be remediated and restored.

268 The decommissioning works may involve removal of some or all of the impermeable hard-standing surfacing and restoration of the permeable greenfield land present prior to construction. This action would result in the surface water flood risk being returned to its pre-development state. Specific decommissioning requirements and potential concerns with regards to hydrology, hydrogeology and flood risk would be discussed with the relevant statutory consultees at the time.

Impact on all environmental receptors

269 Overall, it is predicted that the impact of the decommissioned OnSS on flood risk and water quality would be direct and of a continuous nature and of long duration.

270 The sensitivity of the receptors (watercourses and the fluvial and tidal floodplain) is considered to range from **low** to **medium** and the magnitude of impact is deemed to be **negligible**. The significance of effect would therefore be ***negligible adverse***, which is not significant in EIA terms.

7.13 Environmental assessment: cumulative effects

271 The cumulative impacts of the onshore elements of AyM have been assessed on hydrology, hydrogeology and flood risk receptors in the study area. A list of other major developments has been compiled for the onshore assessment of cumulative effects, which includes other projects that are considered likely to be present in the area of the onshore works once AyM is operational, or where there may be some overlap in respective construction phases and in decommissioning if appropriate. These are listed in Volume 1, Annex 3.1: Cumulative Effects Assessment (CEA) (application ref: 6.1.3.1), with the projects that are identified within the study area and have been given further consideration listed in Table 12.

Table 12: Projects considered within the Hydrology, Hydrogeology and Flood Risk cumulative effect assessment.

DEVELOPMENT TYPE	PROJECT	STATUS	FURTHER DETAILS	TIER
Coastal Defence Infrastructure	Central Prestatyn Coastal Defence Scheme comprising the formation of flood embankments ramps outfall structures and rock armour including landscaping habitat enhancements works	Application submitted and under consideration	The site is located between Rhyl and Prestatyn and involves construction of an earth embankment set back from the existing frontline defences that follows the boundary of Rhyl Golf Club, adjacent to the A548, Rhyl Coast Road.	1
Energy	40/2018/1036 Gas fired power plant at St Asaph Business Park	Consented (construction not commenced)	The plant will include up-to two gas generators, to provide a maximum generation capacity of 5 MW. The consented site is approximately 850 m to the east of the OnSS and on the eastern side of St Asaph Business Park.	1

Energy	Elwy Solar Energy Farm	Application submitted and under consideration	This site is located entirely on agricultural land which comprises Grade 3b and Grade 3a agricultural land. The proposed development is temporary and is a reversible feature, once decommissioned the site's former agricultural use can be restored.	1
Residential	198 Bedroom Care Home	Consented (construction not commenced)	A 1.6 Ha site approximately 50m from the AyM OL. Potential effects from runoff during construction only.	1
Industrial	7 Industrial Units	Consented (2018)	Erection of 7 no. industrial units with associated parking, landscaping, access road and external storage areas approximately 200m to the east of the proposed OnSS.	1

272 Trenchless crossing techniques will be used by AyM to install cables beneath the proposed coastal defence works. There will be no direct interaction between the two projects or cumulative effect. The proposed coastal defence scheme works are scheduled for completion in 2025, before onshore works for AyM commence in 2026 and the scheme includes pollution prevention measures alongside a commitment that these measures will be included into the Environmental Action Plan for the project.

273 The distance from the proposed power plant at St Asaph Business Park to the onshore elements of AyM is approximately 850m. Other built development is already in place between the power plant and AyM OL, meaning that significant cumulative effects are not likely to occur.

274 The Elwy Solar Farm proposals are separated from the OL by Nant y Faenol road and farmland. The application documents include a commitment to provide a Construction Environment Management Plan (CEMP) for approval by DCC that will include appropriate measures to control runoff and prevent the release of polluting substances.

275 The proposed care home is separated from the AyM OL by Fforddd William Morgan which is located on an embankment and another minor road that represent a topographic and physical barrier between the two development areas. The care home scheme will need to implement a Construction Environment Management Plan (CEMP) that has been approved by DCC, which includes measures to control surface water runoff and pollution.

276 The planning conditions associated with the consented industrial units have required the provision of a Construction Method Statement that has been reviewed and approved by DCC and includes mitigation measures to control release of polluting materials.

277 Given the timing of proposed construction activities for these projects, the scale of developments, their proximity away from the OL and the requirements to control potential detrimental effects of development on flood risk and water quality, no significant cumulative hydrology, hydrogeology and flood risk effects arising during the construction phase of these new developments are likely. All other onshore projects are noted to be beyond the study area or are in separate hydraulic catchments to the onshore ECC.

278 Furthermore, it is expected that the onshore elements of AyM would not have any impact on the measures that other developments within the vicinity of the onshore works would need to incorporate during the construction phase to prevent detrimental hydrology or flood risk effects elsewhere.

279 Other than the projects discussed above, many of the receptors potentially affected by the onshore elements of AyM are different to those potentially affected by the projects considered in Volume 1, Annex 3.1 (application ref: 6.1.3.1) as these projects are remote from the onshore ECC or are in separate hydraulic catchments. In cases where the receptors are the same, the relative location and distance of the other projects to AyM mean that there is no significant hydraulic connectivity between them and therefore no potential for cumulative effect.

Further mitigation and future monitoring

280 No further mitigation or monitoring measures are considered necessary.

7.14 Inter-relationships

281 This chapter has considered the effect of the onshore elements of AyM on water quality and flood risk in relation to the proposed onshore infrastructure. Effects on geology are considered in Volume 3, Chapter 6 (application ref: 6.3.6). Effects on offshore water quality are considered in Volume 2, Chapter 3 (application ref: 6.2.3).

282 The potential for effects of AyM to result in consequential effects on receptors would be controlled by the measures set out in this chapter. The effects identified within this chapter are predicted to be ***minor*** *or* ***negligible adverse***. None of these effects would be significant in EIA terms. Given the localised nature of the effects, there is not considered to be potential for significant inter-related effects on any offshore receptors.

283 Impacts on water quality arising from spillages or leaching of potentially polluting material may result in contamination of the ground through pollutants being mobilized to ground in water. With the implementation of mitigation measures detailed in this chapter, the effect on groundwater would be ***negligible adverse***, as defined in Section 7.10.

284 Impacts on the volume of sediment entering watercourses or coastal waters arising from excavation of ground materials during drilling or trenching may result in increased sedimentation of water bodies. With the implementation of mitigation measures detailed in this chapter, the effect on surface water or near shore coastal waters would be ***negligible adverse***, as defined in Section 7.10.

285 There are not considered to be any significant inter-related effects between offshore and onshore parts of AyM in terms of hydrology, hydrogeology and flood risk.

7.15 Transboundary effects

286 The likely effects of AyM would be localised. It is not considered likely that there would be any trans-boundary effects in relation to hydrology or flood risk.

7.16 Summary of effects

287 The potential hydrological receptors in the study area comprise the tidal and fluvial floodplain; various watercourses, including Main Rivers and ordinary watercourses or drains; the near-shore tidal waters of the Irish Sea and underlying groundwater bodies. These receptors vary in their environmental sensitivity from low to high.

288 The assessed magnitude of the various identified impacts of the onshore elements of AyM on water quality and flood risk varies from ***minor*** *to* ***negligible adverse***. Overall, through the implementation of mitigation measures, including those specified in the outline CoCP (application ref: 8.13), it is considered that the likely overall effect of the onshore elements of AyM on water quality and flood risk throughout the construction, operation and decommissioning of AyM is **not significant** in EIA terms.

Table 13: Summary of effects.

IMPACT	MAGNITUDE	SENSITIVITY OF RECEPTOR	MITIGATION MEASURES	RESIDUAL EFFECT
Construction				
Onshore ECC installation: water quality of watercourses	Low	Low to Medium	None in addition to mitigation within the Outline CoCP (application ref:8.13	***Minor Adverse*** *not significant*
Onshore ECC installation: water quality for near shore coastal waters and the Clwyd transitional waters	Negligible	Medium	None in addition to mitigation within the Outline CoCP (application ref:8.13)	***Minor Adverse*** *not significant*
Onshore ECC installation: groundwater quality	Negligible to Low	Low to Medium	None in addition to mitigation within the Outline CoCP (application ref:8.13)	***Negligible to Minor Adverse*** *not significant*
Onshore ECC installation: flood risk	Negligible	Low	None in addition to mitigation within the Outline CoCP	***Negligible Adverse*** *not significant*

IMPACT	MAGNITUDE	SENSITIVITY OF RECEPTOR	MITIGATION MEASURES	RESIDUAL EFFECT
from construction activities			(application ref:8.13) and Onshore ECC FCA (Annex 7.1, Application ref 6.5.7.1)	
OnSS construction: water quality in watercourses	Low	Low	None in addition to mitigation within the Outline CoCP (application ref:8.13)	***Minor Adverse*** *not significant*
OnSS construction: groundwater quality	Negligible	Low to Medium	None in addition to mitigation within the Outline CoCP (application ref:8.13)	***Negligible to Minor Adverse*** *not significant*
OnSS construction: flood risk	Negligible	Low	None in addition to mitigation within the Outline CoCP (application ref:8.13) and ONSS FCA (Annex 7.2,	***Negligible Adverse*** *not significant*

IMPACT	MAGNITUDE	SENSITIVITY OF RECEPTOR	MITIGATION MEASURES	RESIDUAL EFFECT
			Application ref 6.5.7.2)	
OnSS TCC construction: flood risk	Negligible	Low	None in addition to mitigation within the Outline CoCP (application ref:8.13)	***Negligible Adverse*** *not significant*
Trenchless crossing works: water quality for near shore coastal waters and the Clwyd transitional waters	Negligible	High	None in addition to mitigation within the Outline CoCP (application ref:8.13)	***Minor Adverse*** *not significant*
Trenchless crossing works: surface water quality	Low	Low to Medium	None in addition to mitigation within the Outline CoCP (application ref:8.13)	***Minor Adverse*** *not significant*
Trenchless crossing works: groundwater quality	Negligible to Low	Low to Medium	None in addition to mitigation within the	***Negligible to Minor Adverse*** *not significant*

IMPACT	MAGNITUDE	SENSITIVITY OF RECEPTOR	MITIGATION MEASURES	RESIDUAL EFFECT
			Outline CoCP (application ref:8.13)	
Trenchless crossing works: Flood risk	Negligible	Low	None in addition to mitigation within the Outline CoCP (application ref:8.13	***Negligible Adverse*** *not significant*
Trenchless crossing works: Flood risk from TCC	Negligible	Low	None in addition to mitigation within the Outline CoCP (application ref:8.13	***Negligible Adverse*** *not significant*
Landfall installation: near-shore coastal water	Negligible	High	None in addition to mitigation within the Outline CoCP (application ref:8.13)	***Minor Adverse*** *not significant*
Landfall installation: surface water quality	Low	Low to Medium	None in addition to mitigation within the Outline CoCP (application ref:8.13)	***Minor Adverse*** *not significant*

IMPACT	MAGNITUDE	SENSITIVITY OF RECEPTOR	MITIGATION MEASURES	RESIDUAL EFFECT
Landfall installation: trenchless crossing on groundwater quality	Low	Low to Medium	None in addition to mitigation within the Outline CoCP (application ref:8.13)	***Minor Adverse*** *not significant*
Landfall installation: groundwater quality	Low	Low to Medium	None in addition to mitigation within the Outline CoCP (application ref:8.13)	***Minor Adverse*** *not significant*
Landfall installation: Watercourse Flood risk	Negligible	Low	None in addition to mitigation within the Outline CoCP (application ref:8.13)	***Negligible Adverse*** *not significant*
Landfall installation: Tidal Flood risk	Negligible	Low	None in addition to mitigation within the Outline CoCP (application ref:8.13)	***Negligible Adverse*** *not significant*
Operation				

IMPACT	MAGNITUDE	SENSITIVITY OF RECEPTOR	MITIGATION MEASURES	RESIDUAL EFFECT
Permanent Onshore ECC infrastructure: water quality and flood risk	Negligible	Low to Medium	None required	***Negligible to Minor Adverse*** *not significant*
OnSS: flood risk	Negligible	Low	None required	***Negligible Adverse*** *not significant*
OnSS: water quality	Negligible	Low to Medium	None required	***Negligible to Minor Adverse*** *not significant*
Permanent Landfall infrastructure: water quality and flood risk	Negligible	Low to Medium	None required	***Negligible to Minor Adverse*** *not significant*
Decommissioning				
Decommissioning of Onshore ECC on flood risk and water quality	Negligible	Low to Medium	None required	***Negligible to Minor Adverse*** *not significant*

IMPACT	MAGNITUDE	SENSITIVITY OF RECEPTOR	MITIGATION MEASURES	RESIDUAL EFFECT
Decommissioning of OnSS: flood risk	Negligible	Low	None required	***Negligible Adverse*** *not significant*
Decommissioning of OnSS: water quality	Negligible	Low to Medium	None required	***Negligible to Minor Adverse*** *not significant*

7.17 References

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Fferm Wynt Alltraeth

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