

Appendix A Holyhead Marina Pre-Application Advise (September 2019)



REGULATION & ECONOMIC DEVELOPMENT

Pre-Application Advice in Relation to the Re-Building of Holyhead Marina

Application Reference: PAM/2019/9

September 2019

1.0 Introduction

- 1.1 On the 12th July 2019, the applicant (Holyhead Marina) submitted a request to the Isle of Anglesey County Council (IACC) for pre-application advice in relation to the re-building of Holyhead Marina. The applicant supplied a copy of an Environmental Scoping Report (dated June 2019) prepared by Mr. G Garrod, Architect on behalf of the applicant Holyhead Marina Ltd. It was agreed between Mr. Garrod and the IACC that a response would be provided by the 6th September 2019.
- 1.2 The applicant intends to apply for a Harbour Revision Order under section 14 of the Harbours Act 1964, a Marine Licence to Natural Resources Wales (NRW) as well as for Planning Consent from the IACC as the Local Planning Authority.
- 1.3 For consistency, the applicant intends to prepare one Environmental Statement that can be utilised for the three separate (yet interrelated) consenting processes. The IACC support the principle of this approach however, confirmation is required from the applicant as to what consent they are seeking from each of these respective consenting bodies. Given the obvious interdependencies between the three consenting processes and the different jurisdiction in the intertidal area, clarity is required in terms of what they are seeking consent for by the IACC, what falls within the Marine Licence and what is included in the Harbour Revision Order.
- 1.4 The IACC appreciate that there will be some degree of overlap in terms of assessment of impact (e.g. impact on AONB), however the applicant should provide a plan or a detailed explanation of what should be included within each of these separate applications (and similarly, what is included in all three).
- 1.5 For clarity, this response by the IACC is a response to the request for pre-application advice. It is not a formal Scoping Opinion as prescribed under Section 14 of the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017. The applicant will need to submit a formal Scoping Opinion once the necessary detail becomes available on the construction methods and the potential impacts of the proposed development have been assessed.

2.0 Planning History

- 2.1 For a detailed breakdown of the planning history for the Holyhead Waterfront, see **Appendix 1**. For completeness, this breakdown consists of all historical planning applications on or adjacent to the application site.

3.0 Background

- 3.1 Holyhead Marina Ltd was established in 1995 and commenced trading in tandem with the established boatyard business - Trinity Marine Ltd - as a general boatyard on land previously owned by Trinity House as a buoy maintenance depot and lighthouse control centre. Holyhead Marina negotiated a 35 year seabed lease with Stena Line Ports Ltd and commenced construction in 2000.

- 3.2 The marina grew steadily over a number of years finally reaching a capacity of some 350 berths offering tidally unrestricted visitor and contract berthing. The shore side development of 26 apartments completed in March 2007 partly funded the infrastructure costs. The leased area of seabed originally owned by Stena Line Ports Ltd is now owned by Conygar (Holyhead) Ltd.
- 3.3 The marina used 70 tonne floating reinforced concrete breakwater pontoons to protect against the north easterly fetch of some 5.5km which from data available at the time could attenuate a predicted wave height and frequency. The marina was always vulnerable to north easterly storms but operated successfully with very little damage to vessels or pontoons until 2nd March 2018 when Storm Emma generated an unprecedented weather system causing an un-survivable sea state. This led to the catastrophic breakdown of the entire marina. Some 80 vessels were lost and the resultant break-up of the walkway piers led to the release of large amounts of polystyrene within the marina.
- 3.4 The disaster was managed in close collaboration with NRW officers, WG Fisheries, MRCA, the Port Authority and the County Council. Lessons learnt in the clean-up operation have been fed back to Regional Emergency Planning Service by way of a multi-agency debrief held in Llangefni in November 2018 and this formed an important part of the re-build strategy. In particular, this relates to containment in anticipation of increasingly severe weather systems, rising sea levels and climate change/global warming.
- 3.5 Holyhead Marina commissioned specialist harbour engineers to undertake a study of the storm wave conditions approaching the marina site during Storm Emma. The study was also to include an assessment of how extreme the storm was and the likelihood of re-occurrences. The consultants (RPS of Belfast) concluded that global warming/climate change have altered the frequency of severe events such as Storm Emma. The conditions prevalent during Storm Emma were too severe for the safe use of floating breakwaters as the primary protection and it is recommended that the marina be protected by a **fixed rubble mound structure**.

4.0 Proposed Development

- 4.1 Detailed design and specifications for the proposed marina have not been submitted as part of this request for pre-application advice. However, the Environmental Scoping Report does provide a high-level overview of the proposal including the rubble mound breakwater and the floating pontoon berthing system.

4.2 Rubble Mound Breakwater

- 4.2.1 Whilst the detailed methodology for the construction of the rubble mound breakwater is yet to be established, the Scoping Report suggests that the most economical method of construction will be end tipping suitable core material arriving by tipper trucks and trimming / shaping using long reach excavators. Geotextile membranes will be installed to contain the fines and the entire

structure will be armoured with a secondary layer and a primary layer of rock armour stone.

- 4.2.2 Based on an average depth below Chart Datum of approx. 4.5 metres and a top level to safely cope with surge tides of about 5.0 meters AOD the total core volume required will be in the order of 116,000 cubic metres of controlled fill faced with some 40,000 cubic metres of primary and secondary rock armour.
- 4.2.3 There would be a flexible pavement topping to the roadway, which is anticipated to be single carriageway with passing bays and viewing points at the bends. The roundhead will be designed to allow emergency vehicles and maintenance plant to turn around adjacent to the second bridge head. There will also be navigation lights marking the roundhead in accordance with the Harbour Authority and Trinity House requirements.
- 4.2.4 Whilst in the absence of any detail the IACC cannot provide comments on the proposed construction and methodology, the IACC is supportive in principle of a rubble mound breakwater to protect the marina. The marina is an important economic asset not only for the Town of Holyhead, but also for Anglesey. The marina offers the only truly tidally unrestricted deep-water facility in the region and is strategically important for visitors on passage in the Irish Sea as well as catering for commercial demands through windfarm support crafts, military vessels and local employers (namely Turbine Transfers, Holyhead Towing and Holyhead Marine Services).
- 4.2.5 However, without detail on the construction of the rubble mound breakwater (including timescale) it is not possible to assess potential impacts on highways, ecology, visual impacts, lighting etc. which would be required in an Environmental Statement.

4.3 Floating Berthing Pontoons

- 4.3.1 The floating elements of the marina will follow a similar layout to the original design comprising of four piers A, B, C and D linked by the southernmost pier E. The basic berthing unit is expected to be the 9 metre finger berth cantilevered from the walkway piers at approximately 9 metre centres. There will be a number of 10.5 metre berthing fingers and possibly 12 metre finger berths distributed around the marina to cater for the larger vessels. There will also be some small vessel finger berths (7 metre) to cater for the growing demand for RIBS and smaller motor boats. The walkways will be proprietary GRC planked units; 2.5 metres wide tethered using the Seaflex system.
- 4.3.2 Again, in the absence of any detail on the design and construction of the floating pontoons, the IACC cannot provide any meaningful comments at this stage. However, given the proposed layout of the marina (i.e. similar in scale and layout to the previous marina) the IACC are supportive in principle provided that the necessary level of detail is submitted as part of any planning application.

5.0 IACC Topic / Thematic Response

5.1 Planning Policy

- 5.1.1 The following policy response provides a brief overview of the relevant national and local planning policies as contained within Planning Policy Wales (Edition 10) and the Anglesey and Gwynedd Joint Local Development Plan (JLDP).
- 5.1.2 Further input/consultation with the Joint Planning Policy Unit is advised, should the proposal progresses to a formal planning application. Any planning application (and supporting documents) should take account of the following policies.

National Planning Policy - Planning Policy Wales (Edition 10)

- 5.1.3 Section 5.3 of Planning Policy Wales provides further guidance in relation to harbour developments:-
- 5.1.4 *“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).”*
- 5.1.5 Further guidance relating to the role of harbours their current and future operations, including options for expansion and diversification is provided within the Welsh National Marine Plan.

Anglesey and Gwynedd Joint Local Development Plan (2016)

- 5.1.6 The following table provides a brief overview of the relevant local plan policies, which relate to the proposed development:-

Policy	Explanation
PS 1: Welsh Language and Culture	Policy states the requirement to promote and support the Welsh language. Guidance is provided within the policy relating to the requirement to submit a Welsh Language Statement/Impact Assessment for various types of development. Further, the expectation relating to a bilingual signage scheme and the expectation that Welsh names will be used for new developments is also highlighted within the policy.
PS 5: Sustainable Development	All proposals should demonstrate how they are consistent with the principle of sustainable development.

PS 6: Alleviating and Adapting to the Effects of Climate Change	Criteria based policy which requires proposals to demonstrate how they have fully taken into account measures to alleviate the effects of climate change.
PCYFF 2: Development Criteria	Provides guidance as to how proposals should demonstrate compliance with relevant plan policies, National Planning policies and guidance. Further guidance is also provided relating to the general principle of development.
PCYFF 3: Design and Place Shaping	Requirement for all proposals to demonstrate a high quality Design which fully takes into account the natural, historic and built environment,
PCYFF 4: Design and Landscaping	All proposals should demonstrate how consideration has been given to their surroundings, including due consideration to the Landscape Character Assessment /Seascape Character assessment.
PS 13: Providing opportunity for a Flourishing Economy	Promotes facilitating economic growth whilst seeking to protect and enhance the natural and built environment.
CYF 8: Holyhead Regeneration Area	Supports proposals located within the 'Holyhead Regeneration Area' which would aid the transformational change by encouraging Holyhead to become a more attractive location to live, work, visit and enjoy.
PS 19: Conserving and where appropriate enhancing the natural environment	Proposal is located within a sensitive area due to its natural beauty and proximity the nature conservation designations. The following nature conservation designations are within a 350meter proximity of the site:- ▪ Special Protection Area ▪ Special Area of Conservation ▪ Site of Special Scientific Interest In accordance with Strategic Policy PS19, measures should be undertaken to ensure that the Proposal conserves and where appropriate enhances the Plan area's distinctive natural environment and coastline.
AMG 3: Protecting and enhancing features and qualities that are distinctive to the local landscape character	Consideration should be given to protecting and enhancing features and qualities that are distinctive to the local landscape character

AMG 4: Coastal protection	Measures should be taken to ensure that the Proposal doesn't cause unacceptable harm to:- ▪ Water quality ▪ Public Access consideration ▪ The built environment, landscape and seascape character; ▪ The area's biodiversity interest.
AMG 5: Local Biodiversity Conservation	Proposals must protect and where appropriate enhance biodiversity that has been identified as being important to the local area, through avoiding significant harm and considering opportunities to create and improve and manage wildlife habitats and natural landscape. A Proposal which affects sites of local biodiversity importance will be refused unless they can conform with the criteria as listed within the policy.
PS 20: Preserving and where appropriate enhancing heritage assets	Whilst seeking to support the wider economic and social needs of the Plan area, the LPA will preserve and where appropriate enhance its unique heritage assets.

5.2 *Landscape and Visual*

5.2.1 It is appropriate that landscape/seascape effects are considered in association with certain features of the built environment (as per chapter title); however, care will be needed to ensure that effects are appropriately distinguished under the appropriate methodologies and combined when necessary. There may for example be shared viewpoints that could be used for either assessment.

5.2.2 Landscape effects

- i. Receptors within the study area should be agreed with the Local Planning Authority (LPA). They should be assessed using an agreed methodology proposed in the Scoping Report.

5.2.3 Visual Effects

- i. The assessment should consider visual effects at high and low tides; however, if representation of tidal extremes are restricted, the effect at low tide should be represented in visualisations.
- ii. Viewpoints should be agreed with the LPA and Natural Resources Wales (NRW) as part of the EIA process. These are likely to include as suggested in the document, from the Wales Coast Path and from within the AONB. The scoping report makes no mention of any form of visualisation being provided. The SLVIA will need to be accompanied by some visualisations and

these must show the worst-case scenario (i.e. the proposed harbour wall at low tide). The IACC would expect that suitable visualisations be provided from a minimum of four viewpoints.

- iii. A key consideration will to ensure that the assessment of the operation period comprehensively addresses the potential impacts arising from the 6.5m tidal range in relation to the permanent harbour wall.
- iv. The scoping report needs to set out a defined LVIA study area with justification. Within the Scoping Report, there is mention of a 1km radius site centred study area. This may be sufficient as the IACC's initial review indicates that may not be significant seascape, landscape and visual effects beyond 1km however, such a study area would not extend to the closest part of AONB including the summit of Holyhead Mountain. Therefore, the study area requires further justification.
- v. The scoping document should provide a description of the methodology proposed for the assessment and the proposed study area for the assessment. The scoping report needs to set out a clear methodology for undertaking the LVIA. There is no mention of GLVIA3, which will need to form the structure of the LVIA chapter.
- vi. Construction and operational effects should be included in the assessment. The consideration of residual effects will be appropriate if mitigation is proposed or likely – such as weathering of rocks.
- vii. Need to clearly differentiate between the construction and operation periods. The IACC did not find any statement as to the predicted length of construction period but the favoured approach of using end tipping and long reach excavators to place ~156,000m³ of stone (fill and rock armour) and the potential for associated lorry movements, laydown area(s), contractors compounds, lighting etc. could be a key issue for the SLVIA and other disciplines if such temporary elements are in place for more than a short time;
- viii. The construction period issue also ties in with the need for more clarity on the cumulative LVIA – as set out in cumulative and in-combination section (30). There is potential for three simultaneous major developments' construction to be taking place (Holyhead Port Expansion and Holyhead Waterfront Regeneration plus the Marina Rebuild) -worst case scenario for LVIA concerns would be that all three are constructed at the same time.
- ix. The need to provide a lighting assessment is acknowledged. This needs to be provided for the construction and operation periods. Information to be provided on the methodology and guidance to be used for the lighting assessment.

- x. The scoping report considers that the situation that pertained up to Storm Emma in 2018 should be the baseline. This would seem to be logical given that the previous marina was operational for 18 years and the proposed marina covers a similar area with the same capacity and general layout.

5.2.4 Conclusion

- i. The IACC would expect the scoping opinion to be a detailed document informed by the guidelines for Landscape and Visual Impact Assessments including a clear methodology, study area, proposed viewpoints, and a list of landscape and visual receptors to be included in the assessment.
- ii. Overall the scoping is somewhat vague, highly descriptive and does not provide the required clarity and detail that can form the basis for a clear understanding to be reached as to the scope, methodology and form of the LVIA, although it does provide a good understanding of the site's background and the form and justification for the proposed development.

5.3 Highways

- 5.3.1 Having regard to the amount of materials required to construct the Rubble Mound Breakwater, the estimated lorry movements in the region of one 20 tonne HGV every 15-20 minutes during normal working hours seems rather low which equates to between 15 – 24 per 8 hour working day.
- 5.3.2 Having regard to the potential effects on highway safety, wear & tear on the road network and environmental effects of HGV traffic such as noise and pollution, the highway authority's view is that a Transport Assessment should be prepared to better understand the effects of the project on the local highway network.
- 5.3.3 The TA would need to take account of other consented and proposed major projects in the area such as the Stena Line Ports Ltd inner harbour proposals. It will also need to consider the cumulative traffic / highway impacts of other proposals such as the Morlais project, Holyhead Waterfront, Minesto, Wylfa Newydd etc. to ensure a robust assessment of cumulative impacts.
- 5.3.4 If local quarries are to be used as sources for the materials for the breakwater, the TA would need to examine the effect of any increase in quarry traffic on local access roads to the quarries over and above 'normal' usage.
- 5.3.5 Whilst reference has been made briefly to the potential to import stone from elsewhere by sea, this has been discounted on the basis that this would 'likely be prohibitive'. The IACC believes that this should be examined in more detail as part of any formal submission.
- 5.3.6 Whilst the operational effect of the development may not differ greatly from the original marina operation, it would be prudent to reference the likely operational traffic effects within the TA.

5.3.7 The Highways Authority will not be prepared to recommend conditional approval for this development within a detailed application unless there has been submitted to and approved in writing by the LPA, a Construction and operational phase **Traffic Management Plan. The Traffic Management Plan shall include:**

- i. The routing to and from the site of construction vehicles, plant and deliveries, including any Temporary Traffic Management Measures and Traffic Regulation Orders necessary to facilitate safe construction of the scheme including any advance, preparatory and demolition works;
- ii. The type size and weight of construction and delivery vehicles to be used in connection with the construction of the development, having regard to the geometry, width, alignment and structural condition of the highway network along the access route to the site;
- iii. The timing and frequency of construction and delivery vehicles to be used in connection with the development, having regard to minimising the effect on sensitive parts of the highway network and construction routes to the site, including regard for sensitive receptors e.g. schools and network constraints;
- iv. Identification of the routing strategy and procedures for the notification and conveyance of indivisible “out of gauge” loads. This includes any necessary measures for the temporary protection of carriageway surfaces; for the protection of statutory undertakers’ plant and equipment; and for the temporary removal of street furniture;
- v. Measures to minimise and mitigate the risk to road users in particular non-motorised users;
- vi. The arrangements to be made for on-site parking for personnel working on the Site and for visitors;
- vii. The arrangements for storage of plant and materials and the loading and unloading of plant and materials;
- viii. Details of measures to be implemented to prevent mud and debris from contaminating the adjacent highway network;
- ix. Proposals for communicating information and advance notice relating to the approved plan to the Council and other stakeholders;
- x. The construction of the Development shall be completed in accordance with the approved Plan.

5.3.8 Reason: To ensure reasonable and proper control is exercised over construction and demolition traffic and construction activities in the interests of highway safety.

5.4 Minerals and Waste

- 5.4.1 The North Wales Minerals and Waste Service have been asked by the Isle of Anglesey County Council to comment upon the Scoping Report (SR) submitted relating to Minerals and Waste issues that may be associated with the proposed Holyhead Marina development.
- 5.4.2 The information submitted within the SR is somewhat confusing relating to the proposed material to be utilised for the rubble mound breakwater.
- 5.4.3 Although there is reference within the literature to the utilisation of rock armour and hard-core fill together with statements suggesting that the most economical method of construction is by tipping locally sourced controlled fill sourced from local quarries. There is also reference that the operation is to be managed under the Waste (England and Wales) Regulations and Environmental Permitting Regulations.
- 5.4.4 Confirmation is required as to the proposed material, is the development a waste application, non-waste application or a hybrid utilising a mixture of materials?

Waste application or None-waste application?

- 5.4.5 Should the rubble mound breakwater be undertaken as a recovery of waste operation in accordance with the waste hierarchy; further information and active pre-application discussions should be undertaken with the North Wales Minerals and Waste Planning Service.
- 5.4.6 With respect to the principle of importing inert waste materials in site preparation works, if such materials can meet the same specification for basic fill as primary aggregates, then this would meet the objectives of Article 3(15) of the Waste Framework Directive 2008/98/EC, where the use of waste materials is recovery rather than disposal; *“recovery means any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy.....”*. The essential characteristic of a waste recovery operation is that its principal objective is that the waste serves a useful purpose in replacing other materials, which would have had to be used for that purpose, thereby conserving natural resources. This position is further supported by National and Local planning policy requirements as well as the North Wales Regional Technical Statement on Aggregates.
- 5.4.7 If the proposal constitutes a waste operation, there will be a requirement to prepare a Waste Planning Assessment in accordance with the requirements of TAN 21 – Waste to demonstrate need (refer to paragraph 4.23 of the TAN). Although a standalone document that would generally fall outside that of the ES, this can and maybe should be cross-referenced in line with the requirements of Regulation 17 and Schedule 4 of the 2017 Regulations as any reasonable alternatives studied by the applicant and presented in the ES. The

reasons behind the selection of the chosen option should be provided in the ES, including where environmental effects have informed the choices made.

- 5.4.8 Relating to the utilisation of primary and secondary mineral; the Isle of Anglesey County Council endorses the Regional Technical Statement produced by the North Wales Regional Aggregates Working Party. The statement has been prepared in accordance with the sustainability objectives enshrined in Planning Policy (Wales) and the provisions of Technical Advice Note (Wales) 1: Aggregates (MTAN1), setting out an overarching objective to ensure a sustainable and managed supply of aggregates.
- 5.4.9 It is suggested that due to the anticipated amount of aggregate required (unspecified within the SR) a statement should be included relating to the availability and management of material within the context of the Regional Technical Statement.
- 5.4.10 As per comments relating to the Waste Planning Assessment such a document may not fall directly within the remit of the ES. However, such a document will help feed the production of a construction method statement and material management plan that may feed directly to sections within the ES. Although a standalone document falling outside the scope of the ES, this again can be cross-referenced in line with the requirements of Regulation 17 and Schedule 4 of the 2017 Regulations as any reasonable alternatives studied by the applicant should be presented in the ES. The reasons behind the selection of the chosen option should be provided in the ES, including where environmental effects have informed the choices made.
- 5.4.11 Although the following environmental issues are covered by other consultees, the selection of material may have a material consideration and varying effect upon the Environment and needs to be considered within the ES.
- i. Pollution Control and Land Contamination – site, material and construction management issues need to be addressed in order to minimise the risk of chemical run-off and increased sedimentation having an adverse impacts on local biodiversity and the local water environment. Type, size and chemical composition of material will need to be discussed at greater length.
 - ii. Traffic and Access – Whatever material is utilised there will be a temporary increase in traffic movements to and from site. Although deposition by barge has been discussed it is noted that in all probability, standard 8 wheeler 20 tonne vehicles will deliver the material to site every 15-20 minute. No information is submitted regarding the amount of material required for the creation of the breakwater and the timescales involved with importation. The material used is all important in this regard e.g. if inert waste is utilised it may not be as readily available as that of primary or secondary aggregates such as slate and as a consequence may result in the development taking longer. Likewise, rock armour is not something that can be uniformly produced from quarries (unless X blocks are casted). There are various blasting techniques that can help the production of rock armour, however such stone forms only a small percentage of quarry products and there may need to be several quarries supplying the proposal. Guidelines for the

Environmental Assessment of Road Traffic (GEART) is mentioned however there is no mention as to how the material may affect the lifetime of the development.

- iii. General and residential amenities - In terms of impact on residential amenities, the main issues associated with this proposal would be the potential impacts of haulage, noise, vibration, dust derived from engineering operations associated with the development. Such impacts will become evident in the preparation of construction, site and material management plans within the ES.

5.4.12 It is suggested that the applicant engages with the North Wales Minerals and Waste Planning Service in preparation of such an application and ES.

5.5 Environmental Health

Environmental Protection

- 5.5.1 With regards to this application, the IACC would advise the applicant to contact the Public Protection Section at an early opportunity to discuss noise and vibration management through the Section 61 Prior Consent process; as directed through the Control of Pollution Act 1974.
- 5.5.2 Similarly, the IACC would advise the applicant to submit a Construction Environmental Management Plan (CEMP) and a Materials Management Plan (MMP) detailing how potential issues such as noise, vibration, dust, particulate matter and artificial lighting shall be mitigated during the construction of this development.
- 5.5.3 The Public Protection Section would welcome the opportunity to discuss such mitigation measures and monitoring equipment coverage, and may be able to offer considerable guidance when determining the most appropriate course of action.

Noise and Air Quality

- 5.5.4 The Public Protection Section note that the Environmental Scoping Report takes regard of the possible impacts from noise vibration and dust during the construction phase.
- 5.5.6 The proposals indicate that there is a requirement to form a new breakwater of 116,000 cubic meters of controlled fill comprising of primary and secondary rock armour with some 40,000 cubic meters of primary and secondary rock armour.
- 5.5.7 The Public Protection Section have previously received numerous complaints of dust and noise from a transient offloading of rock armour for an off shore cable protection within Holyhead Harbour.
- 5.5.8 The proposal will therefore require to be carefully managed to ensure that similar problems do not arise either, during transport and in fill stages or infill materials and associated construction works. Further information will be required on exactly how noise vibration and dust will be mitigated and the

proposed hours of work so that surrounding residences will not be adversely affected.

- 5.5.9 The applicant should take regard that they may consider it appropriate for applying for consent to the Local Authority under the procedures provided for noise from construction sites under the provisions of Section 61 of the Control of Pollution Act 1974.

Health and Safety

- 5.5.10 The development must comply with the requirements of the Health and Safety at Work etc. Act 1974, and all regulations made under that Act.

Emergency Planning

- 5.5.11 The Regional Emergency Planning Service did not have any comments to make at this time. However, they reserve the right to make comment as further detail becomes available through the formal consenting process.

5.6 Ecology

- 5.6.1 Although the IACC does not envisage there to be any significant issues associated with local Wildlife Sites (covered under Policy AMG6 of the JLDP), the IACC advise that acknowledgement and mapping of those in the area should be included.
- 5.6.2 In terms of ecological survey and issues, most are related to marine and marine-associated wildlife and will be more directly relevant for NRW specialists. The same can be said for the potential impacts on the (marine) SAC and any other sites which may be impacted and are relevant to the Habitat Regulations (2017 as amended). NRW will clearly be best placed to undertake Appropriate Assessment (AA) under the Regulations in relation to the proposals.
- 5.6.3 Though AA is not in itself part of the EIA, it is worth noting at this stage, as much of the same survey material will be relevant, and required.
- 5.6.4 For the EIA scoping itself, the IACC is broadly in agreement with the approach taken, but advise the inclusion of local Wildlife Sites for completeness.

5.7 Archaeology

- 5.7.1 The IACC understand that the applicant has contacted the Gwynedd Archaeological Planning Service (GAPS) directly. Having discussed with the Senior Planning Archaeologist, the IACC understand that the proposals and scope of assessment appear acceptable in principle, and GAPS have requested more information about the types of surveys that will be undertaken.
- 5.7.2 GAPS have recommended that an archaeological assessment should be prepared by an archaeological contractor with appropriate expertise, which should incorporate the results of any survey. The purpose of this is to establish the nature of the seabed archaeology, which will be the main source of potential

impact, and to inform the future mitigation strategy. GAPS have also advised the applicant to contact the Maritime Officer at the Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW) and the applicant have confirmed that they will do so.

5.8 Socio-Economic

5.8.1 From an economic development, tourism and employment perspective, the IACC is supportive of the principle to re-build Holyhead Marina (subject to the submission of the required detail to the satisfaction of the Local Planning Authority). The Marina has been a catalyst for economic growth in the Holyhead area for a number of years. The Marina is also strategically important as a tidally unrestricted safe haven for visiting yachts from the Irish Sea.

5.8.2 Jobs & Skills

- i. Further detail is required on the construction of the marina (including detail on the construction programme / timescale). This shall include details on the construction jobs, type and number of jobs, the skills required, the supply chain opportunities etc.
- ii. A breakdown should also be provided on the number of local job opportunities and the ability of local people / companies to access these opportunities.
- iii. The IACC acknowledge that the proposal is to re-building the marina that was previously in operation. Nevertheless, the IACC would expect to see detail on the number and type of operational jobs in any Environmental Statement.
- iv. Detail is required on the cumulative impacts with other proposed projects in the area, including the Holyhead Waterfront Project, Morlais, Minesto etc. This is critical for the IACC to understand the potential impacts on the local labour market (including potential displacement).

5.8.3 Local Economy

- i. Further detail is required on the contribution the proposed development will make to the local and regional economy (direct, indirect and induced effects).
- ii. Consideration also needs to be given to the likely potential impacts on the local economy during construction and what measures will be implemented to prevent adverse impacts (if any).

5.8.4 Tourism

5.8.4.1 Tourism is the largest economic sector on the Island generating £304M per annum to its economy. The sector supports approximately 4,100 jobs and 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.

5.8.4.2 The Island attracts 1.71 million visitors per annum (2017) 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 1.71M in 2017) and in

the value of tourism to the economy (£186M in 2006 to £304M in 2017). This is a significant growth market that needs to be protected.

- 5.8.4.3 In addition to its 1.71 million visitors, Anglesey's tourism sector is further boosted by Holyhead, the UK's second busiest port, processing two million annual visitors travelling between the UK and the Republic of Ireland. More recently, Holyhead has emerged as Wales' premier cruise port. As such, it is strategically important to this fastest-growing and highly lucrative segment of the Welsh tourism product. In 2018, 52 cruise ships arrived at the port, bringing in 32,700 passengers and generating a cruise tourism impact of +£3M.
- 5.8.4.4 The Scoping Report confirms that there are over 1,000 visitor boat nights in a busy summer month with visitors coming from across Europe, Scandinavia and North America. Maintaining and promoting Holyhead's reputation as a tidally unrestricted safe haven within the Irish Sea is very important from a tourism perspective. The linkages with other key locations along the Irish Sea (such as the Isle of Man, Ireland, and the Scottish Isles) should also be encouraged and promoted to increase tourism potential.
- 5.8.4.5 The draw of a busy Marina is also important for attracting residents and tourists to the waterfront. The re-building of the Marina should act as a catalyst to attract more people to the marina, which in turn could result in further development and growth of the tourism sector in the Holyhead area. Furthermore, North Wales is being positioned as the 'adventure capital of Europe' and the Marina could play a crucial role in this. With less visiting yachts, it would be beneficial for the applicant to further demonstrate how diversifying and embracing other opportunities could be capitalised (e.g. cruise ships, adventure sports, events etc.) to sustain and promote tourism.
- 5.8.4.6 In order for the IACC to be able to assess the potential impacts on tourism, the Scoping Report / EIA should contain further detail an information on:
- i. The potential impact on the tourism economy (including detail on tourism value, anticipated visitor numbers, etc.
 - ii. Detail on the how the proposal will avoid, mitigate or compensate for any tourism impacts during construction and operation.
 - iii. How the proposed development will integrate with other tourism assets (e.g. Coastal Path, AONB, South Stack etc.) and how these opportunities will be maximised.
 - iv. Cumulative impacts with other proposed and existing developments and how this will impact on tourism (during construction and operation).

5.9 Cumulative Impacts

- 5.9.1 One of the chapters to be included in the Environmental Statement should be the assessment of potential cumulative impacts with other schemes, which either exist, or have recently been granted planning permission, as confirmed by Schedule 4, Article 5 (d) of the 2017 EIA Regulations.
- 5.9.2 The IACC would also expect the applicant to consider any reasonably foreseeable projects, which are currently in the public domain or within the statutory planning process. These would be proposals for example, which have undergone public consultation, are at the pre-application stage or planning applications that have been submitted to the Local Planning Authority.
- 5.9.3 The IACC acknowledge that sufficient environmental information / datasets will be required in order for the applicant to make a reasonable assessment of cumulative impacts. It is however, the applicant's role to scope these other proposals and determine whether sufficient information exists.
- 5.9.4 Given the number of proposals in the Holyhead area alone, there may be significant cumulative impacts. These proposals include Holyhead Waterfront, Morlais, Minesto, Holyhead Port Expansion, Port Maintenance Dredging and Breakwater Refurbishment, all within or around the Port of Holyhead. For consistency and alignment with other proposed developments, the IACC include a table of potential proposed developments to be considered in a cumulative impact assessment in **Appendix 2**. These proposals will need to be scoped in / out and assessed as necessary.

6.0 Conclusion

- i. In principle (and subject to the submission of the required detail to the satisfaction of the Local Planning Authority), the IACC is supportive of the re-building of Holyhead Marina. The Marina is strategically important not only to Holyhead and Anglesey but within the wider context of the Irish Sea. Being one of the only tidally unrestricted deep-water facilities in the region, it offers the opportunity to re-build and develop the Marina's reputation as a safe haven for passing and visiting yachts.
- ii. The Marina also offer the opportunity to support local jobs and supply chain opportunities (both construction and operation) and to act as a catalyst to the local economy. The IACC would be eager to maximise these opportunities and would encourage the applicant to engage with the IACC at the earliest opportunity.
- iii. Although the IACC appreciate that this is a request for pre-application advice, the Environmental Scoping Report is severely lacking in detail (particularly on the construction methods and assessment of potential impacts). The IACC is however, aware that RPS of Belfast have been commissioned to develop the Environmental Statement. The applicant should use the contents of this pre-application advice to develop a detailed Environmental Scoping Report.

- iv. The IACC would encourage the applicant to submit a formal Scoping Opinion request once detailed information about the proposal becomes available, responding to the comments made in this report. A Scoping Opinion seeks to ensure that any environmental statement (ES) submitted with respect to a planning application for the development proposal described in the scoping request includes information that is reasonably required to assess the environmental effects, and allow a determination to take place. The ES must 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.
- v. With a number of other major developments proposed in and around the Port of Holyhead, the assessment of cumulative impacts will be critical. Cumulatively, these major projects could have a significant impact in the Holyhead area and measures will need to be identified to avoid, mitigate or compensate for any potential adverse impacts as necessary.
- vi. Although the IACC support the approach of having one Environmental Statement covering the three consenting processes, clarity is required on what consent the applicant is seeking from the IACC, what is Marine Licence and what falls within the Harbour Revision Order. Whilst there will be inevitable overlaps, it is essential that there is consistency and alignment (where possible) between the positions taken by the Statutory Bodies on the various impacts, methodologies, baselines etc.
- vii. Schedule 4 (sub section 2) of the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 requires a description of the reasonable alternatives. This for example includes alternatives in terms of development design, technology, location, size and scale, which have been studied by the applicant and are relevant to the proposed development and its specific characteristics. The applicant must provide an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects. Although there are no details of the proposed development available at this stage, the applicant will be required to consider alternatives and detail why they have chosen this option (including an assessment of alternative options and why these have been discounted). This will be particularly relevant for the design, scale, layout and construction method of the breakwater. Given the regional importance of the proposed development, consideration of alternative locations will also be required.

Appendix 1

19C484 - Proposed pontoon berthing for 350 - 400 leisure craft - shoreside marina amenities and services, boat and car parking along with housing development and hotel expansion on land at Porth y Felin, Holyhead. - **Refused**. 15/10/1991.

19C484A - Proposed pontoon, berthing for approx 300 leisure craft, chandlery, cafe and 26 apartments at Porth y Felin, Holyhead. - **Permitted** 22/05/2000.

19C484B - Listed Building Consent for the repair and repainting of boat repair workshop together with the construction of a marina shorebase at Trinity House Depot, Holyhead. - **Permitted** 09/12/1994.

19C484C - Phase one marina development comprising of: temporary portakabins, 100 no floating pontoon berths, marina access spit and bridge, land reclaim and beach replenishment and renovation of listed marine workshop building at and adjacent to Trinity House Depot, Holyhead. **Permitted** 22/05/2000.

19C484D/LB - Listed Building Consent for phase one development comprising of: temporary portakabins, 100 no floating pontoon berths, marina access spit and bridge, land reclaim and beach replenishment, and renovation of listed marine workshop building at and adjacent to Trinity House Depot, Holyhead. **Permitted** 22/05/2000.

19C484E – Erection of a new marine maintenance building at Trinity Marine Ltd, Holyhead. **Permitted**. 17/02/2000.

19C484F/LB - Listed building consent for the erection of a marine maintenance building at Trinity Marine Ltd., Newry Beach, Holyhead. **Withdrawn**. 09/08/2000.

19C484G/LB - Listed building consent for the erection of a temporary marine maintenance workshop at Trinity Marine Boatyard, Newry Beach, Holyhead. **Withdrawn** 12/12/2000

19C484H - Erection of a temporary marine maintenance workshop at Trinity Marine Ltd, Newry Beach, Holyhead. **Permitted**. 15/01/2001.

19C484J/DA - Detailed plans for the erection of a marina control amenity building, chandlery, cafe and 26 residential apartments together with the construction of a new access at Holyhead Marina, Trinity House Depot, Newry Beach, Holyhead. **Permitted** 08/05/03.

19C484K - Application for the deletion of conditions (15), (16), (17), (18), (19), (20), (21), (22) and (23) on planning permission 19C484A to allow for a gateway and pavement crossing for occasional use and emergency vehicles at Trinity Marine \ Boatyard & Foreshore, Porth y Felin, Holyhead. **Permitted**. 07/06/2013.

19C1046/SCO Request for Scoping Opinion for regeneration works comprising of: 1) a pontoon system of floating boardwalks, protected by a new breakwater, with capacity for approximately 500 boats; 2) a marina office (Captainerie and washroom); 3) a chandlery; 4) approximately 400 residential units; 5) a hotel; 6) leisure \ retail units; 7) a new sailing club building; 8) boat storage facilities; 9) boat maintenance facilities; 10) car parking and hard\soft landscaping 11) infrastructure including new

roads and drainage systems and to include reclamation of land from the sea at Holyhead Waterfront Holyhead – **EIA Not Required** 29/01/2010

19C1046A/EIA/ECON Outline application for a mixed-use development consisting of a new marina, residential properties, a hotel, commercial, leisure and retail uses together with associated land reclamation and service infrastructure at Holyhead Waterfront Holyhead – **Permitted** 14/02/2014

19C1046B/SCR Screening opinion for the erection of 25 vertical axis wind turbines with a maximum height of 23.5m on land at Holyhead Port Holyhead – **Withdrawn** 25/08/2011

19C1046C/LB Application for listed building consent for demolition of part of the house at Soldiers Point, Holyhead - **Permitted** 07/05/2014

19C1046D/DIS Application to discharge conditions (03) and (04) being details of the method of ensuring the safety and the stability of the building and method of proposed demolition from planning permission 19C1046C/LB application for listed building consent for demolition of part of the house at Soldiers Point, Holyhead - **Condition Discharged** 08/05/2015

19C1046E/DIS - Application to discharge condition (02) (programme of building recording and analysis) from planning permission 19C1046C/LB (Listed Building Consent for demolition of part of the house) at Soldiers Point, Holyhead – **Condition Partially Discharged** – 19/06/2015

19C1046G/SCR - Screening opinion to extend the period of the planning application (19C1046A/EIA/ECON) for an additional 3 years at Holyhead Waterfront, Holyhead – **Withdrawn** 18/01/2019

19C1195/RE/SCO - Scoping opinion for the on-shore associated development and cable landfall location in association with the development of the proposed Morlais Tidal Development Zone off the coast of Holyhead on parts of Holyhead and Valley **Scoping Opinion Issued** 14/02/2017

SCR/2019/50 - Screening opinion for the refurbishment at Breakwater, Holyhead – **Not yet Determined**

Appendix 2 – Cumulative Impact Assessment

Developer	Project Title & Description	Source of Information / Application Reference	Status
Conygar	Holyhead Waterfront Development Outline application for a mixed-use development consisting of a new marina, residential properties, a hotel, commercial, leisure and retail uses together with associated land reclamation and service infrastructure.	Planning Application 19C1046A/EIA/ECON	Consented
Stena Line	Marine Licence Application for Maintenance Dredging at Holyhead Port	Natural Resource Wales (NRW)	Consultation closes 26 th September 2019
Stena Line	Marine Licence Application for Holyhead Port Expansion	Natural Resource Wales (NRW)	Consultation closes 9 th October 2019
IACC	Screening Request for Holyhead Breakwater Refurbishment	Isle of Anglesey County Council SCR/2019/50	EIA Screening Request submitted to IACC / NRW.
Conygar	Parc Cybi Stage 2 Mixed-use employment developments on the southern edge of Holyhead, close to the A55. Primarily distribution and warehousing space but also includes an 80-bed hotel.	Planning Application	Consented
Land and Lakes	Penrhos Leisure Village A leisure village at Penrhos Coastal Park, Holyhead, with up to 500 new lodges and cottages	Planning Application 46C427K/TR/EIA/ECON	Consented

	and 315 new dwellings at Kingsland.		
Orthios Group	Anglesey Eco Park including: • a 299 megawatt electric (MWe) biomass power station within the existing consented scheme; • prawn-growing facility (aquaculture); • large soil-less indoor vegetable growing facility (hydroponics); • home compostable food packaging facility; • the compostable food packaging centre of excellence; • research and development; and • a deep water jetty for bulk import.	Planning Application (determined by DECC)	Consented
Minesto	Holyhead Deep 10MW (and phased development to 80MW) Tidal kite installation off the coast of Holyhead, plus on-land elements and grid connection.	Environmental Statement / NRW Scoping Opinion.	Consented.
Morlais	West Anglesey Demonstration Zone Menter Môn has been awarded a long-term lease to manage an area of seabed off the west coast in order to develop the marine energy sector. Planning Application expected September 2019.	Public Consultation. Planning Application to be submitted in September 2019.	Reasonably foreseeable.
IACC	Business units at Penrhos	Planning Application 19LPA1023A/CC	Consented.

	Full application for the erection of 10 flexible business units including associated parking and service yard, landscaping, vehicle charging points, solar panels and two bin / recycling storage and bike storage.		
Anwyl Homes	<i>Residential development at South Stack Road (Phase 1), Holyhead</i> Construction of 123 detached and semidetached homes on an 11-acre site.	Planning Application 19C608F	Under construction.
Anwyl Homes	<i>Residential development at South Stack Road (Phase 2)</i> Full application for the erection of 46 dwellings together with the creation of a new vehicular access on land adjacent to Parc Tyddyn Bach, Holyhead.	Planning Application FPL/2018/57	Application Submitted.
Stena Line Port Limited	<i>Port of Holyhead Expansion</i> Construction of a deep water cruise terminal and associated terminal buildings, as well as improvements to the access roads.	Scoping Report	Reasonably foreseeable.
Huws Gray	<i>Builders Merchant Yard</i> Full application for the erection of a building to be used as a builders merchant with warehouse and sales floor areas (sui generis use), construction of new vehicular site access,	Planning Application FPL/2018/25	Consented.

	storage yard, loading areas together with soft and hard landscaping areas on land at Parc Cybi, Holyhead.		
Horizon Nuclear Power	Wylfa Newydd New Nuclear Power Station	DCO Application National Infrastructure Planning website	DCO Examination completed.

Appendix B Didemnum vexillum: survey of distribution and extent in Holyhead Harbour after storm Emma, October 2018



**Cyfoeth
Naturiol
Cymru
Natural
Resources
Wales**

Didemnum vexillum: survey of distribution and extent in Holyhead Harbour after storm *Emma*, October 2018

Rohan Holt
CloudBase Productions Ltd.

Evidence Report No. 306



Aerial view of Holyhead marina October 2018. R. Holt

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Contents

1. Crynodeb Gweithredol	7
2. Executive Summary	8
3. Introduction and background	9
4. Field survey	11
4.1. Survey methodology	11
4.1.1. Intertidal survey	11
4.1.2. Subtidal survey	13
4.2. Survey results	14
4.2.1. Intertidal survey results	14
4.2.2. Subtidal survey results	30
4.2.3. Results summary	41
5. Discussion	44
5.1. Did storm <i>Emma</i> distribute living <i>D.vexillum</i> on broken pontoon sections?	44
5.2. Temporal change in distribution and extent of <i>Didemnum vexillum</i> in the marina area	44
5.3. Potential for future work and dealing with the remaining <i>D.vexillum</i> problem	46
5.4. Conclusions and summary	47
6. References	49
7. Acknowledgements	49
8. Appendix 1. Dive log sheets	50
9. Appendix 2. General permit to work from Port Control	55
10. Appendix 3. Methods statement	56
Data Archive Appendix	58

List of Figures

Figure 1. Fragments of polystyrene pontoon and fibreglass coating with marine life attached recovered from beaches on the NW Anglesey coast: (a) the fibreglass shell with enough polystyrene to keep it afloat; (b) fresh remains of a solitary ascidian (<i>Ascidia</i> sp.?) and colonial ascidians (<i>Didemnum</i> sp.?): (c) close view of the solitary ascidian; (d) erect bryozoan; (e) and (f) remains of encrusting ascidians, sponges and algae. Photo Paul Brazier, NRW.	10
Figure 2. NW Anglesey shore survey sites and the location of Holyhead Harbour (Google Earth)	12
Figure 3. (a) area surveyed (Microsoft Bing Maps); (b) south side of the causeway at low water; (c) <i>Rhodothamniella floridula</i> on short vertical faces at the base of the wall; (d) moorings and boat hulls; (e) <i>Spartina</i> sp. and <i>Salicornia europaea</i> on muddy sand. Photos R. Holt 15	15
Figure 4. (a) area surveyed (Microsoft Bing Maps); (b) general view showing rocky features on sediment shore; (c) sponges, mussels and didemnids amongst the boulders on the gorad wall; (d) dense <i>Ascophyllum nodosum</i> and boulder overhangs; (e) gorad wall with water percolation channels; (f) the Cob A5 road causeway with cobbles set in sediment. Photos R. Holt. 16	16
Figure 5. (a) area surveyed (Microsoft Bing Maps); (b) investigating sponge-ascidian overhangs by torchlight; (c) general view of fucoid dominated rocky ridges and pools; (d) fibreglass wreckage with <i>Didemnum maculosum</i> ; (e) areas of boulders set in sandy sediment; (f) <i>Rhodothamniella floridula</i> sandy mats on rock; (g) mixed sediment and bedrock and boulders. Photo b. K. Northen. All other photos R. Holt.	18
Figure 6. (a) areas surveyed (Google Earth); (b) aerial image of N section – many bedrock and boulder ridges and gullies; (c) shallow rockpool – boulders with diverse sponges and ascidians; (d) overhang/surge gulley with <i>Clathrina</i> , <i>Dendrodoa</i> , <i>Halichondria</i> and <i>Amphilectus</i> ; (e) aerial image of S section – bedrock and boulder ridges; (f) <i>Rhodothamniella floridula</i> sandy mats, fucoids and red algae at the slipway below the caravan park; (g) large rockpools and steep sided gullies. Photos R. Holt.	20
Figure 7. (a) areas surveyed (Google Earth); (b) sand filled pools with fucoids on rocky ridges; (c) shallow rockpool – coralline algae on vertical faces; (d) overhangs with <i>Halichondria</i> and <i>Amphilectus</i> ; (e) <i>Homarus gammarus</i> lobster from overhang in rock pool. Photos R. Holt.....	22
Figure 8. (a) areas surveyed (Google Earth); (b) sand-rock interface with fucoids and <i>Rhodothamniella floridula</i> on rocky ridges; (c) elevated rocky ridges with fucoids, limpets and barnacles; (d) level cobble and bedrock shore with shallow coralline pools; (e) sandy rock habitats with fucoids and <i>Rhodothamniella floridula</i> on smoothed rocky ridges; (f) sandy rockpools and cobbles with fucoids and <i>Rhodothamniella floridula</i> . Photos R. Holt.....	24
Figure 9. (a) areas surveyed (Google Earth); (b) sandy rock and pools with fucoids and <i>Rhodothamniella floridula</i> ; (c) rocky ridges and deep rockpools with fucoids, limpets and barnacles. Photos R. Holt.....	25
Figure 10. (a) areas surveyed (Google Earth); (b) general view of the bay; (c) mobile cobbles and boulders on the south side of the bay; (d) <i>Halichondria panicea</i> and <i>Amphilectus fucorum</i> sponges in bedrock gullies; (e) <i>Rhodothamniella floridula</i> on sand-influenced bedrock ridges. Photo b & c R. Holt; photos d & e Liz Morris-Webb	26
Figure 11. (a) areas surveyed (Microsoft Bing Maps); (b) general view of the rocky shore ridges; (c) rear of cave with polystyrene debris (d) smooth bedrock ridges with <i>Himanthalia elongate</i> , coralline and green algae; (e) wave-exposed bedrock ridges with <i>Mastocarpus stellatus</i> and fucoids. Photos R. Holt.	27

Figure 12. (a) Aerial image taken 11/3/18 of Scimitar beach showing dense accumulation of marina debris and retaining boom; (b) aerial image of areas surveyed taken 24/10/18 and approximate track followed by divers (red hatched lines A and B) and shore walk (solid red line). Yellow hatched line represents area of Scimitar beach illustrated in image a; (c) breakwater pontoons aground in Porth y Felin (point 2 on Figure b); (d) breakwater pontoon aground in Scimitar beach (point 1 on Figure b); (e) close view of pontoon sides showing remains of *Laminaria* holdfasts and dead barnacle tests; (f) fragment of fibreglass pontoon 'shell' with remains of barnacles and algae; (g) large plastic pipe moored against the breakwater wall (see point 4 on Figure 12b) with green algae on outside surfaces; (h) internal view down the plastic pipe showing barnacle cover; (i) fragments of fibreglass pontoon shell in Scimitar beach; (j) salvaged remains of the marina ashore on the hard standing in Porth y Felin. Photos R. Holt.30

Figure 13. Aerial view of the remaining pontoons taken at the time of survey (22/10/18). Photo R. Holt.....31

Figure 14a. Dive survey sites in the New Harbour (Google Earth). Dive sites are numbered as examined in chronological order (numbers highlighted in red = presence of *D. vexillum*; yellow numbers = absence of *D. vexillum*).....31

Figure 14b. Dive survey sites in the Old Harbour and commercial jetties (Google Earth) Dive sites are numbered as examined in chronological order (numbers highlighted in red numbers = presence of *D. vexillum* at the site; yellow numbers = absence of *D. vexillum* at site).32

Figure 15. (a) *Didemnum vexillum* overgrowing pontoon surfaces on the E-W floating breakwater; (b) *D.vexillum* on *Ascidia aspersa*; (c) large sheets of *D.vexillum* taken from a mooring buoy to the north of the marina; (d) *Lissoclinum perforatum* and *Asterocarpa humilis* growing in clumps under the refuelling buoy at Terminal 4; (e) clumps of *Asterocarpa humilis* overgrown by *Diplosoma spongiforme* and *Lissoclinum perforatum* with *Antedon bifida* and *Laminaria hyperborea*; (f) *Undaria pinnatifida* removed from the sides of the E-W floating breakwater; (g) fuelling buoy at Terminal 4; (h) Largs-style buoy near Terminal 4; (i) RIB *Interceptor* and crew near Terminal 3/5; (j) damaged section of E-W breakwater pontoons; (k) aerial image of the Old Harbour and terminals – silt plume visible around the ferries and east of the New Harbour (Photos a & b, Nick Owen; photos c-k. R. Holt).40

Figure 16. Video stills of wreckage on the seabed in the marina area; (a) finger pontoon deck with cleat. *Ascidia aspersa* now overgrowing the metal frame; (b) concrete mooring block with *A.aspersa*; (c) remains of a yacht mast and sail rigging overgrown with *A. aspersa*. Video images K. Northen.....42

Figure 17. Shore areas (1-10) searched for the presence of *D.vexillum* and didemnids. Yellow stars = rocky habitats with *Didemnum maculosum*.....42

Figure 18. Diagram of floating structures and chains in the marina in 2012 compared to the remains of the marina one week after storm *Emma* in March 2018. Photo. R. Holt.44

Figure 19. Google Earth 'historical' image of the intact marina from June 2011 with indicative locations of moorings and vessels with *D.vexillum* from 2009-2015 surveys (shaded red) and current survey sites (red numbers = with *D.vexillum*; yellow numbers = without *D.vexillum*).45

Figure 20. Aerial image of Porth y Felin. The river runs across the shore in the foreground past the remains of three floating breakwater pontoons. The recovered wreckage is on the hard standing on the right. Photo. R. Holt.47

List of Tables

Table 1. Shore survey results: Site 1, Four Mile Bridge.	14
Table 2. Shore survey results: Site 2, Newlands Park / Beddmanarch Bay.	15
Table 3. Shore survey results: Site 3, Porth Trwyn Mawr to Porth Penrhyn Mawr.	17
Table 4. Shore survey results: Site 4, Porth Trwyn Mawr north and south.	18
Table 5. Shore survey results: Site 5, Porth Trefadog.....	21
Table 6. Shore survey results: Site 6, Porth Trwyn.	23
Table 7. Shore survey results: Site 7, Porth Grugmor.....	25
Table 8. Shore survey results: Site 8, Porth Swtan / Church Bay.	26
Table 9. Shore survey results: Site 9, Porth y Bribys, Porth y Nant and Porth y Hwch.....	27
Table 10. Shore survey results: Site 10, Scimitar beach and Porth y Felin.	28
Table 11. Dive sites in chronological order. Locations with <i>D.vexillum</i> are shaded red. Previous known locations of <i>D.vexillum</i> are noted (yellow shading) and also presented in Figure 18.....	32

1. Crynodeb Gweithredol

Tarodd storm Emma Ynys Môn, Gogledd Cymru ar ddechrau mis Mawrth 2018. Dioddefodd marina Caergybi ddifrod trychinebus wrth i wyntoedd a thonau'r gogledd-ddwyrain, yn rhedeg i lawr ochr fewnol morglawdd Caergybi, rwygo cychod o'u hangorfeydd a throï pontynau'r marina ar eu hochr. Chwythwyd malurion arnofiol i gornel orllewinol yr Harbwr Newydd yn gyntaf, yna cawsant eu gwasgaru allan i'r môr, gan olchi ar y lan o amgylch Ynys Môn ac yn ôl pob tebyg cyn belled ag arfordir dwyreiniol Iwerddon.

Cafwyd adroddiadau bod rhywogaethau estron morol gan gynnwys y Chwistrell Fôr Garped *Didemnum vexillum* ymledol yn trigo yn yr adeileddau pontŵn arnofiol, angorfeydd a chyrff cychod ers 2008. Cafwyd nifer o ymdrechion gan Cyfoeth Naturiol Cymru i'w dileu gan ddefnyddio dulliau rhwystr rhwng 2009 a 2013. Er ei fod yn llwyddiannus ar y cyfan ar y pryd, ailymddangosodd y Chwistrell Fôr ar ôl i'r driniaeth ddod i ben, ac erbyn 2015 roedd wedi dychwelyd i'w helaethrwydd cyn y driniaeth. Pan dorodd y marina yn ddarnau yn ystod storm Emma, tybiwyd bod *D.vexillum* byw ar wasgar gyda'r darnau o bontŵn gan greu risg o wasgaru'r rhywogaeth hon ymhell y tu hwnt i'w therfynau blaenorol.

Gwyddys fod cytrefi o *Didemnum vexillum* yn ffynnu yn ystod misoedd yr haf yng Nghaergybi, gyda chytrefi yn tyfu'n gyflym i gyrraedd eu maint uchaf, sydd i'w gweld yn bennaf ar ddiwedd yr haf a dechrau'r hydref. O ganlyniad, archwiliwyd cyfres o safleoedd arolwg wedi'u targedu o fewn y marina ac ar hyd arfordir cyfagos Ynys Môn ar ddechrau'r hydref i weld a oedd storm Emma wedi achosi newid yn ei dosbarthiad. Cynhaliwyd arolygon ar safleoedd ar y glannau ar droed, ac arolygwyd gweddillion arnofiol y pontynau, yr angorfeydd a chyrff cychod drwy blymio. Arolygwyd 10 safle ar y glannau a 58 o safleoedd plymio, ac o'r rheini darganfuwyd *D.vexillum* ar 12 o safleoedd yn unig - pob un ohonynt ar, neu'n agos iawn at safleoedd yn ardal yr hen farina, ble roedd wedi'i chofnodi'n flaenorol. Golygodd hyn fod ei hamrediad yn gyfyngedig o hyd i'r Harbwr Newydd ac nad oedd wedi ehangu i'r dwyrain nac i'r gorllewin. Ni chynhyrchodd unrhyw un o'r glannau a archwiliwyd unrhyw gofnodion o *D.vexillum*, gan gynnwys y rheini lle roedd pontynau wedi'u cytrefu wedi'u golchi i'r lan a byddai unrhyw ddeunydd *D.vexillum* byw, pe byddai wedi goroesi, wedi bod mewn cysylltiad agos ag is-haenau naturiol am y rhan fwyaf o'r gwanwyn ac i mewn i'r haf.

Cofnodwyd rhywogaethau estron eraill o fewn yr harbwr - yn arbennig *Undaria pinnatifida* ac *Asterocarpa humilis* - yr ymddengys fod y ddwy wedi cynyddu o ran helaethrwydd ac amrediad yn yr ardal.

Trafodir pam nad yw *D.vexillum* wedi gallu sefydlu mewn ardaloedd ble byddai deunydd byw wedi bod mewn cysylltiad agos ag is-haenau naturiol. Gall amodau fod wedi bod yn is-optimaid ar gyfer twf a datblygiad ar yr adeg o'r flwyddyn pan wasgarodd y storm y deunydd byw, neu efallai na fyddai'r rhywogaeth hon o *D.vexillum* wedi gallu cytrefu cynefinoedd rhynglanwol. Mae gan ei diffyg datblygiad oblygiadau pwysig ar gyfer rheoli'r rhywogaeth hon ymhellach, sy'n bresennol o hyd ar gyrff cychod, pontynau ac angorfeydd yn yr Harbwr Newydd.

2. Executive Summary

Storm *Emma* struck Anglesey, N Wales at the beginning of March 2018. Holyhead marina suffered catastrophic damage as the east-north-easterly winds and waves, running down the inside of Holyhead Breakwater, tore boats from their moorings and overturned the marina pontoons. Floating debris was first blown into the west corner of the New Harbour then later scattered out to sea, washing ashore around Anglesey and probably as far as the east coast of Ireland.

Marine non-native species including the invasive carpet seasquirt *Didemnum vexillum* have been known to inhabit the floating pontoon structures, moorings and boat hulls since 2008. Several attempts by NRW to eradicate it using barrier methods took place between 2009 and 2013. Although mostly successful at the time, the seasquirt re-appeared after treatment ceased, and by 2015 had returned to its pre-treatment abundance. When the marina broke apart during storm *Emma*, live *D.vexillum* was assumed to be dispersed with the pontoon fragments risking spreading this species far beyond its previously known limits.

Didemnum vexillum colonies are known to flourish during the summer months in Holyhead, with colonies growing rapidly to reach their maximum size, which are most recognisable in late summer and early autumn. A series of targeted survey sites within the marina and along the adjacent NW Anglesey coast were therefore investigated in early autumn to determine whether storm *Emma* had caused a change in its distribution. Shore sites were surveyed on foot and the floating remains of the pontoons, moorings and boat hulls were surveyed by diving. Ten shores and 58 dive sites were surveyed and of these *D.vexillum* was only located at 12 sites – all of them at or very near sites in the former marina area where it had been recorded previously. This meant its range was still confined to the New Harbour and had neither extended eastwards nor westwards. None of the shores investigated produced any records of *D.vexillum*, including those where colonised pontoons had been brought ashore and any living *D.vexillum* material, had it survived, would have been in close contact with natural substrata for much of the spring and into the summer.

Other non-native species were recorded within the harbour – particularly *Undaria pinnatifida* and *Asterocarpa humilis* – both of which appear to have increased abundance and range in the area.

Why *D.vexillum* has not managed to establish in areas where living material will have been in intimate contact with natural substrata is discussed. Conditions might have been sub-optimal for growth and development at the time of year when the storm dispersed the living material, or this 'strain' of *D.vexillum* might not be able to colonise intertidal habitats. Its lack of development has important implications for further control of this species which is still present on boat hulls, pontoons and moorings in the New Harbour.

3. Introduction and background

The carpet seasquirt *Didemnum vexillum* has been known from Holyhead marina since 2008 having been discovered by Kate Griffith (Griffith *et al* 2009) as part of a study of non-native marine species in the area. *D.vexillum* has well-established credentials world-wide as a highly invasive and damaging species when associated with mariculture and native habitats away from its origin in the western Pacific around Japan (McKenzie *et al* 2017).

Attempts by Natural Resources Wales to eradicate *D.vexillum* in Holyhead during 2009-2013 were only partially successful and it re-established after the eradication project ended. However, subsequent NRW surveys in 2015 found that it was still confined to floating marina structures that move with the rise and fall of the tide and had not spread to natural and fixed substrata anywhere in the harbour area. The reasons for its inability to establish on fixed substrata were under investigation as part of a PhD study that investigated small-scale variations in physical conditions around the marina and how these might affect the distribution, growth rates and morphology of *D.vexillum* (H. Goudge pers. com.). Unfortunately experimental work was abruptly halted by the damage caused by the late winter storms in early 2018. *D.vexillum* is also confined to floating structures in other marinas around mainland UK and Northern Ireland (e.g. Malahide marina – D. Minchin pers. com.). This contrasts with the situation where *D.vexillum* is found associated with oyster culture (e.g. Galway Bay and north Kent coast) where it grows on culture bags supported on static trestles and has transferred onto natural intertidal and subtidal habitats at these locations. The difference between the two growth strategies requires further investigation – including whether it is the same species or requires an environmental cue to live on natural substrata.

In early March 2018 a severe storm, given the name *Emma* by the Met Office, swept through the UK. Eye witnesses from Holyhead lifeboat stated that the ENE wind direction, channelled and intensified by the 'S'-shaped main breakwater, funnelled huge waves exceeding 5 m into the New Harbour and marina at Holyhead. This broke yachts and wind farm boats from their moorings in the marina and 80 vessels were sunk in place or forced aground in the west of the New Harbour. Most of the pontoon floats were separated from their metal walkway superstructures, which sank, scattering the floats and their fractured polystyrene cores into the same area forming a dense mass of beached and floating debris (Figure 12a). A series of floating booms were used to attempt to contain the debris, but with a change of wind direction and damage to the booms a proportion of the floating material escaped and blew out into the open sea. This was reported to have been found as far away as the east coast of Ireland, but the bulk went ashore on the west coast of Anglesey where groups of volunteers and local council workers were involved with the clean-up operation (Wong 2018).

Marina debris, particularly the larger concrete walkways and the fibreglass outer coating of the pontoons, made buoyant by adherent polystyrene, will have carried considerable amounts of live flora and fauna including *D.vexillum* with it. The remains of sponges, byryozoans and solitary and colonial ascidians (possibly *D.vexillum*) were found on debris washed ashore on the

beaches on the north-west coast of Anglesey (Figure 1). Some of this biological material was fresh enough to presumably have been alive when it washed ashore. Whether the mobilisation of this debris has caused *D.vexillum* to spread to new areas and natural habitats, in and beyond the harbour, is the main objective of this survey project.



Figure 1. Fragments of polystyrene pontoon and fibreglass coating with marine life attached recovered from beaches on the NW Anglesey coast: (a) the fibreglass shell with enough polystyrene to keep it afloat; (b) fresh remains of a solitary ascidian (*Ascidia* sp.?) and colonial ascidians (*Didemnum* sp.?): (c) close view of the solitary ascidian; (d) erect bryozoan; (e) and (f) remains of encrusting ascidians, sponges and algae. Photo Paul Brazier, NRW.

4. Field survey

4.1. Survey methodology

4.1.1. Intertidal survey

Nine intertidal areas on the NW coast of Anglesey were identified by NRW for investigation based on the distribution of floating debris found by volunteers involved with the post-storm *Emma* clean up (Figure 2). The intertidal areas immediately adjacent to the marina in Porth y Felin and Scimitar beach were also searched (Figure 12b). The presence of fragments of marina debris, particularly sections of polystyrene-backed marina pontoon fibreglass shell that had the remains of encrusting flora and fauna was noted and examined in detail.

On each shore searches were made for habitats where *Didemnum vexillum* is likely to colonise based on other reports of where it has established on the shores in the UK and British Isles, particularly on the north Kent coast and west coast of Ireland (McKenzie *et al* 2017). The presence of other native didemnid species, most commonly *Didemnum maculosum*, was also used as an indicator of suitable habitat and the presence/location of this species was noted wherever found. This species tends to be confined to vertical and overhanging rock, particularly where shaded by furoid seaweeds, on vertical faces within rock pools and on the undersides of boulders sitting on rocky surfaces that are not embedded in sediment. This species is often accompanied by a variety of other encrusting fauna including the sponges *Halichondria panacea*, *Hymeniacidon perleve*, *Amphilectus fucorum*, *Pachymatisma johnstonia* and *Haliclona* spp., ascidians *Dendrodoa grossularia* and various encrusting and erect bryozoans.

In practice such habitats were found on the mid and lower shore/sublittoral fringe and into the upper infralittoral where rock surfaces are not significantly influenced by mobile sand or sediment. Rugged bedrock shores with large stable boulders and gullies or locally sheltered areas of sediment-free boulders, rock pools and cobbles supported *Didemnum maculosum* and were considered the most likely areas where *D. vexillum* might establish (Figure 17). These areas were targeted for detailed searches whereas less time was spent investigating wave-exposed smooth bedrock platforms, mobile cobbles, or where dense sand-binding mats of *Rhodothamniella floridula* occurred on the mid and lower shore.



Figure 2. NW Anglesey shore survey sites and the location of Holyhead Harbour (Map Data © 2018 Google)

Intertidal sea caves at the NW Anglesey shore locations were also examined – many of which had sections of polystyrene (some recognisable sections of marina float) and various other debris ‘wedged’ into cracks and crevices at the backs of the caves.

Five large breakwater pontoons with variable amounts of damage had been washed ashore by the storm then secured in place on the upper and mid-shores in Porth y Felin and Scimitar beach. The surfaces of these pontoons and the hard substrata near them were examined in detail and photographed.

The shores were examined by Rohan Holt, Nick Owen, Kate Northen and Liz Morris-Webb. The main limitation for this survey was coinciding adequate daylight with the time leading up to low water of spring tides. All shores were therefore surveyed mid to late afternoons on 9-14th October and 24-26th October 2018 to coincide with low water times no later than approximately 1930.

Intertidal survey was supplemented using UAV (drone) images where possible. R. Holt is a professionally qualified Civil Aviation Authority 'licensed' and insured operator.

4.1.2. Subtidal survey

Sites were targeted for diving survey throughout the Holyhead Harbour area to look at a range of floating and static structures including the remaining pontoon floats, boat hulls, mooring buoys and chains, static man-made structures and semi-natural habitats such as stone-built harbour walls, shipping terminals and boulder sea defences. These are listed in Table 11 and mapped in Figures 14a and b. The 'trot' moorings in the mid and eastern areas of the New Harbour were only examined briefly. These moorings comprise stainless steel cables anchored to a chain running across the seabed. The cables are dropped to the seabed when not in use and are almost invariably clean of fouling organisms.

Many of these sites were examined during previous survey events when NRW were actively engaged in attempting to eradicate *D.vexillum* (e.g. Holt and Cordingley 2011), and more recently in 2015 (Holt 2015), and as before were systematically examined to ensure the most likely habitats were viewed for recording presence / absence of *D.vexillum*. Although there was no attempt at recording area or percentage cover, notes were made on approximate relative abundance of *D.vexillum* and the main species present.

The team comprised five divers: Rohan Holt, Kate Northen, Liz Morris-Webb, Nick Owen, Dan Gill, and a dedicated diving supervisor, Martin Sampson, using RIB *Interceptor* skippered and owned by Aubrey Diggie of SBS Charters in Four Mile Bridge near Holyhead. Each of the divers cycled diving and surface support duties so that there were two divers in the water, two divers ready to dive and one person recording findings and positions. All diving activities were logged by the supervisor who also operated a check-in/out system with Holyhead Port Control and Holyhead Coastguard. The divers used through-water wireless communication systems for all dives. Dive logs and work permits from Holyhead Port Control are included in Appendix 1 and 2. Diving took place between 20-24th October 2018 during the neap tide cycle, although poor weather and sea state, and near-zero underwater visibility limited diving to areas away from the more exposed areas of the harbour for part of the week. The dives were purposefully kept short (approx. 5-30 minutes) and shallow (normally around 6-8 m) and the divers breathed nitrox (breathing gas enriched with up to 32% oxygen for these dives) as the nature of this work involved multiple descents and ascents per day which is known to provoke decompression illness.

4.2. Survey results

4.2.1. Intertidal survey results

The results of each shore survey are presented in the tables below accompanied by a map indicating the approximate route taken by the surveyors and a suite of images that illustrate the variety of habitats at each site. Special note is made of the presence of native didemnids and the suitability of the habitat for *D. vexillum* - see also Figure 17) The species name *Didemnum vexillum* is shortened to D vex in the tables.

Table 1. Shore survey results: Site 1, Four Mile Bridge.

Site name / position	Site no.	Date	Times	Main habitats	Survey ors	Native didemnids P/A	D vex P/A	Notes
Four Mile Bridge (either side of the bridge) 53°16'27"N 4°34'50"W	1	14/10/18 & 25/10/18	0940-1100 1300-1330	South side of the stone bridge / causeway where the tide ebbs and flows naturally in the Cymyran Strait / estuary. Stone walls with fucoids – mainly <i>F. vesiculosus</i> and <i>Ascophyllum</i> with sparse barnacles and limpets and patches of <i>Rhodothamniella floridula</i>. Short vertical faces and holes in the wall with a few sponges – <i>Hymeniacidon</i>, <i>Halichondria</i> and <i>Amphilectus</i> but no ascidians. Small boulders and cobbles on the sediment flats embedded in fine silty sand and mud with fucoids and <i>Ascophyllum</i>. Sparse fragments of sponge on fucoids and rocky surfaces. Other sediment habitats with <i>Salicornia</i>, <i>Spartina</i>, <i>Scrobicularia</i> and <i>Arenicola</i>. Several moored boats' hulls examined – little more than barnacles and sparse algae. North side with similar communities plus <i>Aplidium</i> sp. colonial ascidians and greater abundance of sponges. <i>Cereus pedunculatus</i> in fine sand at the base of the wall. Whole area with drift <i>Zostera</i> sp.	RH RH, NO, KN, LM	Absent on any of the bridge hard substrata.	Absent	General images of the causeway from both sides plus fucoid and surface plants on the sediment. Unlikely to have didemnids on the bridge walls but potential for subtidal rock to be colonised. Tides on south side lag Holyhead by an hour or two but LW in the Inland Sea on north side only occurs during neap tides. North side of the bridge surveyed by snorkelling.

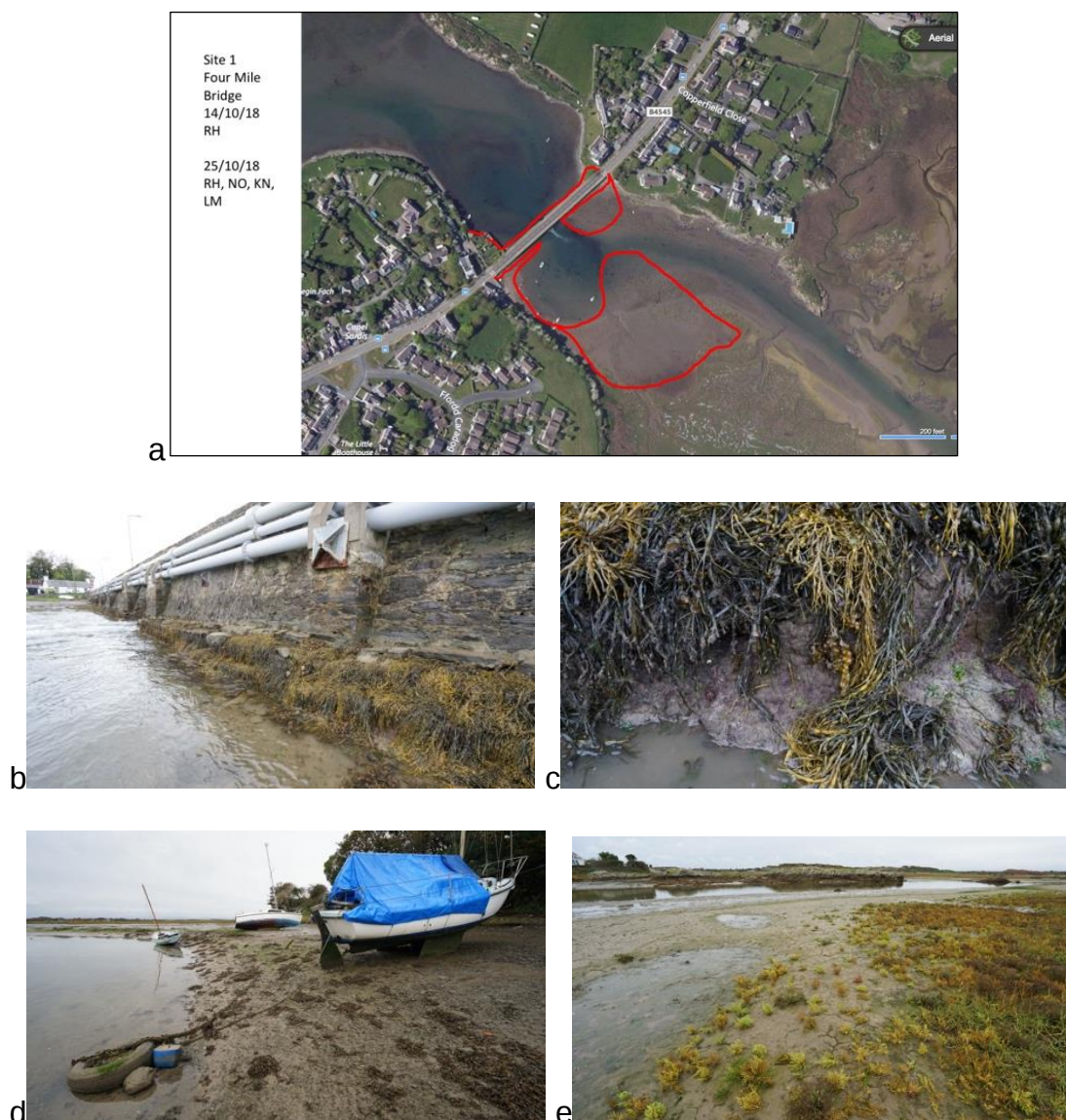


Figure 3. (a) area surveyed (Microsoft Bing); (b) south side of the causeway at low water; (c) *Rhodothamniella floridula* on short vertical faces at the base of the wall; (d) moorings and boat hulls; (e) *Spartina* sp. and *Salicornia europaea* on muddy sand. Photos R. Holt

Table 2. Shore survey results: Site 2, Newlands Park / Beddmanarch Bay.

Site name / position	Site no.	Date	Times	Main habitats	Surveyors	Native didemnids P/A	D vex P/A	Notes
Newlands Park / Beddmanarch Bay. 53°17'44"N 4°34'1"W	Site 2	09/10/18 & 25/10/18	1700-1810 1400-1500	Broad sediment beach with outcrops of boulders and bedrock with silty gravel and sand. Boulder fish trap 'gorad' wall on gravelly sediment with dense <i>Ascophyllum</i> and <i>F. serratus</i> ; overhangs with sponges, <i>Didemnum</i> sp. and abundant <i>Mytilus</i> . Silty, fine muddy sand with fucoid-covered boulders and bedrock towards the A5 road crossing at the Cob.	RH	Present. Frequently found amongst the gorad boulders subject to water flow.	Absent	Didemnids seen on the gorad wall which might support D vex. Other areas of the Cob very sediment-influenced with very little fauna. <i>Zostera noltii</i> on the sediment west side of the Cob.

Table 3. Shore survey results: Site 3, Porth Trwyn Mawr to Porth Penrhyn Mawr.

Site name / position	Site no.	Date	Times	Main habitats	Surveyors	Native didemnids P/A	D vex P/A	Notes
Porth Trwyn Mawr to Porth Penrhyn Mawr 53°19'33"N 4°34'59"W	Site 3	25/10/18	1500-1730	Area A. Extensive barnacle / fucoid rocky shore with deep gullies, rockpools and overhangs some with faunal communities including <i>Dendrodia</i> and didemnids. Few sections of fibreglass wreckage (boat) with <i>Didemnum maculosum</i>. Southern part of this section - extensive cobble shore set in sediment with fucoids. Area B. Low-lying rocky sections with fucoids and <i>Dendrodia</i> on verticals and overhangs. <i>Rhodothamniella floridula</i> on rock adjacent to sandy areas – less sand further north in this section. A few big overhangs with sponge and ascidian communities.	RH & KN NO & LM	Present. Most didemnids were found associated with the most rugged areas of bedrock shore and not on cobbles or sediment-influenced areas	Absent	Large areas of cobbles and low-lying mud and sand-influenced rock unlikely to support didemnids but some large overhangs and large boulders with faunal communities and potential habitat for <i>Didemnum vexillum</i>. Closest rocky shore on this section of coastline to the marina / harbour area.

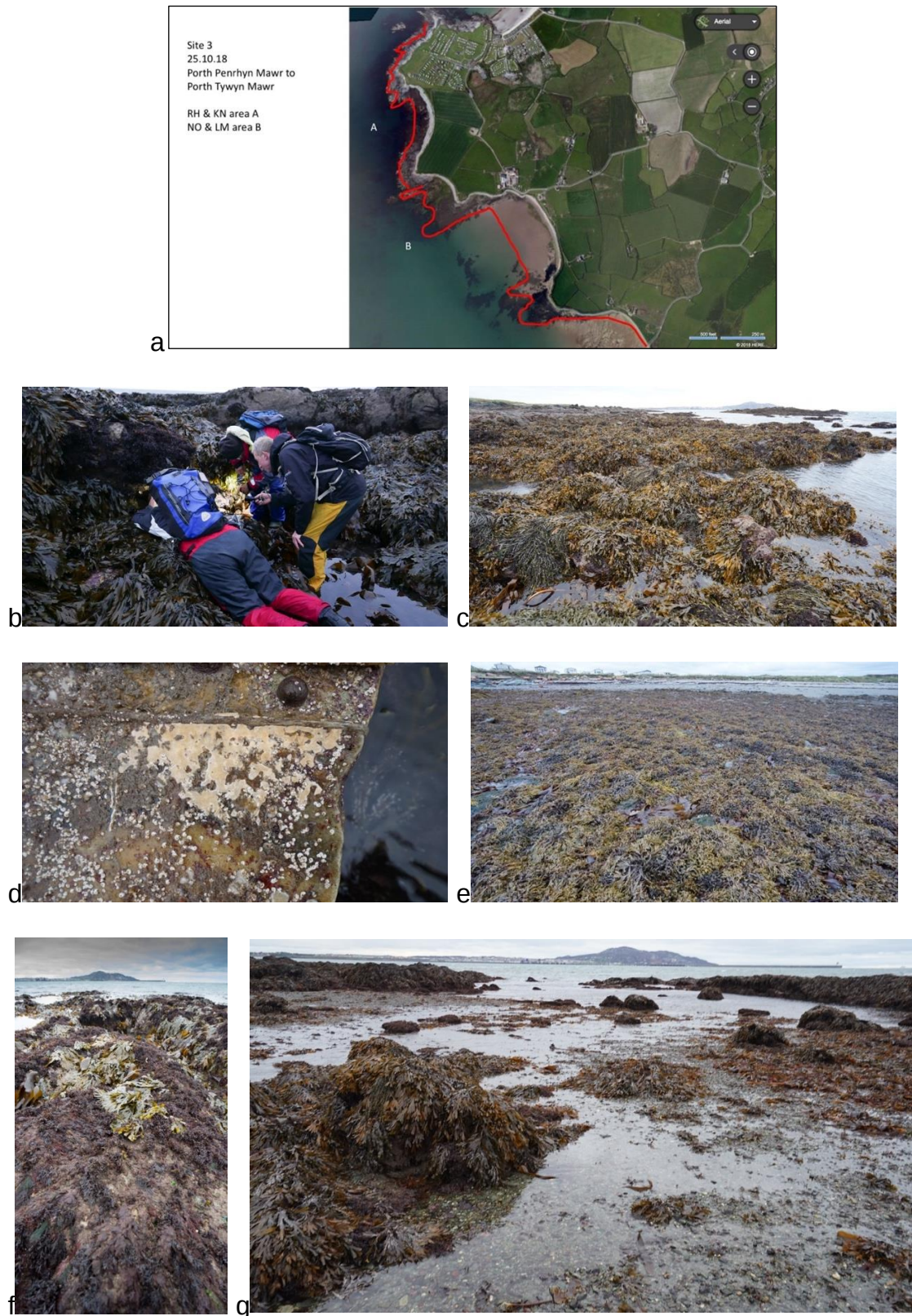


Figure 5. (a) area surveyed (Microsoft Bing Maps); (b) investigating sponge-ascidian overhangs by torchlight; (c) general view of fucoid dominated rocky ridges and pools; (d) fibreglass wreckage with *Didemnum maculosum*; (e) areas of boulders set in sandy sediment; (f) *Rhodothamniella floridula* sandy mats on rock; (g) mixed sediment and bedrock and boulders. Photo b. K. Northen. All other photos R. Holt.

Table 4. Shore survey results: Site 4, Porth Trwyn Mawr north and south.

Site name / position	Site number	Date	Times	Main habitats	Surveyors	Native didemnids P/A	D vex P/A	Notes
Porth Tywyn Mawr (N side) 53°20'22"N 4°34'22"W	4	10/10/18	1600-17.35	Sandy bay with rugged bedrock shore (north side) with boulders leading down to sand. Gullies and 'table' shaped rocks with overhanging and shaded surfaces. Typical moderate exposure barnacle-fucoid zonation to top of <i>Laminaria hyperborea</i> . Shallow pebble and gravel rockpools with rich sponge and didemnid / colonial ascidian under-boulder fauna (including <i>D. maculosum</i> and <i>Haliclona viscosa</i>). Bigger gully overhangs with <i>Clathrina</i> and <i>Dendrodoa</i> communities. Many areas on lower shore with <i>Rhodothamniella</i> sandy mats.	RH	Present. Under boulders in rock pools and under overhangs and large boulders.	Absent	Northern section with many habitats suitable for didemnids This section merges with site 5 to the north..
Porth Tywyn Mawr (S side) 53°20'3"N 4°34'50"W	4	10/10/18	1750-1850	Extensive bedrock and boulder shore to the south side of a sandy beach (continuous with site 3) plus two isolated bedrock outcrops on the lower shore. Area backed by large static caravan site. Mix of low-lying boulders and bedrock with <i>F. serratus</i> and <i>L. digitata</i> and areas of <i>Rhodothamniella</i> sandy mats. Shallow pools with algae including <i>Saccorhiza polyschides</i> and <i>Sargassum</i> . Rugged bedrock shore on the headland with deep, steep sided gullies with sponges, <i>Dendrodoa</i> , and didemnids and mix of typical fucoids, limpets and barnacles.	RH	Present. Limited habitat but more suitable further south (see site 3)	Absent	Some habitats suitable for didemnids, although sand-scoured areas adjacent to the beach area.

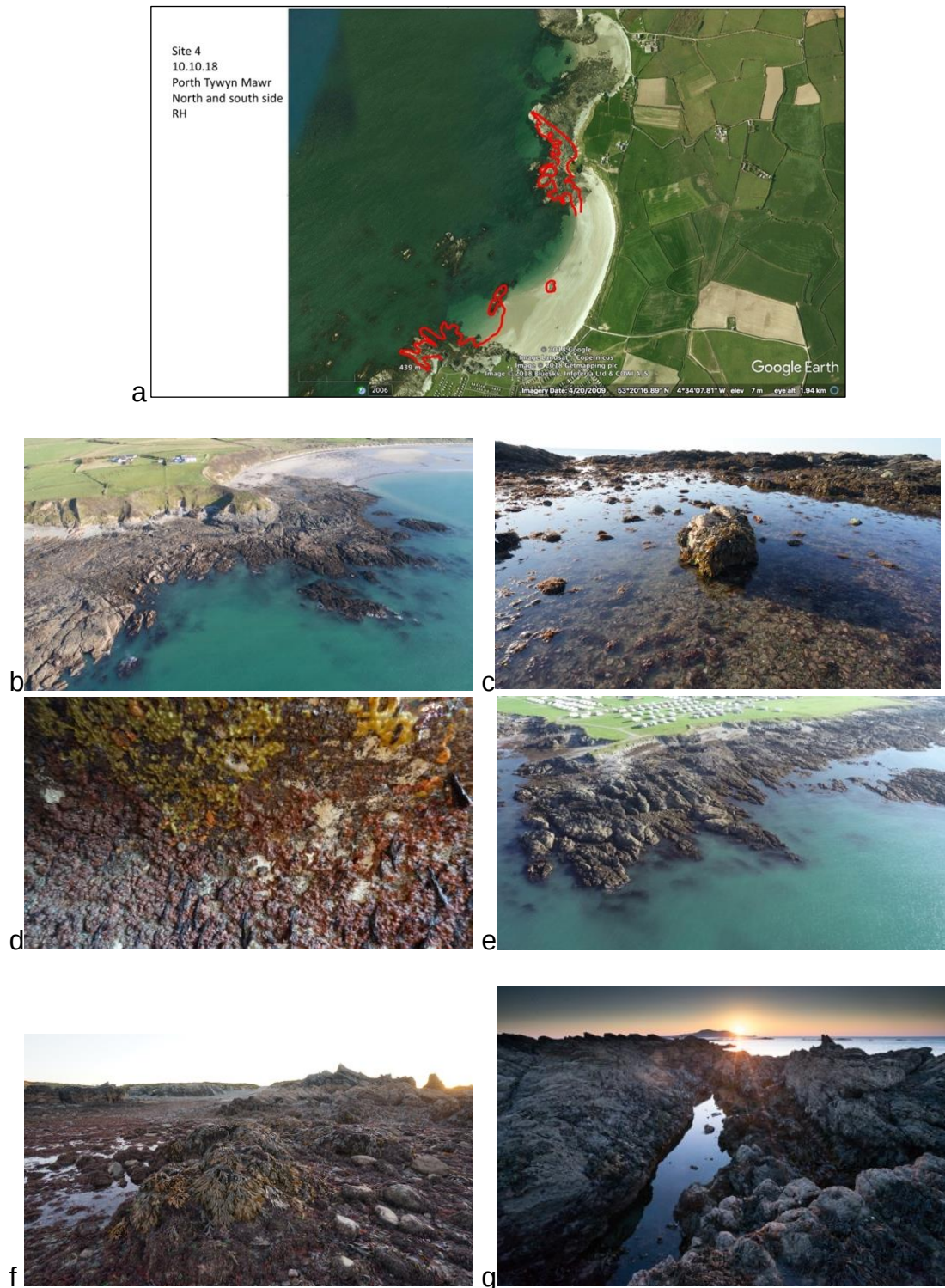


Figure 6. (a) areas surveyed (Map Data © 2018 Google); (b) aerial image of N section – many bedrock and boulder ridges and gullies; (c) shallow rockpool – boulders with diverse sponges and ascidians; (d) overhang/surge gulley with *Clathrina*, *Dendrodoa*, *Halichondria* and *Amphilectus*; (e) aerial image of S section – bedrock and boulder ridges; (f) *Rhodothamniella floridula* sandy mats, fucoids and red algae at the slipway below the caravan park; (g) large rockpools and steep sided gullies. Photos R. Holt.

Table 5. Shore survey results: Site 5, Porth Trefadog.

Site name / position	Site number	Date	Times	Main habitats	Surveyor	Native didemnids P/A	D vex P/A	Notes
Porth Trefadog 53°20'37"N 4°34'7"W	Site 5	09/10/18	1515-1640	Sandy beach with rugged rocky headlands each side. Bedrock open surfaces with fucoids and barnacles. Overhangs and gullies with sponges, anemones, <i>Dendrodoa</i> , <i>Didemnum maculosum</i> , <i>Homarus</i> . Diverse habitats with rich invertebrate crusts on under-boulder surfaces. Lots of rockpools on all levels on the shore (especially south side) with kelps, red algae and rich mix of sponges, colonial ascidians and anemones. Sandier pools with <i>Halidrys</i> .	RH	Present. Found on rocky habitats both sides of the beach although more on the south side away from the sand-influenced areas	Absent	Some habitats suitable for didemnids although sand-scoured areas unlikely to be colonised by D vex.



Figure 7. (a) areas surveyed (Map Data © 2018 Google); (b) sand filled pools with fucoids on rocky ridges; (c) shallow rockpool – coralline algae on vertical faces; (d) overhangs with *Halichondria* and *Amphilectus*; (e) *Homarus gammarus* lobster from overhang in rock pool. Photos R. Holt

Table 6. Shore survey results: Site 6, Porth Trwyn.

Site name / position	Site number	Date	Times	Main habitats	Surveyor	Native didemnids P/A	D vex P/A	Notes
Porth Trwyn 53°21'34"N 4°33'43"W	6	11/10/18	1735-1830	Rocky areas to the south and north of a sandy beach. South side cobbles and sand-smoothed low-lying bedrock with shallow gullies and boulders. Patchy fucoids, limpets and barnacles with dense <i>Rhodothamniella</i> mats on the lower fringes adjacent to sand. Shallow, broad, cobble and pebble rockpools with coralline crusts and red algae. Further south small raised bedrock headland with long gullies and rockpools with typical fucoids and barnacles and <i>Halidrys</i> in the pools. Very few sponges and colonial ascidians on the overhangs North side of the beach with low-lying bedrock and scattered boulders with dense <i>Rhodothamniella</i> mats and scour-tolerant species near the lower shore where the rock meets sand. Isolated rocky area just 'offshore' with dense <i>Laminaria digitata</i>. Pools higher on the shore with mixed red algae and small <i>Halidrys</i>. Very few sponges and ascidians on under-boulder faces.	RH	Present. Small number of colonies amongst the rocky habitats on the headland on the south side of the beach	Absent	General images of shore and habitats/spp Too sand-influenced for much didemnid colonisation near to the beach but some suitable habitats at the southern area of rocky shore.



Figure 8. (a) areas surveyed (Map Data © 2018 Google); (b) sand-rock interface with fucoids and *Rhodothamniella floridula* on rocky ridges; (c) elevated rocky ridges with fucoids, limpets and barnacles; (d) level cobble and bedrock shore with shallow coralline pools; (e) sandy rock habitats with fucoids and *Rhodothamniella floridula* on smoothed rocky ridges; (f) sandy rockpools and cobbles with fucoids and *Rhodothamniella floridula*. Photos R. Holt

Table 7. Shore survey results: Site 7, Porth Grugmor.

Site name / position	Site number	Date	Times	Main habitats	Surveyor	Native didemnids P/A	D vex P/A	Notes
Porth Grugmor 53°22'2"N 4°33'34"W	7	11/10/18	1840-1920	Small sandy cove with rocky headland on both sides. Low-lying intertidal rock on both the south and north sides with sand-influenced communities including dense <i>Rhodothamniella</i> and patchy fucoids and barnacles. Rock merges with sand on the lower shore. Some small rockpools on the mid and lower shore with <i>Halidrys</i> and small patches of sponges. Cave on south side with large pool at its entrance with <i>Halidrys</i> . Caves on the north side of the bay with scour communities only.	RH	Absent. Didemnids not found although likely to be present on the rocky areas further south and north away from the sand beach.	Absent	Too sand-influenced for didemnids. Fragments of polystyrene in the backs of the caves.

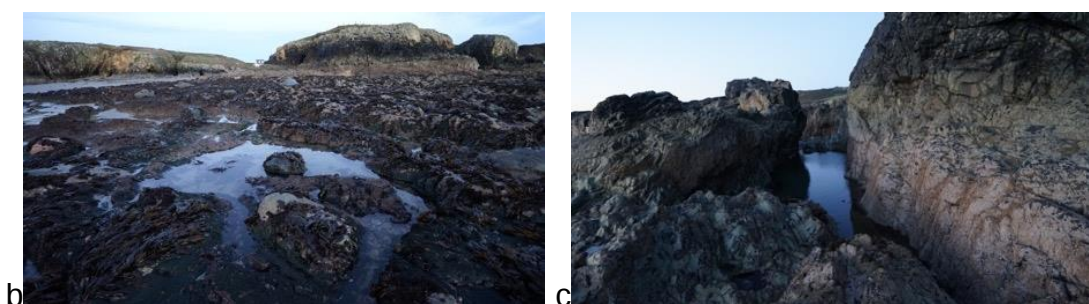


Figure 9. (a) areas surveyed (Map Data © 2018 Google); (b) sandy rock and pools with fucoids and *Rhodothamniella floridula*; (c) rocky ridges and deep rockpools with fucoids, limpets and barnacles. Photos R. Holt

Table 8. Shore survey results: Site 8, Porth Swtan / Church Bay.

Site name / position	Site number	Date	Times	Main habitats	Surveyors	Native didemnids P/A	D vex P/A	Notes
Church Bay / Porth Swtan 53°22'26"N 4°33'21"W	8	26/10/18	1600-1800	Rocky areas to the north and south of a sand beach. North area slightly less wave-exposed with rugged bedrock with overhangs and very large boulders. Fucoids, barnacles and sand influenced <i>Rhodothamniella</i> covered rock. South side of the beach with mobile, rounded boulders and cobbles and bedrock ridges. Furoid and barnacle dominated. Small stream runs across the beach. No didemnids and few faunal-rich habitats found.	NO & LM	Absent.	Absent	Too sand-influenced for didemnids. Fibreglass debris (probably boat) scattered amongst the boulders.

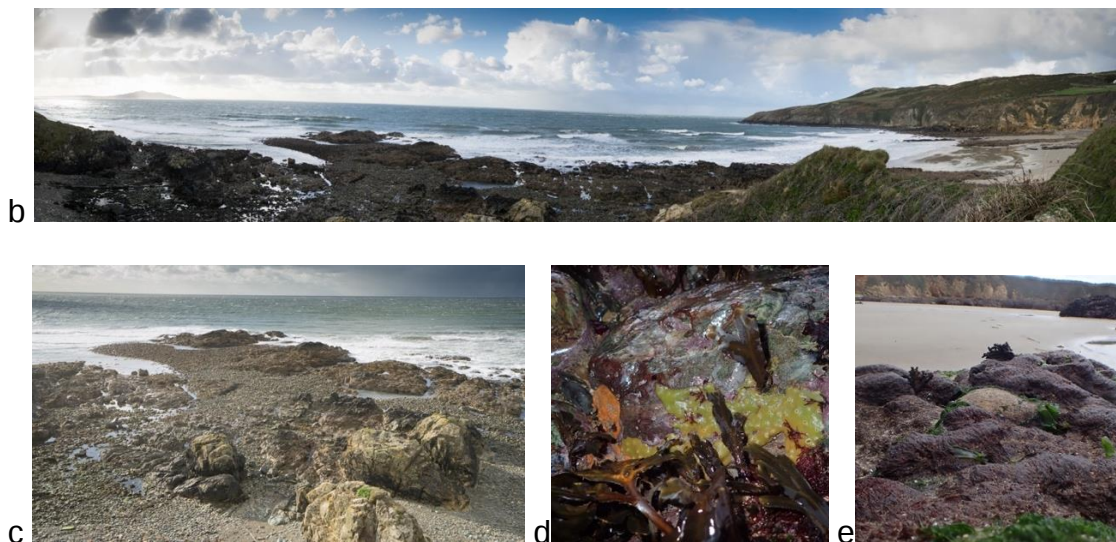
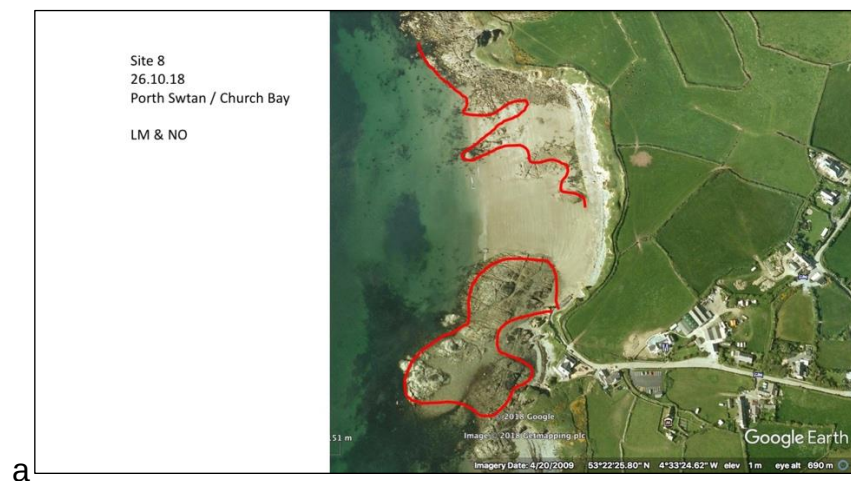


Figure 10. (a) areas surveyed (Google Earth); (b) general view of the bay; (c) mobile cobbles and boulders on the south side of the bay; (d) *Halichondria panicea* and *Amphilectus fucorum* sponges in bedrock gullies; (e) *Rhodothamniella floridula* on sand-influenced bedrock ridges. Photo b & c R. Holt; photos d & e Liz Morris-Webb

Table 9. Shore survey results: Site 9, Porth y Bribys, Porth y Nant and Porth y Hwch.

Site name / position	Site number	Date	Times	Main habitats	Surveyors	Native didemnids P/A	D vex P/A	Notes
Porth y Bribys / Porth y Nant / Porth y Hwch 53°23'22"N 4°33'56"W	9	26/10/18	1615-1800	Wave-exposed platform with diverse sculptured rock formations supporting a range of intertidal communities including limpet-barnacles on smooth bedrock ridges, <i>Mastocarpus</i> and <i>Himanthalia</i> on the lower mid-shore and <i>Laminaria digitata</i> in the sublittoral fringe. Various gullies with steep sides running longitudinally on the shore often appearing scoured with rounded boulders on their floors. Sponges and <i>Dendrodoa</i> amongst the algae and under small overhangs. Caves on the upper shore with algal films.	RH & KN	Absent.	Absent	Most of the shore is probably too wave exposed and boulder scoured for development of didemnid communities, although they might occur under deep overhangs and in crevices. Caves at the top of most shores with polystyrene and various other debris.

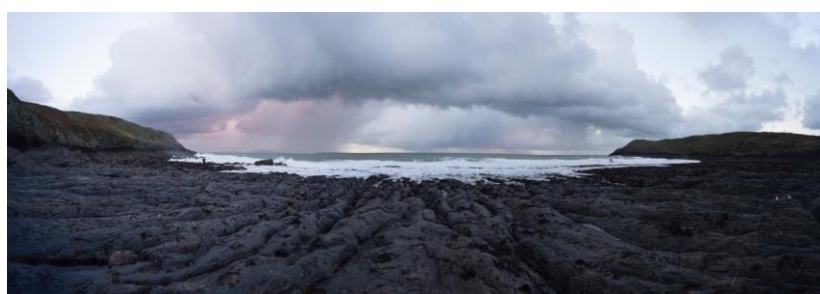


Figure 11. (a) areas surveyed (Microsoft Bing Maps); (b) general view of the rocky shore ridges; (c) rear of cave with polystyrene debris (d) smooth bedrock ridges with *Himanthalia elongate*, coralline and green algae; (e) wave-exposed bedrock ridges with *Mastocarpus stellatus* and fucoids. Photos R. Holt.

Table 10. Shore survey results: Site 10, Scimitar beach and Porth y Felin.

Site name / position	Site number	Date	Times	Main habitats	Surveyors	Native didemnids P/A	D vex P/A	Notes
Scimitar beach and Porth y Felin, Holyhead Harbour. 53°19'8"N 4°38'53"W to 53°19'7"N 4°38'35"W and plastic pipe at 53°19'15"N 4°38'49"W	10	24/10/18	1435	Rocky and muddy gravelly sediment beaches with bedrock and boulder headlands and outcrops. Marina-related structures – jetties and slipways on the upper shores. Very wave-sheltered with freshwater input from a small river at the top of the Porth y Felin shore. Considerable amounts of marina debris in the form of pontoon float fibreglass shell and whole pontoons (labelled 1, 2 and 3 on Figure 12b) on the mid and upper shores although most of the polystyrene debris has been removed to hard standing nearby (Figure 12j). Rocky areas with fucoids in zones typical of a rocky shore. Very little fauna apart from a few <i>Halichondria</i>, <i>Hymeniacidon</i> and <i>Amphilectus</i> sponges but no native didemnids. Debris examined for evidence of the flora and fauna that was attached when the pontoons were in the water. Virtually all the subtidal species had degraded or died. Evidence of old kelp holdfasts, empty <i>Balanus crenatus</i> tests and dried red algae. No recognisable remains of D vex. Pontoon 3 (Figure 12b), positioned on the lower mid shore near the Porth y Felin jetty, had remains of <i>Bugula nertina</i> on the lower portions of the sides Fragments of fibreglass pontoon 'shell' has been sparsely recolonized by intertidal species including a few <i>Austrominius modestus</i> and small limpets. Large diameter (2 m) plastic pipe moored against the west breakwater wall (labelled 4 on Figure 12b) was examined for marine growth. Outside colonised by little other than green algae and barnacles. Inside surfaces with barnacles, a few <i>Ascidella aspersa</i> and bryozoans.	RH KN	Absent.	Absent	See aerial images taken shortly after the storm and the latest image taken 22/10/18 below. Shore area appears unsuitable for growth of didemnids. No D vex located on and adjacent to structures that have supported this species previously.



a



b



c



d



e



Figure 12. (a) Aerial image taken 11/3/18 of Scimitar beach showing dense accumulation of marina debris and retaining boom; (b) aerial image of areas surveyed taken 24/10/18 and approximate track followed by divers (red hatched lines A and B) and shore walk (solid red line). Yellow hatched line represents area of Scimitar beach illustrated in image a; (c) breakwater pontoons aground in Porth y Felin (point 2 on Figure b); (d) breakwater pontoon aground in Scimitar beach (point 1 on Figure b); (e) close view of pontoon sides showing remains of *Laminaria* holdfasts and dead barnacle tests; (f) fragment of fibreglass pontoon 'shell' with remains of barnacles and algae; (g) large plastic pipe moored against the breakwater wall (see point 4 on Figure 12b) with green algae on outside surfaces; (h) internal view down the plastic pipe showing barnacle cover; (i) fragments of fibreglass pontoon shell in Scimitar beach; (j) salvaged remains of the marina ashore on the hard standing in Porth y Felin. Photos R. Holt.

4.2.2. Subtidal survey results

Aerial views of the marina area were taken on 22/10/18 by UAV. The image in Figure 13 (and front cover) shows the layout of the remaining pontoons during the survey. The remains of the E-W floating breakwater are still attached to their concrete mooring blocks by chains but have become detached from each other. The pontoon at the foot of the bridge is in its original position but the next three adjoining sections of the N-S breakwater have been re-installed during the summer and had relatively little marine growth on them.



Figure 13. Aerial view of the remaining pontoons taken at the time of survey (22/10/18).
Photo R. Holt

The following table (Table 11) presents a summary of the sites examined in sequence by diving. Rows highlighted in pale red are sites where *D.vexillum* was found in October 2018, those in yellow indicate that *D.vexillum* has been recorded at or close to the site during previous surveys (see also Figure 19). The survey site positions are plotted on a Google Earth map (Figure 14a and 14b; red numbers = sites with *D.vexillum*). Some of the features on this map predate (28/6/18) the survey with regard to positions of the remaining pontoons, vessels and buoys.



Figure 14a. Dive survey sites in the New Harbour (Google Earth). Dive sites are numbered as examined in chronological order (numbers highlighted in red = presence of *D. vexillum*; yellow numbers = absence of *D. vexillum*)



Figure 14b. Dive survey sites in the Old Harbour and commercial jetties (Google Earth) Dive sites are numbered as examined in chronological order (numbers highlighted in red numbers = presence of *D. vexillum* at the site: yellow numbers = absence of *D. vexillum* at site).

Table 11. Dive sites in chronological order. Locations with *D. vexillum* are shaded red. Previous known locations of *D. vexillum* are noted (yellow shading) and also presented in Figure 19.

20/10/18 Saturday								
Site #	Time of dive	Lat	Long	Location	Substratum	Divers	D vex Presence /Absence - comments	Notes
1	1026	53°19.318'N	04°38.632'W	Marina. E-W floating Breakwater. W end	Pontoon sides, undersides and chains. Sections of damaged pontoon releasing polystyrene.	RH KN	P. Large sheet colonies and overgrowing ascidians	Found here on previous surveys. Lots of new <i>Undaria</i> growth.
2	1039	53°19.297'N	04°38.573'W	Marina. E-W floating breakwater. E end	Pontoon sides, undersides and chain	RH KN	P. Large sheet colonies and overgrowing ascidians	Found here on previous surveys. Lots of new <i>Undaria</i> growth
3	1112	53°19.186'N	04°38.574'W	Remains of fuelling pontoon (S marina)	Pontoon sides, undersides and chains	LM NO	A. Native didemnids and other NNS present	Found here on previous surveys
4	1145	53°19.173'N	04°38 551'W	Marina pontoons at foot of bridge (S marina)	Pontoon sides, undersides and chains	LM NO	P. Colonies only found on the older pontoon. 3 newly replaced pontoons without D vex.	Found here on previous surveys.

20/10/18 Saturday								
Site #	Time of dive	Lat	Long	Location	Substratum	Divers	D vex Presence /Absence - comments	Notes
5	1310	53°19'138"N	04°38'787"W	Scimitar beach – Remains of jetty and west part of bay.	Jetty supports, stone gabions, natural rock seabed adjacent to muddy sand and gravel.	RH KN	A. <i>Ascidella aspersa</i> and sparse sponges, <i>Laminaria</i> spp. and intertidal fucoids	Large amounts of marina debris and wrecked boats were concentrated in this area within a boom.
6	1350	53°19'23.07"N	04°38'33.90"W	Vessel – <i>Fairisle</i> NW of the main marina area on its own mooring	Steel hulled vessel. Unused and immobile.	LM NO	P. Large patches of D vex over a large proportion of the hull	Found here on previous surveys. This vessel broke free of its mooring onto the harbour wall during storm <i>Emma</i> .
7	1420	53°19'27.81"N	04°38'39.06"W	Breakwater wall near to <i>Fairisle</i>	Stone built wall to 4 m then natural loose rock to 8 m	LM NO	A. Native species including unitary ascidians and sponges.	Not located on the breakwater wall during previous surveys.
8	1500	53°19.448'N	04°38.266'W	Vessel – <i>Gulfstreamer</i> N of the marina area on its own mooring	GRP hulled vessel in poor condition	RH KN	P. Large patches of D vex over a large proportion of the hull.	Found here on previous surveys. This vessel is not in use but survived storm <i>Emma</i> on its mooring.
9	1520	53°19.518'N	04°38.091'W	Breakwater wall near to <i>Gulfstreamer</i>	Stone built wall to 4 m then natural loose rock to 8 m	RH KN	A. Abundant native flora and fauna including overhanging surfaces with sponges, ascidians and bryozoans etc.	Not located on the breakwater wall during previous surveys.
10	1553	53°19.214'N	04°37.702'W	End 'dolphin' pilings section of Terminal 4	Steel pilings and submerged railings	NO LM	A. No D vex but lots of <i>Bugula neritina</i> and clumping <i>Asterocarpa</i> amongst other tunicates and algae.	Not found here on previous surveys.
11	1625	53°19.158'N	04°37.631'W	Floating refuelling buoy at Terminal 4	Large painted steel buoy and chain mooring	RH KN	A. Dense aggregations of <i>Asterocarpa</i> and <i>Styela</i> , colonial ascidians and <i>Sabella</i> . No D vex.	Not surveyed before. Very similar communities found on breakwater pontoons where D vex is found.

21/10/18 Sunday								
Site #	Time of dive	Lat	Long	Location	Substratum	Divers	D vex P/A - comments	Notes
12	0946	53°19.442'N	04°37.100'W	Orthios Jetty. N end three sections (7 x pilings)	Steel jetty legs	RH KN	A. No D vex but lots of <i>Didemnum maculosum</i> and <i>Lissoclinum perforatum</i> . Species rich with <i>Laminaria hyperborea</i> in the shallows to sponge / ascidian / bryozoan / <i>Antedon</i> community deeper.	Not found here on previous surveys.
13	1043	53°19 512'N	04°37 117'W	Orthios Jetty. N end of main section (3 pilings)	Steel jetty legs	RH NO	A. No D vex but lots of <i>Didemnum maculosum</i> and <i>Lissoclinum perforatum</i> . Species rich with <i>Laminaria hyperborea</i> in the shallows to sponge / ascidian / bryozoan / <i>Antedon</i> community deeper. Large <i>Cliona celata</i> .	Not found here on previous surveys. Dive terminated with arrival of ferry.
14	1250	53°19'7.66"N	04°38'45.69"W	Scimitar beach - old jetty and east into Porth y Felin towards slipway	Gabions, old wooden structures and natural rocky and sediment habitats. Fragments of pontoon fibreglass coating.	NO KN	A. No D vex. Sparse native <i>Laminaria</i> / fucoid communities and occasional <i>Ascidella aspersa</i> . All very silty and low species richness.	Marina and boat debris concentrated in this area after the storm. (shore area also surveyed separately).
15	1311	53°19 162'N	04°38 686'W	Porth Y Felin Moorings - close to Scimitar beach	Bouy and chain	NO KN	P. D vex found on one mooring chain but not on vessel hulls in this area.	Found in this area on previous surveys

22/10/18 Monday								
Site #	Time of dive	Lat	Long	Location	Substratum	Divers	D vex P/A - comments	Notes
16	0945	53°19 201'N	04°37 129'W	Terminal 3/5 NW corner piling	Steel piling and railings	RH KN	A. Hydroid, bryozoan, <i>Antedon</i> , sponge turf with <i>Didemnum maculosum</i> and <i>Lissoclinum perforatum</i> .	Very poor underwater visibility and moderate swell making diving conditions very difficult. Not found on previous surveys of this area.
17	1010	53°18 837'N	04°37 431'W	Terminal 2 (old harbour) floating pontoon	Steel floating pontoon (ferry ramp support)	NO DG	A. Solitary ascidians including <i>Ascidella aspersa</i> , <i>Ciona intestinalis</i> and <i>Asterocarpa</i> on sides and undersides of the pontoon.	Poor underwater visibility. Not found at this location on previous survey.

22/10/18 Monday								
Site #	Time of dive	Lat	Long	Location	Substratum	Divers	D vex P/A - comments	Notes
18	1100	53°18'623"N	04°37'702"W	Terminal 1. 'ex - HSS terminal'. Floating pontoon and harbour wall	Steel floating pontoon and stone harbour wall.	RH KN	A. Solitary ascidians, native didemnids, <i>Antedon</i> and small <i>Aequipecten</i> on the sides and undersides of the pontoon. Similar fauna on the harbour wall with mobile crustaceans (<i>Necora</i> , prawns) in many cracks and crevices.	Not found at this location on previous surveys.
19	1120	53°18'36.88"N	04°37'43.28"W	Terminal 1 jetty legs	Steel pilings	RH KN	A. Jetty legs with solitary and colonial ascidians, <i>Antedon</i> and sponges.	Not found at this location on previous surveys.
20a 20b	1130-1200	53°18'50.34"N and 53°18'44.06"N	04°37'40.03"W and 04°37'20.11"W	Old harbour area including Pelham Patch and Fish Dock	Surface search by RIB around the old harbour for discarded ropes and buoys, floating debris and 'cache' pots.	ALL	Assumed absent. Many of these areas completely dry at low water. All pontoons have been removed from the Fish Dock. Few discarded ropes with solitary ascidians but little else.	Underwater visibility too poor for diving. Not found in any of these areas on previous surveys.
21	1400	53°19.279"N	04°38.738"W	Mooring NW of marina	Buoy and chain	NO DG	A. Kelp, red algae, <i>Undaria</i> , <i>Ascidella</i> , sponges and ascidians	D vex found on some of the moorings and hulls in this area during previous surveys
22	1415	53°19.254"N	04°38.733"W	Moorings NW of marina	Buoy and chain	NO DG	P. D vex overgrowing <i>Ascidella aspersa</i> .	D vex found on some of the moorings and hulls in this area during previous surveys
23	1420	53°19.235"N	04°38.734"W	Moorings NW of marina	Buoy and chain	NO DG	A. Kelp, red algae, <i>Undaria</i> , <i>Ascidella</i> , sponges and ascidians	D vex found on some of the moorings and hulls in this area during previous surveys
24	1428	53°19.235"N	04°38.751"W	Moorings NW of marina	Buoy and chain	NO DG	A. New bouy and chain – very little growth.	D vex found on some of the moorings and hulls in this area during previous surveys

22/10/18 Monday								
Site #	Time of dive	Lat	Long	Location	Substratum	Divers	D vex P/A - comments	Notes
25	1432	53°19.215'N	04°38.749'W	Moorings W of marina with yacht <i>Owain Glyn Dwr</i>	Buoy and chain and boat hull	NO DG	P. Boat hull and mooring heavily fouled.	D vex found on some of the moorings and hulls in this area during previous surveys but not on this particular boat
26	1451	53°19.186'N	04°38.726'W	Mooring W of marina	Buoy and stainless steel chain	NO DG	A. Chain with little fouling, some ascidians and algae on rope and buoy	D vex found on some of the moorings and hulls in this area during previous surveys
27a	1515	Start 53°19.268'N	04°38.611'W	3 small marker buoys at centre of old marina to remains of the NS floating breakwater (dive approx. NW to SE diagonal across marina wreckage)	Various steel pontoon frames, concrete mooring blocks and yacht masts and sails partly embedded in soft mud.	RH KN	A. Steel frames newly colonised with <i>Ascidella aspersa</i> (these would have originally been above the water line). Old chains and ropes semi-buried in mud with decaying remains of ascidians and algae.	Pontoon floats that supported D vex have been broken away from the steel frames. Most of the structures seen will not have supported any marine flora and fauna before being sunk.
27b		Finish 53°19.226'N	04°38.545'W					

23/10/18 Tuesday								
Site #	Time of dive	Lat	Long	Location	Substratum	Divers	D vex P/A - comments	Notes
28	0940	53°18.996'N	04°37.750'W	South-east side of New Harbour (Bol Sach). Fishing boat <i>Wildcat</i> mooring	Buoy and chain	RH KN	A. Light growth on the chains and buoy – completely clean deeper than 2 m.	Not surveyed previously
29	0945	Adjacent to above		SE New Harbour, Bol Sach.	Buoy and chain	RH KN	A. Heavily fouled chain with <i>Mytilus</i> and ascidians – chain much corroded and thin	Not surveyed previously
30	0950	53°18.987'N	04°37.730'W	SE New Harbour, Bol Sach.	Buoy and chain	RH KN	A. Heavily fouled chain with <i>Mytilus</i> and ascidians. Seabed at 6.5m bsl muddy sand	Not surveyed previously
31	0955	53°18.967'N	04°37.719'W	SE New Harbour, Bol Sach. Mooring and small fishing vessel <i>Panarctic</i>	Buoy and chain	RH KN	A. Sparse fouling.	Not surveyed previously
32	1000	53°18.960'N	04°37.710'W	SE New Harbour, Bol Sach.	Buoy and chain	RH KN	A. Sparse fouling.	Not surveyed previously
33	1005	53°18.950'N	04°37.702'W	SE New Harbour, Bol Sach.	Buoy and chain	RH KN	A. Sparse fouling.	Not surveyed previously
34	1033	53°19.217'N	04°37.641'W	Largs mooring buoy, just	Large rectangular yellow	NO DG	A. Heavily fouled mooring buoy and chain	Not found at this location

23/10/18 Tuesday								
Site #	Time of dive	Lat	Long	Location	Substratum	Divers	D vex P/A - comments	Notes
				east of Terminal 4.	mooring buoy and heavy chain		with kelps, solitary ascidians (including <i>Syela</i> and <i>Asterocarpa</i>), didemnids, <i>Antedon</i> and <i>Sabella</i>	on previous surveys.
35	1255	53°19.359'N	04°38.317'W	Moorings and buoys NE of the marina	Buoy and chain	RH KN	A. Sparse fouling	D vex found on some of the moorings and hulls in this area during previous surveys
36	1257	53°19.353'N	04°38.362'W	Moorings and buoys NE of the marina	Buoy and chain	RH KN	P. D vex on underside of buoy and on <i>Asciidiella</i> on chain.	D vex found on some of the moorings and hulls in this area during previous surveys
37	1300	53°19.315'N	04°38.349'W	Race marker buoy NE of the marina	Vertical floating pole marker and chain	RH KN	A. Dense <i>Asciidiella aspersa</i> and <i>Dasysiphonia japonica</i> .	D vex found on some of the moorings and hulls in this area during previous surveys – although not specifically at this location
38	1310	53°19.291'N	04°38.184'W	Smit mooring buoy E of the marina	Buoy and chain	RH KN	A. No fouling - clean	Not surveyed previously
39	1319	53°19.172'N	04°37.978'W	Boatyard mooring buoy E of the marina	Buoy and chain	RH KN	A. Heavily fouled with algae, ascidians etc.	Not surveyed previously
40	1344	53°19.356'N	04°38.593'W	Yellow mooring buoy N of NW corner of marina	Buoy and chain	NO DG	P. Large D vex colonies (see Figure 15c)	D vex found on some of the moorings and hulls in this area during previous surveys
41	1350	53°19.351'N	04°38.582'W	Pink mooring buoy north of E-W floating breakwater	Buoy and chain	NO DG	A. Moderate fouling only	D vex found on some of the moorings and hulls in this area during previous surveys
42	1358	53°19.330'N	04°38.530'W	Pink mooring buoy for yacht Chinook north of E-W floating breakwater	Buoy and chain	NO DG	A. Moderate fouling including <i>Mytilus</i>	D vex found on some of the moorings and hulls in this area during previous surveys
43	1406	53°19.327'N	04°38.526'W	Red mooring buoy north of the E-W floating breakwater	Buoy and chain	NO DG	A. Moderate fouling including <i>Mytilus</i>	D vex found on some of the moorings and hulls in this area during previous surveys
44	1412	53°19.321'N	04°38.498'W	Yellow solid foam	Buoy and chain	NO DG	A. Moderate fouling only	D vex found on some of

23/10/18 Tuesday								
Site #	Time of dive	Lat	Long	Location	Substratum	Divers	D vex P/A - comments	Notes
				mooring buoy for yacht <i>Red Barrel</i> north of the E-W floating breakwater			including <i>Undaria</i> on many of these buoys.	the moorings and hulls in this area during previous surveys
45	1420	53°19.326'N	04°38.499'W	Cylindrical orange buoy possibly where the German WWII yacht <i>Black Knight</i> was based	Buoy and chain	NO DG	P. Well established D vex colonies on <i>Asciidiella</i> and <i>Ciona</i> .	D vex found on this moorings during previous surveys
46	1424	53°19.322'N	04°38.477'W	Large pink mooring buoy off the E end of the E-W breakwater.	Buoy and chain	NO DG	P. D vex with solitary ascidians and <i>Undaria</i>	D vex found on some of the moorings and hulls in this area during previous surveys
47	1432	53°19.309'N	04°38.424'W	Large pink mooring buoy E of the E-W breakwater with a letter 'T'	Buoy and chain	NO DG	A. Moderate fouling including <i>Undaria</i> but no D vex	D vex found on some of the moorings and hulls in this area during previous surveys
48	1445	53°19'17.04"N	04°38'48.03"W	Ex-outfall plastic pipe moored against the main west breakwater wall	Thick (~10 cm) walled wide diameter (~2 m) pipe that just floats at high water.	RH KN	A. Barnacles, green algae and <i>Asciidiella aspersa</i>	See also intertidal site descriptions

24/10/18 Wednesday								
Site #	Time of dive	Lat	Long	Location	Substratum	Divers	D vex P/A - comments	Notes
49	1000	53°19.152'N	04°37.631'W	Yellow floating refuelling buoy at Terminal 4	Steel buoy and chain	RH KN	A. Further search on floating pipe	Second visit for photography and further search
50	1042	53°19.318'N	04°38.632'W	West end of E-W breakwater	Pontoon surfaces and chains plus abandoned lobster pot	NO LM	P. Abundant colonies of D vex. Large amounts of <i>Undaria</i> on all the E-W breakwater sides	Second visit for photography and further search
51	1344	53°19.148'N	04°38.525'W	Mooring buoy and abandoned lobster pot buoy adjacent to rip rap east of marina car park	Buoy, chains and ropes	NO LM	A. Moderate fouling including <i>Undaria</i>	Not surveyed previously
52	1350	53°19.136'N	04°38.523'W	Lobster pot and ropes east of marina car park	Buoy and ropes	LM NO	A. Moderate fouling including <i>Undaria</i>	Not surveyed previously
53	1352	53°19.127'N	04°38.505'W	Orange buoy for Humber RIB east of marina car park	Buoy and ropes	LM NO	A. Moderate fouling including <i>Undaria</i>	Not surveyed previously
54	1355	53°19.145'N	04°38.496'W	Pink mooring buoy for blue	Buoy and chains	LM NO	A. Moderate fouling including	Not surveyed previously

24/10/18 Wednesday								
Site #	Time of dive	Lat	Long	Location	Substratum	Divers	D vex P/A - comments	Notes
				hulled boat east of marina car park			<i>Bugula neritina</i> and <i>Undaria</i>	
55	1400	53°19.160'N	04°38.496'W	White buoy and blue hulled boat east of marina car park	Buoy and chains	LM NO	A. Moderate fouling including <i>Bugula neritina</i> and <i>Undaria</i>	Not surveyed previously
56	1412	53°19.157'N	04°38.484'W	White mooring buoy and grey hulled RIB east of marina car park	Buoy and chains	LM NO	A. Heavily fouled mooring with <i>Styela clava</i> , <i>Bugula neritina</i> and <i>Undaria</i>	Not surveyed previously
57	1420	53°19.186'N	04°38.513'W	Yellow mooring buoy east of marina car park	Buoy and chain	LM NO	A. Moderate fouling including abundant small scallops	Not surveyed previously
58a 58b	1325 - 1408	From 53°19'9.11"N to 53°19'6.56"N	From 04°38'34.64"W to 04°38'31.33"W	Rip-rap at the bridge head from west side clockwise to the Yacht club slipway	Mix of natural stone rip-rap, bedrock outcrops and mixed muddy gravel and sand	RH KN	A. Lots of overhangs, crevices and vertical rocky faces with upper infralittoral communities including kelps, sponges, solitary ascidians wrasse.	Surveyed previously, D vex not found before
Shore site 10	1435			Scimitar beach area shores				See shore survey site descriptions

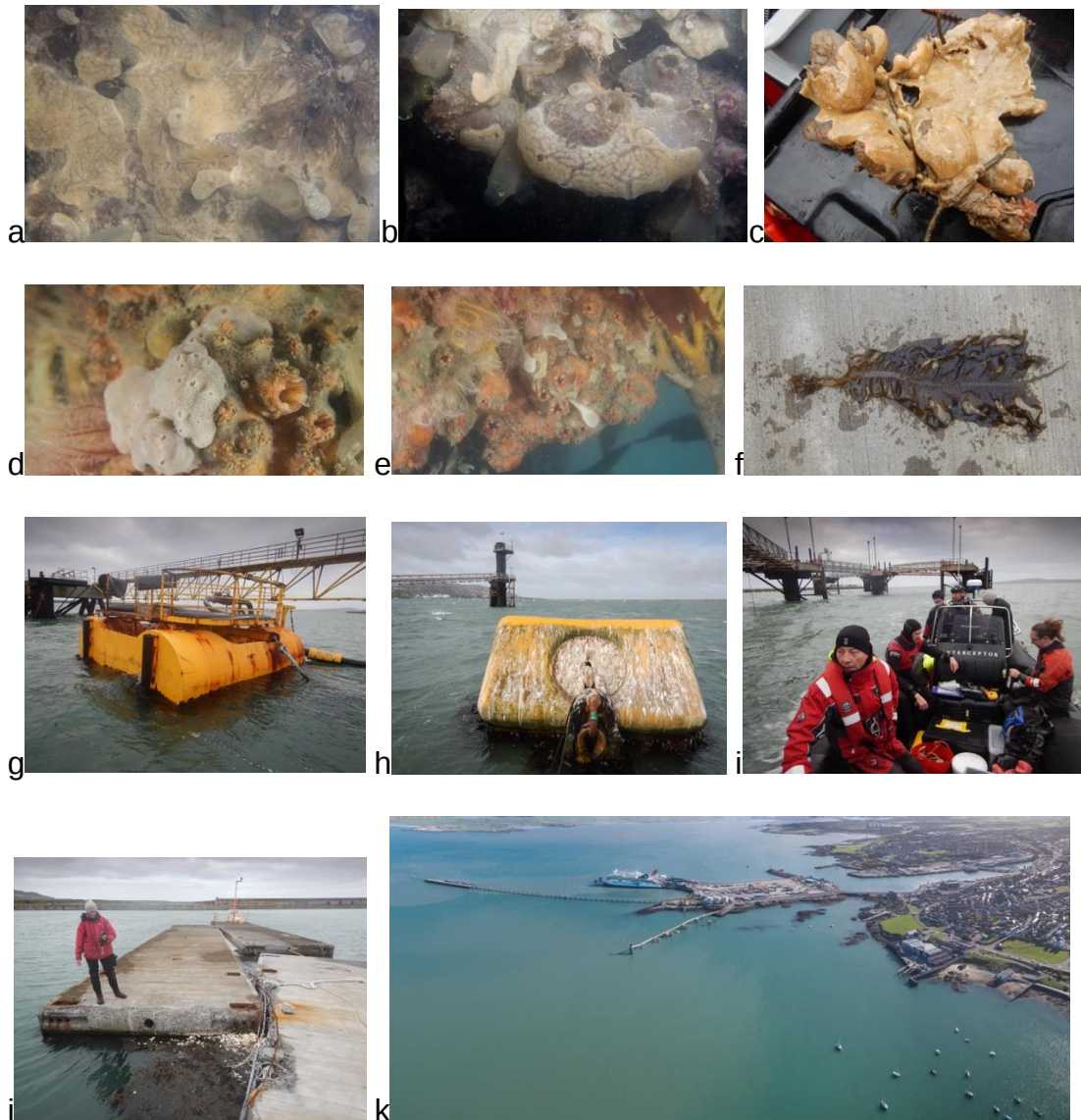


Figure 15. (a) *Didemnum vexillum* overgrowing pontoon surfaces on the E-W floating breakwater; (b) *D.vexillum* on *Ascidiella aspersa*; (c) large sheets of *D.vexillum* taken from a mooring buoy to the north of the marina; (d) *Lissoclinum perforatum* and *Asterocarpa humilis* growing in clumps under the refuelling buoy at Terminal 4; (e) clumps of *Asterocarpa humilis* overgrown by *Diplosoma spongiforme* and *Lissoclinum perforatum* with *Antedon bifida* and *Laminaria hyperborea*; (f) *Undaria pinnatifida* removed from the sides of the E-W floating breakwater; (g) fuelling buoy at Terminal 4; (h) Largs-style buoy near Terminal 4; (i) RIB *Interceptor* and crew near Terminal 3/5; (j) damaged section of E-W breakwater pontoons; (k) aerial image of the Old Harbour and terminals – silt plume visible around the ferries and east of the New Harbour (Photos a & b, Nick Owen; photos c-k. R. Holt).

4.2.3. Results summary

- A total of 10 shore surveys and 58 dives were undertaken around Holyhead harbour and the shores on NW Anglesey between 9th and 26th of October 2018.
- *Didemnum vexillum* was located only on floating structures in and immediately adjacent to the remains of the marina.
- Comparisons of extant data with the current situation show that there appears to be very little change in the extent and distribution of *D.vexillum* in Holyhead Harbour over time (Figure 19). Some of the yachts lost during the storm were known to have had *D.vexillum* on their hulls. A proportion of their mooring buoys, if still present, support *D.vexillum*.
- Its extent eastwards was limited to the motor cruiser *Gulfstreamer* – an unused boat under disputed ownership that has not moved out of the harbour area since the first *D.vexillum* surveys in 2008/2009 when its hull was found to be heavily colonised. Although spray-treated ashore with undiluted bleach at the time it has been recolonized – possibly from its fouled mooring when it was returned to the New Harbour.
- *D.vexillum* was not found on any fixed or floating structures to the east of the New Harbour or anywhere in the Old Harbour, although survey effort in some of these areas was limited by poor underwater visibility and sea state.
- Large (20 m long) pontoons that supported *D.vexillum* were stranded whole or partially damaged high on the shore at Scimitar beach and Porth y Felin as a result of storm *Emma* in March 2018. The dead and decayed remains of the subtidal flora and fauna could be seen on these pontoons' sides. There was no evidence of any live *D.vexillum* either on the pontoons or on the hard substrata immediately adjacent to them.
- Fragments of the pontoon's fibreglass coating were located over much of the intertidal and subtidal area in Porth y Felin and Scimitar beach. Although some of these fragments had the dead remains of subtidal species on them (*Balanus* spp. shells, tufts of dead bryozoan and sections of kelp holdfast) nothing live remained apart from newly settled barnacles and small limpets.
- *D.vexillum* was not found on any of the submerged remains of the marina or sunken vessels in deeper water. Such structures tended to be partially or wholly buried in soft mud on the harbour seabed. Newly settled solitary ascidians – mainly *Ascidia aspersa* and *Ciona intestinalis* have evidently settled on prominent parts of the wreckage during the summer – much of which would have been above the waterline prior to the storm and not colonised by *D.vexillum*. There were a few small sections of pontoon floats found pinned to the seabed by the sunken wreckage. There was no sign of *D.vexillum* on these sections.



Figure 16. Video stills of wreckage on the seabed in the marina area; (a) finger pontoon deck with cleat. *Ascidiella aspersa* now overgrowing the metal frame; (b) concrete mooring block with *A. aspersa*; (c) remains of a yacht mast and sail rigging overgrown with *A. aspersa*. Video images K. Northen.

- Searches of intertidal habitats on the NW of Anglesey, where marina debris washed up after storm *Emma*, failed to find any live *D. vexillum*, even in habitats apparently suitable for didemnid ascidians (Figure 17). Fragments of polystyrene and fibreglass debris is still present on these shores, often wedged into the backs of intertidal sea caves, although none with living material carried from the marina. Eroded fragments of fibreglass with *Didemnum maculosum* were found in rockpools on one of the nearest rocky shores to the marina. However, it is likely that these fragments were colonised with this species *in situ* during the summer.



Figure 17. Shore areas (1-10) (Map Data © 2018 Google) searched for the presence of *D. vexillum* and didemnids. Yellow stars = rocky habitats with *Didemnum maculosum*

- Although not specifically targeted as part of the survey, notes were made on the presence and abundance of other non-native species. Of note *Undaria pinnatifida* (Figure 15f) has significantly increased in abundance since it was first found in 2014. It is now established on most of the mooring buoys and all the floating breakwater pontoons examined at a density approaching 25% of the total kelp plant abundance. The seasquirt *Asterocarpa humilis* (Figure 15d and e) was also often recorded and occurred on the undersides of most of the floating structures examined throughout the New Harbour area. Other common/abundant non-native species that occurred on the majority of objects examined included the red alga *Dasysiphonia japonica*, the bryozoans *Bugula neritina* and *Schizoporella japonica*, and the ascidians *Styela clava* and *Corella eumyota*.

5. Discussion

5.1. Did storm *Emma* distribute living *D.vexillum* on broken pontoon sections?

Figure 18, taken approximately one week after the storm, illustrates how much of the marina was initially lost. Virtually all the small 'finger' pontoon berths and smaller walkways were destroyed, much of the decking and superstructure sank to the seabed and most of the floats went ashore onto Scimitar beach and in to Porth y Felin or were scattered around NW Anglesey and even as far as the east coast of Ireland. Of the 7,000 m² of pontoon submerged surface area (Holt and Cordingley, 2011) originally in place at least 60% was displaced. The likelihood, therefore, of *D.vexillum* being dispersed on floating fragments of pontoon shell backed with polystyrene would seem very high. Jenny Wong (2018) in her report of the volunteer clean-up operation reports that large amounts of material was found washed ashore along the NW Anglesey coast although whether this included living *D.vexillum* was not confirmed.

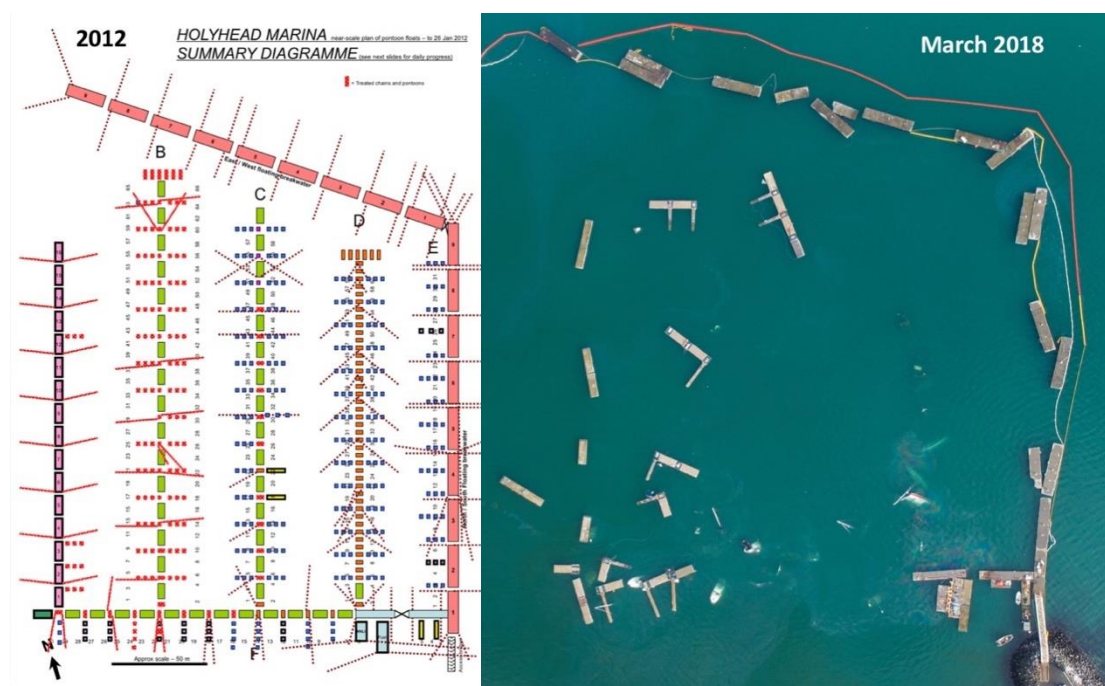


Figure 18. Diagram of floating structures and chains in the marina in 2012 compared to the remains of the marina one week after storm *Emma* in March 2018. Photo. R. Holt.

5.2. Temporal change in distribution and extent of *Didemnum vexillum* in the marina area

From a comparison of records from the initial surveys and eradication programme (2009-2012) and the 2015 survey data with the current 2018 data it would appear that there has been little change in distribution of *D.vexillum* within the harbour area post storm *Emma* (Figure 19). Some of the long-term 'resident' vessels, still with *D.vexillum* on their hulls (e.g. *Gulfstreamer* and *Fair Isle*), were moved to nearby moorings after just surviving the storm – *Gulfstreamer* now being the most easterly structure harbouring *D.vexillum* in Holyhead Harbour. There are also several unoccupied mooring buoys with

D.vexillum that had boats attached prior to the storm. Examples include the yachts *Black Knight* and *Suliman* that were either blown aground or sunk and later salvaged and taken ashore, although it is unclear of the fate of all the vessels and their moorings.

Even where *D.vexillum* is known to occur on some of the surviving pontoons close to semi-natural habitats such as the rip rap that forms the marina car park (e.g. at sublittoral survey site 4), there was no evidence of spread. It is possible, however, that very small colonies have just started to colonise such areas but have not grown large enough during the last summer to be detected. Based on rapid summer growth rates observed during previous surveys this would seem unlikely.

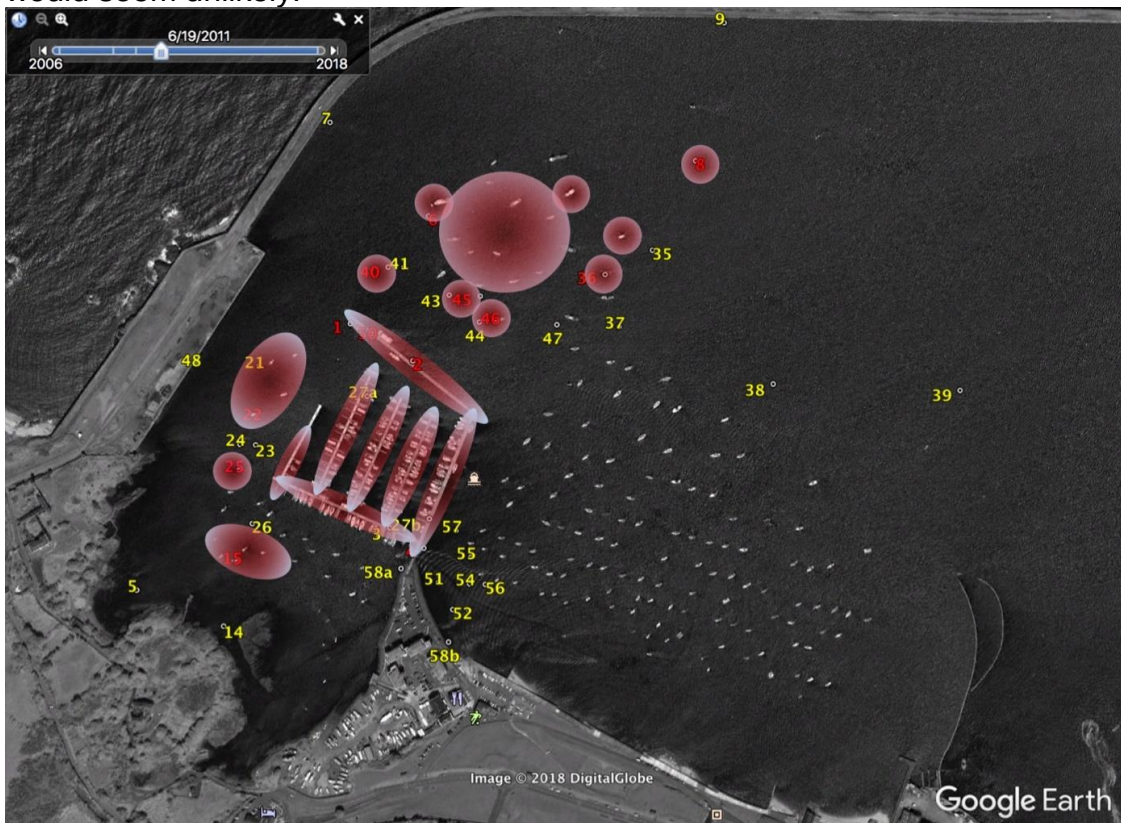


Figure 19. Google Earth 'historical' image of the intact marina from June 2011 with indicative locations of moorings and vessels with *D.vexillum* from 2009-2015 surveys (shaded red) and current survey sites (red numbers = with *D.vexillum*; yellow numbers = without *D.vexillum*).

Five large concrete breakwater pontoons were stranded on the mid and upper shore in Porth y Felin / Scimitar beach just after storm *Emma* (Figure 12c,d,e). Similar growths of *D.vexillum* would have been present on the sides and undersides of these structures at the time as were found on the remains of the E-W breakwater that are still afloat, although probably smaller in size as overwintering colonies tend to shrink. All subtidal flora and fauna including *D.vexillum* on these beached pontoons had died. It would appear that it does not survive in the intertidal even in permanently damp, shaded areas under the edges of the pontoons. Whether its mortality corresponded with the cold, late-winter weather, freshwater runoff or that the Holyhead *D.vexillum* simply is not capable of surviving in the intertidal is unknown.

5.3. Potential for future work and dealing with the remaining *D.vexillum* problem

Slow spread and a possible inability to survive on intertidal habitats have important implications for the control of *D.vexillum* in Holyhead. Further studies are needed to confirm that this is the case at all times of year. For example, to determine whether *D.vexillum* brought ashore during periods of rapid growth in the warmer summer months is capable of establishing on non-floating intertidal rocky substrata. If not it would make eradication of *D.vexillum* on boat hulls and marina structures considerably easier and far less expensive than some of the more labour-intensive alternatives if they could simply be beached on the upper shore for a few weeks and not even require scraping or chemical treatment. This is particularly relevant to the remaining floating pontoons and the unused, low value vessels that have considerable amounts of *D.vexillum* growth on their hulls.

Our observations of moorings in the area suggest that *D.vexillum* thrives on chains and buoys that remain in position long-term. Moorings that are dropped to the seabed and get temporarily embedded in the anoxic muddy sediment are almost invariably 'clean' or support little more than superficial biotic films and a few green and red algae and small mussels. Similarly, the wrecked marina debris embedded in the muddy seabed had very little fouling other than clumps of *Ascidella aspersa* and *Ciona intestinalis*. It would therefore be possible to remove *D.vexillum* from buoys and chains, especially the many that are unused during the winter, by simply taking off existing buoys and dropping the chains to the seabed on temporary ropes marked with smaller buoys. The chains could then be brought back to the surface and attached back onto clean, larger buoys when required.

Freshwater has been implicated in the reduction in growth of *D.vexillum* in other areas. During a period of very high rainfall in winter and spring *D.vexillum* was very much reduced to the point of being undetectable in Malahide marina near Dublin a few years after it was found in large quantities (McKenzie *et al* 2017 and D. Minchin pers. com.), although it has subsequently recovered to its previous levels by 2018 (Dan Gill, pers. com.).



Figure 20. Aerial image of Porth y Felin. The river runs across the shore in the foreground past the remains of three floating breakwater pontoons. The recovered wreckage is on the hard standing on the right. Photo. R. Holt.

The stream flowing onto the upper shore in Porth y Felin (Figure 20) causes a localised drop in salinity around the area where the pontoons and other marina debris came ashore. This might have contributed to the lack of intertidal *D.vexillum* growth. This freshwater source may be of potential benefit against *D.vexillum* and other fully marine INNS if plans to rebuild the marina go ahead. The stream will naturally flow into the vicinity of the planned marina area and could potentially be purposefully rerouted to lower the salinity. A stone breakwater wall would reduce flushing compared to the floating breakwater system and retain more of the freshwater, particularly in shallow water where *D.vexillum* is known to thrive on floating objects in Holyhead harbour. Routine salinity monitoring near to Porth y Felin beach and at stations in the vicinity of the marina would give a more accurate indication of *D.vexillum* survivability when considering its known environmental tolerances (Jenkins et al 2010).

5.4. Conclusions and summary

It is highly likely that the disintegration of the marina resulted in fragmentation of *D.vexillum* colonies into the water column. Live material would have probably settled onto hard substrata around the harbour. It would also have been distributed further afield, still attached to either buoyant or sinking fragments of pontoon. There is, however, no evidence of a change in distribution or increase in extent of *D.vexillum* as a result of storm *Emma* despite the presence of apparently suitable habitats for didemnids on some of the shores in the area. Although *D.vexillum* has a reputation for being a highly invasive species it would appear that circumstances have not been conducive to furthering its spread beyond that known over the last ten years. With the

loss of pontoons and boats, and consequent reduction in the colonised surface area, the overall biomass of *D.vexillum* in Holyhead Harbour is now probably lower than it was in 2015.

We do not know why *D.vexillum* has not colonised new habitats and areas although several reasons have been suggested – a combination of which may apply and require further study:-

- Post-storm fragments of *D.vexillum* ‘landed’ in unsuitable habitats. It seems to thrive on floating structures in Holyhead but not on static habitats that are subject to natural tidal fluctuation.
- Water temperature data gathered at a similar time of year as storm Emma would suggest that it would have been approximately 4-6°C (December to March data from Holt and Cordingley 2011) which is below the 8°C threshold for larval production (Jenkins *et al* 2010). The winter of 2018 was possibly even colder, although the submersible temperature logger that was in the marina was lost in the storm. Met Office data for monthly averages in Wales for March 2018 was 4.1°C compared to 7.6°C and 5.3°C in March 2016 and 2017 respectively. Fragments of *D.vexillum* might not be capable of re-attachment and survival in such conditions.
- The stream that flows into Porth y Felin causes a localised drop in salinity that potentially limited establishment and growth.
- The *D.vexillum* present in Holyhead Harbour may be genetically less ‘vigorous’ than other more invasive ‘strains’.

The risk of having overlooked newly settled material on the shore and subtidal habitats, too small to detect by eye, has been considered. It would seem likely, given its rapid growth rate observed on pontoon surfaces during previous summer months, that colony size would be large enough to detect.

6. References

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7. Acknowledgements

This project was made possible through funding by Welsh Government. Special thanks to Gabrielle Wyn and Kate Griffith, NRW, for launching and running the project and Geoff Garrod and Ed Hughes who have managed Holyhead Marina through huge adversity in 2018. Also very special thanks to the survey team, who battled the autumn weather and murky waters: Liz Morris-Webb, Kate Northen, Nick Owen, Dan Gill, Martin Sampson and Aubrey Diggle.

Rohan Holt, November 2018

8. Appendix 1. Dive log sheets

7.1 Dive logs for 20/10/18

DIVING OPERATIONS DAILY LOG SHEET										Project: 2018 NRW Dyex Holyhead		Ref: 1018-0437		Date: 20/10/2018																																			
Name	Pre-kit check (✓)	Gas mix tested (✓)	Surface Interval	Site Name / Reference	Diver	Standby	Gas EANx %	Tanks wp/wc	Pre-Dive Checks				Air		Duration		Depth (max: m)	Decompression				Supervisor Initials																											
									Regulators	Buoyancy	Gauges	Tools	Eqpt check OK (✓)	Estimated duration (mins)	AVAILABLE GAS	in (Bar)		out (Bar)	in (Leave surface)	out (rtn surface)	time (dive time)		For (time: mins)	at (depth: m)	S/R (safely/reqd)	DeSat (from table/computer)																							
RH				E/W			30%	232/17	✓	✓	✓	✓	✓	210	175	1011	1043	32	5m				AD																										
KN				PON/100S			30%	232/17	✓	✓	✓	✓	✓	210	165	1011	1043	32	5.5m				AD																										
LM				PON/100S			30%	232/17	✓	✓	✓	✓	✓	220	100	1113	1234	31	2.5m				AD																										
NO				PON/100S			26%	232/17	✓	✓	✓	✓	✓	190	60	1113	1234	31	3.6m				AD																										
CH				PON/100S			30%	232/17	✓	✓	✓	✓	✓	170	150	1310	1325	15	2m				AD																										
KN				PON/100S			30%	232/17	✓	✓	✓	✓	✓	160	130	11	11	11	11				AD																										
LM				PON/100S			30%	232/17	✓	✓	✓	✓	✓	200	170	1359	1441	42	3.5m				AD																										
NO				PON/100S			30%	232/17	✓	✓	✓	✓	✓	150	120	11	11	11	3.5m				AD																										
CH				PON/100S			30%	232/17	✓	✓	✓	✓	✓	150	120	1500	1530	30	5m				AD																										
KN				PON/100S			30%	232/17	✓	✓	✓	✓	✓	130	70	1500	1500	11	4m				AD																										
LM				PON/100S			27%	232/17	✓	✓	✓	✓	✓	120	100	1553	1614	11	3.5m				AD																										
NO				PON/100S			30%	232/17	✓	✓	✓	✓	✓	130	100	11	11	11	8m				AD																										
CH				PON/100S			30%	232/17	✓	✓	✓	✓	✓	120	120	1625	1639	11	4m				AD																										
SUPERVISORS (sign/date):										Diving operation 1										Diving operation 2										Diving operation 3										Diving operation 4									
KN										30%										1639										4m										AD									

7.3 Dive logs for 22/10/18

DIVING OPERATIONS DAILY LOG SHEET												Project: 2018 NRW Dvex Holyhead			Ref: 1018-0437		Date: 22/10/2018																																		
Name	Pre-kit check (✓)	Gas mix tested (✓)	Surface Interval	Site Name / Reference	Diver	Standby	Gas EANx %	Tanks wp/wc	Pre-Dive Checks				Air		Duration			Depth (max: m)	Decompression			Supervisor Initials																													
									Equip check OK (✓)	Tools	Gauges	Buoyancy	Regulators	Estimated duration (mins)	AVAILABLE GAS	in (Bar)	out (Bar)		in (Leave surface)	out (rin surface)	time (dive time)		For (time: mins)	at (depth: m)	S/R (safety/reqd)	DeSat (from table/computer)																									
RH	✓	✓		F3/S			30%	222/17	✓	✓	✓	✓	✓	210	200	0940	7m																																		
KN	✓	✓		F3/S			32%	232/17	✓	✓	✓	✓	✓	210	180	4	7m																																		
NO	✓	✓		F2			32%	232/17	✓	✓	✓	✓	✓	200	150	1015	6m																																		
DG	✓	✓		F2			32%	232/12	✓	✓	✓	✓	✓	180	150	11	11																																		
RH	✓	✓		F1			30%	232/17	✓	✓	✓	✓	✓	200	170	1058	8m																																		
KN	✓	✓		F1			32%	232/17	✓	✓	✓	✓	✓	180	160	11	11																																		
NO	✓	✓		8/11/17			32%	232/17	✓	✓	✓	✓	✓	130	120	1403	3m																																		
DG	✓	✓		11			32%	232/17	✓	✓	✓	✓	✓	150	120	1403	4.5m																																		
RH	✓	✓		Green Buoy			32%	232/17	✓	✓	✓	✓	✓	170	130	1515	30																																		
KN	✓	✓		Soft E/W			32%	232/17	✓	✓	✓	✓	✓	150	110	11	6.8m																																		
								2	✓																																										
								2	✓																																										
								2	✓																																										
								2	✓																																										
								2	✓																																										
SUPERVISORS (sign/date):												Diving operation 1										Diving operation 2										Diving operation 3										Diving operation 4									

7.4 Dive logs for 23/10/18

[illegible]

7.5 Dive logs for 24/10/18

DIVING OPERATIONS DAILY LOG SHEET															Project: 2018 NRW Dyex Holyhead			Ref: 1018-0437		Date: 24/10/2018						
Name	Pre-kit check (✓)	Gas mix tested (✓)	Surface Interval	Site Name / Reference	Diver	Standby	Gas EANx %	Tanks wp/wc	Pre-Dive Checks				Air		Duration	Depth	Decompression			Supervisor Initials						
									Egpt check OK (✓)	Tools	Gauges	Buoyancy	Regulators	AVAILABLE GAS			Estimated duration (mins)	out (Bar)	in (Bar)		For (time: mins)	at (depth: m)	S/R (safety/reqd)	DeSat (from table/computer)		
LN	✓	✓		74 FLOW			28	23217	✓	✓	✓	✓	✓	210	200	1013	12	2.4m								
LN	✓	✓					27	23217	✓	✓	✓	✓	✓	210	200	11	3.0m									
NO	✓	✓		WEST END			32	23217	✓	✓	✓	✓	✓	220	220	1042	140	3.3								
LN	✓	✓		OF E/W			32	23217	✓	✓	✓	✓	✓	220	220	11	3.2									
LN	✓	✓		N/S			28	23217	✓	✓	✓	✓	✓	220	220	1325	143	4.1m								
LN	✓	✓		B/W + LANS			27	23217	✓	✓	✓	✓	✓	220	220	11	4.1m									
NO	✓	✓		SMALL MOUND			32	23217	✓	✓	✓	✓	✓	220	220	1338	149	5.7m								
LN	✓	✓		EAST OF BRIDGE			32	23217	✓	✓	✓	✓	✓	150	140	11	5.5m									
SUPERVISORS (sign/date):															Diving operation 1			Diving operation 2			Diving operation 3			Diving operation 4		

9. Appendix 2. General permit to work from Port Control



GENERAL PERMIT TO WORK

Number			
Date Issued	19.10.18	Period of Validity	7 DAYS.
Nature of Work	SCIENTIFIC DWING SURVEY		
Location of Work	OUTER HARBOUR / JETTY / T3.4.5 & INNER HARBOUR		
Contractors details	MARINE ECOLOGICAL SOLUTIONS / NATURAL RESOURCES WALES		
Estimated Duration	5 DAYS FROM 20/10/18	Number of persons	7
Notification of work in progress posted in these positions	PORT CONTROL		
Machinery or related systems isolated	N/A		
Emergency Assembly Area	HOLYHEAD MARINA CAR PARK		

Person responsible for:

Fire Protection	N/A	Security	M. SAMPLSON	Health & Safety	L. MORRIS
First Aid	M. SAMPLSON	Supervision of the work	M. SAMPLSON	Risk Assessment	L. MORRIS

Work Location Asbestos Register checked to confirm possible presence of asbestos	YES ☒ NO ☐	Contractor informed of Register Details	YES ☒ NO ☐
CDM Regulations Apply	YES ☒ NO ☐	Additional Work Permits Required	YES ☒ NO ☐ Tick Below

	TICK		TICK
Confined Spaces		HSS Linkspan	
CDM Regulations		Diving	✓
Electrical		Hot Work	

Comments

Permit Issued To
Signature

Permit issued by
Signature

Work Permit Completion Details

TIME DATE SIGNATURE	Contractor		Stena Line	
		11:20		
		25/10/18		

See back of form for notes on conduct requirements for Contractor's employees.
White copy: contractor. Yellow Copy: Port Engineer/Maintenance Manager or his/her representative.

10. Appendix 3. Methods statement

Intertidal searches

Targeted searches should be made for habitats where *Didemnum vexillum* is likely to colonise based on its known preference for permanently damp, shaded areas based on its other known intertidal locations (McKenzie *et al* 2017). The presence of other native didemnid species, most commonly *Didemnum maculosum*, has been used as an indicator of suitable habitat / area at risk of colonisation and the presence / approximate location of this species should be noted where found. This species tends to be confined to vertical and overhanging rock, particularly where shaded by fucoid seaweeds, on vertical faces within rock pools and on the undersides of boulders sitting on rocky surfaces that are not embedded or scoured by mobile sediment. This species is often accompanied by a variety of other encrusting fauna including the sponges *Halichondria panacea*, *Hymeniacidon perleve*, *Amphilectus fucorum*, *Pachymatisma johnstonia* and *Haliclona* spp., ascidians *Dendrodoa grossularia* and various encrusting and erect bryozoans.

Ideally shore sites should be searched at, and up to an hour or so before, low water of spring tides, so that suitable habitats on the lower shore are investigated following the tide down the shore without the risk of being cut off by a rising tide. Open rocky barnacle-covered surfaces, areas inundated by sand with *Rhodothamniella floridula*, cobbles set in sediment and upper shore rock can be largely ignored so that the surveyors can concentrate on lower shore ridge and gully sides, especially if overhung with a 'curtain' of fucoids, underboulder surfaces, crevices and un-scoured rock in caves and the sides of large rockpools. These habitats should be searched carefully so that replicate habitats are investigated on each area of shore.

The time taken to survey an area of shore will depend on its complexity and area of potentially suitable habitat. As a rough guide, two small (250 m) lengths of rocky shore either side of a sandy beach could be surveyed by one person during one low tide period, ideally in full daylight hours. Larger rocky platforms may require two surveyors working together or two teams of two coordinated to cover specific areas during a low water period.

GIS / Google Earth / drone aerial image prints at a suitable resolution (ideally taken at low water) can be used to aid the surveyors find and note features on the shores. A GPS should be carried to note precise locations in case any *D.vexillum* is found. Photographs should be taken of general views of the shore, habitats where didemnids are found and of species of interest. Specimen bags and pots should be carried for collecting didemnid samples for later confirmation if required, and a torch is essential to search small caves, overhangs and gullies.

Suitable PPE should be worn to cope with slippery rocky surfaces, wading in rockpools and shallow water. A 'buddy-system' should be used to check that surveyors have safely completed their work for the day and returned to base.

Subtidal searches by diving

Sites were targeted for diving survey throughout the Holyhead Harbour area to look at a range of floating and static structures including the remaining pontoons floats, boat hulls, mooring buoys and chains, static man-made structures and semi-natural habitats such as stone-built harbour walls, shipping terminals and boulder sea defences. One of the main aims of the October 2018 survey was to establish the distribution of *D.vexillum* at a fine resolution as possible in the vicinity of its previously established known range and therefore a large number of short duration dives were planned where the surveyors would move to a new location as soon as its presence/absence was confirmed.

Many of these sites were examined during previous survey events when NRW were actively engaged in attempting to eradicate *D.vexillum* (e.g. Holt and Cordingley 2011), and more recently in 2015 (Holt 2015); similar search patterns were used to ensure the most likely habitats were viewed for recording presence / absence of *D.vexillum*. Time constraints prevent recording of detailed species and habitat details but notes should be made on approximate relative abundance of *D.vexillum* and the main species present.

Ideally a team size of five divers (plus boat skipper and Diving Supervisor) should allow for pairs of divers working together and acting as 'in-water standby' for one another. Each of the divers can cycle diving and surface support duties so that there are two divers in the water, two divers ready to dive and one person recording findings and GPS positions using the boat's navigation system. Photographs should be taken *in situ* to illustrate / confirm *D.vexillum* and other non-native species on a range of different habitats.

All diving activities can be carried out within the scope of the HSE Approved Code of Practice for Scientific and Archaeological Diving and must be logged by the Diving Supervisor who can also operate a check-in/out system with Holyhead Port Control and Holyhead Coastguard. The divers should use through-water wireless communication systems for all dives. Dive logs must be kept for all diving operations and work permits obtained from Holyhead Port Control.

Ideally diving should be targeted during the neap tide cycle, although poor weather and sea state, ferry movements and near-zero underwater visibility can limit diving to areas away from the more wave-exposed and busy areas of the harbour. The dives can be kept short (approx. 5-30 minutes) and shallow (around 6-8 m) and the divers use nitrox (breathing gas enriched with up to 32% oxygen for these dives) as the nature of this work involved multiple descents and ascents per day which is known to provoke decompression illness.

Data Archive Appendix

Data outputs associated with this project are:

[A] Digital versions of the contract report: Microsoft Word document; and an Adobe Portable Document Format version.

[B] Excel spreadsheets with species presence absence data.

[C] Photographs of habitats and species

[D] Marine Recorder file.

Metadata for this project is publicly accessible through Natural Resources Wales' Library Catalogue <https://libcat.naturalresources.wales> (English Version) and <https://catllyfr.cyfoethnaturiol.cymru> (Welsh Version) by searching 'Dataset Titles'. The metadata is held as record no. 122967.

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Appendix C – Responses from Pre-Consultations

Response from NRW (re: Didemnum vexillum)

From: [redacted] [mailto:[redacted]@cyfoethnaturiolcymru.gov.uk]
Sent: 06 September 2019 10:42
To: Geoff Samuel <[redacted]@holyheadmarina.co.uk>
Cc: 'redacted' <[redacted]>; [redacted] <[redacted]>
Subject: RE: Natural Resources Wales - query about remaining marina structures

Hi all,

Thank you so much for your time yesterday, it was extremely helpful to thrash out the potential to carry out this work.... your input and positivity to do so was great!

Please find attached a PDF of the report I had with me yesterday.

I have emailed the AMs this morning about attending the Port Users meeting and have also sent an email over to [redacted] and [redacted] at [redacted] to scope out the potential use of Soldier's Quay. Will let you know how I get on.

I'll be in touch next week – hope you all have a good weekend

Thanks

[redacted]

Response from Isle of Anglesey County Council's (IACC) (response re: pre application advice in relation to the re-building of Holyhead Marina (application reference PAM/2019/9))

From: [REDACTED]s [[mailto:\[REDACTED\]@ynysmon.gov.uk](mailto:[REDACTED]@ynysmon.gov.uk)]
Sent: 06 September 2019 13:34
To: Geoff [REDACTED] <[\[REDACTED\]@holyheadmarina.co.uk](mailto:[REDACTED]@holyheadmarina.co.uk)>
Cc: David [REDACTED] <[\[REDACTED\]@ynysmon.gov.uk](mailto:[REDACTED]@ynysmon.gov.uk)>; E [REDACTED] <[\[REDACTED\]@ynysmon.gov.uk](mailto:[REDACTED]@ynysmon.gov.uk)>
Subject: Pre-Application Advice Holyhead Marina: Official Sensitive

Dear [REDACTED],

Please find the Isle of Anglesey County Council's (IACC) response to your request for pre application advice in relation to the re-building of Holyhead Marina (application reference PAM/2019/9).

Please do not hesitate to contact me if you need to discuss anything further.

Kind regards

[REDACTED]

[REDACTED]

[REDACTED] / [REDACTED]

[REDACTED]

[REDACTED] [@anglesey.gov.uk](mailto:[REDACTED]@anglesey.gov.uk)

Response from Historic Environment (Cadw)

-----Original Message-----

From: [REDACTED]@gov.wales [mailto:[REDACTED]@gov.wales]

Sent: 19 August 2019 11:28

To: [REDACTED] [mailto:[REDACTED]@holyheadmarina.co.uk]

Subject: Cadw - Harbour Revision Order Scoping Report - Response

Dear [REDACTED],

Thank you for your email inviting our comments on the attached report.

Scheduled Ancient Monuments:

AN019 Caer y Twr

Listed Buildings:

5743 HOLYHEAD BREAKWATER, SOLDIER'S POINT II*
5744 LIGHTHOUSE ON HOLYHEAD BREAKWATER II
5771 CUSTOMS HOUSE, SALT ISLAND II
5772 HARBOUR OFFICE, SALT ISLAND II*
5773 GEORGE IV ARCH, SALT ISLAND II*
14729 ZODIAC RESTAURANT, BEACH ROAD (N SIDE) II
14730 TRINITY HOUSE OFFICE, BEACH ROAD (N SIDE) II
14731 TRINITY YARD LARGE WORKSHOP, BEACH ROAD (N SIDE) II
14732 TRINITY YARD SMALL WORKSHOP, BEACH ROAD (N SIDE) II
14755 GUNPOWDER MAGAZINE, BREAKWATER QUARRY II
14756 COTTAGE ON CORNER OF PENTRE PELLA (INCLUDING FOREGARDEN WALL),
14759 PORTHYFELIN HOUSE, SOLDIER'S POINT II
14760 SOLDIER'S POINT HOUSE, SOLDIER'S POINT II
14761 SCREEN WALL TO SOLDIER'S POINT HOUSE, SOLDIER'S POINT II

Conservation Areas:

Holyhead Beach

The scoping report includes section 13 Conservation Areas, Cultural Heritage, Archaeology, Landscape And Seascape which identifies the major historic environment issues that will need to be considered in preparation of the Environment Impact Assessment (EIA).

In general, we agree with the issues raised in this section but it is recommended that rather than applying an arbitrary 1km search area around the proposed development to identify that the potential impact of the proposed development on the designated heritage assets, the assets that should be included in the assessments should have views to the existing marina area. An initial list of these assets are given above, but these will need to be checked on site in accordance with Section 1 of the Welsh Government guidance "The Setting of Historic Assets in Wales".

It is noted that on-site geophysical surveys will be carried out, that will identify artefacts buried in the muds underlying the development area and also to identify any wrecks in the area. These works should be carried out in accordance with the Standard and Guidance for Geophysical Survey set by the Chartered Institute for Archaeologists.

The main part of any section on the historic environment that will be included in the EIA will require searches to be made of the Historic Environment Record held by the Gwynedd Archaeological Trust and the

Maritime Heritage Assets Section of the National Monuments Record of Wales curated by the Royal Commission for the Ancient and Historical Monuments of Wales. The results of these searches should be assessed in accordance with the Standard and Guidance for Desk-based Heritage Assessment set by the Chartered Institute for Archaeologists and the impact of the development on the settings of the historic assets should be carried out in accordance with the Welsh Government guidance "The Setting of Historic Assets in Wales".

Regards,

[REDACTED]

[REDACTED]

Rheolwr Gwaith Achos/ Casework Manager

Diogelu a Pholisi / Protection and Policy Amgylchedd Hanesyddol / Historic Environment Cadw / Cadw

Llywodraeth Cymru/ Welsh Government Plas Carew / Plas Carew Uned 5/7 Cefn Coed / Unit 5/7 Cefn Coed

Parc Nantgarw / Parc Nantgarw Caerdydd / Cardiff

CF15 7QQ

Ffôn / Tel: 03000 256007

Ffacs / Fax: 03000 256007

E-bost/ Email: [REDACTED]@gov.wales

Dilynwch Cadw / Follow Cadw:

Response from Gwynedd Archaeological Planning Service

-----Original Message-----

From: [REDACTED] [mailto:[REDACTED]@heneb.co.uk]

Sent: 14 August 2019 13:39

To: [REDACTED] <[REDACTED]@holyheadmarina.co.uk>

Subject: RE: Emailing: HARBOUR REVISION ORDER SCOPING REPORT

Dear [REDACTED],

Thank you for sending this through, and sorry for the delay in responding. My preliminary thoughts are that this all appears fine, but I would recommend contacting [REDACTED], Maritime Officer at the RCAHMW, if you haven't already done so ([REDACTED]@rcahmw.gov.uk), as this is her specialist area. As noted, the main archaeological issues are expected to be identification and mitigation of impacts on any seabed remains. I'd be interested to know more about what surveys are planned and would recommend that these are made available to an archaeological contractor with appropriate expertise so that they can compile an archaeological assessment to support the various consenting processes, establishing the nature of seabed archaeology at the site and informing the future mitigation strategy. I had a look through the work that was done several years ago for the waterfront regeneration scheme, which included a side scan sonar survey, but it excluded the modern marina area. It hadn't occurred to me till reading the scoping report the scale of contamination and modern debris that may be present. Would a dive survey be feasible/desirable to complement the remote surveys in identifying where readings might reflect the results of the storm or other recent activity, rather than historic features and craft?

Best regards

[REDACTED]

[REDACTED]

Uwch Archaeolegydd Cynllunio - Senior Planning Archaeologist

Gwasanaeth Cynllunio Archaeolegol Gwynedd - Gwynedd Archaeological Planning Service Craig Beuno,
Ffordd Garth, Bangor, Gwynedd, LL57 2RT

Tel: 01248 370926

Mob: 07824 481052

Response from School of Ocean Sciences, Bangor University

From: [REDACTED] [[mailto:\[REDACTED\]@bangor.ac.uk](mailto:[REDACTED]@bangor.ac.uk)]
Sent: 07 August 2019 16:52
To: [REDACTED] <[\[REDACTED\]@holyheadmarina.co.uk](mailto:[REDACTED]@holyheadmarina.co.uk)>
Cc: [REDACTED] <[\[REDACTED\]@bangor.ac.uk](mailto:[REDACTED]@bangor.ac.uk)>
Subject: HARBOUR REVISION ORDER SCOPING REPORT

Dear [REDACTED]

Siobhan passed on your email regarding the report and we just had a chat about it. We aren't fully conversant with the procedures you have to go through and so are a bit unsure as to the level of detail you need to go to. One potential omission on the subject of biosecurity is recognition that there are a number of non native species prevalent in ports and marinas around the UK so any consideration of this matter should recognise its not only a Didemnum vexillum issue.

On a wider note we certainly recognise the fact that over the years you have been unbelievably helpful in facilitating our research on non native species and would be happy that this is communicated. If you need any statement to that effect we would be happy to give it.

If there are any specific questions we can help with, we'd be happy to answer them

All the best

[REDACTED]

Response from Royal Yachting Association

From: [REDACTED] [mailto:[REDACTED]@rya.org.uk]
Sent: 14 August 2019 16:29
To: [REDACTED] <[REDACTED]d@holyheadmarina.co.uk>
Subject: HARBOUR REVISION ORDER SCOPING REPORT

Good Afternoon

The RYA welcomes the opportunity to provide its opinion on the scoping report for the Harbour Revision Order at Holyhead. We consider the report to adequately consider potential impacts to recreation and navigation. The RYA, and its affiliates will welcome further consultation as the proposal develops.

Regards

[REDACTED]

Senior Administrator | Cruising, Legal & Government Affairs Department

Royal Yachting Association

T: 023 8060 4223 | E: [REDACTED]@rya.org.uk

Response from Trinity House

From: [REDACTED]s [[mailto:\[REDACTED\]@trinityhouse.co.uk](mailto:[REDACTED]@trinityhouse.co.uk)]
Sent: 21 August 2019 08:39
To: [REDACTED] <[\[REDACTED\]@holyheadmarina.co.uk](mailto:[REDACTED]@holyheadmarina.co.uk)>
Cc: [REDACTED]@stenaline.com; [REDACTED] <[\[REDACTED\]@trinityhouse.co.uk](mailto:[REDACTED]@trinityhouse.co.uk)>
Subject: Holyhead Harbour Revision Order Scoping Report

Dear Sir,

Please be advised that Trinity House has no objections to your initial proposals and will confirm/consent to any marking requirements in consultation with the Stenaline Holyhead under section 78 of the Harbours Docks and Piers Clauses Act 1847, and once a formal application has been made to Natural Resources Wales.

Yours faithfully,

[REDACTED]

[REDACTED]

Navigation Support Officer | Navigation Directorate | Trinity House

Response from Irish Sea offshore Racing Association (ISORA)

From: [REDACTED] [REDACTED]@live.com]

Sent: 29 August 2019 09:36

To: [REDACTED] <[REDACTED]@holyheadmarina.co.uk>

Cc: chair@isora.org

Subject: RE: Emailing: HARBOUR REVISION ORDER SCOPING REPORT

Hi [REDACTED]

Many thanks for your message.

I am delighted to hear that progress is being made towards re-building the Marina facility at Holyhead.

I have published the document on the home page of the ISORA web site [>here](#) and it will be circulated with the next ISORA e-newsletter to invite responses.

I will digest the full report later and then respond fully to outline the importance of a facility at Holyhead to ISORA.

I wish you well with the project and I hope you get the full support the project deserves as a strategic marina port on the Welsh coast.

Kind regards

Stephen

[REDACTED]
ISORA – Hon Sec.

www.isora.org

0044 7977929116

Response from Holyhead Group

From: [REDACTED] <[REDACTED]@holyhead.co.uk>

Sent: 10 September 2019 12:22

To: [REDACTED] <[REDACTED]@holyheadmarina.co.uk>

Subject: Report

Very well written, [REDACTED], and I've no argument with any of it. But taking an overall view for the town and port it's nonsense to solely protect your marina when you could protect the whole harbour for little more I suspect.

However I'd be conscious of potentially causing you delays and problems if I said that to others?

I'd guess you're probably correct that stone from Scotland would be too costly, but bear in mind we could set up a cheapish smaller barging operation from the Inner Hbr or Port Penrhyn to use more local material and avoid the environmental impact locally.

Kind regards,

[REDACTED]

Response from Ribride

From: [REDACTED] [REDACTED]@ribride.co.uk]
Sent: 25 September 2019 16:46
To: [REDACTED] <[REDACTED]@holyheadmarina.co.uk>
Subject: Re: Emailing: HARBOUR REVISION ORDER SCOPING REPORT

Dear [REDACTED]

I have read your report with great interest from a tourism perspective.

Ribride has been operating its tours from Holyhead Marina for 5 years however the past two have seen significant issue due to the sad impacts of storm Emma. This culminated in us not operating during the busy summer season to enable us to focus on our other departure locations. The single and simple reason for this was due to the restricted and complicated logistic of operation without marina support.

RibRide has invested heavily not only in a specific vessel for Holyhead operations but, with the cooperation of Holyhead Marine, in a petrol bunkering facility with support of Anglesey Council.

Without redevelopment it is unclear how RibRide will continue to operate in a sustainable manner. We fully support this redevelopment and the effort of Holyhead Marina is this action. Indeed, if anything, I would ask for the tourism section to be further expanded upon and to include the negative effects upon RibRide, as well as our continued support and desire to operate from a fully operational marina as soon as possible.

Best regards,

[REDACTED]

RibRide | Porth Daniel Boat Yard | Water Street |

Menai Bridge | Anglesey | LL59 5DE | Wales

T: +44 (0)333 1234 303 M: +44(0)7879067783

E: info@ribride.co.uk W: www.ribride.co.uk

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02 October 2019

To [REDACTED], Holyhead Marina,

Dear [REDACTED]

Rebuilding of Holyhead Marina

I am writing to you in my capacity as Head of Public Affairs, Policy and Research at British Marine regarding the application for redevelopment of the Holyhead Marina site following the catastrophic storms of last year.

British Marine is the trade association for the leisure boating industry, representing around 1,500 member companies. Our members provide the boats, equipment, facilities and services that enables 4 million adults to enjoy their recreation afloat on the coast and inland waterways of our country.

Our industry is comprised of small and medium-sized enterprises, with over 98% of companies employing less than 50 people. In total, the UK leisure marine sector directly employs almost 34,000 FTE and generates an annual revenue of £3.2 billion, of which 33% represents export sales.

Holyhead Marina's position makes it a key point for recreational marine traffic both locally, and in the Irish Sea. It is a starting (and arrival) point for sailing to Ireland and for those vessels traveling north or south in the Irish Sea it is perfectly located to offer refuelling, resupplying and shelter in rough weather.

Marinas and harbours have a local social benefit whilst cafes, hotels and others will get a direct commercial benefit. The reconstruction of Holyhead Marina will provide an opportunity to create a first-class facility for the future that delivers leisure experiences to existing and new boaters whilst also delivering financial benefits to the local community.

British Marine would therefore encourage the support of the proposed redevelopment.

Yours sincerely,

[REDACTED]
Head of Public Affairs, Policy and Research British Marine

Lesley Griffiths AC/AM
Gweinidog yr Amgylchedd, Ynni a Materion Gwledig
Minister for Environment, Energy and Rural Affairs



Llywodraeth Cymru
Welsh Government

Ein cyf/Our ref LG/06556/19

Geoffrey Garrod

Geoff.Garrod@holyheadmarina.co.uk

25

September 2019

Thank you for your email of 20 July and attached scoping report on the re-build of Holyhead Marina. I apologise for the delay in responding.

During my visit to the marina in March 2018, I saw first hand the devastation caused by Storm Emma and witnessed the efforts of so many people involved in the clean-up operation.

I have asked my officials to raise your situation with colleagues in the Welsh Government's Economy and Transport Division. Please visit the Business Wales Website for details on what support may be available to you: <https://businesswales.gov.wales>

The administration and determination of marine licence applications is carried out by Natural Resources Wales, on behalf of the Welsh Ministers. As the responsibility for marine licensing fall within my Portfolio I am limited to what I can say about the re-build while applications are being assessed and determined.

Lesley Griffiths AC/AM
Gweinidog yr Amgylchedd, Ynni a Materion Gwledig
Minister for Environment, Energy and Rural Affairs

Bae Caerdydd • Cardiff Bay
Caerdydd • Cardiff
CF99 1NA

Canolfan Cyswllt Cyntaf / First Point of Contact Centre:
0300 0604400
Gohebiaeth.Lesley.Griffiths@llyw.cymru
Correspondence.Lesley.Griffiths@gov.wales

Rydym yn croesawu derbyn gohebiaeth yn Gymraeg. Byddwn yn ateb gohebiaeth a dderbynnir yn Gymraeg yn Gymraeg ac ni fydd gohebu yn Gymraeg yn arwain at oedi.

We welcome receiving correspondence in Welsh. Any correspondence received in Welsh will be answered in Welsh and corresponding in Welsh will not lead to a delay in responding.



Noddwyr/Patrons:
Rear Admiral Keith Beckett CBE BSc. MDA CEng. FIMarEST Royal Navy
Mr. Albert Owen MP/AS Ynys Môn

Swyddfa Cofrestredig/Registered Office:
Amgueddfa Arforol, Traeth Newry, Caergybi, LL65 1YD
Maritime Museum, Newry Beach, Holyhead, LL65 1YD

[REDACTED]
Holyhead Marina Ltd
Newry Beach Holyhead
Isle of Anglesey
LL65 1YA

22nd September 2019

Dear Mr [REDACTED]

I am writing to you on behalf of the Holyhead Maritime Museum to thank you for including us within the distribution of your preliminary consultation document.

As trustees of the museum, we have read your document and note your plans.

We wish you well but have no comments to make at present.

Yours sincerely,

[REDACTED]
Secretary,
Holyhead Maritime Museum



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Rhif Elusen 514840
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Charity No. 514840

Ffôn/Tel: (01407) 769745 maritimemuseumholyhead@gmail.com www.holyheadmaritimemuseum.co.uk

Subject:

From: Grŵp Ymgyrch Traeth Newry / Waterfront Action Group [<mailto:traethnewrybeach@gmail.com>]

Sent: 20 October 2019 00:02

To: [REDACTED]@holyheadmarina.co.uk>

Subject: Marina Re-Build

Comments from the Waterfront Action Group on the Environmental Scoping Report

Dear [REDACTED]

The Waterfront Action Group (WAG) welcomes the opportunity to provide comment on the Holyhead Marina Re-build Strategy, Environmental Scoping Report.

We have considered the report from the viewpoint of impact on the immediate and local community, Holyhead and Anglesey. As you know WAG formed to campaign against the Waterfront Development proposed by Conygar. The primary aim of the group is to retain Newry Beach, Promenade and Greens in a form that is in keeping with its adjacent AONB status and to maintain this area as a significant recreational amenity for the local and wider community.

Whilst the report goes some way to address pertinent issues, we note with some concern that there is a lack of detail in addressing considerations of the effects of the construction processes on the immediate and local communities affected by the Re-Build project, particularly in relation to other major construction projects planned for the area.

It is also noted that there is no mention of Trinity Court in the report, the residential and commercial area immediately adjacent to the construction site.

Whilst we welcome the re-build project we would point out the need for full consideration to be given to the cumulative impact effects of proposed infrastructure support and visual effects, in the design of the re-build, on the Trinity Court Development and its residents. In addition, noise, air pollution (dust and diesel fumes), safety and disruption must be addressed, given the proximity of Trinity Court and its residents to the Marina.

We trust these comments are helpful to you and we wish Holyhead Marina the very best in achieving the re-build of the Marina.

Yours sincerely

[REDACTED]

[REDACTED]

Chair

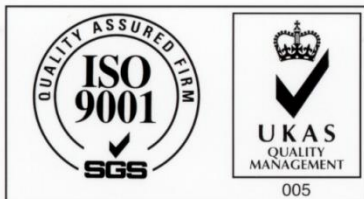
**Grŵp Ymgyrch Traeth Newry
Waterfront Action Group
Newry Beach Holyhead**

Appendix D - Assessment of Wave Climate during Storm Emma (RPS 2018)

Holyhead Marina

**Assessment of the Wave Climate
during Storm Emma**

July/August 2018



RPS
ELMWOOD HOUSE
74 BOUCHER ROAD
BELFAST BT12 6RZ
Telephone 028 90667914
Facsimile 028 90 668286
e-mail info@rpsgroup.com



Holyhead Marina

Assessment of the Wave Climate during Storm Emma

STUDY REPORT

DOCUMENT ISSUE

Client	Holyhead Marina					
Project Title	Assessment of the Wave Climate during storm Emma					
Document Title	Study Report					
Document No.	IBE1520/AKB/Holyhead					
This Document Comprises	DCS	TOC	Text	Figures	Tables	
	1	1	24	12	10	

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
	Final	AKB	NS	AKB	Belfast	28/08/2018

CONTENTS

	Page
1.0 INTRODUCTION	1
2.0 SITE LOCATION AND EXPOSURE	1
3.0 STORM EMMA	3
3.1 Wind data	3
3.2 The Return Period of Storm Emma	4
4.0 WAVE MODELS AND BATHYMETRY	6
4.1 Wave Model Software	6
4.2 Bathymetry	7
5.0 WAVE MODELLING PROCEEDURE	9
6.0 RESULTS OF WAVE SIMULATIONS & IMPLICATION FOR THE MARINA	11
6.1 Storm Emma Wave Climate at the Marina Site	11
6.2 Future Design Conditions for a Marina at the Site in Holyhead	11
7.0 CONCLUSIONS	13

1.0 INTRODUCTION

Holyhead Marina suffered catastrophic damage as a result of storm Emma which occurred on the 1-2 March 2018.

RPS has been commissioned to undertake a study of the storm wave conditions approaching the marina site during storm Emma. The study was also to include the assessment of how extreme the storm was and its likely hood of re-occurrences. Based on this analysis RPS was to recommended future design conditions (wind speed, direction and duration) and simulate the wave conditions approaching the marina site for the recommended design conditions.

This report sets out the RPS analysis of the conditions during storm Emma and the resulting wave climate at the marina site.

2.0 SITE LOCATION AND EXPOSURE

Holyhead marina is located in at the western end of Holyhead harbour as shown in Figure 1. The harbour breakwater provides protection from storms in the Irish Sea from all directions except the North East to East sector. However the orientation of the inner face of the main pier structure adjacent to the marina site can result in reflected waves entering the marina area. The pier at the eastern end of the harbour is mostly of open piled construction and thus provides little or no shelter to the marina from the east.

The pontoon berths in the marina were protected from incoming waves by 4m wide floating breakwaters on the eastern and northern site of the marina area. The breakwaters were moored by a series of nylon cables anchored to the seabed.

The largest direct fetch for wind wave generation at the marina site is about 5.3 kilometres from the East to East North East direction to the adjoining coastline of Anglesey. However due to the shape of the main breakwater at Holyhead, storm wave energy from North East storms can enter the harbour and contribute to the wave energy approaching the marina site.



3.0 STORM EMMA

Storm Emma received its name from the Portuguese meteorological office as the storm moved north from the area around Portugal to the UK at the beginning of March 2018. The peak of the storm around Holyhead occurred around 4.00 to 5.00 hrs on the morning of the 2 March at a time of low tide. However the intensity of the storm was fairly similar through most of the flood tide.

3.1 Wind data

Various sources of wind data recording during storm Emma have been examined and as expected they give different wind speeds depending upon the location of the particular wind gauge. Data examine by RPS include:

1. UK Met Office gauge at RAF Valley
2. Stena gauge at the lighthouse at Holyhead Pier
3. Research ship Prince Madog moored at Menai Bridge
4. M2 weather buoy located in the Irish Sea approximately mid way between Holyhead and Dublin.

The UK Met office data for Valley is a very long dataset of more than thirty years but Valley is sheltered for the ENE wind directions which occurred during Storm Emma. The records from Valley show that the maximum mean speed recorded during storm Emma was 36 knots from 60° with maximum gust of 57 knots from 70°. By contrast the research ship Prince Madog at the Menai Bridge recorded over 99 knots from 50° during the storm. The differences in these wind speed can easily be explained by local acceleration through the Menai Strait and the shelter at Valley for ENE winds.

Our analysis indicates that the Stena recordings are most likely to give the best representation of the storm wind speeds for wave climate generation at the marina during storm Emma. These show that the mean speeds were about 55 knots from about 63° with gusts in excess of 65 knots. The wind speeds recorded at the M2 buoy were shown as mean speeds of 41 knots with gust speeds of 56 knots. However the wave heights at the M2 buoy were 6.25 metres significant wave height with mean periods of 7.45 seconds and mean wave directions of 70°N. The fetch for wave generation for these waves passes close to Anglesey and back analysis of the wave heights periods and fetches indicates that the wind speed in this area must have been in excess of 60 knots to generate the waves recorded at the M2 buoy. This confirms that the wind speeds recorded by the Stena gauge are likely to be the correct speeds for wave generation of the wave climate at the Holyhead marina site during storm Emma.

3.2 The Return Period of Storm Emma

To answer the question as to how rare was Storm Emma wind speed requires a reasonably long data set to undertake an extreme value analysis. The RAF Valley data set is more than thirty years but the site is sheltered from the ENE direction and thus this site is unlikely to give an accurate view of the return period of winds for wave generation at Holyhead. Examining the frequency table of winds speed by direction produced by the Met Office for this site shows that for the sector 45° to 75° there were no events with wind speeds of 36 knots or greater in the last 30 years. There was only one hour of 35 knots from this direction prior to storm Emma which had 3 hours of 36 knots. RPS analysis of the Valley data suggests that the records indicate a return period for storm Emma of about 1 in 50 years but, as explained earlier, due to the sheltered nature of this site we think that this is likely to be an underestimate.

The M2 weather buoy has been in position since 2002 and the wave heights recorded at this buoy during storm Emma were some 35% greater than any other wave height record at the buoy for East to North East storms. Since the waves arriving at Buoy M2 during East to North East storms are the results of winds generated over the fetches across the Irish Sea adjoining Anglesey and North Wales an extreme value analysis of the wave climate at the M2 buoy for the North East to East sector can be used to indicate the likely return period on any of the North East to East storms. RPS has undertaken a peak over threshold analysis of the wave heights for waves from the North East to East sector at the M2 buoy using the Mike EVA toolbox. The probability plot from the analysis is shown in Figure 3 with the Storm Emma event ringed in blue. It will be seen from this diagram that the storm Emma is an outlier and that its return period would be about 1 in 75 years. This ties in well with observations in that no one who has lived around Holyhead has seen conditions similar to those encountered during storm Emma before.

The analysis outlined above uses historical data and the return period is only relative to historical data. We are now in a period of climate change when rising sea temperatures are likely to significantly increase the frequency of occurrence of extreme storm events. Indeed during the winter of 2017/18 the UK and Ireland have seen unprecedented events in that a hurricane (Ophelia) came directly north to the British Isles rather than heading west to America and this was followed by Storm Emma which also came north. It is lucky for Holyhead that Ophelia ran up the west coast of Ireland rather than up the Irish Sea. These events are most likely linked to changes in sea temperatures due to climate change and therefore one must expect that extreme events like storm Emma will become more frequent in the future.

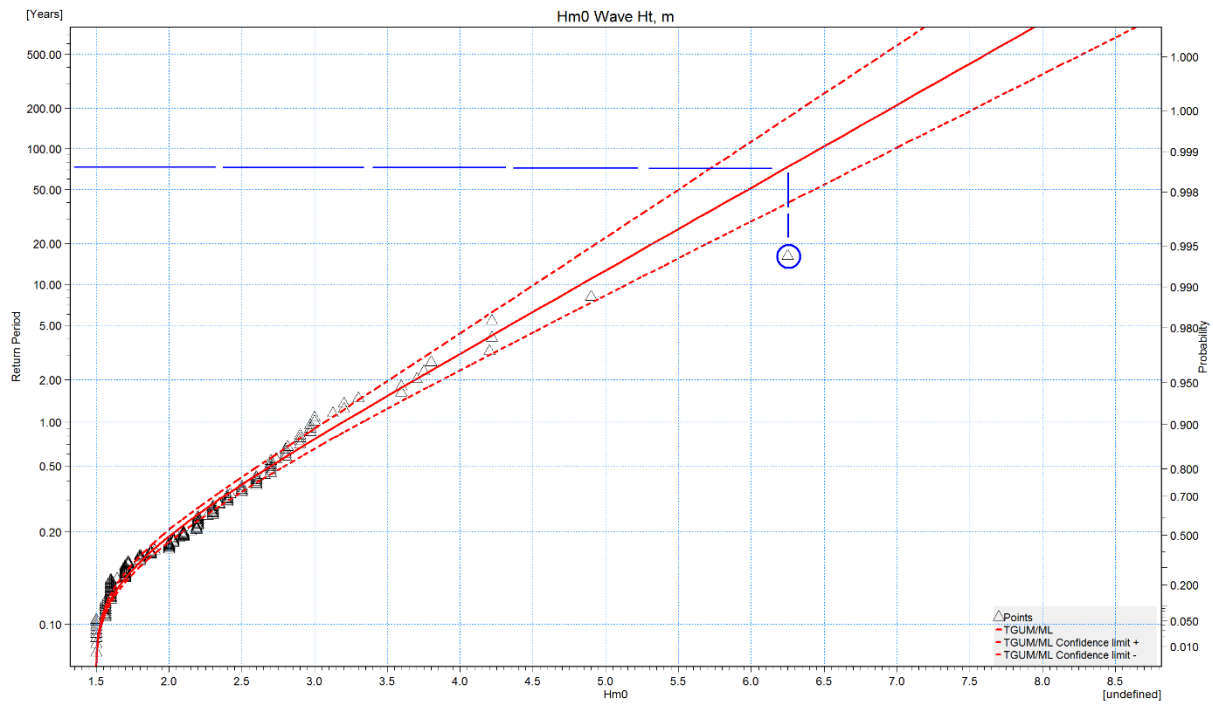


Figure 3 Extreme value analysis of NE-E sector wave heights at weather buoy M2

4.0 WAVE MODEL AND BATHYMETRY

4.1 Wave Model Software

MIKE21 SW

The modelling of the wave generation across the fetches to the site area was undertaken using the MIKE 21 SW model which is a new generation spectral wind-wave model based on unstructured meshes. The model simulates the growth, decay and transformation of wind-generated waves and swell in offshore and coastal areas.

MIKE 21 SW includes the following physical phenomena:

- Wave growth by action of wind
- Non-linear wave-wave interaction
- Dissipation due to white-capping
- Dissipation due to bottom friction
- Dissipation due to depth-induced wave breaking
- Refraction and shoaling due to depth variations
- Diffraction
- Wave-current interaction
- Effect of time-varying water depth and flooding and drying
- A simplified method of including wave energy reflection

The discretization of the governing equation in geographical and spectral space is performed using a cell-centred finite volume method. In the geographical domain, an unstructured mesh technique is used. The time integration is performed using a fractional step approach where a multi-sequence explicit method is applied for the propagation of wave action.

MIKE 21 SW includes two different formulations:

- Directional decoupled parametric formulation
- Fully spectral formulation

The fully spectral formulation was used in the simulations. This formulation is based on the wave action conservation equation, as described in e.g. Komen et al. (1994) and Young (1999), where the directional-frequency wave action spectrum is the dependent variable.

4.2 Bathymetry

Wave model

Flexible mesh technology was employed for the model bathymetry to enable the model grid to be adjusted over the model area to allow the most detail to be included in the areas of the model where it is required. The bathymetry of the overall model used for this study is shown in Figure 4. The model had cell sizes ranging from 22,500m² to 225m² as shown in Figure 5. The bathymetry data for the model was taken from a variety of sources including the INSPIRE data sets from the UK Hydrographic office and digital chart data from C-Map of Norway.

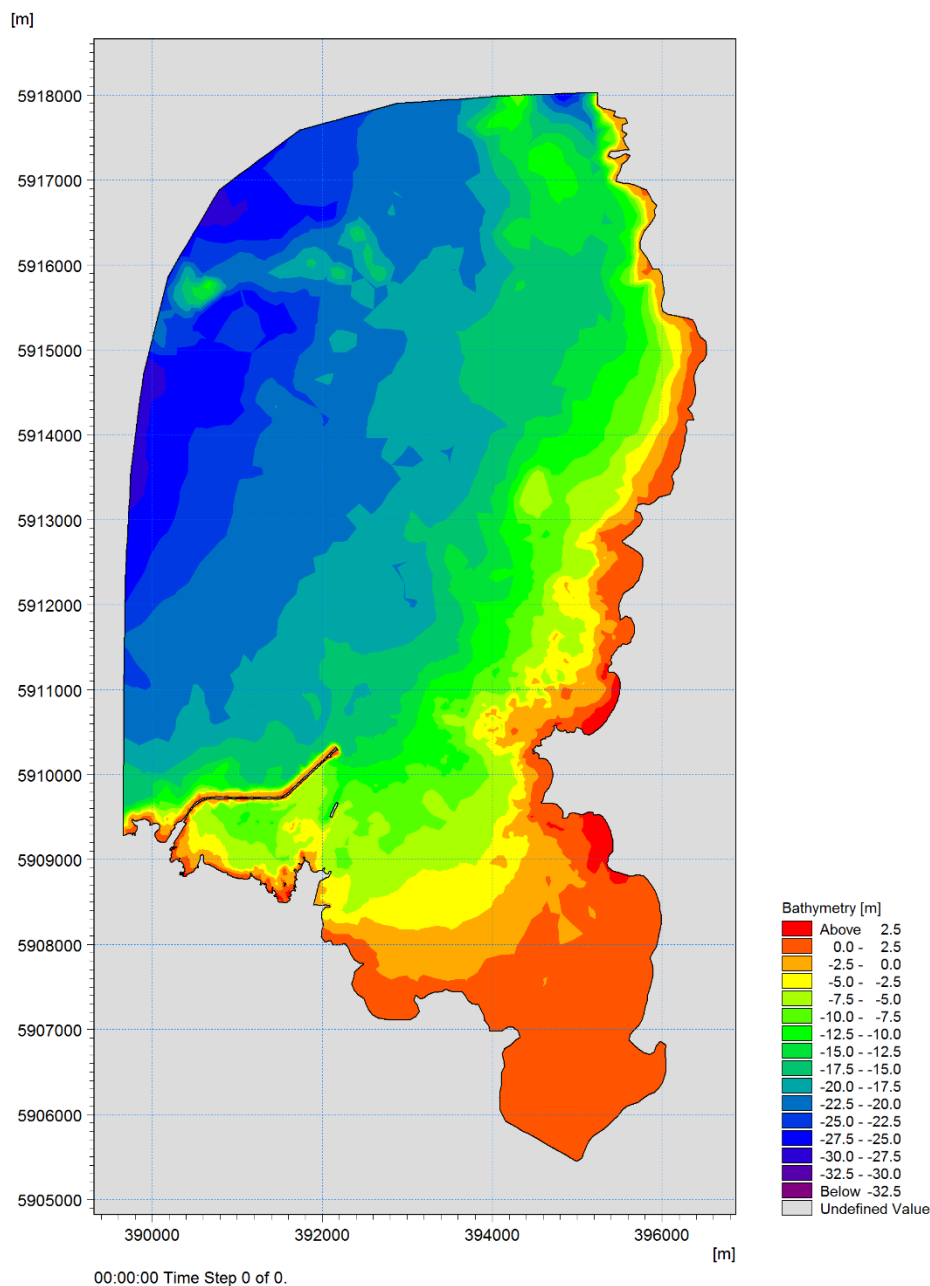


Figure 4 Bathymetry of the wave model of Holyhead and its approaches

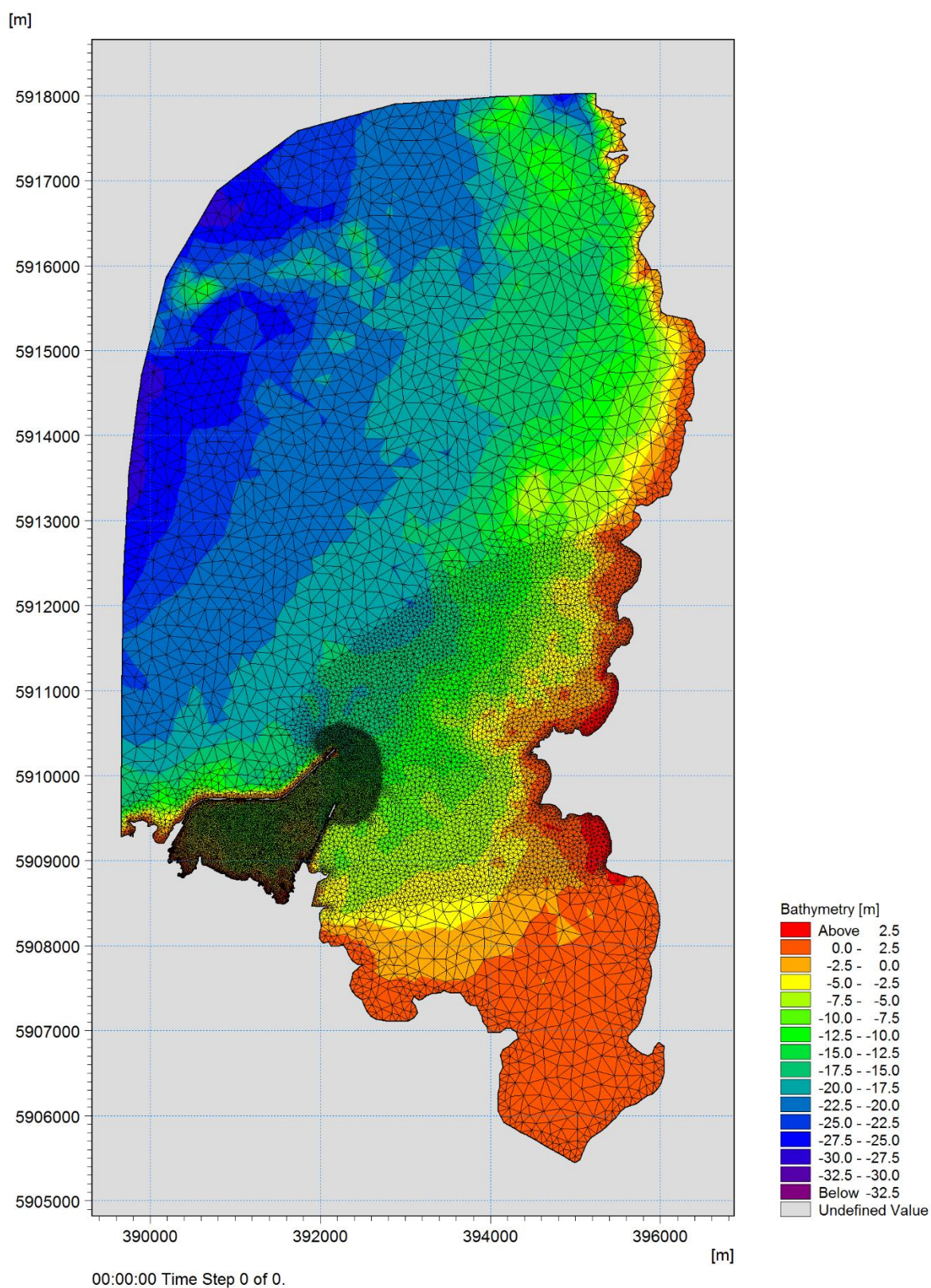


Figure 5 Mesh of the Holyhead wave model

5.0 WAVE MODELLING PROCEEDURE

The storm wave climate at the site was calculated using the latest wave spectral analysis techniques using the Mike21 SW wave model. The wind speeds used in the model were based on the records from Stena's weather station which, at the time of the storm, was located on the lighthouse at the end of the main Holyhead breakwater. The peak of the storm Emma occurred at low tide at about 04.00 hrs on the 2nd March 2018. However even at around 7.30 am the mean wind speeds were about 55 knots with sustained gust in excess of 65 knots. These wind speeds were adjust to suit the standard 10m gauge height and used in the Mike SW model to simulate the wave climate around the harbour with a tidal level of 4m CD which was the tidal level at this time.

The wave model was set up to include the effects of wave diffraction and wave energy reflection from the inner face of the existing breakwater structure around the marina site area. The marina structures were not included in the model as the purpose of the model was to assess the incoming wave climate to the marina site. Furthermore the wave length of the storm waves were such that there would very little attenuation of these storm waves provided by the 4m wide concrete breakwater structures which were on site at that time.

Figure 6 shows the predicted significant wave heights and mean wave direction around the harbour during Storm Emma. Although the wind direction measured at the Stena weather station gauge during the storm was from about 63°N, due to the area of open water to the north of the entrance to Holyhead harbour the mean wave direction of the waves entering the harbour was more from the North East.

It will be seen that the significant wave heights in the marina area are likely to have been in excess of 1.5 metres during this storm.

The spectral peak wave periods around the harbour are shown in Figure 7. Waves with peak wave periods of almost 4 seconds are predicted to have occurred in the marina area during this storm.

Following on from the modelling of storm Emma the wave model was run for what RPS considers should be the design conditions for any replacement for the marina.

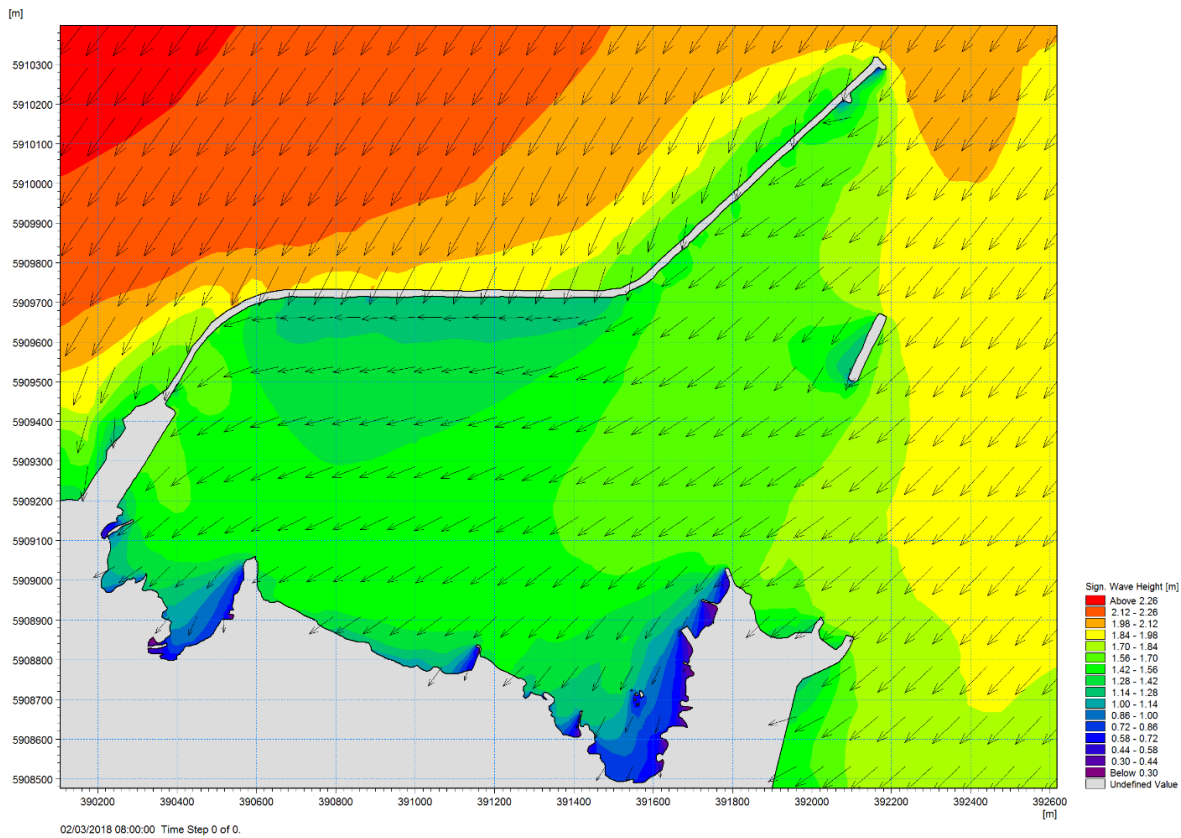


Figure 6 Predicted significant wave height and mean wave direction during Storm Emma

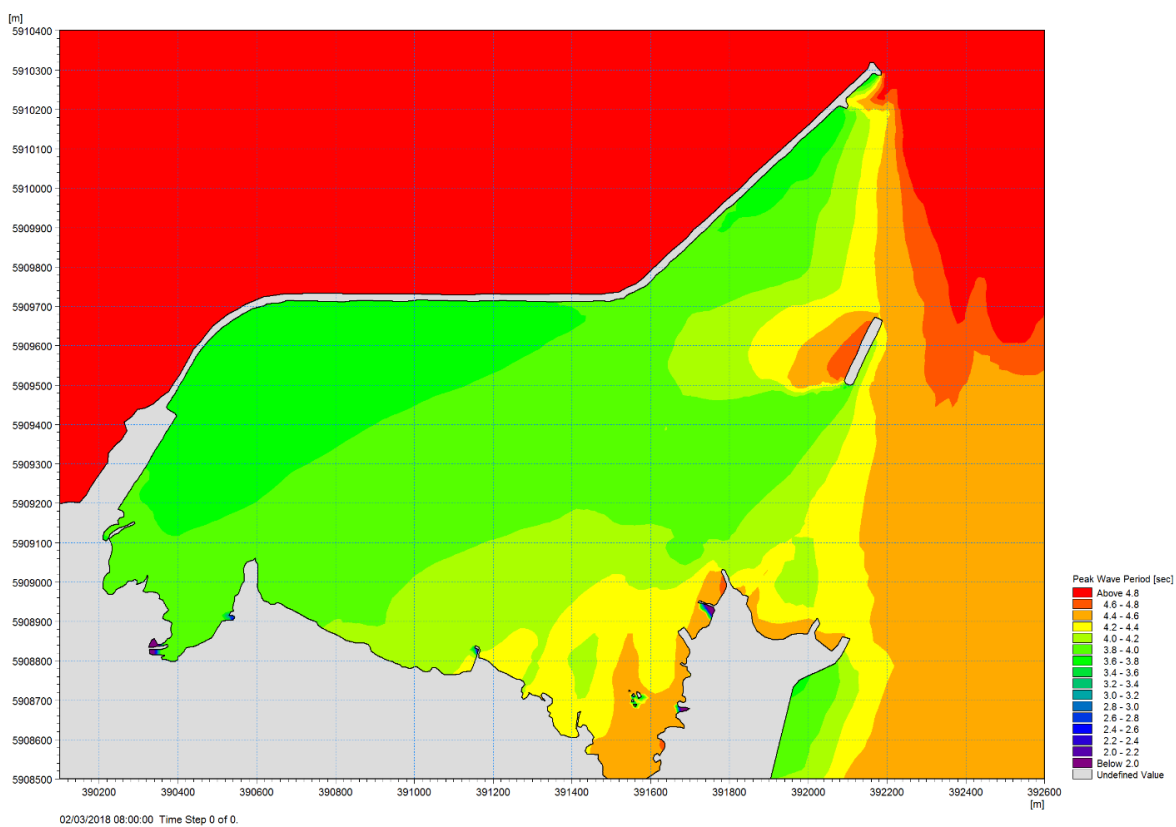


Figure 7 Predicted spectral peak wave periods during storm Emma

6.0 RESULTS OF WAVE SIMULATIONS AND IMPLICATION FOR THE MARINA

6.1 Storm Emma Wave Climate at the Marina Site

The wave climate predicted to have occurred during storm Emma has the following parameters:

Significant wave height	H _{m0}	1.57 metres
Maximum wave height	H _{max}	3.05 metres
Spectral Peak wave period	T _p	3.86 seconds
Mean Energy wave period	T _{m10}	3.50 seconds
Wave length		24 metres

From the above it will be seen that the wave climate predicted to have occurred at the marina site during storm Emma is extremely severe for what would have been considered to be a sheltered site. RPS would not recommend floating protections structures for the protection of a marina in such a severe wave climate. Even if you could have obtained a 40% attenuation with the 4m wide breakwaters the wave climate in the marina would have had significant wave heights in excess of 0.9m at the pontoon berths. This is away above any recommended wave height for such berthing systems and severe damage to any moored vessel is bound to have occurred irrespective of any failure of the breakwaters themselves.

Our examination of the calculations for the mooring system indicates that although the wave heights were in excess of those used in the design, there is enough resilience in the system that we think that the mooring would have survived in storm Emma's conditions. Our view is that with very large maximum wave heights, in excess of 3 metres, it is unlikely that the concrete breakwater system could survive such a large overload. This large breaking wave would probably snap any joint system that could be used on such floating structures irrespective of any reasonable amount of maintenance that could be undertaken.

6.2 Future Design Conditions for a Marina at the Site in Holyhead

RPS has examined the design conditions which we think will be required for a marina at the site of the existing marina at Holyhead. Based on historical data these conditions would have had a return period approximating to 1 in 200 years. However we are already seeing the effects of climate change on wave heights in the Irish Sea thus we think that within the life time of the marina the 1 in 200 year

events likely to have a lower return period due to the effects of increased storminess due to climate change.

The recommended wind and wave data for a redesigned marina should be at least as follows.

- 3 second gust speed 48m/s
- 30 second gust speed 38 m/s
- Significant wave height 1.80 metres
- Maximum wave height 3.50m
- Spectral Peak wave period 4.2 seconds
- Mean energy wave period 3.8 seconds

These conditions in our opinion are too severe for the safe use of floating breakwaters as the primary protection. We recommend that the marina be protected by a fixed rubble mound structure. Subject to detailed modelling it may be possible to use floating breakwaters for secondary protection measures.

7.0 CONCLUSIONS

The wind speeds and directions that occurred at various sites around Anglesey during storm Emma have been analysed to provide the data for wave modelling of the wave climate at the marina site at Holyhead.

Extreme value analysis methodology has been used to assess the return period for the Storm Emma at Holyhead. The best estimate is that storm Emma was a 1 in 75 year return period event.

The wave climate at the marina site during storm Emma has been simulated using advanced wave modelling techniques. The wave climate was predicted to have had significant wave heights of 1.57 metres with spectral peak wave periods of 3.8 second and wave lengths of about 24 metres. The maximum wave height at the site that is likely to have occurred during the storm was 3.05 metres.

It is considered that the wave conditions at the marina site were so severe during the storm that even with the breakwaters in place vessels would have been subjected to wave heights in excess of 0.9 metres at the berths. These conditions are away above any recommended limit for pontoon berthing and severe damage to vessels would have been expected even if the breakwaters remained in place.

Examination of the mooring design suggest that the mooring had sufficient resilience that they would have been capable of withstanding the loads imposed during storm Emma. However the maximum wave height is so large that we consider that it was inevitable that the joints between the breakwaters would fail leading to a breakup of the marina infrastructure.

RPS has developed design wind and wave conditions for any rebuild of the Holyhead Marina which include some allowance for increased storm frequency due to climate change. This analysis suggest that the marina should be designed for a significant wave height of at least 1.8 metres with maximum wave heights of at least 3.5 metres. These conditions are considered to be far too severe to allow the use of floating breakwaters as the primary protection for the pontoon berthing area and the use of a fixed rubble mound type structure is recommended. Subject to detailed modelling it may be possible to use floating breakwaters for secondary protection measures.

Appendix E – Listed Buildings

No	CADW Record No.	Name	Designation	Grade	Location	Broad Class	Report
1	5413	St Cybi's Church	26/09/1951	I	In churchyard overlooking inner harbour, entered by archway from Market Square.	Religious, Ritual and Funerary	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=5413
2	5414	Capel y Bedd	26/09/1951	II	In churchyard overlooking inner harbour, entered by archway from Market Square. To S of St Gybi's Church near archway to churchyard.	Religious, Ritual and Funerary	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=5414
3	5415	Walls of upper churchyard	26/09/1951	I	Between Stanley Street and Victoria Road enclosing St Gybi's Church, and Capel-y-Bedd, entered by gateway from Market Square.	Religious, Ritual and Funerary	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=5415
4	5417	Skinner Monument	26/09/1951	II	Overlooking harbour on rocky outcrop; reached via steps on Turkey Shore Road.	Commemorative	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=5417
5	5724	NO 2, VICTORIA TERRACE, VICTORIA TERRACE,,,,,GWYNEDD,	07/09/1973	II	At junction of Victoria Road and Market Street.	Commercial	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=5724
6	5726	Tanalltran Cottages	06/08/1979	II	To E of Plas Alltran (see Turkey Shore Road).	Domestic	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=5726
7	5727	Plas Alltran	06/08/1979	II	On acutely angled corner site between Turkey Shore Road and Llanfawr Road.	Domestic	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=5727
8	5728	Stable Block to Plas Alltran	06/08/1979	II	To E of Nos 1 & 2 Turkey Shore Road.	Domestic	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=5728
9	5729	,1,TURKEY SHORE ROAD,Holyhead,,GWYNEDD,	06/08/1979	II	To E of Plas Alltran.	Domestic	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=5729

10	5734	Fitting, Boiler and Smithy Shops	17/10/1986	II	Opposite Water Street. Irregular group of 3 parallel ranges to rear (NW) of office and stores building, the Smithy overlooks Victoria Road.	Commercial	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=5734
11	5735	Office and Stores Building	17/10/1986	II	Part of a large group of marine workshop buildings opposite Water Street, this block behind Fitting, Boiler, and Smithy Shops facing harbour.	Commercial	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=5735
12	5736	Sailmakers, Seamstresses and Polishers Workshops	17/10/1986	II	Opposite Cross Street.	Commercial	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=5736
13	5737	Store, Old Boiler Shop & Sawmill buildings at Marine Yard	17/10/1986	II	Opposite Water Street.	Commercial	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=5737
14	5741	Ucheldre Centre (Former Bon Sauveur Convent Chapel),	04/05/1989	II		Religious, Ritual and Funerary	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=5741
15	5743	Holyhead Breakwater	19/07/1988	II*	Enormous Z-plan breakwater (2.4km long) stretches into Holyhead bay from Soldier's Point, NW of town centre.	Maritime	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=5743
16	5744	Lighthouse on Holyhead Breakwater	19/07/1988	II	Set on ovoid platform forming the outer end of the long breakwater stretching into Holyhead Bay.	Maritime	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=5744
17	5763	Market Hall	24/04/1992	II	In town centre on sloping site. Set back and above the street behind single storey shops; side and rear elevations to Summer Hill and Trearddur Square.	Commercial	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=5763
18	5771	Customs House	11/03/1993	II	Situated within the security zone of the Port of Holyhead, facing south across the inner harbour that is now the ferry terminal. Adjacent to Harbour Office.	Civil	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=5771

19	5772	Harbour Office	11/03/1993	II*	Situated within the security zone of the Port of Holyhead, facing south across the inner harbour that is now the ferry terminal. Adjacent to Customs House.	Maritime	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=5772
20	5773	George IV Arch	11/03/1993	II*	Situated within the security zone of the Port of Holyhead, to the east of the Harbour Office and Customs House and facing the end of the Admiralty Pier.	Commemorative	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=5773
21	14726	Stanley House	26/09/1951	II	At SE corner of Churchyard, adjacent to entrance arches, with rear facing over Holyhead inner harbour.	Domestic	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=14726
22	14727	The Captains Table	26/09/1951	II	At SE corner of Churchyard, adjacent to entrance arches, with rear facing over Holyhead inner harbour.	Domestic	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=14727
23	14728	Ty'n Parc	04/05/1989	II		Domestic	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=14728
24	14729	Zodiac Restaurant	25/07/1994	II	On rocks below Beach Road NE of junction with Walthew Avenue.	Commercial	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=14729
25	14730	Trinity House Office	25/07/1994	II	Below Beach Road near sailing club; in walled enclosure.	Commercial	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=14730
26	14731	Trinity Yard Large Workshop	25/07/1994	II	Below Beach Road near sailing club; in walled enclosure.	Commercial	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=14731
27	14732	Trinity Yard Small Workshop	25/07/1994	II	Below Beach road near sailing club; in walled enclosure. Aligned SW-NE, to rear of large workshop, at right angles.	Commercial	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=14732

28	14733	Ebenezer Chapel	25/07/1994	II	Approximately 100m S of junction with Cytir Road. Behind low wall with stone posts, iron railings and gates.	Religious, Ritual and Funerary	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=14733
29	14734	Tanalltran Cottages	06/08/1979	II	To East of Plas Alltran (see Turkey Shore Road).	Domestic	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=14734
30	14735	Clock Turret in Station Approach	25/07/1994	II	In forecourt of entrance to Holyhead station and ferry terminal, reached via incline from main bridge over railway.	Gardens, Parks and Urban Spaces	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=14735
31	14736	Caernarfon Castle P H	25/07/1994	II	At top of Summer Hill facing down towards Stanley Street.	Commercial	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=14736
32	14737	Tabernacl Chapel	25/07/1994	II	On corner with Baptist Street.	Religious, Ritual and Funerary	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=14737
33	14738	Hyfrydle Chapel (including Forecourt Gates and Railings)	25/07/1994	II	In prominent position near top of Thomas Street, on corner of Ucheldre Avenue. Behind forecourt with stone piers and iron gates and railings (from Blackbridge Foundry, Holyhead) dated 1888.	Religious, Ritual and Funerary	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=14738
34	14739	Train Shed at Holyhead Station	25/07/1994	II	On E side of inner angle of Holyhead inner harbour.	Transport	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=14739
35	14740	,2,TURKEY SHORE ROAD,Holyhead,,GWYNED D,	06/08/1979	II	To East of Plas Alltran.	Domestic	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=14740
36	14741	Pillbox near Skinner's Monument	25/07/1994	II	On high ground 80m to S of Skinner Monument.	Defence	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=14741
37	14742	South Pier	25/07/1994	II	To S of Admiralty Pier; reached via Turkey Shore Road.	Maritime	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=14742

38	14743	Stanley Cottages	25/07/1994	II	On corner of Tyn Pwll Road and Cytir Road. U-plan layout of three ranges. Nos 1&2 face Tyn Pwll Road, Nos 3-5 face Cytir Road, no 6 faces side lane.	Domestic	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=14743
39	14744	Stanley Cottages	25/07/1994	II	On corner of Tyn Pwll Road and Cytir Road. U-plan layout of three ranges. Nos 1&2 face Tyn Pwll Road, Nos 3-5 face Cytir Road, no 6 faces side lane.	Domestic	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=14744
40	14745	Stanley Cottages	25/07/1994	II	On corner of Tyn Pwll Road and Cytir Road. U-plan layout of three ranges. Nos 1&2 face Tyn Pwll Road, Nos 3-5 face Cytir Road, no 6 faces side lane.	Domestic	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=14745
41	14746	Stanley Cottages	25/07/1994	II	On corner of Tyn Pwll Road and Cytir Road. U-plan layout of three ranges. Nos 1&2 face Tyn Pwll Road, Nos 3-5 face Cytir Road, no 6 faces side lane.	Domestic	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=14746
42	14747	Stanley Cottages	25/07/1994	II	On corner of Tyn Pwll Road and Cytir Road. U-plan layout of three ranges. Nos 1&2 face Tyn Pwll Road, Nos 3-5 face Cytir Road, no 6 faces side lane.	Domestic	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=14747
43	14748	Stanley Cottages	25/07/1994	II	On corner of Tyn Pwll Road and Cytir Road. U-plan layout of three ranges. Nos 1&2 face Tyn Pwll Road, Nos 3-5 face Cytir Road, no 6 faces side lane.	Domestic	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=14748
44	14749	Cenotaph	25/07/1994	II	Opposite Victoria Terrace.	Commemorative	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=14749
45	14750	Lower Churchyard Walls and Gateway	25/07/1994	II	Below St Cybi's Church, parallel to road enclosing lower level of churchyard.	Religious, Ritual and Funerary	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=14750

46	14751	NO 3, VICTORIA TERRACE, VICTORIA TERRACE,,,,,GWYNEDD,	07/09/1973	II	At junction of Victoria Road and Market Street.	Commercial	http://cadwpublic- api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=147 51
47	14752	NO 4, VICTORIA TERRACE, VICTORIA TERRACE,,,,,GWYNEDD,	07/09/1973	II	At junction of Victoria Road and Market Street.	Commercial	http://cadwpublic- api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=147 52
48	14753	NO 5, VICTORIA TERRACE, VICTORIA TERRACE,,,,,GWYNEDD,	07/09/1973	II	At junction of Victoria Road and Market Street.	Commercial	http://cadwpublic- api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=147 53
49	14754	NO 6, VICTORIA TERRACE, VICTORIA TERRACE,,,,,GWYNEDD,	07/09/1973	II	At junction of Victoria Road and Market Street.	Commercial	http://cadwpublic- api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=147 54
50	14755	Gunpowder Magazine	25/07/1994	II	To N of road to Breakwater Country Park, approximately 200m W of bridge over road.	Industrial	http://cadwpublic- api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=147 55
51	14756	Cottage on corner of Pentre Pella (including Foregardem Wall)	25/07/1994	II	In settlement on lower slopes of Holyhead Mountain, above south stack road. On S corner of Pentre Pella, at R of row, facing SE.	Domestic	http://cadwpublic- api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=147 56
52	14757	Admiralty Pier (including Sea Wall between Salt Island Bridgea and George IV Arch)	25/07/1994	II	At NE end of Victoria Road, projecting E into harbour.	Maritime	http://cadwpublic- api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=147 57
53	14758	Lighthouse on Admiralty Pier	25/07/1994	II	At the E end of Admiralty Pier.	Maritime	http://cadwpublic- api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=147 58
54	14759	Porthyfelin House	25/07/1994	II	Approximately 200m NW of junction of Porth-y-Felin Road and Beach Road with main front facing E (away from road).	Domestic	http://cadwpublic- api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=147 59
55	14760	Soldier's Point House	25/07/1994	II	Close to landward end of great breakwater. In extensive grounds which include garden walls and ornaments in similar style to grand screen wall to N of house.	Domestic	http://cadwpublic- api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=147 60

56	14761	Screen Wall to Soldier's Point House	25/07/1994	II	To N and NW of Soldier's Point House.	Domestic	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=14761
57	16526	Bridge Over Railway near Ty Mawr Farmhouse	01/11/1995	II	Carries footpath over main railway line near Ty Mawr Farm.	Transport	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=16526
58	20076	Former powder magazine for fog signalling station and enclosure walls	30/06/1998	II	Located on the NE corner of Holy Island, on the edge of high cliffs, in an enclosure bounded by a low stone wall. Reached via a rough track over the headland.	Maritime	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=20076
59	20077	Ffynnon y Wrach	30/06/1998	II	Set back slightly from the SE side of the road below Holyhead mountain, SW of Holyhead.	Water Supply and Drainage	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=20077
60	87587	Cybi Building, Holyhead High School	13/03/2009	II	North-west of the town centre, opposite the main buildings of Ysgol Uwchradd Caergybi.	Education	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=87587
61	87588	Boundary Wall to Cybi Building, Holyhead High School	13/03/2009	II	Defines the boundary of the school grounds to South Stack Road and to the west, and encloses the former head-masters house (Gwynant) to the east.	Education	http://cadwpublic-api.azurewebsites.net/reports/listedbuilding/FullReport?lang=en&id=87588