REPORT

Environmental Impact Assessment Report

Holyhead Breakwater Refurbishment Scheme

Client: Isle of Anglesey County Council

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Stena Line

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WFD Compliance Assessment

Acronyms

Acronym	Acronym description
AA	Appropriate Assessment
AADT	Annual Average Daily Traffic
AAS	Assessment of Alternative Solutions
AAWT	Annual Average Weekday Traffic
ACBM	Articulated Concrete Block Mattress
ADMS	Atmospheric Dispersion Modelling System
AEZ	Archaeological Exclusion Zones
AONB	Area of Outstanding Natural Beauty
APIS	Air Pollution Information System
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Areas
AQS	Air Quality Strategy
ATC	Automatic Traffic Count
BAP	Biodiversity Action Plan
BCT	Bat Conservation Trust
BEIS	Department for Business, Energy and Industrial Strategy
BNL	Basic Noise Level
BPM	Best Practicable Means
BS	British Standard
BTO	British Trust for Ornithology
BWM	Ballast Water and Sediments
Cadw	Cymru National Historic Assets of Wales
CAS	Clean Air Strategy
CBED	Concentration Based Estimated Deposition
CCC	Committee for Climate Change
CCR	Climate Change Resilience
CCRA	Climate Change Risk Assessment
CCW	Countryside Council for Wales
CD	Chart Datum
CEH	Centre for Ecology and Hydrology
CEMP	Construction Environmental Management Plan
CIA	Cumulative Impact Assessment
CIEEM	Chartered Institute of Ecology and Environmental Management
COP	Conference of the Parties
COP21	Climate Change Conference in Paris

CRoW	Countryside and Rights of Way Act
CRTN	Calculation of Road Traffic Noise
dB	Decibels
DBA	Desk-Based Assessment
DCMS	Department of Culture, Media and Sport
DDV	Drop Down Video
DEFRA	Department for Environment, Food and Rural Affairs
DETR	Department of the Environment, Transport and the Regions
DfT	Department for Transport
DMP	Dust Management Plan
DMRB	Design Manual for Roads and Bridges
DoS	Degree of Saturation
DPF	Diesel Particulate Filters
EC	European Commission
EcIA	Ecological Impact Assessment
EFT	Emission Factor Toolkit
EHO	Environmental Health Officer
EIA	Environmental Impact Assessment
EMODnet	European Marine Observation and Data Network
EPA	Environmental Protection Act
EP1HS	Extended Phase 1 Habitat Survey
EPUK	Environmental Protection UK
ES	Environmental Statement
EU	European Union
FCS	Favourable Conservation Status
FRAME	Fine Resolution Atmospheric Multi-pollutant Exchange
FSA	Food Standards Agency
GAPS	Gwynedd Archaeological Planning Service
GAT	Gwynedd Archaeological Trust
GEART	Guidelines for the Environmental Assessment of Road Traffic
GHG	Greenhouse Gas
GIS	Geographical Information System
GloMEEP	Global Maritime Energy Efficiency Partnerships Project
GLVIA3	Guidelines for Landscape and Visual Impact Assessment, Third Edition
GPP	Guidelines for Pollution Prevention
GWP	Global Warming Potential
HAP	Habitat Action Plans
HAT	Highest Astronomical Tide

HDV	Heavy Duty Vehicles
HER	Historic Environment Record
HFC	Hydrofluorocarbons
HFO	Heavy Fuel Oil
HGV	Heavy Goods Vehicle
HM	Her Majesty
HMSO	Her Majesty's Stationery Office
HMWB	Heavily Modified Water Bodies
HOCI	Habitats of Conservation Interest
HRA	Habitat Regulations Assessment
IAPH	International Association of Ports and Harbours
IAQM	Institute of Air Quality Management
ICE	Inventory of Carbon and Energy
IEF	Important Ecological Features
IEMA	Institute of Environmental Management & Assessment
IoACC	Isle of Anglesey County Council
INNS	Invasive Non-Native Species
IROPI	Imperative Reasons of Over-Riding Public Interest
IUCN	International Union for Conservation of Nature
JLDP	Joint Local Development Plan
JNCC	Join Nature Conservation Committee
kW	Kilowatt
kWh	Kilowatt Hour
LAQM	Local Air Quality Management
LAT	Lowest Astronomical Tide
LBAP	Local Biodiversity Action Plan
LBC	Listed Building Consent
LDP	Local Development Plan
LDV	Light Duty Vehicles
LOAEL	Lowest Observed Adverse Effect Level
LPA	Local Planning Authorities
LSE	Likely Significant Effect
LWS	Local Wildlife Site
MAGIC	Multi Agency Government Information for the Countryside
mAOD	Metres Above Ordnance Datum
MCAA	Marine and Coastal Access Act
MCLG	Ministry for Communities and Local Government
MCTC	Manually Classified Turning Counts

MCZ	Marine Conservation Zones
MHCLG	Ministry of Housing, Communities and Local Government
MHWS	Mean High Water Springs
MLW	Mean Low Water
MLWM	Mean Low Water Mark
MLWN	Mean Low Water Neaps
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
MMQ	Mean Max Queue
MPA	Marine Protected Area
MPS	Marine Policy Statement
MSL	Mean Sea Level
MSP	Maritime Spatial Plans
MU	Management Unit
NAP	National Adaptation Programme
NCR	National Cycle Route
NERC	Natural Environment and Rural Communities
NEWS	Non-Estuarine Wetland Survey
NIEA	Northern Ireland Environment Agency
NMBAQC	North East Atlantic Marine Biological Analytical Quality Control Scheme
NMRW	National Monuments Record of Wales
NMWTRA	North and Mid Wales Trunk Road Agent
NNG	Night Noise Guideline
NOEL	No Observed Effect Level
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance for Noise
NPS	National Policy Statement
NPSE	Noise Policy Statement for England
NRMM	Non-Road Mobile Machinery
NRW	Natural Resources Wales
NRW TE	Natural Resources Wales Technical Experts
NSAPW	Noise and Soundscape Action Plan for Wales
NSN	National Site Network
NSR	Noise Sensitive Receptors
OBC	Outline Business Case
OD	Ordnance Datum
PAC	Pre-Application Consultation
PCU	Passenger Car Units

PD	Permitted Development
PFC	Perfluorocarbons
PIC	Personal Injury Collision
PM	Particulate Matter
PPG	Planning Practice Guidance
PPW	Planning Policy Wales
RCAHMW	Royal Commission on the Ancient and Historical Monuments of Wales
RCP	Representative Concentration Pathways
RFC	Ratio of Flow to Capacity
RHDHV	Royal HaskoningDHV
RMC	Ready Mixed Concrete
RMSE	Root Mean Square Error
RNLI	Royal National Lifeboat Institute
ROV	Remotely Operated Video
RSPB	Royal Society for the Protection of Birds
RSZ	Reduced Speed Zone
SAC	Special Areas of Conservation
SCI	Sites of Community Importance
SEPA	Scottish Environment Protection Agency
SLA	Sea Level Anomaly
SMP	Seabird Monitoring Programme
SMP2	West of Wales Shoreline Management Plan 2
SO	Strategic Objective
SOAEL	Significant Observed Adverse Effect Level
SPA	Special Protection Areas
SPR	Source Pathway Receptor
SSSI	Site of Special Scientific Interest
TAN	Technical Advice Notes
TE	Technical Experts
TEMPro	Trip End Model Presentation Programme
TERN	Trans-European Road Network
TRaC	Transitional and Coastal Waters
UK	United Kingdom
UKCP	UK Climate Projections
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
WBP	Wales Biodiversity Partnership
WeBS	Wetland Bird Survey

WFD	Water Framework Directive
WFG	Well-being of Future Generations
WGF	Welsh Government Fisheries
WHO	World Health Organisation
WNMP	Welsh National Marine Plan
ZOI	Zone of Influence
ZTV	Zone of Theoretical Visibility

1 Introduction

1.1 Background to the Holyhead Breakwater Refurbishment Scheme

Constructed between 1848 and 1873, Holyhead Breakwater ("the Breakwater") provides an area of sheltered water for the Port of Holyhead and Holyhead New Harbour, and provides protection to the surrounding coastline from coastal erosion and flooding (**Figure 1-1**). The Breakwater is a Grade II* listed Victorian structure and, at a total length of 2.4km, is the longest breakwater in the UK. At the end of the Breakwater (the roundhead) sits the Grade II-listed Holyhead Breakwater Lighthouse. The Breakwater is formed by a wide rubble mound with a crest around the waterline and a vertical blockwork-walled superstructure on top (see **Figure 1-2)**.

The Breakwater offers coastal protection for the Port of Holyhead and a number of waterfront facilities in Holyhead New Harbour ("the New Harbour"), including a marina, sailing club, coastguard station, Royal National Lifeboat Institute (RNLI) lifeboat station and maritime museum, all of which hold social or economic significance. Through its role, the Breakwater supports the economy of Holyhead and the wider Anglesey / North Wales region by supporting opportunities for regeneration and development and preventing potential flooding from wave overtopping.

The Port of Holyhead is a strategically important international ferry port, providing the main transport link between Ireland and mainland UK. The Breakwater forms part of the essential infrastructure for the operation of the Port, providing sheltered waters for berthing ferries and other vessels.

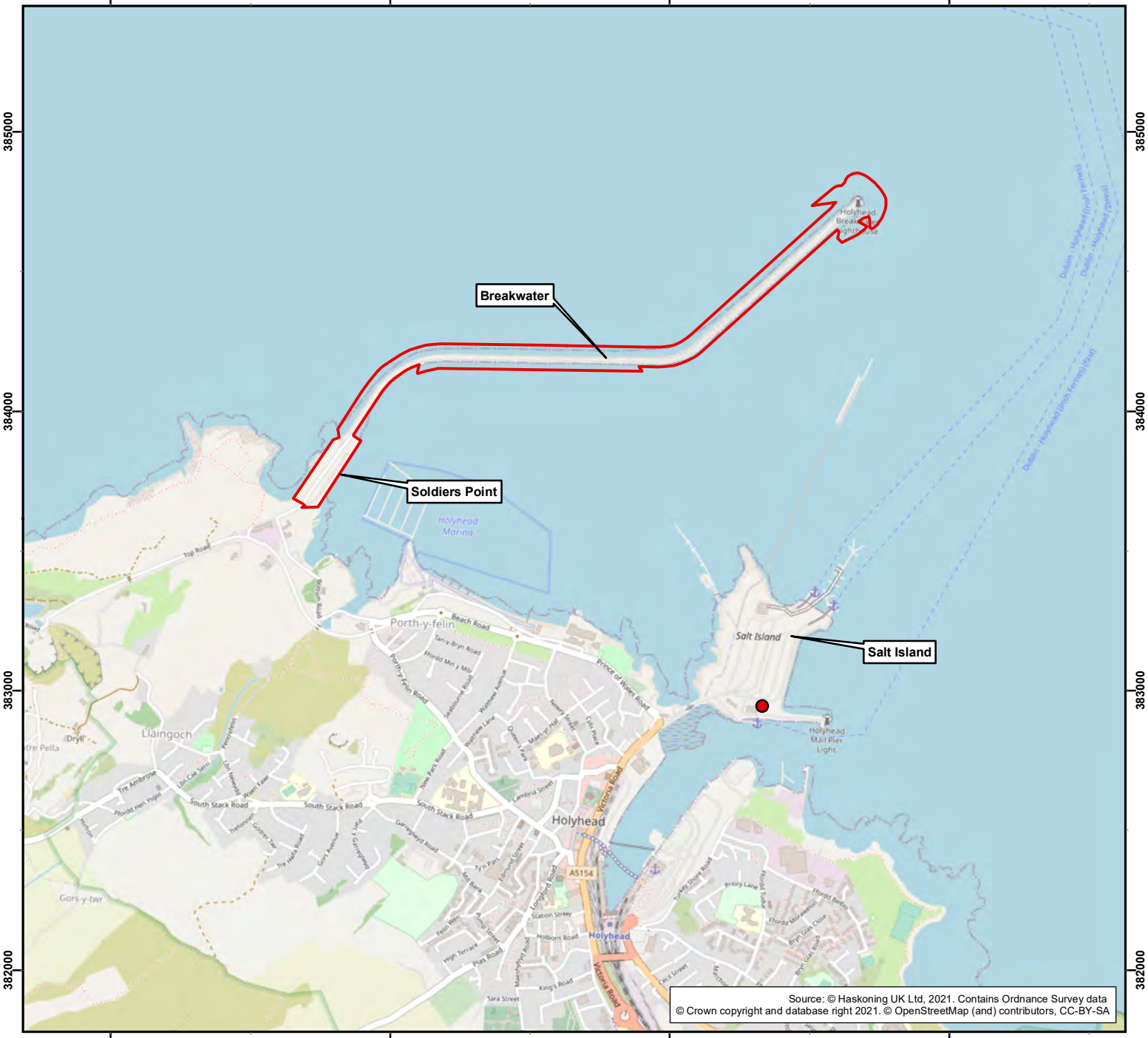
Over time the Breakwater has been subject to considerable wave action, which has led to the displacement and erosion of the rock that makes up the rubble mound and, consequently, a loss of integrity of the rubble mound itself (see **Plate 1-1**). As a result, the rubble mound has been subject to regular, expensive maintenance through the partial replacement of lost material. The vertical blockwork wall superstructure is subject to periodic damage, which is repaired on an ongoing basis.

The Isle of Anglesey County Council (IoACC) commissioned an Outline Business Case (OBC) in 2017 (Royal HaskoningDHV, 2017), the aim of which was to identify a cost-effective, long-term and sustainable solution to the erosion of the rubble mound so that it can continue to provide a stable foundation for the superstructure. In addition, it aimed to contribute towards the objectives of the West of Wales Shoreline Management Plan 2 (SMP2) (Royal HaskoningDHV, 2012) for Holyhead by:

- Maintaining Holyhead as a viable commercial centre and supporting opportunities for regeneration; and,
- Maintaining Holyhead as a functioning port.

The preferred options for the Holyhead Breakwater Refurbishment Scheme (henceforth referred to as the 'proposed scheme'), based on the appraisal categories considered within the OBC (economic, technical, environmental, and alignment with the Well-Being Act and Critical Success Factors), were as follows:

- Seaward side – An armoured slope to reduce wave impact forces and wave overtopping; and,
- Leeward side – Restoration of the rubble mound to original levels using a concrete mattress.



Legend:

- Holyhead Breakwater
- Potential Location of Concrete Batching Plant

Client: Isle of Anglesey County Council	Project: Holyhead Breakwater Refurbishment Scheme

Title: Location Plan

Figure: 1.1 | Drawing No: PB9014-200-014

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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Co-ordinate system: British National Grid

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PB9014-RHD-BW-XX-DR-YE-0063

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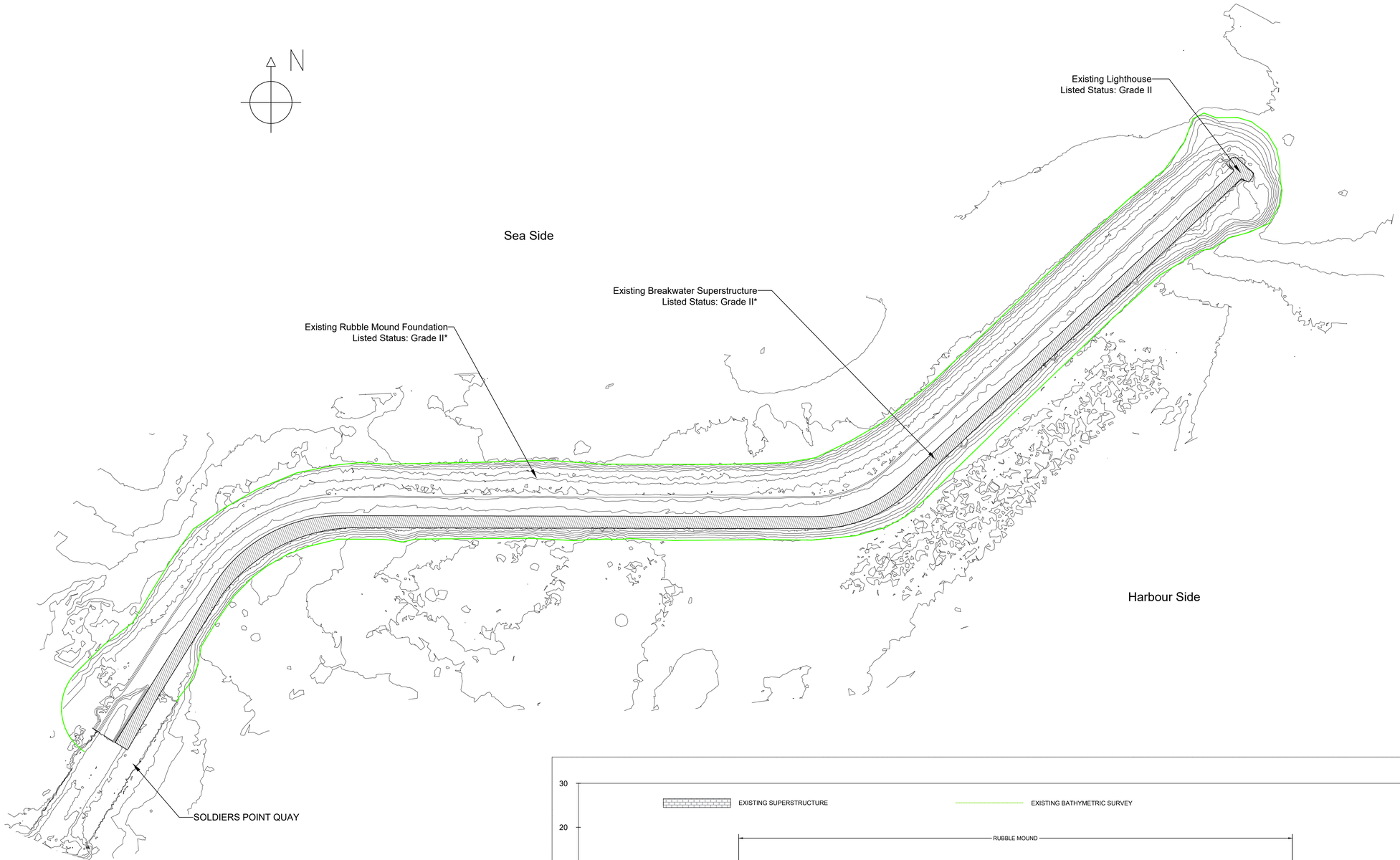

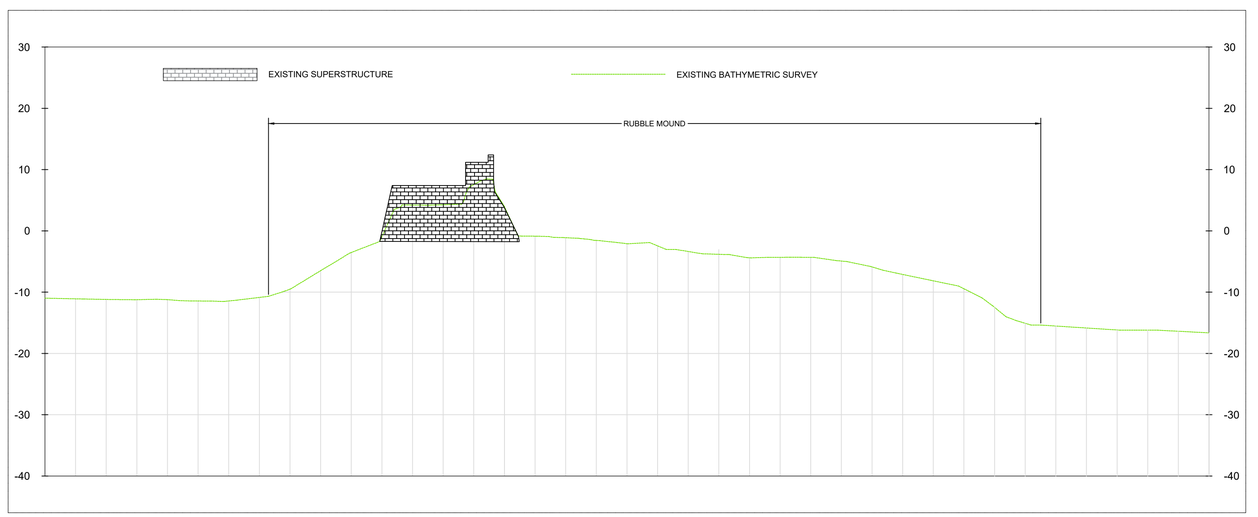

TYPICAL SECTION THOUGH BREAKWATER

NOTES

KEY

FOOTPRINT OF THE EXISTING RUBBLE MOUND

CONTOURS AT 1m INTERVALS

P1.0	16.07.19	SUITABLE FOR COSTING

REVISIONS

CLIENT

CYNGOR SIR YNYS MÔN ISLE OF ANGLESEY COUNTY COUNCIL

PROJECT

HOLYHEAD BREAKWATER REFURBISHMENT

TITLE

HOLYHEAD BREAKWATER STRUCTURE

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DRAWN GB	CHECKED PS	APPROVED NC
DATE JULY 2019	SCALE 1:5000	REF. Figure 1.2

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PB9014-RHD-BW-XX-DR-YE-0063	D1	P01

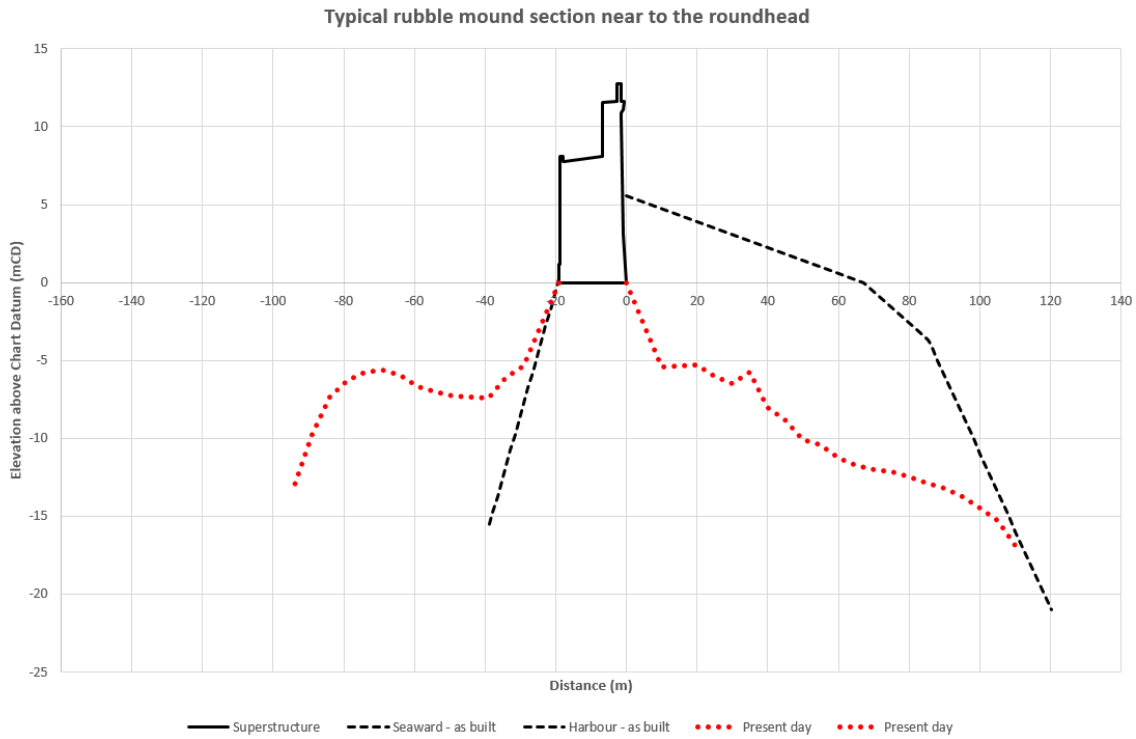

Plate 1-1 Cross-section of the Breakwater structure showing erosion of the rubble mound

1.2 Summary of the Proposed Scheme

Subsequent to the OBC and further work on refining a suitable solution, the proposed scheme comprises the following:

- Seaward side – installation of concrete armour onto the existing rubble mound along the length of the Breakwater, in the form of 18.1m^3 Tetrapod units and reinforcing 120-tonne Z-shaped concrete units to prevent displacement;
- Breakwater roundhead (i.e. the terminal section of the Breakwater on which the lighthouse stands) – rock placement to widen the existing rubble mound, with installation of Tetrapod units and reinforcing Z-shaped blocks; and,
- Leeward side – restoration of the existing rubble mound along sections of the Breakwater through the installation of an Articulated Concrete Block Mattress (ACBM), and rock revetment where the existing rubble mound is too steep to accommodate the ACBM.

The proposed scheme could be undertaken over the course of a single construction phase of around two years, or over three phases, each lasting approximately nine months with two-year intervals. A full description of the proposed scheme is provided in **Chapter 3** Description of the Proposed Scheme.

1.3 Requirement for Environmental Impact Assessment

An EIA Screening Report along with requests for Screening Opinions were submitted to NRW and the IoACC on the 13th August 2019 (Royal HaskoningDHV, 2019), with Screening Opinions received on 1st October and 18th October 2019 respectively.

NRW confirmed that the proposed scheme does not require a statutory EIA ref: SC1903 (**Appendix 1-1**) under the Marine Works (EIA) Regulations 2007, as amended; however, the IoACC confirmed that the proposed scheme does require an EIA (ref: SCR/2019/50) (**Appendix 1-2**) under the Town and Country Planning (EIA) (Wales) Regulations 2017.

Given IoACC's Screening Opinion did not contain any detail as to why the proposed scheme was considered an EIA Development, discussions with the IoACC identified that this was due to uncertainty with regards to the potential environmental impacts that could arise from the proposed concrete batching plant, specifically if it was to be located at Soldier's Point.

A case was made that further information could be provided that was considered to address these uncertainties and it was agreed this could be provided for the IoACC to reconsider their Screening Opinion. The further information was submitted to the IoACC on the 27th November 2019 (**Appendix 1-3**). The IoACC provided a second Screening Opinion on the 17th February 2020 (**Appendix 1-4**) that also considered the proposed scheme to be EIA Development.

Given IoACC's requirement for an EIA, it was agreed with NRW that an EIA would be undertaken by agreement, in accordance with Section 5 of the Marine Works (EIA) Regulations 2007, as amended ("Requirement of assessment by agreement"), in order to align with the requirements of the planning permission.

1.4 Description of the Study Area

The study area considered in this EIA Report is the Zone of Influence (ZOI) over which direct and indirect potential impacts of the proposed scheme may occur. For the marine elements of the proposed scheme, the ZOI consists of the footprint of the proposed armour units and rock and a 2km buffer, given that there would be no far-reaching impacts such as changes to hydrodynamic or sedimentary regimes (see **Chapter 7** Coastal Processes) or impulsive noise-emitting activities such as piling. In terms of the terrestrial study area, this has been determined by the ZOI of landscape and visual settings impacts, which radiate approximately 2km from the footprint of the proposed scheme. The existing baseline within the ZOI, in terms of relevant receptors, is described in the relevant sections of this report.

1.5 Changes to the Proposed Scheme Since Scoping

The following changes have been made to the project design since the EIA Scoping Report was issued:

- At the toe end of the Tetrapod units, a row of interlocking 120-tonne Z-shaped concrete units will be installed, as opposed to two rows of interlocking 60t chevron units, to provide more stability to the structure;
- The maximum width of the rubble mound at the roundhead will be slightly wider at 70m from the superstructure, as opposed to 45-50m;
- Assessment of the potential locations for the concrete batching plant has been undertaken that confirmed that Soldier's Point is not suitable to support a batching plant. As such, Soldier's Point is no longer being considered as a potential location for the concrete batching plant (see **Section 3.2.2**); and,
- Potential for construction materials to be delivered by road to Holyhead Port; therefore, Traffic and Transport has been scoped into the EIA (see **Chapter 8** Traffic and Transport).

1.6 Purpose of the EIA Report

This document constitutes the EIA Report for the proposed scheme and presents the findings of the EIA process. It has been prepared in accordance with the Town and Country Planning (EIA) (Wales) Regulations 2017 and the Marine Works (EIA) Regulations 2007 (as amended), to support an application for the required consents (i.e. Planning Permission and marine licence).

The objectives of the EIA process are to ensure that environmental factors are considered throughout the project development and the decision-making process, and that potential significant environmental effects are identified and assessed – both temporary and permanent, direct and indirect – during the construction and operation phases of the proposed scheme. As a result of this assessment process, mitigation measures that would prevent or reduce any adverse impacts have been identified.

1.7 Report Structure

Following this introductory section, **Chapter 2** describes the need for the proposed scheme.

Chapter 3 provides a detailed description of the proposed scheme and the alternatives considered.

Chapter 4 outlines the relevant legislation and policy taken in to consideration when undertaking the EIA.

Chapter 5 describes the approach taken to EIA, including Cumulative Impact Assessment (CIA), and the incorporation of a Water Framework Directive (WFD) compliance assessment and a Habitats Regulations Assessment (HRA).

Chapter 6 describes the consultation undertaken for the project to date.

Chapters 7 to 16 set out the environmental assessment of the proposed scheme. These sections describe the baseline environment for the environmental topics considered. Potential impacts that could arise during the proposed scheme are identified and assessed and, where appropriate, mitigation measures are defined. The predicted residual impacts (i.e. those potential impacts remaining, assuming the recommended mitigation measures are implemented) are set out.

Chapter 17 presents the CIA.

Chapter 18 presents a summary of the potential impacts and mitigation measures.

Chapter 19 presents the WFD compliance assessment.

Chapter 20 presents the shadow HRA.

Chapter 21 lists the references cited within this EIA Report.

2 Need for the Proposed Scheme

Holyhead has suffered from poverty, unemployment, and deprivation for many decades. Large scale job losses have been experienced in recent years. To improve the local economy, Holyhead has been designated in Welsh Government strategic plans as a specific Growth Hub, Primary Key Settlement, Key Regeneration Area, Key Business Sector Area, National Connectivity link and an area of Coastal Tourism Potential.

Tourism is the largest economic sector on Anglesey, generating £311M per annum to its economy. On average, the sector supports approximately 4,000 jobs and the importance of the visitor economy to Anglesey, its residents and its future cannot be over emphasised (STEAM Report, 2018).

Anglesey attracts 1.70 million visitors per annum (STEAM Report 2018) and has a high number of repeat visitors at over 85%. The tourism sector has transformed itself over the past 10 years. This is demonstrated in increased visitor numbers (from 1.39M in 2006 to 1.70M in 2018) and in the value of tourism to the economy (£186M in 2006, £304M in 2017 to £311M in 2018). This is a significant growth market that needs to be protected.

Holyhead is the UK's second busiest port processing two million annual visitors travelling between the UK and the Republic of Ireland, further boosting Anglesey's tourism sector. More recently, Holyhead has emerged as Wales' premier cruise port. In 2018, 52 cruise ships arrived at the port, bringing in 32,700 passengers and generating a cruise tourism impact of in excess of £2.5M.

Visitors come to Anglesey to experience its unique character and very special sense of place, peaceful and tranquil setting, its beaches, seascapes and its dramatic landscapes. In 2016, Anglesey was named the second-best UK holiday destination. Its greatest tourism assets lie in its natural and historic environment, which have been acknowledged and designated nationally and internationally. Most (95%) of Anglesey's 201km coastline and coastal habitat is a designated AONB and it attracts a large and growing number of visitors to its beaches and 125 miles of Coastal Path. The Isle of Anglesey AONB has one of the most distinctive, attractive and varied landscapes in the British Isles.

Growth in Anglesey's economy has been led by its visitor economy and the Island depends on a thriving, innovative and profitable tourism sector. It is the UK's most tourist-dependant local authority with one of the highest percentages of employment in the tourism sector as a percentage of total employment.

The importance of Holyhead Port for both ferry passengers and the cruise ship industry is vital to the Anglesey and North Wales economy. The Breakwater supports the economy of Holyhead and the wider Anglesey and North Wales region in its role of protecting the Port and Holyhead Harbour by supporting opportunities for regeneration and development, offering security for investments into the area and preventing flooding from wave overtopping. The proposed scheme would also comply with and deliver aspects of the West of Wales SMP2 (Royal HaskoningDHV, 2012). The SMP2 policy for Holyhead is to 'Hold the Line' over the long term and recognises the role of the Breakwater in achieving this.

Since its completion in 1873, the rubble mound has gradually been eroded by wave action increasing the wave impacts on the superstructure. Without maintenance the loss of the rubble mound would eventually result in the superstructure being undermined and breaches in the Breakwater forming, which would expand along the length of the Breakwater culminating in total failure.

Due to its design, the Breakwater has always required regular maintenance to maintain the condition of the superstructure and replenish the rubble mound. Whilst the current maintenance regime provides a temporary solution to the problem, the likelihood of a failure of the Breakwater during more frequent and

severe storm events increases with time. This maintenance regime has become increasingly expensive and is no longer matching the rate of erosion of the rubble mound; therefore, a more viable long-term solution to ensure the stability of the Breakwater is required. The most recent serious damage to the Breakwater occurred in February 1983 when a length of approximately 300m was damaged seaward of Soldier's Point, leading to a breach in the Breakwater.

If the Breakwater were to fail, then the wave climate in the New Harbour and at the Port of Holyhead would increase significantly, resulting in the following impacts:

- The loss of the Grade II*-listed Holyhead Breakwater and access to the Grade II-listed Holyhead Breakwater Lighthouse;
- The loss of a reliable ferry and freight service to Ireland resulting in the port eventually becoming unviable with the associated losses of income and employment to the town;
- The loss of refuge provided by the Holyhead Harbour, one of the main reasons for the construction of the Breakwater;
- More frequent flooding events due to wave overtopping in the Beach Road and Prince of Wales Road areas of the town, affecting 19 properties including the RNLI lifeboat station, HM Coastguard Station and Holyhead Maritime Museum;
- Closure of the marina and sailing club due to increased wave climate;
- Forced relocation of the RNLI Lifeboat station; and,
- Loss of confidence of investors in several major proposed regeneration and development projects.

A permanent solution to the constant erosion of the foundations of the Breakwater and damage of the blockwork-walled superstructure itself is required before the next breach occurs, which is predicted within the next 15 years (Royal HaskoningDHV, 2017).

3 Description of the Proposed Scheme

3.1 Introduction

The proposed approach to the refurbishment of the seaward and leeward sides of the Breakwater is described in this chapter. Most of the refurbishment works described would be located within the existing footprint of the Breakwater. However, there is a small area at the roundhead of the Breakwater that would extend past the rubble mound as it currently exists (see **Figure 3-1**), though is within the original footprint of the Breakwater when it was constructed.

3.2 Description of the Construction Phase

3.2.1 Delivery and storage of materials

There are two options under consideration for the delivery of refurbishment materials and plant:

- Delivery of refurbishment materials and plant to Holyhead Port by sea or road; and,
- Delivery of refurbishment materials and plant to Soldier's Point by sea.

Under both options, the material would be stockpiled and then transported to the refurbishment site by barge. At any given moment during the construction phase, up to three barges may be in use for the transportation of material from stockpiles to the refurbishment site. The number of trips required for deliver and placement of the materials has been calculated in **Table 3-1**.

Table 3-1 Vessel movements for delivery and placement of Tetrapods and Z-blocks

	Tetrapod unit delivery/placement	Z-block unit delivery/placement
Total number of barges	3	3
Units per trip	30	11
Total number of units	11,592	744
Number of trips per barge	129	23
Total trips	774	138

For the assessment a worst-case scenario of materials being delivered by road to a batching plant at Holyhead Port on Salt Island has been assessed. This has been predicted to include 41,184 truckloads over a two-year period. A working day of 10hrs has been assumed meaning delivery of up to 10 trucks an hour; therefore, the worst-case scenario would be 408 truck journeys per day (204 in, 204 out).

3.2.2 Fabrication of concrete armour units

Three options have been considered for the fabrication of the concrete armour units. The first two would require a temporary concrete batching plant to be established within a short distance of the Breakwater whilst the third, and preferred, option would be to use an existing facility elsewhere. The options are:

- Temporary concrete batching plant at Salt Island, Holyhead Port;
- Temporary concrete batching plant at Soldier's Point; or,
- A precast concrete yard elsewhere.

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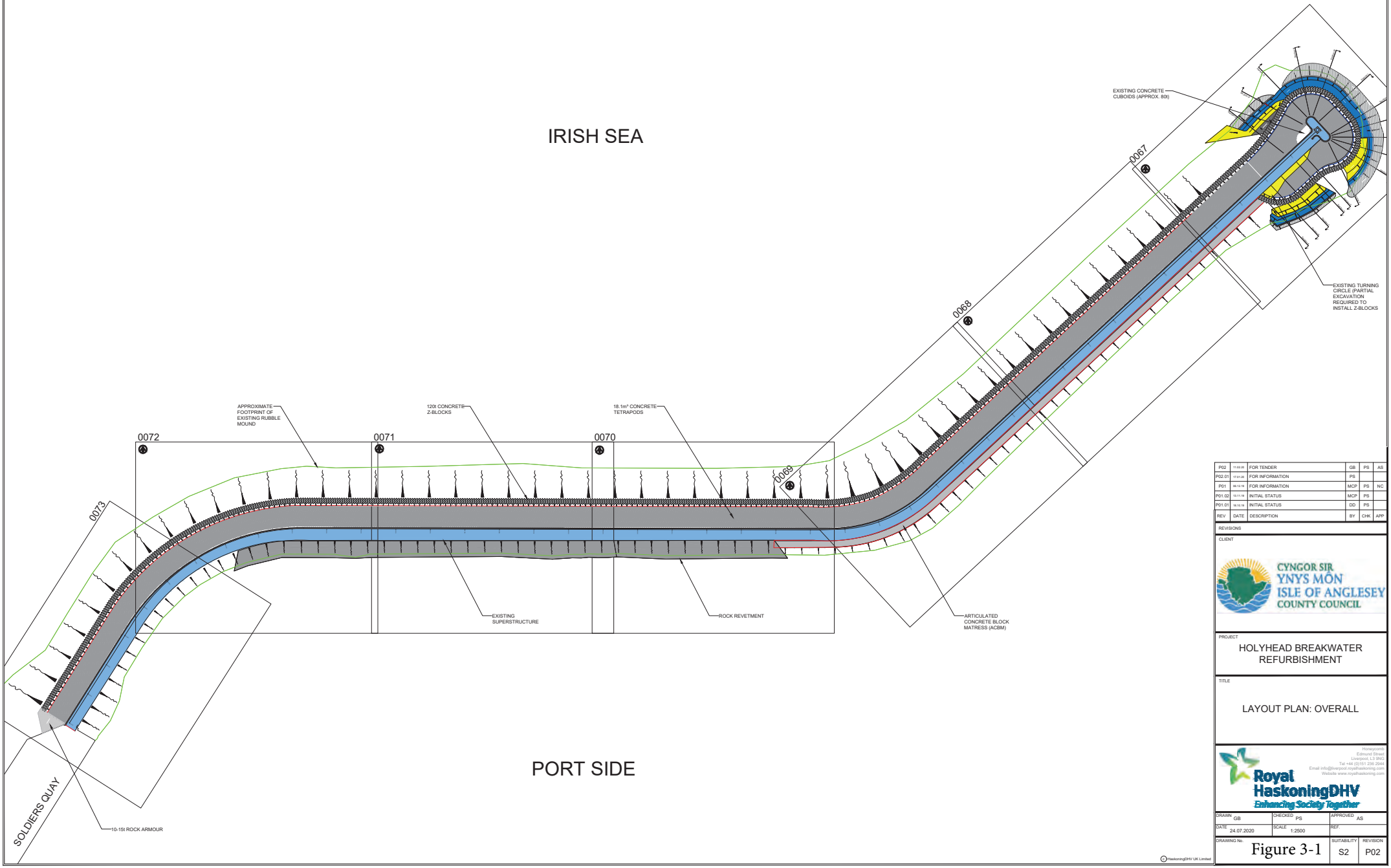

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P01.02	15.11.19	INITIAL STATUS	MCP	PS	
P01.01	16.10.19	INITIAL STATUS	DD	PS	

REVISIONS

CLIENT

CYNGOR SIR YNYS MÔN ISLE OF ANGLESEY COUNTY COUNCIL

PROJECT

HOLYHEAD BREAKWATER REFURBISHMENT

TITLE

LAYOUT PLAN: OVERALL

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REVISION P02

An assessment of the batching plant and casting yard requirements was undertaken to assess the suitability and feasibility of the proposed locations at Salt Island and Soldier's Point (Royal HaskoningDHV, 2020). The assessment concluded that there was insufficient area required to fabricate and store the units at Soldier's Point; however, that sufficient space is available on Salt Island.

The area at Soldier's point is an existing industrial quay owned by Stena Line and would be used for storage of concrete armour units during the construction works.

3.2.3 Placement of refurbishment material

Marine-based plant would be used for the placement of the armour units (i.e. Tetrapods, Z-shaped concrete armour units, rock and ACBM). A jack-up or floating barge with spud legs, or an alternative form of anchoring system, would provide a platform for a crane and a long-reach excavator.

Whilst a suitable method of anchoring the barge has yet to be confirmed, one option is that a series of concrete anchor blocks placed seaward of the rubble mound may be used to hold the barge in place. Up to two barges would be used to transport the armour units to the jack-up / floating barge. From the jack-up / floating barge, armour units would be lowered into place on the existing rubble mound by crane.

At the roundhead, there may be a need to place rock outside the footprint of the existing rubble mound. This would be placed directly onto the seabed over an area that formed part of the footprint of the original breakwater, constructed in the 1800s.

3.2.4 Regrading works

The level of the existing rubble mound undulates along its length due to the seabed topography and the influence of environmental conditions such as tides, wind and waves. Where undulations are such that they would prohibit the armour units from sitting in a stable orientation, it may be necessary to regrade such areas. Regrading works would be carried out by spreading the rubble using a long-reach excavator from the jack-up / floating barge. It is anticipated that very little regrading works would be required, and there would be no requirement for the removal of rubble from the site.

3.2.5 Construction programme

There are two programme options being considered for the proposed scheme, as follows:

- Completion of the refurbishment works in a single phase (the preferred option) (see **Section 3.2.5.1**); and,
- Completion of the refurbishment works across three phases (see **Section 3.2.5.2**).

It should be noted that the actual construction programme is dependent upon the availability of funding and could differ, both in the number of phases and the time between phases. However, a three-phased construction programme is considered to represent the mostly likely scenario.

3.2.5.1 Completion of works in a single construction phase

Under this option, the refurbishment of the Breakwater would be undertaken over an estimated two-year period, likely to commence around March 2022, with expected completion around January 2024.

3.2.5.2 Completion of works across three construction phases

Under this option, each phase would take approximately nine months to complete, excluding mobilisation and demobilisation. The interval between each consecutive phase would be approximately two years. An example timeframe is presented below:

- Phase 1: March 2022 – October 2022
- Phase 2: March 2025 – October 2025
- Phase 3: March 2027 – October 2027

Under this option, the outermost section of the Breakwater (i.e. the section from the second bend to the roundhead) would be refurbished in Phase 1, both bend sections would be refurbished in Phase 2, and the remainder of the structure would be refurbished in Phase 3.

3.3 Description of the Operational Phase

3.3.1 Seaward side

The refurbishment of the seaward side of the Breakwater comprises the placement of double-stacked 18.1m^3 Tetrapod concrete armour units (see **Plate 3-1**), weighing between 40tn and 45tn each, extending from the superstructure to a width of *c.*30m and with a crest elevation of +6.7m CD (+3.7m OD). At the toe end of the Tetrapods a row of interlocking 120t Z-shaped concrete armour units would be placed to prevent displacement of the Tetrapods from continuous or severe wave action.

At the landward end of the Breakwater, adjacent to Soldier's Point, 10-15tn rock would be placed in a small triangular-shaped area, as a transition between the Tetrapods / Z-shaped units and the seaward-facing wall of Soldier's Point (see **Figure 3-1**).

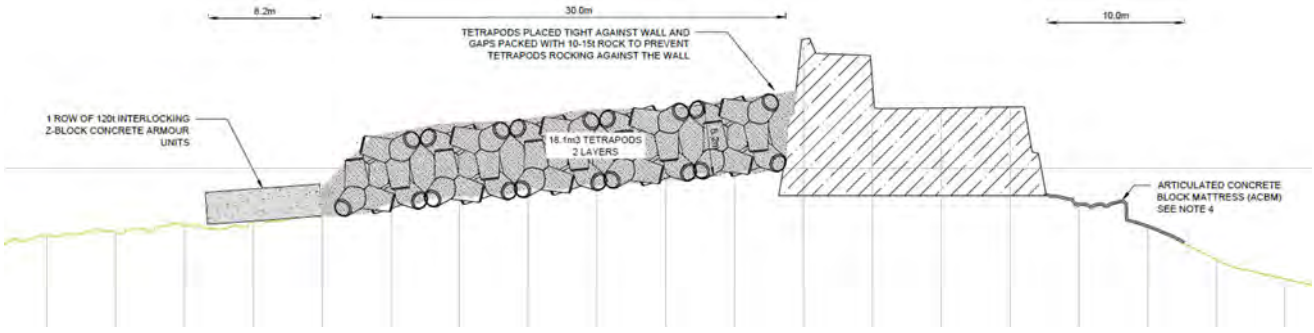


Plate 3-1 Cross-section of seaward side refurbishment

The refurbished breakwater has a design life of 50 years and has been designed to resist a 100-year extreme event, taking into account 1 in 100-year wave height combined with a 1 in 100-year storm surge and 50 years of sea level rise. In order to meet these standards, the design height of the double layer of Tetrapods is required to be 1.1m above MHWS level, therefore the upper extent of the Tetrapods would be visible throughout the tidal cycle.

The refurbishment of the seaward side of the Breakwater would stabilise the rubble mound at the toe of the superstructure and restore the level of protection by dissipating wave energy. This would reduce the risk of emergency works whilst also reducing the risk of overtopping, thus minimising the need for future repairs to the superstructure of the Breakwater.

2D physical modelling of the proposed scheme has shown that the refurbished breakwater would reduce the current volume of overtopping by around 90%.

3.3.2 Roundhead

At the roundhead of the Breakwater, the rubble mound has suffered considerable erosion and narrowing due to tidal and wave action, therefore the current rubble mound profile would have to be widened to enable the Tetrapods to be installed. To achieve this, a number of different rock berms or tiers would need to be installed on the seabed to a level of around 0mCD (-3m OD) (see **Plate 3-2**).

The first tier would be constructed from the existing seabed up to a level of -10mCD (-13m OD) and would be formed from core material with a grading of 1-1,000kg. The second tier would extend up to -5mCD (-8m OD) and would be formed from slightly larger rock with a grading of 1,000-3,000kg. The final tier would extend up to 0mCD (-3m OD) and would be formed from rock with a grading of 3,000-6,000kg. The maximum width of the rubble mound widening is anticipated to be *c.*70m at the seabed.

These tiers would be formed by either dropping rock from a barge or, alternatively, a clamp shell bucket could be attached to a long reach excavator or crawler crane and the rock placed into its final position. It may also be possible to place smaller material (1-1,000kg rock) using a fall pipe[1]. Once the three tiers have been constructed, the Tetrapod and Z shaped armour units can be installed.

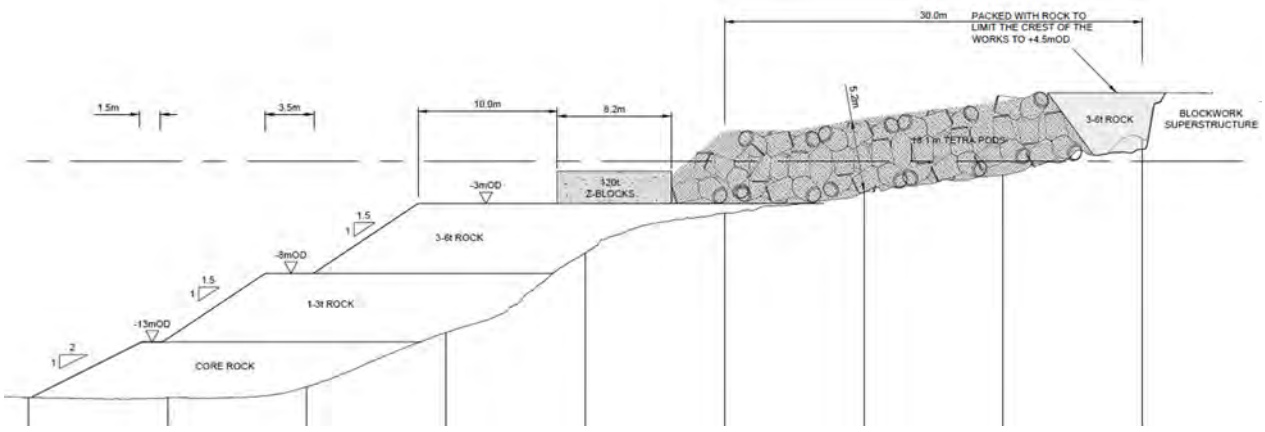


Plate 3-2 Diagram showing the three rock tiers around the roundhead

[1] *A fall pipe is a large diameter pipe that is lowered to the seabed through which rock material is placed down to the seabed, thus minimising the potential environmental impacts of just tipping or pushing the material directly off a barge.*

3.3.3 Leeward side

Along the outermost section of the Breakwater (from the second bend to where the Tetrapod units would be located near the roundhead), the ACBM would abut the leeward face of the superstructure, with a width of *c.*10-15m, to prevent further erosion of the rubble mound (see **Plate 3-3**). The ACBM level would generally follow the contours of the existing rubble mound.

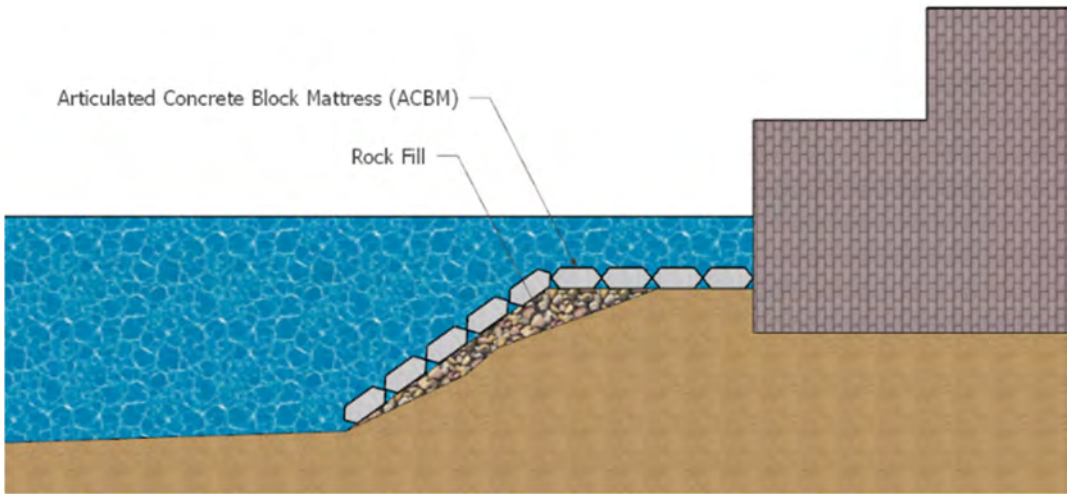


Plate 3-3 Diagram of leeward side refurbishment

Additional rock may be required to raise any particularly low sections of the existing rubble mound before the ACBM is installed. Any prominent raised points of the mound would be regraded, as required. The ACBM would provide a good level of protection to the existing lee wall against waves generated within the harbour and waves diffracted around the head of the Breakwater.

In addition to the ACBM, a low-level rock revetment would be installed to stabilise the existing mound in its current position along the central section of the Breakwater, between the first and second bend, where the existing mound would be too low and / or too steep to accommodate the ACBM. The low-level rock revetment would replenish existing low levels along the toe and offer greater protection against undermining by physical processes.

The finished height of the ACBMs and rock revetment would be lower than mean low tide (taken as the average between mean low water neaps (MLWN) and mean low water springs (MLWS)) and as such would not be visible during most tides; however, during spring tides the ACBM and revetment would be visible at low water.

3.3.4 Maintenance requirements

Once the refurbishment of the Breakwater is complete, further maintenance of the rubble mound would be minimal and far less than the current maintenance activities. Wave overtopping of the superstructure would be reduced by around 90% and as such any repointing and repair of the superstructure would also be reduced. The structure would continue to be monitored annually and repairs undertaken if damage occurs.

3.3.5 Measures to manage environmental risks

As with any construction project, there would be the potential for spillages or leakages of oils, fuels or construction materials which would directly or indirectly impact upon the environment. The risk of this occurring would be managed through the production of a Construction Environmental Management Plan (CEMP) setting out best practice measures to be employed during the refurbishment works.

Stena Line has plans and procedures in place to manage environmental risk during the regular operation of the port. This includes an Oil Spill Contingency Plan (Stena Line Ports Limited, 2017) which was produced in consultation with the IoACC, NRW, Welsh Government Fisheries (WGF) and the Marine Management Organisation (MMO) for use in the event of a spill.

Stena Line has also produced a Biosecurity Plan in consultation with NRW in order to prevent or reduce the spread of invasive non-native species (INNS) within Holyhead Port limits, which would be adhered to throughout the proposed scheme and any subsequent maintenance activities. A project specific biosecurity risk assessment will be undertaken by the chosen contractor prior to the works being undertaken.

3.4 Decommissioning

There are no plans to decommission the Breakwater, given its listed status and role in the protection of Holyhead and the port. Further consideration of the decommissioning phase is therefore not required.

3.5 Assessment of Alternatives

A number of alternative options were considered by the OBC (Royal HaskoningDHV, 2017). A summary of these options is presented below.

3.5.1 Do nothing

This option assumes that all attempts to maintain or repair the Breakwater are abandoned and nothing is done to protect the structure. If this approach were to be adopted, a breach of the Breakwater could be expected in the near future, although the exact timing of the breach is difficult to predict. Single or multiple breaches would lead to progressive collapse along the length of the Breakwater.

The breach scenario assumed for the OBC predicted the first breach to occur in Year 15 (2033) at the southern elbow with the breach width increasing by 15m per annum, and the second “breach” resulting from the loss of the furthest end of the wall in Year 20 (2038) and the damage extending south at a rate of 15m per annum. On this basis the landward breach would reach the root of the Breakwater in Year 60 (2078) and the two breaches would join up in Year 97 (2115), resulting in the total failure of the Breakwater.

3.5.2 Do minimum

Under the ‘Do minimum’ scenario the current maintenance of the existing superstructure and rubble mound would continue. This would include spring/early summer inspections to identify areas of greatest need followed by repairs to the masonry superstructure. Maintenance tasks may include the replacement of dislodged masonry to reinstate the front wall and the infill of large cracks or voids.

This option provided the cheapest option for maintaining a serviceable Breakwater in the short term. It was anticipated that repairs to damaged sections of the masonry wall would increase in frequency as damage

to the rubble mound continues over time, until a breach occurs, at which point the effects would be the same as the 'Do nothing' option above.

3.5.3 Do something

3.5.3.1 Seaward side

Alternatives to the preferred option to refurbish the seaward side of the Breakwater are described below.

Selection of armour material

Subsequent to the OBC carried out in 2017 (Royal HaskoningDHV, 2017), further work has been undertaken to refine the preferred options to provide a suitable solution for the refurbishment of the Breakwater. The size of rock required to restore the seaward side of the Breakwater would mean sourcing and transporting rock material from Norway. Consequently, this option has been discounted due to it being economically unfeasible and a concrete armour solution is preferred to restore the rubble mound and provide wave protection to the superstructure.

Strengthen the existing superstructure

This option would involve the installation of a new concrete blockwork facing wall to the masonry sea wall. A small rock mound would be installed at the toe of the blockwork to provide scour protection. The construction of the blockwork wall would be difficult in the marine environment and due to the greater heritage impact on the Breakwater this option was considered unlikely to be acceptable from a planning or environmental perspective. Consequently, this option was rejected at the OBC stage.

Detached breakwaters

This option considered the addition of a series of detached island breakwaters, or reefs, approximately 20m in front of the existing Breakwater. These would form protective salient shaped outcrops that would reduce the wave climate approaching the Breakwater and significantly reduce wave overtopping. No direct modifications would be required to the Grade II* listed structure; however, the breakwaters may be considered unsightly and present a risk to navigation. This option was considered to be technically feasible; however, was rejected due to technical uncertainties and potential impacts on the marine environment.

Restore rubble mound

This option would involve reinstating the rubble mound with a crest level similar to that of the original construction in 1875, protecting the wall against wave forces and providing protection to minimise the risk of undermining. Replenishment work to the new mound would need to be carried out as and when required. The revetment would dissipate energy and reduce overtopping minimising need for regular repair to the top of the superstructure. Given that the size of rock required to restore the seaward side of the Breakwater would mean sourcing and transporting rock material from Norway. This option was considered to be technically feasible; however, was ruled out due to environmental impacts arising from the regular need to replace the rock and high ongoing costs required to maintain the rubble mound following restoration being economically unfeasible.

Periodic replenishment of the rubble mound

The rubble mound would be periodically replenished to replace stone lost from the seaward slope, with the wall repaired as necessary. Emergency repairs following storm events would also be required. An initial top up of the mound would be required to bring the structure up to a standard that is not susceptible to major

damage. This option was considered to be technically feasible; however, due to low technical performance, ongoing environmental impacts and high costs this option was rejected.

3.5.3.2 Leeward side

Alternative options to the preferred option to refurbish the leeward side of the Breakwater are described below.

Construct rock groynes

Approximately ten rock groynes would be installed along the leeward side of the Breakwater to control the natural movement of material and provide energy dissipation properties. Replenishment work may be required periodically. This would provide a good level of protection against wave forces. Over time sediment will naturally accumulate between the groynes, which would restrict the movement of the existing rubble mound along the Breakwater under wave induced longshore currents. This option was considered to be technically feasible; however, it was ruled out due to potential impacts on the environment and uncertainties associated with how it would interact with the existing Breakwater and coastal processes, and the potential impacts on navigational safety.

Periodic replenishment of the rubble mound

The rubble mound would be periodically replenished to replace stone lost from the landward slope, with the superstructure repaired as necessary. An initial top up would be required to bring the structure up to a standard that is not susceptible to major damage. This option was considered to be technically feasible; however, it was ruled out due to potential impacts on the environment and high ongoing costs.

4 Legislative Framework

4.1 Introduction

This section of the EIA Report provides details on the overarching legislative framework for the proposed works. Additional legislation specific to an environmental topic is described in the relevant chapter.

4.2 Enabling Legislation

4.2.1 Town and Country Planning Act 1990

The Town and Country Planning Act 1990 regulates the development of land in England and Wales and provides Local Planning Authorities (LPAs) the power to approve planning proposals, preserve buildings of architectural or historical interest (Listed Buildings) and redevelop land, amongst others. The Town and Country Planning Act 1990 extends to the Mean Low Water Mark (MLWM).

As the proposed scheme has been determined to require an EIA (see **Section 1.3**), Stena Line Ports' Permitted Development (PD) Rights do not apply. As such, Planning Permission is required from the IoACC to permit the proposed scheme.

The Town and Country Planning (Development Management Procedure) (Wales) (Amendment) Order 2016 sets out the procedure for the use of local development orders by planning authorities such as the IoACC, and also sets out the requirements for statutory 'pre-application consultation' (PAC) to be undertaken prior to the submission of planning applications for 'major developments' such as the proposed scheme.

4.2.2 Marine and Coastal Access Act 2009 (as amended)

Part 4 of the Marine and Coastal Access Act 2009 (MCAA, 2009), as amended[2], provides a framework for the marine licensing system for those 'licensable marine activities' undertaken within the UK marine area below MHWS. As there are elements of the proposed scheme that would be undertaken below MHWS, a marine licence is required. NRW is the regulatory authority for marine licensing in Welsh inshore and offshore waters.

4.2.3 Planning (Listed Buildings and Conservation Areas) (Wales) Act 2012 (as amended)

Listed Building Consent (LBC) under the Planning (Listed Buildings and Conservation Areas) (Wales) Act 2012, as amended[3], is required for all works of demolition, alteration or extension to a listed building that affects its character as a building of special architectural or historic interest. The requirement applies to all works and to all parts of those buildings covered by the listing protected (possibly including attached and curtilage buildings or other structures), provided the works affect the character of the building.

An application for LBC must be accompanied by a heritage impact statement. The Breakwater is Grade II* listed, and the lighthouse at the roundhead is Grade II listed. As such, the proposed scheme will require LBC and a heritage impact statement has been to support the EIA and LBC application (see **Appendix 15-1**).

[2] *Amended by the Marine and Coastal Access Act 2009 (Amendment) Regulations 2011*
[3] *Amended by the Planning (Listed Buildings and Conservation Areas) (Wales) (Amendment No. 2) Regulations 2017*

4.3 Other Applicable Legislation

4.3.1 Town and Country Planning (EIA) (Wales) Regulations 2017

The requirement to carry out an EIA on certain planning proposals is contained within the Town and Country Planning (EIA) (Wales) Regulations 2017. The refurbishment works have been screened in as requiring an EIA by the IoACC under Clause 10(m)[4] of Schedule 2 of these Regulations, using the criteria set out in Schedule 3. As such an EIA is required to support the planning application.

4.3.2 Marine Works (EIA) Regulations 2007 (as amended)

The Marine Works (EIA) Regulations 2007, as amended[5], apply to marine licences issued by NRW and implement a legal requirement on NRW to make an EIA consent decision when determining a marine licence for a type of project to which the 2007 Regulations apply. Under these regulations, NRW determined that the proposed scheme was not considered to be a project for which an EIA was required.

Nonetheless, during discussion with NRW in May 2019 it was agreed that an EIA would be undertaken by agreement, in accordance with Section 5 of the regulations ("Requirement of assessment by agreement"), in order to align with the requirements of the planning permission.

4.3.3 The Conservation of Habitats and Species Regulations 2017 (as amended)

Regulation 63 of the Conservation of Habitats and Species Regulations 2017 (as amended) (the 'Habitats Regulations') defines the procedure for the assessment of the implications of plans or projects on European sites (Special Areas of Conservation (SAC) and Special Protection Areas (SPA)). Under these Regulations, if a proposed development is unconnected with site management and is likely to significantly affect a European site, the statutory regulator (the 'Competent Authority') of the proposed development must undertake an 'appropriate assessment' (Regulation 63(1)).

Changes to The Conservation of Habitats and Species Regulations 2017 (as amended) have been implemented by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. The key changes are the creation of a 'National Site Network' (NSN) (which no longer forms part of the EU Natura 2000 network) and the establishment of management objectives for the NSN. The network objectives are to:

- Maintain or, where appropriate, restore habitats and species listed in Annexes I and II of the Habitats Directive to a favourable conservation status; and,
- Contribute to ensuring, in their area of distribution, the survival and reproduction of wild birds and securing compliance with the overarching aims of the Wild Birds Directive.

Whilst Ramsar sites do not form part of the NSN, they are subject to the same protections as SACs and SPAs.

Should the proposed scheme, either alone or in combination with other plans or projects, be deemed to have a Likely Significant Effect (LSE) on an SAC or SPA (or it cannot be determined that there would not be a significant effect), then, in accordance with Section 63 of the Habitats Regulations, the competent

[4] *Coastal work to combat erosion and maritime works capable of altering the coast through the construction, for example, of dykes, moles, jetties and other sea defence works, excluding the maintenance and reconstruction of such works;*

authority must undertake an 'Appropriate Assessment' (AA) of potential adverse effects, with input from the statutory nature conservation body (i.e. NRW).

The footprint of the proposed scheme is within the following designations (see **Figure 4-1**):

- Anglesey Terns / Morwenoliaid Ynys Môn SPA; and,
- North Anglesey Marine / Gogledd Môn Forol SAC.

The ZOI of the proposed scheme, as set out in **Section 1.3**, overlaps with the following sites:

- Holy Island Coast/Glannau Ynys Gybi SPA and SAC.

A shadow Habitats Regulations Assessment (HRA) has been undertaken on the proposed scheme and is presented in **Chapter 20** Shadow Habitats Regulations Assessment.

4.3.4 Wildlife and Countryside Act 1981 (as amended)

Under the terms of Section 28H of the Wildlife and Countryside Act 1981, as amended[6], any elements of the proposed scheme within, or adjacent to, a Site of Special Scientific Interest (SSSI) require assent from the competent authority. The proposed scheme is adjacent to Glannau Ynys Gybi / Holy Island Coast SSSI, which underpins the Glannau Ynys Gybi / Holy Island Coast SPA and SAC and can therefore be considered in conjunction with the HRA.

4.3.5 Marine Conservation Zones

The MCAA (2009) created a new type of Marine Protected Area (MPA), known as Marine Conservation Zones (MCZs) which will protect nationally important marine wildlife, habitats, geology and geomorphology. Section 126 of the MCAA places specific duties on NRW relating to MCZs and marine licence decision-making. There are no MCZs within 2km of the proposed scheme.

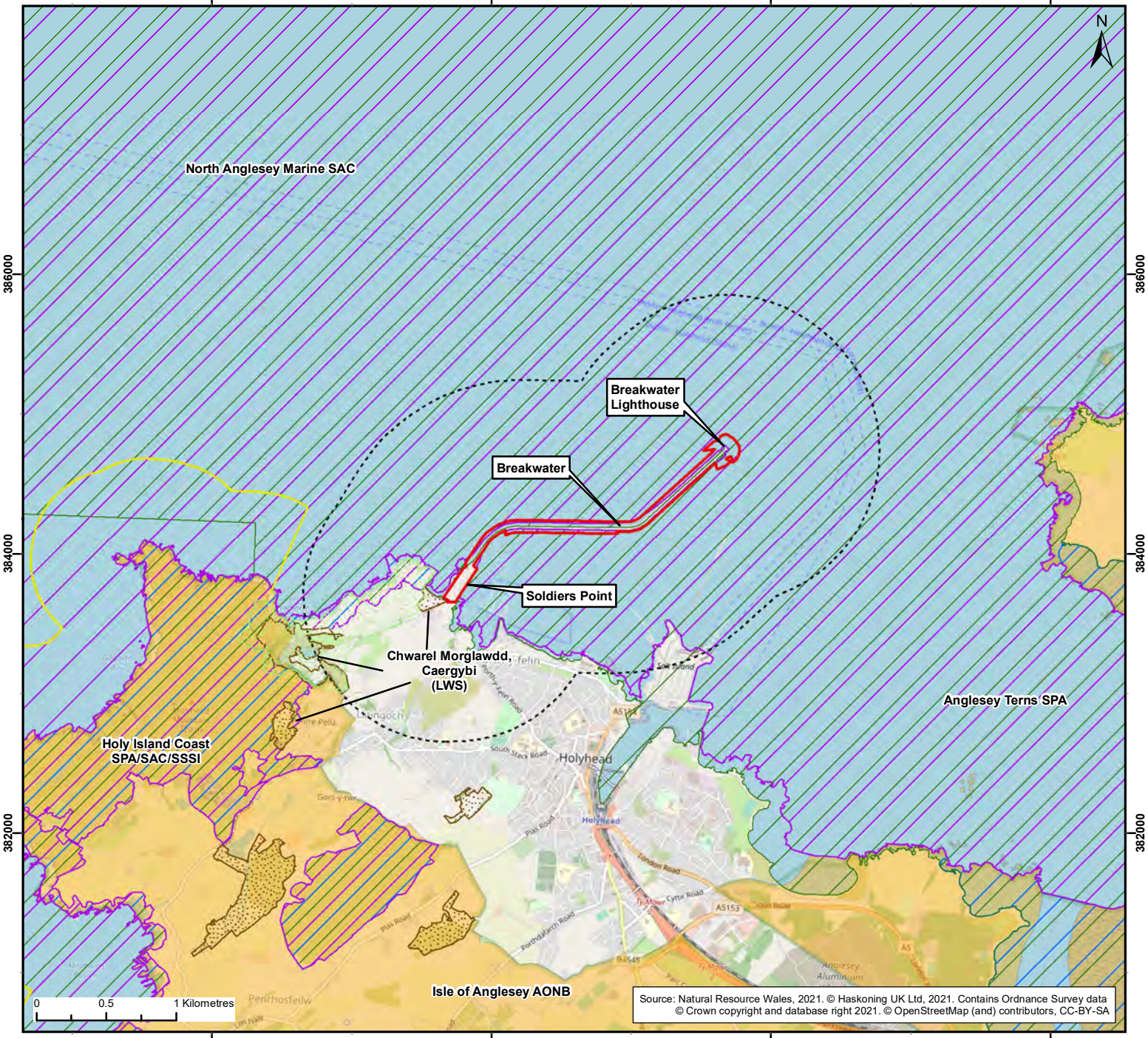
4.3.6 Countryside and Rights of Way Act 2000

The Countryside and Rights of Way Act 2000 (CRoW 2000), adds further and more recent legislation to the National Parks and Access to the Countryside Act 1949. It provides for better management of Areas of Outstanding Natural Beauty (AONB). AONB's are protected by law because of their special landscape qualities, wildlife, geology and geography. In terms of landscape and scenery, they are equal to National Parks. The Anglesey AONB is located approximately 1.5km to the south west of the Breakwater.

4.3.7 Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (as amended)

The Water Environment (WFD) (England and Wales) Regulations 2017, as amended by the Floods and Water (Amendment etc.) (EU Exit) Regulations 2019, transpose the WFD (2000/60/EC) into national law. These regulations provide for the implementation process of the WFD from designation of all surface waters (rivers, lakes, transitional (estuarine) and coastal waters and groundwater) as waterbodies through to achieving good ecological status by 2027. NRW is the responsible authority for WFD compliance in Wales. The WFD applies to a distance of 1nm offshore.

[6] *As amended by Schedule 9 to the Countryside and Rights of Way Act 2000.*



Legend:

- Holyhead Breakwater
- 1km Buffer

Designated sites

- Special Area of Conservation (SAC)
- Special Protection Area (SPA)
- Site of Special Scientific Interest (SSSI)

Non-statuatory Designated sites

- Local Wildlife Site
- Area of Outstanding Natural Beauty (AONB)
- Country park
- Heritage coast

Client:	Project:
Isle of Anglesey County Council	Holyhead Breakwater Refurbishment Scheme

Title: Designated and Non-Designated Sites

Figure: 4-1 | Drawing No: PB9014-013-001

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	12/05/2021	JT	SM	A4	1:40,000

Co-ordinate system: British National Grid

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The WFD specifies the factors, referred to as quality elements, which must be used in determining the ecological status or ecological potential and the surface water chemical status of a surface waterbody. The proposed scheme is located within the following WFD waterbodies (see **Figure 19-1** in **Chapter 19** Water Framework Directive Compliance Assessment):

- Holyhead Bay Coastal Water Body (GB681010360000); and,
- Caernarfon Bay North Coastal Water Body (GB621010380000).

A WFD compliance assessment has been undertaken on the proposed scheme and is presented in **Chapter 19** Water Framework Directive Compliance Assessment.

4.3.8 Protected Areas (Shellfish Waters)

The Shellfish Waters Directive (2006/113/EC) has now been subsumed by the WFD. All previously designated shellfish waters have been placed on the Protected Areas register under the WFD. Following the repeal of the Directive at the end of 2013, there is an ongoing requirement to manage designated shellfish waters to ensure there is no deterioration in water quality and the levels of protection are not relaxed. Therefore, existing shellfish waters must at least maintain their current Food Standards Agency (FSA) classification and the environmental objective under the WFD for the wider water body in which they are located. There are no shellfish waters within the ZOI of the proposed scheme and therefore shellfish waters have not been considered further in this EIA report.

4.3.9 Bathing Water Directive

The Bathing Water Directive preserves, protects and improves the quality of the environment and protects human health. The Directive seeks to improve management practices at all bathing waters and to standardise the information available to bathe across Europe.

The revised Bathing Water Directive was adopted in 2006 (2006/7/EC) and reporting against this Directive has commenced. The key features of the revised Directive include more stringent water quality standards and increased provision of public information. Compliance will be measured using the classes: poor, sufficient, good and excellent. The revised Directive requires all bathing waters to be classed as 'sufficient' and changes the receptors measured to assess water quality. There are no Bathing Waters within the ZOI of the proposed scheme and therefore shellfish waters have not been considered further in this EIA report.

4.3.10 Waste Framework Directive

The Waste Framework Directive (2008/98/EC) sets out the general rules applying to all categories of waste, a key objective of which is to provide measures to protect the environment and human health by preventing or reducing the adverse impacts of the generation and management of waste.

Article 3(1) of the Directive defines waste as:

"any substance or object… which the holder discards or intends or is required to discard".

More generally, the Directive provides a general duty to ensure that waste is dealt with in an environmentally friendly way. The key to this is the 'waste hierarchy', which emphasises prevention (in the first instance) and then re-use, recycling and recovery of waste (see **Plate 4-1**). EU Member States must have regard to the waste hierarchy when dealing with waste. Disposal to landfill or at sea is the least favourable option.

Plate 4-1 The 'waste hierarchy' under the Waste Framework Directive

The only waste generated during the fabrication scheme would arise from the fabrication of the concrete armour and general site activities. There would be no need to remove any material from the marine environment. No unusual wastes would arise in terms of the type or quantity of waste.

4.4 National Planning Policy

4.4.1 Planning Policy Wales

Planning Policy Wales (PPW) (Welsh Government, 2018) ensures that planning decisions in Wales take into account the goals set in the Well-being of Future Generations Act. Section 5.3 of Planning Policy Wales provides further guidance in relation to harbour developments: "*5.3.14 Functional and attractive ports, harbours, marinas and inland waterways, which meet current and future demand, make Wales an attractive location for businesses, visitors and freight transportation. Support and investment in these facilities unlocks potential to boost the economy both directly, from the greater use of the facilities, and indirectly through the opportunities that improved maritime transport infrastructure provide for other sectors (both nationally and internationally).*" It continues in paragraph 5.3.16: *"5.3.16 Planning authorities should seek to promote the use of ports, harbours, marinas and inland waterways by the protection or provision of access to them and by the retention or provision of appropriate wharf, dock, harbour and rail transfer facilities to support economic activities in a way that minimises any adverse impacts on the environment."*

Section 6.1 of PPW provides the national planning policy framework for the consideration of the historic environment, ensuring that it is conserved and enhanced. Section 6.5 of PPW ensures that coastal areas are protected, requiring the consideration of how onshore and offshore developments can affect the coastal environment. PPW also highlights the importance of Shoreline Management Plans in influencing development in light of climate change and coastal defence. Section 6.6 of PPW recognises the environmental qualities of places, particularly relation to flood risk. Paragraph 6.6.28 requires that Shoreline Management Plans and potential environmental effects both onshore and offshore are taken into account. Flood defence works can provide opportunities to achieve wider social, economic and environmental and PPW requires that these should be maximised where possible.

The proposed scheme aligns with the Shoreline Management Plan policy of 'Hold the Line' for Holyhead. It will also restore and protect a listed building and ensure the continued protection of Holyhead from coastal flooding.

4.4.2 The Environment (Wales) Act 2016

The Environment (Wales) Act delivers against Welsh Government's Programme for Government commitment to introduce new legislation for the environment. This positions Wales as a low carbon, green economy, ready to adapt to the impacts of climate change. The act will mean significant economic, social and environmental benefits for Wales. It has been carefully designed to support and complement work to help secure Wales' long-term well-being, so that current and future generations benefit from a prosperous economy, a healthy and resilient environment and vibrant, cohesive communities.

4.4.3 The Well-being of Future Generations (Wales) Act 2015

The Well-being of Future Generations (Wales) Act 2015 places a duty on public bodies in Wales (including the IoACC and NRW) to ensure that the sustainable development principle is met (i.e. the needs of the present are met without compromising the ability of future generations to meet their own needs).

The Act has established seven well-being goals (see **Table 4.1**) to ensure that public bodies work towards one vision of a sustainable Wales.

Table 4-1 A summary of the seven well-being goals as defined by the Well-being of Future Generations (Wales) Act 2015

Well-being goal	Description of the goal
A Prosperous Wales	*"An innovative, productive and low-carbon society which recognises the limits of the global environment and uses resources efficiently and proportionately, and which develops a skilled and well-educated population in an economy which generates wealth and provides employment opportunities".*
A Resilient Wales	*"A nation which maintains and enhances a biodiverse natural environment with healthy functioning ecosystems that support social, economic and ecological resilience and the capacity to adapt to change".*
A More Equal Wales	*"A society that enables people to fulfil their potential no matter what their background or circumstances".*
A Healthier Wales	*"A society in which people's physical and mental well-being is maximised and in which choices and behaviours that benefit future health are understood".*
A Wales of Cohesive Communities	*"Attractive, viable, safe and well-connected communities".*
A Wales of Vibrant Culture & Welsh Language	*"A society that promotes and protects culture, heritage and the Welsh language, and which encourages people to participate in the arts, sport and recreation".*
A Globally Responsible Wales	*"A nation which, when doing anything to improve the economic, social, environmental and cultural well-being of Wales, takes account of whether doing such a thing may make a positive contribution to global well-being".*

In carrying out the Act's duty to carry out sustainable development, the Act requires for all public bodies to:

- Set and publish well-being objectives designed to maximise a public body's contribution to achieve each of the well-being goals; and,
- Take reasonable steps, whilst undertaking its functions, to meet the well-being objectives.

The refurbishment of the Breakwater would strongly support the Well-being goals, by ensuring the longevity of the Grade II* listed Breakwater and Grade II listed lighthouse, as well as providing added economic security for the continued development of the Port of Holyhead and other waterfront facilities within the New Harbour.

4.5 Marine Planning Policy

4.5.1 Maritime Spatial Planning Directive

In July 2014, the European Parliament and the Council adopted Directive 2014/89/EU to create a common framework for maritime spatial planning in the European Union. In broad terms, the Directive places a legal requirement on Member States to develop and implement Maritime Spatial Plans (MSP) by 2021 at the latest. Ultimately, the Directive aims to establish '*a framework for maritime spatial planning aimed at promoting the sustainable growth of maritime economies, the sustainable development of marine areas and the sustainable use of marine resources*.'

4.5.2 UK Marine Policy Statement

The MCAA 2009 and the Marine Works (EIA) Regulations 2007 are supported by policy presented in the UK Marine Policy Statement (MPS), which provides the framework for preparing marine plans and taking decisions affecting the marine environment. The MPS is intended to contribute to the achievement of sustainable development in the UK marine area. The MPS enables an appropriate and consistent approach to marine planning across UK waters, and ensures the sustainable use of marine resources and strategic management of marine activities.

Ports and shipping play an important role in the activities taking place within the marine environment and both are an essential part of the UK economy. The MPS recognises the importance of having infrastructure in place to support and promote safe, profitable and efficient marine business.

4.5.3 Welsh National Marine Plan

The Welsh National Marine Plan (WNMP), published in November 2019, covers inshore and offshore Welsh waters and was prepared and adopted for the purposes of Section 51 of the MCAA 2009 in accordance with Schedule 6 of the MCAA and in conformity with the UK MPS and the Marine Spatial Planning Directive. This is the first marine plan for Wales and its purpose is to guide sustainable development of the marine area. A marine plan assessment has been undertaken on the refurbishment works and provided in support of the marine licence application.

4.5.4 Shoreline Management Plan

SMPs aim to identify the best ways to manage flood and erosion risk to people and the developed, historic and natural environment, and to identify opportunities where shoreline managers can work with others to make improvements. They do not set policy for anything other than coastal defence management. The proposed scheme lies within the West Wales SMP2 (Royal Haskoning, 2012). The long-term management policies for the sections of coastline of relevance are presented in **Table 4-2**.

Table 4-2 SMPs for Holyhead and Penrhos and Newlands and Afon Alaw

Policy Number	Policy Unit	Policy Plan		
		2025	2055	2105
17.15	Holyhead	HTL	HTL	HTL
17.16	Penrhos Bay	MR	MR	MR
17.17	Penrhos Headland	NAI	NAI	NAI
17.18	Stanley Embankment	HTL	HTL	HTL

Policy Number	Policy Unit	Policy Plan		
		2025	2055	2105
17.21	Newlands	MR	MR	MR
17.22	Afon Alaw	MR	MR	MR
17.23	Traeth Gribin to Twyn Cliperau	MR	MR	MR

The proposed scheme would restore a coastal defence structure to its original state, ensuring the ongoing and future protection of Holyhead and the port, supporting the SMP2's of Hold The Line policy for Holyhead.

4.6 Other Applicable Plans and Polices

4.6.1 Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026

The Anglesey and Gwynedd Joint Local Development Plan (JLDP) (Isle of Anglesey County Council and Gwynedd Council, 2017) covers the local authorities of the Isle of Anglesey County Council and Gwynedd Council. Following its adoption in July 2017, the JLDP replaced the Gwynedd Structure Plan and the Ynys Môn Local Plan and now forms the basis for land use planning in these areas. The plan covers the period 2011 to 2026.

Policy CYF8: Holyhead Regeneration Area sets out the aims for transformational change by encouraging Holyhead to be become a more attractive location to live, work, visit and enjoy (Strategic Objective SO13). The Plan also sets out how Holyhead as an international gateway should be promoted and maximised (Strategic Objective SO4). It is considered that the restoration of the Breakwater will significantly contribute to both of these objectives by protecting Holyhead, Holyhead Port and its hinterland.

The associated Anglesey Local Biodiversity Action Plan[7] sets out those areas that support important biodiversity to help secure partnership work between local people and organisations to ensure these local resources are valued and looked after in the future. The action plan set out work to help important habitats and species. Among these sites is the Chwarel Morglawdd Caergybi Local Wildlife Site (LWS) which contains lowland and coastal heath habitats. A small section of this LWS is located adjacent to Soldier's Point, which is an important bird feeding and nesting area.

4.6.2 Wales Spatial Plan – People, Places and Future

Holyhead is the centre of a Secondary Hub within the Wales Spatial Plan (Welsh Assembly Government, 2008) and the focus of much of the planned future investment in the area. Therefore, maintaining the flood defence provided by the Breakwater is seen as vital to sustaining this regional intent. Holyhead is a recognised key growth settlement with the focus on providing services and employment and building on established strengths to support and spread prosperity to the wider rural hinterland. The focus of investment centres around the port where there are opportunities for exploiting the benefits accruing from links with Ireland and the potential to capture the cruise ship sector. The National Development Framework is currently being developed and will replace the Wales Spatial Plan in September 2020.

[7] *Isle of Anglesey County Council (2003) Working for the Wealth of Wildlife: Anglesey's local biodiversity action plan (LBAP) – B2 Habitat Action Plans (HAPs) and Species Action Plans (SAPs)*

4.6.3 North Wales Growth Deal

The North Wales Growth Deal was developed in partnership between the six North Wales councils, business partners, colleges and universities and was agreed by the UK and Welsh Governments on the 17th December 2020. The proposals will enable investment of £1.3 billion in the North Wales economy, providing jobs, new businesses and housing (North Wales Growth Board, 2017). The founding principles of the Plan are:

- Smart: supporting innovation in high value sectors to advance economic performance;
- Resilient: retaining young people, raising employment levels and improving skills to achieve inclusive growth; and,
- Connected: improving transport and digital infrastructure to improve connectivity to and within the region.

The proposed scheme is essential to ensure that the founding principles of the North Wales Growth Deal are achieved by ensuring that the town of Holyhead and the Port are protected from climate change and future predictions of sea level rise and wave heights and therefore can continue to support the local, and wider north Wales, communities.

4.6.4 Wales Biodiversity Partnership

The Wales Biodiversity Partnership (WBP) brings together key players from the public, private and voluntary sectors to promote and monitor biodiversity and ecosystem action in Wales. WBP provides a leadership role and an expert steer on priorities for action on biodiversity and ecosystems in Wales. The Wales Biodiversity Partnership contributes to the delivery of Global, European and national targets for biodiversity and ecosystems. The role of the Wales Biodiversity Partnership focuses on:

- Prioritising and promoting activity to ensure biodiversity conservation (protection, enhancement and restoration) and associated benefits for ecosystem structure and function are planned and delivered at the appropriate scale.
- Developing and communicating the understanding of the dynamic relationship within species, between species and their abiotic environment in order to conserve ecosystem structure and function.
- Providing expertise on the conservation and sustainable use of natural resources.
- Working with local and regional partners to ensure management of the environment, and of human activity which impacts on the environment, at the appropriate level incorporating local knowledge, innovations and practices.

Identify evidence requirements and build consensus on priorities to inform the development and delivery of biodiversity conservation and the Ecosystem Approach.

5 Approach to Environmental Impact Assessment

5.1 Introduction

This section sets out the approach for the assessment of potential impacts which has been adopted within this EIA Report. In summary, this section presents:

- The EIA process;
- The approach adopted to define the baseline environment (specific details are provided for each environmental topic considered in the relevant chapter);
- The generic approach taken to assess potential impacts, including the evaluation of significance (where a different approach has been adopted for a specific topic, this is set out in the relevant chapter);
- The generic approach taken to the derivation of mitigation measures and the assessment of residual impacts;
- The approach taken to the assessment of potential cumulative impacts;
- The approach taken to the WFD compliance assessment; and,
- The approach taken to the HRA.

5.2 EIA Guidance

This EIA has been undertaken in accordance with the requirements of the Marine Works (EIA) Regulations 2007, as amended, and the Town and Country Planning (EIA) Regulations 2017, as amended, and has taken into account key policies, legislation, guidance and advice, including but not limited to the following:

- Ministry for Communities and Local Government (MCLG) *"Guidance: Environmental Impact Assessment"* (2017);
- Chartered Institute of Ecology and Environmental Management (CIEEM) *"Guidelines for Ecological Impact Assessment in the UK and Ireland"* (2018); and,
- Institute of Environmental Management & Assessment (IEMA) *"Guidelines for Environmental Impact Assessment"* (2017).

It is noted that this list of guidance is not exhaustive, and the relevant guidance adopted for the assessment of each environmental parameter is described in the relevant topic chapter.

5.3 The EIA Process

EIA is an iterative tool for systematically examining and assessing the impacts and effects of the construction, operational and, if applicable, decommissioning phases of the proposed scheme on the environment.

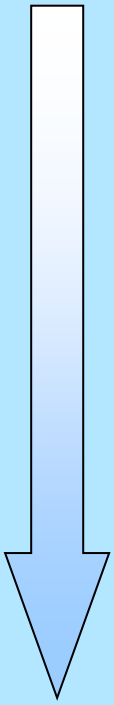
Under the EIA Directive, the formal reporting mechanism for an EIA is the EIA Report. In accordance with Part 3, Section 12 of the Marine Works (EIA) Regulations 2007 and Part 5, Section 17 of the Town and Country Planning (EIA) (Wales) Regulations 2017, the EIA Report should include such information as is reasonably required to assess the likely significant environmental effects of the proposed scheme and which the applicant can reasonably be required to compile, including:

- a description of the project comprising information on its site, design, size and other relevant features;

- a description of the measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects;
- a description of the reasonable alternatives studied and an indication of the main reasons for the chosen option, taking into account the environmental effects; and,
- a non-technical summary of the above.

EIA is a process that systematically examines and assesses the potential impacts of a project on the environment. The process is outlined in **Table 5-1**.

Table 5-1 The EIA Process

Stage	Task	Aim / objective	Work / output (examples)
Screening report	Screening	To formally confirm route for EIA and lead responsible authority.	Appropriate level of information on proposals and approach.
Scoping study	Scoping	To identify the potentially significant direct and indirect impacts of the proposed scheme.	Preliminary consultation with key consultees. Targets for specialist studies (e.g. benthic ecology survey).
EIA 	Consultation	Consult with statutory and non-statutory organisations and individuals with an interest in the area and the proposed scheme.	Local knowledge and information.
	Primary data collection	To characterise the existing environment.	Background data including existing literature and specialist studies.
	Specialist studies	To further investigate those environmental parameters which may be subject to potentially significant effects.	Specialist reports.
	Impact assessment	To evaluate the existing environment, in terms of sensitivity. To evaluate and predict the impact (i.e. magnitude) on the existing environment. To assess the significance of the predicted impacts.	Series of significant adverse and beneficial impacts.
	Mitigation measures	To identify appropriate and practicable mitigation measures and enhancement measures.	The provision of solutions to minimise adverse impacts as far as possible. Feedback into the design process, as applicable.
	EIA Report	Production of the EIA Report in accordance with EIA guidance.	EIA Report.

The approach adopted for this EIA is summarised in the following sections. It should be noted that these stages are not consecutive and overlap. For example, iterative design changes may be made in light of emerging findings of the EIA process to prevent or reduce the significance of a potential impact. This would then require re-assessment of the potential impact, potentially informed by further survey work to adequately describe the baseline environment.

The EIA process also requires that an EIA Report is prepared by competent experts. This report has been compiled by Royal HaskoningDHV, a company which is a corporate member of the Institute of Environmental Management & Assessment (IEMA) (number 0001189) and also a Corporate Registered Assessor for EIA under IEMA's voluntary EIA Quality Mark scheme, through which EIA activity is

independently reviewed, on an annual basis, to ensure it delivers excellence in areas including EIA management, team capabilities, regulatory compliance, content, presentation, and improving practice.

5.4 Screening and Scoping

Screening is the official process by which the relevant planning / licensing authorities determine the requirement for a proposed scheme to undertake an EIA.

An EIA Screening Report along with requests for Screening Opinions were submitted to NRW and the IoACC on the 13th August 2019 (Royal HaskoningDHV, 2019), with Screening Opinions received on 1st October and 18th October 2019 respectively.

NRW confirmed that the proposed scheme does not require a statutory EIA ref: SC1903 (**Appendix 1-1**) under the Marine Works (EIA) Regulations 2007, as amended; however, the IoACC confirmed that the proposed scheme does require an EIA (ref: SCR/2019/50) (**Appendix 1-2**) under the Town and Country Planning (EIA) (Wales) Regulations 2017.

Given IoACC's Screening Opinion did not contain any detail as to why the proposed scheme was considered an EIA Development, discussions with the IoACC identified that this was due to uncertainty with regards to the potential environmental impacts that could arise from the proposed concrete batching plant, specifically if it was to be located at Soldier's Point.

A case was made that further information could be provided that was considered to address these uncertainties and it was agreed this could be provided for the IoACC to reconsider their Screening Opinion. The further information was submitted to the IoACC on the 27th November 2019 (**Appendix 1-3**). The IoACC provided a second Screening Opinion on the 17th February 2020 (**Appendix 1-4**) that also considered the proposed scheme to be EIA Development.

Given the IoACC's requirement for an EIA, it was agreed with NRW that an EIA would be undertaken by agreement, in accordance with Section 5 of the Marine Works (EIA) Regulations 2007, as amended ("Requirement of assessment by agreement"), in order to align with the requirements of the planning permission.

Scoping is the process of identifying the potential environmental impacts (both direct and indirect) associated with a proposed scheme. It also determines the structure, focus and scope of work of the subsequent EIA, including the identification of further specialist studies which may be required.

An EIA Scoping Report for the proposed scheme was submitted to the IoACC and NRW on 20th April 2020. This was to allow NRW and the IoACC to issue their Scoping Opinions in parallel. Scoping Opinions from NRW and the IoACC were received on the 23rd July 2020 and 20th August 2020, respectively (see **Section 6.1.2** and **Appendix 6-1** and **Appendix 6-2**).

5.5 EIA Report

5.5.1 Baseline environment

The term *'baseline environment'* is used to describe the nature, scale, condition, and other relevant information to provide a detailed description of a given environmental receptor that falls within the scope of the EIA Report. Within this Report, the description of the baseline environment consists of the following aspects:

- the spatial location and extent of the environmental features or receptors;
- a description of the environmental features or receptors and their character;
- the context of the environmental features or receptors in terms of rarity, function, and population at the local, regional and national level;
- the sensitivity of the environmental features or receptors in relation to physical, chemical or biological changes; and,
- the value of the environmental features or receptors (e.g. designated status).

A range of information has been gathered and activities undertaken to define the baseline environment and likely receptors that could be affected by the proposed scheme, including:

- desk-based review of existing published data;
- data provided by consultees; and,
- desk-based studies and field surveys, including:
- A marine ecological survey (**Appendix 11**);
- A Visual Appraisal including photomontages (**Appendix 14**); and,
- A Desk-Based Assessment and Heritage Statement (**Appendix 15**).

5.5.2 Receptor sensitivity

All receptors will exhibit a greater or lesser degree of sensitivity to the changes brought about by the proposed scheme, so defining receptor 'sensitivity' as part of the definition of the baseline environment helps to ensure that the subsequent assessment is transparent and robust. The sensitivity of a receptor is a function of its capacity to accommodate change and reflects its ability to recover if it is affected, and is defined by the following factors:

- Adaptability – the degree to which a receptor can avoid, adapt to or recover from an effect.
- Tolerance – the ability of a receptor to accommodate temporary or permanent change.
- Recoverability – the temporal scale over which a receptor will recover following an effect, and the extent to which it will recover.

In order to define the sensitivity of a receptor, the guidelines presented in **Table 5-2** have been adopted in this EIA Report and the conclusions reached regarding the sensitivity of receptors has been presented in the baseline sections of each relevant environmental topic.

Table 5-2 Generic guidelines used in the determination of receptor sensitivity and value

Sensitivity / value	Description
Very high	Receptor has very limited or no capacity to accommodate physical or chemical changes or influences. Receptor possesses fundamental characteristics which contribute significantly to the distinctiveness, rarity and character of the resource, is of very high importance and rarity that is international in scale (e.g. designated sites

Sensitivity / value	Description
	such as SACs, SPAs, World Heritage Sites, Geological Conservation Review Sites, and Habitats Directive Annex II species), and has very limited potential for substitution / replacement.
High	Receptor has a limited capacity to accommodate physical or chemical changes or influences. Receptor possesses key characteristics which contribute significantly to the distinctiveness, rarity and character of the resource, is of high importance and rarity that is national in scale (e.g. designated sites such as SSSIs, Biodiversity Action Plan (BAP) habitats and species, Areas of Outstanding Natural Beauty, Heritage Coasts, Scheduled Monuments, Grade I and II* Listed Buildings, Conservation Areas, etc.), and has limited potential for substitution / replacement.
Medium	Receptor has a limited capacity to accommodate physical or chemical changes or influences. Receptor possesses key characteristics which contribute to the distinctiveness and character of the resource, is of medium importance and rarity that is regional in scale (e.g. Regionally Important Geological Sites, Grade II Listed Buildings, Local BAP, etc.), and has limited potential for substitution / replacement.
Low	Receptor has a moderate capacity to accommodate physical or chemical changes or influences. Receptor possess characteristics which are locally distinctive only, are of low to medium importance and rarity that is local in scale (e.g. designated sites such as LWSs), and potentially can be substituted / replaced.
Very low	Receptor is generally tolerant of and can accommodate physical or chemical changes or influences. Receptor characteristics do not make a significant contribution to local character or distinctiveness, and are of very low importance and rarity, are not designated, and are easily substituted / replaced.

It should be noted that the sensitivity criterion is a composite one; combining value (a measure of the receptors importance, rarity and worth) with sensitivity. In some instances, the inherent value of a receptor is recognised by means of designation (see below), and the 'value' element of the composite criterion recognises and gives weight in the assessment to that designation; however, irrespective of the recognised value, all receptors will exhibit a greater or lesser degree of sensitivity to the potential changes brought about by the proposed scheme. It should be noted that the assessment of sensitivity is a matter of judgement applied by professional experts based on the receptors within the relevant study area.

5.5.3 Receptor value

The value of the feature or receptor is a function of a range of factors (e.g. biodiversity value, social/community value, and economic value). The value or potential value of a receptor or feature can be determined within a defined geographical context. For example, the following hierarchy to describe value is recommended by CIEEM (CIEEM, 2018) with respect to ecological receptors:

- International and European;
- National;
- Regional;
- Metropolitan, County, vice-county or other local authority-wide area; and,
- Local (e.g. assessment within a district or borough context, or within a ZOI).

5.5.4 Impact identification and assessment

The EIA has been undertaken within a framework that allows for a transparent approach to the assessment and the resulting conclusions presented within this EIA Report. This section sets out the assigned definitions that are used in the assessment process for a number of topics considered. In addition, a description of the approach taken to the specific impact assessment for each environmental topic is provided (in the relevant chapters) so that it is clear to the reader how impacts have been defined, particularly where an approach differs to that described within this section.

EIA provides an assessment of the potential impacts on sensitive receptors as a result of the effects of a development upon the environment. The terms 'effects' and 'impacts' have, in the past, been used interchangeably, but they are in fact different and one drives the other. Effects are physical changes in the environment that are set in motion as a consequence of a particular development or activity. Effects do not impact all receptors, as some receptors are not always sensitive to them.

Effects are measurable physical changes in the prevailing environment (e.g. volume, time and area) arising from construction and operation activities. Effects can be classified as primary (e.g. the physical presence of a built element of the development) or secondary (e.g. increase in erosion due to a change in the rate of discharge of surface water).

Impacts consider the possible changes in potentially sensitive receptors as a result of an effect. Impacts can be classified as direct or indirect, permanent or time-limited and beneficial or adverse.

The relationship between effects and impacts is not always straightforward. For example, a secondary effect may result in both a direct and indirect impact on a single receptor. Given this, the EIA framework used herein is based on the 'source-pathway-receptor' conceptual model process used to provide a systematic and auditable approach to understanding the potential for effects to arise, the spatial extents of the effect-receptor interactions, impact pathways, and potential impact significance. The conceptual *'source-pathway-receptor'* model is effective in the identification of potential effects and the means by which these can manifest themselves on the receiving environment and its sensitive receptors.

The term 'source' describes the origin of potential effects (e.g. construction activities) and the term 'pathway' describes the means (e.g. through air, water, or ground) by which the effect reaches the receiving sensitive 'receptor' (e.g. terrestrial habitats, archaeology and human receptors). If the source, pathway or receptor is absent, no linkage exists and thus there will be no potential for an impact to manifest.

For each effect, the assessment identifies receptors within the study area that are sensitive to that effect and implements a systematic approach to understand the impact pathways and the level of impacts on given receptors. The process considers the following:

- the magnitude of the effect;
- the sensitivity of a receptor to the effect;
- the probability that an effect-receptor interaction will occur;
- the determination and (where possible) qualification of the level of impact on a receptor, considering the probability that the effect-receptor interaction will occur, the spatial and temporal extents of the interaction and the significance of the resulting impact; and,
- the level of certainty at all stages.

5.5.5 Magnitude of effect

The magnitude of an effect is typically defined by four factors:

- Extent – the area over which an effect occurs.
- Duration – the time for which the effect occurs.
- Frequency – how often the effect occurs.
- Severity – the degree of change relative to existing environmental conditions.

In order to help define impact magnitude, the criteria presented in **Table 5-3** have been adopted for the purposes of this EIA. While this table provides guidelines of a generic nature, it should be noted that more

specific guidelines in relation to impact magnitude have been adopted for the topics assessed, where considered necessary.

Table 5-3 Generic guidelines used in the determination of magnitude of effect

Magnitude	Description
Very high	Loss of resource and/or integrity of the resource; severe damage to key characteristics, features or elements (Adverse). Permanent / irreplaceable change, which is certain to occur. Large scale improvement of resource or attribute quality; extensive restoration or enhancement (Beneficial).
High	Loss of resource, but not affecting integrity of the resource; partial loss of or damage to key characteristics, features or elements (Adverse). Permanent / irreplaceable change, which is likely to occur. Improvement to, or addition of, key characteristics, features or elements of the resource; improvement of attribute quality (Beneficial).
Medium	Minor loss of, or alteration to, one (maybe more) key characteristics, features or elements; measurable change in attributes, quality or vulnerability (Adverse). Long-term though reversible change, which is likely to occur. Minor improvement to, or addition of, one (maybe more) key characteristics, features or elements of the resource; minor improvement to attribute quality (Beneficial).
Low	Very minor loss of, or alteration to, one (maybe more) key characteristics, features or elements; noticeable change in attributes, quality or vulnerability (Adverse). Short- to medium-term though reversible change, which could possibly occur. Very minor improvement to, or addition of, one (maybe more) key characteristic, feature or element; very minor improvement to attribute quality (Beneficial).
Very low	Temporary or intermittent very minor loss of, or alteration to, one (maybe more) characteristic, feature or element; possible change in attributes, quality or vulnerability (Adverse). Short-term, intermittent and reversible change, which is unlikely to occur. Possible very minor improvement to, or addition of, one (maybe more) characteristic, feature or element; possible improvement to attribute quality (Beneficial).

5.5.6 Determination and qualification of impact significance

The significance of an impact is determined by combining the predicted magnitude of the effect with the sensitivity of the receptor; for example, as defined in **Table 5-4**. Impact statements carry a degree of subjectivity, as they are based on expert judgement regarding the effect-receptor interaction that occurs and on available data. As such, impact statements should be qualified appropriately.

The probability of an effect occurring (i.e. an effect-receptor interaction) should also be considered in the assessment process; capturing the probability that the effect will occur and also the probability that the receptor will be present. For example, the magnitude of the effect and the sensitivity of the receptor may have been established, and it may be highly probable that the effect will occur; however, the probability that the receptor will be present at the same time should also be considered.

Table 5-4 Impact assessment matrix

Receptor sensitivity (inclusive of value)	Magnitude of effect				
	Very high	High	Medium	Low	Very low
Very high	Major	Major	Moderate	Moderate	Minor
High	Major	Moderate	Moderate	Minor	Negligible
Medium	Moderate	Moderate	Minor	Minor	Negligible
Low	Minor	Minor	Minor	Negligible	Negligible
Very low	Minor	Negligible	Negligible	Negligible	Negligible

In the context of EIA, 'significant impacts' are taken to be those of moderate or major significance (as defined above); albeit that appropriate mitigation, where available, should be sought for all impacts.

It should be reiterated that, although this section sets out the overall approach adopted for this EIA (using, for example, magnitude and sensitivity to determine the level of impact), individual sections may take their own approach where industry standard methodologies are appropriate or another approach has been agreed with the relevant regulator. Where a different approach is taken, this is explained in the relevant methodology section.

5.5.7 Mitigation

Mitigation measures have been proposed, where available and practical, in those cases where adverse impacts have been identified. It is important to note that the mitigation measures applied should be proportionate to the scale of the impact predicted. Appropriate mitigation measures have been discussed and agreed, where possible, with the relevant regulatory authorities and stakeholders.

Whilst mitigation for minor or negligible impacts may not be specifically defined, as a matter of course industry standard or 'embedded' mitigation often applies in these cases (and is set out herein). It is also recognised that minor and negligible impacts could become significant when considered cumulatively with other pressures on a receptor and, in this event, mitigation may be required.

5.5.8 Monitoring

Appropriate mitigation measures have been identified and recommended in this EIA Report where the EIA process has identified an adverse impact and mitigation is available (see above). In some cases, in order to ensure that the mitigation measures are successful or where there is significant uncertainty with respect to important receptors, monitoring requirements have been identified and are presented within the relevant topic chapters of this EIA Report.

5.5.9 Residual impacts

Where further mitigation measures are identified, the significance of the residual environmental impact (i.e. the post-mitigation impact) is assessed.

5.5.10 Assumptions and limitations

The EIA process requires an EIA Report to provide an indication of any difficulties (technical deficiencies or lack of expertise) encountered during the assessment process. Any such assumptions or limitations are identified within the relevant topic chapter, where appropriate.

5.6 Cumulative Impact Assessment

5.6.1 Impact inter-relationships

This EIA Report has given due consideration to the potential for different residual impacts to have a combined impact on key sensitive receptors. The objective is to identify where the accumulation of impacts on a single receptor, and the relationship between those impacts, potentially gives rise to a need for additional mitigation. Inter-relationships have been assessed within the relevant sections of the topic chapters of the EIA Report.

5.6.2 Cumulative impacts

In line with IEMA's Guidelines for EIA (2017), cumulative impacts are defined as:

"…the impacts on the environment which result from incremental impacts of the action when added to other past, present and reasonably foreseeable future actions …"

There is no legislation that outlines how cumulative impact assessments (CIAs) should be undertaken; however, the EIA and Habitats Regulations require the consideration of direct impacts and any indirect, secondary and cumulative effects of a project. Government guidance states that: "cumulative effects could refer to the combined effects of different development activities within the vicinity" (Ministry of Housing, Communities and Local Government, 2017). Guidance on CIA is provided in a number of good practice documents (e.g. the European Commission, 1999). This guidance is not prescriptive, but rather suggests various approaches which may be used, depending on their suitability to the project (for example the use of matrices, expert opinion, consultation, spatial analysis and carrying capacity analysis).

With respect to 'past' projects, a useful ground rule in CIA is that the environmental impacts of schemes that have been completed should be included within the environmental baseline; as such, these impacts will be taken into account in the EIA process and, generally, can be excluded from the scope of CIA. However, the environmental impacts of recently completed projects may not be fully manifested and, therefore, the potential impacts of such projects should be taken into account in the CIA.

5.6.3 WFD Compliance Assessment

The way in which WFD impacts are assessed is different to the approach conventionally used within the EIA process. The standard EIA approach assesses whether an impact is minor, moderate or major, and whether it is beneficial or adverse. This is not compatible with the requirements of the WFD, which requires an assessment of whether a scheme (or element of a scheme) is compliant or noncompliant with the environmental objectives set out in the WFD.

There is no designated methodology for the assessment of projects against WFD compliance parameters. The guidance considered to be the most relevant to these proposals is "Clearing the Waters for All" (Environment Agency, 2016). The WFD compliance assessment is presented in **Chapter 19** Water Framework Directive Compliance Assessment.

5.6.4 Habitats Regulations Assessment

The HRA process follows a four-staged approach, as summarised below:

- Stage 1 – Screening: The process of identifying potentially relevant National Site Network (NSN) and Ramsar sites, and whether the likely impacts of a project upon the qualifying features of the site, either alone or in-combination with other plans and projects, are likely to be significant. If predicted impacts are not likely or significant then the process ceases at this point.
- Stage 2 – Appropriate Assessment (AA): The consideration of the potential impacts on the integrity of the site(s), either alone or in-combination with other plans and projects, with regard to the site's structure and function and its Conservation Objectives. Where there are adverse impacts, an assessment of mitigation options is carried out to determine adverse effect on the integrity of the site. If these mitigation options cannot avoid adverse effects, then development consent can only be given if the tests set out in Stages 3 and 4 can be passed.

- Stage 3 – Assessment of Alternative Solutions (AAS): Examining alternative ways of achieving the objectives of the project to establish whether there are solutions that would avoid or have a lesser effect on the site(s).
- Stage 4 – Imperative reasons of over-riding public interest (IROPI): Where no alternative solution exists and where an adverse effect on site integrity remains, the next stage of the process is to assess whether the development is necessary for IROPI and, if so, the identification of compensatory measures needed to maintain site integrity or the overall coherence of the designated site network.

The shadow HRA is presented in **Chapter 20** Shadow Habitats Regulations Assessment.

6 Consultation

6.1 Consultation Undertaken

Informal consultation has been undertaken with the appropriate authorities (primarily NRW and the IoACC, and the statutory consultees) as part of the pre-application process, as well as formal consultation through the EIA screening and scoping stages.

Further consultation with other individuals and organisations has also been undertaken in order to collect additional information to inform the EIA and to assess potential impacts and determine an appropriate mitigation and monitoring strategy.

6.1.1 EIA Screening Opinions

Details of the screening exercise can be found in **Section 1.3**. The Screening Opinion issued by the IoACC did not provide any information as to why an EIA was required; however, discussions with the IoACC identified that this was due to uncertainty with regards to the potential environmental impacts that could arise from the proposed concrete batching plant, specifically if it was to be located at Soldier's Point.

NRW provided the following advice with their Screening Opinion:

- Noise Disturbance / Marine Mammals - No likely significant effects on any marine mammal features as a result of underwater noise is anticipated.
- Coastal Processes - Agreed that numerical modelling is not required. It was recommended that an overview of the potential local and regional scale changes to coastal processes be presented in the final application.
- Archaeology - The scope of work relating to archaeology and cultural heritage reflects previous pre-application discussions with the Welsh Archaeological Trust and is still considered to be appropriate.
- HRA - At this stage it is not possible to state whether an appropriate assessment will be required. Given mitigation cannot be used when determining Likely Significant Effect, it is likely that an HRA would have to go to appropriate assessment. This does not mean that any potential impact pathways from the proposed scheme cannot be mitigated.
- Navigational Safety – The Marine and Coastguard Agency would expect the safety of navigation to be considered, with any predicted impact on shipping and navigation to be suitably mitigated.

6.1.2 EIA Scoping Opinions

An EIA Scoping Report (Royal HaskoningDHV, 2020) was submitted to the IoACC and NRW on 20th April 2020, and formal Scoping Opinions were issued on 20th August 2020 (see **Appendix 6-1**) and 23rd July 2020 (see **Appendix 6-2**), respectively. A summary of the responses received and where they have been addressed in this EIA report is presented in **Table 6-1.**

Table 6-1 Summary of the scoping responses received from the IoACC and NRW

Scoping Opinion	Response	Where response is addressed
General Comments		
NRW	Any marking requirements and/or alterations to existing Atons should be considered in consultation with the Local Lighthouse Authority once a formal application is made.	Noted
NRW	Uncertainty remains regarding the proposed location of the batching plant and possible storage/curing site. We recommend that you engage with the IoACC to discuss the impacts on designated heritage assets.	See **Section 15.5**
NRW / IoACC	If Soldier's Point is selected for the concrete batching plant, the IoACC noted that a detailed management plan will need to be prepared which will identify and mitigate these risks to the public, using the public highway and rights of way.	Noted
IoACC	The issues of light pollution, air quality (PM_{10} and $PM_{2.5}$), dust, noise and vibration will all be issues in this development. No development shall take place until a site specific Construction Environmental Management Plan (CEMP) has been submitted to and approved in writing by the Council. The plan must demonstrate the adoption and use of the best practicable means to reduce the effects of noise, air quality, dust, vibration and site lighting.	It is proposed that a CEMP will form a consent condition.
IoACC	The development must comply with the requirements of the Health and Safety at Work Act 1974, and all regulations made under that Act.	Noted
Legislative and Consenting Requirements		
NRW	The IoACC confirmed that the proposed works to the Holyhead Breakwater must obtain Listed Building Consent, which should be supported by a detailed Heritage Impact Statement and an accompanying Method Statement.	See **Appendix 15.1**
IoACC	Planning Policy – need to ensure that the EIA contains the relevant local and national legislation and policy.	All topic chapters
Topics Scoped Out of the EIA		
NRW	Agree that the following topic can be scoped out of the EIA; however, an acknowledgement of each topic should still be made in the submitted EIA Report: • Commercial and Recreational Navigation; • Marine Water and Sediment Quality; • Traffic and Transport; • Accidents and Natural Disasters; • Population and Human Health; • Existing Infrastructure and Other Users; • Waste; • Socio-economics; and, • Marine Mammals.	Noted

Scoping Opinion	Response	Where response is addressed
NRW	We note that in Section 7.8 'Accidents and Natural Disasters', the potential for vessels to collide with Holyhead Breakwater either during the construction or operational phase due to failed steering or engine failure, has not been considered and should have been acknowledged in the Scoping Report.	Noted
Project Description		
IoACC	Provide further detail on the proposed application – particularly confirmation and details in relation to the proposed batching plant and curing and storage arrangements for raw materials and fabricated armour units. This must be accompanied by an assessment of likely significant effects and proposed mitigation (including detail as to how the mitigation is to be secured).	See **Section 3.2**
IoACC	Section 2.3: Alternatives It is not clear from this section whether the use of natural rock has been considered and assessed as one of the options for the Breakwater refurbishment.	See **Section 3.5.3.1**
IoACC	Section 3.1: EIA Screening Exercise It appears that there has been a variation in scheme design since we were first consulted. Initial advice on the requirements for specific modelling related to physical processes may no longer apply given the design change (see physical process comments). In line with this advice, and until the results of the numerical modelling have been assessed, it is not possible to comment on the range of potential benthic habitat receptors as part of the current scheme.	Noted
Fish and Shellfish Resource and Commercial Fisheries		
NRW	The proposed refurbishment will have a short-term impact on recreational fishing during the construction phase of the works. This should be acknowledged within the ES. It is anticipated however, that the completed refurbishment will provide new habitat for fish and shellfish.	Noted
Coastal Processes		
NRW / IoACC	We disagree that Section 7.1 'Coastal Processes and Geomorphology' can be scoped out of the EIA. As modelling is to be undertaken for design purposes, NRW recommended that this modelling is also used to describe any local and regional scale changes to coastal processes and the redistribution of wave and tidal energy from the scheme. Until this is undertaken, NRW noted that it is not possible to comment on the range of potential benthic habitat receptors as part of the current scheme. We therefore recommend that you engage with NRW regarding modelling outputs. We recommend that a robust physical processes and geomorphology assessment should be undertaken to evaluate the potential impacts on benthic ecology receptors.	See **Chapter 7** Coastal processes
IoACC	Section 2.2 Description of the Operational Phase Initial modelling has shown a large reduction in overtopping. We require clarification about the redistribution of energy from the scheme. Modelling is going to be undertaken for design purposes and this should be shown in a representation of changes to wave and tidal energy and the surrounding environment.	See **Section 7.8**

Scoping Opinion	Response	Where response is addressed
Marine Water and Sediment Quality		
NRW / IoACC	We agree that Marine and Sediment Quality can be scoped out of the EIA. However, the Developer should take note of GPP5 Work and Maintenance In or Near Water.	See **Section 19.3.2**
Marine and Coastal Ecology		
NRW / IoACC	Consideration must be given in the assessment to the introduction of marine Invasive Non-Native Species (INNS) and any mitigation required. Agree with the consideration of the Stena Line Biosecurity Plan as part of the current proposal to minimise the risks associated with marine INNS. However, for this document to be fully incorporated, it is recommended that it is included with the application and made specific to the proposed development. We consider that a biosecurity plan must be submitted with the application. Clarification on whether the use of natural rock has been considered as one of the options for the Breakwater refurbishment. This option would significantly reduce the risks associated with the colonisation of marine INNS.	See **Section 11.6.2** See **Section 3.5.3.1**
Ornithology		
NRW	Advise that a bird survey of the Breakwater is carried out before works commence to ensure no bird nests or eggs are damaged or destroyed during construction. Impact on nesting birds must be considered within the assessment and relevant mitigation identified where required.	See **Section 12.6**.
NRW	Recommend that potential opportunities during refurbishment of the inner breakwater are taken to create habitat for nesting birds, namely black guillemots (*Cepphus grylle*), through the installation of nest boxes or nest cavities in the wall of the Breakwater.	
Terrestrial Ecology		
IoACC	We would comment that the methodology referred to will need to be clearly covered through the main application. If there is any likelihood at all that areas of habitat suitable for protected species may indeed be used in works, then the EIA itself should include this, even where basic, to avoid doubt and ensure full coverage.	See **Chapter 13** Terrestrial Ecology
Traffic and Transport		
IoACC	Given that the materials required for the works will be delivered by sea, no significant highway impacts are forecast. However, should the Soldier's Point location be selected for locating the concrete batching plant, this will be located near human receptors and a public right of way. As such, it will be necessary to prepare a detailed management plan which will identify and mitigate risks to the public using the public highway and rights of way.	To be included in the CEMP.
Noise and Vibration		
NRW	No comments were received. The EIA Report should include an assessment of the impacts on noise, as set out in the scoping report.	See **Chapter 10** Noise and Vibration

Scoping Opinion	Response	Where response is addressed
Air Quality		
NRW	No comments were received. The EIA Report should include an assessment of the impacts on air quality, as set out in the scoping report.	See **Chapter 9** Air Quality
Archaeology and Cultural Heritage		
NRW / IoACC	We broadly agree with the scope of the assessment outlined in Section 8.6 'Cultural Heritage', although we consider that the study area proposed for the assessment of designated heritage assets should be increased to 3km. The impact of the proposed works on the settings of these designated heritage assets should be assessed in accordance with the Welsh Government guidance given in the document "The Setting of Historic Assets in Wales". Welsh Archaeological Trust recommended that the evidence gathering discussed in Section 8.6 'Cultural Heritage Assessment' should include a site visit and consideration of ancillary activities.	See Section 6 of **Appendix 15-1**.
IoACC	The EIA will need to consider all heritage assets that will be affected by the proposed development and an initial list of these assets has been provided.	See **Section 15.5** and Appendix A4 in **Appendix 15-1**.
IoACC	The refurbishment works to the Breakwater will require Listed Building Consent and an application for such consent must be supported by a detailed Heritage Impact Statement and accompanying Method Statement.	Section 7 of **Appendix 15-1**.
Landscape/Seascape and Visual Setting		
NRW / IoACC	Provided that the duration of the work proposed can be regarded as temporary, it is appropriate that construction and operational effects on seascape and landscape are scoped out of the ES. The methodology to produce images appears appropriate (baseline, construction and residual/post completion). However, as colouration of the tetrapods and the probable rate and degree of discolouration/weathering are considerations, the assessment could be enhanced by, for example, a Year 10 image, based on similar armour/sites or images of the tetrapods at installation and after several years. We agree that a full Seascape and Landscape Visual Impact Assessment is not required but that Visual Effects are assessed as proposed in the scoping report (subject to considerations above) and these images used to inform possible mitigation for both Heritage and amenity.	See **Chapter 14** Visual Setting.
IoACC	We agree that wire frame images would not be necessary, however images submitted as part of the environmental statement should be of better quality and include pictures of the development area at low tide in order to understand the full magnitude of change. A description of the development's likely zone of visual influence is commonly set out in the introduction of visual effects assessment. An assessment of sequential views would not be necessary. However, we would expect a general description to confirm locations within the AONB and lengths of the Anglesey Coastal Path (locations accessed by sensitive visual receptors) that would have views of the Breakwater.	See **Chapter 14** Visual Setting.

Scoping Opinion	Response	Where response is addressed
Coastal Defence and Flood Risk		
IoACC	We are generally satisfied with the engineering works to refurbish the Breakwater.	Noted
IoACC	We suggest that flood risk be scoped in or a suitable flood risk assessment be carried out to determine the impact flooding could have.	Flood Consequence Assessment has been submitted in support of the Planning Application.
Tourism and Recreation		
NRW / IoACC	Tourism and Recreation has been scoped out of the EIA as it is deemed that the proposed refurbishment will not have any significant impacts on tourism. Whilst it is agreed that the proposed refurbishment will not have a direct impact on tourism, it is nevertheless important to highlight the significant indirect impacts on tourism if the Breakwater fell into a state of disrepair. For example, the impact on the ferries, cruise ships, Holyhead Marina, Holyhead Waterfront etc. which are worth millions to the local economy each year.	See **Chapter 2** Need for the Proposed Scheme.
Climate Change		
NRW	We do not agree that Section 7.9 'Climate Change' can be scoped out of the EIA, as all projects are vulnerable to the impacts of climate change to some extent. In this case, the potential long-term impacts of sea level rise on the proposed scheme should have been addressed utilising a proportionate approach.	See **Chapter 16** Climate Change.
Socio-Economics		
NRW / IoACC	Again, whilst we agree that no further assessment is required, we would be looking for commitments by the applicant to the use of local employment and supply chain opportunities where possible. Recognising that the refurbishment is a specialised construction, there may be opportunities for local people in supporting roles and this should be actively encouraged and promoted by the applicant.	Noted.
Minerals and Waste		
IoACC	Transportation It is noted that should a batching plant be located on site, it will be supplied by Sea. Such an arrangement needs to address the baseline conditions, likely significant impacts, the probability of effects and the proposed mitigation measures. The information provided should be that which is necessary to demonstrate the risks, likelihood of occurrence, likelihood of any significant impact and an outline of the main alternatives studied by the applicant. e.g. road.	See **Section 13.6.**

Scoping Opinion	Response	Where response is addressed
IoACC	Noise, dust and air quality It is acknowledged that noise, dust and air quality are discussed within the Scoping submission and these are addressed elsewhere in this scoping opinion. It should be noted that the proposed sites for the batching plant are in a coastal location and pollution prevention measures must be fully considered within the requirements of EIA regulations.	See various Chapters of this EIA Report.
IoACC	Area of site The information provided within the ES should be that which is necessary to demonstrate the risks, likelihood of occurrence, likelihood of any significant impact and an outline of the main alternatives studied by the applicant e.g. off-site casting and importation to site.	See **Section 3.5.**
IoACC	Water use The sustainable use of water and its effect upon the environment must be fully considered within the requirements of EIA regulations.	Noted
IoACC	Supply of aggregate/raw materials The ES will need to incorporate a material management plan specifying how the project is to be achieved through the sustainable use of natural resources in line with European, National and Local Planning Policy.	See Material Specification submitted in support of the Planning Application.
IoACC	Waste management The ES must explain how waste generated on site is to be managed in accordance with the EU Waste Framework Directive and in line with European, National and Local Planning Policy and Targets.	See **Section 4.3.10.**
IoACC	Amenity effects The effects upon the amenity of local residents will also need to be fully considered within the requirements of EIA regulations.	See **Chapter 8** Traffic and Transport and **Chapter 9** Air Quality
Cumulative Impact Assessment		
NRW	The ES must include an assessment of cumulative and in-combination effects. There are many projects either approved or being developed at present and therefore, caution will be needed with any in-combination assessment and baseline chosen.	See **Chapter 17** Cumulative Impact Assessment
IoACC	Whilst not stating that all should be included in the CIA, they should nevertheless be considered and an explanation provided why they have been scoped in/out: • Conygar - Holyhead Waterfront Development; • Stena Line - Maintenance Dredging at Holyhead Port; • Stena Line - Holyhead Port Expansion; • Conygar - Parc Cybi Stage 2; • Land and Lakes - Penrhos Leisure Village; • Orthios Group - Anglesey Eco Park;	

Scoping Opinion	Response	Where response is addressed
	• Minesto - West Anglesey Demonstration Zone; • IACC - Business units at Penrhos; • Anwyl Homes - Residential development at South Stack Road (Phase 1); • Anwyl Homes - Residential development at South Stack Road (Phase 2); • Huws Gray - Builders Merchant Yard; and, • Horizon Nuclear Power - Wylfa Newydd New Nuclear Power Station.	
Water Framework Directive		
NRW / IoACC	We agree with Section 11.2 'The WFD Process', that a WFD assessment will be required. The WFD assessment should draw upon the assessments and information provided in the wider EIA, where there are common topic areas.	See **Chapter 19**.
IoACC	We agree that there are no Bathing Waters or Shellfish Waters within 2km of the works (sections 4.2.5 and 4.2.6).	
Habitats Regulations Assessment		
NRW / IoACC	The 2km buffer area for designated sites is currently unclear – we would expect to see a 2km buffer radius from the scheme. We agree that North Anglesey Marine SAC should be considered in the HRA. Please note that should mitigation via a CEMP be considered the appropriate route to control possible pollution, this cannot be considered for HRA purposes until the Appropriate Assessment stage due to the People over Wind ruling and therefore potential spills should be scoped in to the HRA.	See **Chapter 20** Shadow HRA

6.1.3 Pre-application stakeholder meeting

A stakeholder pre-application meeting was held on the 24th April 2019 with attendees including:

- The IoACC Conservation Team;
- Welsh Government;
- Stena Line;
- NRW North Planning Team; and,
- Gwynedd Archaeological Planning Service (GAPS).

The objectives of the workshop were to:

- Present the proposed scheme;
- Confirm the consenting route;
- Identify key potential constraints and opportunities as a result of the proposed scheme; and,
- Identify likely studies and investigations required to support consent applications.

Consultation responses were received from GAPS and NRW which are presented in **Appendix 6-3** and **6-4**, respectively.

6.1.4 Public event

A public consultation event for the proposed scheme was held on the 29th of March 2019 in Holyhead Town Hall. The event introduced the scheme to the local residents and business owners and sought their opinions on the plans. A log of the consultation responses received is presented in **Appendix 6-5**.

The majority of residents were interested in the heritage value of the Breakwater and used the Breakwater for recreation such as fishing or walking. These residents were most concerned about maintaining public access to the structure for recreational use. Residents with an interest in yachting were concerned about the ongoing protection for the marina and harbour provided by the Breakwater. A summary of the responses is provided in **Plate 6-1** and **Plate 6-2**.

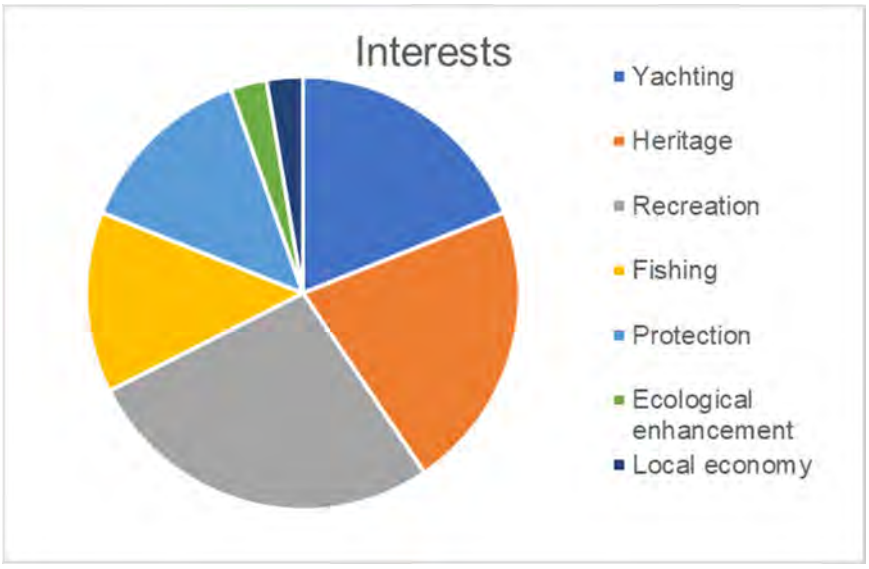


Plate 6-1 Summary of interests in the Breakwater

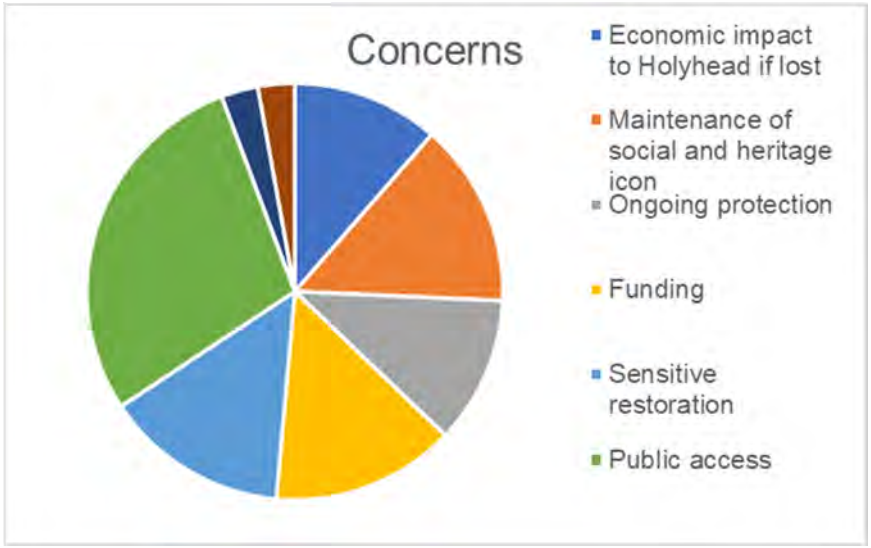


Plate 6-2 Summary of concerns relating to the refurbishment

6.1.5 Pre-application consultation advice

Further consultation with technical experts has been undertaken to inform and confirm the approach to sampling plans, modelling specifications and study specifications as outlined below.

6.1.5.1 Visual impact and heritage assessments

On the 20th September 2019 consultation with GAPS, Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW), the IoACC and NRW was undertaken to agree the scope of the visual and heritage setting assessments for the proposed scheme (see **Appendix 6-6**). It was agreed that the following viewpoints should be considered:

- View 1 – looking south west along the seaward side of the Breakwater from the lighthouse. This would consider views from the Grade II listed lighthouse;
- View 2 – the nearest view from the coastal path and within the Anglesey AONB looking north east along the seaward side of the Breakwater;
- View 3 – an elevated view of the breakwater looking north east from Holyhead Mountain and the AONB; and,
- View 4 – From a midpoint along the Breakwater towards the lighthouse.

Further consultation for the proposed scheme was undertaken on the 25th March 2020 with the IoACC, Cadw, GAPS and RCAHMW to present the draft findings of the heritage impact assessment and in particular the photomontages of how the proposed scheme would look from the above viewpoints (see **Chapter 14** Visual Setting and **Chapter 15** Cultural Heritage).

A note was issued prior to the meeting and a series of the photomontages were presented during the meeting. A summary of responses received from the consultees is presented below (see **Appendix 6-6**):

- A general acceptance of the proposed scheme and its requirements;
- Questions were raised regarding the colour and texture of the Tetrapods to see if they could blend in better to the existing environment;
- The potential for further visual montages for a second round of public consultation showing possible aging and algal growth and higher tide levels;

- On the basis of the information presented during consultation Cadw agreed that the impacts on the designated historical assets will be limited to the Breakwater and lighthouse; and,
- RCAHMW offered access to records of wrecks and other sites in the wider study area to inform the placement of any anchor blocks on the seabed.

6.1.5.2 Marine and coastal ecology survey specification

Consultation was undertaken with the Marine Area Advice and Management department of NRW to confirm the scope of the required marine ecology surveys, required to characterise the intertidal and subtidal marine ecology (see **Appendix 6-7**). It was agreed with NRW that the following would be implemented:

- Eight transects will be conducted on both the seaward and leeward sides of the Breakwater;
- Seaward transects will be at least 200m in length and Leeward transacts at least 60m;
- Surveys will be undertaken with a Remotely Operated Vehicle (ROV) using a high resolution camera to record 4k quality video to allow detailed analysis; and,
- The invasive species *Didemnum vexillum* will be targeted when undertaking and reviewing the video footage of the transects. Should potential *D. vexillum* be identified, the location will be noted, and samples collected where possible for identification purposes.

6.1.5.3 Approach to modelling

A proposal for the modelling specification and the approach to assessing changes in coastal processes was submitted to NRW for review in December 2020 to ensure that the specification was adequate for addressing any potential effects on hydrodynamics, sedimentation, water flushing and wave conditions arising from the proposed scheme. NRW's response was received on the 21st December 2020 which confirmed the approach taken was suitable (see **Appendix 6-8**).

6.2 Further Consultation

Consultation will continue to be undertaken with the public and stakeholders as part of the statutory PAC process.

7 Coastal Processes

7.1 Introduction

This chapter describes the existing environment in relation to coastal processes and details the assessment of the potential impacts during the construction and operational phases of the proposed scheme. Changes to waves and tidal current velocities may drive changes in sediment transport, and patterns of erosion and deposition in the coastal zone. These changes may arise during both construction and operation of the proposed scheme. The effects of the scheme on both bedload processes (sediment particles transported in contact with the bed) and suspended sediment processes (sediment particles transported in suspension) are considered. Mitigation measures are described, and a discussion of the residual impacts provided where significant impacts were identified.

7.2 Legislation, Planning Policy and Guidance

7.2.1 Legislation

The WFD considers the potential impact of a project on the surrounding waters' biological, hydrological, geomorphological and physico-chemical characteristics. The lee side of the Breakwater is within the Holyhead Bay Coastal Water Body and the seaward side of the Breakwater is within the Caernarfon Bay North Coastal Water Body (**Chapter 19** Water Framework Directive Compliance Assessment). Within the WFD classification, Holyhead Bay is a heavily modified water body and changes to the hydrology and geomorphology by the proposed scheme may affect its ability to reach good ecological potential, which is the desired objective of the WFD. The intertidal and subtidal areas close to the proposed scheme are sensitive ecological receptors and their health is dependent on coastal processes within Holyhead Bay. The Caernarfon Bay North Coastal Water Body is at good overall status. The biological quality elements are at good status which is based on the status of invertebrates.

7.2.2 Planning policy and guidance

The assessment of potential effects on coastal processes has been made with specific reference to the relevant National Policy Statements (NPS). The NPS relevant to Holyhead Breakwater is for Ports (Department for Transport, 2012), whose relevant aspects are presented in **Table 7-1**. This chapter of the EIA Report either directly addresses these issues or provides information which enables these issues to be addressed in other, more relevant chapters, including **Chapter 11** Marine Ecology and **Chapter 15** Cultural Heritage.

Table 7-1 NPS assessment requirements

NPS Requirement	NPS Reference	ES Reference
Where relevant, applicants should undertake coastal geomorphological and sediment transfer modelling to predict and understand impacts and help identify relevant mitigating or compensatory measures.	Section 5.3, paragraph 5.3.4	The approach adopted in this EIA Report is conceptual based on expert judgement. This was agreed in general terms through coastal processes modelling consultation with NRW (see **Chapter 6** Consultation).
The ES should include an assessment of the effects on the coast. In particular applicants should assess: the impact of the proposed project on coastal processes and geomorphology, including by taking account of potential impacts from climate change. If the development will have an	Section 5.3, paragraph 5.3.5	The assessment of potential construction and operation impacts are described in **Sections 7.7** and **7.8**, respectively. The project will not affect the SMP2.

NPS Requirement	NPS Reference	ES Reference
impact on coastal processes, the applicant must demonstrate how the impacts will be managed to minimise adverse impacts on other parts of the coast. the implications of the proposed project on strategies for managing the coast, as set out in Shoreline Management Plans, any relevant marine plans, River Basin Management Plans and capital programmes for maintaining flood and coastal defences. the effects of the proposed project on marine ecology, biodiversity and protected sites. the effects of the proposed project on maintaining coastal recreation sites and features. the vulnerability of the proposed scheme to coastal change, taking account of climate change, during the project's operational life and any decommissioning period.		Potential effects on marine ecology are assessed in **Chapter 11** Marine Ecology. Tourism and Recreation is scoped out of this EIA. The project has been designed so that it is not vulnerable to coastal change or climate change.
The applicant should be particularly careful to identify any effects on the integrity and special features of Marine Conservation Zones, Special Areas of Conservation (SACs) and candidate SACs, Special Protection Areas (SPAs) and potential SPAs, Ramsar sites, actual and potential Sites of Community Importance and Sites of Special Scientific Interest.	Section 5.3 paragraph 5.3.7	The designated sites potentially effected by changes in coastal processes are the North Anglesey Marine/Gogledd Môn Forol SAC and Anglesey Terns/Morwenoliaid Ynys Môn SPA. The potential effects are assessed with respect to changes in sea bed level caused by concrete armour installation (see **Section 7.8.2**) and changes to sediment distribution and transport due to the presence of the refurbished breakwater (see **Section 7.8.3**).

The Marine Policy Statement (MPS, HM Government 2011) provides the high-level approach to marine planning and general principles for decision making that contribute to achieving this vision. It also sets out the framework for environmental, social and economic considerations that need to be considered in marine planning. The key reference for estuarine processes is in Section 2.6.8.6 of the MPS which states:

"…Marine plan authorities should not consider development which may affect areas at high risk and probability of coastal change unless the impacts upon it can be managed. Marine plan authorities should seek to minimise and mitigate any geomorphological changes that an activity or development will have on coastal processes, including sediment movement."

7.3 Consultation

Consultation undertaken throughout the pre-application phase informed the approach and the information provided in this chapter (see **Chapter 6** Consultation).

7.4 Assessment Methodology

The assessment of effects on coastal processes is predicated on a Source-Pathway-Receptor (S-P-R) conceptual model, whereby the source is the initiator event, the pathway is the link between the source and the receptor impacted by the effect, and the receptor is the receiving entity. An example of the S-P-R conceptual model is provided by rock armour placement which disturbs sediment on the sea bed (source). This sediment is then transported by tidal currents until it settles back to the sea bed (pathway). The deposited sediment could change the composition and elevation of the sea bed (receptor). Numerical modelling of coastal processes effects of the proposed scheme would be disproportionate to the potential impact and an expert-based assessment is preferred.

Consideration of the potential effects of the proposed scheme on coastal processes has been carried out over the following spatial scales:

- near-field: the area within the immediate vicinity (tens or hundreds of metres) of the proposed scheme; and,
- far-field: the wider area that might also be affected indirectly by the proposed scheme (e.g. due to disruption of waves, tidal currents or sediment pathways).

The assessment of coastal processes follows two approaches. The first type of assessment covers impacts where several discrete direct receptors are identified. These include receptors which possess their own intrinsic morphological value, such as beaches and intertidal flats. The impact assessment incorporates a combination of the sensitivity of the receptor, its value (if applicable) and the magnitude of the change to determine a significance of impact by means of an impact significance matrix. **Chapter 5** Approach to EIA provides an overview of this approach to the assessment of impacts.

The second type of assessment covers changes to coastal processes which in themselves are not necessarily impacts to which significance can be ascribed. Rather, these changes (such as a change in the wave climate, the tidal regime or a change in suspended sediment concentrations) represent effects which may manifest themselves as impacts upon other receptors, most notably marine ecology (e.g. in terms of increased suspended sediment concentrations and/or erosion or smothering of habitats on the sea bed). In this case, the magnitude of effect is determined in a similar manner to the first assessment method but the sensitivity of the other receptors and the significance of impacts on them is assessed within the relevant chapters of this EIA Report pertaining to those receptors.

7.4.1 Justification for using Existing Numerical and Physical Modelling

Previous numerical and physical modelling work has been undertaken to define the baseline tidal current/wave conditions and the effects of the refurbishment on wave energy, respectively. The results of this modelling has been used as part of the expert-based assessment and judgement of potential construction and operational effects, without the necessity for new modelling. This is because the proposed scheme would have very limited impact on the redistribution of waves and currents, and hence, sediments. The order of magnitude of change would be too small to identify in numerical model outputs and so the use of numerical modelling in the assessment would be disproportionate to the magnitude of the potential impact.

7.4.1.1 Physical modelling for waves and design purposes

A set of 2D and 3D small-scale physical models have been completed for the proposed scheme to assess the concrete armour stability and the effect of the refurbishment on wave overtopping and wave loads on the vertical wall. These include:

- 2D tests to decide on the type of concrete armour units (XBloc and Tetrapod) (DHI, 2019a);
- 2D tests to establish a stable toe detail (DHI, 2019b); and,
- 3D tests to check the roundhead stability (HR Wallingford, 2020).

Previous baseline tidal current model shows that currents are weak and have a negligible influence on the design of the coastal defences.

7.4.1.2 Wave and tidal current modelling for the baseline conditions

A baseline scenario for tidal currents using water levels and tidal current velocities was ran using a MIKE21-FMHD model over one month to cover two spring-neap cycles (Royal HaskoningDHV, 2020a). Model runs have also been run to represent the baseline wave conditions at the Breakwater using MIKE21-SW. A suite of scenarios was completed for four return period events: 1 in 1 year for typical conditions, and 1 in 100 year, 1 in 200 year and 1 in 1,000 year for extreme storm events. The wave model was not run for the proposed scheme in place.

7.4.2 Transboundary Impact Assessment

Transboundary impacts are assessed through consideration of the extent of influence of changes or effects and their potential to impact upon coastal processes receptor groups that are located within other EU states. Given the distance of the proposed scheme is from international boundaries in the Irish Sea, it was concluded that transboundary impacts on coastal processes would not occur.

7.4.3 Impact Receptors

The proposed scheme is located within and adjacent to internationally and nationally designated sites. Two of these sites have the potential to be affected by changes to coastal processes: the North Anglesey Marine/Gogledd Môn Forol SAC and the Anglesey Terns/Morwenoliaid Ynys Môn SPA.

The North Anglesey Marine/Gogledd Môn Forol SAC is recognised as an area with predicted persistent high densities of harbour porpoise. The site covers an area of 3,249km^2, including all of Holyhead Bay south to the Afon Alaw. The site contains a mixture of hard substrate and sediments, including rock, coarse sediment, sand and mud. The Anglesey Terns/Morwenoliaid Ynys Môn SPA is designated due to its population importance for four species of tern.

The proposed scheme is also approximately 150m to the east of three other designations: Holy Island Coast/Glannau Ynys Gybi SAC, SPA and SSSI. Small changes to coastal processes are very unlikely to have any impact on the designated features of these sites, because they primarily relate to hard rock cliffs, associated coastal cliff vegetation and fauna, maritime grasslands and heathland.

7.5 Baseline Environment

7.5.1 Coastal geomorphology and geology

The general planform shape of Holyhead Bay is a funnel-shaped embayment, widening from a narrow ‘strait’ north of Stanley Embankment to a larger embayment north of Penrhos headland. The geology of the coast is dominated by metamorphosed mudstones and sandstones (mica schist and psammite) overlain by Pleistocene glacial diamicton (gravelly clay). The shoreline either side of the Breakwater is largely hard cliffs and shore platforms of schist/psammite. The cliffs and hinterland are capped by a layer of diamicton, which locally approaches beach level. The rock outcrops have fixed the shoreline as headlands with small sandy bays forming in between where the eroding diamicton approaches beach level.

7.5.2 Bathymetry

The Admiralty Chart shows that the entrance to Holyhead Bay (between the end of Holyhead Breakwater and the headland at Twyn Cliperau) has water depths up to approximately -15m CD. Water depths reduce to the southeast into the Harbour until the area becomes largely intertidal (Traeth y Gribin Bay) with a narrow

low water channel towards Stanley Embankment. The naturally sheltered location of Holyhead Bay, combined with the Breakwater and other structures, results in an environment which has induced deposition of extensive areas of intertidal sand within the inner parts of the Harbour.

The sea bed adjacent to the lee side of the Breakwater lowers rapidly (over about 20m or less) to -5m CD before slowly deepening further to the southeast to a maximum of about -9m CD forming the shallow enclosed area between the Breakwater and Salt Island. On the seaward side of the Breakwater the sea bed drops rapidly (over about 40m or less) to -10m CD before sloping to around -20m CD about 1km into the Irish Sea.

7.5.3 Astronomical water levels

The tides at Holyhead are regular and semi-diurnal, with predicted spring and neap tide ranges of 4.9m and 2.4m, respectively (2020 Admiralty Tide Tables) (see **Table 7-2**).

Table 7-2 Tidal datums at Holyhead (2020 Admiralty Tide Tables)

Tidal Datum	Elevation at Holyhead (m CD)*
Highest Astronomical Tide (HAT)	6.3
Mean High Water Spring (MHWS)	5.6
Mean High Water Neap (MHWN)	4.4
Mean Sea Level (MSL)	3.3
Mean Low Water Neap (MLWN)	2.0
Mean Low Water Spring (MLWS)	0.7
Lowest Astronomical Tide (LAT)	0.0

*Chart Datum (CD) is 3.05m below Ordnance Datum (OD Newlyn) at Holyhead

7.5.4 Tidal currents

The nearest Admiralty tidal stream (Admiralty Chart No. 2011 “Holyhead Harbour”) is located immediately outside the Bay entrance. Here, flows are generally to the east on the flood tide and to the west on the ebb tide, with speeds between 0.1m/s and 0.7m/s during spring tides and 0.1m/s to 0.4m/s during neap tides.

Tidal currents to the southeast of the Breakwater are slower because of the barrier to flows created by the structure. Tidal currents at two hours before high tide (flood) and two hours after high tide (ebb) for a spring tide have been simulated. During a flood tide, a relatively high velocity clockwise gyre is predicted to form in the Bay north of Salt Island, whereby currents flow south through the centre of the Bay before returning north along its western side exiting around the tip of the Breakwater (see **Figure 7-1**). A relatively low velocity anticlockwise gyre is predicted to form to the west of the clockwise gyre on the lee side of the Breakwater. On a flood tide, maximum predicted speeds on the lee side of the Breakwater are mainly less than 0.3m/s accelerating up to greater than 0.6m/s as the clockwise gyre passes around the end of the Breakwater.

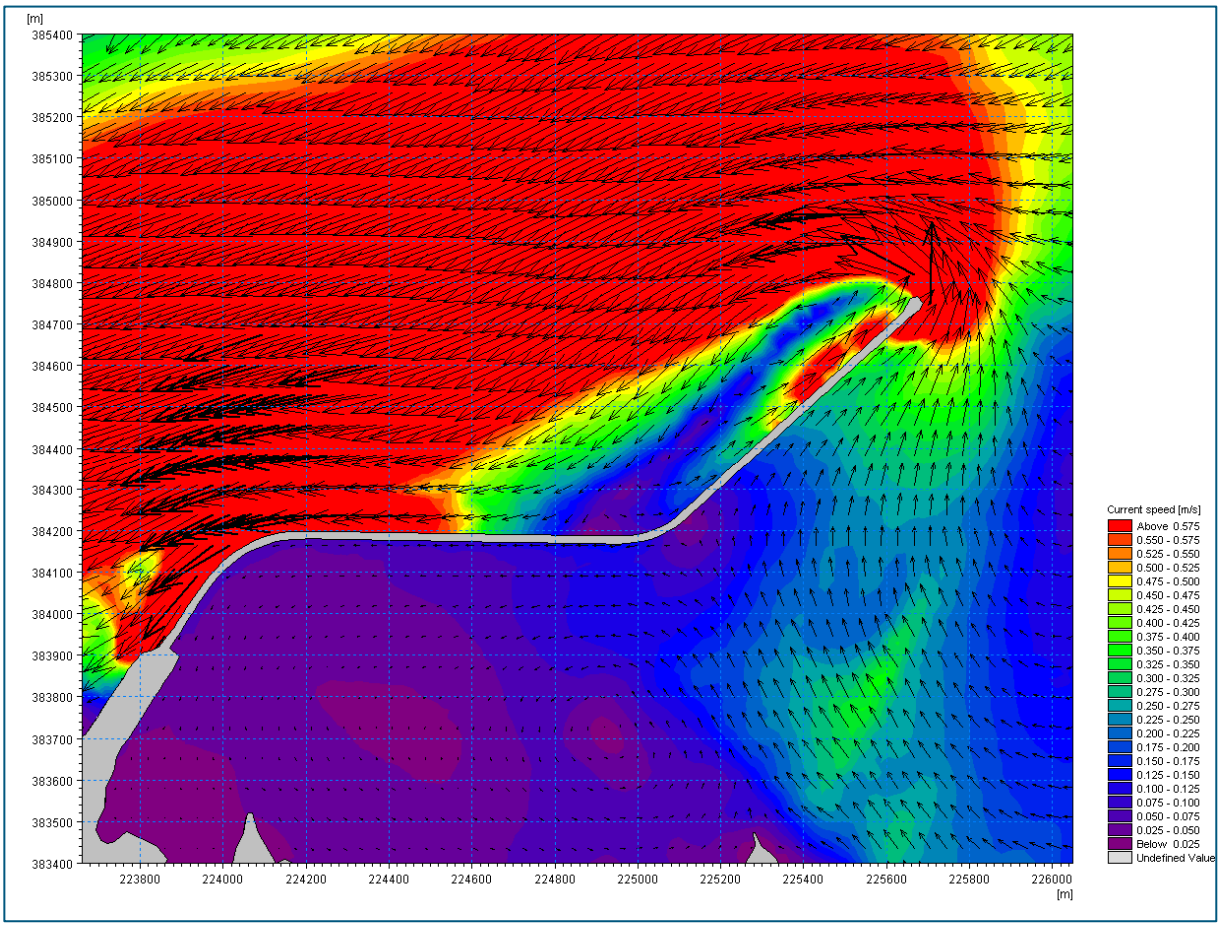


Figure 7-1 Predicted tidal current velocities and directions two hours before high tide for a spring tide.

Predicted ebb tidal currents flow to the northeast in the lee of the Breakwater and at speeds less than 0.2m/s. Adjacent to the seaward side of the Breakwater, tidal flow speeds are predicted to be greater than 0.6m/s with opposing directions; flow to the northeast along the outer half as part of an anticlockwise gyre and flow to the southwest along the inner quarter with slower speeds in-between (see **Figure 7-2**).

7.5.5 Wave climate

The wave exposure across Holyhead Bay varies due to the differing orientation of the coast, the presence of significant structures including the Breakwater, and various wave approach directions. Offshore waves approach the Bay entrance from the southwest to northeast sector, with the largest waves approaching from north and northwest directions. The 1 in 1-year offshore wave height is 4.2m and 1 in 100-year offshore wave height is 7.2m (Royal Haskoning, 2011). Due to the orientation of Holyhead Bay, it is sheltered from offshore waves from other directions. The open coast of Holy Island to the west of the Breakwater is exposed to significant wave action from swell waves travelling across the Irish Sea from the northwest and southwest.

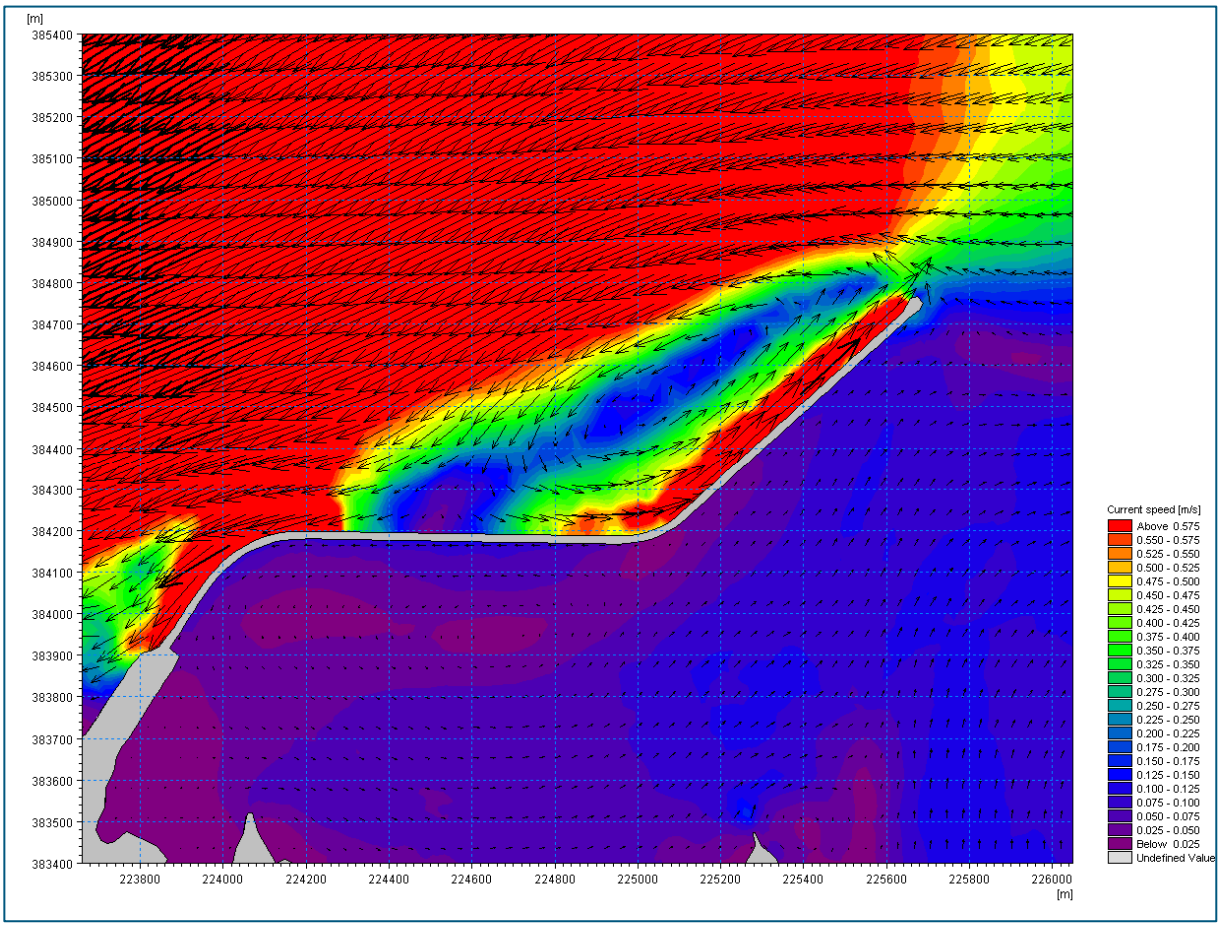


Figure 7-2 Predicted tidal current velocities and directions two hours after high tide for a spring tide.

Wave measurements have been recorded at the entrance to Holyhead Port and at Terminal 5 on Salt Island (both south of the Breakwater) between November 2005 and May 2006. Over the recording period, wave heights up to 2.5m were recorded at the Port entrance and up to 1.25m at Terminal 5. Most of the waves arrived at the Port entrance from the west to north sector. Wave directions at Terminal 5 varied significantly due to the local disturbances (for example passing by ships and reflections from structures) as well as due to local wind generated waves within the Port (Royal Haskoning, 2011). Significant wave heights have been simulated in the vicinity of the Breakwater for a one-year return period condition for waves approaching from the north. Predicted significant wave heights are up to 3m at the entrance to Holyhead Bay and along the seaward side of the Breakwater (see **Figure 7-3**). Upon entering the Bay, significant wave heights are predicted to reduce and the shelter afforded by the Breakwater means predicted wave heights on its lee side are less than 0.8m.

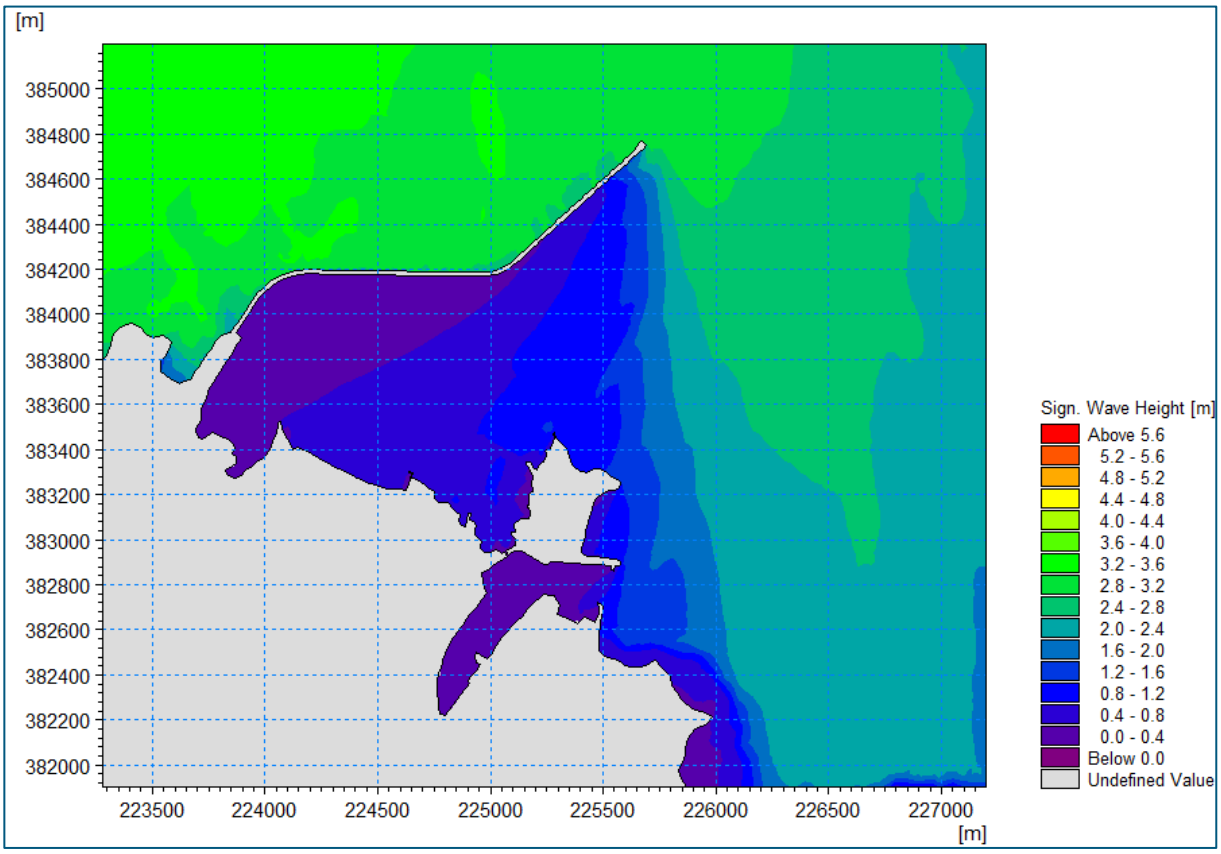


Figure 7-3 Predicted significant wave heights for a one-year return period event (highest offshore waves with lowest water levels) approaching from the north.

7.5.6 Bed shear stress

Royal HaskoningDHV (2019) predicted baseline bed shear stresses in the vicinity of the Breakwater. Predicted baseline bed shear stresses at two hours before high tide (flood) and two hours after high tide (ebb) for a spring tide are shown in **Figure 7-4** and **Figure 7-5**, respectively. Predicted bed shear stresses on the flood tide are low, predominantly less than 0.2N/m^2, increasing rapidly to greater than 2.0N/m^2 at the tip of the Breakwater. On the ebb tide, predicted bed shear stresses are less than 0.1N/m^2 on the lee side of the Breakwater with higher predicted values adjacent to the seaward side (0.5N/m^2 increasing to greater than 2.0N/m^2 towards the tip).

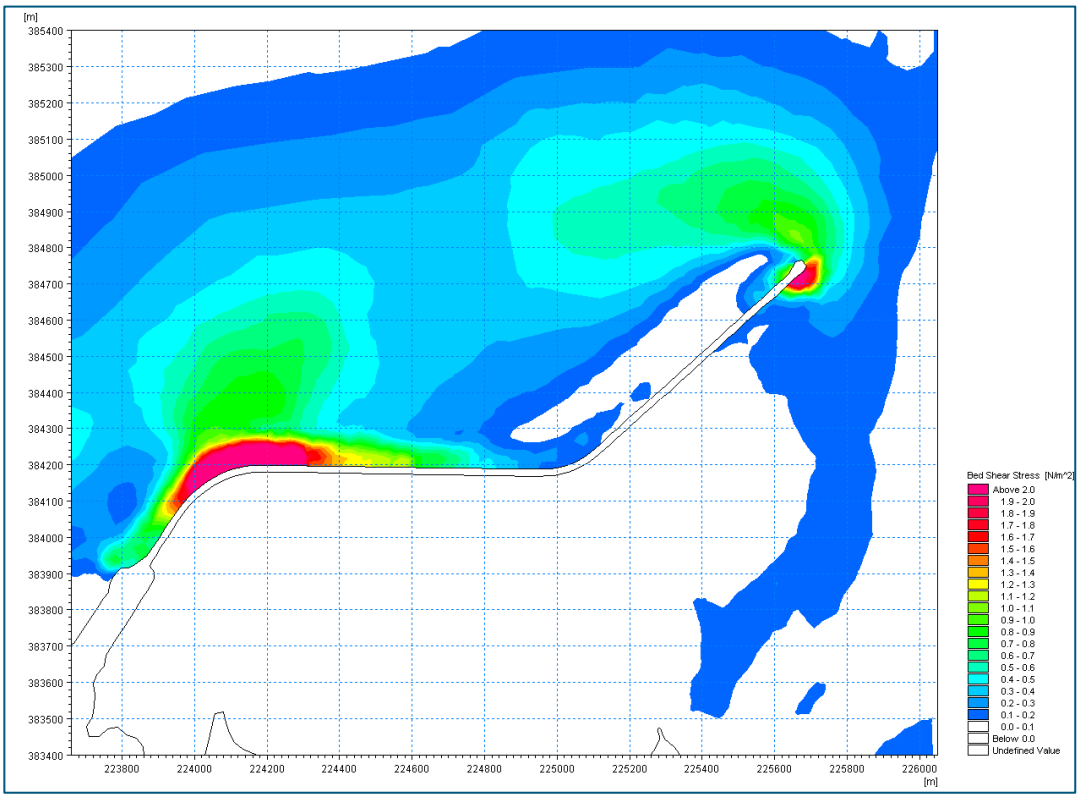


Figure 7-4 Predicted bed shear stresses two hours before high tide for a spring tide (Royal HaskoningDHV, 2019)

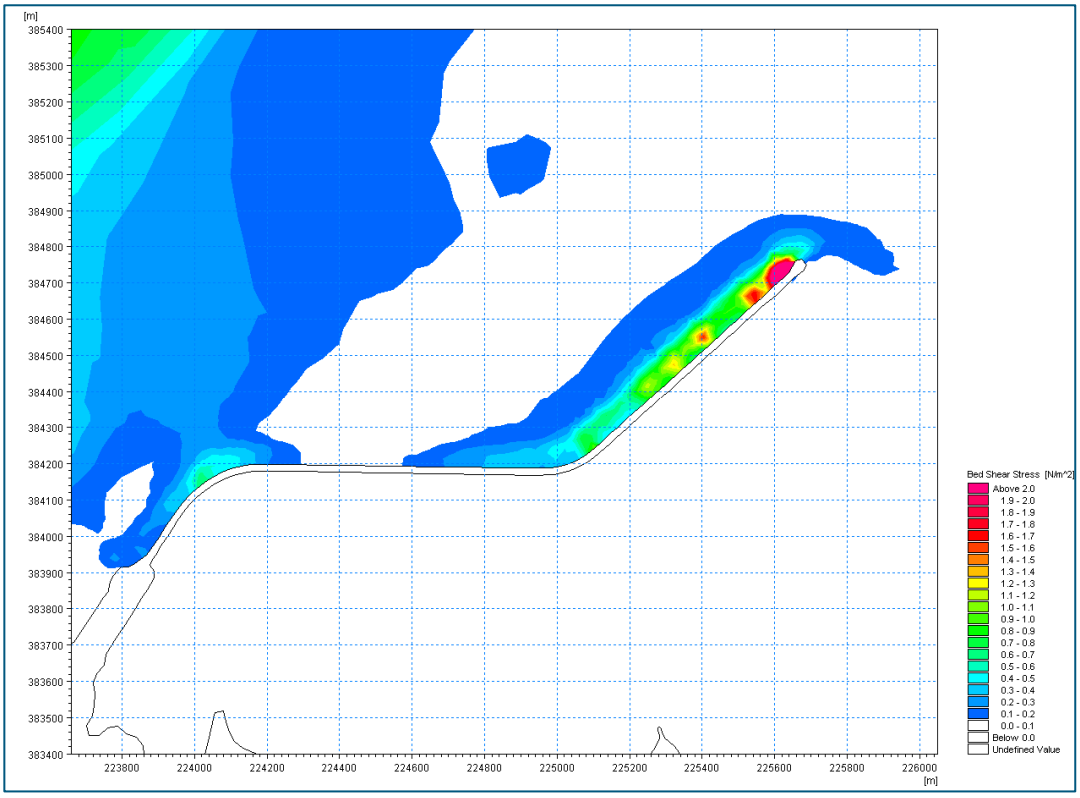


Figure 7-5 Predicted bed shear stresses two hours after high tide for a spring tide (Royal HaskoningDHV, 2019)

7.5.7 Sediment transport

Only limited sea bed sediment data are available within Holyhead Bay. British Geological Survey (1990) data are restricted to the sea bed north of the Breakwater and Bay entrance where sandy gravel, rock (schist) outcrop or rock sub-crop overlain by a thin layer mobile or lag sediment was mapped. According to Mouchel and Partners (1994), the bed sediments within the shelter of the Breakwater are sandy silt. The critical bed shear stress for initiation of movement of 0.05mm particles (silt) from the bed is 0.111N/m^2 (Soulsby and Whitehouse, 1997).

Wave attack on a bay-headland coast results in concentration of wave energy at the headlands (due to refraction) and reduction of wave energy in the bays. This results in low wave energy environments providing sheltered water in the bays and higher energy environments at the headlands, leading to headland erosion and bay deposition. It is likely that there is little interaction between the beaches in each bay due to a combination of the relatively sheltered aspect of the Holyhead Bay coast and its indented form. The headlands act as barriers to sediment transfer between the bays, and so they are effectively self-contained.

7.6 Worst-case Scenario

The existing breakwater is formed by a rubble mound which is largely submerged topped by a vertical wall. Over the decades, the existing rubble mound has lowered, due primarily to attrition under wave action. In its current condition, the rubble mound is “tripping-up” approaching waves, which break/slam into the front face of the vertical wall. The structure is at risk of breaching due to undermining of the vertical walls and/or impulsive wave loading on the vertical wall. The primary aim of the refurbishment is to mitigate these threats and extend the working life of the Breakwater.

In the design, the seaward-facing side and roundhead of the Breakwater would be protected by concrete armour units. The lee side would be protected with concrete mattresses/thin rock revetment. The footprint of the rubble mound refurbishment would be almost entirely inside the footprint of the existing breakwater. The breakwater superstructure will remain the same length as the existing breakwater. However, there would be a small extension of the rubble mound at the roundhead (approximately 70m beyond the existing rubble mound) to re-instate the rubble mound profile as close as possible to the as-built footprint from the 1800’s. So, the main changes to the geometry of the Breakwater that are assessed are:

- replacement of substantial volumes of rock that have been lost due to erosion with a 5.2m thick layer of concrete armour units (Tetrapods and Z-shaped blocks) on the seaward side;
- rock placement on the existing rubble mound on the Breakwater roundhead, to support the installation of concrete armour units on top; and,
- replacement of a less substantial volume of rock on the lee side with a 220mm thick articulated concrete block mattress (ACBM), and a rock revetment where the existing rubble mound is too steep to accommodate the ACBM.

The proposed scheme could be undertaken over the course of a single construction phase of around two years, or over three phases, each lasting approximately nine months with two-year intervals. A full description of the proposed scheme is provided in **Chapter 3** Description of the Proposed Scheme.

During construction, marine-based plant would be used for the placement of the Tetrapods, Z-shaped blocks, rock and ACBM. A jack-up or floating barge with spud legs, or an alternative form of anchoring system, would provide a platform for a crane and a long-reach excavator. Whilst a suitable method of anchoring the barge has yet to be confirmed, one option is that a series of concrete anchor blocks placed

seaward of the rubble mound may be used to hold the barge in place. Rock to extend the rubble mound would be placed directly on to the sea bed.

7.7 Prediction of Potential Effects During Construction

7.7.1 Potential increase in suspended sediment due to armour placement

Release of fine sediment during construction has the potential to enhance suspended sediment concentrations in the water column, making it more turbid, until the plume becomes dispersed by tidal currents and waves. Given the small footprint of the refurbishment works (a maximum of 15m wide on the leeward side of the Breakwater and up to 50m on the seaward side), the short period of activity during construction at any location along the Breakwater, and that all works will be almost totally restricted to the footprint of the existing rubble mound, the disturbance would cause only minor and temporary enhancements in suspended sediment concentration.

Assessment of effect magnitude and/or impact significance

The changes in suspended sediment concentrations due to armour placement are highly likely to have the magnitudes of effect shown in **Table 7-3**.

Table 7-3 Magnitude of effect on suspended sediment concentrations under the worst-case scenario for armour placement

Location	Scale	Duration	Frequency	Reversibility	Magnitude of Effect
Near-field*	Negligible	Negligible	Negligible	Negligible	Negligible
Far-field	Negligible	Negligible	Negligible	Negligible	Negligible

*The near-field effects are confined to a small area, likely to be up to a few hundred metres from the point of placement

7.7.2 Potential deposition of suspended sediment due to armour placement

Any sediment that becomes entrained in the water column would have the potential to deposit on the sea bed. Given the low volumes of sediment predicted to be released during construction, the deposition on the sea bed will be extremely small in thickness, as sediments would be transported away (and continually re-suspended) by waves and tidal currents.

Assessment of effect magnitude and/or impact significance

The changes in sea bed levels due to armour placement are highly likely to have the magnitudes of effect shown in **Table 7-4**.

Table 7-4 Magnitude of effect on sea bed levels under the worst-case scenario for armour placement

Location	Scale	Duration	Frequency	Reversibility	Magnitude of Effect
Near-field*	Negligible	Negligible	Negligible	Negligible	Negligible
Far-field	Negligible	Negligible	Negligible	Negligible	Negligible

*The near-field effects are confined to a small area, likely to be up to a few hundred metres from the point of placement

7.8 Prediction of Potential Effects During Operation

7.8.1 Potential changes to tidal currents due to the presence of the refurbished Breakwater

The maximum increase in length of the Breakwater will be 70m, which is only about 3% of the total length of the superstructure (2,150m) and the width of the entrance of Holyhead Bay (2,300m from the tip of the Breakwater to Twyn Cliperau). The width of the Breakwater would remain within the existing footprint.

Given the very small change in dimensions of the Breakwater, the general direction of approach of tidal currents would not change. The water depth at the roundhead of the Breakwater would reduce over a short distance (about 70m) and so a very small increase in tidal current velocities would be expected at the tip of the Breakwater. Given the scale of the change relative to the width of the entrance to Holyhead Bay, the change in tidal current velocity would be minimal (see **Figure 7-6** and **Figure 7-7**). Hence, the potential impact of placing rock and concrete armour at the roundhead of the Breakwater will have a highly localised and small impact on tidal current flows. Regionally, tidal currents would not change from their baseline conditions.

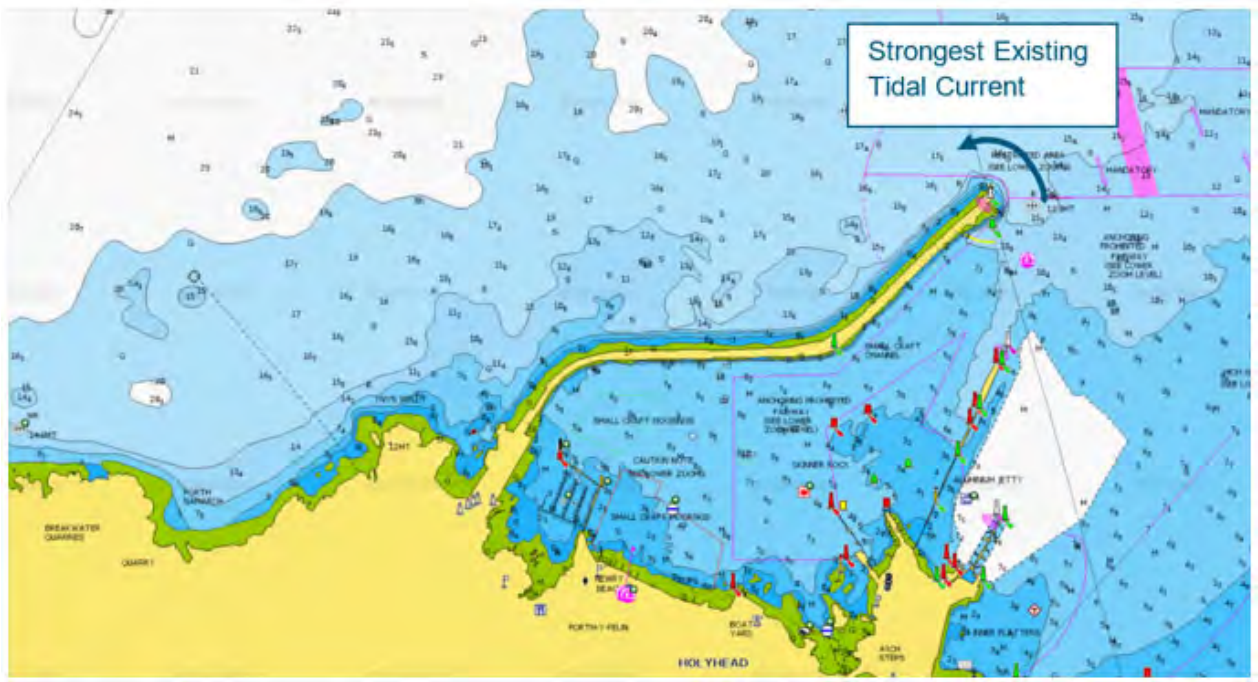


Figure 7-6 Pre-construction conceptual location of the strongest tidal current at the Breakwater (chart data from Navionics)

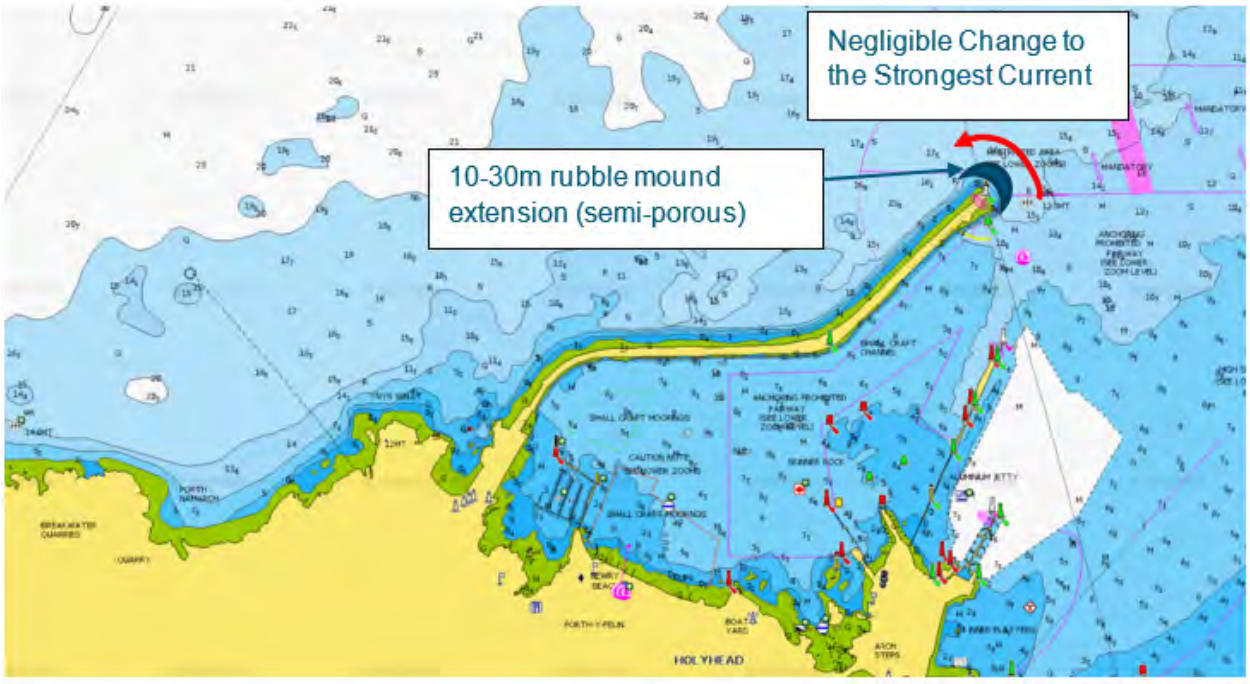


Figure 7-7 Post-construction conceptual location of the strongest tidal current at the Breakwater (chart data from Navionics)

Assessment of effect magnitude and/or impact significance

The worst-case changes to tidal currents due to the presence of the refurbished Breakwater are likely to have the magnitudes of effect shown in **Table 7-5**.

Table 7-5 Magnitude of effect on tidal currents under the worst-case scenario for the refurbished Breakwater

Location	Scale	Duration	Frequency	Reversibility	Magnitude of Effect
Near-field	Negligible	Negligible	Negligible	Negligible	Negligible
Far-field	Negligible	Negligible	Negligible	Negligible	Negligible

7.8.2 Potential changes to waves due to the presence of the refurbished Breakwater

The physical modelling of waves predicts that the concrete armour would reduce the wave energy approaching the vertical wall and would reduce the degree of overtopping. This reduction is caused by the breaking up of wave energy within the concrete armour layer, rather than any increase in reflected wave energy (which might be expected from a vertical seawall, for example). Waves reflecting from the superstructure would pass back over the armour layer, thereby losing further energy. In addition, the introduction of the Tetrapod concrete armour units was shown to reduce overtopping ten-fold in small-scale physical model tests.

The small-scale physical models demonstrated a small reduction in reflected wave energy local to the structure, resulting in marginally calmer conditions further to the north and west (see **Figure 7-8** and **Figure 7-9**). The area of coast to the west of the Breakwater would still be exposed to the full force of waves approaching from the Irish Sea, and therefore the effect of a small reduction in reflected wave energy from the Breakwater would be negligible in comparison.

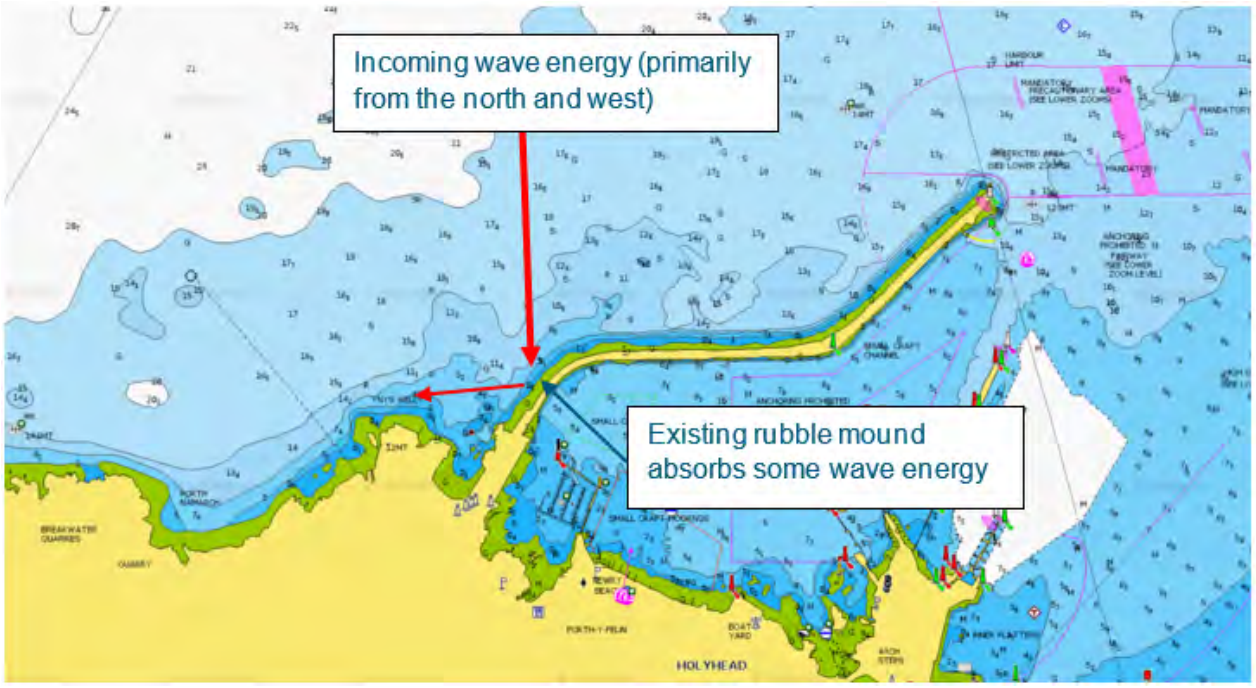


Figure 7-8 Pre-construction conceptual assessment of wave energy reflected to the west off the Breakwater, towards the rocky headland (chart data from Navionics)

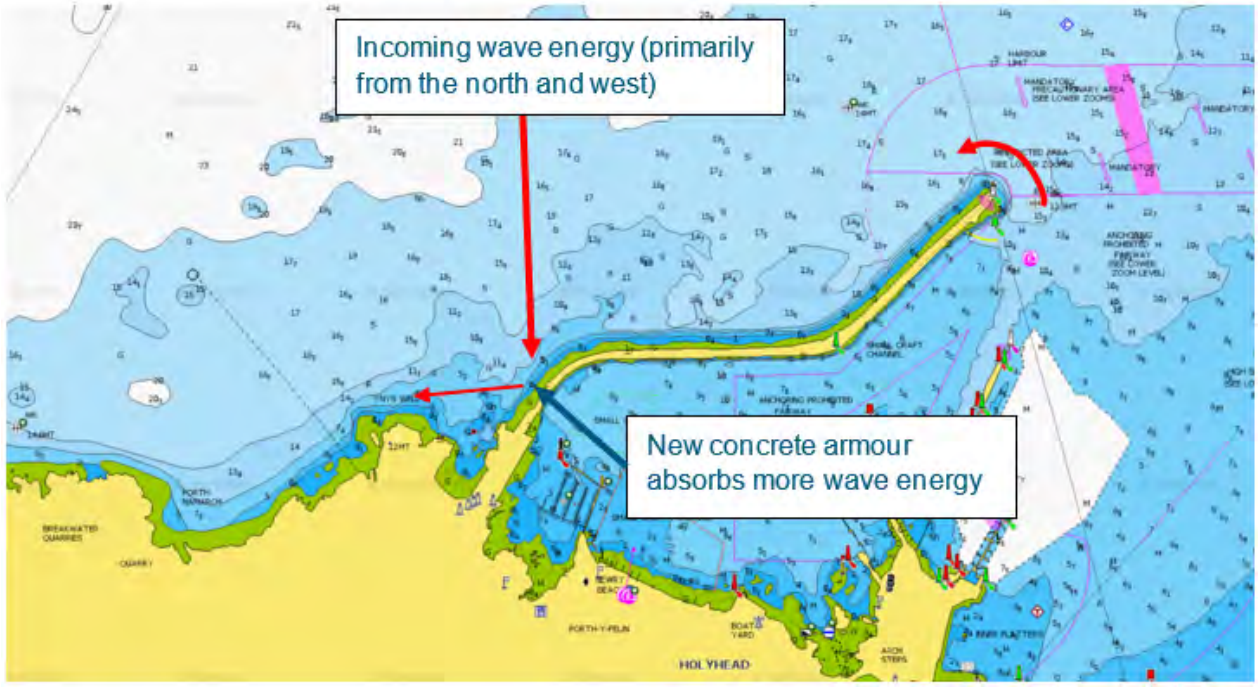


Figure 7-9 Post-construction conceptual assessment of less wave energy reflected to the west, towards the rocky headland. The magnitude of incoming wave energy exceeds the reflected wave energy component (chart data from Navionics)

Assessment of effect magnitude and/or impact significance

The worst-case changes to wave heights due to the presence of the refurbished Breakwater are likely to have the magnitudes of effect shown in **Table 7-6**.

Table 7-6 Magnitude of effect on wave heights under the worst-case scenario for the refurbished Breakwater

Location	Scale	Duration	Frequency	Reversibility	Magnitude of Effect
Near-field	Negligible	Negligible	Negligible	Negligible	Negligible
Far-field	Negligible	Negligible	Negligible	Negligible	Negligible

7.8.3 Potential changes to sediment distribution and transport due to the presence of the refurbished Breakwater

The local modifications to the tidal current and wave regimes due to the presence of the refurbished Breakwater may affect the sediment regime. Since it is expected that the changes in waves and tidal current flow would be small and local to the Breakwater, then the changes in sediment transport would be similar in scale. Also, given that the surrounding sea bed and coast is dominated by rock with a thin layer of relatively coarse sediment (0-2m), the marginal reduction in reflected wave energy would have no noticeable effect on the distribution of sediments.

Assessment of effect magnitude and/or impact significance

The worst-case changes to sediment distribution and transport due to the presence of the refurbished Breakwater are likely to have the magnitudes of effect shown in **Table 7-7**.

Table 7-7 Magnitude of effect on sediment distribution and transport under the worst-case scenario for the refurbished Breakwater

Location	Scale	Duration	Frequency	Reversibility	Magnitude of Effect
Near-field	Negligible	Negligible	Negligible	Negligible	Negligible
Far-field	Negligible	Negligible	Negligible	Negligible	Negligible

7.9 Summary

A summary of potential impacts arising from changes to coastal processes are listed in **Table 7-8**.

Table 7-8 Summary of potential impacts

Potential Impact	Receptor	Significance	Mitigation	Residual Impact
Construction				
Potential increase in suspended sediment due to armour placement	North Anglesey Marine/Gogledd Môn Forol SAC and Anglesey Terns/Morwenoliaid Ynys Môn SPA	Negligible	None Proposed	Negligible
Potential deposition of suspended sediment due to armour placement	North Anglesey Marine/Gogledd Môn Forol SAC and Anglesey Terns/Morwenoliaid Ynys Môn SPA	Negligible	None Proposed	Negligible
Operation				
Potential changes to tidal currents due to the presence of the refurbished Breakwater	North Anglesey Marine/Gogledd Môn Forol SAC and Anglesey Terns/Morwenoliaid Ynys Môn SPA	Negligible	None Proposed	Negligible

Potential Impact	Receptor	Significance	Mitigation	Residual Impact
Potential changes to waves due to the presence of the refurbished Breakwater	North Anglesey Marine/Gogledd Môn Forol SAC and Anglesey Terns/Morwenoliaid Ynys Môn SPA	Negligible	None Proposed	Negligible
Potential changes to sediment distribution and transport due to the presence of the refurbished Breakwater	North Anglesey Marine/Gogledd Môn Forol SAC and Anglesey Terns/Morwenoliaid Ynys Môn SPA	Negligible	None Proposed	Negligible

8 Traffic and Transport

8.1 Introduction

This chapter of the EIA Report examines the existing environment with regard to Traffic and Transport and assesses the potential impacts during the construction of the proposed scheme. There would be no potential impacts to traffic and transport during the operational phase.

Additional information to support the Traffic and Transport assessment is provided separately in the following appendix:

- Appendix 8-1: Traffic and Transport Environmental Statement Scoping Note;
- Appendix 8-2: Daily Background Reference Flows;
- Appendix 8-3: Peak Daily Construction Flows;
- Appendix 8-4: Junction 1 and 4 Model Outputs;
- Appendix 8-5: Junction 2 Model Outputs; and,
- Appendix 8-6: Junction 3 Model Outputs.

8.2 Policy

The following sections provide detail on key pieces of policy and guidance which informed the traffic and transport assessment.

8.2.1 National Policy

The assessment of potential traffic and transport impacts has been made with specific reference to the NPS for England and Wales. The NPS for Ports was prepared by the Department for Transport (DfT) and received designation by the Secretary of State on the 26th of January 2012. For development in Wales, the principal policy documents are the Planning Policy Wales (PPW) and the associated Technical Advice Note (TAN) suite of documents. The PPW was published in November 2016 and sets out the land use planning policies of the Welsh Government. Chapter 8 of the PPW sets out the transport related planning policies.

The TAN series of documents supplement the PPW by providing detailed planning advice. The TAN documents were first published in November 1996 and were last updated in October 2017. TAN 18: Transport (2007) gives a description of how to integrate land use, transport planning and details how transport impacts should be assessed and mitigated.

Table 8-1 sets out the salient national transport policies that have shaped the scope of the assessment for the proposed scheme.

Table 8-1 National (UK and Wales) Planning Policies

Policy	Section/Policy Reference
NPS for Ports (2012)	Paragraph 5.4.4: "*If a project is likely to have significant transport implications, the applicant's ES (see section 4.7) should include a transport assessment, using the WebTAG methodology stipulated in Department for Transport guidance, WelTAG for developments in Wales, or any successor to such methodology. Applicants should consult the Highways Agency and/or the relevant highway authority, as appropriate, on the assessment and mitigation. The assessment should distinguish between the construction, operation and decommissioning project stages as appropriate.*"

Policy	Section/Policy Reference
PPW (Edition 9, 2016)	8.7 Development Management and Transport: *"When determining a planning application for development that has transport implications, local planning authorities should take into account:* *• the impacts of the proposed development on travel demand;* *• the level and nature of public transport provision;* *• accessibility by a range of different transport modes;* *• the opportunities to promote active travel journeys, and secure new and improved active travel routes and related facilities, in accordance with the provisions of the Active Travel (Wales)Act 2013;* *• the willingness of a developer to promote travel by walking, cycling or public transport, or to provide infrastructure or measures to manage traffic, to overcome transport objections to the proposed development (payment for such measures will not, however, justify granting planning permission to a development for which it would not otherwise be granted);* *• the environmental impact of both transport infrastructure and the traffic generated (with a particular emphasis on minimising the causes of climate change associated with transport); and* *• the effects on the safety and convenience of other users of the transport network"*
TAN18 Transport (2007)	The TAN18 in conjunction with the PPW is taken account by local planning authorities in the preparation of development plans. They may be material to decisions on individual planning applications and will be a material consideration by the Assembly Government and Planning Inspectors where relevant to the determination of called-in planning applications and appeals. The note provides guidance on: a) Integration between land use planning and transport; b) Location of development; c) Parking; d) Design of development; e) Walking and cycling; f) Public transport; g) Planning for transport infrastructure; and, h) Assessing impacts and managing implementation.

8.2.2 Regional and Local Planning Policy

Regional and local planning policy's and Regional Transport Plans relevant to the proposed scheme are listed in **Table 8-2**.

Table 8-2 Regional and Local Policy

Document	Policy/guidance
North Wales Joint Local Transport Plan (2015)	Jointly produced by the six north Wales local authorities. The key outcomes that the Local Transport Plan aims to achieve are: • Providing affordable and accessible transport to jobs and services with a focus on the most deprived communities. • Improved safety and security benefits of both actual and perceived safety of travel by all modes. • Minimising impacts on the natural environment, with infrastructure to support public and community.
Anglesey and Gwynedd Joint Local Development Plan (2011 - 2026)	Strategic Policy PS 4: Sustainable Transport, Development and Accessibility: *"Development will be located so as to minimise the need to travel. The Councils will support improvements that maximise accessibility for all modes of transport, but particularly by foot, cycle and public transport. This will be achieved by securing convenient access via footways, cycle infrastructure and public transport where appropriate, thereby encouraging the use of these modes of travel for local journeys and reducing the need to travel by private car.* *The Council will endeavour to improve accessibility and seek to change travel behaviour. The Councils will also require appropriate transport infrastructure elements to be delivered as part of major infrastructure development schemes either in kind or through section 106 obligations."*

Document	Policy/guidance
	Policy TRA 1: Transport Network Developments *"Proposals for large-scale development or developments in sensitive areas that substantially increase the number of journeys made by private vehicles will be refused unless they include measures as part of a Transport Assessment and/or a Travel Plan. Where the Transport Assessment reveals the need for a Transport Implementation Strategy this will need to be secured through a planning obligation."*
	Policy TRA 4: Managing Transport Impacts *"Where appropriate, proposals should be planned and designed in a manner that promotes the most sustainable modes of transport."*

8.2.3 Guidance

8.2.3.1 The Guidelines for the Environmental Assessment of Road Traffic

The guidelines for the Environmental Assessment of Road Traffic (GEART) (published January 1993 by the Institute of Environmental Assessment) are guidelines for the assessment of the environmental impacts of road traffic associated with new developments, irrespective of whether the developments are to be subject to formal EIAs. The purpose of the guidelines is to provide the basis for systematic, consistent and comprehensive coverage for the appraisal of traffic impacts arising from development projects.

8.2.4 Data sources

The following data sources contained within **Table 8-3** inform the assessment.

Table 8-3 Data sources

Data	Date	Coverage	Confidence	Notes
7-Day Classified Automatic Traffic Counts	October 2018	1 link within the traffic and transport study area.	High	Traffic count commissioned by Royal HaskoningDHV which provide classified hourly and daily count and speed data (over 7 days).
24-Hour Manually Classified Turning Count	14:00hrs to 14:00hrs 3rd/4th October 2018	• Railway Station/Ferry Access/Llanfawr Road/A55 roundabout • A55/A5 junction • A5154/A55 junction • Kingsland Roundabout	High	Traffic counts commissioned by Royal HaskoningDHV which provide classified hourly turning count data.
Personal Injury Collision Data	Five-year period, January 2015 to December 2019	All links within the traffic and transport study area	High	Date periods do not include lockdown restrictions during the Covid19 pandemic.
Sensitive Receptors	Latest available	All links within the study area	High	Desktop studies.

Full details of the location of the traffic surveys are provided in **Section 8.4**. In addition, a desk-based assessment was undertaken to provide information with regard to the existing baseline highway network which included consideration of Personal Injury Collison (PIC) data utilising street view and mapping data. Open source PIC data for the most recent five-year period (01.01.2015 to 31.12.19) was obtained for the study area from the website Crashmap (Crashmap, 2021).

Limited traffic signal data was also supplied by the North and Mid Wales Trunk Road Agent (NMWTRA); however, upon review this data was incomplete, and hence this was not used to inform the assessment.

8.3 Consultation

Consultation undertaken throughout the pre-application phase informed the approach and the information provided in this EIA Report (see **Chapter 6** Consultation).

Specific to the Traffic and Transport assessment, a Traffic and Transport Environmental Statement Scoping Note (see **Appendix 8-1**) was circulated to both the NMWTRA and the IoACC Highways Services on the 16th February 2021. The Scoping Note presented the proposed scope for the traffic and transport assessment, detailing the construction traffic demand, and methodology of assessment and reasons for scoping out operational assessment.

The NMWTRA responded to the scoping note; however, it was not possible to undertake further engagement with the IoACC Highways Services. In the interim, NMWTRA provided limited traffic signal data, as set out in **Section 8.2**.

8.4 Assessment Methodology

This section describes the assessment methodology, including data collation, impacts and impact assessment criteria that were used in the traffic and transport assessment. The traffic and transport assessment methodology follow the principles set out in **Chapter 5** Approach to Environmental Impact Assessment. These principles have been augmented by traffic and transport specific methodologies (as prescribed in GEART) to inform a significance evaluation.

8.4.1 Scale of assessment

The following rules, taken from the GEART, have informed the screening process and thereby defined the extent and scale of this assessment:

- Rule 1: Include highway links where traffic flows are predicted to increase by more than 30% (or where the number of HGVs is predicted to increase by more than 30%); and,
- Rule 2: Include any other specifically sensitive areas where traffic flows (or HGV component) are predicted to increase by 10% or more.

In justifying these rules GEART examines the science of traffic forecasting and states:

> *"It is generally accepted that accuracies greater than 10% are not achievable. It should also be noted that the day to day variation of traffic on a road is frequently at least some + or - 10%. At a basic level, it should therefore be assumed that projected changes in traffic of less than 10% create no discernible environmental impact.*
>
> *…a 30% change in traffic flow represents a reasonable threshold for including a highway link within the assessment."*

Therefore, changes in traffic flows below the GEART Rules (thresholds) are assumed to result in no discernible or negligible environmental effects and have therefore not been assessed further as part of this study.

The exception to the GEART Rule 1 and 2 is the consideration of the effects of driver delay and road safety. These effects can be potentially significant when high baseline traffic flows are evident, and a lower change

in traffic flow can be potentially significant. Full details of the methodology adopted for these effects are set out later in this chapter.

Following initial screening, GEART, sets out consideration and, in some cases, thresholds in respect of changes in the volume and composition of traffic to facilitate a subjective judgement of traffic impact and significance.

The following environmental effects have been identified as being susceptible to changes in traffic flow and are appropriate to the local area.

8.4.1.1 Severance

Severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery. The term is used to describe a complex series of factors that separate people from places and other people. Severance may result from the difficulty of crossing a heavily trafficked road or a physical barrier created by the road itself. It can also relate to quite minor traffic flows if they impede pedestrian access to essential facilities.

GEART suggests that changes in total traffic flow of 30%, 60% and 90% are considered to be slight, moderate and substantial respectively. However, GEART notes that these figures should be used cautiously, and that the assessment should pay full regard to specific local conditions.

8.4.1.2 Amenity

Amenity is broadly defined as the relative pleasantness of a journey, and is considered to be affected by traffic flow, traffic composition and pavement width and separation from traffic. This definition also includes pedestrian fear and intimidation and can be considered to be a much broader category including consideration of the exposure to noise and air pollution, and the overall relationship between pedestrians and traffic.

GEART suggests that a threshold of a doubling of total traffic flow or the HGV component may lead to a negative impact upon pedestrian amenity.

8.4.1.3 Road safety

The salient GEART guidance on road safety is as follows:

"Where a development is expected to produce a change in the character of traffic (e.g. HGV movements on rural roads), then data on existing accidents levels may not be sufficient. Professional judgement will be needed to assess the implications of local circumstances, or factors which may elevate or lessen the risk of accidents, e.g. junction conflicts."

In this context, an examination of the baseline collisions occurring within the traffic and transport study area will be undertaken to identify any collision cluster sites. These sites are considered to be sensitive to changes in traffic flows (sensitive receptors) and therefore a more detailed analysis of the types of collisions will be undertaken.

8.4.1.4 Driver delay

GEART recommends the use of proprietary software packages to model junction delay and therefore estimate increased vehicle delays; however, it is noted that vehicle delays are only likely to be significant when the surrounding highway network is at, or close to, capacity.

8.4.2 Receptor sensitivity

The sensitivity of a road (link) can be defined by the type of user groups who may use it, e.g. elderly people or children. A sensitive area may be a village environment or where pedestrian or cyclist activity may be high, for example in the vicinity of a school. Taking into consideration the nature of the proposed scheme (the Breakwater refurbishment accessed from the Port) and local amenities within proximity of the development, sensitive user groups include and are not limited to:

- ferry passengers;
- local pedestrians and cyclists;
- Holyhead railway station users; and,
- Residents of Holyhead.

Table 8-4 provides broad definitions of the different sensitivity levels which have been applied to the assessment.

Table 8-4 Example definitions of the different sensitivity levels for a highway link

Sensitivity	Definition
High*	High concentrations of sensitive receptors (e.g. ferry passengers, local pedestrians, cyclists, railway users and residents) and limited separation provided by the highway environment. Defined Collision Clusters. Junctions with negative spare capacity.
Medium	A low concentration of sensitive receptors (e.g. residential dwellings, pedestrian desire lines, etc.) and limited separation from traffic provided by the highway environment. Junctions approaching or at capacity.
Low	Few sensitive receptors and / or highway environment that can accommodate changes in volumes of traffic.
Negligible	Links that fall below GEART Rule 1 and 2 screening thresholds.
* High sensitivity links are considered to be 'specifically sensitive areas' for the purpose of GEART Rule 2	

8.4.3 Magnitude

Table 8-5 details the assessment framework for magnitude thresholds adapted from GEART. These thresholds are guidance only and provide a starting point by which additional evidence (for example more detailed traffic analysis and site observations) and professional judgement will inform an analysis of the magnitude of effect.

Table 8-5 Traffic and transport assessment framework

Effect	Magnitude of Effect			
	Negligible	Low	Medium	High
Severance	Changes in total traffic flows of less than 30%.	Changes in total traffic flows of 30 to 60%.	Changes in total traffic flows of 60 to 90%.	Changes in total traffic flows of over 90%.

Effect	Magnitude of Effect			
	Negligible	Low	Medium	High
Amenity	Change in traffic flows (or HGV component) less than 100%.	Greater than 100% increase in traffic (or HGV component) and a review based upon the quantum of vehicles, vehicle speed and pedestrian footfall.		
Road Safety	Informed by a review of collision patterns and trends based upon the existing personal injury collision records and the forecast increase in traffic.			
Driver delay	Increases in peak hour traffic flows less than 30 vehicles per hour.	Informed by projected traffic increases through sensitive junctions within the study area.		

Table 8-6 sets out the traffic and transport assessment matrix adopted for routes that meet the screening criteria (Rule 1 and 2). This combines the assessment of the magnitude of effect, derived from the framework included in

Table 8-5, with a given sensitivity receptor value in order to determine the significance of the predicted impact.

Table 8-6 Traffic and transport impact significance matrix

		Negative Magnitude				Beneficial Magnitude			
		High	Medium	Low	Negligible	Negligible	Low	Medium	High
Sensitivity	High	*Major*	*Major*	*Moderate*	*Minor*	*Minor*	*Moderate*	*Major*	*Major*
	Medium	*Major*	*Moderate*	*Minor*	*Minor*	*Minor*	*Minor*	*Moderate*	*Major*
	Low	*Moderate*	*Minor*	*Minor*	*Negligible*	*Negligible*	*Minor*	*Minor*	*Moderate*
	Negligible	*Minor*	*Negligible*	*Negligible*	*Negligible*	*Negligible*	*Negligible*	*Negligible*	*Minor*

Note that for the purposes of the EIA, major and moderate impacts are deemed to be significant. In addition, whilst minor impacts are not significant in their own right, it is important to distinguish these from other non-significant impacts as they may contribute to significant impacts cumulatively or through interactions.

8.4.4 Transboundary impact assessment

There are no transboundary impacts with regard to traffic and transport as the proposed scheme is entirely within the UK and would not be sited in proximity to any international boundaries. Transboundary impacts are therefore scoped out of the assessment and are not considered further.

8.5 Existing Environment

Characterisation of the existing environment in relation to traffic and transport has been informed through a number of sources, including:

- Desktop studies;
- Personal Injury Collision (PIC) data sourced from Crashmap[8]; and,
- Traffic surveys commissioned by Stena Line Ports Limited as undertaken for the Holyhead Port Expansion Environmental Statement (ES) (Royal HaskoningDHV, 2019).

[8] *www.crashmap.co.uk*

8.5.1 Highway network

The Traffic and Transport study area has been informed by the most probable routes for traffic, for both the movement of materials and personnel, during the construction phase of the proposed scheme. The wider highway network leading to Holyhead Port from the UK mainland is illustrated in **Figure 8-1** and described below.

The principal highway network includes the A55 (managed by NMWTRA) and the A5, and the A5154 (managed by the IoACC). The A55 (North Wales Expressway) forms a direct link from Holyhead Port from Chester. The A55 is the second crossing between the mainland and the Isle of Anglesey and runs parallel to the A5. The A55 forms part of the European Route E22 which runs from the United Kingdom to Russia.

The A5 London Holyhead trunk road is a major road which runs for about 443km in England and Wales. The A5 runs from London through Milton Keynes, Hinkley, Shrewsbury and Bangor to Holyhead. The A5 is one of the three crossings between the mainland and the Isle of Anglesey.

Figure 8-2 illustrates the traffic and transport study area and is divided up into four separate highways sections known as links which are defined as sections of road with similar characteristics and traffic flows. The key links are set out below.

Link 1 – A55 North Wales Express Way

- The A55 North Wales Expressway (Link 1) is a two-lane dual carriageway road that runs north to a roundabout junction with the B4545 and Kingsland Road. The road has lighting present and is subject to a 50mph speed limit, there are no footways or frontage developments along the link.

Link 2 – A55 Victoria Road

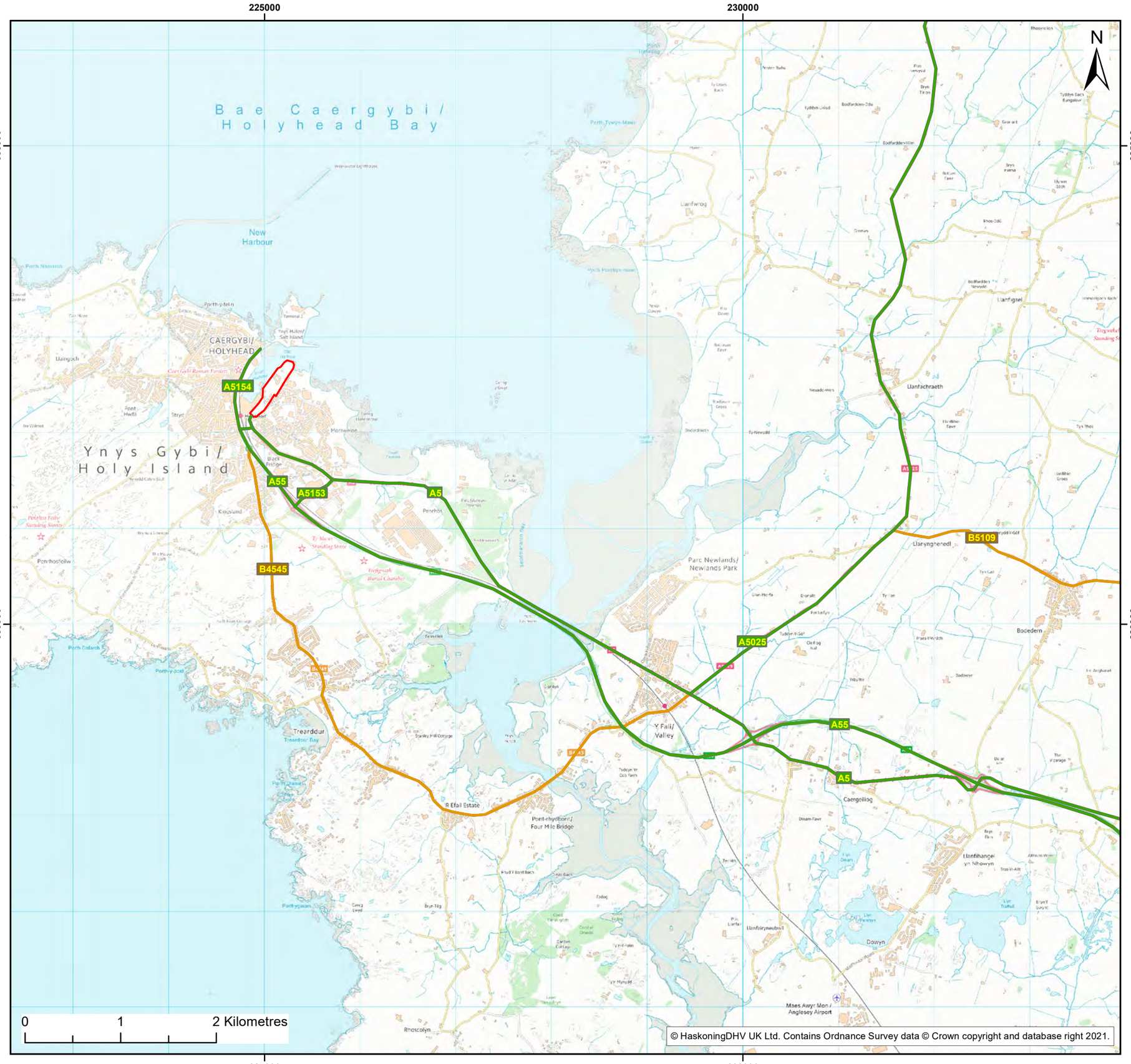
- The A55 Victoria Road (Link 2) continues north for a further 200 metres to a signalised junction with the A5154 and the A55 (London Road). The road consists of two-lane dual carriageway subject to a 30mph speed limit with street lighting present. No footways or frontage developments are present along the road.

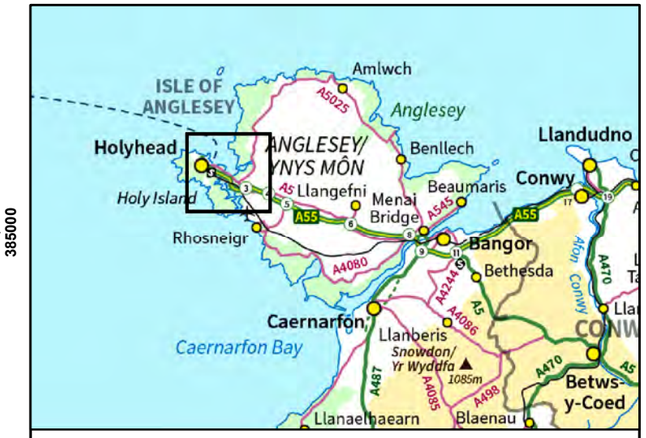
Link 3 – A55 London Road

- The A55 London Road (Link 3) is a three-lane single carriageway road that runs 110m east of its junction with A55 Victoria to the signalised junction with the A5 London Road. The road is subject to a speed limit of 30mph with footways and street lights provided on both sides of the road. Vehicular access to Holyhead Rail Station is located on the A55 London Road.

Link 4 – A55 London Road

- The A55 London Road (Link 4) is the terminal section of the A55 before entering the Holyhead Port. It consists of a three-lane single carriageway road with a single lane heading north from the junction with the A5 London Road to a roundabout junction serving Holyhead train station the Port access road and LLanfawr Road. Two lanes (ahead only and dedicated right turn lane) head south to exit the port area. The road is subject to a 30mph speed limit with continuous footways and street lighting on both sides.
- National Cycle Route 8 (NCR8) links Holyhead to Cardiff and begins at Holyhead Port. The NCR8 crosses the A55 roundabout junction with the B4545 and Kingsland Road and continues on-road along Llanfawr Road.





Legend:

- Site Location
- A Road
- B Road

Client: Isle of Anglesey County Council	Project: Holyhead Breakwater Refurbishment Scheme

Title: Wider Highway Network

Figure:	Drawing No:
8.1	PB9014-102-051

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	29/03/2021	GC	LM	A3	1:40,000

Co-ordinate system: British National Grid

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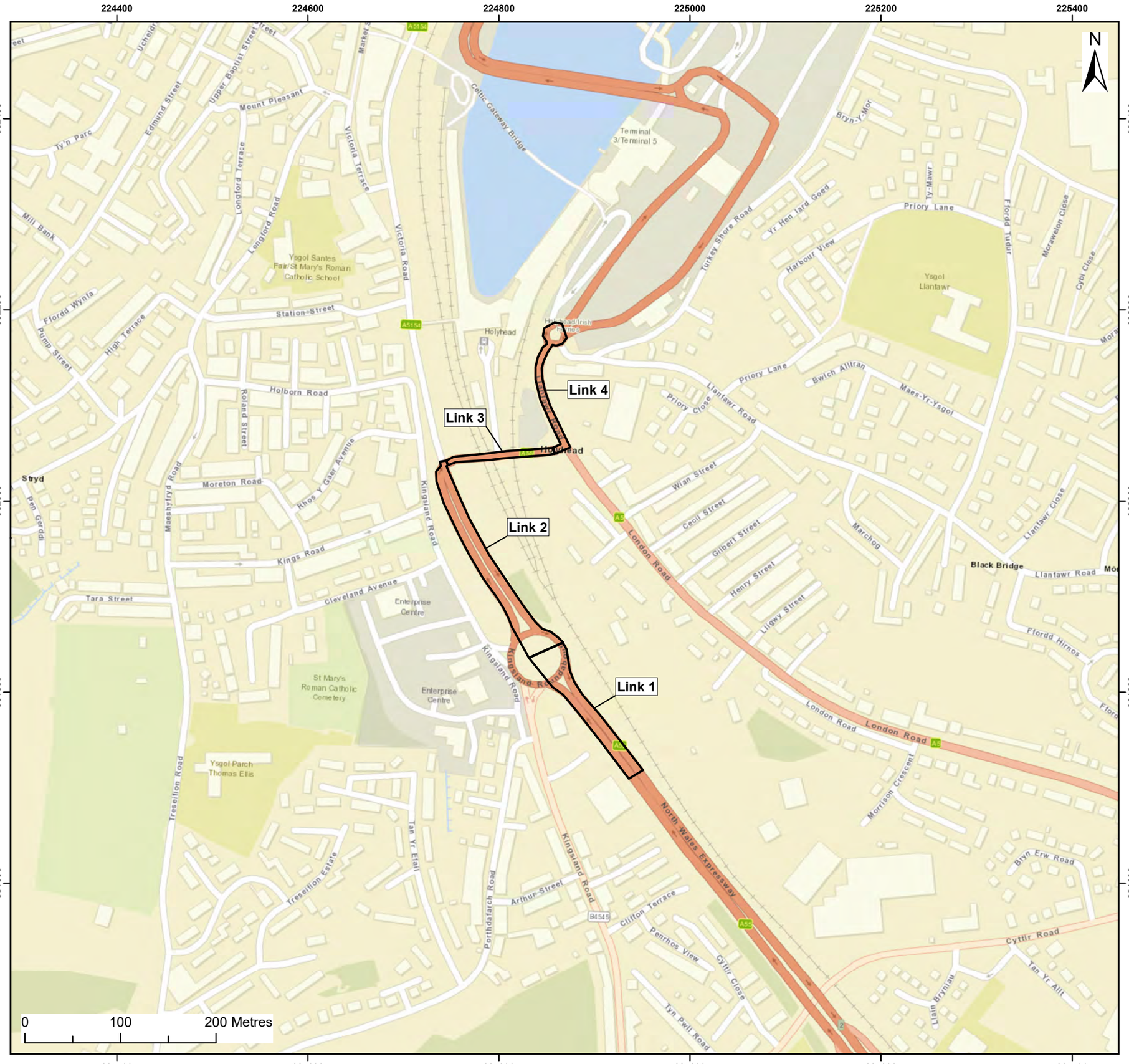

Legend:

Study Area

Base map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Client:	Project:
Isle of Anglesey County Council	Holyhead Breakwater Regeneration Scheme

Title: Study Area

Figure: 8.2 | Drawing No: PB9014-102-050

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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8.5.2 Traffic flow data

At time of writing, the Welsh Government had enforced a national lockdown and 'Stay at Home' orders in response to the Covid19 pandemic. Therefore, existing traffic flows are not expected to be representative, as the number of vehicles on the road is likely to be lower than flows typically experienced within Holyhead.

To produce a robust methodology, data from surveys undertaken in 2018 for the Holyhead Port Expansion ES (Royal HaskoningDHV, 2019) has been used to present typical flows on the highway network. The traffic flow data is comprised off the following:

- Automatic Traffic Count (ATC) commissioned by Stena Line; and,
- Manually classified turning counts (MCTC) commissioned by Stena Line.

Baseline traffic flow data are summarised in **Table 8-7** which includes the date and type of survey from which the data has been derived. The survey locations are illustrated in **Figure 8-3**.

Table 8-7 Existing annual average daily traffic flows

Link ID	Link Description	Total Vehicles (24hr AADT*)	Total HGVs (24hr AADT*)	Data Source, Type and Date
1	A55 - N Wales Expressway	11,557	1,513	October 18 MCTC
2	A55 - Victoria Road	12,501	1,517	October 18 MCTC
3	A55 - London Road	10,254	1,526	October 18 MCTC
4	A55 - North of A55/A5 Junction	7,504	1,429	October 18 MCTC
*	24hr AADT – Annual Average Daily Traffic (i.e. traffic flows average over seven days a week. 24 hr AADT derived from a 24hr (Wednesday) MCTC surveys factored utilising a seven-day ATC located on the A55 – Victoria Road.			

The assessment uses the term HGV as a proxy for a collective of those vehicle types above 3.5 tonnes (i.e. Other Goods Vehicles, HGVs, buses and coaches) for both baseline data, development generated traffic and the impact assessment (recognising the similar environment characteristics of the vehicle types). The majority of vehicular access to the port is routed through Link 4. Thus, a typical daily traffic profile of Link 4 would best represent the network peak hours within the traffic and transport study area. As detailed within the Holyhead Port Expansion ES (Royal HaskoningDHV, 2019), The daily traffic profile for Link 4 was derived from the MCC surveys at the Railway Station / Ferry Access / Llanfawr Road / A55 roundabout and the A55 / A5 junction and is reproduced in **Plate 8-1**.

Legend:

Surveys

- Automatic Traffic Counts (ATC) (Nov 2018)
- Manually Classified Turning Counts (MCTC) (Oct 2018)

Client: Isle of Anglesey County Council	Project: Holyhead Breakwater Regeneration Scheme

Title: Survey Locations

Figure:	Drawing No:
8.3	PB9014-102-053

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	29/03/2021	LM	PM	A3	1:4,000

Co-ordinate system: British National Grid

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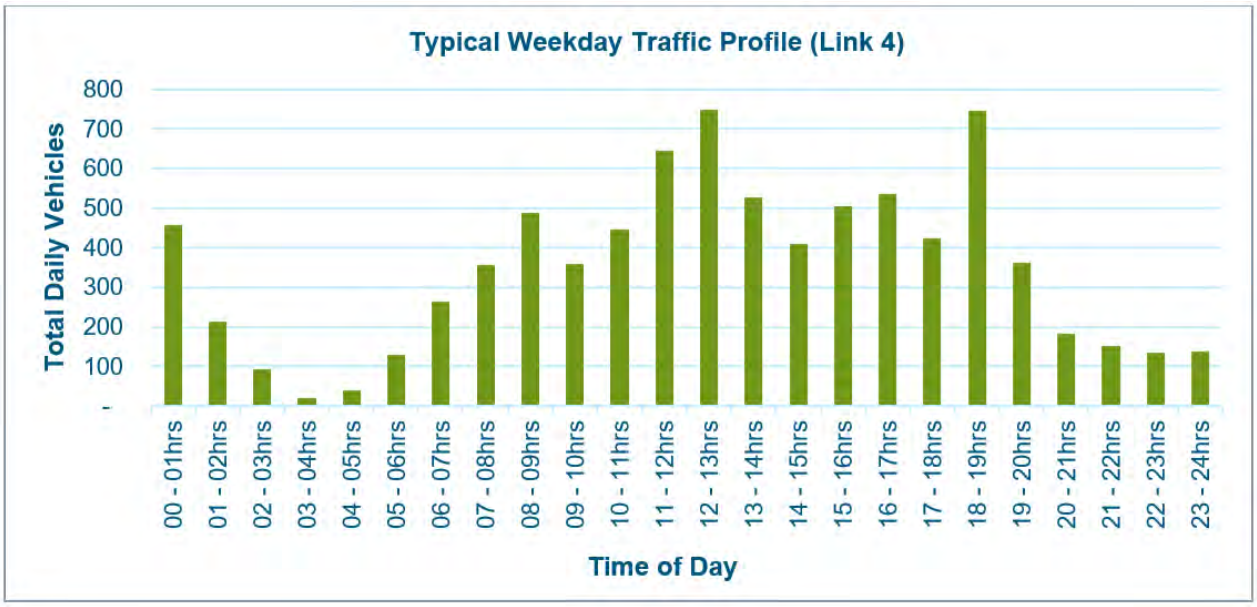


Plate 8-1 Typical weekday traffic profile (Link 4)

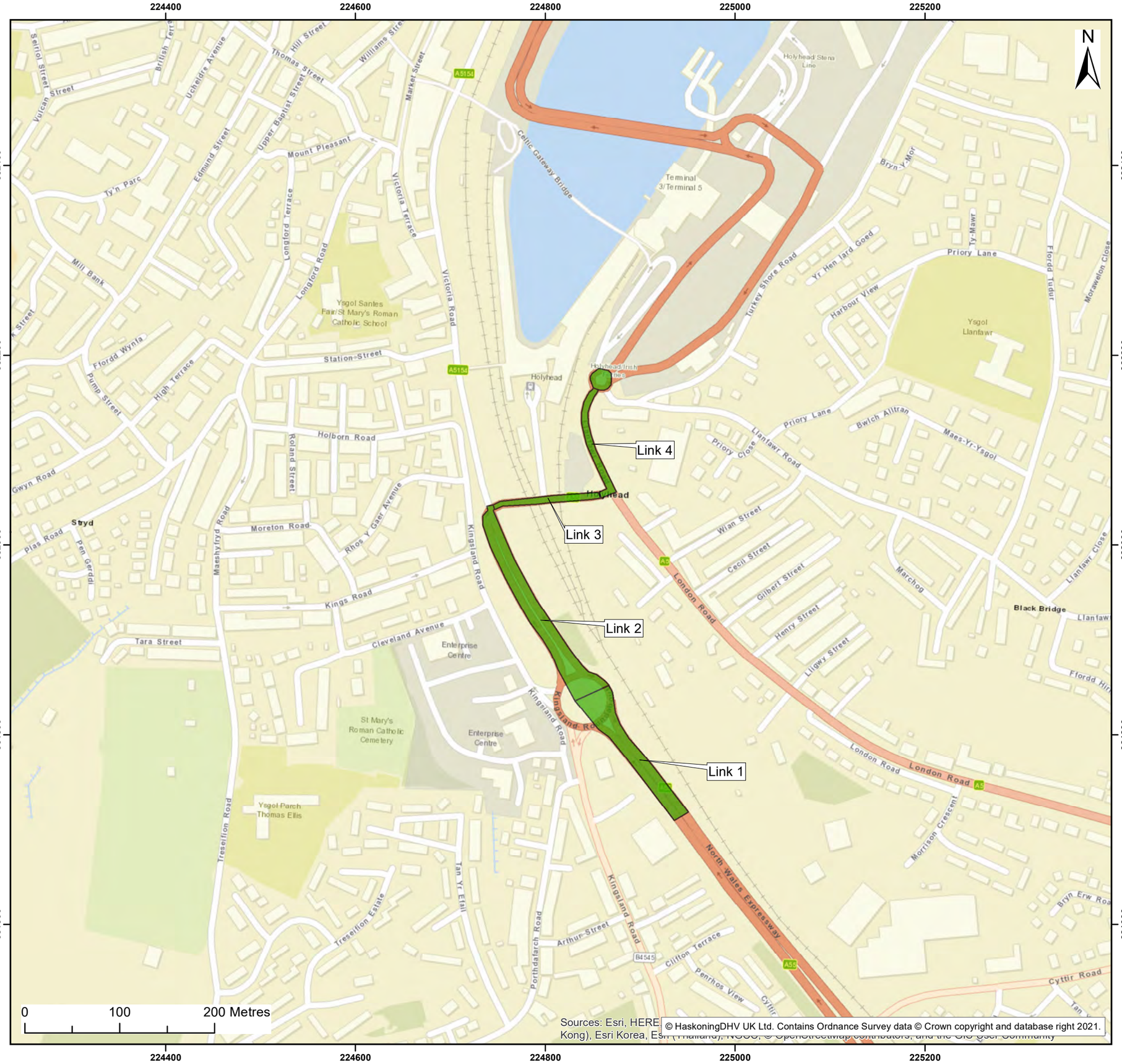
As shown in **Plate 8-1**, peak traffic movements occur between 12:00 to 13:00 at 748 vehicle movements and between 18:00 to 19:00 at 746 vehicle movements which coincide with the arrival and departure of the RoPax ferries at the port.

8.5.3 Link based sensitive receptors

A desktop exercise has been undertaken to identify the sensitive receptors in the traffic and transport study area utilising the definitions outlined in **Table 8-4**. All four links within the study area have been assessed and assigned a sensitivity. **Table 8-8** details the routes and the rationale for the applied link sensitivity and **Figure 8-4** illustrates these routes graphically.

Table 8-8 Link based sensitive receptors

Link ID	Link Description	Link Sensitivity	Comments
1	A55 - North Wales Expressway	Low	The link is a main A-road and forms part of the Trans-European Road Network Route E22 (TERN Route) that can accommodate a high volume of traffic and has limited sensitive receptors. There is minimal frontage development present. No pedestrian facilities are provided along the extents of each link.
2	A55 - Victoria Road	Low	
3	A55 - London Road	Low	The link is a main A-road and forms part of the Trans-European Road Network Route E22 (TERN Route) that can accommodate a high volume of traffic and has limited sensitive receptors. There is minimal frontage development present. A footpath is provided on both side of the carriageway with dedicated crossing facilities.
4	A55 - North of A55/A5 Junction	Low	



Legend:

Link Sensitivity

- High
- Medium
- Low

Client: Isle of Anglesey County Council	Project: Holyhead Breakwater Refurbishment Scheme

Title: Link Sensitivity

Figure:	Drawing No:
8.4	PB9014-102-053

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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8.5.4 Road safety

It is necessary to establish if there are any road safety conditions that could be exacerbated by the proposed scheme. In order to establish whether there are any inherent safety issues a high-level search of the traffic and transport study area utilising open source data[9] has been undertaken to identify any PIC groupings (clusters).

The PIC cluster criteria has been based on a 'Statistical Bulletin' (Welsh Government, 2019) produced by the welsh government for the TERN routes, of which the A55 forms Link 1, 2 and 3 of the traffic and transport study area. The document defines collision clusters as at least four personal injury road accidents in a 3-year period within a 100m radius.

Within the traffic and transport study area a total of six collisions occurred within the most recent five-year period available (January 2015 to December 2019)[10], of these five were regarded as slight and one was serious, no fatal collisions occurred. **Table 8-9** provides a summary of the collisions and their respective locations in respect to the links.

Table 8-9 Summary of collision data

Link	Description	No. of collision			Summary
		Fatal	Serious	Slight	
1	A55 - North Wales Expressway	0	0	1	One slight collision identified on the A55 dual carriageway.
2	A55 - Victoria Road	0	1	2	One serious and one slight collision identified at the junction with the B4545. One slight collision identified at the junction with the A5154.
3	A55 - London Road	0	0	2	Two slight collisions identified at the junction with the A5.
4	A55 - North of A55/A5 Junction	0	0	0	No recorded collisions within assessment period.

Table 8-9 identifies that no collision clusters were identified on any of the links within the traffic and transport study area. It is therefore considered that there are not any inherent safety issues (i.e. cluster sites) on the traffic and transport study area. Therefore, from a road safety perspective, the study area is considered to be of a very low sensitivity and the addition of development traffic is unlikely to result in significant impact, as such no further assessment of road safety is presented.

8.5.5 Anticipated trends in baseline conditions – future year traffic flows

The evaluation of the traffic and transport aspect of the proposed scheme has identified one distinct period when the maximum traffic will be generated, the peak construction assessment year of 2022.

To take account of sub-regional growth in housing and employment to the assessment year , light vehicle flows only have been factored to the future year baseline traffic demand for the assessment periods using DfT Trip End Model Presentation Programme (TEMPro) Version 7.2 with data set 72 for the Isle of Anglesey geographical areas.

[9] *http://www.crashmap.co.uk/*
[10] *Discounting the period during Covid19 Pandemic.*

HGV growth factors have been derived by the port projections presented within the Holyhead Port Expansion ES (Royal HaskoningDHV, 2019) which are reproduced in **Table 8-10,** which provides the estimated vehicle movements for 2018 and the organic port growth to 2023.

Table 8-10 Forecast RoPax vehicle movements

Type of Vehicle	2018		2023	
	Arrival	Departures	Arrivals	Departures
Car / van Units	1300	1300	1560	1560
Coaches	30	30	36	36
Accompanied RoRo	233	233	292	292
Unaccompanied RoRo	250	250	312	312

As can be seen from **Table 8-10**, It is predicted that 25% growth of HGV traffic will be seen between 2018 and 2023. This equates to approximately 5% growth per year.

Utilising the HGV projections and TEMPro growth factors, background reference flows for the identified assessment period of 2022 have been derived and are presented in **Appendix 8-2**.

8.6 Prediction of Potential Impacts During Construction

This section details the forecasts of the traffic generated by the construction of the proposed scheme and distributes vehicle trips to the highway network to establish a basis for assessing the potential transport impacts.

The realistic worst-case traffic demand has been developed by examining:

- The likely minimum construction programme;
- The earliest commencement date;
- Demand for materials and personnel;
- Likely delivery windows; and,
- The distribution of traffic.

The assumptions that underpin the worst-case scenario are discussed in this section.

8.6.1 Worst case scenario

Whilst materials for the units could be imported by barge, and concrete mixed on site, a “worst-case scenario” could see HGVs being used to import the concrete from an offsite concrete plant, which would likely have an impact of the local highway network. Therefore, an assessment of transport impacts in the “worst-case scenario” has been undertaken.

8.6.2 Traffic demand

The refurbishment of the Breakwater would result in a temporary increase in traffic flow during the construction phase with the earliest realistic start of construction in quarter two of 2022 and would last for two years. The programme is constrained by the fact that the Tetrapods and Z shaped concrete units can only be placed during the spring and summer months.

The preferred option for delivery of materials to site would be by sea; however, to consider a "worst-case scenario" the delivery method would be by road from an offsite concrete batching plant to a designated curing location within the Port of Holyhead.

At this stage, we have assumed that concrete would be delivered to Holyhead Port from the nearby Hanson Ready-mix plant, located at the Caer Glaw Quarry, Gwalchimai. All HGV Ready Mixed Concrete (RMC) movements related to the proposed scheme are assumed to be within the quarry's permitted HGV movements and thus no assessment on links local to the Ready-mix plant are to be assessed.

The delivery of concrete and moulds, for the construction of the Tetrapods units and Z-shaped units on-site, via HGVs would be expected to occur over a five-day working week with the delivery of RMC and plant to the port occurring between a typical 07:00 to 19:00 delivery window. There may be a requirement for Saturday working to deliver the project on time in case of delays in the programme.

To account for breaks in deliveries such as lunch breaks and rest breaks, the HGV construction traffic would be profiled over a 10-hour period resulting in a worst case higher hourly HGV flows.

It is estimated that an average of 20 Tetrapods (18.1m^3 concrete) and five Z-block (50m^3 concrete) would be cast per day. In total, 612m^3 of RMC would be required daily and delivered in 6m^3 RMC capacity HGVs. In total 102 (612m^3 / 6m^3) RMC HGV deliveries would be required per day equating to 204 daily HGV movements.

There may be some variability in the speed of casting (slower in bad weather periods and faster during good weather periods). Thus, as a worst-case scenario, the assessment assumes that the maximum rate the units could be produced (and stored) is double the average rate. Therefore, the assessment considers peak daily HGV movements of 408 (204 x 2).

It is understood that the speed of casting cannot exceed these levels as storage space within the Port of Holyhead would rapidly run out.

8.6.3 HGV traffic distribution

At this stage, it is assumed that concrete would be delivered to Holyhead Port from the nearby Hanson Ready-mix plant, located at the Caer Glaw Quarry, Gwalchimai. Thus, it is likely that all RMC for the proposed scheme delivered by road would come from outside of Holyhead to the south and thus would route into Holyhead via the A55 directly to the port entrance.

8.6.4 Employee traffic demand and distribution

It is estimated that a maximum workforce of 30 construction employees would be expected to work on the scheme per day.

It is proposed that a five-day working week (Monday to Friday) would be employed with a typical day shift time occurring between 07:00 to 19:00 in accordance with the RMC delivery window. There may be a requirement for Saturday working to deliver the project on time in case of delays in the programme.

In respect to the employee's arrival and departure profile, these fall outside of network peak hours and would not add to the congestion and delay experienced currently.

It is expected that the staff would be based locally and have limited impact on the highway network and thus have not been included in the assessment.

8.6.5 Traffic assignment

Appendix 8-3 details the assignment of the RMC HGVs to the highway network.

8.6.6 Traffic impact screening

In accordance with the GEART (Rule 1 and Rule 2), a screening process has been undertaken for the traffic and transport study area to identify routes that are likely to have significant changes in traffic flows and therefore require further impact assessment.

Table 8-11 summarises the assigned peak daily vehicle movements of all materials and plant during construction when distributed across the traffic and transport study area. **Appendix 8-3** graphically depicts this demand on the traffic and transport study area.

Table 8-11 also provides a comparison of the peak daily construction movements with the forecast background daily traffic flows in 2022 and identifies the screened links.

Only those links that are showing greater than a 10% increase in total traffic flows (or HGV component) for sensitive links, or greater than 30% increase in total traffic or HGV component for all other links, are considered when assessing the traffic impact upon receptors.

Table 8-11 Existing and proposed daily construction traffic flows (2022)

Link ID	Link Description	Link Sensitivity	Forecast Background 2022 Flows (24Hr AADT)		2022 – Daily Construction Vehicle Movements		Percentage Increase	
			All vehicles	HGVs	All vehicles	HGVs	All vehicles	HGVs
1	A55 – North Wales Expressway	Low	12,252	1,812	408	408	3.3%	22.5%
2	A55 – Victoria Road	Low	13,234	1,816	408	408	3.1%	22.5%
3	A55 – London Road	Low	10,900	1,827	408	408	3.7%	22.3%
4	A55 – North of A55/A5 Junction	Low	8,026	1,711	408	408	5.1%	23.8%

It is noted from **Table 8-12** that all links (1 to 4) are below the GEART screening thresholds with the greatest increase on the public highway network occurring on link 4 (total vehicles increasing 5.1% over baseline and a HGV increase of 23.8%). These increases are considered **negligible** and are therefore not considered further within the impact assessment for the assessment of Severance and Amenity.

8.6.7 Road safety

Road Safety has not been assessed further recognising that **Section 8.4.4** identified that there are no inherent safety issues (i.e. cluster sites) on the highway network in the vicinity of Holyhead Port.

8.6.8 Driver delay

The GEART screening thresholds do not apply to this effect as the potential impact is defined as significant when the traffic system surrounding the proposed project under consideration is at or close to capacity.

To facilitate the assessment of driver delay, four junctions have been selected based on level of hourly construction traffic, consultation and are considered potentially sensitive to an increase in construction traffic and are as follows.

- Junction 1 - Railway Station/ Ferry Access/ Llanfawr Road/ A55 roundabout;
- Junction 2 - A55/A5 signalised junction;
- Junction 3 - A5154/A55 signalised junction; and,
- Junction 4 - A55/B4545 - Kingsland Roundabout

Table 8-11 sets out at peak there could be up to 408 HGV movements (204 arrivals and 204 departures) per day entering the study area. These vehicle movements would occur on Link 4 (A55 – North of A55/A5 Junction). It is therefore envisaged that Link 4 is a valid representation of the worst-case scenario of construction traffic movements for all links.

The 408 movements per day would be evenly profiled over the delivery window of 12 hours (07:00 to 19:00), with 10 hours delivery time allocated. This equates to approximately 41 HGV movements per hour.

With reference to the daily traffic profiles experienced within Holyhead as detailed in **Section 8.5.2**, the following junction assessment scenarios are proposed to be undertaken for the reference baseline year of 2018 and a forecast construction year of 2022:

- Traditional network peak hour of 8am to 9am; and,
- Port related network peak hour of 12pm to 1pm.

When assessing junction capacity, reference has been made to the Ratio of Flow to Capacity (RFC) and Degree of Saturation (DoS). RFC is the standard recognised threshold for roundabout junctions in the UK and DoS is the standard recognised threshold for signalised junctions, both are typically reported by junction approach arm. When values for RFC and DoS are above 0.85 and 90% respectively, a junction is considered to be operating beyond its desirable capacity (but within its's theoretical maximum capacity) and mitigation measures may be required.

In assessment terms, the baseline RFC/DoS gives indication of a junction's sensitivity to changes in traffic throughput, whereas, with the addition of construction traffic, the level of change in RFC/DoS gives an indication of the magnitude of effect.

Modelling of the roundabout junctions has been undertaken with the use of industry standard software (Junctions 9) and LinSig for signalised junctions.

Junction 1 - Railway Station/ Ferry Access/ Llanfawr Road/ A55 roundabout

The outputs of Junction 1 are presented in **Table 8-12** for the traditional and port network peak hours. Full junction modelling outputs are provided in **Appendix 8-4**.

Table 8-12 Junction 1 capacity and delay results

Scenario	Arm	Traditional Network Peak (08:00-09:00)			Port Network Peak (12:00-13:00)		
		RFC	Delay (s)	Queue (Veh)	RFC	Delay (s)	Queue (Veh)
2018 Surveyed Base	Railway Station	0.04	3.42	0.0	0.07	3.84	0.1
	Port Access (Private)	0.09	6.76	0.1	0.71	17.87	3.2
	Llanfawr Road	0.17	4.04	0.2	0.18	5.31	0.2
	A55 (South)	0.28	5.13	0.5	0.47	7.3	1.2
Junction Level of Service		A			B		
2022 Forecast Base	Railway Station	0.04	3.47	0.0	0.07	3.95	0.1
	Port Access (Private)	0.14	8.46	0.3	0.78	23.33	4.7
	Llanfawr Road	0.23	4.35	0.3	0.20	5.61	0.2
	A55 (South)	0.31	5.41	0.6	0.52	8.36	1.5
Junction Level of Service		A			B		
2022 Forecast Base + Peak Construction Traffic	Railway Station	0.04	3.54	0.1	0.08	4.04	0.1
	Port Access (Private)	0.19	9.07	0.4	0.84	29.37	6.5
	Llanfawr Road	0.23	4.46	0.3	0.20	5.78	0.3
	A55 (South)	0.35	6.02	0.7	0.56	9.30	1.8
Junction Level of Service		A			C		

Table 8-12 indicates that the junction operates within capacity during the Forecast 2022 Base with a maximum RFC of 0.78 during the port peak hour and 0.31 during the am peak. The junction is therefore considered to be operating under capacity and thus considered to be of low sensitivity.

With the addition of the peak construction traffic the traditional am peak shows an increase in RFC to 0.35 on the A55 (south). During the port peak the RFC increases to 0.84 which is approaching the recognised 0.85 RFC thresholds of desirable capacity. This is an increase of 0.06 RFC and an increase in queues of 1.7 PCUs. These changes are considered a low magnitude of change. It is also worth noting that these queues occur within the private land of Holyhead Port and during the peak port period which experiences a high volume of traffic during baseline conditions.

It is considered that with the addition of the proposed schemes construction traffic, the magnitude of change is assessed as low on a receptor of low sensitivity resulting in a **minor adverse** effect.

Junction 2 - A5154/A55 signalised junction

The outputs of Junction 2 are presented in **Table 8-13** for the traditional am and port network peak hours. Full junction modelling outputs are provided in **Appendix 8-5**.

Table 8-13 Junction 2 capacity and delay results

Scenario	Arm	Traditional Network Peak (08:00-09:00)			Port Network Peak (12:00-13:00)		
		DoS (%)	Delay (s)	Queue (Veh)	RFC	DoS (%)	Delay (s)
2018 Surveyed Base	A55 (West) Left + Ahead	32.3	8.8	2.2	58.7	13.6	4.0
	A55 (North) Ahead	26.6	50.0	1.4	43.7	57.2	2.2
	A55 (North) Right	35.7	27.1	4.6	48.6	17.9	8.1
	A5 (South) Left / Ahead	21.4	17.1	2.5	35.3	28.0	2.8
Practical Reserve Capacity over all lanes		152.8%			53.3%		
2022 Forecast Base	A55 (West) Left + Ahead	35.9	9.2	2.4	65.7	14.5	4.6
	A55 (North) Ahead	28.1	50.3	1.5	46.6	58.2	2.3
	A55 (North) Right	37.0	25.7	4.9	53.2	17.4	9.3
	A5 (South) Left / Ahead	23.1	18.2	2.8	37.4	1.4	0.2
Practical Reserve Capacity over all lanes		143.4%			36.9%		
2022 Forecast Base + Peak Construction Traffic	A55 (West) Left + Ahead	39.6	9.3	2.6	66.8	14.0	4.6
	A55 (North) Ahead	31.6	23.0	5.6	46.6	58.2	2.3
	A55 (North) Right	39.0	23.0	5.6	57.8	18.3	10.5
	A5 (South) Left / Ahead	25.7	20.4	3.1	37.4	29.3	3.0
Practical Reserve Capacity over all lanes		127.1%			34.7%		
*MMQ = Mean Max Queue in Passenger Car Units (PCUs)							

Table 8-13 indicates that the junction operates within capacity during both the Forecast 2022 with and without the peak construction traffic scenarios, with all arms operating under the 90% DoS threshold. The junction is therefore considered to be operating under capacity and thus considered to be of low sensitivity.

With the addition of the peak construction traffic the traditional am peak shows an increase of between 2% to 3.7% on all arms. A maximum increase of 4.6% DoS on the A55 North (right turn) is shown during the port peak hour. These changes are considered a low magnitude of change.

It is considered that with the addition of the proposed schemes construction traffic, the magnitude of change is assessed as low on a receptor of low sensitivity resulting in a **minor adverse** effect.

Junction 3 - A5154/A55 signalised junction

The outputs of Junction 3 are presented in **Table 8-14** for the traditional am and port network peak hours. Full junction modelling outputs are provided in **Appendix 8-6**.

Table 8-14 Junction 3 capacity and delay results

Scenario	Arm	Traditional Network Peak (08:00-09:00)			Port Network Peak (12:00-13:00)		
		DoS (%)	Delay (s)	MMQ* (PCU)	DoS (%)	Delay (s)	MMQ* (PCU)
2018 Surveyed Base	A55 – London Road (East) Left	15.1	8.7	1.2	41.3	8.9	3.6
	A55 – London Road (East) Right	51.3	35.9	6.1	49.6	42.1	4.7
	A5154 Left	18.8	13.2	2.5	24.4	20.5	3.1
	A5154 Ahead	48.6	17.9	3.7	59.2	23.8	5.1
	A55 (South) Ahead	27.4	8.4	3.8	23.3	5.8	2.9
	A55 (South) Right	48.7	37.8	5.0	55.2	29.3	8.0
Practical Reserve Capacity over all lanes		75.4%			52.0%		
2022 Forecast Base	A55 – London Road (East) Left	17.0	8.8	1.4	47.5	9.5	4.4
	A55 – London Road (East) Right	54.2	36.6	6.5	55.8	45.1	5.2
	A5154 Left	19.9	13.3	2.6	28.7	21.7	3.8
	A5154 Ahead	51.4	18.3	3.9	65.3	25.7	5.9
	A55 (South) Ahead	29.0	8.6	4.2	24.2	5.5	3.0
	A55 (South) Right	54.7	39.3	5.8	62.1	30.3	9.5
Practical Reserve Capacity over all lanes		64.7%			37.8%		
2022 Forecast Base + Peak Construction Traffic	A55 – London Road (East) Left	21.0	8.4	1.6	50.9	9.6	4.6
	A55 – London Road (East) Right	56.7	38.2	6.7	55.8	45.1	5.2
	A5154 Left	21.2	15.1	2.8	29.5	22.6	3.8
	A5154 Ahead	55.3	20.2	4.4	68.3	27.6	6.2
	A55 (South) Ahead	28.6	8.1	4.1	24.2	5.5	3.0
	A55 (South) Right	57.2	36.9	6.8	67.1	31.0	10.9
Practical Reserve Capacity over all lanes		57.3%			31.8%		
*MMQ = Mean Max Queue in Passenger Car Units (PCUs)							

Table 8-14 indicates that the junction operates within capacity during both the Forecast 2022 with and without the peak construction traffic scenarios, with all arms operating under the 90% DoS threshold. The junction is therefore considered to be operating under capacity and thus considered to be of low sensitivity.

With the addition of the peak construction traffic the traditional am peak shows an increase of between 0.4% to 4% over all arms. A maximum increase of 5% DoS on the A55 South (right turn) is shown during the port peak hour. These changes are considered a low magnitude of change.

It is considered that with the addition of the proposed schemes construction traffic, the magnitude of change is assessed as low on a receptor of low sensitivity resulting in a **minor adverse** effect.

Junction 4 - A55/B4545 - Kingsland Roundabout

The outputs of Junction 4 are presented in **Table 8-15** for the traditional and port network peak hours. Full junction modelling outputs are provided in **Appendix 8-4**.

Table 8-15 Junction 4 capacity and delay results.

Scenario	Arm	Traditional Network Peak (08:00-09:00)			Port Network Peak (12:00-13:00)		
		RFC	Delay (s)	Queue (Veh)	RFC	Delay (s)	Queue (Veh)
2018 Surveyed Base	A55 - Victoria Road	0.14	**2.00**	**0.2**	**0.41**	**3.22**	**0.9**
	A55 – N Wales Expressway	0.23	**2.87**	**0.4**	**0.36**	**3.66**	**0.7**
	B4545 (south)	0.18	**2.89**	**0.2**	**0.28**	**3.50**	**0.4**
	Fire Station	0.00	**0.00**	**0.0**	**0.00**	**2.38**	**0.0**
	Kingsland Road (north)	**0.21**	**4.23**	**0.3**	**0.29**	**5.05**	**0.4**
Junction Level of Service		A			A		
2022 Forecast Base	A55 - Victoria Road	0.25	**2.32**	**0.4**	**0.45**	**3.51**	**1.0**
	A55 – N Wales Expressway	0.29	**3.23**	**0.5**	**0.39**	**3.98**	**0.9**
	B4545 (south)	0.46	**4.52**	**0.9**	**0.30**	**3.69**	**0.4**
	Fire Station	0.00	**4.50**	**0.0**	**0.00**	**2.44**	**0.0**
	Kingsland Road (north)	**0.42**	**5.99**	**0.7**	**0.32**	**5.37**	**0.5**
Junction Level of Service		A			A		
2022 Forecast Base + Peak Construction Traffic	A55 - Victoria Road	0.27	**2.49**	**0.4**	**0.48**	**3.76**	**1.2**
	A55 – N Wales Expressway	0.32	**3.50**	**0.6**	**0.42**	**4.24**	**1.0**
	B4545 (south)	0.47	**4.66**	**0.9**	**0.30**	**3.78**	**0.5**
	Fire Station	**0.01**	**4.57**	**0.0**	**0.00**	**0.00**	**0.0**
	Kingsland Road (north)	**0.43**	**6.22**	**0.7**	**0.33**	**5.54**	**0.5**
Junction Level of Service		A			A		

Table 8-15 indicates that the junction operates within capacity during both the Forecast 2022 with and without peak construction traffic for all scenarios with a maximum RFC of 0.45 experienced on the A55 – Victoria Road during the 2022 Forecast Base during the port peak scenario. The junction is therefore considered to be operating under capacity and thus considered to be of low sensitivity.

With the addition of the peak construction traffic, A maximum increase of 0.03 RFC and increase of 0.2 PCU queue on the A55 Victoria Road is shown during the port peak hour. These changes are considered a low magnitude of change.

It is considered that with the addition of the proposed schemes construction traffic, the magnitude of change is assessed as low on a receptor of low sensitivity resulting in a **minor adverse** effect.

8.7 Summary

This chapter of the EIA has assessed the potential impacts on traffic and transport associated with the construction of the proposed scheme. This chapter has been developed with regard to the policy framework outlined in **Section 8.2**.

In accordance with national guidance (GEART) a traffic and transport study area was identified, baseline conditions established, and sensitive receptors identified. The traffic and transport study area was screened to identify routes that could potentially impacted by the project's traffic generation.

A total of four highway links within the traffic and transport study area have been assessed for the effects of severance, amenity, road safety and driver delay. The residual impact for all highway links was assessed to be **not significant**.

9 Air Quality

9.1 Introduction

This chapter provides a summary description of key aspects relating to existing air quality followed by an assessment of the magnitude and significance of the effects upon the baseline conditions resulting from the construction and operation of the proposed scheme. The potential effects on air quality are assessed conservatively using realistic worst-case scenarios for the proposed scheme. No significant air quality impacts are anticipated during the operational phase of the proposed scheme.

Additional information to support the Air Quality assessment is provided separately in the following appendices:

- Appendix 9-1: Construction Dust and Particulate Matter Assessment Methodology;
- Appendix 9-2: Traffic Data used in the Air Quality Assessment; and,
- Appendix 9-3: Valley Meteorological Station Wind Roses (2014 – 2019).

9.2 Legislation, Policy and Guidance

9.2.1 Air quality standards and objectives

9.2.1.1 Human receptors

The EU Air Quality Framework Directive 96/62/EC on Ambient Air Quality Assessment and Management entered into force in 1996 (European Parliament, 1996). Directive 96/62/EC and the first three Daughter Directives were combined to form the new European Union Directive 2008/50/EC (European Parliament, 2008) on Ambient Air Quality and Cleaner Air for Europe, which came into force in June 2008.

The 1995 Environment Act (HMSO, 1995) required the preparation of a national Air Quality Strategy (AQS) which sets air quality standards for specified pollutants. The Act also outlined measures to be taken by local planning authorities in relation to meeting these standards and Objectives, which became the Local Air Quality Management (LAQM) system.

The UK AQS was originally adopted in 1997 (Department of Environment, 1997) and has been reviewed and updated to take account of the evolving EU legislation, technical and policy developments and the latest information on health effects of air pollution. The AQS was revised and reissued in 2000 as the AQS for England, Scotland, Wales and Northern Ireland (Department of the Environment, Transport and the Regions (DETR), 2000). This was subsequently amended in 2003 (DETR, 2003) and was last updated in July 2007 (Defra, 2007).

The UK Government published its Clean Air Strategy (CAS) in January 2019 (Defra, 2019), which reset the focus for the first time since the 2007 AQS revision. The CAS identifies a series of ‘new’ air quality issues, including biomass combustion, shipping emissions, and releases from agricultural activities. There is a recognition that the effects of pollutant deposition on sensitive ecosystems and habitats needs greater focus. The concept of an overall exposure reduction approach is raised, in recognition that numerical standards are not safe dividing lines between a risk and a safe exposure, within a population with a varying age and health profile. The CAS is supplemented by an Industrial Strategy, policy guidance for the ports sector, a developing approach for aviation, and by plans for road transport fuels shift to zero emissions by 2040.

The standards and Objectives relevant to the LAQM framework have been prescribed through the Air Quality (Wales) Regulations (2000) (HMSO, 2000), and the Air Quality (Wales) (Amendment) Regulations (2002) (HMSO, 2002). The European Union Limit Values have been implemented via the Air Quality Standards Regulations (2010), which set out the combined Daughter Directive limit values and interim targets for Member State compliance (HMSO, 2010).

The current air quality standards and Objectives of relevance to this assessment are presented in **Table 9-1**. Pollutant standards relate to ambient pollutant concentrations in air, set on the basis of medical and scientific evidence of how each pollutant affects human health. Pollutant Objectives, however, incorporate target dates and averaging periods which take into account economic considerations, practicability and technical feasibility.

Table 9-1 Air quality strategy objectives (Wales) for the purpose of LAQM

Pollutant	Air Quality Objective		To be achieved by
	Concentration	Measured as*	
Nitrogen dioxide (NO_2)	200µg.m^{-3}	1 hour mean not to be exceeded more than 18 times per year	31/12/2005
	40µg.m^{-3}	Annual mean	31/12/2005
Particles (PM_{10})	50µg.m^{-3}	24-hour mean not to be exceeded more than 35 times per year	31/12/2004
	40µg.m^{-3}	Annual mean	31/12/2004
Particles ($PM_{2.5}$)	25µg.m^{-3}	Annual mean (target)	2020
	15% cut in annual mean (urban background exposure)		2010 – 2020
Sulphur dioxide (SO_2)	266µg.m^{-3}	15-minute mean not to be exceeded more than 35 times a year	31/12/2005
	350µg.m^{-3}	1-hour mean not to be exceeded more than 24 times a year	31/12/2004
	125µg.m^{-3}	24-hour mean not to be exceeded more than 3 times a year	31/12/2004
Carbon monoxide (CO)	10mg.m^{-3}	Maximum daily running 8-hour mean	31/12/2004
**Note: how the Objectives are to be measured is set out in the UK Air Quality (Wales) Regulations (2000)*			

Where an air quality Objective is unlikely to be met by the relevant deadline, local planning authorities must designate those areas as Air Quality Management Areas (AQMAs) and take action to work towards meeting the Objectives. Following the designation of an AQMA, local planning authorities are required to develop an Air Quality Action Plan (AQAP) to work towards meeting the Objectives and to improve air quality locally.

Possible exceedances of air quality Objectives are usually assessed in relation to those locations where members of the public have the potential to be regularly present and for the same period of time as the averaging period of the Objective.

9.2.1.2 Ecological receptors

National air quality Objectives also apply for the protection of vegetation and ecosystems, which are termed Critical Levels. Critical Levels apply irrespective of habitat type and are based on the concentration of the relevant pollutants in air. IAQM guidance (IAQM, 2020) recommends that only the annual mean Critical Level is used in assessments due to the comparative importance of annual effects to impacts upon vegetation, except where specifically required by the regulator where high short-term emissions may occur, such as from an industrial stack emission source.

The Critical Levels of relevance to this assessment are detailed in **Table 9-2**.

Table 9-2 Critical level

Pollutant	Critical Level	
	Concentration	Measured as
Oxides of nitrogen (NOx)	30µg.m^{-3}	Annual mean
Ammonia (NH_3)	3µg.m^{-3}	Annual mean

Whilst Critical Levels apply regardless of habitat type, Critical Loads for habitat sites in the UK are habitat-specific and are published on the Air Pollution Information System (APIS) website (CEH, 2021). These are the maximum levels of nutrient nitrogen and acid deposition that can be tolerated without harm to the most sensitive features of these habitat sites. Potential impacts were therefore considered in relation to the appropriate Critical Loads, as detailed in **Section 9.5.3**.

9.2.2 National Planning Policy

The national planning policy framework for Wales is provided through the PPW, TANs, Welsh Government Circulars and policy clarification letters. In February 2020, the Welsh Government sought consultation on 'TAN 11: Noise' to include air quality and soundscape. The consultation document states that *"the focus on placemaking in PPW means policy topics such as air quality… should be considered alongside all other relevant policy topics when… determining planning proposals… future air quality policy in Wales will be driven by our* [the Welsh Government] *Clean Air Plan which has been developed in the context of the WFG* [Well-being of Future Generations (Wales)] *Act"* (Welsh Government, 2020a).

The Welsh Government released the Clean Air Plan for Wales (Welsh Government, 2020b) in August 2020. The Plan identifies a range of actions to be delivered to improve Wales' air quality, sets out a 10-year pathway to achieving cleaner air and aims to tackle air pollutants from numerous sources, including reducing emissions from industry, agriculture, and heating homes.

9.2.2.1 Planning Practice Guidance

The UK Government Planning Practice Guidance (PPG) (Ministry of Housing, Communities and Local Government, 2019) provides guidance on how the planning process can take account of the impact new development may have on air quality.

The PPG states that air quality may be relevant to a planning application where:

- Traffic in the vicinity of the development may be affected by increasing volume or congestion or altering the fleet composition on local roads;
- New point sources of air pollution are to be introduced;
- People may be exposed to existing sources of pollution including dust;
- Potentially unacceptable impacts (such as dust) may arise during construction; and,
- Biodiversity may be affected.

9.2.3 Local Planning Policy

The IoACC and Gwynedd Council have adopted a Joint Local Development Plan (LDP) for the area. The LDP was adopted on 31st July 2017 (IoACC & Gwynedd Council, 2017). The LDP is a land use development strategy which concentrates on sustainable development in Anglesey (and Gwynedd) up to 2026.

The Joint LDP was reviewed for policies of relevance to air quality. The following relevant policies were identified:

> *"Strategic Policy PS 5: Sustainable Development*
>
> *Development will be supported where it is demonstrated that they are consistent with the principles of sustainable development. All proposals should:*
>
> *[…]*
>
> *7. Reduce the effect on local resources, avoiding pollution and incorporating sustainable building principles in order to contribute to energy conservation and efficiency; using renewable energy; reducing / recycling waste; using materials from sustainable sources; and protecting soil quality;"*
>
> *"Policy PCYFF 2: Development Criteria*
>
> *[…]*
>
> *Additionally, planning permission will be refused where the proposed development would have an unacceptable adverse impact on:*
>
> *7. The health, safety or amenity of occupiers of local residences, other land and property uses or characteristics of the locality due to increased activity, disturbances, vibration, noise, **dust**, fumes, litter, drainage, light pollution, or other forms of **pollution** or nuisance…"*

The requirements of these policies were considered in the air quality assessment.

9.3 Consultation

Consultation undertaken throughout the pre-application phase informed the approach and the information provided in this EIA Report (see **Chapter 6** Consultation).

Additional consultation specific to this chapter are detailed in **Table 9-3**.

Table 9-3 Air quality consultation and responses

Consultee and Date	Response	Section where comments addressed
Mick Goodfellow, IoACC Environmental Health Officer (EHO), 18th December 2020 and 8th April 2021	Email confirmation of agreement on the assessment methodology for the air quality assessment.	The methodology for the air quality assessment is provided in **Section 0**.

9.4 Assessment Methodology

9.4.1 Study area

The study area for the air quality assessment was defined as follows:

- Construction phase dust and particulate matter assessment:
- Human receptors within 350m of the site boundary and within 50m of routes used by construction vehicles, up to 500m from the site entrance; and,
- Ecological receptors within 200m of the site boundary and within 50m of routes used by construction vehicles, up to 500m from the site entrance.
- Construction phase road traffic emissions:
- Human and ecological receptors within 200m of roads that are expected to experience a change in traffic flows as a result of the proposed scheme.
- Construction phase vessel emissions assessment:
- Human receptors located in the vicinity of the proposed works of the proposed scheme; and,
- Ecological receptors within or near the areas expected to be used by vessels.

9.4.2 Data sources

The assessment was undertaken with reference to a number of sources, as detailed in **Table 9-4**.

Table 9-4 Key Information sources

Data Sources	Reference
Centre for Ecology and Hydrology (CEH) (CEH, 2021)	Air Pollution Information System (APIS)
Defra (2018)	Local Air Quality Management Technical Guidance (LAQM.TG16)
Defra's LAQM Support Tools (Defra, 2020a)	LAQM 1 km x 1 km grid background pollutant maps
Institute of Air Quality Management (IAQM) (IAQM, 2016)	Guidance on the Assessment of Dust from Demolition and Construction. Version 1.1
IAQM and Environmental Protection UK (EPUK)	IAQM & EPUK (2017): Land-use Planning & Development Control: Planning for Air Quality
Wood (2020)	North Wales Authorities Collaborative Project: 2020 Air Quality Progress Report

9.4.3 Baseline conditions

The North Wales Combined Authority has published a series of Annual Progress Reports in accordance with the LAQM process. The 2020 Air Quality Progress Report (Wood, 2020) and the latest 2019 air quality monitoring data were obtained from the IoACC website and reviewed to obtain any available information to establish the existing conditions at, and in proximity to, the proposed scheme.

Background concentrations of nitrogen dioxide (NO_2), particulate matter (as PM_{10} and $PM_{2.5}$), sulphur dioxide (SO_2) and carbon monoxide (CO) corresponding to the 1km x 1km grid squares within the study area, were obtained from the latest LAQM support tools provided by Defra (Defra, 2020a) for use in air quality assessments. The latest 2018-based background pollutant maps were used for NO_2, PM_{10} and $PM_{2.5}$. The most recently available SO_2 and CO background pollutant concentrations are from 2001, as it has not

been necessary to update these because ambient concentrations of SO_2 and CO rarely exceed the AQS Objectives detailed in **Table 9-1** (Defra, 2020b).

The projections in the 2018 reference year background maps and associated tools are based on assumptions which were current before the Covid-19 outbreak in March 2020 in the UK. Consequently, these tools do not reflect short or longer term impacts on emissions in 2020 and beyond resulting from behavioural change during the national or local lockdowns (Defra, 2020a).

9.4.4 Construction phase

9.4.4.1 Construction phase dust and particulate matter assessment

The location of the concrete batching plant for the proposed scheme has yet to be confirmed; this will either be located as a new, temporary batching plant at Salt Island, Holyhead Port or an existing batching plant at a third-party location. To provide a conservative assessment, it was assumed that the batching plant will be located on Salt Island. There are sensitive receptors nearby (i.e. within 350m), which have the potential to be impacted upon by construction dust, therefore a construction phase dust and particulate matter assessment was undertaken in accordance with IAQM guidance (IAQM, 2016). It was anticipated that none of the activities at the proposed scheme site would generate dust during construction; therefore, the concrete batching plant at Salt Island was the focus of the construction phase dust assessment. A summary of the assessment process is provided below.

Construction phase dust assessment steps:

1. Screen the need for a more detailed assessment;
2. Separately for demolition, earthworks, construction and trackout:
   a. determine potential dust emission magnitude;
   b. determine sensitivity of the area; and,
   c. establish the risk of dust impacts.
3. Determine site specific mitigation; and,
4. Examine the residual effects to determine whether or not additional mitigation is required.

It should be noted that the term ‘trackout’ is defined as the transport of dust and dirt from the construction site onto the public road network. Full details of the assessment methodology are provided in **Appendix 9-1**.

Defra technical guidance (Defra, 2016) states that emissions from Non-Road Mobile Machinery (NRMM)[11] used on construction sites are unlikely to have a significant impact on local air quality where relevant control and management measures are employed. As such, emissions from NRMM were not considered quantitively in this assessment, and the relevant control measures to be employed are detailed in **Section 9.6.2.5**.

9.4.4.2 Construction phase road traffic emissions assessment

Screening criteria for a detailed assessment

As previously stated, the location of the concrete batching plant for the proposed scheme has yet to be confirmed. The delivery method of materials (i.e. either by barge or road) to the concrete batching plant has

[11] *NRMM is defined as any mobile machinery, transportable industrial equipment or vehicle fitted with an internal combustion engine not intended for passenger or goods transport by road. Explanatory Memorandum to the UK Non Road Mobile Machinery (Emissions of Gaseous & Particulate Pollutants) (Amendment) Regulations (2006).*

also yet to be confirmed; therefore, to provide a conservative assessment, it was assumed that the concrete needed for the batching plant (were it to be located on Salt Island) would be delivered by road. Transport of the armoured units to the proposed scheme would be by barge from whichever of the batching plant option locations is to be chosen.

The requirement for a detailed assessment of construction vehicle exhaust emissions at sensitive receptors was considered using screening criteria provided by IAQM and EPUK (2017), Welsh Government *et al.* (2019) and Natural England (2018).

These documents set out screening criteria for increases in total traffic flow and HDV movements. In the event that these screening criteria are exceeded, a detailed assessment of the potential air quality impacts may be required. If increases in traffic flows and HDV movements are below the criteria, there are unlikely to be any significant air quality impacts as a result of the development and detailed assessment of air quality is unlikely to be required. The assessment criteria are detailed in **Table 9-5**.

Table 9-5 Road traffic assessment screening criteria

Receptor	Guidance Document	Screening Criteria	
Human receptors	IAQM and EPUK (2017)	LDVs	A change in annual average daily traffic (AADT) of more than 100 within or adjacent to an AQMA, or more than 500 elsewhere.
		HDVs	An increase in HDV movements of more than 25 per day within or adjacent to an AQMA, or more than 100 elsewhere.
Ecological receptors	Highways England (2019) and Natural England (2018)	LDVs	Increase of 1,000 AADT or more.
		HDVs	An increase in HDV movements of more than 200 per day.

Each of the road links considered in this assessment (see **Appendix 9-2** for the traffic data used in the assessment) experienced increases in construction phase traffic flows in exceedance of the screening criteria and therefore were assessed using detailed dispersion modelling, as described below, to predict potential impacts at receptors.

Air dispersion model

The potential impact of exhaust emissions from construction phase road vehicles was assessed using the Atmospheric Dispersion Modelling System for Roads (ADMS-Roads) v5.0.0.1. The main pollutants of concern for human health as a result of vehicle emissions are annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$. Concentrations of these pollutants were therefore the focus of the ADMS-Roads assessment at the identified receptors located adjacent to the assessed road network.

Assessment scenarios

A base year of 2018 was considered in the assessment. The most recent full calendar year for which meteorological data and ratified local air quality monitoring data were available is 2019; however, 2018 monitoring data were used to provide a more representative model verification process (this is detailed further in the **Model verification Section**).

The 2018 base year included traffic flows for the existing road network in the vicinity of Salt Island which were derived from traffic count data from 2018 provided by Royal HaskoningDHV's transport consultants, the transport consultants for the proposed scheme.

The air quality assessment considered the potential maximum traffic generated by the proposed scheme and the earliest year of construction, where pollutant emission rates and background concentrations would be higher than in later years of construction, as a conservative scenario.

In summary, the following scenarios were considered in the road traffic emissions assessment:

- Scenario 1: Verification / Base year (2018);
- Scenario 2: Earliest Construction Year (2022) 'without the proposed scheme'; and,
- Scenario 3: Earliest Construction Year (2022) 'with the proposed scheme'.

Traffic data

AADT flows and HDV percentages were provided by Royal HaskoningDHV's transport consultants. These data were derived and adjusted from traffic and turning counts undertaken in 2018. Construction phase flows were considered for the earliest year of construction (2022).

Traffic data for the following roads were included in the air quality assessment:

- A55 – North Wales Expressway;
- A55 – Victoria Road;
- A55 – London Road;
- A55 – North of A55/A5 Junction; and,
- Port Access Road.

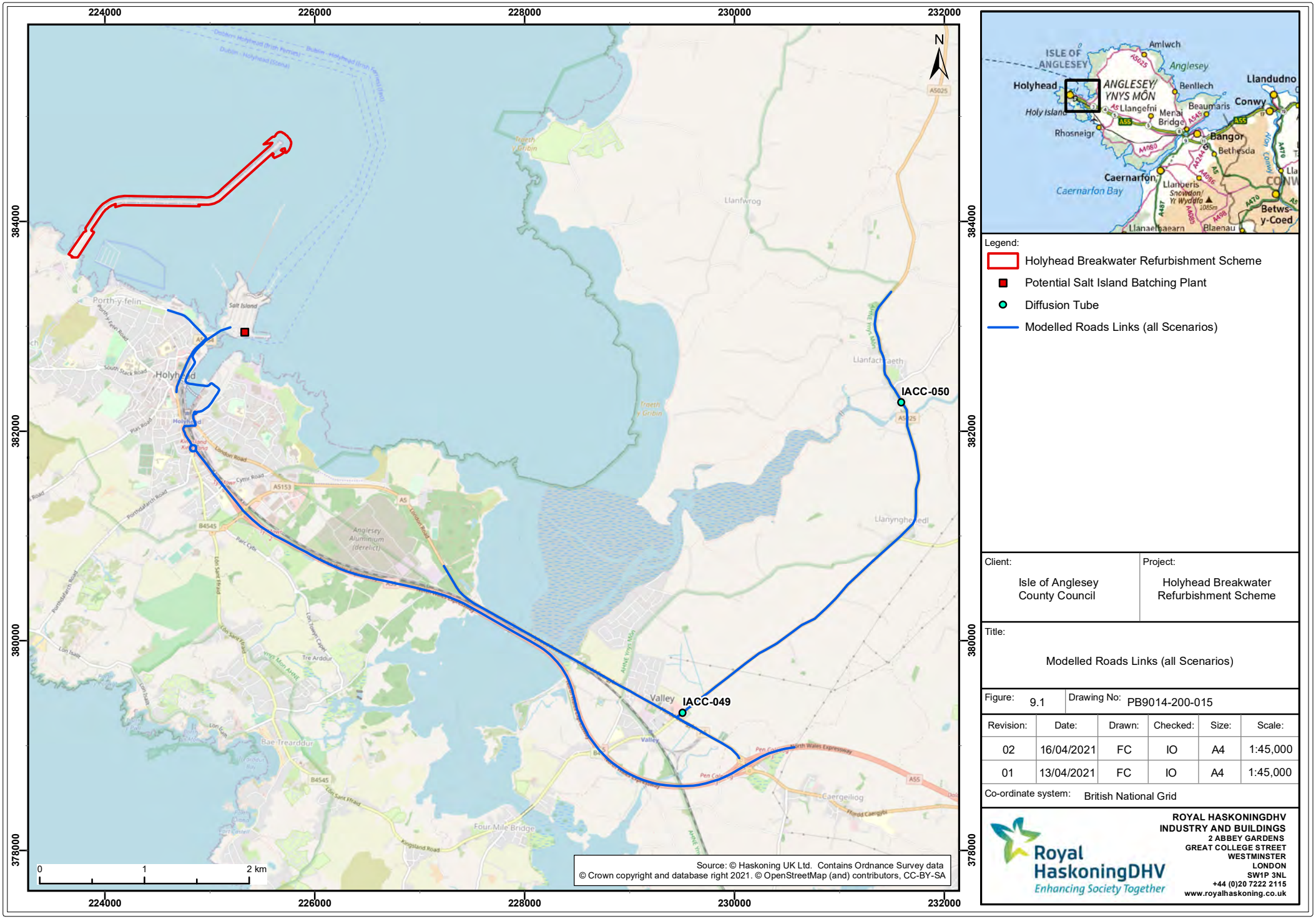
Royal HaskoningDHV traffic data were supplemented with DfT 'Manual Count Point Data' (DfT, 2021) for the A5154 (Site number 77035), A5025 (Site number 50659), A5 Holyhead Road (Site number 77044) and A5 London Road (Site number 88024) in order to verify the dispersion model and to ensure modelled pollutant concentrations at receptor locations were as representative as possible.

The road network utilised in the assessment is shown in **Figure 9-1**.

Traffic speeds were included in the air dispersion modelling as follows:

- Speed data for free-flowing traffic conditions were obtained from national speed limits;
- Queues were included in the model at junctions where traffic lights / zebra crossings were present, and on entry to roundabouts, and were modelled at 20kph;
- The average speed on roundabouts was modelled at 20kph; and,
- To provide a conservative assessment, the speed limit within the Port boundary was modelled at 32kph.

Background growth factors that account for regional traffic growth were used to determine traffic flows for the future year (2022) Scenarios using the Trip End Model Presentation Program (TEMPro), which takes into account traffic growth from committed developments. 2022 traffic data used in this assessment also included other planned and/or consented projects (e.g. the Holyhead Port Expansion and Morlais (West Anglesey) Demonstration Zone projects) to provide a cumulative assessment; this is discussed further in **Section 9.6.3**.



Legend:

- Holyhead Breakwater Refurbishment Scheme
- Potential Salt Island Batching Plant
- Diffusion Tube
- Modelled Roads Links (all Scenarios)

Client:	Project:
Isle of Anglesey County Council	Holyhead Breakwater Refurbishment Scheme

Title: Modelled Roads Links (all Scenarios)

Figure: 9.1 Drawing No: PB9014-200-015

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
02	16/04/2021	FC	IO	A4	1:45,000
01	13/04/2021	FC	IO	A4	1:45,000

Co-ordinate system: British National Grid

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Emission factors

Emission factors were obtained from the Emission Factor Toolkit (EFT) v10.1 provided by Defra (Defra, 2020c). 2018 emission factors were used in the verification/base year assessment and emission factors for 2022 were used in the future year 'without' and 'with' the proposed scheme scenarios. There has historically been uncertainty in the future vehicle emissions projections in versions previous of the EFT; however, evidence has been published to suggest that v10.1 of the EFT, as used in the assessment, provides a reasonable prediction of vehicle emissions into the future and a sensitivity test is not required (Air Quality Consultants, 2020). Given this evidence, the use of 2022 emission factors in the assessment is considered to be appropriate. The use of future year emission factors was agreed with the EHOs at IoACC during consultation.

The default fleet projections in EFT v10.1 are based on fleet growth assumptions which were current before the Covid-19 outbreak in the UK in March 2020. Consequently, default fleet outputs from the tool do not reflect short or longer term impacts on emissions in 2020 and beyond resulting from behavioural change during the national and/or local lockdowns (Defra, 2020b).

Vehicles are also a source of ammonia (NH_3), which can impact upon designated ecological sites. Defra's EFT does not provide vehicle emission factors for ammonia; as such, to provide a quantification of the impact of ammonia from road traffic, the Air Quality Consultants tool 'CREAM v1A' was used to provide ammonia emission factors for consideration of ecological impacts (Air Quality Consultants, 2020b).

Meteorological data

Hourly sequential meteorological data from the Valley recording station for 2018 were used in the ADMS-Roads model. This recording station is the closest and most representative of the site and is located approximately 11.2km south-east of the proposed scheme. The use of this recording station was agreed with the IoACC during consultation.

Model verification

Model verification is the process of adjusting model outputs to improve the consistency of modelling results with respect to available monitored data. In this assessment, model uncertainty was minimised following Defra (Defra, 2018) and IAQM and EPUK (IAQM & EPUK, 2017) guidance.

The IoACC provided provisional monitoring data for 2020 during consultation; however, the Covid-19 outbreak in the UK in March 2020 may have affected local emission sources such as the port operations and local traffic flows and associated monitored pollutant concentrations. Therefore, it is not considered to be representative to derive an adjustment factor using 2020 monitoring data for the purposes of model verification.

As such, the use of data pre-2020 was considered for the model verification process. The IoACC undertake NO_2 diffusion tube monitoring at Marine Square, Holyhead, approximately 1.5km south-east of the proposed scheme and within 400m of Salt Island. This site was initially considered for model verification due to its proximity. DfT Count Point data for the A5154 (Site number: 77035) (DfT, 2021) were used to supplement the traffic count data provided by the Royal HaskoningDHV traffic consultants in order represent conditions in the area as accurately as possible. The model was found to be underpredicting in relation to monitored concentrations, and a high adjustment factor of 4.9 was derived. Therefore, the dispersion model and surrounding area was revisited to determine what may be the cause of the poor agreement. This review identified that the difference between monitored and modelled concentrations may be due to the presence of a parking area in the vicinity of the diffusion tube, which could not be represented within the dispersion

model, and as a result of other sources in the area, potentially from within the port, which are not represented within the Defra background concentrations. Therefore, application of the derived adjustment factor of 4.9 was not considered to provide a representative consideration of model performance.

As such, other monitoring locations were considered with which to verify the model. A review of the monitoring data identified five NO_2 diffusion tubes located on the considered road network and/or on roads where DfT Manual Count Point data were available to supplement the traffic data, with available data for 2018 and 2019. These diffusion tubes are:

- IACC-049 (Valley; 7.25km south-east of the proposed scheme);
- IACC-050 (Llanfachraeth; 7.87km east of the proposed scheme);
- IACC-059 (A1 Valley; 7.23km south-east of the proposed scheme);
- IACC-060 (A2 Llanfachraeth; 8km east of the proposed scheme); and,
- IACC-084 (Orthios Penrhost Lodge; 3.67km east of the proposed scheme).

Locations IACC-059 and IACC-060 were decommissioned in February 2018 and therefore did not have sufficient data capture (i.e. 75%) to be used for model verification in accordance with Defra guidance (2018). Location IACC-084 was only installed in November 2019 and again therefore did not have sufficient data capture to be used in model verification. Locations IACC-049 and IACC-050 were decommissioned in January 2019, however both had sufficient data capture in 2018 to be used for model verification.

DfT Count Point data for the A5025 (Site number: 50659) and A5 (Site numbers: 77036 and 77044) (DfT, 2021) were used to supplement the traffic count data provided by the Royal HaskoningDHV traffic consultants in order represent conditions in the area as accurately as possible. The derivation of the model adjustment factor used in the air quality assessment is detailed in **Table 9-6**.

Table 9-6 Model verification using IACC-049 and IACC-050 (2018)

	NO_2 Diffusion Tube Monitoring Location	
	IACC-049	**IACC-050**
2018 Monitored Total NO_2 ($\mu g.m^{-3}$)	13.1	8.8
2018 Background NO_2 ($\mu g.m^{-3}$)	4.79	4.06
Monitored Road Contribution NOx (total - background) ($\mu g.m^{-3}$)	15.1	8.48
Modelled Road Contribution NOx (excludes background) ($\mu g.m^{-3}$)	6.0	2.4
Adjustment Factor for Modelled Road Contribution	**2.68**	
Adjusted Modelled Road Contribution NOx ($\mu g.m^{-3}$)	16.0	6.3
Modelled Total NO_2 (based on empirical NOx / NO_2 relationship) ($\mu g.m^{-3}$)	13.55	7.62
2018 Monitored Total NO_2 ($\mu g.m^{-3}$)	13.1	8.8
% Difference [(modelled - monitored) / monitored] x 100	3%	-13%

The Root Mean Square Error (RMSE) of the model was $1\mu g.m^{-3}$. The RMSE is *"used to define the average error or uncertainty of the model"* and should be within the ideal value of $4\mu g.m^{-3}$ (i.e. 10% of the annual mean NO_2 Objective of $40\mu g.m^{-3}$), as specified in Defra guidance (Defra, 2018). If the RMSE value is higher than ± 25% of the Objective (i.e. $10\mu g.m^{-3}$), Defra guidance recommends that model inputs and verification should be revised. Model performance in this assessment was therefore considered to be suitable, as the RMSE was within the ideal value.

There is no monitoring of PM_{10} and $PM_{2.5}$ carried out along the road links included in the air quality assessment. Therefore, the derived NOx adjustment factor was applied to the modelled PM_{10} and $PM_{2.5}$ concentrations to provide a conservative assessment (in accordance with guidance in LAQM TG (16) (Defra, 2018)).

NOx to NO_2 conversion

NOx concentrations were predicted using the ADMS-Roads model. The modelled road contribution of NOx at the identified receptor locations was then converted to NO_2 using the NOx to NO_2 calculator (v8.1) (Defra, 2020d), in accordance with Defra guidance (Defra, 2018).

Background pollutant concentrations

The ADMS-Roads assessment requires the derivation of background pollutant concentration data that are factored to the year of assessment, to which contributions from the assessed roads are added. Background NO_2, PM_{10} and $PM_{2.5}$ concentrations were therefore obtained from Defra mapping (Defra, 2020a) for the 1 x 1km grid squares covering the study area and receptor locations for the 2018 and 2022 assessment years. The use of future year background pollutant concentrations was agreed with the IoACC during consultation.

Calculation of short-term pollutant concentrations

Defra guidance (Defra, 2018) sets out the method for the calculation of the number of days, in which the PM_{10} 24-hour Objective is exceeded, based on a relationship with the predicted PM_{10} annual mean concentration. The relevant calculation utilised in the prediction of short-term PM_{10} concentrations was:

$$No.\ 24\text{-}hour\ mean\ exceedances = -18.5 + 0.00145 \times annual\ mean^3 + (206/annual\ mean)$$

Research projects completed on behalf of Defra and the Devolved Administrations (Laxen and Marner, 2003; AEAT, 2008) concluded that the hourly mean NO_2 Objective is unlikely to be exceeded if annual mean concentrations are predicted to be less than $60\mu g.m^{-3}$. This value was therefore used as an annual mean equivalent threshold to evaluate likely exceedance of the hourly mean NO_2 Objective.

9.4.4.3 Construction phase vessel emissions assessment

A qualitative assessment of construction phase vessel emissions was undertaken. This took into account the anticipated number/type of vessels needed for construction, existing air quality conditions in the area, based on mapped background pollutant concentrations (Defra, 2020a), distances to the nearest human receptors and prevailing meteorological conditions.

The current best estimates of the number of vessel trips generated by the proposed scheme are detailed in **Table 3-1**. At any given moment during the construction phase, up to three barges may be in use for the transportation of armour units to the jack-up/floating barge, from which the Breakwater will be refurbished.

9.4.5 Assessment significance criteria

9.4.5.1 Construction phase dust and particulate matter assessment

The IAQM construction dust assessment methodology (IAQM, 2016) states that the dust emission magnitude should be combined with the sensitivity of the area to determine the risk of impacts prior to mitigation. Full details are provided in **Appendix 9-1**. Once appropriate mitigation measures have been identified, the significance of construction phase impacts can be determined. The aim is to prevent significant effects at receptors due to the implementation of effective mitigation.

With implementation of effective mitigation measures, generation of dust and particulate matter will be minimised such that the residual impacts can be considered to be '**not significant**' in accordance with guidance provided by the IAQM.

9.4.5.2 Construction phase road traffic emissions assessment

Human receptors

Guidance is provided by the IAQM and EPUK (IAQM and EPUK, 2017) on determining the magnitude and significance of a project's impact on local air quality. The guidance was developed specifically for use in planning and assessing air quality impacts associated with mixed-use and residential developments; however, due to the nature of the proposed scheme, the criteria detailed below were utilised in the assessment to provide consideration of the associated impacts.

The impact descriptors take account of the magnitude of changes in pollutant concentrations, and the concentration in relation to the Air Quality Objectives, are detailed in **Table 9-7**.

Table 9-7 Impact descriptors for individual receptors

Long term average concentration at receptor in assessment year	%change in concentration relative to the Air Quality Objective			
	1	2-5	6-10	>10
75% or less of Objective	Negligible	Negligible	Slight	Moderate
76 - 94% of Objective	Negligible	Slight	Moderate	Moderate
95 - 102% of Objective	Slight	Moderate	Moderate	Substantial
103 - 109 of Objective	Moderate	Moderate	Substantial	Substantial
110% or more of Objective	Moderate	Substantial	Substantial	Substantial
Note: Figures are to be rounded up to the nearest round number. Any value less than 1% after rounding (effectively less than 0.5%) will be described as "Negligible".				

Further to the determination of the impact at individual receptors, the guidance recommends that assessment is made of the overall significance of the impact from a development on local air quality. The overall significance will need to take into account the following factors:

- The existing and future air quality in the absence of the proposed scheme;
- The extent of current and future population exposure to the impacts; and,
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

The guidance also states that a judgement of the significance should be made by a competent professional who is suitably qualified. This air quality assessment and determination of the significance of the proposed scheme on local air quality was undertaken by members of the IAQM.

For the purposes of this assessment, any effects with a significance level of slight adverse or less have been concluded to be not significant in terms of the EIA Regulations. The above criteria relate to impacts based on annual mean pollutant concentrations. Short-term pollutant concentrations were compared to the relevant air quality Objectives; any predicted exceedances of these Objectives would be considered to constitute a significant impact.

Ecological receptors

Natural England (2018) and IAQM (2020) guidance on the assessment of road traffic impacts on designated ecological sites references the screening criteria contained in the DMRB guidance (Welsh Government *et al*., 2019) to determine whether a development may give rise to significant impacts on habitats. These criteria are detailed in **Table 9-5**.

The screening criteria (i.e. an increase in 1,000 AADT or 200 HDVs) are considered by Natural England to equate to a 1% change in the Critical Load or Level (Natural England, 2018) which is regarded as a threshold of insignificance. A change of this magnitude is likely to be within the natural range of fluctuations in deposition and is unlikely to be perceptible.

However, consideration should be given to impacts associated with a project or plan both in isolation, and in addition to other plans or projects which may affect the same designated site (an 'in-combination' assessment). The outcome of recent court judgements (notably the Wealden Judgement, 2017) has led to the requirement for the 1% criterion (or the screening criteria detailed in **Table 9-5**) to be applied to the in-combination impact to determine whether impacts remain insignificant, or whether further ecological investigation is required.

This assessment considered the impacts of the proposed scheme in addition to the in-combination effect of background traffic growth as well as cumulative traffic as a result of other developments within the study area.

Whilst Critical Levels apply regardless of habitat type (see **Table 9-2**), Critical Loads for habitat sites in the UK are habitat-specific and are published on the Air Pollution Information System (APIS) website (CEH, 2021). These are the maximum levels of nutrient nitrogen and acid deposition that can be tolerated without harm to the most sensitive features of these habitat sites. The consideration of impacts on Critical Loads is detailed in **Section 9.5.3.2**.

9.5 Baseline Environment

9.5.1 Overview

Holyhead is located on Holy Island on the west of the Isle of Anglesey, Wales. The main sources of air pollution in the area are from road traffic and vessels at Holyhead Port, approximately 1.7km south-east of the proposed scheme.

9.5.2 Local air quality management

The proposed scheme is not located within a statutory designated AQMA. The IoACC has not declared any AQMAs within Anglesey and the North Wales Authorities have not declared any AQMAs in northern Wales. The IoACC undertakes monitoring of NO_2 using passive diffusion tubes and particulate matter (PM_{10} and $PM_{2.5}$) using continuous analysers. None of the particulate matter monitoring is undertaken on Holy Island, and only one diffusion tube (IACC-081) is currently located on Holy Island. This diffusion tube is located 1.4km south-east of the proposed scheme in Marine Square; site details and monitoring data are provided in **Table 9-8**.

Table 9-8 NO_2 monitoring data for IACC-081

Site Ref	Location	Site Type	Coordinates		NO_2 Annual Mean		
			X	Y	2018	2019	2020
IACC-081	Marine Square, Holyhead	Roadside	224942	382866	19.7*	18.7	19.5**

*Data have been annualised (as per LAQM.TG16) as monitoring was only undertaken for 25% of 2018 (Wood, 2020)
**Provisional data provided by IoACC during consultation via email on 8th April 2021

IACC-081 was installed in October 2018, in relation to the proposed extension of Holyhead Port, and therefore 2018 data were only available for three months and have been annualised. As can be seen, NO_2 concentrations within the study area are well below (i.e. less than 75% of) the annual mean NO_2 Objective of 40µg.m^{-3}. This area is likely to experience higher pollutant concentrations than the proposed scheme area, as it is a roadside location and situated closer to Holyhead Port.

9.5.3 Identification of receptors

9.5.3.1 Construction phase dust and particulate matter assessment

The IAQM guidance states that a Detailed Assessment is required if there are human receptors located within 350m of the site boundary (i.e., the concrete batching plant at Salt Island) and/or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s). Ecological receptors within 200m of the concrete batching plant, or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s), are also identified at this stage.

The exact location of the concrete batching plant on Salt Island, Holyhead Port (if this location was chosen) has not been confirmed, therefore the worst-case location in terms of proximity to receptors (i.e., to the south of Salt Island) was assumed to provide a conservative assessment.

Receptor locations were identified within the study area as follows:

- There are human receptors within 350m of the anticipated worst-case location of the concrete batching plant; and,
- There are ecological receptors within 200m of the anticipated worst-case location of the concrete batching plant. The concrete batching plant would be located within the Anglesey Terns SPA and within 200m of the North Anglesey Marine SAC. It was determined that these sites were not likely to be sensitive to the effects of dust deposition (as detailed in **Table 9-9**), and therefore were scoped out of the construction dust assessment.

Table 9-9 Identification and sensitivity of ecological receptors

Ecological Receptor	Distance from Proposed Concrete Batching Plant on Salt Island	Sensitivity to dust deposition	Reason
Anglesey Terns SPA	0m (concrete batching plant would be within SPA boundary)	Not sensitive	The SPA is designated for foraging of the Arctic, Common, Roseate and Sandwich Tern. The SPA extends from predominantly the mean high-water mark out to between 10-20km from the shore (NRW, 2016). As the SPA is below the mean high-water mark, it is therefore not sensitive to dust deposition.

Ecological Receptor	Distance from Proposed Concrete Batching Plant on Salt Island	Sensitivity to dust deposition	Reason
North Anglesey Marine SAC	Approximately 20m	Not sensitive	The SAC has been designated for the protection of the harbour porpoise. The site extends from the Mean Low Water (MLW) level from the Anglesey Coast to 100m below sea level (JNCC, 2017). As the SAC is below the MLW level, it is therefore not sensitive to dust deposition.

A Detailed Assessment was therefore required to assess the impact of dust during the construction phase at human receptors only. The distance boundaries for the construction phase assessment are detailed in **Figure 9-2**.

9.5.3.2 Construction phase road traffic emissions assessment

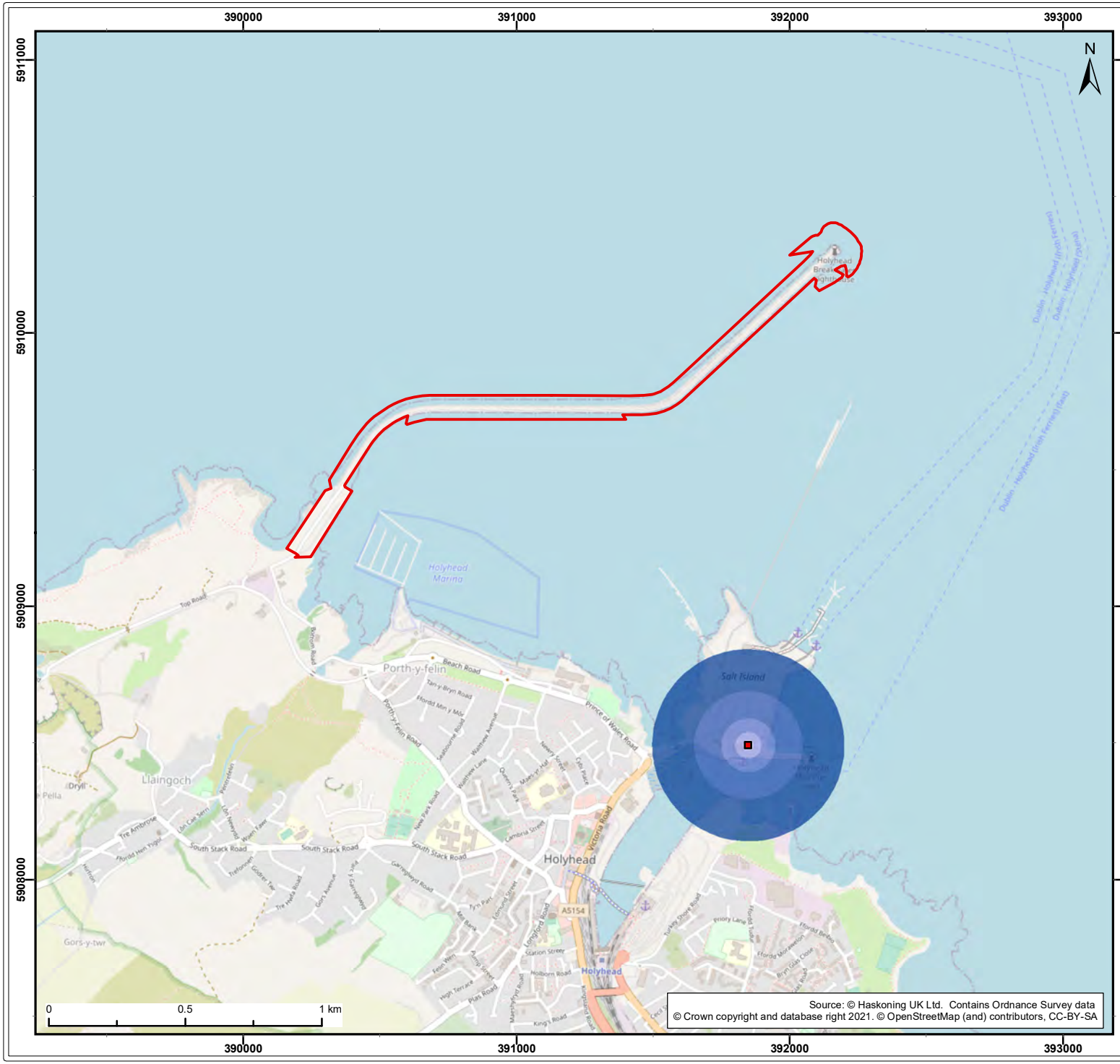
Human receptors

Existing sensitive receptor locations were identified within the air quality study area for consideration in the assessment. Predicted changes in changes in NO_2, PM_{10} and $PM_{2.5}$ concentrations as a result of the proposed scheme-generated traffic were calculated at these locations.

The screening criteria detailed in **Table 9-5** were exceeded on all links considered in the assessment, as a result of construction of the proposed scheme (see **Appendix 9-2** for traffic data). Sensitive human receptor locations were selected based on their proximity to road links affected by the proposed scheme, where the potential effect of scheme-generated traffic emissions on local air pollution would be most significant. The sensitive receptor locations are detailed in **Table 9-10** and shown in **Figure 9-3**.

Table 9-10 Sensitive human receptor locations for the construction phase road traffic emissions assessment

Receptor ID	Location	Grid Reference (m)		Height (m)
		X	Y	
R1	Fair View, Holyhead	224990	382908	1.5
R2	Victoria Rd, Holyhead	224912	382838	1.5
R3	4 Stanley Crescent, Holyhead	224833	382759	1.5
R4	Hen lard Goed, Holyhead	225055	382284	1.5
R5	2 Turkey Shore Rd, Holyhead	224940	382165	1.5
R6	15 Llanfawr Road, Holyhead	224879	382144	1.5
R7	5 London Rd, Holyhead	224909	382039	1.5
R8	2 Kingsland Rd, Holyhead	224716	382027	1.5
R9	6 Arthur St E, Holyhead	224978	381627	1.5
R10	4 Cyttir Rd, Holyhead	225100	381466	1.5
R11	Llain Bryniau, Holyhead	225214	381458	1.5



Legend:

- Holyhead Breakwater Refurbishment Scheme
- Potential Salt Island Batching Plant

Construction Phase Dust and Particulate Matter Distance Boundaries

- 20m
- 50m
- 100m
- 200m
- 350m

Client:	Project:
Isle of Anglesey County Council	Holyhead Breakwater Refurbishment Scheme

Title: Construction Phase Dust and Particulate Matter Distance Boundaries

Figure: 9.2 | Drawing No: PB9014-200-016

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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Co-ordinate system: WGS 1984 UTM Zone 30N

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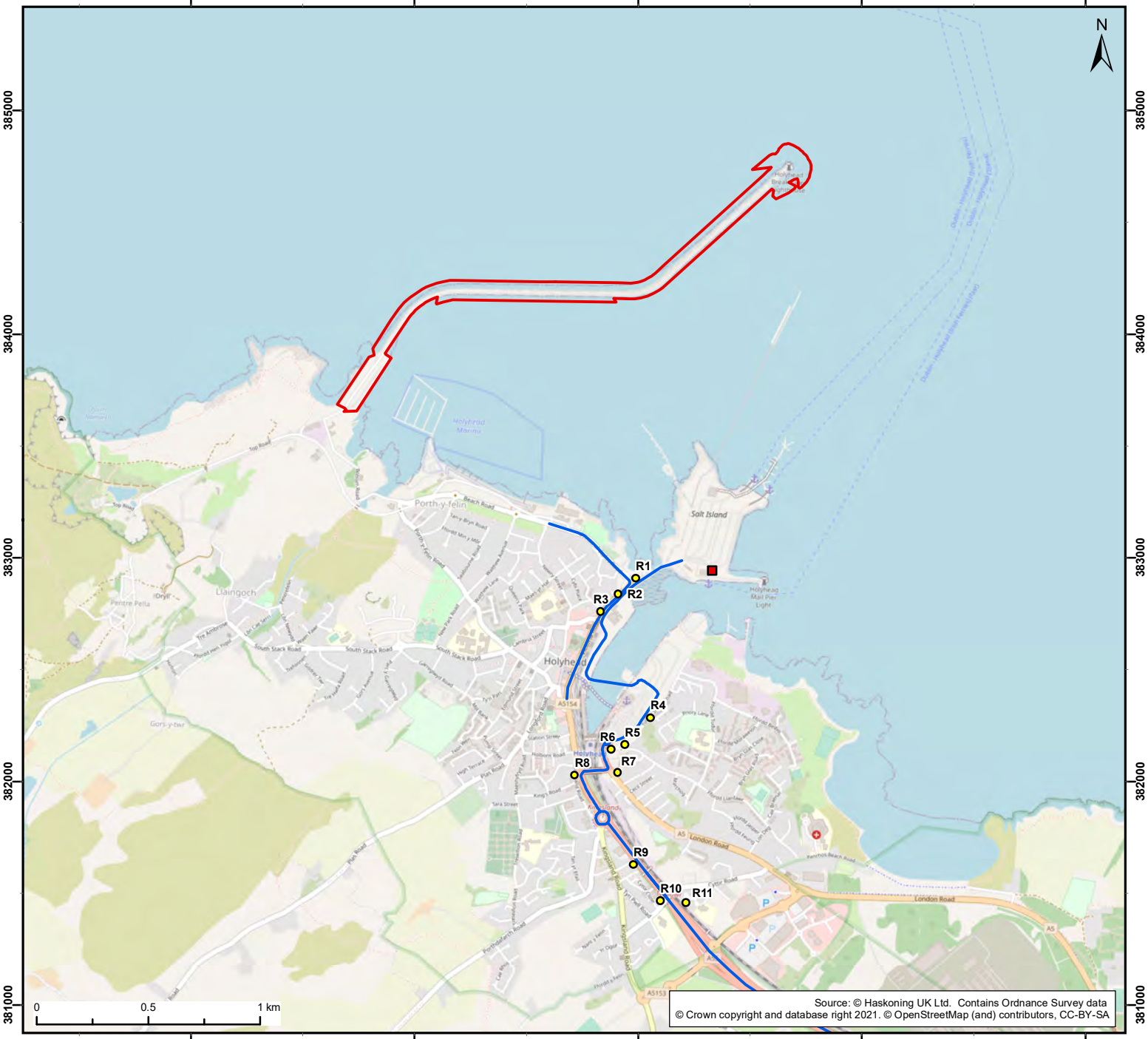

Legend:

- Holyhead Breakwater Refurbishment Scheme
- Potential Salt Island Batching Plant
- Human Receptors
- Modelled Road Links

Client:	Project:
Isle of Anglesey County Council	Holyhead Breakwater Refurbishment Scheme

Title:

Human Receptor Locations for the Construction Phase Road Traffic Emission Assessment

Figure:	Drawing No:
9.3	PB9014-200-017

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Ecological receptors

There are three statutory designated ecological sites within 200m of road links experiencing an increase in traffic flows as a result of proposed scheme: the North Anglesey Marine SAC; the Anglesey Terns SPA; and the Beddmanarch-Cymyran SSSI. The SAC and SPA are located within 200m of the Port Access Road leading to Salt Island and a section of the A55 is within the SSSI. It is anticipated that the A55 will be the main transport route of construction material by road traffic vehicles during construction of the proposed scheme.

Evaluation of data on the APIS website (CEH, 2021) for the North Anglesey Marine SAC show that the SAC is not sensitive to air quality impacts (i.e. not sensitive to NOx, nutrient nitrogen or acid deposition). Details on the Anglesey Terns SPA are not available on APIS, as it is only a potential site, however it was also assumed to not be sensitive to air quality impacts given its marine designation for birds and that it extends from mean high water mark outwards from the shore (NRW, 2016).

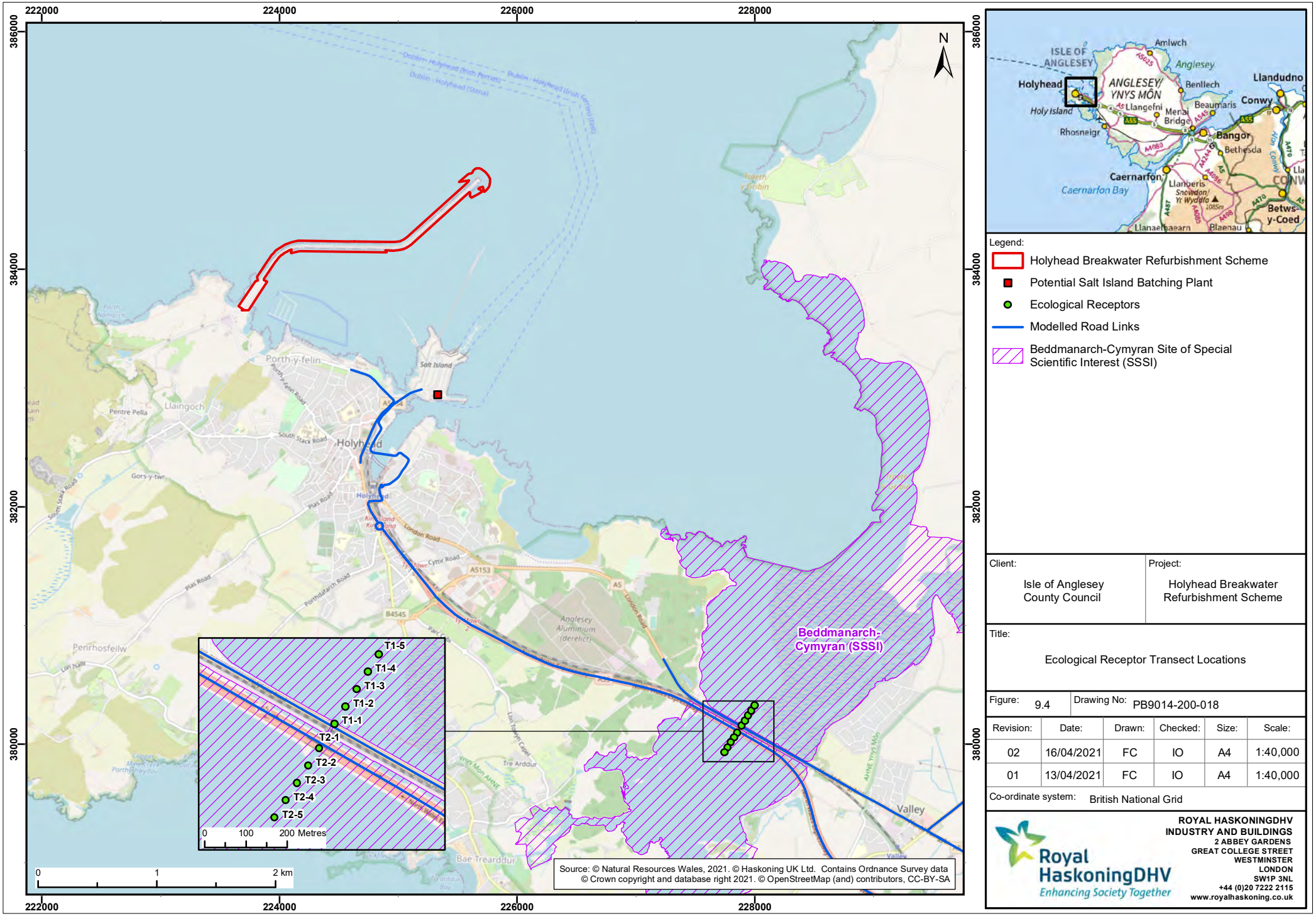
Evaluation of data on the APIS website (CEH, 2021) showed that the broad habitat types 'Scrub' and 'Coastal Heath Land' were the only habitats sensitive to nutrient nitrogen and/or acid deposition within the Beddmanarch-Cymyran SSSI. However, these habitats were not found within the SSSI habitat maps on Defra's MAGIC Map Application (Defra, 2021) within 200 m of the A55, therefore the effect of traffic vehicle emissions on Critical Loads was not considered in the assessment.

The potential impacts on Critical Levels of NOx and NH_3 (as detailed in **Table 9-2**) were considered within the Beddmanarch-Cymyran SSSI. Two transects were included in the ADMS-Roads model to consider the impact of vehicle emissions at 50m intervals up to 200m back from the roads. The IAQM guidance document 'Guidance on the assessment of air quality impacts on nature conservation sites' (IAQM, 2020) states that *"concentrations should not however be predicted too close to the roadway, since such predictions can be unreliable and may not represent areas of relevance to the assessment. It is recommended, for example, that predictions are not made closer than 2 m from the edge of a road."* As per the guidance, the first transect locations within the Beddmanarch-Cymyran SSSI were located 2m from the A55.

The transect details are provided in **Table 9-11** and **Figure 9-4**.

Table 9-11 Ecological receptor transect

Designated Ecological Site	Transect ID	Grid Reference		Direction from Road
		X (m)	Y (m)	
Beddmanarch-Cymyran SSSI	T1-1	227892	380156	South-west to north-east from A55
	T1-2	227919	380199	
	T1-3	227946	380241	
	T1-4	227973	380283	
	T1-5	228000	380325	
	T2-1	227855	380097	North-east to south-west from A55
	T2-2	227828	380055	
	T2-3	227801	380013	
	T2-4	227774	379971	
	T2-5	227747	379929	



Legend:

- Holyhead Breakwater Refurbishment Scheme
- Potential Salt Island Batching Plant
- Ecological Receptors
- Modelled Road Links
- Beddmanarch-Cymyran Site of Special Scientific Interest (SSSI)

Client:	Project:
Isle of Anglesey County Council	Holyhead Breakwater Refurbishment Scheme

Title: Ecological Receptor Transect Locations

Figure: 9.4 | Drawing No: PB9014-200-018

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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Co-ordinate system: British National Grid

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9.5.3.3 Construction phase vessel emissions assessment

Human receptors

The closest human receptors to the proposed scheme are located off Bottom Road, approximately 90m and 125m south of Soldier's Point. Other human receptors in close proximity to the proposed scheme include houses along Top Road (250m south), further along Bottom Road (310m south) and the apartments in the Holyhead Marina (400m south-east).

Ecological receptors

There are three designated ecological sites within the study area. North Anglesey Marine SAC and Anglesey Terns SPA are located at the edge of the proposed scheme, and within the area vessels will be manoeuvring during construction, and the Holy Island Coast SPA and SSSI is located 130m west at its closest point to the proposed scheme; however, this distance increases to up to 2.2km as works continue along the Breakwater. As mentioned in the previous section, the North Anglesey Marine SAC is not sensitive to air quality impacts (i.e. not sensitive to NOx, nutrient nitrogen or acid deposition) and it has also been assumed that the Anglesey Terns SPA is also not be sensitive to air quality impacts.

The Holy Island Coast SPA is designated for reproducing and wintering of the Red-billed chough (CEH, 2020) and the Holy Island Coast SSSI is designated for vegetated sea cliffs of the Atlantic and Baltic Coasts and European Dry Heath (JNCC, no date). Defra's MAGIC Map Application (Defra, 2021) was used to determine which habitats were found in close proximity to the construction works, and only intertidal substrate (i.e. littoral sediment) was identified, and this habitat is not sensitive to air pollution impacts.

A small section of the Holyhead Breakwater Quarry/Chwarel Morglawdd Local Wildlife Site (LWS) (which comprises three sites) is also located immediately adjacent to Soldier's Point and this part of the LWS is an important feeding and nesting area for birds. The three sites that make up the LWS consists of a disused quarry and a small area of dry heathland and a series of small enclosures. Habitats in the section adjacent to the proposed scheme may be sensitive to air pollution impacts and therefore this LWS was considered in the construction phase vessel emission assessment.

9.5.4 Background pollutant concentrations

9.5.4.1 Construction phase road traffic emissions assessment

Human receptors

Background pollutant concentrations of NO_2, PM_{10} and $PM_{2.5}$ were obtained from the air pollutant background concentration maps provided by Defra (2020b) for the grid squares covering the study area. 2018 (verification/base year assessment) and 2022 (earliest year of construction) background concentrations were obtained from the latest 2018-based maps. The background concentrations used in the assessment are detailed in **Table 9-12**.

Table 9-12 Background pollutant concentrations for human receptors in the construction phase road traffic emissions assessment

Receptor ID	Centre of Grid Square (m)		2018 Background Concentration (µg.m-3)			2022 Background Concentration (µg.m-3)		
	X	Y	NO2	PM10	PM2.5	NO2	PM10	PM2.5
R1-R3, R5-R8	224500	382500	7.0	11.5	7.5	6.0	10.9	7.0
R4	225500	382500	8.6	10.0	6.6	7.1	9.3	6.1

Receptor ID	Centre of Grid Square (m)		2018 Background Concentration (µg.m-3)			2022 Background Concentration (µg.m-3)		
	X	Y	NO2	PM10	PM2.5	NO2	PM10	PM2.5
R9	224500	381500	5.7	10.1	6.6	4.8	9.5	6.2
R10 and R11	225500	381500	6.9	10.5	6.7	5.7	9.9	6.2

As detailed in **Table 9-12**, background pollutant concentrations were 'well below' (i.e. less than 75% of), and no greater than 50% of, the relevant air quality Objectives/targets (detailed in **Table 9-1**) and are predicted to decrease into the future.

Ecological receptors

Background concentrations of NOx for the transects included in the Beddmanarch-Cymyran SSSI were also obtained from the air pollutant concentration maps provided by Defra for 2022 (Defra, 2020b). Average background concentrations of NH_3 for the designated sites were obtained from the APIS website (CEH, 2021). Ambient monitoring of NH_3 is undertaken as part of the National Ammonia Monitoring Network (NAMN) at 85 locations in the UK; these data are interpolated across the UK by the Concentration Based Estimated Deposition (CBED) model at a 5km resolution. The CEH uses the national transport model (FRAME) to spatially distribute ammonia concentrations which are calibrated to the annual ammonia measurements. The APIS website provides these estimates of NH_3 concentrations as a three-year average (2017-2019) NH_3 concentration. Background concentrations used in the ecological assessment are provided in **Table 9-13**.

Table 9-13 Background NOx concentrations used in the construction phase road traffic emissions assessment

Designated Ecological Site	Grid Square (m)		NOx Background Concentration (µg.m^{-3})	NH_3 Background Concentration (µg.m^{-3})
	X	Y		
Beddmanarch-Cymyran SSSI	227500	380500	5.2	0.97
	227500	379500	4.0	0.92

As detailed in **Table 9-13**, background pollutant concentrations are anticipated to be well below the NOx and NH_3 Critical Level Objectives of 30µg.m^{-3} and 3µg.m^{-3} respectively.

9.5.4.2 Construction phase vessel emissions assessment

Background pollutant concentrations of NO_2, PM_{10}, $PM_{2.5}$ SO_2 and CO were obtained from the air pollutant background concentration maps provided by Defra (2020b) for the grid squares covering the study area. 2022 background concentrations were obtained from the latest 2018-based maps, with the exception of SO_2 and CO for which the latest mapped data provided by Defra is from 2001. The background concentrations used in the assessment are detailed in **Table 9-14**.

Table 9-14 Background pollutant concentrations for human receptors

Grid Square (X, Y)	Defra Mapped Background Concentration (µg.m^{-3})				
	NO_2	PM_{10}	$PM_{2.5}$	SO_2	CO
223500, 383500	3.90	8.04	5.32	2.18	142
223500, 384500	3.75	8.04	5.12	N/A	N/A
224500, 383500	6.22	7.99	5.68	N/A	N/A
224500, 384500	4.26	8.75	5.17	N/A	N/A

Grid Square (X, Y)	Defra Mapped Background Concentration (µg.m^{-3})				
	NO_2	PM_{10}	$PM_{2.5}$	SO_2	CO
225500, 384500	5.34	9.42	5.18	N/A	N/A

As can be seen from **Table 9-14**, background concentrations of all pollutants in the study area were well below (i.e. less than 75% of) their respective annual mean air quality Objectives.

9.5.5 Baseline road traffic emission assessment

The ADMS-Roads model was used to estimate contributions of vehicle exhaust emissions to annual and short-term NO_2, $PM_{2.5}$ and PM_{10} concentrations for the 'base year' (2018) and opening year 'without proposed scheme' (2022) scenarios considered in the assessment. The 24-hour AADT flows and HDV percentages used in the assessment are detailed in **Appendix 9-2**. **Table 9-15** provides the results of the baseline assessment, which include modelled road traffic and background contributions.

Table 9-15 Predicted baseline NO_2, $PM_{2.5}$ and PM_{10} annual mean concentrations (µg.m^{-3}) at human receptor locations

Receptor	Annual Mean NO_2 (µg.m^{-3})	PM_{10}		Annual Mean $PM_{2.5}$ (µg.m^{-3})
		Annual Mean (µg.m^{-3})	Number of days >50 µg.m^{-3}	
Scenario 1: Base Year (2018)				
R1	13.0	12.2	1	7.9
R2	17.7	12.9	1	8.4
R3	15.5	12.7	1	8.2
R4	13.2	10.5	3	6.9
R5	12.8	12.1	1	7.9
R6	17.5	12.5	1	8.2
R7	11.4	12.0	1	7.8
R8	15.4	12.4	1	8.1
R9	12.8	11.2	2	7.3
R10	14.9	12.0	1	7.6
R11	9.8	11.0	2	7.0
Scenario 2: Without proposed scheme (2022)				
R1	12.2	12.0	1	7.8
R2	15.6	12.8	1	8.2
R3	14.3	12.5	1	8.1
R4	13.4	10.3	3	6.8
R5	12.8	11.9	1	7.7
R6	16.3	12.4	1	8.0
R7	11.5	11.7	1	7.6
R8	14.5	12.1	1	7.8
R9	11.2	10.9	2	7.0
R10	12.6	11.8	1	7.3
R11	9.0	10.6	3	6.7
Air Quality Objective	**Annual mean NO_2 and PM_{10} Objective of 40 µg.m^{-3}** **Annual Mean $PM_{2.5}$ target value of 25 µg.m^{-3}** **No greater than 35 exceedances of the daily mean PM_{10} Objective of 50 µg.m^{-3}**			

Pollutant concentrations were predicted to be below the annual mean Objectives in the 2018 and 2022 baseline scenarios at all receptors. In accordance with Defra guidance (Defra, 2018), it may be assumed that exceedances of the 1-hour mean Objective for NO_2 are unlikely as the predicted annual mean concentrations are less than 60µg.m^{-3}. The short-term PM_{10} Objective was predicted to be met at all modelled locations with fewer than 35 exceedances of the daily mean Objective of 50µg.m^{-3}.

9.5.6 Anticipated trends in baseline conditions

Air pollution within the area is expected to be dominated by emissions from road vehicles and vessels. The quantity and composition of vehicle emissions is dependent on the type of fuel used, engine type, size and efficiency, vehicle speeds and the type of exhaust emissions abatement equipment employed. Fuels used in shipping are subject to increasingly stringent regulation in terms of emissions of pollutants such as NOx and SO_2. It is therefore expected that air quality will improve over time with the evolution of the vehicle fleet, the use of alternative fuel vehicles, and regulations on shipping emissions. As can been seen from **Table 9-12**, background pollutants are anticipated to decrease into the future from the already low baseline.

As previously mentioned, the projections in the 2018 reference year background maps and associated tools are based on assumptions which were current before the Covid-19 outbreak in March 2020 in the UK. Consequently, these tools do not reflect short or longer term impacts on emissions in 2020 and beyond resulting from behavioural change during the national or local lockdowns (Defra, 2020a).

9.6 Prediction of Potential Effects During Construction

9.6.1 Worst-case scenario

The realistic worst-case parameters associated with the proposed scheme with respect to air quality are identified in **Table 9-16**. Further details on different construction scenarios are provided in **Chapter 3** Description of the Proposed Scheme.

Table 9-16 Worst-case parameters for the air quality assessment

Impact	Notes
Construction phase dust and particulate matter emissions	The location of the concrete batching plant for the proposed scheme has yet to be confirmed. In order to provide a conservative assessment, it was assumed that the batching plant would be located on Salt Island, Holyhead Port at a location in the closest proximity to receptors.
Construction phase road traffic emissions	The delivery method of construction materials (i.e. either by barge or road transport) to the concrete batching plant, were it to be located on Salt Island, has yet to be confirmed. In order to provide a conservative assessment, it was assumed that the construction material for the concrete batching plant on Salt Island would be delivered by road.
Construction phase vessel emissions	Completion of the refurbishment works in a single construction period was considered the worst-case scenario for construction phase vessels, as construction works would be undertaken over a slightly shorter period (i.e. March 2022 to January 2024) than if undertaken over three phases (see Chapter 3 Description of the Proposed Scheme for more details).

9.6.2 Construction phase dust and particulate matter

A qualitative assessment of construction phase dust and PM_{10} emissions was carried out in accordance with the IAQM guidance (IAQM, 2016). The methodology for the dust assessment is provided in **Appendix 9-1**.

The construction works associated with the proposed scheme have the potential to impact on local air quality conditions as follows:

- Dust emissions generated by demolition, excavation, construction and earthwork activities associated with the construction of the proposed scheme, have the potential to cause nuisance to, and soiling of, sensitive receptors; and,
- Emissions of NO_2 and PM_{10} from non-road mobile machinery (NRMM) operating within the proposed scheme site, have the potential to adversely impact local air quality at sensitive receptors in close proximity to the works.

As described in **Section 9.4.4.1**, emissions from NRMM have not been considered in the assessment, but the relevant control and management measures are included in **Section 9.6.2.5**.

9.6.2.1 Step 1: screen the need for a detailed assessment

The IAQM guidance (2016) states that a detailed assessment is required if there are human receptors located within 350m and ecological sites within 200m (internal Natural England guidance) of the site boundary (i.e., the concrete batching plant). There are human receptors present within 350m and as previously stated, the Anglesey Terns SPA and North Anglesey Marine SAC are located within 200m of the concrete batching plant; however, both ecological sites were not considered to be sensitive to dust deposition, as detailed in **Table 9-9**, and therefore were not considered in this assessment. A Detailed Assessment was undertaken for human receptors only.

This assessment considered the worst-case scenario based on the activities to be undertaken closest to sensitive receptors

9.6.2.2 Step 2A: define the potential dust emission magnitude

The IAQM guidance (2018) recommends that the dust emission magnitude is determined for demolition, earthworks, construction and trackout. It is anticipated that no buildings will be demolished as part of construction of the concrete batching plant and the concrete batching plant will be located on existing hardstanding; therefore, demolition and earthworks have been scoped out of the assessment.

The dust magnitudes for construction and trackout activities were determined in accordance with the IAQM methodology and are summarised in **Table 9-17**.

Table 9-17 Dust emission magnitude for the site

Construction Activity	Dust Magnitude	Justification
Construction	Large	There will be onsite concrete batching which is considered to be a dusty activity.
Trackout	Large	>50 HDV outward movements in any one day

The potential dust emission magnitude for the concrete batching plant as part of the proposed scheme was determined using the criteria in Table 9.1.1 in **Appendix 9-1**.

The risk of potential impacts of construction phase dust and particulate matter emissions during construction and trackout is used to recommend appropriate mitigation measures. The dust magnitude for construction activities associated with the concrete batching plant at Salt Island was categorised as **large** for both construction and trackout.

9.6.2.3 Step 2B: define the sensitivity of the area

The sensitivity of human receptors to dust soiling and health effects of PM_{10} associated with construction and trackout activities of the concrete batching plant as part of the proposed scheme were determined and are summarised in **Table 9-18**.

Sensitivity of people to dust soiling

- Construction: There are >1 medium sensitivity receptors (i.e. places of work) within 20m and 1-10 high sensitivity receptors (i.e. residential properties) within 350m of the concrete batching plant. The sensitivity is therefore **medium**.
- Trackout: There are between >10 high sensitivity receptors within 20m of the access roads, up to 500m from the concrete batching plant. The sensitivity is therefore **high**.

Sensitivity of people to health effects of PM_{10}

- Construction: The annual background PM_{10} concentration at the site is less than 24µg.m^{-3}, there are >1 medium sensitivity receptors (i.e. Harbour Office) within 100m and 1-10 high sensitivity receptors (i.e. residential properties) within 350m of the concrete batching plant. The sensitivity is therefore **low**.
- Trackout: The annual mean background PM_{10} concentration at the site is less than 24µg.m^{-3} and there are >10 high sensitivity receptors within 20m of the access roads up to 500m from the concrete batching plant. The sensitivity is therefore **low**.

Table 9-18 Outcome of defining the sensitivity of the area

Potential Impact	Sensitivity of the Surrounding Area	
	Construction	Trackout
Dust Soiling	Medium	High
Human Health	Low	Low

9.6.2.4 Step 2C: define the risk of impact

The dust emission magnitude detailed in **Table 9-17** is combined with the sensitivity of the area detailed in **Table 9-18** to determine the risk of impacts with no mitigation applied. The risks concluded for dust soiling and human health impacts are provided in **Table 9-19**.

Table 9-19 Summary dust risk table to define site-specific mitigation

Potential Impact	Risk	
	Construction	Trackout
Dust Soiling	Medium risk	High risk
Human Health	Low risk	Low risk

As detailed in **Table 9-19**, the worst case risk of impact as a result of construction activities was a '**high risk**' as a result of dust soiling from trackout. If the materials were to be delivered to the concrete batching plant via barge, the worst-case risk of impact would be a '**medium risk**', as no trackout activities would occur under this scenario.

9.6.2.5 Step 3: site specific mitigation

Step three of the IAQM guidance identifies appropriate site-specific mitigation. These measures are related to the site risk for each activity. Whilst concrete batching plants used on construction sites are exempt from the Environmental Permitting Regulations, such equipment should be operated in accordance with the latest version of Process Guidance Note 3/1 'Statutory guidance for blending, packing, loading, unloading and use of cement' (Defra, 2012).

The dust assessment determined that there was a **high risk** of impacts resulting from construction activities without the implementation of mitigation measures. If materials were to be delivered to the concrete batching plant via barge, the worst-case risk of impact would reduce to a **medium risk**. Additional guidance is provided by the IAQM in relation to dust and air mitigation measures. It is recommended that the good practice measures outlined in the IAQM guidance are followed.

The recommendations below should be detailed in a Dust Management Plan (DMP) or CEMP to prevent or minimise the release of dust entering the atmosphere and/or being deposited on nearby receptors. Particular attention should be paid to operations which must unavoidably take place close to the site boundary. The effective implementation of the DMP/CEMP will ensure that any potential dust releases associated with the construction phase will be reduced.

Highly recommended mitigation measures

A list of mitigation measures that are highly recommended for a **high-risk** site by the IAQM are provided below. If materials were delivered to the concrete batching plant via barge and not HDV, the site would be of a **medium risk** and the mitigation measures marked with an asterix (*) would be considered desirable mitigation measures and those recommended for 'trackout' would no longer be required.

Communications

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary and the head or regional office contact information. This may be the environment manager/engineer or the site manager.
- Display the head or regional office contact information.

Dust management

- Develop and implement a DMP/CEMP, which may include measures to control other emissions, approved by the IoACC.
- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
- Make the complaints log available to the IoACC when asked.
- Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the logbook.
- *Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100m of site boundary, with cleaning to be provided if necessary.
- Carry out regular site inspections to monitor compliance with the DMP/CEMP, record inspection results and make an inspection log available to the IoACC when asked.

- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
- Plan the site layout so that machinery and dust causing activities are located away from receptors, as far as is practicable.
- Erect solid screens or barriers around dusty activities, or the site boundary, that are at least as high as any stockpiles on site.
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
- Take measures to control site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible.
- Cover, seed or fence stockpiles to prevent wind whipping.
- Ensure all vehicles switch off engines when stationary – no idling vehicles.
- *Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
- Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable.
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
- *Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).
- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/ mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
- Bonfires and burning of waste materials should not be permitted.

Measures specific to construction

- *Avoid scabbling (roughening of concrete surfaces) if possible.
- Ensure sand and other aggregates are stored in silos, bunded areas or in a controlled and well-managed manner.
- *Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
- *For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust release.

Measures specific to trackout

- *Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.

- *Avoid dry sweeping of large areas.
- *Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- *Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- *Record all inspections of haul routes and any subsequent action in a site logbook.
- *Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- *Install a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- *Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
- *Locate site access gates at least 10m from receptors where possible.

Measures specific to NRMM

NRMM and plant would be well maintained. If any emissions of dark smoke occur, then the relevant machinery should stop immediately, and any problem rectified. In addition, the following controls should apply to NRMM:

- All NRMM should use fuel equivalent to ultralow sulphur diesel (fuel meeting the specification within EN590:2004);
- All NRMM should comply with the appropriate NRMM emission standards;
- All NRMM will be fitted with Diesel Particulate Filters (DPF) conforming to defined and demonstrated filtration efficiency (load/duty cycle permitting);
- The ongoing conformity of plant retrofitted with DPF, to a defined performance standard, should be ensured through a programme of onsite checks; and,
- Fuel conservation measures should be implemented, including instructions to (i) throttle down or switch off idle construction equipment; (ii) switch off the engines of trucks while they are waiting to access the site and while they are being loaded or unloaded and (iii) ensure equipment is properly maintained to ensure efficient fuel consumption.

9.6.2.6 Step 4: determine significant effects

With the implementation of the above mitigation measures, the residual impacts from the construction phase of the proposed scheme are considered to be **not significant**, in accordance with IAQM guidance (IAQM, 2016).

9.6.3 Road traffic emissions

9.6.3.1 Human receptors

The 24-hour AADT flows and HDV percentages used in the air quality assessment scenarios are detailed in **Appendix 9-2**. Predicted NO_2, $PM_{2.5}$ and PM_{10} concentrations for the 2022 construction 'with proposed scheme' are detailed in **Table 9-20**, which include the contribution from the modelled road network, cumulative projects (e.g. the Holyhead Port Expansion and Morlais (West Anglesey) Demonstration Zone projects) and the relevant future year background pollutant concentrations. Concentrations for the 'without proposed scheme' scenario and the predicted change in NO_2, $PM_{2.5}$ and PM_{10} concentrations, as a result of the proposed scheme, are also shown for comparison purposes.

Table 9-20 Predicted pollutant concentrations and impact of development for construction of the proposed scheme (2022) at identified human receptor locations

Receptor	Total Predicted Concentrations (2022)				
	Without proposed scheme (µg.m^{-3})	With proposed scheme (µg.m^{-3})	Change (µg.m^{-3})	Change as % of Objective	Impact Descriptor
NO_2 Annual Mean – Objective = 40 µg.m^{-3}					
R1	12.2	12.7	0.6	1%	Negligible
R2	15.6	16.3	0.7	2%	Negligible
R3	14.3	14.9	0.5	1%	Negligible
R4	13.4	13.9	0.5	1%	Negligible
R5	12.8	13.4	0.6	1%	Negligible
R6	16.3	17.3	1.0	2%	Negligible
R7	11.5	11.9	0.4	1%	Negligible
R8	14.5	15.2	0.6	2%	Negligible
R9	11.2	11.6	0.4	1%	Negligible
R10	12.6	12.9	0.3	1%	Negligible
R11	9.0	9.1	0.1	0%	Negligible
PM_{10} Annual Mean – Objective = 40µg.m^{-3}					
R1	12.0	12.1	0.1	0%	Negligible
R2	12.8	12.9	0.1	0%	Negligible
R3	12.5	12.6	0.1	0%	Negligible
R4	10.3	10.4	0.1	0%	Negligible
R5	11.9	12.0	0.1	0%	Negligible
R6	12.4	12.5	0.1	0%	Negligible
R7	11.7	11.7	0.1	0%	Negligible
R8	12.1	12.2	0.1	0%	Negligible
R9	10.9	11.0	0.1	0%	Negligible
R10	11.8	11.9	0.1	0%	Negligible
R11	10.6	10.7	0.1	0%	Negligible
PM_{10} Short Term – No. of days >50µg.m^{-3}					
R1	1	1	0	-	-
R2	1	1	0	-	-
R3	1	1	0	-	-
R4	3	3	0	-	-
R5	1	1	0	-	-
R6	1	1	0	-	-
R7	1	1	0	-	-

Receptor	Total Predicted Concentrations (2022)				
	Without proposed scheme (µg.m^{-3})	With proposed scheme (µg.m^{-3})	Change (µg.m^{-3})	Change as % of Objective	Impact Descriptor
R8	1	1	0	-	-
R9	2	2	0	-	-
R10	1	1	0	-	-
R11	3	3	0	-	-
$PM_{2.5}$ Annual Mean – Objective = 25µg.m^{-3}					
R1	7.8	7.8	0.1	0%	Negligible
R2	8.2	8.3	0.1	0%	Negligible
R3	8.1	8.1	0.1	0%	Negligible
R4	6.8	6.8	0.1	0%	Negligible
R5	7.7	7.8	0.1	0%	Negligible
R6	8.0	8.1	0.1	0%	Negligible
R7	7.6	7.6	0.0	0%	Negligible
R8	7.8	7.9	0.1	0%	Negligible
R9	7.0	7.1	0.1	0%	Negligible
R10	7.3	7.4	0.1	0%	Negligible
R11	6.7	6.7	0.0	0%	Negligible

As detailed in **Table 9-20**, predicted pollutant concentrations were predicted to be below the respective air quality Objectives for all pollutants in 2022. The change in concentrations was predicted to give rise to a **negligible** impact at all receptors, in accordance with IAQM and EPUK guidance (IAQM and EPUK, 2017).

The assessment showed that all NO_2 concentrations were below 60µg.m^{-3} and therefore, in accordance with Defra guidance in LAQM.TG (16) (Defra, 2018), the 1-hour mean Objective is unlikely to be exceeded. The short-term PM_{10} Objective was predicted to be met at all modelled locations with fewer than 35 exceedances of the daily mean Objective of 50 µg.m^{-3}, and no change in the number of days exceeding 50µg.m^{-3}.

Impact significance

The assessment determined that construction traffic impacts upon local air quality at human receptors are **not significant** based upon:

- The impact of the proposed scheme is likely to have a negligible impact on human receptors considered in the assessment;
- The predicted concentrations also included the contribution from traffic flows associated with committed developments;
- Background concentrations are conservative as they included the maximum predicted shipping contributions from the Holyhead Port Expansion, as there may be a temporal overlap between the two schemes; and,
- The development was not predicted to cause a breach of any of the air quality Objectives at any identified sensitive receptor location.

9.6.3.2 Ecological receptors

Critical Level impacts upon designated ecological sites are detailed in **Table 9-21** and **Table 9-22**.

Table 9-21 Predicted annual mean NOx concentrations at designated ecological site in 2022

Transect ID	Annual mean NOx Concentration				
	NOx Conc. without proposed scheme ($\mu g.m^{-3}$)	NOx Conc. with proposed scheme ($\mu g.m^{-3}$)	Change ($\mu g.m^{-3}$)	Change as % of CL	Total NOx/CL
T1-1	18.6	18.7	0.10	0%	62%
T1-2	9.1	9.1	0.06	0%	30%
T1-3	7.7	7.7	0.04	0%	26%
T1-4	7.1	7.1	0.03	0%	24%
T1-5	6.7	6.7	0.03	0%	22%
T2-1	26.2	26.6	0.45	2%	89%
T2-2	10.8	10.9	0.11	0%	36%
T2-3	8.7	8.8	0.07	0%	29%
T2-4	6.6	6.6	0.05	0%	22%
T2-5	6.1	6.1	0.04	0%	20%

Table 9-22 Predicted annual mean NH_3 concentrations at designated ecological site in 2022

Transect ID	Annual Mean NH_3 Concentration				
	NH_3 Conc. without proposed scheme ($\mu g.m^{-3}$)	NH_3 Conc. with proposed scheme ($\mu g.m^{-3}$)	Change ($\mu g.m^{-3}$)	Change as % of CL	Total NH_3/CL
T1-1	2.0	2.1	0.04	1%	69%
T1-2	1.3	1.3	0.02	1%	44%
T1-3	1.2	1.2	0.01	0%	40%
T1-4	1.1	1.1	0.01	0%	38%
T1-5	1.1	1.1	0.01	0%	37%
T2-1	2.8	3.0	0.18	6%	99%
T2-2	1.5	1.5	0.04	1%	50%
T2-3	1.3	1.3	0.03	1%	43%
T2-4	1.1	1.2	0.02	1%	39%
T2-5	1.1	1.1	0.01	0%	37%

The results of both the NOx and NH_3 Critical Level assessment showed that in 2022 concentrations of NOx and NH_3 were greater than 1% of the respective annual mean Critical Levels at the first transect location of T2-1 (i.e. 2 m away from the roads edge), however were equal to or less than 1% at every other transect location. As can be seen from the results in **Table 9-21** and **Table 9-22**, predicted concentrations decrease significantly as the distance from the roads edge increases. The total NOx and NH_3 concentration with the proposed scheme (inclusive of in combination traffic growth, cumulative traffic from committed

developments and emissions from the A5 road) are below the NOx and NH_3 Critical Level at all transect locations.

Impact significance

Concentrations of NOx and NH_3 were greater than 1% of the respective annual mean Critical Levels at the first transect location of transect T2 (i.e. T2-1), which runs perpendicular to the A55 in a south-west direction. However, the total NOx and NH_3 concentrations, including the background, cumulative traffic from committed developments and emissions from the A5, were not predicted to exceed the Critical Levels at any of the assessed receptors. The Critical Level represents a threshold above which impacts would be experienced; as total concentrations were not predicted to exceed the Critical Levels; it is considered that the impact of the proposed scheme is **not significant**.

9.6.4 Vessel emissions

A qualitative assessment of construction phase vessel emission impacts on nearby human and ecological receptors was undertaken.

The total number of vessels (i.e., barge) trips needed for placement and delivery during construction is estimated to be 912 (see **Table 3-1**). This equates to approximately 9.1 barge trips per week over the worst-case scenario for construction (i.e., single construction period of 23 months), or 1.3 trips per day; however, at any given moment during the construction phase, up to two barges may be in use for the transportation of Tetrapod or Z-Block units or rocks from Salt Island and/or Soldier's Point to the refurbishment of the Breakwater. This number of trips as a proportion of the existing vessel traffic in the area (2-3 movements per hour from Holyhead Harbour alone (MarineTraffic, 2020)) is considered unlikely to be significant.

Section 9.5.3 details that the existing background concentrations in the study area of all pollutants are well below their respective objectives, these background concentrations include existing vessel emissions in the area.

The increase in vessel movements is unlikely to equate to a 1% change in the Critical Load or Level (Natural England, 2018), which is regarded as a threshold of insignificance, of any of the designated ecological sites in the study area; therefore the impact on ecological sites is considered unlikely to be significant.

The Valley meteorological station is the closest to, and most representative of, the proposed scheme site and is located approximately 11km south-east of the proposed scheme. Meteorological data collected from the Valley meteorological station from 2014 – 2019 is shown in **Appendix 9-3**. The wind roses show that the predominant wind direction is from the south and south-west; however, the wind roses show a proportion of hours each year in which winds originated from the north-east. As mentioned in **Section 9.5.3**, the nearest human receptors to the proposed scheme are located to the south and south-east and as such, any vessel emissions are likely to disperse away from these receptors for the majority of the time. In addition, the distance between emission sources and receptors will increase by up to 2km as works continue along the Breakwater.

Due to the small number of vessel trips generated by the proposed scheme in comparison to existing vessel traffic in the area, the low background pollutant concentrations within the study area (inclusive of existing vessel emissions), the prevailing meteorological conditions and distance to nearest receptors (which will increase by up to 2km as works are completed further out the Breakwater), it is anticipated that emissions from shipping vessels during construction are unlikely to have a significant impact on local air quality. Therefore, construction phase air quality impacts relating to vessel emissions were considered to be **not significant**.

9.7 Summary

A summary of the air quality impact assessment is provided in **Table 9-23**.

Table 9-23 Impact summary

Description of Impact	Significance	Mitigation	Residual Impact
Construction phase dust and particulate matter	N/A	Best practice dust minimisation and suppression techniques.	Not significant
Construction phase road traffic emissions	Not significant	N/A	Not significant
Construction phase vessel emissions	Not significant	N/A	Not significant

10 Noise and Vibration

10.1 Introduction

This chapter of the EIA Report considers the potential airborne noise and vibration impacts associated with the proposed scheme. Specifically, this section provides an overview of the baseline noise environment, identifies potentially sensitive receptors to noise and vibration and predicts noise levels associated with the proposed scheme at the receptor locations. No significant noise and vibration impacts are anticipated during the operational phase of the proposed scheme.

10.2 Legislation, Policy and Guidance

10.2.1 National Legislation

Environmental Protection Act 1990

Section 79 of the Environmental Protection Act 1990 ('the EPA 1990') defines statutory nuisance with regard to noise and determines that local planning authorities have a duty to detect such nuisances in their area. The EPA 1990 also defines the concept of 'Best Practicable Means' (BPM) as:

- "'Practicable' means reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to the financial implications;
- The means to be employed include the design, installation, maintenance and manner and periods of operation of plant and machinery, and the design, construction and maintenance of buildings and structures;
- The test is to apply only so far as compatible with any duty imposed by law; and,
- The test is to apply only so far as compatible with safety and safe working conditions, and with the exigencies of any emergency or unforeseeable circumstances."

Section 80 of the EPA 1990 provides local planning authorities with powers to serve an abatement notice requiring the abatement of a nuisance or requiring works to be executed to prevent their occurrence.

The Control of Pollution Act 1974

Section 60 of the Control of Pollution Act 1974 provides powers to local planning authority officers to serve an abatement notice in respect of noise nuisance from construction works.

Section 61 provides a method by which a contractor can apply for 'prior consent' for construction activities before commencement of works. The 'prior consent' is agreed between the local planning authority and the contractor and may contain a range of agreed working conditions, noise limits and control measures designed to minimise or prevent the occurrence of noise nuisance from construction activities. Application for a 'prior consent' is a commonly used control measure in respect of potential noise impacts from major construction works.

10.2.2 National Planning Policy

Noise and Soundscape Action Plan for Wales 2018-2023

The Noise and Soundscape Action Plan for Wales 2018-2023 (NSAPW 2018-2023) aligns noise and soundscape policy in Wales with the Well-being of Future Generations (Wales) Act 2015 and encourages greater integration between noise and air quality management by public bodies.

The Preface to the NSAPW 2018-2023 states:

> *"Under the Environmental Noise Regulations, the Welsh Ministers have an obligation to draw up action plans for places near major roads and major railways, and for agglomerations. The Regulations apply to environmental noise to which humans are exposed in particular in built-up areas, in public parks or other quiet areas in an agglomeration, and near schools, hospitals and other noise-sensitive buildings and areas."*

Planning Policy Wales (Edition 10)

The PPW contains the following guidance in relation to noise issues arising from new developments:

> *"6.7.6 - In proposing new development, planning authorities and developers must therefore:*
>
> - Address any implication arising as a result of its association with, or location within, air quality management areas, noise action planning priority areas or areas where there are sensitive receptors;
> - Not create areas of poor air quality to inappropriate soundscape; and,
> - Seek to incorporate measures which reduce overall exposure to air and noise pollution and create appropriate soundscapes."
>
> *"6.7.24 - The potential impacts of noise pollution arising from existing development, be this commercial, industrial, transport-related or cultural venues (such as music venues, theatres or arts centres), must be fully considered to ensure the effects on new developments can be adequately controlled to safeguard amenity and any necessary measures and controls should be incorporate as part of the proposed new development."*

Planning Guidance (Wales) Technical Advice Note (Wales) 11, Noise - October 1997

Technical Advice Note 11 (TAN11), provides advice on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business. It outlines some of the main considerations which local planning authorities should take into account in drawing-up development plan policies when determining planning applications for development which will either generate noise or be exposed to existing noise sources.

The standard stipulates that noise from construction sites should be assessed in accordance with BS 5228 parts 1-4. As TAN Wales 11 refers to a superseded version of BS 5228, the assessment has been undertaken in accordance with the latest revision of this standard.

National Planning Policy Framework

Whilst not directly applicable to Wales, the National Planning Policy Framework (NPPF) 2019 provides useful guidance and introduces key phrases including 'significant adverse' and 'adverse'.

The NPPF was introduced in March 2012 replacing the former Planning Policy Guidance 24: Planning and Noise. It was revised in 2018 and again in 2019. This document now forms the basis of the Government's planning policies for England and how these should be applied.

The 2018 and 2019 documents are generally consistent with the 2012 policy, with the exception detailed in paragraph 170 (reproduced below) including a reference to existing development in contrast to the 2012 policy referring only to new development. In addition, the 2019 policy also highlights decisions should consider cumulative effects, thus being aligned with the terminology detailed in the Noise Policy Statement for England (NPSE).

Paragraph 170 of the NPPF states planning policies and decisions should contribute to and enhance the natural and local environment by:

> *"……preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution……".*

Furthermore, Paragraph 180 of the NPPF states:

> *"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*
>
> *a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
>
> *b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
>
> *c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation."*

The NPPF also refers to the Noise Policy Statement for England.

National Planning Practice Guidance for Noise

Specific to England, though considered relevant as The National Planning Practice Guidance for Noise (NPPG Noise), issued under the NPPF, provides additional guidance regarding decision making, whereby noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. NPPG establishes concepts from toxicology that are being applied to noise impacts and introduced in the Institute of Environmental Management and Assessment for EIA guidelines:

- NOEL – No Observed Effect Level; this is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise;

- LOAEL – Lowest Observed Adverse Effect Level; this is the level above which adverse effects on health and quality of life can be detected; and,
- SOAEL – Significant Observed Adverse Effect Level which is defined as the level above which significant effects on health and quality of life occur.

10.2.3 Local Planning Policy

Anglesey and Gwynedd Joint Local Development Plan 2011 - 2026

With regard to noise impacts Anglesey Council stipulates the following policy:

Policy PCYFF 2: Development Criteria – Planning permission will be refused where the proposed development would have an unacceptable adverse impact on:

> 7. *The health, safety or amenity of occupiers of local residences, other land and property uses or characteristics of the locality due to increased activity, disturbance, vibration, noise, dust, fumes, litter, drainage, light pollution, or other forms of pollution or nuisance.*

10.2.4 Guidance

The guidance outlined in **Table 10-1** has been employed for the noise impact assessment.

Table 10-1 Noise assessment methodology guidance

Document	Policy / guidance purpose
BS 5228-1:2009+A1:2014 Parts 1 and 2 - Code of Practice for Noise and Vibration Control on Construction and Open Sites (BS 5228)	These documents provide recommendations for basic methods of noise and vibration control relating to construction and open sites where work activities/operations generate significant noise and/or vibration levels. The legislative background to noise and vibration control is described and recommendations are given regarding procedures for the establishment of effective liaison between developers, site operators and Local Planning Authorities. This British Standard provides guidance on methods of predicting and measuring noise and assessing its impact on those exposed to it.
Design Manual for Roads and Bridges (DMRB), 2020	LA111 Noise and Vibration, Revision 2 (formerly HD 213/11, IAN 185/15) provides guidance on the environmental assessment of noise impacts from road schemes. DMRB contains advice and information on transport-related noise and vibration, which has relevance regarding the construction and operational traffic impacts affecting sensitive receptors adjacent to road networks. It also provides guideline significance criteria for assessing traffic related noise impacts.
WHO Guidelines for Community Noise, 1999 (WHO 1999)	These guidelines present health-based noise limits intended to protect the population from exposure to excess noise. They present guideline limit values at which the likelihood of particular effects, such as sleep disturbance or annoyance, may increase. The guideline values are 50 or 55 dB L_{Aeq} during the day, related to annoyance, and 45 dB L_{Aeq} or 60 dB L_{Amax} at night, related to sleep disturbance.
WHO Night Noise Guidelines for Europe, 2009 (WHO 2009)	An extension to the WHO Guidelines for Community Noise (1999). It concludes that: "Considering the scientific evidence on the thresholds of night noise exposure indicated by $L_{night,outside}$ as defined in the Environmental Noise Directive (2002148/EC), an $L_{night,outside}$ of 40 dB should be the target of the night noise guideline (NNG) to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly. $L_{night,outside}$ value of 55 dB is recommended as an interim target for those countries where the NNG cannot be achieved in the short term for various reasons, and where policy-makers choose to adopt a stepwise approach."

Document	Policy / guidance purpose
WHO Environmental Noise Guidelines for the European Region, 2018 (WHO 2018)	The guidance states: "The main purpose of these guidelines is to provide recommendations for protecting human health from exposure to environmental noise originating from various sources: transportation (road traffic, railway and aircraft) noise, wind turbine noise and leisure noise. They provide robust public health advice underpinned by evidence, which is essential to drive policy action that will protect communities from the adverse effects of noise."

10.3 Assessment Methodology

10.3.1 Study area

The study area for this section of the EIA Report is the area that has the potential to be directly and/or indirectly affected by noise associated with the proposed scheme.

It is understood that refurbishment works will be focused at Holyhead Breakwater and Soldier's Point with the potential for a concrete batching plant operating at Salt Island; therefore, the study area comprises of Noise Sensitive Receptors (NSRs) in the immediate areas surrounding Soldier's Point and Salt Island and the local road network used for construction-stage road traffic, should materials be delivered by road to Salt Island.

10.3.2 Construction-stage noise

Potential noise impacts associated with the construction-stage were assessed in accordance with BS 5228 using the ABC method outlined in Annex E. **Table 10-2**, reproduced from BS 5228 Table E.1, presents the criteria for selection of a noise limit for a specific receptor location.

Table 10-2 Construction-stage noise threshold levels based on the ABC method

Assessment category and threshold value period	Threshold value, L_{Aeq} (dB)		
	Category A [A)]	Category B [B)]	Category C [C)]
Night-time (23.00 – 07.00)	45	50	55
Evenings and weekends [D)]	55	60	65
Daytime (07.00 – 19.00) and Saturdays (07.00 – 13.00)	65	70	75
A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.			
B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.			
C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.			
D) 19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays.			

The 'ABC method' described in BS 5228 establishes that there would be no impact below the three thresholds presented above.

BS 5228 states:

"If the site noise level exceeds the appropriate category value, then a potential significant effect is indicated. The assessor then needs to consider other project-specific factors, such as the number of receptors affected and the duration and character of the impact, to determine if there is a significant effect."

Noise levels for the construction phase were calculated using the methods and guidance in BS 5228. This Standard provides methods for predicting receptor noise levels from construction works based on the number and type of construction plant and activities operating on site, with corrections to account for:

- The 'on-time' of the plant, as a percentage of the assessment period;
- Distance from source to receptor;
- Acoustic screening by barriers, buildings, or topography; and,
- Ground type.

Construction noise impacts were assessed using the impact magnitude presented in **Table 10-3** for the daytime period, **Table 10-4** for the evening and weekend periods and **Table 10-5** for the night-time period.

Table 10-3 Construction-stage noise magnitude of effect, daytime

Construction noise level, L_{Aeq} (dB)			Magnitude of effect
Category A	Category B	Category C	
≤ 65.0	≤ 70.0	≤ 75.0	Very low
65.1 - 65.9	70.1 - 70.9	75.1 - 75.9	Low
66.0 - 67.9	71.0 - 72.9	76.0 - 77.9	Medium
68.0 - 69.9	73.0 - 74.9	78.0 - 79.9	High
≥ 70	≥ 75	≥ 80	Very high

Table 10-4 Construction-stage noise magnitude of effect, evenings and weekends

Construction noise level, L_{Aeq} (dB)			Magnitude of effect
Category A	Category B	Category C	
≤ 55.0	≤ 60.0	≤ 65.0	Very low
55.1 - 55.9	60.1 - 60.9	65.1 - 65.9	Low
56.0 - 57.9	61.0 - 62.9	66.0 - 67.9	Medium
58.0 - 59.9	63.0 - 64.9	68.0 - 69.9	High
≥ 60	≥ 65	≥ 70	Very high

Table 10-5 Construction-stage noise magnitude of effect, night-time

Construction noise level, L_{Aeq} (dB)			Magnitude of effect
Category A	Category B	Category C	
≤ 45.0	≤ 50.0	≤ 55.0	Very low
45.1 - 45.9	50.1 - 50.9	55.1 - 55.9	Low
46.0 - 47.9	51.0 - 52.9	56.0 - 57.9	Medium
48.0 - 49.9	53.0 - 54.9	58.0 - 59.9	High
≥ 50	≥ 55	≥ 60	Very high

None of the proposed construction plant are considered to represent a significant source of vibration. Given this, and the distance between Breakwater and the nearest NSR, approximately 375m, potential vibration impacts are not considered significant; therefore, a vibration assessment has not been undertaken.

10.3.3 Construction-stage road traffic noise

In order to assess the potential noise impact of increased traffic flows along the local road network, Basic Noise Level (BNL) calculations were undertaken in accordance with CRTN using the 18-hr AAWT traffic flows. BNL calculations, outlined in CRTN Charts 3 applying HGV percentage corrections from Chart 4, were conducted for baseline, and construction phase traffic flows. The calculation used the 18-hr AAWT traffic flows, HGV percentage, average vehicle speed and low flow correction, where applicable. Increases in road traffic associated with the proposed scheme have been determined by assessing the change in BNL. **Table 10-6** presents the effect level criteria provided in Table 3.17 of the DMRB for construction road traffic.

Table 10-6 Construction road traffic noise magnitude of effect

Magnitude of effect	Increase in BNL of closest public road used for construction traffic (dB)
Negligible / very low	Less than 1.0
Minor / low	Greater than or equal to 1.0 and less than 3.0
Moderate / medium	Greater than or equal to 3.0 and less than 5.0
Major / high - very high	Greater than or equal to 5.0

10.4 Baseline Environment

Consideration of the existing noise environment was initially conducted by undertaking a desk-based study of existing available geographical information (including aerial and satellite photography and mapping data) in order to determine the nearest NSRs and noise sources present within the study area for use in the assessment. From the desk-based study the NSR locations outlined in **Table 10-7** were identified.

Table 10-7 Noise sensitive receptor locations

Receptor ID	Description	Sensitivity	X	Y
NSR1	Residential premises on the corner of Prince of Wales Road and the A5154.	Medium	224994	382911
NSR2	Residential properties along Prince of Wales Road.	Medium	224922	382858
NSR3	The Beach Hut Guest Hotel.	Medium	224935	382991
NSR4	Residential properties along Ffordd Tudur.	Medium	225211	382494
NSR5	Residential premises adjacent to Soldier's Point.	Medium	223643	383597
NSR6	Porth-y-felin House.	Medium	223764	383359
NSR7	The Boathouse Hotel	Medium	223896	383236

To inform the assessment, available baseline data from previous application were used; Holyhead Port Expansion Environmental Statement (Royal HaskoningDHV, 2019) and Holyhead Waterfront Regeneration Scheme Environmental Statement (AXIS, 2020). Baseline survey measurement locations are presented in **Figure 10-1** and outlined in **Table 10-8**. Results from the surveys are detailed in **Table 10-9** along with the corresponding BS 5228 reference period.

Legend:

- Holyhead Breakwater
- Noise Sensitive Receptor
- Baseline Noise Survey

Client: Isle of Anglesey County Council	Project: Holyhead Breakwater Refurbishment Scheme

Title: Noise Sensitive Receptor and Baseline Noise Survey Locations

Figure: 10.1 | Drawing No: PB9014-200-003

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	20/01/2021	AB	SC	A4	1:20,000

Co-ordinate system: British National Grid

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Table 10-8 Baseline noise survey locations

Measurement location	Source	Description	X	Y	Associated receptor ID
LT1	Royal HaskoningDHV, 2019	Long-term monitoring position located at the Beach Hut Hotel situated approximately 40m away from the Pelham Patch Development.	224922	382858	NSR1, NSR3
ST2		Short-term monitoring location representative of receptors along Prince of Wales road close to the port.	224881	382989	NSR2
ST3		Short-term monitoring location representative of receptors along Ffordd Tudur.	225358	382422	NSR4
P1	AXIS, 2020	Lon-term monitoring location at 15 Maes-y-Mor representative of receptors along Prince of Wales Road.	224800	383047	NSR2
P2		Long-term monitoring location at The Boathouse Hotel representative of receptors along Beach Road.	223891	383254	NSR5, NSR6, NSR7

Table 10-9 Baseline noise survey results

Measurement location	BS 5228 reference period	Start time	Duration (hh:mm)	$L_{Aeq,T}$ (dB)
LT1	Evenings and weekends	05/09/2018 - 19:40	03:20	60.4
	Night-time	05/09/2018 - 23:00	08:00	61.2
	Daytime	06/09/2018 - 07:00	12:00	65.8
	Evenings and weekends	06/09/2018 - 19:00	04:00	61.2
	Night-time	06/09/2018 - 23:00	08:00	61.3
	Daytime	07/09/2018 - 07:00	04:40	62.6
ST2	Night-time	05/09/2018 - 23:57	00:15	48.0
	Daytime	06/09/2018 - 10:37	01:00	65.9
	Daytime	06/09/2018 - 14:17	00:45	51.0
	Night-time	07/09/2018 - 00:11	00:15	45.4
ST3	Night-time	06/09/2018 - 00:23	00:15	56.8
	Daytime	06/09/2018 - 11:50	01:00	55.1
	Daytime	06/09/2018 - 15:19	00:45	71.5
	Night-time	06/09/2018 - 23:48	00:15	47.6
P1	Daytime	22/03/2019 - 11:15	07:45	55.4
	Evenings and weekends	22/03/2019 - 19:00	04:00	46.3
	Night-time	22/03/2019 - 23:00	08:00	47.0
	Daytime	23/03/2019 - 07:00	06:00	54.2

Measurement location	BS 5228 reference period	Start time	Duration (hh:mm)	$L_{Aeq,T}$ (dB)
	Evenings and weekends	23/03/2019 - 13:00	10:00	57.9
	Night-time	23/03/2019 - 23:00	08:00	45.7
	Evenings and weekends	24/03/2019 - 07:00	16:00	53.7
	Night-time	24/03/2019 - 23:00	08:00	48.0
	Daytime	25/03/2019 - 07:00	03:15	58.8
P2	Daytime	22/03/2019 - 12:00	07:00	54.7
	Evenings and weekends	22/03/2019 - 19:00	04:00	51.1
	Night-time	22/03/2019 - 23:00	08:00	43.5
	Daytime	23/03/2019 - 07:00	06:00	50.0
	Evenings and weekends	23/03/2019 - 13:00	10:00	50.6
	Night-time	23/03/2019 - 23:00	08:00	45.4
	Evenings and weekends	24/03/2019 - 07:00	16:00	52.0
	Night-time	24/03/2019 - 23:00	08:00	45.5
	Daytime	25/03/2019 - 07:00	05:00	54.6

From the above measured baseline noise data BS 5228 noise thresholds were determined for each NSR, displayed in **Table 10-10**.

Table 10-10 BS 5228 noise category thresholds

Receptor ID	BS 5228 noise threshold (dB)		
	Daytime	Evenings and weekends	Night-time
NSR1	70 (B)	65 (C)	55 (C)
NSR2	65 (A)	60 (B)	50 (B)
NSR3	70 (B)	65 (C)	55 (C)
NSR4	65 (A)	55 (A)	55 (C)
NSR5	65 (A)	55 (A)	50 (B)
NSR6	65 (A)	55 (A)	50 (B)
NSR7	65 (A)	55 (A)	50 (B)

10.5 Prediction of Potential Effects During Construction

10.5.1 Construction-stage noise

Predicted noise levels for on-site construction noise were undertaken in accordance with the methodology described in BS 5228 assuming 'hard' ground due to the intervening area between the proposed refurbishment works and nearby NSRs larger consisting of paved surfaces and waterbodies.

Assumptions for construction plant type and number per work area were provided by the project team; detailed in **Table 10-11**. Where possible, noise source levels have been taken using those available in BS 5228 Annex C and Royal HaskoningDHV's (RHDHV) library from previous projects.

Table 10-11 Assumed construction plant

Work area	Plant	Number of plant	BS 5228 reference	Noise level at 10m ($L_{Aeq,T}$ dB)
Breakwater	Crane 110t	1	C3.28	67
Breakwater	Backhoe dredger	1	C7.1	78
Soldier's Point	Barge (moving materials around site)	3	RHDHV	70
Soldier's Point	Barge deliveries (unloading)	2	RHDHV	70
Salt Island	Crane 110t	1	C3.28	67
Salt Island	Barge deliveries (loading)	1	RHDHV	70
Salt Island	Concrete batching plant	1	RHDHV	71.9

It is understood that loading of barges on Salt Island can take place over a 24-hour period but works at Breakwater and Soldier's Point would be limited to a 10-hour working shift (assumed to only occur during the daytime reference period).

Noise predictions at the NSRs are detailed in **Table 10-12**,Table 10-13 **Table 10-13**, **Table 10-14** for daytime, evening and weekends and night-time reference periods, respectively.

Table 10-12 Construction noise assessment, daytime

Receptor ID	Predicted construction noise level (dB $L_{Aeq,T}$)	BS 5228 daytime threshold (dB $L_{Aeq,T}$)	Level above BS 5228 threshold criteria (dB)	Magnitude of effect
NSR1	47.3	70	-22.7	Very low
NSR2	45.4	65	-19.6	Very low
NSR3	45.3	70	-24.7	Very low
NSR4	42.6	65	-22.4	Very low
NSR5	50.0	65	-15.0	Very low
NSR6	46.7	65	-18.3	Very low
NSR7	45.2	65	-19.8	Very low

Table 10-13 Construction noise assessment, evenings and weekends

Receptor ID	Predicted construction noise level (dB $L_{Aeq,T}$)	BS 5228 daytime threshold (dB $L_{Aeq,T}$)	Level above BS 5228 threshold criteria (dB)	Magnitude of effect
NSR1	46.9	65	-18.1	Very low
NSR2	44.6	60	-15.4	Very low
NSR3	44.6	65	-20.4	Very low
NSR4	41.8	55	-13.2	Very low
NSR5	30.0	55	-25.0	Very low
NSR6	31.0	55	-24.0	Very low
NSR7	32.2	55	-22.8	Very low

Table 10-14 Construction noise assessment, night-time

Receptor ID	Predicted construction noise level (dB $L_{Aeq,T}$)	BS 5228 daytime threshold (dB $L_{Aeq,T}$)	Level above BS 5228 threshold criteria (dB)	Magnitude of effect
NSR1	46.9	55	-8.1	Very low
NSR2	44.6	50	-5.4	Very low
NSR3	44.6	55	-10.4	Very low
NSR4	41.8	55	-13.2	Very low
NSR5	30.0	50	-20.0	Very low
NSR6	31.0	50	-19.0	Very low
NSR7	32.2	50	-17.8	Very low

All predicted construction-stage noise levels are considered to be very low magnitude of effect; therefore, using the impact magnitude matrix provided in **Table 5-4** a **negligible** impact significance is expected at all NSRs and no specific mitigation measures are required.

10.5.2 Construction-stage road traffic noise

To inform the construction phase road traffic noise assessment, data were provided by Royal HaskoningDHV, the transport consultants, as AAWT flows and percentage HGVs on the surrounding road network; values are presented in **Table 10-15**.

Table 10-15 18-hr AAWT construction-stage traffic flows

Link	Link description	Average speed (km/h)	Baseline traffic flows		Baseline + construction-stage traffic flows	
			18hr AAWT	HGV%	18hr AAWT	HGV%
1	A55 - N Wales Expressway	80.5*	12,186	16.4	12,594	19.1
2	A55 - Victoria Road	46.7	13,185	13.1	13,593	15.7
3	A55 - London Road	48.3*	10,682	16.3	11,090	19.4

Link	Link description	Average speed (km/h)	Baseline traffic flows		Baseline + construction-stage traffic flows	
			18hr AAWT	HGV%	18hr AAWT	HGV%
4	A55 - North of A55/A5 Junction	48.3*	7,650	24.1	8,058	28.0
4b	Port Access Road	48.3*	3,045	58.0	3,453	63.0

* displayed as the posted speed limit

In accordance with the DMRB guidance, the change in predicted BNL along each link were calculated using the methodology outlined in CRTN. The calculation method accounts for HGV percentage, average road speed and low flow correction, where applicable. Results for predicted construction road traffic impacts are shown in **Table 10-16**.

Table 10-16 Construction-stage road traffic noise assessment

Link	Baseline BNL (dB)	Baseline + construction BNL (dB)	Change in BNL (dB)	Magnitude of effect
1	73.6	74.1	0.5	Very low
2	70.9	71.5	0.6	Very low
3	70.7	71.3	0.6	Very low
4	70.4	71.1	0.7	Very low
4b*	69.3	70.2	0.9	Very low

* low flow correction applied to link 4b as the 18-hr AAWT is less than 4000

The predicted change in BNL due to construction phase road traffic associated with the proposed scheme is considered very low in magnitude. Therefore, predicted impacts at a medium receptor sensitivity are of **negligible** significance.

10.6 Prediction of Potential Effects During Operation

It is considered that there are no significant sources of noise or vibration during the operation-stage; therefore, there are no pathways for potential operation-stage noise impacts and an assessment has not been undertaken.

10.7 Summary

Potential noise impacts associated with proposed scheme were assessed in accordance with current guidance. Predicted impacts from construction-stage activities and construction-stage road traffic are of **negligible** significance at all receptor locations and identified road links; therefore, mitigation is not required as the potential impacts are considered not significant in EIA terms.

11 Marine Ecology

11.1 Introduction

This chapter of the EIA report describes the baseline environment in relation to marine ecological receptors present in the study area, namely benthic invertebrates. An assessment of potential impacts to marine ecology from the construction and operation of the proposed scheme are described. Appropriate mitigation measures (where necessary) are also provided along with an assessment of any residual impacts.

As stated in the Scoping Report (Royal HaskoningDHV, 2020), operation-stage impacts on marine ecological receptors were scoped out of the EIA process given that there would be no change to the existing footprint, usage or accessibility of the Breakwater once the proposed scheme is completed.

Additional information to support the Marine Ecology assessment is provided separately in the following appendix:

- Appendix 11-1: Benthic Ecology Remotely Operated Vehicle (ROV) Survey Report; and,
- Appendix 11-2: Drop Down Video Survey 2020.

Potential impacts of the proposed scheme on Ornithology are considered within **Chapter 12** Ornithology. Potential impacts to NSN and Ramsar sites are considered in **Chapter 20** Shadow Habitats Regulations Assessment.

11.2 Legislation, Policy and Guidance

11.2.1 Legislation

The Habitats Regulations

Undesignated Annex I habitats present on or surrounding to the proposed scheme include:

- Reefs.

Environment (Wales) Act 2016

The Environment (Wales) Act 2016 enables sustainable, proactive, and joined-up planning and management of the natural resources of Wales. It enhanced the biodiversity duty under the NERC Act 2006 which required that public authorities must have regard to conserving biodiversity when carrying out their functions.

The Environment (Wales) Act 2016 (Section 7) lists priority species and habitats in Wales considered to be of key significance to sustain and improve biodiversity. All reasonable steps should be taken by public authorities to maintain and enhance the living organisms and types of habitat in the Section 7 list.

Habitats present on or surrounding to the proposed scheme for which are on the Section 7 priority list include:

- Intertidal boulder communities; and,
- Mud habitats in deep water.

11.2.2 Policies and Plans

National Policy Statement for Ports

The assessment of potential effects on marine ecology has been made with specific reference to the relevant NPS. The statement relevant to Holyhead Breakwater is the NPS for Ports (Department for Transport, 2012). The particular assessment requirements relevant to marine ecology, as presented within the NPS for Ports are summarised in **Table 11-1**.

Table 11-1 NPS for ports summary for marine ecology

NPS for Ports requirements	NPS for Ports Reference	ES Reference
Where the development is subject to EIA, the applicant should ensure that the ES clearly sets out any effects on internationally, nationally, and locally designated sites of ecological or geological interests.	*Section 5.1 Paragraph 5.1.4*	**Section 4.3, 11, 12, 19 and 21**
The applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests.	*Section 5.1 Paragraph 5.1.5*	**Section 2**
The ES should include an assessment of the effects on the coast. In particular, the applicant should assess the effects of the proposed project on marine ecology, biodiversity and protected sites.	*Section 5.1*	**Section 11.6**
The applicant should be particularly careful to identify any effects on the integrity and special features of MCZs, SACs and candidate SACs, SPAs, Ramsar sites, actual and potential Sites of Community Importance (SCI) and SSSIs.	*Section 5.1 Paragraphs 5.1.10, 5.1.11, 5.1.13 and 5.1.14*	**Section 11.6, 12 and 13.**

Anglesey and Gwynedd Joint Local Development Plan

Adopted in July 2017, the Anglesey and Gwynedd JLDP is a land use development strategy which concentrates on sustainable development. One of its key aims is to protect areas to ensure the maintenance and enrichment of the natural (and built) environment. Policy AMG 5 of the JLDP is aimed at local biodiversity conservation. Under this policy, development proposals must protect and, where appropriate, enhance biodiversity that has been identified as being important to the local area by:

- Avoiding significant harmful impacts through the sensitive location of development; and,
- Considering opportunities to create, improve and manage wildlife habitats and natural landscape including wildlife corridors, steppingstones, trees, hedges, woodlands, and watercourses.

If the affected area is of local biodiversity importance (i.e. it supports important populations of priority species and habitats listed under Section 42 of the NERC Act 2006 (superseded by the lists under Section 7 of the Environment (Wales) Act 2016)) (see **Section 11.2.1**):, proposals that may affect such features must conform with the following criteria:

- That there are no other satisfactory alternative sites available for the development;
- The need for the development outweighs the importance of the site for local nature conservation; and,
- That appropriate mitigation or compensation measures are included as part of the proposal.

Isle of Anglesey Local Biodiversity Action Plan (BAP) 2005

Anglesey's BAP is a local implementation of the UK BAP and forms part of the approach to conserving and enhancing the natural environment as set out by Policy PS19 of the JLDP. It was written to help secure partnership between local people and conservation organisations to ensure that local natural resources are

valued and looked after in the future. The Anglesey BAP sets out the measures required to help maintain and improve important habitats and species.

The Anglesey BAP sets out Habitat Action Plans (HAPs) for locally significant habitats that support local species of interest. HAPs set out overall objectives and targets for each habitat type, along with current and proposed action to meet such objectives and targets. Intertidal habitats present in or near to the Proposed Scheme for which HAPs have been produced include the following:

- Rocky shores.

11.2.3 Guidance

The impact assessment has been based upon the following guidance and standards:

- Chartered Institute of Ecology and Environmental Management (CIEEM) (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine; and,
- CIEEM Guidelines for Ecological Report Writing (2nd Edition, December 2017).

11.3 Consultation

Consultation undertaken throughout the pre-application phase informed the approach and the information provided in this chapter (see **Chapter 6** Consultation).

11.4 Assessment Methodology

11.4.1 Study area

For marine ecology, the study area comprises the likely maximum extent over which potential significant environmental impacts of the proposed scheme may occur, which in this case is considered to be within the footprint of the proposed scheme, given predicted changes to coastal processes are considered to be negligible, see **Chapter 7** Coastal Processes.

11.4.2 Surveys

In order to characterise the intertidal and subtidal habitats and species present on and surrounding the Breakwater, a video transect survey of the leeward and seaward sides of the Breakwater was undertaken using a ROV and Drop-Down Video (DDV). The leeward side transects were undertaken in December 2019 whilst the seaward and roundhead side transects were undertaken in July and November 2020. The purpose of the survey was to identify existing habitats and features along the Breakwater and identify the presence of invasive non-native species. The results of the survey are presented in **Appendix 11-1** and **Appendix 11-2** and are discussed in **Section 11.5**.

The survey methodology was chosen as high-definition video allows in-depth analysis of the footage which can identify colonies of invasive non-native species such as the carpet sea squirt (*Didemnum vexillum*). *D. vexillum* is capable of smothering large areas, posing a threat to native marine ecosystems and is known to be present in Holyhead New Harbour (Black and Veatch, 2009). All ROV footage and image analysis was undertaken in-line with JNCC guidance provided in the Marine Monitoring Handbook (JNCC, 2001; JNCC, 2015), the JNCC guidance on assigning benthic biotopes (Parry, 2015) and the NMBAQC and JNCC epibiota interpretation guidelines (Turner *et al.,* 2016).

11.4.3 Assessment of potential impacts

The methodology used to assess the significance of the potential environmental impacts associated with the proposed scheme is described in **Chapter 5** Approach to Environmental Impact Assessment.

11.5 Baseline Environment

11.5.1 Benthic ecology

It is generally considered that sediment types on the west coast of Wales are typically medium to coarse, consisting of mainly gravel and sand, with a low proportion of mud and clay sediments. Data from the NRW HabMap project (NRW, 2017) showed that the predicted biotopes in and around Holyhead Breakwater are:

- SS.SSa.IMuSa.FfabMag - Infralittorial muddy sand;
- SS.SCS.ICS.SLan - Infralittorial coarse sediment; and,
- SS.SMp.KSwSS.LsacR - Kelp and seaweed (on sublittoral sediment).

These biotopes are typically characteristic of those found on sandy/gravelly substrate and in mobile, well swept environments. Benthic communities typically consist of common polychaete, crustacean, mollusc or echinoderm. The HabMap data shows that these biotopes are typically common in the Anglesey area and wider Welsh coastal area.

Surveys undertaken on behalf of NRW in 2018, post storm Emma, to assess the presence and possible spread of *D. vexillum* in Holyhead showed very little change in the extent and distribution of *D. vexillum* in Holyhead Harbour compared to previous surveys, with *D. vexillum* being located only on floating structures in and immediately adjacent to the remains of Holyhead Marina (Holt, 2018).

11.5.2 Intertidal ecology

The west coast of Anglesey has substantial lengths of exposed shores which are largely coastal cliff headlands interspersed with beaches of moderately coarse sediment. The intertidal areas within the New Harbour and surrounding the Breakwater are typical of those encountered along the Anglesey coast. Data from the European Marine Observation and Data Network (EMODnet) (EMODnet, 2017) was used to identify the habitats present, which included:

- *Semibalanus balanoides*, *Patella vulgata* and *Littorina* spp. - on exposed to moderately exposed or vertical sheltered eulittorial rock;
- *Laminaria digitata* – on moderately exposed sublittoral fringe bedrock;
- *Verrucaraia maura* – on very exposed to very sheltered upper littoral fringe rock;
- *Fucus serratus* – on moderately exposed lower eulittoral rock;
- *Porphyra purpurea* – on sand-scoured mid or lower eulittoral rock; and,
- *Ascophyllum nodosum* - on full salinity mid-eulittoral rock.

11.5.3 Leeward side survey results

A survey of the leeward side of the Breakwater was undertaken between the 2nd and 4th of December 2019, with weather conditions at the time preventing survey operations on the seaward side of the Breakwater. A total of eight 60m transects, spaced evenly along the leeward side of the Breakwater, were flown by the ROV heading in towards the Breakwater.

A total of nine infralittoral and circalittoral biotope complexes (JNCC, 2015) were identified following the ROV survey, suggesting a relatively diverse and ecologically heterogeneous site (see *Figure 3 to Figure 10* in **Appendix 11-1**). **Figure 11-1** and **Figure 11-2** show the biotopes identified on the leeward side of the Breakwater. The biotopes identified are described in **Table 11-2** below.

Table 11-2 Description of biotopes identified on the leeward side of the Breakwater

JNCC Biotope Classification	EUNIS Habitat Classification	Description
LR.MLR.BF.Fser.R	A1.2141	*Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock
IR.MIR.KR	A3.21	Kelp and red seaweeds (moderate energy infralittoral rock)
IR.MIR.KR.Ldig	A3.211	*Laminaria digitata* on moderately exposed sublittoral fringe rock
SS.SSa.IMuSA	A5.24	Infralittoral muddy sand
SS.Smu.CSaMu.VirOphPmax	A5.354	*Virgularia mirabilis* and *Ophiura* spp. With *Pecten maximus* on circalittoral sandy of shelly mud
SS.SMx.Cmx	A5.44	Circalittoral mixed sediment
SS.SMx.CMx.ClloMx	A5.441	*Cerianthus lloydii* and other burrowing anemones in circalittoral muddy mixed sediment
SS.SMx.Imx	A5.43	Infralittoral mixed sediment
SS.SMp.KSwSS.LsacR	A5.521	*Laminaria saccharina* and red seaweeds on infralittoral sediments

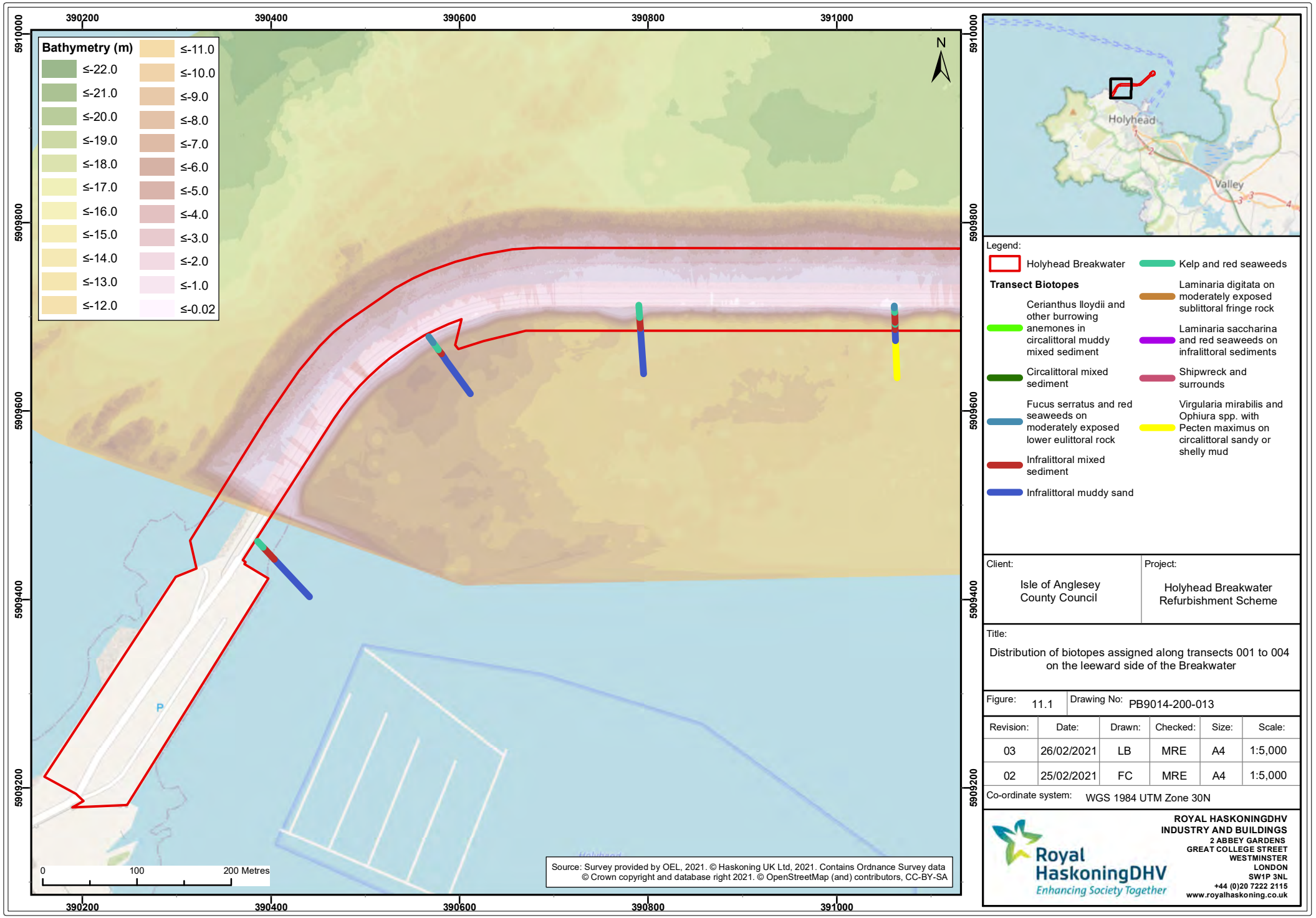
The biotopes designated to the communities at Holyhead were generally typified by moderately sheltered conditions with relatively low energy regimes, and ranged from the sublittoral to the shallow infralittoral zones. Low-moderate tidal flow was a defining environmental condition within the survey area which was influential for the algal and faunal species identified across the site.

Variation in faunal assemblages was apparent along all transects in approach to the Breakwater and was correlated with the habitat type and environmental conditions. Habitats transitioned from fine sediments in deeper water at the start of each transect and were designated as biotopes such as 'Infralittoral muddy sand' and '*Virgularia mirabilis* and *Ophiura* spp. with *Pecten maximus* on circalittoral sandy or shelly mud'. Fine muddy sands were gradually replaced by mixed sediments as the conditions became shallower in the approach to the Breakwater ('Circalittoral mixed sediment' and 'Infralittoral mixed sediment'). Finally, mixed sediments gave way to sublittoral and fringe rock at the base of the Breakwater. Biotopes were dominated by kelps, fucoids and red seaweeds, and were classified as '*Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock', 'Kelp and red seaweeds (moderate energy infralittoral rock)' or '*Laminaria digitata* on moderately exposed sublittoral fringe rock' depending largely on the dominant algal cover and formations. Though the habitats dominated by fine sediments located in the deeper open-water sections appeared sparse due to a lack of algal cover, faunal communities were relatively abundant and demonstrated some diversity.

11.5.3.1 Notable features

Epibenthic fauna

The epibenthic fauna identified in both the video and stills were relatively diverse for the small area surveyed and indicative of a fairly complex community. Notable features included large expanses of fine muddy sands colonised by the sea pen *V. mirabilis*, ophiuroids and other burrowing species in the deeper waters as well as a relatively diverse population of macroalgae and invertebrate species nearer to the Breakwater. Communities present on the vertical wall of the Breakwater itself were characterised by low diversity but high abundance with barnacles (Cirripedia) and the common limpet, *Patella vulgata*, frequently recorded as the only conspicuous fauna.



Client: Isle of Anglesey County Council

Project: Holyhead Breakwater Refurbishment Scheme

Title: Distribution of biotopes assigned along transects 001 to 004 on the leeward side of the Breakwater

Figure: 11.1

Drawing No: PB9014-200-013

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
03	26/02/2021	LB	MRE	A4	1:5,000
02	25/02/2021	FC	MRE	A4	1:5,000

Co-ordinate system: WGS 1984 UTM Zone 30N

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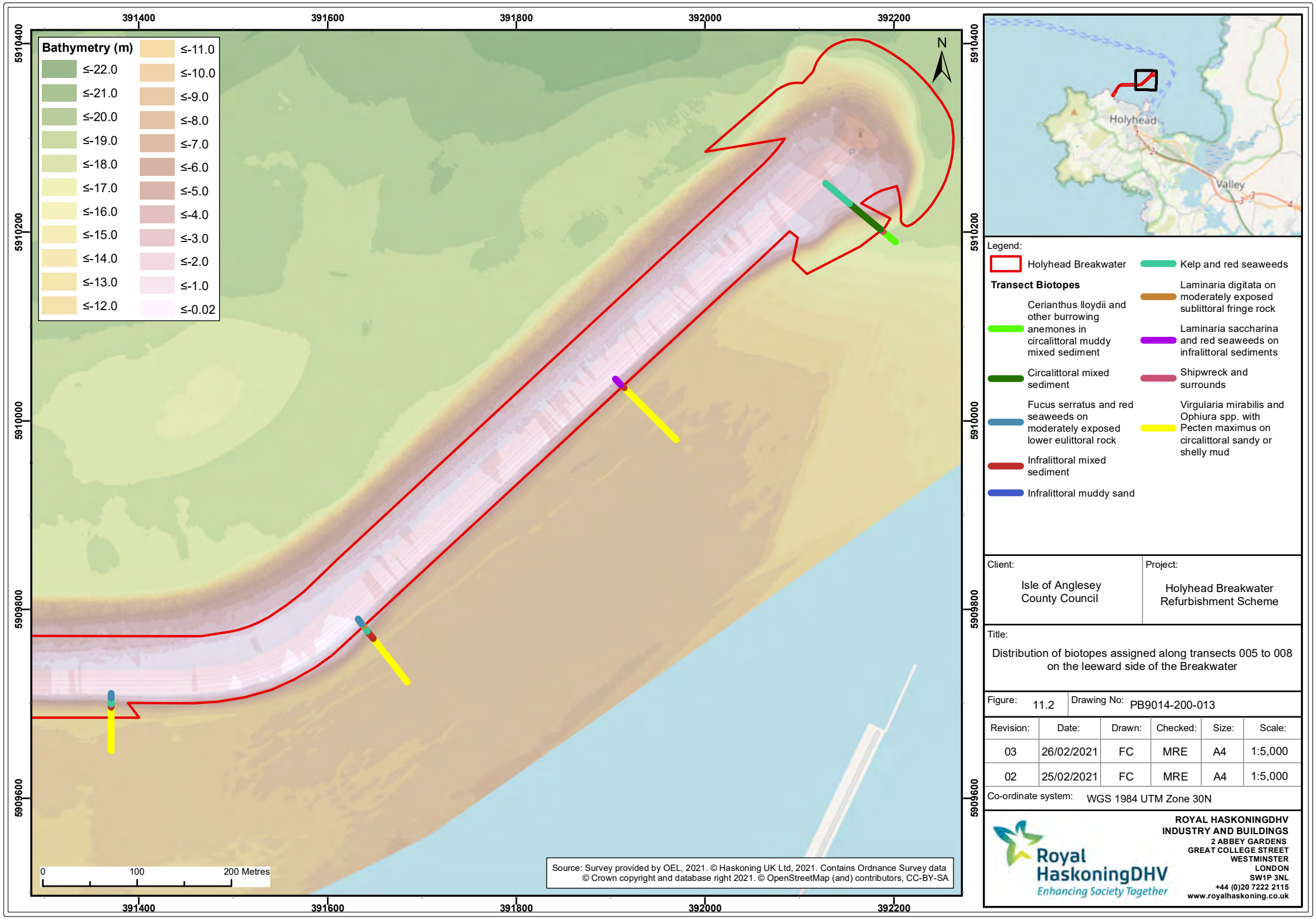
391400
391600
391800
392000
392200
5910400
5910200
5910000
5909800
5909600
N
Bathymetry (m)
≤-22.0
≤-21.0
≤-20.0
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≤-12.0
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≤-9.0
≤-8.0
≤-7.0
≤-6.0
≤-5.0
≤-4.0
≤-3.0
≤-2.0
≤-1.0
≤-0.02
0
100
200 Metres
Source: Survey provided by OEL, 2021. © Haskoning UK Ltd, 2021. Contains Ordnance Survey data © Crown copyright and database right 2021. © OpenStreetMap (and) contributors, CC-BY-SA
Holyhead
Valley
Legend:
Holyhead Breakwater
Transect Biotopes
Cerianthus lloydii and other burrowing anemones in circalittoral muddy mixed sediment
Circalittoral mixed sediment
Fucus serratus and red seaweeds on moderately exposed lower eulittoral rock
Infralittoral mixed sediment
Infralittoral muddy sand
Kelp and red seaweeds
Laminaria digitata on moderately exposed sublittoral fringe rock
Laminaria saccharina and red seaweeds on infralittoral sediments
Shipwreck and surrounds
Virgularia mirabilis and Ophiura spp. with Pecten maximus on circalittoral sandy or shelly mud
Client:
Isle of Anglesey County Council
Project:
Holyhead Breakwater Refurbishment Scheme
Title:
Distribution of biotopes assigned along transects 005 to 008 on the leeward side of the Breakwater
Figure: 11.2
Drawing No: PB9014-200-013
Revision: 03 Date: 26/02/2021 Drawn: FC Checked: MRE Size: A4 Scale: 1:5,000
Revision: 02 Date: 25/02/2021 Drawn: FC Checked: MRE Size: A4 Scale: 1:5,000
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All of the fauna identified in the footage collected were typical for the circalittoral and infralittoral habitats present and those distributed along the coast of north Wales. The majority of immobile taxa were represented by common Bryozoa (colonial invertebrates), Hydrozoa (invertebrates from the same family as jellyfish, corals and anemones) and Porifera (sponge) species, as well as anemones including the tube-dwelling anemone *Cerianthus lloydii* and the dahlia anemone *Urticina felina*. Signs of burrowing fauna and Annelida (segmented worms) were also present across much of the site where soft sediments were present, although burrow identification was not possible.

Video analysis revealed that the most frequently recorded taxon was the sea squirt *Ascidiella aspersa* which was identified at 18 of the 42 habitat sections identified along the transects at Holyhead. This species is common across the UK and though *A. aspersa* is a solitary colony, it is often present in high abundance in relatively shallow, sheltered sites (Curtis, 2005). A summary of the 10 most frequently observed faunal taxa (from ROV video analysis) is given in **Table 11-3**.

Table 11-3 Ten most frequently recorded taxa from ROV video footage of the leeward side of the Breakwater

Taxon name	Frequency of identification
Ascidiella aspersa	18
Gobiidae	12
Spirorbidae (calcareous tube-dwelling polychaete worm)	11
Spirobranchus sp. (tube-dwelling fan worm)	10
Cirripedia	9
Callionymus lyra	8
Patella vulgate	7
Hydrozoa	7
Sertulariidae (hydrozoans)	7
Ophiuroidea	5

Habitats of conservation interest

Three habitats were recorded which were deemed to be representative of habitats of conservation interest (HOCI) as set out in **Table 11-4**. Of particular note was the band of kelp forest with seaweeds and understory communities including coralline algal crusts, limpet, barnacle and encrusting sponges. This band was present on all transects indicating it is likely to extend the length of the Breakwater on the leeward side.

Table 11-4 List of representative HOCI present on the leeward side of the Breakwater

JNCC Code	EUNIS Code	Description	Annex I	Features of conservation interest
IR.MIR.KR	A3.21	Kelp and red seaweeds (moderate energy infralittoral rock)	Yes	Representative of 'Mixed kelp with foliose red seaweeds, sponges and ascidians on tide-swept infralittoral rock'
IR.MIR.KR.Ldig	A3.211	*Laminaria digitata* on moderately exposed sublittoral fringe rock	Yes	Representative of '*Laminaria digitata* and under-boulder fauna on sublittoral fringe boulders'
LR.MLR.BF.Fser.R	A1.2141	*Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock	Yes	Representative of '*Fucus serraturs* and under-boulder fauna on exposed to moderately exposed lower eulittoral boulders'

Fish fauna

Fish identified across the site included juvenile wrasse (*Labridae*), common dragonets (*Callionymus lyra*), *Gobiidae*, *Pleuronecteformes* and the small spotted catshark (*Scyliorhinus canicula*). Several commercially valuable species including the European lobster (*Homarus gammarus*), and the common spider crab (*Maja squinado*) were recorded in low abundance across the site. Anchored fishing pots were also observed at several locations within the site boundaries.

The small spotted catshark (*S. canicula*) was identified at the site and is listed on the IUCN Red List though is categorised as 'Least Concern' with the main threat considered to be fishing and harvesting of aquatic resources (Ellis et al., 2009). The population mature of *S. canicula* is considered to be stable and widespread across Europe.

Seapen (*V. mirabilis*)

Further from the shore (Transects 3-7), the sea pen *V. mirabilis* was recorded frequently which (alongside the presence of brittle stars (*Ophiura* spp.) and appropriate habitat conditions) resulted in the designation of the biotope '*Virgularia mirabilis* and *Ophiura* spp. with *Pecten maximus* on circalittoral sandy or shelly mud' along large stretches of the site.

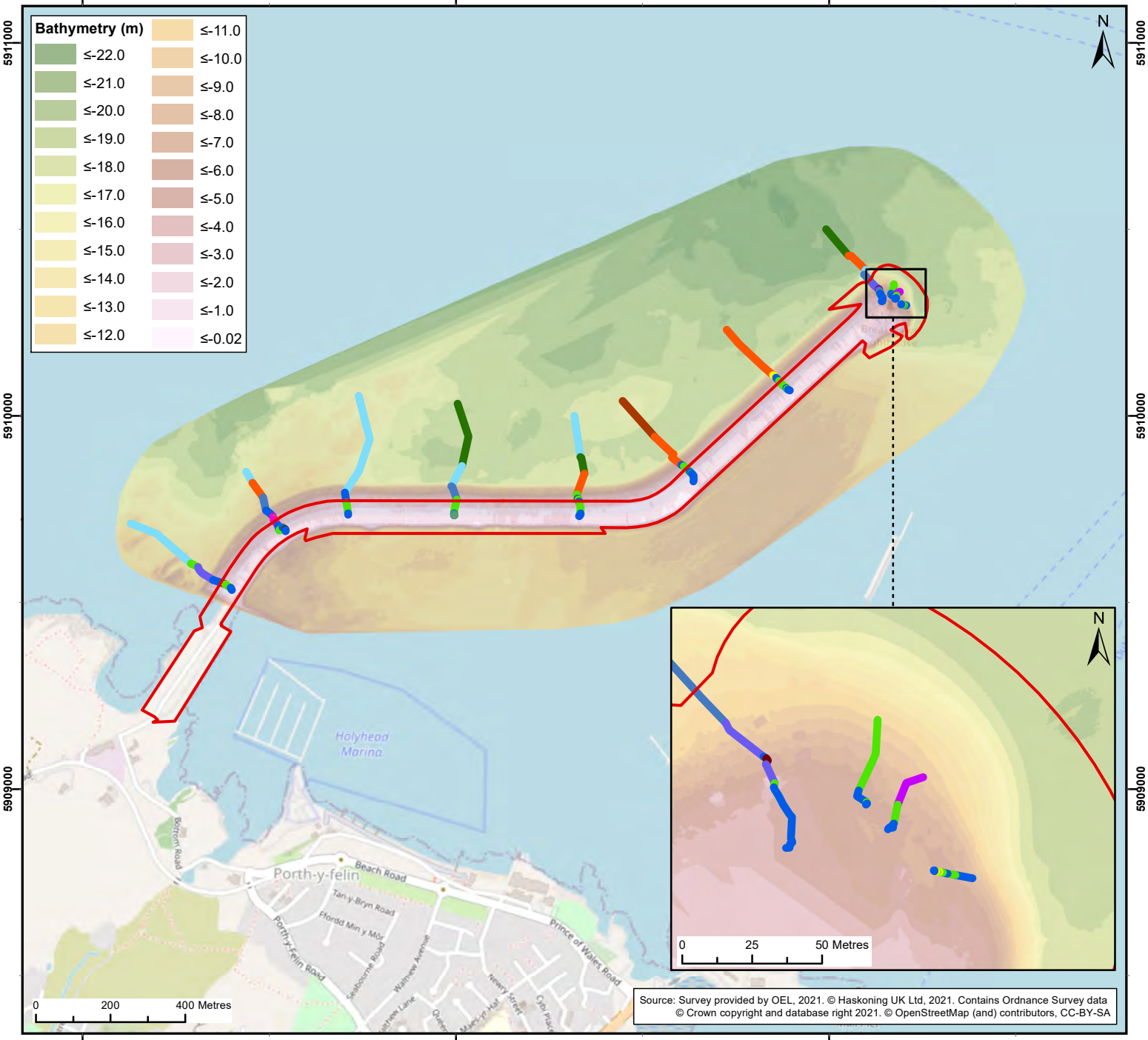
Invasive non-native species (*D. vexillum*)

No INNS (including *D.vexillum*) were identified in the footage and stills collected on the leeward side of the Breakwater (**Appendix 11-1**).

11.5.4 Seaward side survey

The survey of the seaward side of the Breakwater was completed over two separate survey events. Seabed imagery of the sediment areas at the offshore end of transects 001-008 was collected on the 21st July 2020 and transects 001-011 were collected on the 29th November 2020. A total of eight 200m transects, spaced evenly along the Breakwater, were flown by the ROV heading in towards the Breakwater.

A total of 22 habitats and biotopes were observed during the survey (see *Figure 3* to *Figure 7* in **Appendix 11-2**). **Figure 11-3** shows the biotopes which were identified on the seaward side of the Breakwater and the biotopes identified are described in **Table 11-5**.



Legend:

- Holyhead Breakwater

Transect Biotopes

- Atlantic and Mediterranean high energy infralittoral rock
- Barnacles and fucoids on moderately exposed shores
- Circalittoral coarse sediment
- Circalittoral mixed sediment
- Faunal communities on moderate energy infralittoral rock
- Infralittoral coarse sediment
- Kelp and seaweed communities in tideswept sheltered conditions
- Kelp with cushion fauna and/or foliose red seaweeds
- Mixed faunal turf communities on circalittoral rock
- Robust faunal cushions and crusts in surge gullies and caves
- Sediment-affected or disturbed kelp and seaweed communities
- Sublittoral sand
- Very tide-swept faunal communities on circalittoral rock

Client: Isle of Anglesey County Council

Project: Holyhead Breakwater Refurbishment Scheme

Title: Distribution of biotopes assigned along the 11 transects on the seaward side of the Breakwater

Figure: 11.3

Drawing No: PB9014-200-002

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
02	26/02/2021	FC	MRE	A4	1:15,000
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Co-ordinate system: WGS 1984 UTM Zone 30N

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Table 11-5 Description of biotopes found on the seaward side of the Breakwater

JNCC Classification	EUNIS Classification	EUNIS Description
LR.MLR.BF	A1.21	Barnacles and fucoids on moderately exposed shores
LR.MLR.BF.Fser	A1.214	*Fucus serratus* on moderately exposed lower eulittoral rock
IR.HIR	A3.1	Atlantic and Mediterranean high energy infralittoral rock
IR.HIR.KFaR	A3.11	Kelp with cushion fauna and / or foliose red seaweeds
IR.HIR.KFaR.LhypFa	A3.113	*Laminaria hyperborean* forest with a faunal cushion (sponges and polyclinids) and foliose red seaweeds on very exposed infralittoral rock
IR.HIR.KFaR.FoR	A3.116	Foliose red seaweeds on exposed lower infralittoral rock
IR.HIR.KSed	A3.12	Sediment-affected or disturbed kelp and seaweed communities
IR.HIR.KSed.DesFilR	A3.124	Dense *Desmarestia* spp. with filamentous red seaweeds on exposed infralittoral cobbles, pebbles and bedrock
IR.MIR.KT	A3.22	Kelp and seaweed communities in tide-swept sheltered conditions
IR.MIR.KT.KT.XKT	A3.222	Mixed kelp with foliose red seaweeds, sponges and ascidians on sheltered tide-swept infralittoral rock
IR.MIR	A3.24	Faunal communities on moderate energy infralittoral rock
IR.FIR.SG	A3.71	Robust faunal cushions and crusts in surge gullies and caves
IR.FIR.SG.CrSpAsDenB	A3.713	Crustose sponges and colonial ascidians with *Dendrodoa grossularia* or barnacles on wave-surged infralittoral rock
CR.HCR.FaT	A4.11	Very tide-swept faunal communities on circalittoral rock
CR.HCR.XFa	A4.13	Mixed faunal turf communities on circalittoral rock
CR.HCR.XFa.ByErSp	A4.131	Bryozoan turf and erect sponges on tide swept circalittoral rock
CR.HCR.XFa.FluCoAs	A4.134	*Flustra foliacea* and colonial ascidians on tide-swept moderately wave-exposed circalittoral rock
SS.SCS.ICS	A5.13	Infralittoral coarse sediment
SS.SCS.OCS	A5.14	Circalittoral coarse sediment
SS.SSa	A5.2	Sublittoral sand
SS.SMx.CMx	A5.44	Circalittoral mixed sediment
SS.SMx.CMx.OphMx	A5.445	*Ophiothrix fragilis* and / or *Ophiocomina nigra* brittlestar beds on sublittoral mixed sediment

The most frequently observed biotopes were associated with sublittoral rock habitats which extended from the base of the Breakwater wall to the sediment areas in deeper water ~100m from the Breakwater.

Immediately adjacent to the base of the Breakwater, rock substrate was bare and devoid of fauna and flora. Moving away from the Breakwater, kelp and foliose red seaweed biotopes dominated to approximately 10m water depth. Beyond, biotopes were dominated by fauna with rock substrate being encrusting with bryozoan / hydroid turf and mixed faunal turf communities.

The sediment areas further away from the Breakwater were dominated by coarse / mixed sediments as well as areas of clean sands with sparse fauna. Coarse / mixed sediment habitats were dominated by the brittlestars *O.fragilis* and / or *O.nigra* and crinoid feather stars.

11.5.4.1 Notable features

Sublittoral rock habitats

Sublittoral rock habitats were recorded in all 11 transects surveyed and were deemed to represent Annex I 'Reef' type habitats and Section 7 habitats. Sublittoral rock habitats were present from the shallow sublittoral adjacent to the Breakwater down to approximately 15m water depth where the habitats transitioned into sediment. Shallow sublittoral rock habitats (< 8m) were dominated by kelp and red seaweeds and deeper water sublittoral rock habitats were dominated by faunal communities including some areas of mixed faunal turf, dense *F. foliacea* and erect sponges.

No observations of Annex I biogenic reef forming species such as Ross worm (*Sabellaria spinulosa*) or horse mussel (*Modiolus modiolus*) were recorded.

Other habitats of conservation interest

Eight habitats were recorded which were deemed to be representative of HOCI as set out in **Table 11-6**. Of particular note was the band of kelp forest with seaweeds and understory communities including coralline algal crusts, barnacle and encrusting sponges. This band was present on all transects indicating it is likely to extend the length of the Breakwater on the seaward side. Kelp habitats were generally recorded between 2m and 8m water depth.

Table 11-6 List of representative HOCI present on the seaward side of the Breakwater

JNCC Code	EUNIS Code	Description	Annex I	Features of conservation interest
LR.MLR.BF.Fser.R	A1.214	*Fucus serratus* on moderately exposed lower eulittoral rock	Yes	Representative of '*Fucus serratus* and under-boulder fauna on exposed to moderately exposed lower eulittoral boulders'
IR.HIR.KFaR	A3.11	Kelp with cushion fauna and / or foliose red seaweed	Yes	Representative of '*Laminaria hyperborea* forest, foliose red seaweeds and a diverse fauna on tide-swept upper infralittoral rock'
IR.HIR.KFaR.LhypFa	A3.113	*Laminaria hyperborea* forest with a faunal cushion (sponges and polyclinids) and foliose red seaweeds on very exposed infralittoral rock	Yes	
IR.MIR.KT	A3.22	Kelp and seaweed communities in tide-swept sheltered conditions	Yes	
IR.MIR.KT.KT.XKT	A3.222	Mixed kelp with foliose red seaweeds, sponges and ascidians on sheltered tide-swept infralittoral rock	Yes	
CR.HCR.XFa	A4.13	Mixed faunal turf communities on circalittoral rock	Yes	Representative of 'Mixed turf bryozoans and erect sponges with *Dysidia fragilis* and *Actinothoe sphyrodeta* on tide-swept wave-exposed circalittoral'
SS.SMx.CMx.OphMx	A5.445	*Opuntia fragilis* and / or *Ophiocomina nigra* brittlestar beds on sublittoral mixed sediment	No	Representative of '*Opuntia fragilis* and / or *Ophiocomina nigra* brittlestar beds on sublittoral mixed sediment'
SS.SSa	A5.2	Sublittoral sand	No	Representative of 'Infralittoral mobile clean sand with sparse fauna'

Seapens (*V. mirabilis)*

There were no seapens (*V. mirabilis*), a characteristic species of the OSPAR habitat 'Seapens and burrowing megafauna communities', recorded during the seaward side survey.

Invasive non-native species (*D. vexillum)*

There were no INNS (including *D. vexillum*) identified in the footage and stills collected on the seaward side of the Breakwater.

11.5.5 Roundhead survey

The survey of the roundhead of the Breakwater was undertaken in November 2020. A total of three 100m transects, radiating out from the roundhead of the Breakwater, were flown by the ROV. The roundhead ROV inspection transect was run from west to east on the intersection of the Breakwater footings and the

seabed and then from west to east approximately 3m above the seabed. Low visibility due to water clarity meant the ROV had to be flown within 0.5m of the wall and therefore the field of view was restricted. The seabed at the footing of the roundhead was a mosaic of coarse sediments, representative of 'A5.13 - Infralittoral coarse sediment' and clean, stable cobble representative of 'A4.2 – Atlantic and Mediterranean moderate energy circalittoral rock'.

The lower footings of the roundhead were characterised by a turf of bryozoans and hydroids with occasional encrusting sponges and grazing echinoderms including *Asterias rubens* and *Crossaster papposus*, representative of 'A4.21 – Echinoderms and crustose communities on circalittoral rock'. The upper section of transect was characteristic of the vertical rock wall biotope 'A3.117 -*L.hyperborea* and red seaweeds on exposed vertical rock' with red algae, occasional kelp fronds and a turf of bryozoans and encrusting sponges. The INNS, *D.vexillum,* was not present on the roundhead (**Appendix 11-2**).

11.6 Prediction of Potential Effects During Construction

11.6.1 Direct loss of species and habitats within the footprint of the proposed scheme

Loss of species and habitats on the leeward side of the Breakwater

The proposed placement of the ACBM and rock revetment along the Breakwater would result in the direct loss of existing benthic and epibenthic species and habitats. As such the magnitude of this impact is considered to be **medium**.

The leeward side survey indicated that the biotopes present are typical of the local area and the coastal habitats of North Wales and as such are considered to be of local or **low** value. A total of three habitat species of conservation importance were identified. As such it is considered that the sensitivity of the habitats within the leeward side of the Breakwater is **medium**.

On completion of the refurbishment works it is expected that the ACBM and rock revetment would quickly become colonised by species similar to those already present on the existing rubble mound. In conclusion, the existing habitats within the footprint of the proposed scheme would be lost; however, they are considered to be of low value and common along the coastline of North Wales and recolonisation of the new structures will occur over time. Therefore, a potential impact of **minor adverse** significance is predicted in relation to the loss of existing species and habitats on the leeward side of the Breakwater.

Loss of species and habitats on the seaward side of the Breakwater

The proposed placement of the Tetrapod units and Z-shaped concrete units along the Breakwater would result in the direct loss of benthic and epibenthic species and habitats. As such the magnitude of this impact is considered to be **medium**.

The seaward side survey indicated the biotopes present are typical of the local area and the coastal habitats of North Wales and as such are considered to be of local or **low** value. A total of eight habitat species of conservation importance were identified. As such it is consider that the sensitivity of the habitats within the seaward side of the Breakwater is **medium**.

On completion of the refurbishment works it is expected that the Tetrapod units and Z-shaped concrete units would quickly become colonised by species similar to those present on the existing rubble mound. In conclusion, the existing habitats within the footprint of the proposed scheme would be lost; however, they are considered to be of low value and common along the coastline of North Wales and recolonisation of the

new structures will occur over time. Therefore, an impact of **minor adverse** significance is predicted in relation to the loss of existing species and habitats on the seaward side of the Breakwater.

Mitigation and residual impact

No mitigation is considered necessary and as such the residual impact for loss of species and habitats on the leeward and seaward sides of the Breakwater is of **minor adverse** significance.

11.6.2 Spread of invasive non-native species, *D. vexillum*

The ROV surveys undertaken in December 2019, July 2020 and November 2020 did not identify any INNS on the leeward or seaward side of the Breakwater (**Appendix 11-1** and **Appendix 11-2**). Although *D. vexillum* is known to be present within the Holyhead New Harbour area, it is not believed to have spread onto the Breakwater.

In order to prevent the spread of INNS, the port has a Biosecurity Plan, which is reviewed annually in consultation with NRW. Biosecurity measures outlined within this Plan will be used to manage the risk of invasive species being introduced as a consequence of the increased vessel traffic with the delivery of material for the Breakwater.

As such, although the sensitive of the marine biotopes within the proposed scheme to colonisation by INNS, particularly *D.vexillum* is considered to be **high**, the probability of the construction activities contributing to the spread of this species is considered to be of **low** magnitude as the species was not identified in the surveys of the Breakwater and sufficient biosecurity measures will be adopted during the construction phase. Consequently, an impact of **minor adverse** significance is predicted.

Mitigation and residual impact

A Biosecurity Plan specific to the Breakwater would be submitted by the Contractor once a construction methodology was confirmed. The residual impact would remain of **minor adverse** significance.

11.7 Summary

The potential impacts on marine ecology arising from the proposed scheme are summarised in **Table 11-7.**

Table 11-7 Summary of impacts for marine ecology

Description of impact	Significance	Mitigation	Residual Impact
Construction - stage			
Direct loss of species and habitats within the footprint of the proposed scheme	Minor adverse	None	Minor adverse
Spread of invasive species, i.e *Didemnum vexillum*	Minor adverse	Biosecurity Plan	Minor adverse

12 Ornithology

12.1 Introduction

This chapter assesses the potential impacts of the proposed scheme on sensitive and / or valuable ornithological receptors. An assessment of potential impacts to marine ecology from the construction and operation of the proposed scheme are described. Appropriate mitigation measures (where necessary) are also provided along with an assessment of any residual impacts.

As stated in the Scoping Report (Royal HaskoningDHV, 2020), operation-stage impacts on ornithological receptors were scoped out of the EIA process given that there would be no change to the existing footprint, usage or accessibility of the Breakwater once the proposed scheme is completed.

Potential impacts to NSN and Ramsar sites are considered in **Chapter 20** Shadow Habitats Regulations Assessment.

12.2 Legislation, Policy and Guidance

12.2.1 Wildlife and Countryside Act 1981

The Wildlife and Countryside Act 1981 (as amended) is the principal mechanism for statutory protection of wildlife in Great Britain. Section 1 of the Act provides protection for all species of wild birds and their nests.

Under S1 of the Wildlife and Countryside Act 1981, it is an offence to intentionally or recklessly:

- Kill, injure or take a wild bird;
- Take, damage, destroy or interfere with a nest of any wild bird whilst it is in use or being built;
- Take or destroy an egg of any wild bird;
- Disturb any wild bird listed on Schedule 1 of the Act whilst it is building a nest or is in, on or near a nest containing eggs or young; and,
- Disturb the dependent young of any wild bird listed on Schedule 1.

12.3 Consultation

Consultation undertaken throughout the pre-application phase informed the approach and the information provided in this chapter (see **Chapter 6** Consultation).

12.4 Assessment Methodology

The process for assessing the environmental impact on ornithological receptors follows that set out in **Chapter 5** Approach to Environmental Impact Assessment, and is guided by the *'Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine*', published by the Chartered Institute of Ecology and Environmental Management (CIEEM) (2018).

12.4.1 Study area

The study area for assessing the potential impacts on ornithological receptors includes the footprint of the proposed scheme plus a maximum radius of 2km around the footprint, as presented in **Section 1.4**.

12.4.2 Data sources

A desk-based study has been carried out to understand the baseline ornithological environment and inform the impact assessment. Information used in the study included the following data sources:

- The JNCC standard data forms for Holy Island Coast / Glannau Ynys Gybi SPA (JNCC, 2016) and Anglesey Terns / Morwenoliaid Ynys Môn SPA (JNCC, 2017), which provide information on the designation features of the SPA features;
- NRW's departmental brief for the Anglesey Terns / Morwenoliaid Ynys Môn SPA (NRW, 2016), which was used to provide the scientific rationale for classification of the site;
- British Trust for Ornithology (BTO) Wetland Bird Survey (WeBS) counts from the New Harbour (sector 68408), to 1991;
- BTO Non-Estuarine Wetland Survey (NEWS) counts from the New Harbour and Salt Island in winter 2015/16;
- JNCC's Seabird Monitoring Programme, a partnership of 19 organisations undertaking an ongoing annual monitoring programme;
- SCAN ringing group (the local North Wales ringing group);
- Data from a 2016 Salt Island breeding bird survey, RPS Group (RPS, 2016); and,
- Data from a 2009 Holyhead waterfront breeding bird survey (Argus Ecology Ltd., 2009; in Axis, 2010).

12.5 Baseline Environment

12.5.1 Designated sites for ornithological features

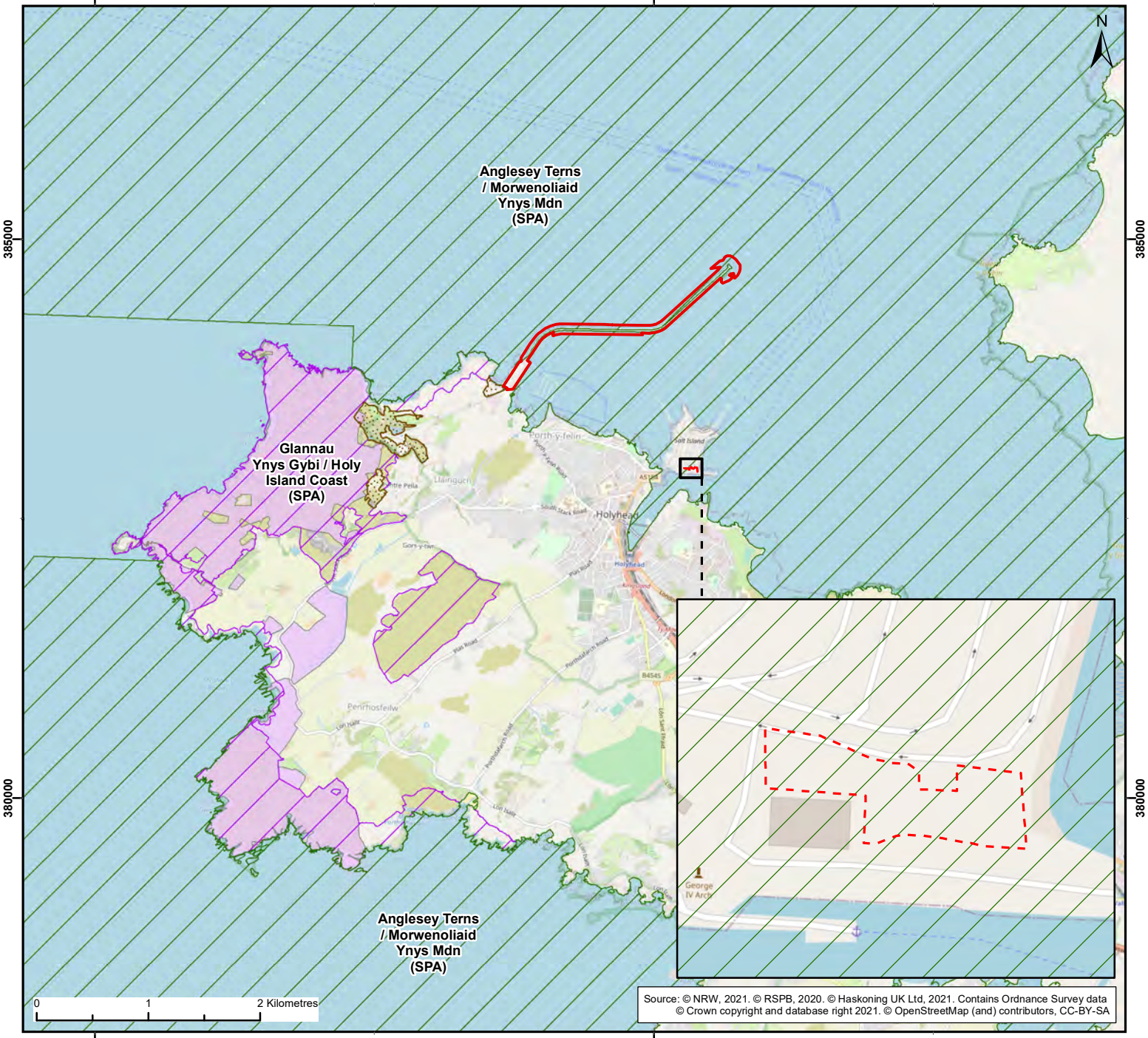
A small section of the non-statutory designation 'Chwarel Morglawdd Caergybi' LWS is located to the west of Soldier's Point. This section of the LWS is a recognised nesting and / or feeding area for coastal species such as oystercatcher *Haematopus ostralegus*, ringed plover *Charadrius hiaticula*, shelduck *Tadorna tadorna* and red-breasted merganser *Mergus serrator*. The South Stack Cliffs RSPB reserve is located *c.*1.2km from the Breakwater at the nearest point, although the main seabird colonies on the cliffs within the reserve are *c.*3km away and are beyond the range to which disturbance impacts may be experienced. The locations of the LWS and RSPB reserve in relation to the proposed scheme are presented in **Figure 12-1**.

12.5.2 Baseline non-breeding bird population data

12.5.2.1 BTO Wetland Bird Survey

The closest coastal WeBS core count sector to the Breakwater is Holyhead Harbour (sector code: 68408), which encompasses the New Harbour and is bordered by Salt Island, Newry Beach and the Breakwater (see **Figure 12-2**). There are no WeBS count sectors to the west of the Breakwater.

Data from the Holyhead Harbour WeBS count sector is of relevance as an indication of the assemblage of bird species present during the non-breeding season. It is noted however that this WeBS count site has not been counted since 1990/91, so the data are around 30 years old. At the time of the counts, only small numbers of a few waterbird species (red-breasted merganser, little grebe *Tachybaptus ruficollis*, great crested grebe *Podiceps cristatus* and cormorant *Phalacrocorax carbo*, see **Table 12-1**) were present when the site was counted, suggesting that the area is of low to negligible value for coastal birds during the non-breeding season. Given that there is an absence of extensive intertidal and other feeding habitats within the study area, there is no indication that the site could support significant numbers of non-breeding waterbirds.



Legend:

- Holyhead Breakwater Refurbishment Scheme
- Salt Island Batching Plant
- Anglesey Terns / Morwenoliaid Ynys Mdn Special Protection Area (SPA)
- Glannau Ynys Gybi / Holy Island Coast Special Protection Area (SPA)
- Chwarel Morglawdd Caergybi Local Wildlife Site (LWS)
- South Stack RSPB Reserve

Client:	Project:
Isle of Anglesey County Council	Holyhead Breakwater Refurbishment Scheme

Title: Ornithological Nature Conservation Designations

Figure: 12.1 | Drawing No: PB9014-200-010

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
02	29/04/2021	AB	BH	A4	1:50,000
01	26/01/2021	AB	BH	A4	1:50,000

Co-ordinate system: British National Grid

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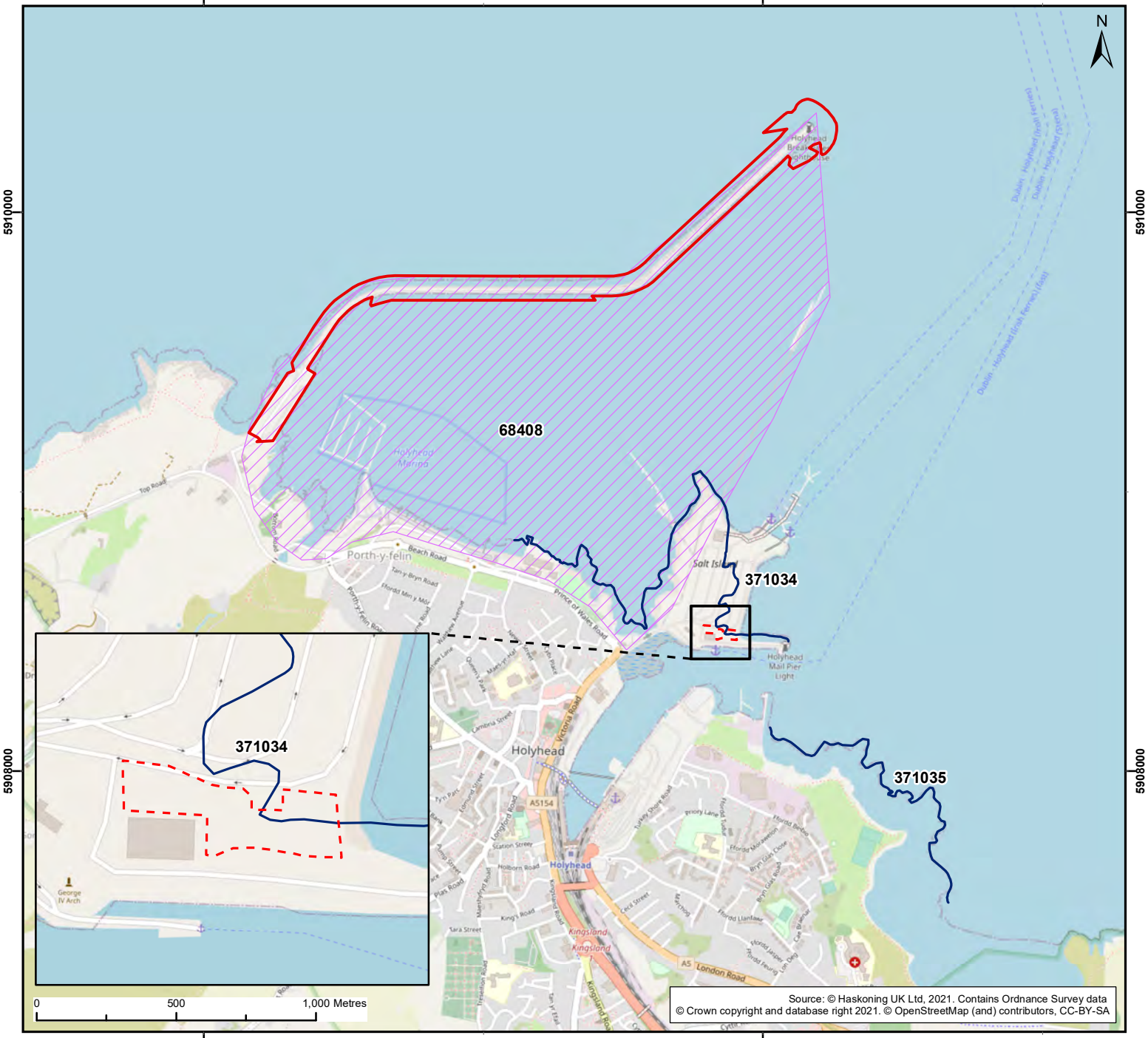

Legend:

- Holyhead Breakwater Refurbishment Scheme
- Salt Island Batching Plant
- BTO Non Estuarine Wetland Survey Area (NEWS)
- BTO Wetland Bird Survey Sector

Client: Isle of Anglesey County Council	Project: Holyhead Breakwater Refurbishment Scheme

Title: WeBS and NEWS Count Sectors

Figure: 12.2 | Drawing No: PB9014-200-011

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
02	29/04/2021	AB	BH	A4	1:20,000
01	26/01/2021	AB	BH	A4	1:20,000

Co-ordinate system: WGS 1984 UTM Zone 30N

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Table 12-1 Summary of most recent data from Holyhead Harbour WeBS sector

Species	Year					Month of peak count	5 year mean
	86/87	87/88	88/89	89/90	90/91		
Red-breasted merganser	12	13	3		3	January	8
Little grebe	0	0	2		0		1
Great crested grebe	0	0	0		3	January	1
Cormorant		4	2		0		2
*http://www.bto.org/volunteer-surveys/webs/publications/webs-annual-report							

Low tide count data were not available for Holyhead Harbour. The nearest low tide count sector to the proposed scheme is at the Inland Sea, which is beyond the study area and therefore sufficiently far that there would be no disturbance to birds in that sector.

12.5.2.2 BTO Non-Estuarine Wetland Survey

NEWS is an intermittent survey organised by BTO, carried out over non-estuarine areas of UK coastline, which complements the WeBS counts. Non-estuarine coastal areas are important for several species of waders.

The most recent NEWS was carried out in the winter of 2015 / 2016. A single visit was made to each count sector at low tide between 1st December 2015 and 31st January 2016. Waterbirds present were recorded within and assigned to the following habitats: intertidal, inshore waters (i.e. the sea adjacent to the coast), landward (i.e. inland areas visible to within 100m of high water); and the strandline or wrack at high water. While NEWS counts placed particular focus on wading birds in intertidal habitats, recorders were asked to record all species of birds and mammals present; however, there are no extensive intertidal mudflats within Holyhead New Harbour or to the west of the Breakwater.

Within the study area, NEWS count sector 371034 (see **Figure 12-2**) extended along the shoreline from Newry Beach, in Holyhead New Harbour, to Salt Island Fish Dock (in the Old Harbour). The species and counts recorded in the sector are included in **Table 12-2**. A total of 23 species was recorded, included coastal and estuarine birds (waders, wildfowl, seabirds), as well as terrestrial birds. Species of conservation interest that were recorded included one each of chough, red-throated diver *Gavia stellata* and great northern diver *G. immer* (listed in Annex I of the Wild Birds Directive and Schedule 1 of the Wildlife and Countryside Act), though the nearest SPA for which divers are a feature of interest is the Liverpool Bay SPA, approximately 25km east of the Breakwater at the nearest point. Herring gull *Larus argentatus*, black-headed gull *Chroicocephalus ridibundus* and song thrush *Turdus philomelos* are species listed in Section 7 of the Environment (Wales) Act 2016.

Table 12-2 Non-Estuarine Wetland Bird counts at count sector 37104, January 2016

Species		Count	Habitat
Black guillemot	*Cepphus grylle*	4	Inshore waters
Blackbird	*Turdus merula*	2	Landward
Black-headed gull	*Chroicocephalus ridibundus*	3	Intertidal
Carrion Crow	*Corvus corone*	2	Landward
Chough	*Pyrrhocorax pyrrhocorax*	1	Landward
Cormorant	*Phalacrocorax carbo*	1	Inshore waters
Goldfinch	*Carduelis carduelis*	3	Landward
Great Black-backed Gull	*Larus marinus*	2	Inshore waters
Great Crested Grebe	*Podiceps cristatus*	2	Inshore waters

Species		Count	Habitat
Great Northern Diver	*Gavia immer*	1	Inshore waters
Greenfinch	*Chloris chloris*	2	Landward
Grey Heron	*Ardea cinerea*	1	Intertidal
Guillemot	*Uria aalge*	1	Inshore waters
Herring Gull	*Larus argentatus*	42	Landward / inshore waters
Little Grebe	*Tachybaptus ruficollis*	1	Inshore waters
Oystercatcher	*Haematopus ostralegus*	23	Landward / intertidal
Red-breasted Merganser	*Mergus serrator*	10	Inshore waters
Redshank	*Tringa totanus*	4	Intertidal
Red-throated Diver	*Gavia stellata*	1	Inshore waters
Robin	*Erithacus rubecula*	2	Landward
Shag	*Phalacrocorax aristotelis*	3	Inshore waters
Song Thrush	*Turdus philomelos*	1	Landward
Turnstone	*Arenaria interpres*	6	Intertidal

Given that there are no extensive intertidal mudflats within the study area, nor are there significant counts of vulnerable / rare species from the surveys described above, this provides further evidence that the area is of low importance for wintering waterbirds. Records of chough are likely to be attributed to the relative proximity of coastal heathland to the west of Soldier's Point, rather than any intrinsic value of the surveyed area (or of the Breakwater and Soldier's Point) for non-breeding chough.

12.5.3 Baseline breeding bird population data

A review of Cofnod data obtained in 2019 indicates records of 42 'rare, endangered or vulnerable' bird species listed in Annex I of the Wild Birds Directive and / or Schedule 1 to the Wildlife and Countryside Act 1981 (as amended) within 2km of Holyhead Marina, an area that encompasses Holyhead New Harbour, Soldier's Point, most of the Breakwater and the LWS. Most of these are passage migrants or vagrant species which are do not regularly occur in the area.

12.5.3.1 Salt Island breeding bird survey 2016

In May and June 2016, a breeding bird survey (RPS, 2016) was undertaken in an area encompassing Salt Island, Holyhead Port, and a coastal area of the New Harbour just to the west of Salt Island (i.e. within an area afforded shelter by the Breakwater). A total of 17 species of breeding bird were confirmed to be breeding in the surveyed area during the survey, as listed in **Table 12-3**. None of the species recorded during the survey are listed on Annex I of the Wild Birds Directive or under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended), and no bird species were found to be breeding in numbers of national significance (RPS, 2016); however, it should be noted that the surveyed area did not include the Breakwater or Soldier's Point.

Seven pairs of black guillemots were found to be breeding within the wider Port area at a level considered regionally significant to Wales. The large boulders scattered along the shoreline close to Salt Island were considered prime nesting sites for the species, although there was no reference to use of the Breakwater or Soldier's Point. During consultation for the Holyhead Port Expansion EIA (Royal HaskoningDHV, 2019), the SCANS ringing group also indicated that the Inner Harbour near to Salt Island provides nesting opportunities for up to 4 pairs of black guillemots. Although not an Annex I / Schedule 1 species, these numbers are of regional importance for the wider North Wales population.

Table 12-3 Confirmed breeding birds during survey of Salt Island to Newry Beach, 2016 (RPS, 2016)

Species		Min. no. of breeding territories near to Salt Island
Blackbird	Turdus merula	4
Black guillemot	Cepphus grylle	7
Carrion crow	Corvus corone	1
Collared dove	Streptopelia decaocto	1
Dunnock	Prunella modularis	4
Greylag goose	Anser anser	1
Herring gull	Larus argentatus	11
House martin	Delichon urbicum	3
House sparrow	Passer domesticus	9
Lesser black-backed gull	Larus fuscus	1
Oystercatcher	Haematopus ostralegus	5
Pied wagtail	Motacilla alba	2
Robin	Erithacus rubecula	1
Starling	Sturnus vulgaris	2
Swallow	Hirundo rustica	2
Wren	Troglodytes troglodytes	1

12.5.3.2 Holyhead waterfront breeding bird survey 2009

A breeding bird survey was undertaken in 2009 for a project along the Holyhead waterfront (Argus Ecology Ltd., 2009; in Axis, 2010). The survey area extended from Salt Island to the small bay west of Soldier's Point. Of the 41 species recorded in the survey area, seven are listed in Section 7 of the Environment (Wales) Act 2016:

- Linnet Carduelis cannabina;
- Ringed plover Charadrius hiaticula;
- Herring gull;
- House sparrow;
- Dunnock;
- Chough;
- Starling; and,
- Song thrush.

Most of the above species are still considered common in a regional and local context, despite falling national numbers. Most are unlikely to nest on the Breakwater or Soldier's Point Quay, and are more likely to nest in woodland, scrub or coastal habitats above MHWS to the west and east of Soldier's Point.

Chough was the only Annex I / Schedule 1 species recorded during the 2009 survey. Although a breeding feature of the Holy Island Coast / Glannau Ynys Gybi SPA, this species nests on breeding cliffs with nearby coastal heath and pastures. There was no evidence of breeding within the surveyed area, and there is no suitable breeding habitat within the footprint of the proposed scheme. Areas to the west of Soldier's Point

(i.e. within the SPA itself), where there is a mix of coastal heathland and meadows, are more likely to support breeding chough than the Breakwater or Soldier's Point.

12.6 Prediction of Potential Effects During Construction

12.6.1 Disturbance and displacement

Bird reactions are likely to depend on the level and nature of the disturbance, which may be visual or acoustic (i.e. associated with noise arising from the construction activities).

In terms of noise disturbances, a distinction may be made between 'continuous' noise levels (i.e. those associated with vessel and plant usage) and 'impulsive' noise levels (i.e. sudden loud noises arising from e.g. pile driving). Generally speaking, the greatest disturbance to birds arises from impulsive noises; however, in the proposed scheme there is no pile driving or other 'noisy' activities above water that may result in significant impulsive noise. As such, during the construction phase it is assumed that disturbance (if any) will arise from sources of 'continuous' noise, such as the use of construction vessels / plant and the action of lifting the armour units and rock into position.

In terms of visual disturbances, this is likely to arise as a result of the presence of construction vessels, plant / machinery, artificial lighting and personnel involved in the proposed scheme. This may be associated with the works on the Breakwater itself, or with the use of the potential storage site at Soldier's Point.

Disturbance leading to displacement of birds would effectively represent temporary habitat loss while the source of disturbance remains, noting that the length of the Breakwater means that works undertaken along one section would be unlikely to disturb birds present near other sections. It should also be noted that sources of disturbance will be removed from site upon completion of the construction phase, and so represent a temporary impact.

12.6.1.1 Non-breeding birds

The Breakwater and nearby environs are generally of low value for non-breeding species (as demonstrated by historic WeBS and NEWS counts outlined in **Section 12.5.2**), although wintering chough are a feature of Holy Island Coast / Glannau Ynys Gybi SPA. Other Annex I species that have been recorded in the vicinity (in the surveys outlined in **Section 12.5.2**), such as red-throated diver and great northern diver, are incidental records and do not make regular use of the site.

Visual / noise disturbances caused by construction activity on the Breakwater would be restricted to areas within close proximity to the Breakwater and Soldier's Point. With the quay at Soldier's Point to be used for storage of concrete armour units, there is potential for localised disturbance on land immediately adjacent to the quay throughout the construction phase as a result of both unit transportation and on-site activity; however, the Breakwater and the land adjacent to Soldier's Point are sub-optimal habitats for wintering chough, which prefer to forage in cattle-grazed grassland, especially where a short sward is maintained through winter grazing. There are ample, more suitable foraging grounds for wintering chough within the SPA that would not be affected by disturbances at Soldier's Point. Furthermore, it is anticipated that there would be an element of acclimatisation for those individuals that may occasionally forage on the land adjacent to Soldier's Point. With this in mind, **no impact** is expected to non-breeding chough and other non-breeding birds.

12.6.1.2 Potential impacts on breeding birds

While the focus of this assessment is on those receptors of value at a local, regional or national scale, best practice procedures will be in place during the construction phase to minimise impacts on other breeding birds. Notably, prior to any works being undertaken during the breeding season, pre-construction nesting bird surveys will be undertaken within the footprint of the proposed scheme to avoid contravention of the Wildlife and Countryside Act 1981, as amended (which prohibits intentional or reckless destruction of disturbance of nesting birds). Given the nature of the structure and the regular use of the structure as a public access route, it is unlikely that there will be significant use of the Breakwater or Soldier's Point Quay by nesting birds. However, should any nests be identified, appropriate measures will be set, including the possible introduction of exclusion zones that would be agreed upon with an experienced ecologist / ornithologist and would be in place until nests are no longer in use.

Given the above, disturbance impacts on breeding birds would be of **negligible** significance.

12.6.1.3 Potential impacts to foraging terns

There are no tern colonies within the study area – the nearest colony is at The Skerries, approximately 10km north of the Breakwater roundhead – therefore there is no impact pathway by which noise or visual disturbance may affect terns on nests; however, the Breakwater lies within Anglesey Terns / Morwenoliaid Ynys Môn SPA and is within the theoretical foraging range of terns from The Skerries and other colonies at Cemlyn and Ynys Feurig.

The likely areas of usage by breeding common, Arctic and Sandwich terns from the SPA were modelled and presented in NRW's departmental brief for the site, which was used to provide the scientific rationale for classification (NRW, 2016; Wilson *et al.*, 2014). The core areas used by foraging birds lie outwith the ZOI of the proposed scheme and, in all cases, the modelled usage of Holyhead New Harbour and coastal waters within the ZOI is low.

Regardless, the mean maximum foraging range of common, Arctic and Sandwich terns is 19km, 32km and 49km, respectively (Wilson *et al.*, 2014). With these extensive foraging ranges in mind, temporary disturbance affecting a small, low-usage area within those foraging ranges would represent a very low magnitude of effect. Furthermore, given the proximity of the Breakwater to the hub of Holyhead Harbour, where visual and noise disturbance from recreational and commercial vessels (including international passenger and vehicle ferries, dredging vessels and speed craft from the marina) is already relatively high, terns that forage within this general area are likely to have some habituation to vessel activity and associated disturbances, and are therefore likely to have a medium to low sensitivity, at worst. There are ample alternative foraging areas for terns, including areas closer to the nesting colonies and areas with fewer existing sources of disturbance. As such, disturbance impacts on foraging terns whether visual or acoustic, would be of **negligible** significance.

12.6.2 Potential impacts on chough

Breeding sites for chough are principally located in shallow caves in cliffs within the Holy Island Coast / Glannau Ynys Gybi SPA, in the component SSSIs of Holy Island Coast / Glannau Ynys Gybi and Rhoscolyn Coast / Glannau Rhoscolyn. The coastline immediately west and east of Soldier's Point is considered to be suboptimal for nesting chough; instead, prime nesting areas are located over a kilometre from the Breakwater at South Stack RPSB reserve and North Stack, and along the coastline in Glannau Rhoscolyn SSSI. As such, there is considered to be very little risk of impact on nesting activity.

Within the foraging area of breeding chough, feeding sites close to the nesting sites are used preferentially (Kerbiriou *et al.*, 2006); however, the foraging area of breeding chough may extend over dry heath, grassland, maritime heath, wet heath and fields or pastures with low sward (i.e. less than 5cm) used for low intensity livestock farming (CCW, 2008). Foraging chough may occasionally use the areas of grassland / heathland immediately west of Soldier's Point, although the relatively high sward and shrub cover at this location are likely to make it suboptimal as a feeding habitat (Kerbiriou *et al.*, 2006).

The noise assessment (see **Chapter 10** Noise and Vibration) indicates that likely construction noise levels at the buildings at Soldier's Point (receptor NSR5), approximately 100m south west of Soldier's Point (and therefore indicative of noise levels on land adjacent to Soldier's Point), would be around 50 dB L_{AeqT} during daytime hours, and around 30 dB L_{AeqT} on evenings, nights and weekends. This indicates that the magnitude of construction level noises in potential foraging areas, even on land adjacent to Soldier's Point, would be very low. As such, in the event that foraging chough from the SPA do make use of the land to the west of Soldier's Point, noise levels from construction activities are unlikely to cause significant disturbance.

Similarly, visual disturbances created by activity at Soldier's Point, and from vehicular access to this facility, would only be expected to affect a very small area immediately adjacent to the proposed scheme. Cutts *et al.* (2009) describe a 300m radius from visual source as a threshold for disturbance effects on wintering/foraging waterbirds on open intertidal areas, which are considered particularly sensitive to visual disturbances. This is clearly not directly relatable to the disturbance tolerances of chough and is likely to be a more conservative threshold than may otherwise be necessary; however, there is a lack of species-specific information on the anthropogenic disturbance tolerances of chough, and even if this threshold is applied then it would indicate that less than 0.5% of the SPA area would be affected.

Any choughs that may be affected by visual or acoustic disturbances from the proposed scheme would have ample alternative foraging opportunities elsewhere in the SPA (and other functionally linked territory), which would be unaffected by such disturbances. Much of the unaffected area within the SPA would be preferable for foraging chough in the first instance since habitat within the immediate vicinity of Soldier's Point is suboptimal. As such, any temporary disturbance, even during the breeding season, would represent a very low magnitude of effect.

Given the above, disturbance impacts on foraging choughs, whether visual or acoustic, would be of **negligible** significance.

12.6.3 Potential impacts on waterbirds in the Chwarel Morglawdd Caergybi LWS

The coastline immediately west of Soldier's Point is of local importance as part of the Chwarel Morglawdd Caergybi LWS. This section of the coastline is recognised as a potential nesting and feeding area for waterbird species such as oystercatcher, shelduck and ringed plover. Construction activity at the landward end of the Breakwater, plus activity at Soldier's Point, has the potential to lead to disturbances to breeding birds in the LWS.

As stated above, noise levels expected during construction activities are anticipated to be low at a short distance from the source (50dB L_{AeqT} at @ 100m), hence the range in which noise disturbance may be a factor is small. According to the Waterbird Disturbance and Mitigation Toolkit (Cutts and Spencer, 2013), oystercatcher, shelduck and ringed plover are relatively insensitive of noise disturbances, with caution advised for sources of noise level exceeding 55dB (oystercatchers) and 60dB (shelduck and ringed plover) at the receptor. These levels are only likely to be exceeded in very close proximity to the source, leaving much of the potential nesting / feeding habitat unaffected. Ringed plover and oystercatcher are known to be tolerant of foraging close to plant. Within the context of the area covered by the LWS, the magnitude of noise associated disturbance is expected to be low and temporary in nature.

Oystercatchers and ringed plover are also relatively insensitive to visual disturbance, with caution advised for sources of disturbance within 50m (ringed plover) and 100m (oystercatcher), although shelduck are considered a highly sensitive species to moderate- and high-level visual disturbance (Cutts and Spencer, 2013); however, all three are capable of habituating to ongoing and long-term disturbances, and it is important to note that the Breakwater, and the bay to the west of Soldier's Point, can be publicly accessed (including walkers, dog walkers and anglers), and it is within close proximity to the Anglesey Coastal Path access route. As such, it is likely that any waterbirds breeding within the LWS are likely to have a level of habitation to visual disturbances arising from the presence of personnel, therefore sensitivity is predicted to be medium, at worst.

In case of use of artificial lighting on Soldier's Point, best practices will be in place to ensure that the lighting is sympathetic to the surrounding environment. The coastline to the west of Soldier's Point, including the LWS, is sufficiently distant that it would not be significantly affected by light spill. Other sources of visual disturbance would include plant and vessels on both the seaward and landward side of the Breakwater, including prominent structures such as cranes. As a result, the magnitude of the visual disturbance is expected to be medium, and would be temporary in nature.

Given the above, disturbance impacts on breeding waterbirds that form notification features of the LWS, whether visual or acoustic, will be of **minor adverse** significance.

12.6.4 Potential impacts on breeding black guillemots

In the event that Salt Island is used to site a batching plant for the concrete armour units, this would lead to potential disturbance effects within Holyhead Old Harbour / port area, both from activity at the batching plant and from the arrival of materials / departure of completed units (which may occur up to 24 hours a day). Up to four pairs of black guillemot nest annually in Holyhead Inner Harbour and in drainage holes within the harbour walls to the south of Salt Island, representing about 14-30% of the Welsh breeding population (Royal HaskoningDHV, 2019). The breeding bird survey undertaken in 2016 (see **Section 12.5.3**) indicated there may also be up to seven pairs utilising the boulders immediately west of Salt Island (RPS, 2016).

Noise and visual disturbance has the potential to displace black guillemots from nest sites and therefore reduce the nesting habitat available to the local population. If displaced birds are unable to find alternative nesting sites nearby, then the local breeding population would be reduced (at least during the time that the batching plant is in operation).

Given the nature of the proposed scheme, and the fact that vessel movements would be in keeping with the busy usage of the port, there are not anticipated to be any effects over foraging areas elsewhere in the harbour and wider Holyhead Bay area. As such, this assessment focuses on potential impacts on nesting activity.

Baseline noise levels close to Salt Island (monitoring station LT1, see **Section 10.4**) ranged between 60.4 dB L_{AeqT} and 65.8 dB L_{AeqT} (see **Table 10-9**), reflective of the everyday activities and vessel movements associated with a busy port environment. The presence of nesting black guillemot in the port in the first instance indicates tolerance of / habituation to disturbance from human activities such as regular and significant shipping traffic, and they occupy an environment where baseline noise levels are reflective of sustained port activity. Predicted construction noise levels arising from the proposed scheme at receptor NSR1 (see **Table 10-12**,**Table** 10-13 and

Table 10-14) (same location as LT1) range from 46.9 dB L_{AeqT} at night to 47.3 dB L_{AeqT} during daytime. This indicates that the noise levels expected from construction-phase activities, even in close proximity to Salt

Island, are generally within (or less than) those regularly experienced under baseline conditions. As such, the magnitude of the increase in noise levels is considered to be low, and would be in temporary in nature.

Visual disturbance from vessel movements would increase as a result of the need for transportation of materials and completed units from the batching site, although black guillemots nesting in Holyhead Harbour are assumed to be habituated to frequent vessel movements. Artificial lighting associated with construction activities is a potential source of disturbance at night, although the Holyhead Port area is already lit at night and is close to central urban areas in Holyhead, so it is expected that birds using the harbour would be habituated to sources of artificial lights. In addition, coastal birds may feed at night and may actually take advantage of artificial light sources to extend feeding opportunities in darkness (e.g. Dwyer *et al*., 2012). Whilst fledglings of some seabird species (e.g. shearwaters) are known to be disoriented by artificial light on their first flights (e.g. Troy *et al.* 2011), this has not been recorded in auks (species where fledglings tend to leave nests by jumping into the water and swimming away rather than flying).

Black guillemot is identified as a receptor of medium sensitivity, with the high value of the breeding population near Salt Island (in the context of the Welsh population) being balanced by the fact that those nesting there are already habituated to the noise and visual disturbances associated with regular commercial vessel movements and anthropogenic activity on port-owned land. As discussed, in the context of the port operations the magnitude of disturbance events are anticipated to be low, due primarily to the fact that the noise levels predicted generally fall within the expected background levels (day and night) within the port environs, and the visual factors are in keeping with those already expected in a busy port environment. The potential impact is considered to be **minor adverse** significance.

12.7 Summary

The potential impacts on ornithology arising from the proposed scheme are summarised in **Table 12-4**.

Table 12-4 Summary of impacts for Ornithology.

Description of impact		Significance	Mitigation	Residual Impact
Construction stage				
Disturbance and displacement	Nonbreeding birds	N/A	N/A	N/A
	Breeding Terns	N/A	N/A	N/A
	Breeding Chough	N/A	N/A	N/A
	Water birds	Minor adverse	None	Minor adverse
	Black Guillemot	Minor adverse	None	Minor adverse

13 Terrestrial Ecology

13.1 Introduction

This chapter of the EIA report describes the baseline environment in relation to terrestrial ecological receptors present in the study area. An assessment of potential impacts to terrestrial ecology from the construction and operation of the proposed scheme are described. Appropriate mitigation measures (where necessary) are also provided along with an assessment of any residual impacts.

As stated in the Scoping Report (Royal HaskoningDHV, 2020), operation-stage impacts on marine ecological receptors were scoped out of the EIA process given that there would be no change to the existing footprint, usage or accessibility of the Breakwater once the proposed scheme is completed.

Potential impacts of the proposed scheme on Ornithology are considered within **Chapter 12** Ornithology. Potential impacts to marine NSN and Ramsar sites are considered in **Chapter 20** Shadow Habitats Regulations Assessment.

13.2 Legislation, Policy and Guidance

This section outlines the key legislation, policy, and guidance relevant to terrestrial ecology and to this Ecological Impact Assessment (EcIA).

13.2.1 Legislation

13.2.1.1 The Conservation of Habitats and Species Regulations 2017, as amended

The Habitats Regulations offer protection to a number of Annex IV(a) European Protected Species (EPS), which are listed in Schedule 2 of the regulations. Under Section 43, any disturbance or harm to an EPS is prohibited and, as such, if there are potential impacts on such species then an EPS licence may be required before an activity associated with a development can commence.

13.2.1.2 Wildlife and Countryside Act 1981 (as amended)

The Act makes provision for the notification and confirmation of SSSIs. Under the terms of Section 28H of the Wildlife and Countryside Act 1981, as amended by Schedule 9 to the Countryside and Rights of Way Act (CRoW) 2000, any operations within, or adjacent to, a SSSI require assent from NRW. Assent under Section 28H of the Wildlife and Countryside Act 1981, as amended, can be included in NRW's advice regarding the requirement (or otherwise) for HRA under the Habitats Regulations, where SSSIs are covered by a NSN site(s).

The proposed scheme is located adjacent to the following SSSI (see **Figure 4-1**):

- Holy Island Coast/Glannau Ynys Gybi SSSI.

Section 9 of the Wildlife and Countryside Act 1981, as amended, offers varying levels of protection to animal species listed in Schedule 5 to the Act. Depending on the level of protection conferred by the Act, activities associated with a development may require a Protected Species Licence if they are likely to result in impacts to species listed in Schedule 5.

Section 13 of the Act makes it an offence (subject to exceptions) to intentionally pick, uproot or destroy any wild plant listed in Schedule 8 of the Act.

Section 14 relates to invasive non-native species, making it illegal to plant or allow to escape into the wild any invasive non-native species listed in Schedule 9.

13.2.1.3 Environment (Wales) Act 2016

The Environment (Wales) Act 2016 (Section 7) lists priority species and habitats in Wales considered to be of key significance to sustain and improve biodiversity. All reasonable steps should be taken by public authorities to maintain and enhance the living organisms and types of habitat in the Section 7 list.

13.2.1.4 Countryside and Rights of Way Act 2000

The CRoW Act 2000 includes amendments in relation to SSSIs to improve their management and protection, as well as to the Wildlife and Countryside Act 1981, to strengthen the legal protection for threatened species.

13.2.1.5 Protection of Badgers Act 1992

The Protection of Badgers Act 1992 makes it illegal to wilfully kill, injure or take badgers, obstruct, damage, or destroy an occupied sett and disturb a badger when it is occupying a sett. In the event of a sett being identified within the site, any works associated with a development that may result in damage or destruction of the sett would require a licence to be issued by NRW.

13.2.2 Policies and Plans

This section outlines relevant local policies and plans regarding nature conservation and biodiversity on the Isle of Anglesey and Holy Island.

13.2.2.1 Anglesey and Gwynedd Joint Local Development Plan

Adopted in July 2017, the Anglesey and Gwynedd JLDP is a land use development strategy which concentrates on sustainable development. One of its key aims is to protect areas to ensure the maintenance and enrichment of the natural (and built) environment.

Policy AMG 5 of the JLDP is aimed at local biodiversity conservation. Under this policy, development proposals must protect and, where appropriate, enhance biodiversity that has been identified as being important to the local area by:

- Avoiding significant harmful impacts through the sensitive location of development; and,
- Considering opportunities to create, improve and manage wildlife habitats and natural landscape including wildlife corridors, steppingstones, trees, hedges, woodlands, and watercourses.

If the affected area is of local biodiversity importance (i.e. it supports important populations of priority species and habitats listed under Section 42 of the NERC Act 2006 (superseded by the lists under Section 7 of the Environment (Wales) Act 2016)), proposals that may affect such features must conform with the following criteria:

- That there are no other satisfactory alternative sites available for the development;

- The need for the development outweighs the importance of the site for local nature conservation; and,
- That appropriate mitigation or compensation measures are included as part of the proposal.

Policy AMG 6 of the JLDP is aimed at protecting sites of regional or local significance. Under this policy, proposals that are likely to cause direct or indirect significant harm to local nature conservation designations (such as LWSs) must give evidence that there is an overriding social, environmental and/or economic need for the development, and there is no suitable alternative. It is necessary to ensure that there are appropriate mitigation measures in place to safeguard a site's biodiversity importance.

Policy PS19 of the JLDP states that the Councils will manage development so as to conserve and where appropriate enhance the Plan area's distinctive natural environment, countryside and coastline, and proposals that have a significant adverse effect on them will be refused unless the need for and benefits of the development in that location clearly outweighs the value of the site or area and national policy protection for that site and area in question.

13.2.2.2 Isle of Anglesey Local Biodiversity Action Plan 2005

Anglesey's BAP is a local implementation of the UK BAP and forms part of the approach to conserving and enhancing the natural environment as set out by Policy PS19 of the JLDP. It was written to help secure partnership between local people and conservation organisations to ensure that local natural resources are valued and looked after in the future. The Anglesey BAP sets out the measures required to help maintain and improve important habitats and species.

The Anglesey BAP sets out HAPs for locally significant habitats that support local species of interest. HAPs set out overall objectives and targets for each habitat type, along with current and proposed action to meet such objectives and targets.

13.2.3 Guidance

The impact assessment has been based upon the following guidance and standards:

- Chartered Institute Ecology and Environmental Management of CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.1; and,
- CIEEM (2017) Guidelines for Ecological Report Writing. 2nd Edition.

The following species-specific guidance and standards have been used during the EcIA process:

- NRW (2015) Good Practice Guide: Approach to Bats and Planning; and,
- NRW (2018) Fact Sheet: A Guide for Developers.

13.3 Consultation

Consultation undertaken throughout the pre-application phase informed the approach and the information provided in this chapter (see **Chapter 6** Consultation).

13.4 Assessment Methodology

For the EcIA presented in this chapter, the methodology proposed in relation to Terrestrial Ecology was based on the CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial,

Freshwater, Coastal and Marine version 1.1. EcIA is a process of identifying, quantifying, and evaluating the potential effects of development-related or other proposed actions on habitats, species and ecosystems.

The CIEEM guidelines predict the residual impacts on important ecological features affected, either directly or indirectly by a development, once all the appropriate mitigation has been implemented. The approach to determining the significance of an impact follows a systematic process for all impacts. This involves identifying, qualifying and, where possible, quantifying the importance and magnitude of all ecological receptors which have been scoped into this assessment. Using this information, the significance of each potential impact has been determined. Each of these steps is set out in the remainder of this section.

The EcIA has used professional judgement to ensure the assessed significance level is appropriate for each individual receptor, taking account of local values for biodiversity to avoid a subjective assessment wherever possible, as per the CIEEM guidelines. As a result, the assessed significance level may not always be directly attributed to the guidance matrix detailed below.

13.4.1 Importance

The first stage of an EcIA is determining the importance of ecological features or receptors. CIEEM identifies the important ecological features as those key sites, habitats and species which have been identified by European, national, and local governments and specialist organisations as a key focus for biodiversity conservation in the UK. These include:

- Statutory and non-statutory designated sites for nature conservation;
- Species occurring on national biodiversity lists;
- UK Habitats of Principal Importance; and,
- Red listed, rare or legally protected species.

Importance is also qualified by the geographic context of an ecological receptor, i.e. a species which may be not recognised on a national biodiversity list may be locally in decline, and therefore its local importance is greater than its national importance.

For this EcIA, the guidelines outlined in **Table 13-1** have been followed to identify the relative importance of different ecological features.

Table 13-1 Definitions of ecological importance

Ecological Importance	Definition
High	• An internationally designated site (Ramsar site) or candidate site or an area which the statutory nature conservation organisation has determined meets the published selection criteria for such designation, irrespective of whether or not it has yet been notified or a nationally designated site (a site in the NSN site including SSSI, SAC and SPA) or a discrete area which NRW has determined meets the published selection criteria for designation, irrespective if it has yet been notified; • A viable area of a habitat type listed in Annex I of the Habitats Directive, or smaller areas of such habitat which are essential to maintain the viability of a larger whole; • A viable area of a UK Habitat of Principal Importance or smaller areas of such habitat which are essential to maintain the viability of a larger whole; • A European Protected Species; or, • A regularly occurring, nationally significant population/number of any internationally important species.

Ecological Importance	Definition
Medium	• County Council / Unitary Authority designated sites and other sites which the designating authority has determined meet the published ecological selection criteria for designation, including CWSs, Local Nature Reserves selected on defined ecological criteria and Wildlife Trust sites; • Viable areas of habitat identified in the Anglesey BAP; • Semi-natural woodland greater than 0.5ha which is in 'good condition'. • Any regularly occurring population of a nationally important species which is threatened or rare in the region; or, • A regularly occurring, locally significant number of a species identified as important on a regional basis.
Low	• Semi-natural woodland greater than 0.25ha which is considered to be in 'good condition' or greater than 0.5ha in unfavourable condition; • Network of inter-connected hedgerows including some species-rich hedgerows; • Individual important hedgerows or other ancient-countryside linear features; • Viable areas of habitat identified in a sub-county (District/Borough) BAP; • Any regularly occurring population of a nationally important species which is not threatened or rare in the region or county; • Sites/features that are scarce within the District/Borough or which appreciably enrich the District/Borough habitat resource; or, • Other features identified as wildlife corridors or migration routes.
Negligible	• Features of value to the immediate area only e.g. within the site.

In addition to the features listed in **Table 13-1**, ecological features which play a key functional role in the landscape, or are locally rare, have been considered. The value of such features has been determined by professional judgement. The CIEEM guidelines place emphasis on using professional judgement when considering importance of ecological receptors, based on available guidance, information, and expert advice. Different aspects of ecological importance should be taken into account to determine the sensitivity of a receptor, including designations, biodiversity value, potential value, secondary or supporting value, social value, economic value, legal protection, and multi-functional features.

For the purposes of this assessment, only receptors identified within the baseline conditions as being of low importance or above have been considered 'Important Ecological Features (IEFs)' and assessed. Appropriate mitigation may be proposed for non-IEFs where it is necessary to ensure offences are not committed under relevant legislation.

13.4.2 Magnitude

The magnitude of the effect has been assessed according to:

- The extent of the area subject to a potential impact;
- The duration the potential impact is expected to last prior to recovery or replacement of the resource or feature;
- Whether the potential impact is reversible, with recovery through natural or spontaneous regeneration, or through the implementation of mitigation measures or irreversible, when no recovery is possible within a reasonable timescale or there is no intention to reverse the impact; and,
- The timing and frequency of the potential impact, i.e. conflicting with critical seasons or increasing impact through repetition.

Table 13-2 summarises the definitions of magnitude for the terrestrial ecology receptors.

Table 13-2 Definitions of magnitude levels for terrestrial ecology

Magnitude	Definition
High	Major impacts on the feature / population, which would have a sufficient effect to alter the nature of the feature in the short to long term and affect its long-term viability. For example, more than 20% habitat loss or damage.
Medium	Impacts that are detectable in short and long-term, but which should not alter the long-term viability of the feature / population. For example, between 10 - 20% habitat loss or damage.
Low	Minor impacts, either of sufficiently small-scale or of short duration to cause no long-term harm to the feature / population. For example, less than 10% habitat loss or damage.
Negligible / No change	A potential impact that is not expected to affect the feature / population in any way, therefore no effects are predicted.

13.4.3 Duration

The definitions of duration used within this EcIA are dependent on the individual ecological receptor, and how sensitive it is to effects over different timescales; however, in general terms the following definitions have been used:

- **Short term** – effects which at most occur over a part of – or over a part of a key period of – a species' active season or a habitat's growing season, i.e. typically effects which occur over a matter of days or weeks;
- **Medium term** – effects which occur over the full duration of a species' active season or a habitat's growing season, i.e. typically effects which occur over a matter of months or one year; and,
- **Long term** – effects which occur over the multiple active or growing seasons, i.e. typically effects which occur over more than one year.

13.4.4 Impact significance

Following the identification of receptor importance and magnitude of the effect, it is possible to determine the significance of the impact.

Ecologically significant impacts are defined as:

'…impacts on structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution)' (CIEEM, 2018).

Impacts are unlikely to be significant where features of low importance are subject to small scale or short-term effects. If an impact is found not to be significant at the level at which the resource or feature has been valued, it may be significant at a more local level.

CIEEM (2018) recommend that the following factors are taken into account when determining significance for selected ecological receptors.

13.4.4.1 Designated/defined sites and ecosystems

- **Designated sites** – is the project and associated activities likely to undermine the site's conservation objectives, or positively or negatively affect the conservation status of species or habitats for which the site is designated, or may it have positive or negative effects on the condition of the site or its interest/qualifying features?
- **Ecosystems** – is the project likely to result in a change in ecosystem structure and function?

13.4.4.2 Habitats and species

- **Habitats** – conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure, and functions as well as its distribution and its typical species within a given geographical area.
- **Species** – conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area.

Following the identification of receptor importance and magnitude of effect, the significance of the impact has been considered using the matrix presented in **Table 13-3** below and knowledge of the ecological features affected.

Table 13-3 Impact significance matrix

Importance	Magnitude				
	High	Medium	Low	Negligible	No change
High	Major	Major	Moderate	Minor	No impact
Medium	Major	Moderate	Minor	Negligible	No impact
Low	Moderate	Minor	Minor	Negligible	No impact
Negligible	Minor	Negligible	Negligible	Negligible	No impact

The assessment of potential impacts has been undertaken assuming that all embedded mitigation and project decisions made during the design process to minimise impacts will be successfully implemented. Where, following this assessment, significant impacts are identified, additional mitigation measures are then proposed. A final assessment of the residual impacts remaining following implementation of these additional mitigation measures is then made.

The impact significance categories are defined as shown **Table 13-4**.

Table 13-4 Impact significance definitions

Impact Significance	Definition
Major	Very large or large change in receptor condition, both adverse or beneficial, which are likely to be important considerations at a regional or district level because they contribute to achieving national, regional, or local objectives, or, could result in exceedance of statutory objectives and / or breaches of legislation.
Moderate	Intermediate change in receptor condition, which are likely to be important considerations at a local level.
Minor	Small change in receptor condition, which may be raised as local issues but are unlikely to be important in the decision-making process.
Negligible	No discernible change in receptor condition.
No impact	No impact, therefore, no change in receptor condition.

Note that for the purposes of the EcIA, major and moderate impacts are deemed to be significant. In addition, whilst minor impacts are not significant in their own right, it is important to distinguish these from other non-significant impacts as they may contribute to significant impacts cumulatively or through interactions.

Embedded mitigation has been referred to and included in the initial assessment of impact. If the impact does not require mitigation (or none is possible) the residual impact remains the same. If however mitigation is required an assessment of the post-mitigation residual impact has been provided.

13.4.5 Transboundary impact assessment

There are no transboundary impacts with regards to terrestrial ecology as the proposed scheme is not sited in proximity to any international boundaries. Transboundary impacts are therefore scoped out of this assessment and will not be considered further.

13.4.6 Study area

The study areas for specific terrestrial ecological receptors used in this EcIA are provided in **Table 13-5**. Different study areas have been used for different receptors depending on their sensitivity and on their habitat preferences. These study areas were selected according to standard guidance and professional judgement.

Table 13-5 Study areas for terrestrial ecology receptors

Data / survey	Study area	Study area name used in the remainder of this document
Statutory designated sites	Within 1km of the terrestrial project area	'designated site study area'
Non-statutory designated sites		
UKHPI and Anglesey BAP Habitats	Within 50m of the terrestrial project area	'habitats and species study area'
Protected and notable species		

13.4.7 Data sources

This EcIA has been informed by a desk-based review of the Holyhead Waterfront Regeneration Scheme, Environmental Statement (Axis, 2020). This document includes a review of available existing information, including biological records of the site. In addition, a suite of ecological surveys was undertaken in 2019, including:

- Updated Extended Phase One Habitats Survey (EP1HS);
- Badger survey;
- Bat Emergence/Re-entry and Activity surveys;
- Presence/absence reptile survey; and,
- Habitat Suitability (HS) Assessment survey of ponds for their suitability to support Great Crested Newts.

Data presented within these documents has been used to inform this EcIA as Soldier's Point was included within the study are for the Holyhead Waterfront Regeneration Scheme. At the time of writing, the survey data was less than two years old and therefore considered to remain valid (CIEEM, 2019).

13.5 Baseline Environment

13.5.1 Statutory designated sites

Holy Island Coast / Glannau Ynys Gybi SSSI is designated for its geological and biological features, including heathland and maritime grassland communities, coastal cliffs and ledges, its assemblages of vascular plants and birds, invertebrates, and its solid geology (Anglesey Nature, 2019). The site lies on the north-west corner of Holy Island and includes the most westerly point on Anglesey. The closest point of the SSSI is approximately 150m to the north west of the Breakwater (see **Figure 13-1**). A summary of the site is detailed below in **Table 13-6**.

Table 13-6 Summary of the Holy Island Coast / Glannau Ynys Gybi SSSI

Site	Designation features
Holy Island Coast / Glannau Ynys Gybi SSSI	Heathland and maritime grassland communities, coastal cliffs and ledges, assemblages of vascular plants and birds and invertebrates.

13.5.2 Non-statutory designated sites

Holyhead Breakwater Quarry / Chwarel Morglawdd LWS consists of a disused quarry, a small area of dry heathland and a series of small enclosures. It borders the Holy Island Coast / Glannau Ynys Gybi SSSI. The site supports important flora and is an important feeding and nesting area for birds (see **Chapter 12** Ornithology). A small area of the LWS is located immediately adjacent to Soldier's Point (see **Figure 13-1**). A summary of the LWS is detailed below in Table 13-7.

Table 13-7 Summary of the Holyhead Breakwater Quarry / Chwarel Morglawdd LWS

Site	Features
Holyhead Breakwater Quarry / Chwarel Morglawdd LWS	This LWS comprises three sections, of which the easternmost is closest to the site. This section of the LWS is an important feeding and nesting area for birds.

13.5.3 Terrestrial habitats

Should the batching plant be located on Salt Island, the area is currently tarmacked. As such there are no terrestrial habitats present which may be impacted and potential impacts to terrestrial habitats of Salt Island are not considered further in this EcIA.

The EP1HS undertaken in 2019 to inform the Holyhead Waterfront Regeneration Scheme identified the following habitats within the habitat and species study area:

- Areas of bare ground (hard standing and areas of rubble); and,
- Poor semi-improved grassland (compromising species such as grasses, broad-leaved dock *Rumex obtusifolius*, white clover *Trifolium repens*, dandelion *Taraxacum spp.*, and red clover *Trifolium pratense*).

The location of these habitats is shown on **Figure 13-1**). A photograph of Soldier's Point, showing these habitats is presented below (see **Plate 13-1**).

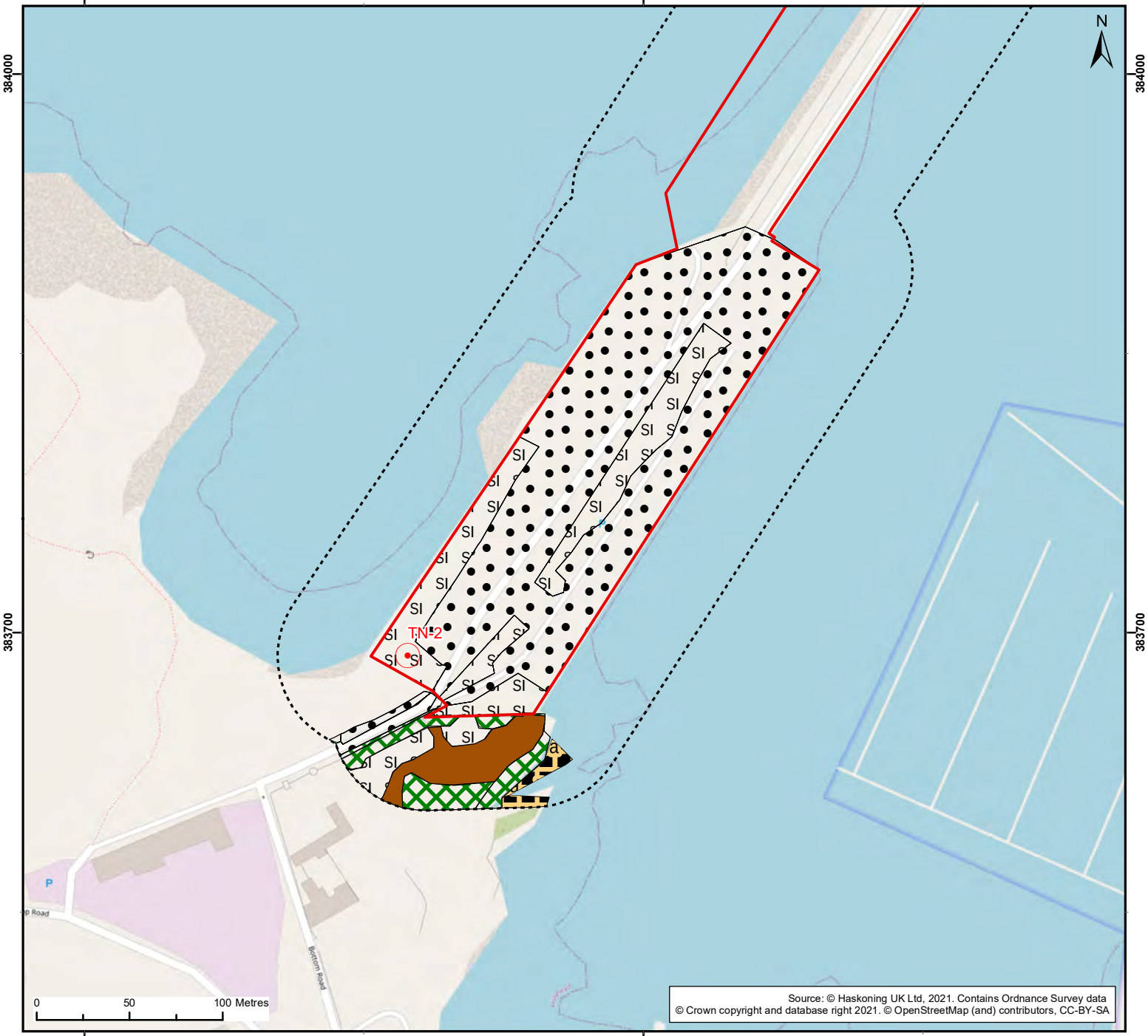
13.5.4 Protected, notable and invasive species

The desk-based review of the Holyhead Waterfront Regeneration Scheme, Environmental Statement (Axis, 2020) identified the potential for following protected, notable, and invasive species to be present within the species study area.

13.5.4.1 Badgers

The biological records, requested in 2019, returned 15 records of badger *Meles meles* within 2km of the Holyhead Waterfront Regeneration Scheme, the most recent being in April 2015. No biological records of badger were returned within the species study area.

Suitable badger habitat, including woodland and scrub at Soldier's Point House, was identified during the 2019 EP1HS. Badger activity was observed on the 19th September 2019 in the nearby grounds of Soldier Point House; however, no badger setts were recorded during the 2019 EP1HS.



Legend:

- Holyhead Breakwater
- 50m Buffer
- Target Notes

Phase 1 Habitat Classification

- Dense/continuous scrub
- Scattered scrub
- Poor semi-improved grassland
- Continuous Bracken
- Intertidal boulders/rocks
- Bare ground

Client:	Project:
Isle of Anglesey County Council	Holyhead Breakwater Refurbishment Scheme

Title: Phase One Habitat Survey (source: Axis, 2020)

Figure:	Drawing No:
13-1	PB9014-113-002

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	12/05/2021	JT	SM	A4	1:3,000

Co-ordinate system: British National Grid

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Plate 13-1 Photograph of Solders Point quay, looking towards the Breakwater

Due to the nature of the species study area (i.e. areas of bare ground and pockets of poor semi-improved grassland) it is considered unlikely that badgers would use area for residence; however, given that badger activity is known in the wider area, the presence of foraging badger at Soldier's Point cannot be excluded.

13.5.4.2 Bats

The biological records, requested in 2019, returned 11 records of bat species within 2km of the Holyhead Waterfront Regeneration Scheme, including:

- Common pipistrelle *Pipistrellus pipistrellus*;
- Soprano pipistrelle *P. pygmaeus*;
- Brown long-eared bat *Plecotus auritus*;
- Leisler's bat *Nyctalus leisleri*; and,
- *Myotis* sp.

The 2019 EP1HS and bat activity transect surveys found foraging and commuting bat activity (namely Common and Soprano pipistrelle) focused along the lane extending from Beach Road to Soldier's Point. The lane forms a linear habitat corridor, with adjacent scrub, woodland, and grassland/pasture habitats for foraging, providing shelter and good flying insect density in an otherwise rather exposed coastal location. No evidence of roosting bats was noted during the 2019 survey.

Although recorded bat activity was focused away from the species study area, as bats are mobile species, the presence of foraging or commuting bats at Soldier's Point cannot be excluded.

13.5.4.3 Otters

The biological records, requested in 2019, returned no records of otter *Lutra lutra* within 2km of the Holyhead Waterfront Regeneration Scheme.

Furthermore, no suitable habitat was identified during the EP1HS, which would support otters within the species study area. As such, this species has been considered to be absent from the species study area and therefore not considered further in this EcIA.

13.5.4.4 Dormice

The biological records, requested in 2019, returned no records of dormouse *Muscardinus avellanarius* within 2km of the Holyhead Waterfront Regeneration Scheme.

Furthermore, no suitable habitat was identified during the EP1HS (i.e. woodland or hedgerow habitat with hazel present) was identified within the species study area. Consequently, this species has been considered to be absent from the species study area and therefore not considered further in this EcIA.

13.5.4.5 Water voles

The biological records, requested in 2019, returned no records of water vole *Arvicola amphibius* within 2km of the Holyhead Waterfront Regeneration Scheme.

Furthermore, no evidence of water vole was recorded during the EP1HS and no suitable habitat to support water voles is present within the species study area. As such, this species has been considered to be absent from the species study area and therefore not considered further in this EcIA.

13.5.4.6 Reptiles

The biological records, requested in 2019, returned 11 records of reptiles within 2km of the Holyhead Waterfront Regeneration Scheme; however, none of these records were within the species study area.

During the EP1HS, slow worm *Anguis fragilis* and common lizard *Zootoca vivipara* were recorded. In addition, the habitats present at Soldier's Point, although sub-optimum, include poor semi-improved grassland and bare ground, and may provide suitable habitat opportunities for common reptile species.

13.5.4.7 Great crested newts

The biological records, requested in 2019, returned 18 records of great crested newts *Triturus cristatus* within 2km of the Holyhead Waterfront Regeneration Scheme; however, none of these records were within the species study area.

Furthermore, there are no waterbodies within 500m of the species study area suitable for supporting great crested newts. Consequently, this species has been considered to be absent from the species study area and therefore not considered further in this EcIA.

13.5.4.8 White-clawed crayfish

The biological records, requested in 2019, returned no records of white-clawed crayfish *Austropotamobius pallipes* within 2km of the Holyhead Waterfront Regeneration Scheme.

Furthermore, there are no waterbodies suitable to support white-clawed crayfish within the species study area. Consequently, this species has been considered to be absent from the species study area and therefore not considered further in this EcIA.

13.5.4.9 Invasive non-native species

Japanese knotweed *Fallopia japonica* has been recorded within the species study area, located on Soldier's Point. Japanese knotweed is listed on Schedule 9 of the Wildlife and Countryside Act 1981, as amended, and is therefore prohibited from being released or allowed to grow in the wild.

13.5.5 Importance of features of ecological interest

A summary of the ecological interest features identified within the study area and their associated importance is presented below in **Table 13-8**.

Table 13-8 Importance of ecological features within the study area

Feature	Legal Status	Ecological Importance
Designated Sites		
Holy Island Coast / Glannau Ynys Gybi	• SSSI	High
Holyhead Breakwater Quarry / Chwarel Morglawdd	• LWS	Medium
Terrestrial habitats		
Poor semi-improved grassland	• None	Low
Areas of bare ground	• None	Low
Protected, Notable and Invasive Species		
Badger	• Protection of Badgers Act, 1992; and, • Schedule 5 of the Wildlife & Countryside Act 1981, as amended.	Medium
Bats	• European Protected Species under Annex IIa and IVa of Habitats Directive; • Schedule 2 of Habitats Regulations; • Schedule 5 of Wildlife & Countryside Act 1981, as amended; • Section 7 of Environment (Wales) Act 2016; and, • Anglesey BAP.	High
Reptiles (Common lizard and slow worm)	• Schedule 5 of the Wildlife & Countryside Act 1981, as amended; • Section 7 of the Environment (Wales) Act 2016; and, • Anglesey BAP.	Medium
Invasive non-native species (Japanese knotweed)	• Schedule 9 of the Wildlife & Countryside Act 1981, as amended.	Medium

13.6 Prediction of Potential Effects During Construction

13.6.1 Potential impacts to Holy Island Coast / Glannau Ynys Gybi SSSI

There are no predicted direct impacts to the designated features of the SSSI due to the distance of the SSSI from the proposed scheme.

The Air Quality assessment concluded that construction phase air quality impacts to ecological receptors relating to shipping vessel emissions were considered to be not significant (see **Chapter 9** Air Quality). In addition, noise level associated with the construction phase at Soldier's Point are predicted to be less than the existing daytime baseline levels (see **Chapter 10** Noise and Vibration).

No impacts to the SSSI relating to dust generated by the potential concrete batching plant at Salt Island are predicted due to the distance of the SSSI from the plant.

As such, **no impacts** to the designated features of the SSSI are anticipated.

13.6.2 Potential direct impacts to Holyhead Breakwater Quarry / Chwarel Morglawdd LWS

The LWS adjoins the boundary of the Soldier's Point at its most south-west corner. There is therefore the potential for the construction works to cause direct accidental damage to the LWS. The LWS is considered to be of medium ecological importance and the magnitude of the effect medium. Therefore, the predicted impact significance is considered to be **moderate adverse.**

To mitigate this impact, it is recommended that a fenced off buffer zone should be established and maintained between the LWS and the proposed works on Soldier's Point, to ensure that the site is not accidentally damaged. The location of such fencing should allow for maintained vehicular access to Soldier's Point.

The residual impact, following this mitigation measure, is considered **negligible**.

13.6.3 Potential indirect impacts to Holyhead Breakwater Quarry / Chwarel Morglawdd LWS

The Air Quality assessment concluded that construction phase air quality impacts to ecological receptors relating to shipping vessel emissions were considered to be not significant (see **Chapter 9** Air Quality). In addition, noise levels associated with the construction phase are predicted to be less than the existing daytime baseline levels (see **Chapter 10** Noise and Vibration). Therefore, no indirect impacts to the LWS are anticipated as a result in changes in air quality or noise levels.

The construction phase of the proposed scheme would increase human activity, including additional lighting, and vessel and vehicle movements delivering armour units to Soldier's Point. Working hours within the area of Soldier's Point are expected to be 10-hours a day, with works being carried out mostly during daylight hours; however, during the winter months, this is likely to extend into dawn/ dusk.

The LWS is considered to be of medium ecological importance and the magnitude of the effect of disturbance caused by the indirect impacts of increased lighting is low. Therefore, predicted impact significance is considered to be **minor adverse.**

Ecological best practice measures are recommended to reduce the potential impacts of disturbance to species associated with the LWS via increased light levels; these measures may include locating and directing lighting away from the LWS. With these measures in place, the residual impact is considered to remain of **minor adverse** significance.

No impacts to the LWS relating to dust generated by the potential concrete batching plant on Salt Island are predicted due to the distance of the LWS from the plant.

13.6.4 Potential direct impacts to terrestrial habitats

The use of Soldier's Point is anticipated to last a minimum of two years. As the works would occur over multiple growing seasons, they are considered long-term in relation to the ecological receptors; however, the species present are common and the areas are likely to recolonise quickly post-construction.

As such, these habitats are considered to be of low ecological importance and the magnitude of the effect, low. Therefore, the predicted impact significance is considered to be **minor adverse**. No mitigation is proposed.

13.6.5 Potential indirect impacts to terrestrial habitats

The Air Quality assessment concluded that construction phase air quality impacts to ecological receptors relating to shipping vessel emissions were considered to be not significant (see **Chapter 9** Air Quality). In addition, noise levels associated with the construction phase are predicted to be less than the existing daytime baseline levels (see **Chapter 10** Noise and Vibration). Therefore, a **negligible** potential impact to terrestrial habitats are anticipated as a result in changes in air quality or noise levels.

No impacts to the terrestrial habitats relating to dust generated by the potential concrete batching plant on Salt Island are predicted due to the distance of the habitats from the plant.

13.6.6 Potential impact to protected species

13.6.6.1 Badger

Badgers are known to be present within the grounds of Soldier's Point. However, it is unlikely that that this species would utilise Soldier's Point, as the habitats present are considered sub-optimal for the species.

The construction phase of the proposed scheme would increase human activity, including additional lighting, and barge movements delivering armour units to Soldier's Point. Working hours are expected to be 10-hours a day, works would be carried out mostly during daylight hours; however, during the winter months, this is likely to extend into dawn/dusk which may result in the disturbance of badger should they be present.

Badger are considered to be of medium ecological importance and the magnitude of the effects on this species caused by the impact of construction phase works is negligible. Therefore, the predicted impact significance is considered to be **negligible.** No mitigation is proposed.

13.6.6.2 Bats

No direct impacts to bats are predicted as a result of the construction phase of the proposed scheme as there are no known bat roosts or features with potential for bat roosts present within the species study area.

The construction phase of the proposed scheme would increase human activity, including additional lighting and barge movements delivering armour units to Soldier's Point. Working hours are expected to be 10-hours a day, carried out mostly during daylight hours.

Increased in human activity and lighting may impact upon foraging and commuting bats in adjacent habitats. All bat species are considered of high ecological importance. The magnitude of the effect is low. Therefore, the predicted impact is considered to be of **minor adverse** significance.

As the potential impact is not significant, mitigation is not required; however, ecological best practice measures are recommended to further reduce the potential impacts to bat species that may be present, such as directing any temporary artificial lighting away from potential bat commuting areas. The residual impact significance remains **minor adverse.**

13.6.6.3 Reptile

There is the potential that habitats located on Soldier's Point may provide suitable basking, refugia and foraging habitat for reptile species, in particular common lizard and slow worm, which have been recorded nearby. Although these species are mobile, there remains the potential for works to result in injury or damage to individuals that may be present.

Common reptile species, including those detailed above, are considered to be of medium ecological importance and the magnitude of the effects is low. Therefore, the predicted impact significance is considered to be **minor adverse**.

As the potential impact is not significant, mitigation is not required; however, to further reduce potential impacts on reptiles, a precautionary method of working should be carried out. This should include the dismantling of any potential refugia present and ensuring that vegetation is cut to 5cm 48hrs prior to works commencing to allow any reptiles that may be present time to vacate the area. In addition, an ecological site walk over is recommended by a suitably qualified ecologist no more than 48 hours prior to the construction works to ensure their absence from the area, thereby reducing the magnitude to negligible. The residual impact, following this mitigation measure, is considered **negligible**.

The construction phase of the proposed scheme has the potential to damage or destroy small areas of terrestrial habitat present on Soldier's Point that may be used by common reptile species; however, these habitats are considered sub-optimal with better quality habitats located offsite. The magnitude of the effect is negligible. Therefore, the predicted impact significance is considered to be **negligible** with no mitigation required.

13.6.6.4 Dispersal of invasive non-native species

Japanese knotweed has been recorded on Soldier's Point. The threat posed by Japanese knotweed is considered to be of medium ecological importance and the potential impact of the construction works on the spread of this species is of medium magnitude. Therefore, the predicted impact significance is considered to be **moderate adverse**.

An invasive species survey should therefore be undertaken and a management plan produced prior to the construction phase of proposed scheme. In addition, toolbox talks, and biosecurity measures should be put in place to ensure that disturbance to areas of with Japanese knotweed are avoided, thereby reducing the risk of spread.

It is predicted that the mitigation measures listed above are sufficient to reduce the risk of spread of this species, thereby reducing the magnitude to low. Taking these measures into consideration, the residual impact significance is considered to be **minor adverse**.

13.7 Summary

Table 13-9 below provides a summary of the predicted impacts associated the construction and operational phases of the proposed scheme on the terrestrial ecology of the site and surrounding area.

Table 13-9 Summary of predicted impact significance, mitigation, and residual impacts.

Interest Feature	Impacts	Impacts Significance	Suggested Mitigation	Residual Impact Significance
Construction Phase				
Holy Island Coast / Glannau Ynys Gybi SSSI	None	**No change**	NA	**No change**
Holyhead Breakwater Quarry /	Direct impacts of potential land take causing damage	**Moderate adverse**	A fenced off buffer zone should be established and maintained between the LWS	**Negligible**

Interest Feature	Impacts	Impacts Significance	Suggested Mitigation	Residual Impact Significance
Chwarel Morglawdd LWS	to ecological interest features.		and the proposed storage area at Soldier's Point quay.	
	Indirect impacts of increased light levels causing disturbance to species.	**Minor adverse**	Locating and directing lighting away from LWS.	**Minor adverse**
Terrestrial habitats	Direct impacts of land use causing habitat damage and loss.	**Minor adverse**	None required.	**Minor adverse**
	Indirect impacts of changes in air quality causing damage to habitats.	**Negligible**	None required.	**Negligible**
Badger	Direct impacts of construction work causing injury and/or death of protected species.	**Negligible**	Ecological site walk-over to confirm absence.	**Negligible**
	Indirect impacts of increased light levels and human activity causing disturbance to species.	**Negligible**	None required.	**Negligible**
Bats	Direct impacts of construction work causing injury and/or death of protected species.	**No change**	Non required.	**No change**
	Indirect impacts of lighting and human activity on foraging and commuting.	**Minor adverse**	Following accepted good practice guidance (Bat Conservation Trust (BCT) and Institute of Lighting Professionals (ILE), 2018).	**Minor Adverse**
Common lizard/slow worm	Direct impacts of construction work causing injury and/or death of protected species.	**Minor adverse**	Vegetation clearance to 5cm and dismantling any potential refugia 48-hours before commencing works. Ecological site walk-over to confirm absence.	**Negligible**
	Indirect impacts of habitat loss at causing reduced foraging and basking opportunity.	**Negligible**	Non required.	**Negligible**
Japanese knotweed	Potential to spread Schedule 9 species.	**Moderate adverse**	Invasive species management plan, toolbox talks and biosecurity measures to reduce the risk of spread.	**Minor Adverse**

14 Visual Setting

14.1 Introduction

This section of the EIA Report summarises the outcome of a Visual Appraisal of the proposed scheme. The appraisal considered the visual setting within the study area and the potential visual effects of the proposed scheme using a series of 'representative viewpoints' and photomontage visualisations.

Additional information to support the visual settings assessment is provided separately in the following appendix:

- Appendix 14-1: Visual Appraisal Report.

14.2 Legislation, Policy and Guidance

14.2.1 Statutory designations

14.2.1.1 Planning Policy Wales

Planning Policy Wales, (Edition 10 para 6.3.7) advises 'Great weight should be given to conserving and enhancing the natural beauty of AONBs, and regard should be given to the wildlife, cultural heritage and social and economic well-being of the areas'.

14.2.2 Local Policy

14.2.3 Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026

The development plan for Anglesey, set out in the Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026, is based on a series of objectives that determine strategic and detailed policies. Those related to the landscape and visual setting are set out in **Table 14-1.**

Table 14-1 Anglesey and Gwynedd JLDP policies related to landscape and visual setting

Policy No.	Policy	Description
AMG1	Area of Outstanding Natural Beauty Management Plans	Proposals within or affecting the setting and/r significant views into and out of the AONB must, where appropriate, have regard to the relevant AONB Management Plan (i.e. the Isle of Anglesey AONB Management Plan).
AMG4	Coastal Protection	A proposal on the coast must not cause unacceptable harm to the built environment, or the landscape or seascape character. A proposal should prioritise locations with close visual connection to current buildings or existing structures.
AT1	Conservation Areas, World Heritage Sites and Registered Historic Landscapes, Parks and Gardens	Proposals within or affecting the setting and/or significant views into and out of Conservation Areas, World Heritage Sites and Registered Historic Landscapes, Parks and Gardens must, where appropriate, have regard to adopted Conservation Area Appraisals, Conservation Area Plans and delivery strategies.

14.3 Consultation

Consultation undertaken throughout the pre-application phase informed the approach and the information provided in this chapter (see **Chapter 6** consultation).

14.4 Assessment methodology

Methodology used in the appraisal was based on the Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA3) (LI & IEMA 2013). The appraisal comprised:

- Mapping of key landscape and visual constraints;
- Site visits to assess existing views; and,
- Assessment of the predicted effects to visual receptors and key viewpoints, including protected sites.

14.4.1 Study area

The extent of the study area adopted for the visual settings appraisal was defined through site investigation and the use of Zone of Theoretical Visibility (ZTV) analysis. Given the nature of the proposed scheme and the characteristics of the study area, significant visual effects would not be expected beyond a 2km zone from the scheme boundary.

14.4.2 Viewpoint appraisal

The viewpoint appraisal was based on:

- Site observations made during visits undertaken in November 2019 and February 2020; and,
- ZTV analysis.

An assessment of visual effects was undertaken from six representative viewpoints, which were selected to represent typical views from key receptors at varying distances and orientations from the Breakwater. Representative viewpoint locations are shown in **Figure 14-1**, and full details of the viewpoints are provided in the Visual Appraisal Report (see **Appendix 14-1**).

To support the assessment process, computer generated Photomontage Views were prepared from the representative viewpoints to illustrate the appearance of the operational scheme. Visible elements of the proposed scheme have been computer modelled and an output render superimposed on photographs of the representative viewpoints. The Photomontage Views are provided in the Visual Appraisal Report (**Appendix 14-1**).