

## 7 Water Resources

### Introduction

- 7.1 This Section of the Screening and Scoping Report provides the proposed assessment methodology to address the potential effects of the Proposed Project on water quality and water resources that may arise during the construction, operation and decommissioning of the Proposed Project. The assessment will focus on discharges, dewatering of excavations, surface runoff of silts and potential to affect local surface water quality. This section will also address flood risk, hydromorphological risk and consider implications of the EU Water Framework Directive (WFD).
- 7.2 The scoping of water quality and water resource risks has been undertaken in line with the guidance set out in the following documents:
- Groundwater Protection<sup>1</sup> (14 March 2017);
  - Draft Planning Policy Wales (Edition 10) (Welsh Government, Consultation Draft, February 2018);
  - Planning Policy Wales (Edition 9) (2016); and
  - Technical Advice Note 15 (TAN15): Development and Flood Risk (2004).
- 7.3 The potential for contamination to groundwater is provided in Section 8 (Ground Conditions). Impacts to the Dwyryd Estuary are addressed separately in Section 16 (Marine Physical Environment).

### Legislation and Policy

- 7.4 Legislation and policy relevant to the control and protection of water resources and provision of flood risk management comprises:
- The EU Water Framework Directive (WFD) (2000/60/EC);
  - The EU Floods Directive (2007/60/EC);
  - The Water Resources Act 1991, as amended;
  - The Water Act 2003, and 2014;
  - The Environment Act 1995;
  - The Environmental Protection Act 1990;
  - The Land Drainage Act 1991; and
  - The Flood and Water Management Act 2010.
- 7.5 A number of specific regulations have been made to implement the statutory European and national legislation into law as set out above. These regulations include:
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017;
  - The Flood Risk Regulations 2009, as amended in Wales by The Flood Risk (Amendment) (Wales) Regulations 2011;
  - The Anti-Pollution Works Regulations 1999;

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<sup>1</sup> <https://www.gov.uk/government/collections/groundwater-protection> (14

- The Water Resources (Control of Pollution) (Oil Storage) (Wales) Regulations 2016;
- The Groundwater Regulations (England and Wales) 2009;
- The Environmental Damage (Prevention and Remediation) Regulations 2009, as amended in Wales by The Environmental Damage (Prevention and Remediation) (Amendment) (Wales) Regulations 2015 and The Environmental Damage (Prevention and Remediation) (Wales) (Amendment) (No.2) Regulations 2015;
- The Water Resources Act (Amendment) (England and Wales) Regulations 2009;
- The Environmental Permitting (England and Wales) Regulations 2010, as amended; and
- Water Supply (Water Quality) Regulations 2010, as amended (amended in 2011 and 2016).

7.6 In terms of planning policy, Planning Policy Wales sets out the land use planning policies of the Welsh Government and TAN 15 supplements policy in relation to development and flood risk. Draft PPW (Edition 10) is currently out for consultation.

## Baseline Environment

- 7.7 The Afon Dwyryd (classified as a Main River) widens into an estuary flowing west into Tremadog Bay. The Area of Search for Permanent and Temporary Works also crosses the Penrhyn Cyt (Main River) and a number of other smaller watercourses on either side of the estuary which are managed by the Natural Resources Wales/ Harlech and Maentwrog Internal Drainage District (IDD).
- 7.8 The Area of Search for Permanent and Temporary Works crosses a large area of Flood Zone 3 as shown in Natural Resources Wales's Flood Risk Map Viewer<sup>2</sup>. Flood Zone 3 is associated with the tidal Dwyryd Estuary and Penrhyn Cyt and covers part of Penrhyndeudraeth. Flood Zone 3 is an area at high flood risk with a 1% (1 in 100) chance (or greater) annual probability of fluvial flooding or a 0.5% (1 in 200) chance (or greater) annual probability of flooding from the sea. Both the proposed SEC and Tunnel Head Houses are located within Flood Zone 3, although the western Tunnel Head House (at Garth) is shown to be in an area benefitting from flood defences.
- 7.9 The TAN 15 Development Advice Map, also accessed via Natural Resources Wales Flood Risk Map Viewer, shows the Area of Search for Permanent and Temporary Works to contain Zones C1 and C2, with limited amounts of Zone B<sup>3</sup>, with the eastern proposed SEC and Tunnel Head House located within Zone C1 and the western proposed Tunnel Head House located within Zone C2. Zone B shows areas known to have been flooded in the past. Zone C1 shows areas of the floodplain which are developed and served by significant flood defence infrastructure and Zone C2 shows areas of the floodplain without significant flood defence infrastructure. See Figure 7.1.
- 7.10 In accordance with Chapter 13 of Planning Policy Wales (Edition 9) and accompanying TAN 15, whilst all new development should be located outside areas of floodplain wherever possible, any proposed permanent works within the floodplain (Zone C) must be subject to the justification test (as set out in Section 6 of TAN 15) and approved by the Local Planning Authority in consultation with Natural Resources Wales, alongside any suitable required mitigation. Flood risk and mitigation should also be addressed through a Flood Consequence

<sup>2</sup> <https://www.naturalresources.wales/evidence-and-data/maps/long-term-flood-risk/?lang=en>, accessed 01/05/2018

<sup>3</sup> Zone A - Considered to be at little or no risk of fluvial or tidal/coastal flooding. Zone B - Areas known to have been flooded in the past evidenced by sedimentary deposits. Zone C - Based on extreme flood outline, equal to or greater than 0.1% (river, tidal or coastal). Zone C1 - Areas of the floodplain which are developed and served by significant infrastructure, including flood defences. Zone C2 - Areas of the floodplain without significant flood defence infrastructure.

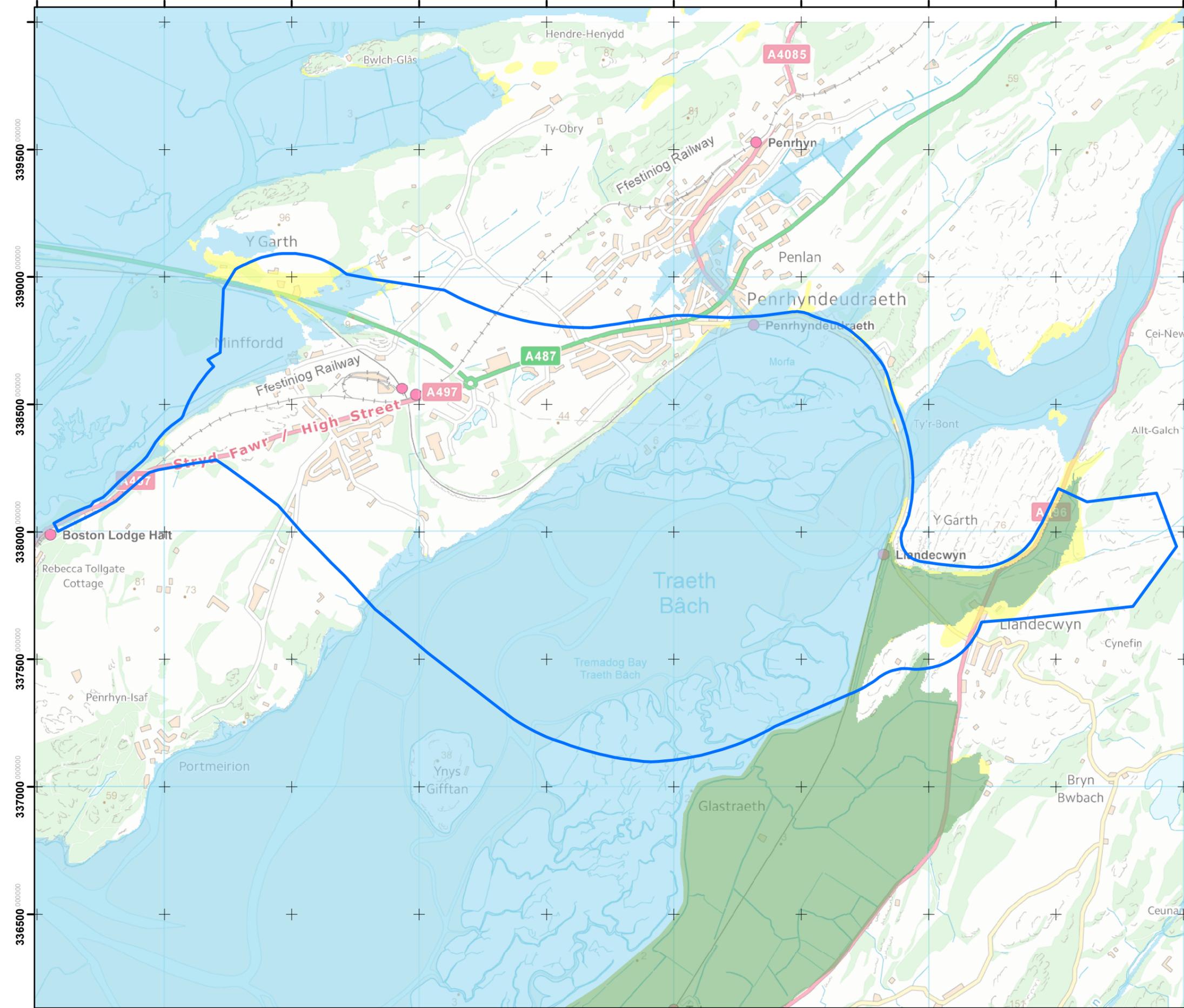
Assessment (FCA). Construction must not adversely impact on flood defences or impede access to maintain them. Where construction works in the floodplain are a necessity, attention should be given to the potential impact that mobile temporary works may have on important flow routes such that any adverse effects can be assessed.

- 7.11 The Natural Resources Wales Flood Risk Map Viewer also shows that most of the Area of Search for Permanent and Temporary Works falls into an area mapped at risk of reservoir flooding associated with a number of upstream reservoirs. Whilst reservoir flooding is extremely unlikely to happen, emergency evacuation routes will be considered as part of construction phase risk assessment.
- 7.12 The Area of Search for Permanent and Temporary Works extends across areas subject to the Western Wales River Basin Management Plan (RBMP) 2015-2021 (Natural Resources Wales, 2015). The RBMP provides a classification of the current status of each water body in the district as required under the WFD. The Dwryd Estuary is currently at Good overall status<sup>4</sup>. In terms of groundwater, the Area of Search for Permanent and Temporary Works is entirely underlain by the Llyn & Eryri groundwater body which has a Good current quantitative quality but Poor chemical quality.
- 7.13 A review of the British Geological Survey (BGS) 'Geology of Britain' viewer (BGS website) indicates that most of the Area of Search for Permanent and Temporary Works comprises bedrock of the Mawddach Group (Mudstone, Siltstone and Sandstones) which occurs on both sides of the Dwryd Estuary. Superficial deposits comprise alluvial material (clay, silt and sand) with rocks formed from rivers depositing mainly sand and gravel detrital material in channels to form river terrace deposits, with fine silt and clay from overbank floods forming floodplain alluvium. Local geology is explained in more detail within Chapter 8: Geology, Soils and Contaminated Land.

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<sup>4</sup> <http://waterwatchwales.naturalresourceswales.gov.uk/en/>

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**Legend**

Search Area for Permanent and Temporary Works

**Risk of Flooding**

- Zone A
- Zone B
- Zone C1
- Zone C2

Zone A - considered to be at little or no risk of fluvial or coastal flooding.

Zone B - areas known to have been flooded in the past.

Zone C1 - served by significant infrastructure, including flood defences.

Zone C2 - without significant flood defence infrastructure.

(Zone C1 and C2 are based on the Environment Agency's Extreme Flood Outline >= 1,000 year event (flood, tidal or coastal))

Source:  
Welsh Government 'Development Advice Map' data. Available from <http://lle.wales.gov.uk>

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Rev	Description	Cre'd	Chk'd	App'd	Date



Master Scheme No:	Sub-Scheme No:	Site:
TBC	TBC	Snowdonia

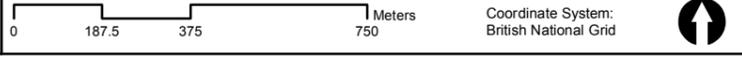
Scheme Name:  
**Visual Impact Provision Snowdonia Project**

Document Title:  
**Figure 7.1:  
Risk of Flooding Development Advice Map  
Sheet 1 of 1**

Created by:	Date:	Checked by:	Date:	Approved by:	Date:
GS	02/05/18	LA	03/05/18	KL	07/05/18
Development Eng:	Document Type:	Scale:	Format:	Sheet(s):	Rev:
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- 7.14 Natural Resources Wales have provided aquifer designation maps for the Area of Search for Permanent and Temporary Works, which indicates that most of the Area of Search overlies a 'Secondary B Bedrock' aquifer. This aquifer designation is defined by Natural Resources Wales as:
- 'Secondary B Aquifers: These include a wide range of rock layers or drift deposits with an equally wide range of water permeability and storage. Secondary B aquifers are predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.'*
- 7.15 A review of licensed water abstractions as provided by Natural Resources Wales has not identified any licensed abstractions within the Area of Search for Permanent and Temporary Works, although there is one licensed surface water abstraction for industrial use just beyond the western boundary operated by Tarmac Trading Ltd. The Llyn Tecwyn Uchaf Reservoir is a licensed public water supply located within less than 1km of the eastern boundary of the Area of Search for Permanent and Temporary Works which is operated by Welsh Water.
- 7.16 Natural Resources Wales is responsible for identifying zones for the protection of drinking water sources. These zones are used in conjunction with groundwater protection policy to set up pollution prevention measures. No source protection zones (SPZs) have been identified within the Area of Search for Permanent and Temporary Works, the nearest being the Eisingrug Drinking Water Protected Area (River Catchment) which is located to the south east. In addition, there are no groundwater Safeguard Zones (SGZ) within the Area of Search for Permanent and Temporary Works.
- 7.17 Within the Area of Search for Permanent and Temporary Works, the Afon Dwyrdd widens and shows large meandering loops as well as braided channels. These hydromorphological features are a sign of an active channel which moves over time under the marine influence (tide and waves) and riverine influence (flow and sediment inputs).
- 7.18 Any alterations to the geomorphology or water quality of the Afon Dwyrdd (or its tributaries) during construction, operation or decommissioning of the Proposed Project could lead to significant effects on the estuary in terms of the species and habitats it supports and thus its ecological status under the WFD.

## Potential Impacts

- 7.19 It is anticipated that impacts from decommissioning works will be much less than those associated with the construction works. As such, the assessment of impacts generated by construction works will be applicable to both the construction and decommissioning phases of the Proposed Project. Any reference in the following text to 'construction' should therefore also be taken to mean decommissioning also.
- 7.20 The following potential impacts, which might arise during the construction and decommissioning phases are scoped into the assessment:
- Impacts on surface water and groundwater quality from ground disturbance, construction of temporary access tracks, construction vehicle movements, and storage of soils and potentially polluting materials and substances, leading to potential WFD status effects for waterbodies (during heavy rainfall soil material may be washed into watercourses by surface water runoff);
  - Impacts on groundwater quality from direct contact through tunnelling, leading to potential WFD status effects for waterbodies and potential impacts to the public drinking water supply (should pathways be considered likely);
  - Changes to groundwater levels and modification to groundwater flow pathways due to construction of tunnel and excavation works. Where shallow groundwater levels are

encountered, excavations would need to be dewatered and the pumped water discharged elsewhere with possible impacts on the quality of the receptor which would need to be mitigated. This could also impact local groundwater levels which may support water dependent designated sites or public water supply provision;

- Modification to channel banks and beds affecting water quality, hydromorphology and surface water resources due to ground disturbance due to tunnelling or excavation works (removal of existing structures such as pylons in the estuary is addressed in Section 16 (Marine Physical Environment));
- The use of vehicles for construction and access also poses the risk of spillage of contaminants, such as oil and hydraulic fluid, potentially impacting on surface water and groundwater quality;
- Modified hydrological connectivity affecting hydromorphology, flood risk and surface water resources due to potential flow diversion or flow blockage during construction works. This could result in changes in overland flow pathways that would affect hydromorphology and flood risk; and
- The use of temporary construction compounds and access tracks have the potential to increase surface water runoff and result in increased flood risk where they are not located on existing areas of hard standing.

7.21 The following potential operational impacts are scoped into the assessment:

- Impact on flood risk, both at the location of the Proposed Project and elsewhere, due to the potential for the tunnelling route to interrupt groundwater flow pathways and the potential for construction of the SEC and Tunnel Head Houses to increase localised surface water runoff;
- Impacts on groundwater due to the presence of the tunnel that could affect groundwater flow pathways and indirectly result in changes in groundwater levels affecting local water features or reduced groundwater recharge;
- Impacts on hydromorphology due to the location of new above ground and underground structures that could result in modified or reduced surface and sub-surface hydrological connectivity (removal of long-standing structures such as pylons and their foundations in the estuary is addressed in Section 16 (Marine Physical Environment)); and
- Impacts of the operational elements of the Proposed Project on floodplain storage and/or conveyance.

## Proposed Assessment Methodology

7.22 To support the assessment, a wide range of data will be collated to describe the baseline environment within a defined Study Area and assist with the identification of potential receptors. Data sources will include Public Domain Open Government Licence Sources, Natural Resources Wales, and other external sources (as required).

7.23 Once the water resources baseline environment and potential receptors have been established, an impact prediction and assessment will be undertaken based on a source-pathway-receptor approach, using a mix of qualitative and quantitative approaches. The assessment will include construction, operation and decommissioning-phase related activities. The assessment will assume the incorporation of embedded and standard mitigation practices in each of these phases.

7.24 The significance of the effect will be formulated as a function of the receptor sensitivity and the magnitude of impact (change). Receptor classes will be defined as surface water

resources, groundwater resources, hydromorphology, water quality (both surface and groundwater) and flooding and drainage. Water-related receptors will then be listed and a sensitivity value would be then defined as falling into the following classes: high, medium, low, very low or uncertain. The criteria presented in Table 7.1 will be used to define the magnitude of potential impact.

**Table 7.1: Definition of Magnitude of Impact**

Magnitude of Impact	Definition
<b>High</b>	Irreversible or long term (over 10 years) changes.
<b>Medium</b>	Moderate changes from which the receptor will recover over a medium period of time (5–10 years).
<b>Low</b>	A slight change where the proposals could occasionally cause minor changes from which the receptor will recover in the short term (1–5 years).
<b>Very Low</b>	No effect detectable.
<b>Beneficial</b>	Change is likely to have a beneficial impact.

- 7.25 The significance of the effect of the Proposed Project will be quantified through comparison of the value of the receptor and the potential magnitude of impact upon it, in accordance with the matrix presented in Table 3.1 in Section 3.
- 7.26 A Flood Consequence Assessment (FCA) will be undertaken to determine flood risks to or from the Proposed Project and any mitigation which may be required and will be prepared to be compliant with the Planning Policy Wales (2016) and TAN 15. In addition to the FCA, a Sustainable Drainage Systems (SuDS) Statement will be prepared. The SuDS Statement will draw on information contained in the FCA and will provide a description of the SuDS proposed and the reasons why they are the most suitable for the Proposed Project.
- 7.27 If potential impacts are identified that could lead to the deterioration of a water body from its current status or prevent a water body from achieving 'Good Status' (or potential) in the future in relation to hydro-morphology or water quality, it is likely that a separate Water Framework Directive Assessment (WFDa) will be required. This will be confirmed in agreement with Natural Resources Wales as a regulatory body.
- 7.28 The FCA, SuDS Strategy (and WFDa if required) will be submitted as technical appendices to the Environmental Assessment Report.

## Proposed Mitigation Measures

- 7.29 The majority of the potential effects of the Proposed Project are associated with the construction and decommissioning phases. Potential risks could potentially be mitigated during the construction and decommissioning phases by best practice pollution prevention measures including, for example:
- Using an appropriate geotextile in the immediate vicinity of watercourse crossings to minimise damage to the surrounding ground and vegetation and minimise erosion;
  - Ensure that areas used for temporary spoil storage are located more than 10m from the nearest watercourse (where possible) and that silt traps are included if required;
  - Where obstruction of flow is unavoidable, create a natural flow diversion or temporarily pump surface water around the obstruction and restore lateral connectivity;

- Where possible, avoid stockpiling soil and alluvium within areas at risk of flooding;
- Review existing Ground Investigation data to obtain an understanding of groundwater levels prior to construction, use of infiltration control measures, and implementing a spill control and response plan;
- Implementing regular maintenance of machinery and vehicles to reduce the possibility of pollutant leakages;
- Agree the location, volume, and rates of any discharges of water as a result of tunnel dewatering with the appropriate authority, and obtain any required authorisations and permits;
- Disposing of waste material in accordance with relevant waste management plans and waste disposal regulations to prevent pollution; and
- Restoring the areas impacted by temporary access to their former state once the construction is complete and ensure that all reinstated surfaces have the same runoff properties and are at the same elevation as existing as near as practically feasible.

7.30 Potential increases in flood risk could potentially be mitigated by:

- Careful siting of SEC/Tunnel Head Houses;
- Ensuring that any construction compounds and storage areas are situated outside of recognised Flood Zones;
- Ensuring that temporary construction access routes and watercourse crossings are constructed with consideration of potential effects on local flows.

## Issues to be Scoped Out

7.31 Based on the proximity of hydrological receptors and flood risk sources, no potential impacts have been scoped out at this stage.

## Overview of the Likely Significance of Effect

7.32 From the information currently available, it is not currently anticipated that the Proposed Project will give rise to significant residual impacts. It should be noted that the location of any discharges of water as a result of tunnel dewatering will need to be agreed with the relevant authority and the appropriate permits and authorisations obtained.