



MILFORD HAVEN WATERWAY
ENVIRONMENTAL SURVEILLANCE GROUP

GRŴP CADW GOLWG AMGYLCHEDDOL
AR DDYFRFFORDD ABERDAUGLEDDAU



Annual Report 2018



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COVER IMAGES

Front cover: 25th anniversary celebratory cake with shelduck

Rear cover: Attendees at the 25th anniversary event, April 2018

MILFORD HAVEN WATERWAY ENVIRONMENTAL SURVEILLANCE GROUP

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Pembrokeshire Coast National Park Authority
Pembrokeshire County Council
Port of Milford Haven
Puma Energy Ltd
RWE Generation UK plc
South Hook LNG Terminal Company LTD
Valero Energy Ltd
Valero Pembrokeshire Oil Terminal Ltd

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 UK Marine Monitoring and Assessment Strategy secretariat
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 Skomer MCZ Advisory Committee Chair
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Milford Haven Waterway Environmental Surveillance Group Report 2018

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Chair's Foreword

2018 began with the enjoyable task of planning an event to mark the 25th anniversary of the MHWESG. These last 25 years in the waterway have seen the Sea Empress oil spill, industries come and go, as well as the merging of statutory authorities. Individual members of the MHWESG over the years have also inevitably changed, but support for the group has remained a constant. This has been helped by the clear mandate set out by the founding members back in 1991, which remains relevant today:

'To provide high quality environmental information to contribute to the maintenance and enhancement of the rich and diverse marine environment of the Waterway.'

Twenty-five years is enough time to road test the effectiveness of a working model where members of a group contribute a relatively modest sum of money to a collective pot, and the money is then put to a common cause not ordinarily affordable by individual members. It is by this collaborative style of working that the MHWESG has managed to successfully identify and commission projects over the years. Members in return have access to the data for their own internal needs e.g. inclusion in Environmental Impact Statements, marine licence applications, environmental reporting etc. There is no getting away from the fact that high quality data costs money, and so it should when you consider the skills and experience it involves. From that perspective, I can say confidently that members get a good return on their investment.

The 25th anniversary was also a mark in the sand for the end of Blaise Bullimore's tenure as the group's first Project Manager and for when the reins were handed over to another local marine biologist, Aethne Cooke. To say that the group is indebted to Blaise does not do justice to his hard work and dedication to the many complex tasks that have been successfully tackled over the years. We wish him many enjoyable underwater excursions.

As members of the MHWESG, we are all busy with our day jobs, and finding time to serve the needs of the group is not always easy to come by. The 25th anniversary event provided the opportunity to remind us why the group was first established and to take stock of the surveillance work that has been commissioned, reviewed and curated over the years. As part of this 'stock-taking' the group invited the renowned bird scientist Professor Tim Birkhead to review the value of long-term monitoring and surveillance based on his insights from 40 years of monitoring guillemots on Skomer Island. All his key messages chimed with the work of the group - and one especially so: the need for improved scientific rigour in long-term monitoring studies. This has been a mantra of the group over the years, and it was reassuring to have it reaffirmed by Professor Birkhead. Another message was the particularly high value and usefulness of *longer-term* datasets. The group has a way to go to match the 40 years of Skomer guillemot surveillance data, but what is apparent is that the longer the duration of the dataset, the more insight gained.

And on that note, here's to another 25 years of the MHWESG!

Paul Howells, Dragon LNG Ltd

Chair MHWESG

Rhagair y Cadeirydd

Dechreuodd 2018 trwy gynllunio digwyddiad i ddathlu pen-blwydd MHWESG yn 25 oed. Yn ystod y pum mlynedd ar hugain hynny, mae'r ddyfrffordd wedi wynebu'r gollyngiad olew o'r Sea Empress, wedi gweld diwydiannau newydd yn agor ac eraill yn cau, a gwahanol awdurdodau statudol yn cael eu cyfuno â'i gilydd. Roedd yn anochel y byddai'r cyrff a oedd yn aelodau o MHWESG hefyd yn newid gyda'r blynyddoedd, ond mae'r grŵp wedi parhau i dderbyn cefnogaeth yr aelodau. Un ffactor a fu'n hynny oedd yr anogaeth eglur, a wnaed gan yr aelodau gwreiddiol yn 1991 ac sy'n parhau'n berthnasol heddiw, i:

'ddarparu gwybodaeth amgylcheddol o ansawdd uchel . . . er mwyn cyfrannu at ddiogelu a gwella amgylchedd morol cyfoethog ac amrywiol y Ddyfrffordd.'

Bu'r pum mlynedd ar hugain yn ddigon o amser I brofi effeithiolrwydd y model gweithredu, a barai bod aelodau'r grŵp yn cyfrannu symiau cymedrol o arian i gronfa gyfunol, ac a ddefnyddiai'r arian hwnnw wedyn at ddibenion cyffredin, a fyddai wedi bod yn anfforddiadwy i unrhyw aelod unigol. Trwy ddilyn y dull cydweithredol hwnnw dros y blynyddoedd y llwyddodd MHWESG i bennu a chomisiynu prosiectau. Yn gyfnewid am eu cyfraniad, caiff yr aelodau ddefnyddio'r data a gesglir at eu hanghenion mewnol eu hunain, er enghraifft trwy eu cynnwys mewn Datganiadau Effaith Amgylcheddol, ceisiadau am drwyddedau morol, neu mewn adroddiadau amgylcheddol, etc. Ni ellir osgoi'r ffaith bod darparu data o ansawdd uchel yn gostus; a chostus y dylai hynny fod, o ystyried yr holl sgiliau a phrofiad sy'n ofynnol. O'r safbwynt hwnnw, gallaf ddweud yn hyderus fod yr aelodau yn cael elw da o'u buddsoddiad.

Roedd y 25^{ain} pen-blwydd hefyd yn dynodi diwedd cyfnod Blaise Bullimore yn ei swydd fel Rheolwr Prosiectau cyntaf y grŵp, ac yn trosglwyddo'r awenau i ddwylo biolegydd morol lleol arall, sef Aethne Cooke. Annigonol fyddai dweud bod dyled y grŵp i Blaise yn fawr. Prin y byddai hynny'n gwneud cyfiawnder â'i holl waith caled a'i ymgysgriad i'r llu o dasgau cymhleth a gyflawnodd yn llwyddiannus dros y blynyddoedd. Dymunwn iddo lawer o deithiau tanddwr pleserus yn y dyfodol.

Fel aelodau MHWESG, rydym i gyd yn brysur yn ein swyddi beunyddiol ac nid yw'n hawdd canfod amser i gyflawni anghenion y grŵp bob tro. Rhoddodd achlysur y 25^{ain} pen-blwydd yn gyfle i atgoffa ein hunain o'r rheswm gwreiddiol dros sefydlu'r grŵp, ac i ailystyried y gwaith goruchwyllo a gomisiynwyd, adolygwyd a churadwyd dros y blynyddoedd. Yn rhan o'r 'ailystyriaeth' honno, gwahoddodd y grŵp y gwyddonydd adar enwog, yr Athro Tim Birkhead, i adolygu gwerth monitro a goruchwyllo hirdymor, yng ngoleuni'r 40 mlynedd y bu'n monitro gwylogod ar Ynys Sgomer. Roedd pob un o'i negeseuon allweddol yn cydgordio â'r gwaith a wneir gan y grŵp – yn enwedig un neges, sef bod angen gwella manwl gywirdeb gwyddonol mewn astudiaethau monitro hirdymor. Dyna oedd mantra'r grŵp trwy gydol y blynyddoedd, ac yr oedd yn galonddid clywed yr Athro Birkhead yn ailddatgan hynny. Neges arall oedd fod gwerth a defnyddioldeb arbennig yn perthyn i setiau o ddata *hirdymor*. Mae gan y grŵp ffordd bell i fynd cyn y bydd ei ddata yntau yn cymharu â'r 40 mlynedd o ddata am wylogod Sgomer, ond po hwyaf fydd parhad y set ddata, mwyaf fydd y mewnwelediad a enillir.

Gan ddweud hynny, edrychwn ymlaen at 25 mlynedd nesaf MHWESG!

Paul Howells, Dragon LNG Ltd

Cadeirydd MHWESG

1. Introduction

This is the eighteenth annual report of the Milford Haven Waterway Environmental Surveillance Group. It covers the period January to December 2018.

A description of the celebratory event to mark the 25th anniversary of the MHWESG is covered in 2.1. This event also marked the retirement of Blaise Bullimore as project manager for the MHWESG and a tribute to his work for the group is included in 2.2. A brief review of the MHWESG's work programme and the approach taken, is outlined in 2.3. Professor Tim Birkhead produced a review of the value of long-term surveillance and lessons learnt from a 40-year study of guillemots on Skomer Island (2.4). Although the subject matter of Professor Birkhead's study and those of the MHWESG differ, parallels can be drawn between the general principles that apply to the gathering of long-term data. A brief scope of a newly established sediment contaminant survey undertaken in 2018 is described in 2.5 followed by the well-established annual wetland bird surveillance projects (wildfowl and wader counts and the annual survey of summer shelduck populations) in sections 2.6 and 2.7 respectively.

Finally, other non-MHWESG surveillance-related work relevant to the Milford Haven waterway is included in Section 3 – where summaries of the SWEPT project (gathering of localised information on nitrate and phosphate pollution entering the Milford Haven waterway) and also Seasearch dives are included.

The full reports for all MHWESG commissioned work are available from mhwesg@gmail.com.

2. MHWESG report 2018

2.1 Celebratory event for 25th anniversary of MHWESG

Members of the Milford Haven Waterway Environmental Surveillance Group (MHWESG) came together in April 2018 to celebrate 25 years of successful collaborative working. The Port of Milford Haven hosted a celebratory event to mark the occasion with current group members and their senior representatives, as well as guests from Welsh Government, Universities and Welsh Water.

Whilst local industry and members of the MHWESG have changed over the years, the high level of commitment and purpose from individuals involved has continued throughout. As well as financial contributions, members have provided support through their expertise in project and financial management as well as scientific knowledge. Along with the many accomplished contractors involved over the decades, this collaborative approach has resulted in a series of high-quality datasets that provide a measure of the environmental health of the waterway. For this reason, attendance by contractors, current and retired group members and previous chairs at the event added to the completeness of the occasion.

Paul Howells (Dragon LNG Ltd and chair of the MHWESG), introduced a series of talks that showcased the work of the MHWESG over the years: Blaise Bullimore, the group's Project Manager explained the origin of the group and its achievements to date. This was followed by a talk from a previous member, Jane Hodges, who talked about the group's longest running project – the annual survey of summer shelduck populations in the waterway. Jane initiated these surveys back in 1992 when she worked as Ecologist for the Pembrokeshire Coast National Park Authority. The final talk was by the Port of Milford Haven's Environmental Manager, Jonanthan Monk, who spoke about how industry has used the group's data for their own individual business needs over the years and the benefits to be had from many contributing to a single financial resource.



Figure 1. Attendees at the 25th anniversary of the MHWESG, April 2018

2.2 Blaise Bullimore, MHWESG Project Manager retires

2018 marked the 25th anniversary year of the Milford Haven Waterway Environmental Surveillance Group (MHWESG). Regrettably 2018 also marked the year Blaise Bullimore retired from the role as the group's project manager.

Around these parts, the name 'Blaise Bullimore' is synonymous with protection of the seas around the Pembrokeshire coast and beyond - from Skomer Marine Nature Reserve to management of European Marine Sites, Seasearch, and the Sea Empress oil spill clean-up. The MHWESG has also been fortunate to have benefited from Blaise's expertise and passion for marine life and its protection – first as a contributor to project planning and later representing the Countryside Council for Wales for many years, followed by MHWESG project manager for a further 12 years.

Blaise has been there from the beginning and has been instrumental in shaping the group into what it is today. Over the years, there have been changes in membership as industries come and go, members retire or change jobs. Blaise's presence has ensured a level of continuity within the partnership, being familiar with its history and evolution.



Figure 2. Blaise in his favourite outfit.

Blaise has provided his scientific input into the design and implementation of most of the MHWESG's projects over the years - projects on bioaccumulation, bird surveys, benthos and infauna, sediment profiling and contamination. One of the most ambitious and expensive surveys undertaken was a sediment profile survey. This was carried out by the developer of the sediment profile imaging technique and involved flying half a ton of equipment from the developer's base in Seattle,

USA. Over a period of twelve days in May 2012, more than 550 stations were successfully sampled using a seabed penetrating camera system. It is worth mentioning here the warm gratitude in the sediment profile report for Blaise:

'for coordinating this entire effort, from initial inquiries back in 2009 to contract negotiations, in-country logistics/housing arrangements and final report review; his local knowledge and technical expertise combined with his friendship, hospitality, and winning personality helped to make this survey one of the best experiences our staff has ever had. We thank you all for a truly excellent adventure and memorable time.'

Blaise has also coordinated a suite of projects on sediment contaminants including forensic analysis of hydrocarbons, investigations into sediment transport and levels of contamination. Working alongside another consultant, these projects have spanned over a decade of work and required more than a degree of patience and tenacity to complete. Incomparable laboratory methods required the organisation of an intercalibration exercise whereby samples were analysed using modern and older laboratory techniques, ultimately enabling older data to be used in the development of a timeline for sediment contaminants going back to the late 1800s (using data from isotopic dating of deep sediment cores).

In 2015 the MHWESG's Memorandum of Agreement was out of date as the majority of member organisations had been subject to name changes, dissolution or merging, and no longer reflected the actual membership. So Blaise put away his survey equipment, sharpened his pencils and for the next two years negotiated with members' legal representatives a comprehensive 'Collaboration Agreement'. This agreement outlines the governance and *modus operandi* of the group, providing a framework for the MHWESG to operate within and addressing details such as financial management, liability and intellectual property rights etc. This Collaboration Agreement will underpin the MHWESG work going forward.

Paul Howell's, chair of the MHWESG, remarked that 'the success of the MHWESG is a group achievement. However Blaise's enthusiasm, thoroughness and conviviality over the years has unquestionably contributed to the successful collaborative approach demonstrated by the group'.

Soon after the 25th anniversary event held in April 2018, Aethne Cooke started as project co-ordinator. Aethne has worked as a marine biologist in Pembrokeshire for over 15 years and is also familiar with the Milford Haven waterway through survey work and various research projects. Aethne can still be contacted at the email address mhwesg@gmail.com.

2.3 Review of work programme 2018

Throughout its existence, the MHWESG has periodically paused to review and agree work programme priorities for an upcoming period. The 25th year of the group in 2018 was a timely occasion to undertake this task once again. Over 20 projects were included in the review, covering benthic and infaunal biology, bioaccumulation and ecotoxicology, bird surveys, sediment and water contaminants as well as projects relating to curation of the data itself. The review included:

- projects that are currently commissioned, either on a recurring annual or triennial basis
- projects recommended as follow-up projects to existing projects
- projects that have survived previous reviews, but have not been enacted (or continued)
- newly proposed projects

There are multiple criteria to consider when assessing the selection of priority projects. For example, all projects were considered in the context of statutory monitoring already being undertaken in the Milford Haven waterway by Natural Resources Wales to ensure that no duplication occurs. Industry business needs were considered, as well as the ability for any project to enhance an already existing dataset. Many of the group's existing projects have been ongoing for many years (e.g. annual summer shelduck populations, wetland birds, rocky shore surveys and macrofaunal surveys). The value of these long time-series projects increases with each further additional survey event and there is a strong rationale for continuing these projects.

Rather than ranking all projects in a priority order, projects that were of the highest priority and within the group's financial means to deliver were identified. A further list of priority projects was identified, which are clearly relevant to the surveillance of the environmental quality of the Milford Haven waterway, but finances do not allow these further projects to be progressed immediately. Project scopes for this latter group of projects will be developed regardless, with the intention that they will be implemented when finances and/or opportunities allow.

For example, there is support for undertaking analysis of contaminants in deep core sediments with isotopic dating. This project could determine the status over time of novel contaminants in sediments, as well as the status of banned contaminants such as tributyl tin (TBT) and dichloro-diphenyl trichloroethane (DDT). The group have provisionally agreed to develop a scope and costings for this work with a view to progressing when funds allow.

A recommendation from a review undertaken in 2003 (Bent 2003) was the need to periodically analyse and interpret data collected. The group has implemented this recommendation with the development of a sediment contaminant timeline (Little 2017), an analysis and review of sediment macrobenthic data (Warwick 2016) and regular reviews of wetland bird data (Haycock 2016). It is also planned to commission an independent evaluation and review of the annual summer shelduck surveys that have been carried out since 1992. The group intend to continue these periodic reviews when there is sufficient additional data gathered to warrant them.

The management and security of data was also considered as part of the group's work programming. It was agreed to develop a website to provide password protected access to reports, data and other relevant material. As well as providing a means to archive data, the

website will allow sharing of information between members without encountering security or size limit issues.

Having identified priority projects, the group must operate within its available finances, and continuing or initiating projects needs to be confirmed at the commissioning stage. Also to consider is the reality that environmental issues in the Milford Haven waterway continually evolve and unforeseen opportunities emerge. The group has the advantage that it's mode of operation allows it to respond to these changing demands and opportunities should that be considered necessary.

2.4 The Value of Long-term Monitoring and Long-term Research

T.R. Birkhead, University of Sheffield

EXECUTIVE SUMMARY

The long-term population study of guillemots that started on Skomer Island, Wales in 1972, has generated the necessary data to understand the population dynamics of this species. Guillemots across much of their geographic range are in decline because of climate change and deteriorating food resources. The long-term study on Skomer has created a large database that will, if continued, allow future researchers to assess and interpret future changes in the guillemot population. Such resources are rare.

Equally important, the insight gained from the guillemot study has identified lessons that are relevant to other long-term monitoring programmes. It is for this reason that the Milford Haven Waterway Environment Surveillance Group (MHWESG), a consortium of industry and public bodies, extended an invitation to capture these insights in this review. The MHWESG has undertaken surveillance of the quality of the marine physico-chemical environment, marine biology and ornithology of the Milford Haven waterway for the last 25 years, and potentially has a lot to gain from this information.

Key messages are that ultimately, data must inspire confidence among the end users. For this to happen, there is an absolute need for more scientific rigour and reproducibility in long-term monitoring studies. Monitoring also needs to be better valued as a component of mainstream science, particularly in these times of changing climate, increased human impacts and risk to the natural world.

SYNTHESIS

In a world in which environmental conditions continue to deteriorate as a result of direct and indirect human impact, monitoring the state of the natural world is more important than ever. It is ironic that as the need for monitoring has increased, the will to finance such work seems to have decreased. It is now almost universally recognized that the most ubiquitous environmental threat is climate change. This is apparent globally in terms of the increased risks of flooding and fires, but also more locally in terms of the advancement of 'spring' manifest in the earlier bud burst and flowering of plants and earlier breeding by birds. It is also apparent in the changes in the geographic distribution and availability of fish for seabirds, and the effect that extreme events have on survival and longevity of marine birds, for example.

Our understanding of environmental threats, including climate change, depends on the data from long-term monitoring programmes. For example, the BTO's bird surveys conducted since the 1960s allow us to see the extraordinary magnitude of the population reductions that have taken place since that time. Without this information we (and governments) may have been even more complacent than we are now about the negative impact of human activity on the natural world.

Long-term studies and long-term monitoring programmes are generally given low priority by governments partly because the goals of those agencies are usually short term, but also because long-term studies are revelatory only occasionally, for example, when an ecological catastrophe takes place. Thus, long-term studies and monitoring programmes can seem to be

using up resources to little effect. But that is an extremely short-sighted view, especially in the present day when environmental issues are more pressing than ever before.

Long-term studies and monitoring programs are like insurance policies: one continues to pay in year in year out, on the understanding that one day the policy might pay for itself. In the case of environmental issues, that pay back seems increasing likely. We cannot afford to fail to monitor the state of the natural environment. While it is neither feasible nor necessary to monitor all aspects of the environment, we need to identify priorities and continue to fund already-existing, tried and tested (i.e. scientifically robust), long-term studies.

Long-term studies allow us to continue to monitor on-going situations, but also to investigate environmental problems that we have not yet anticipated. When the long-term study of guillemots on Skomer Island started in the 1970s, no one had heard of climate change, yet that study provides some of the clearest evidence for an effect. Moreover, it also seems likely also that as the climate continues to change, more and more effects will be detected that can be usefully investigated using our 46-year database.

A final issue concerns the way monitoring is undertaken and valued. We need to stop thinking about monitoring as the poor relation to science, and instead start to recognize that to be useful and trustworthy, monitoring needs to be undertaken professionally and treated with the same respect and rigor as mainstream science. Good quality monitoring may sometimes be expensive, but monitoring is only worth doing if it is done appropriately. Bad data are worse than no data at all.

2.5 Sediment contaminant sampling, 2018

The MHWESG has commissioned numerous reviews relating to sediment contaminants in the Milford Haven waterway over the years (see Appendix 3). A consistent recommendation from these has been the need to establish surveillance of sediment contamination in the waterway as a core component of the group's routine environmental quality surveillance.

Having intercalibrated older and newer methods, and considered the historical baseline and trends in sediment contaminants (Little 2017), the group initiated a programme of routine sediment contaminant surveillance in September 2018. Dr. David Little was commissioned to provide advice on the scope of the laboratory analysis and sampling design.

Natural Resources Wales (NRW) undertook MHWESG's sediment sampling on this occasion at the same time as their own sediment sampling in 2018. It is hoped that this arrangement can continue, as apart from obvious financial and logistical benefits, this arrangement provides a more comprehensive representation of the waterway in any year. MHWESG's data can be used alongside NRW's data, but MHWESG's sampling strategy was designed such that it can stand alone from NRW's data to provide information specific to the needs of the MHWESG.

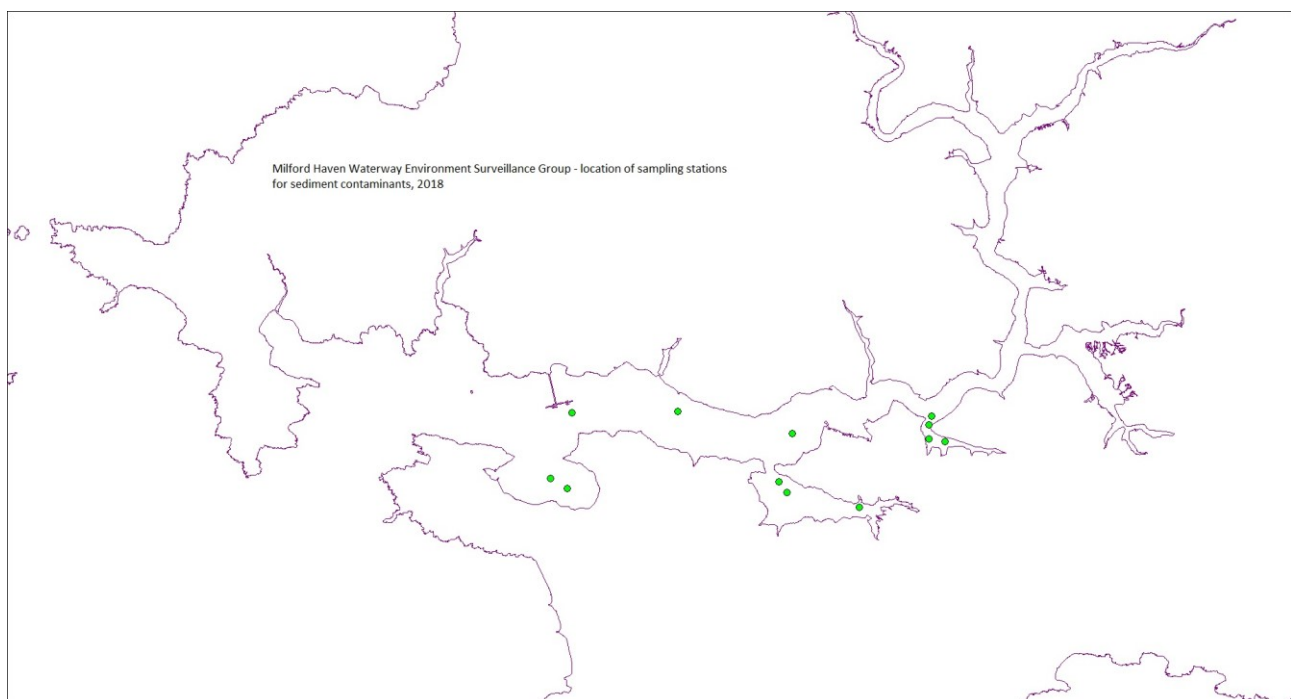


Figure 3. MHWESG sampling stations for contaminant analysis in the Milford Haven waterway, 2018.

Twenty-four sediment samples were collected from 12 locations in the waterway (5 replicates at 3 stations and 1 replicate at each of the 9 additional stations (see Figure 2 for locations of sampling stations)). Each sediment sample was analysed as follows:

- Total Hydrocarbons using UVF spectroscopy
- Polycyclic Aromatic Hydrocarbons by gas chromatography-mass spectrometry
- Metals using atomic spectroscopy
- Particle Size Analysis by laser diffraction
- Moisture content

Once a few sampling events have occurred, the data will be added to the established timeline of sediment contaminants (Little 2017). Sediment contamination data will also complement interpretation of macrobenthic surveillance undertaken by the group.



Figure 4. Natural Resources Wales staff taking sub-samples from larger Day Grab sample.

2.6 Daugleddau Estuary and Milford Haven Waterway: annual surveillance of summer shelduck populations 2018

Jane Hodges, Ecologist

Executive summary

The Daugleddau Estuary and Milford Haven waterway hold regionally important numbers of shelducks during the winter months. There is also a small summer population that has been the subject of annual surveillance carried out between 1991 and 2017. The summer shelduck survey was repeated in 2018 as part of a co-ordinated programme of environmental surveillance work in the estuary system. The aims, objectives and methods used to carry out the survey, together with the data obtained are described in this report.

The results indicate that in terms of the number of broods seen in the estuary system (11), the 2018 breeding season was a significant improvement on that of 2017. This suggests that the modest recovery in the numbers of broods observed between 2014 and 2016 (which followed a steady decline over several years) may have been resumed in 2018. The average brood size seen in 2018 (5.5) was however, the smallest recorded since 2014, and was considerably lower than in 2017 (8.9). This may indicate a resumption of a gradual decline in average brood size (a measure of productivity) following a recovery over the previous three breeding seasons.

As in previous years, predation (by avian and/or mammalian predators) is likely to have been a significant factor affecting the number and size of broods recorded in the estuary system in 2018. Adverse weather conditions (e.g. heavy rain accompanied by low temperatures) in May and June can impact on the survival of eggs to hatching and/or recently hatched ducklings. However poor weather conditions are not likely to have been a significant factor affecting the number of ducklings making it onto the water or their survival once on the water in 2018. Disturbance (on land and/or on the water) may have affected breeding success and subsequent survival of ducklings, although there is little evidence to suggest that this was the case in 2018. Other factors e.g. the presence of thick "mattresses" of green macro-algae (linked to elevated levels of nutrients in the estuary system) on mudflats at low tide and the re-distribution of sediments and contaminants as a result of anthropogenic activities may have had localised effects on access to and/or the quality of foraging habitat, hence on the fitness and survival of adult and young shelducks.

Since the mid-1990s, there has been a downward trend in the numbers of shelducks over-wintering in the UK. This national trend has been mirrored by a decline in the numbers of shelducks electing to over-winter in the estuary system. It is likely to be linked to factors such as the increasing tendency for birds to "short-stop" in mainland Europe in response to the recent trend in mild winters across Northeastern and Western Europe, and possibly to changes in the annual moult grounds. A consequence of the long-term downward trend in the numbers over-wintering in the estuary system has been that fewer birds have remained to breed. The WeBS data for the 2017/18 winter suggest however that, although the numbers of shelducks present in the estuary system was lower than the long-term average in most months, the long-term decline in the over-wintering population in the estuary system may be levelling off. The higher numbers of shelducks present at the end of the 2017/18 winter may explain the higher numbers of non-breeding shelducks recorded in June 2018 and result in higher numbers remaining to breed than in recent years.

Data collected for other wetland birds once again underlined the importance of the estuary system during migration, especially for species such as curlew.

The report concludes with a recommendation for the continuation of the annual surveillance of the summer shelduck population in the estuary system as part of the Milford Haven Waterway Environmental Surveillance Group's annual work programme. Potential lines of enquiry into the continued decline in the size of broods in particular (which is most likely to be linked to local environmental conditions) are suggested. It is also suggested that actions to address the high nutrient status of the waters of the estuary system be identified and implemented.

2.7 Wildfowl and wader counts on the Milford Haven Waterway, 2017-18.

Annie Haycock, Pembrokeshire WeBS Coordinator

Executive Summary

The Wetland Bird Survey was carried out on the Cleddau Estuary system between September 2017 and March 2018 with additional counts for June and July 2017 made by Jane Hodges during the annual survey of summer shelduck populations.

The methodology used followed that set out in the BTO WeBS Counters Handbook.

A total peak count of 26,556 birds between November and February confirms that the estuary system is still of international importance for its winter waterbird populations. Counts of migrating birds (notably curlew) in July takes this total to 27,435. This peak count is about average for the site, in winters when there is no great influx of lapwing and golden plover.

The levels of "National Importance" for many water birds were revised in 2011, and only four species now qualify (based on a five-year mean): wigeon (max. 8703 in November), teal (max 1812 in December), greenshank (max 39 in October), and Little Egret (68 in October).

Curlew (1244 in July) were at their lowest level since 1999-2000, a reflection of the decline recorded across their range.

Dunlin (3214 in December) reached the qualifying level in 2017-18 but were short based on the 5-year average. Shelduck (449 in March) is still well below the qualifying level.

Wigeon numbers seem to have recovered from the low counts in 2013-15, reaching their highest count since 2005-06. The peak count was in November, with numbers remaining higher than average in December. The reason for these changes is not yet known, however the Milford Haven waterway is not the only site to have experienced temporary reductions in numbers in recent years.

The total number of birds recorded in September and October was lower than the average of the past twenty years, except in November when the influx of wigeon boosted the total. Numbers remained similar to or just above average for the rest of the winter. However, there were considerable differences from month to month, and from species to species. This was particularly noticeable in March with very cold and windy weather conditions (the 'Beast from the East') caused many birds, particularly shelduck and teal, to pause in their migration.

Comparison of counts with the national report for 2016-17 (the most recent that is available) show that for most species, the local population trends are similar to those experienced nationally.

3. Other activity in the waterway

3.1 SWEPT

Sue Burton, Pembrokeshire Marine SAC Officer

Summary

SWEPT (Surveying the Waterway Environment for Pollution Threats) emerged from a need for more localised information on nitrate pollution entering the Milford Haven waterway and improved awareness of the impacts of land run-off on the marine environment. Marine features of the Pembrokeshire Marine Special Area of Conservation (SAC) (which extends around the Pembrokeshire coast and includes the Milford Haven waterway to tidal limits) are in unfavourable condition due in part to nutrient pollution from agricultural run-off carrying fertilizers and sewage. The waterway has also failed to meet 'Good' status which is required for Water Framework Directive compliance by 2027. More data was considered helpful to NRW to better identify problem areas and help to best target effective management effort.

Social media and local networks were utilised to recruit volunteers for the project; the level of interest took all by surprise with over 100 volunteers involved in surveys. Following training and provision of survey packs, volunteer 'citizen scientists' carried out repeat monthly surveys of their allocated coastal stretches between November 2018 and February 2019.



Figure 5. Some of the SWEPT volunteers at the project feedback event.

Surveys were on publicly accessible land, either the foreshore or adjacent paths. All freshwater inputs to the marine environment were logged, photographed, and a subset tested for nitrate and phosphate levels (847 tests for each were recorded). Survey sessions were also conducted with educational groups, and during canoeing trips to hard-to-reach areas.

SWEPT took its methodology from the inspiring Freshwater Habitats Trust *Clean Water for Wildlife* project (2015-2017) using accurate cheap and easy to use

Kyoritsu Pack Test kits. Results saw a myriad of different freshwater inputs from seeps and mini-waterfalls to pipes and streams. The number of inputs can obviously vary according to rainfall; December had the greatest number logged at 320. Nitrate levels were very high in many places. Phosphate was generally low throughout. In addition to the water quality results, volunteers also collected information on interesting finds, marine litter, non-natives and any other pollution threats such as oil or fly tipping.

SWEPT has proved popular with participants and undoubtedly raised awareness of the issue of land run-off affecting the marine environment. We should all be more aware of our close connection to the sea and take actions to look after it and its wildlife, whether that is being

careful of how we dispose of our waste, mindful of what we flush down drains, or how we use the sea and interact with wildlife.

SWEPT has been led by the Pembrokeshire Marine Special Area of Conservation (SAC) Officer and co-delivered with the West Wales Rivers Trust, Pembrokeshire Coastal Forum and the Darwin Centre. It has been funded by a grant from Natural Resources Wales (NRW).

For more information, contact Sue Burton sue@pembrokeshirermaresac.org.uk

www.PembrokeshireMarineSAC.org.uk



@PembsMarineLife



@PembrokeshireMarineWildlife

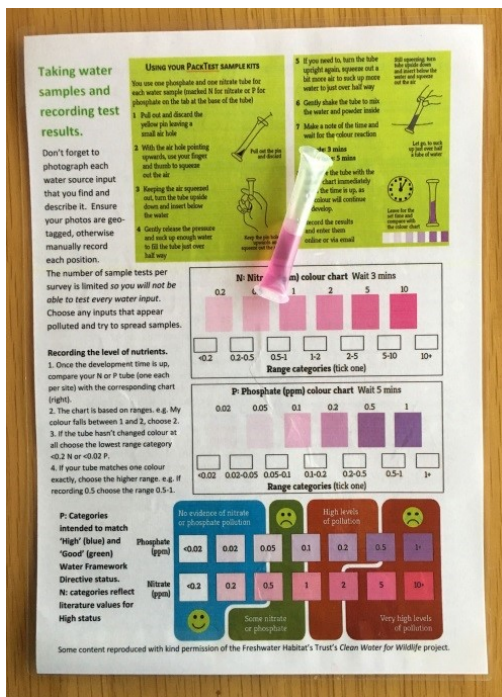


Figure 7. Prolific opportunistic macroalgae (seaweed) growth on mudflats within the Milford Haven waterway as a result of elevated nutrient levels.

Figure 6. Kyoritsu PackTest nitrate kits used by volunteers to gauge levels of pollution. They are a simple, rapid and cost-effective way to identify nutrient pollution, especially in large landscape-wide surveys where the costs of laboratory analysis are often prohibitive.

3.2 Seasearch surveys in Milford Haven: a twelve-year summary 2004 – 2015

Kate Lock and Blaise Bullimore, Seasearch South and West Wales, March 2018

SUMMARY

Seasearch is a UK ‘citizen science’ diving marine survey project for both recreational and professional divers. Seasearch divers carry out cost-effective surveys, recording and photographing species and habitats, and completing detailed, quality assured, survey forms which contribute to the Seasearch data holdings and the UK’s marine survey database, Marine Recorder.

Thirty Seasearch diving survey days were completed in the Milford Haven waterway between 2004 and 2015. In total, 104 individual volunteer divers completed 287 survey forms for 43 site areas. Sites surveyed extend from Llangwm Ferry in the upper reaches of the Daugleddau through the length of Milford Haven to St Ann’s Head on the western side and Sheep Island on the east side of the entrance of the waterway.

In addition to substantially increasing baseline knowledge of seabed habitats and species distributions in the waterway, the surveys have recorded Environment Act (2016) Wales Section 7 priority species and habitats, non-native and invasive species and notable rare and scarce species. The knowledge of the presence of these species and their locations are particularly useful.

Seasearch divers, Natural Resources Wales marine staff, the Pembrokeshire Marine SAC Officer and the Milford Haven Waterway Environmental Surveillance Group (MHWESG) project manager worked closely together and this partnership working has allowed the surveys to target areas effectively. The species and habitat data and the considerable collection of digital images stored can be used to support management planning and assessment of proposed developments for the area.

Diving conditions in the Cleddau estuaries and Milford Haven waterway are challenging and careful dive planning is needed. Poor underwater visibility is common but the richness of the waterway’s marine wildlife and the records, photographs and experience acquired by Seasearch divers in the Haven are rewarding and make the effort worthwhile.

Survey summary:

Seasearch efforts in the Milford Haven waterway began in 2004. The aims have evolved over the years but primarily include:

- filling gaps in survey coverage;
- revisiting locations that have not been recorded for many years, several decades in some instances;
- surveying rocky seabeds, with emphasis on previously unknown areas of reef revealed by a comprehensive multibeam acoustic survey carried out by Countryside Council for Wales (CCW; now Natural Resources Wales (NRW)) in 2000;
- targeting selected species in support of Section 7 priority species and habitats, local Biodiversity Action Plan (BAP) and Pembrokeshire Marine SAC data needs, e.g. native oyster and crawfish surveys; non-native species assessments; photographing and

collecting specimens to contribute to development of the Seasearch ascidian identification guide.



Figure 8. Divers taking a break between dives on board the Cleddau King.

In addition to contributing to the Seasearch data holdings and the UK's marine survey database Marine Recorder, information has been shared directly with CCW / NRW, Pembrokeshire Marine SAC, Pembrokeshire Nature Partnership (local BAP), the authors of the Seasearch ascidian identification guide and Milford Haven Waterway Environmental Surveillance Group (MHWESG).

Undoubtedly, because of pressures, changing activities, climate change and the arrival of non-native species there will be ongoing need for high quality diving observations and records to supplement formal monitoring and surveillance programmes, in particular those carried out by NRW and industry which are focused on statutory monitoring obligations and permit compliance monitoring rather than the opportunistic, reactive or special interest survey and surveillance Seasearch is able to conduct.

One weekend of Seasearch surveys in Milford Haven was completed in 1999, but specific efforts to survey sites in the waterway did not begin until 2004. Site selection and surveys were carried out in liaison with CCW, later NRW, marine staff, the Pembrokeshire Marine SAC Officer and the MHWESG in order to ensure that data collected would be useful to management needs of the area.

Thirty survey days have been completed with 104 individual volunteer divers involved. In total 287 survey forms have been completed for the 43 sites as shown Maps 1 and 2, with 29 MNCR biotopes identified (see Appendix 1) and over 350 species recorded.

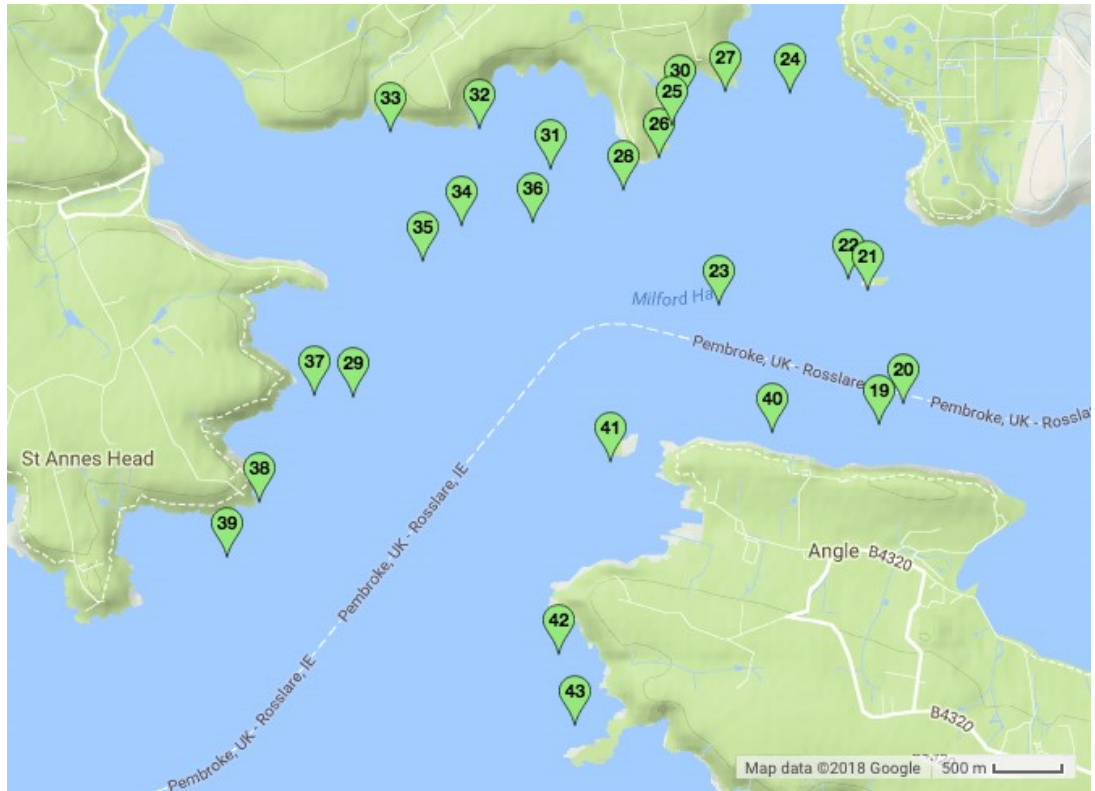
Sites surveyed extend from Llangwm Ferry in the upper reaches of the Daugleddau through the length of Milford Haven to St Ann's Head on the western side and Sheep Island on the east

side of the entrance of the waterway. Survey effort is reasonably evenly distributed with 130 forms from 18 sites covering the mid to upper waterway upstream of Stack Rock (Map 1) and 158 forms from 25 sites from the lower waterway and entrances (Map 2). Summary site descriptions are detailed in Section 3.

A considerable library of underwater digital images has been built up during the period of Seasearch surveys in Milford Haven. Although the typical diving conditions of relatively poor underwater visibility within the Haven, particularly upstream of Pembroke Dock / Neyland, has resulted in the overwhelming majority of images being close-up (macro) photographs of individual species and species assemblages, the determined efforts of some Seasearch photographers have generated a useful range of representative, if not necessarily high quality, habitat images.



Map 1. Survey sites 1 to 18 in the mid to upper Milford Haven waterway.



Map 2. Survey sites 19 to 43 in lower waterway and entrances of Milford Haven.

The full report, including details of the seabed type and marine life recorded at each site, is available for download at: <http://www.seasearch.org.uk/downloads/Milford-Haven-2004-2015.pdf>

4. Future work programme

Data archiving and facilitating easy access by members to datasets commissioned by the MHWESG has been a regular discussion point over the years. Members have made the decision to address these issues through development of a website with a private log-in area for members to access reports and data. This new website, to be developed in 2019, will also promote the MWESG more generally and provide a useful reference point for members.

Occasionally, it has been the case that the group's data have gone to non-members, usually for inclusion within an Environmental Impact Assessment. In these cases, it is important to maintain governance of the data in view of its financial value i.e. depending on the purpose, fees are sometimes considered necessary to reflect the continued finance and time commitment from members. One way of managing dissemination of data in future is for it to be accompanied with a Data Licence Agreement (to be developed in 2019), whereby use of data by non-members is time-limited and for a specified purpose.

The well-established annual wetland bird surveillance projects (wildfowl and wader counts and the annual survey of summer shelduck populations) are also scheduled to continue into 2019.

Appendices

Appendix 1: Purpose and terms of reference

The Milford Haven Waterway¹ is an extensive natural inlet of the sea with a long and distinguished maritime history. Its deep waters provide a natural harbour of significant economic importance. It is one of the best examples of a ria system in Britain and supports a particularly diverse range of high quality marine and estuarine habitats and biological communities.

The identification and consideration of political and management issues or the setting of environmental standards are specifically excluded from these Terms of Reference. However, group members are free, and are expected to use the group's outputs to help meet their own requirements.

Purpose

To provide high quality environmental information to enable members of the Group, and other authorities and industry working in and adjacent to the Waterway, to contribute to the maintenance and enhancement of the rich and diverse marine environment of the Waterway.

Terms of Reference

The Milford Haven Waterway Environmental Monitoring Steering Group will:

1. Maintain surveillance of the quality of the marine physico-chemical environment, marine biology and ornithology of the Milford Haven Waterway
2. Undertake surveillance of the foreshore, seabed and waters of the Milford Haven Waterway from a line between St Anne's Head and Sheep Island to the tidal reaches of the Eastern and Western Cleddau Rivers and other tributaries to normal tidal limits by:
 - 2.1 keeping under review all relevant survey, surveillance and monitoring;
 - 2.2 commissioning surveys to fill gaps in knowledge and to establish baselines;
 - 2.3 undertaking surveillance projects;
 - 2.4 maintaining a literature and information database.
3. Jointly maintain, and keep under review, a prioritised programme of survey and surveillance projects.
4. Share technical output equally under joint ownership and copyright.
5. Function as a technical, science based, group.
6. Form and appoint specific sub-groups to undertake specific responsibilities as required.
7. Publish an annual report which will comprise a summary of work undertaken, the executive summaries from individual project reports, a financial statement and the planned work programme.

¹ The term Waterway in this document specifically refers to the waters, seabed and foreshore of the Milford Haven Waterway and the Daugleddau Estuary from a line between St Anne's Head and Sheep Island to the tidal reaches of the Eastern and Western Cleddau Rivers and other tributaries to normal tidal limits.

8. Make its output available to the wider community in addition to its membership.

Membership and Funding

Membership is comprised of statutory authorities, industry and others with an interest in the environmental quality of the Waterway. Membership will be at the invitation and discretion of the Group's existing members.

Each member will contribute to the functioning of the group, either in monetary terms or 'in kind'.

Appendix 2: Milford Haven Waterway Environmental Surveillance Group Knowledge Collaboration Agreement

Agreement dated 17 January 2017 between:

- 1) Dragon LNG Limited
- 2) Milford Haven Port Authority
- 3) Natural Resources Wales
- 4) Pembrokeshire Coast National Park Authority
- 5) Pembrokeshire County Council
- 6) Puma Energy (UK) Ltd
- 7) RWE Generation UK Plc
- 8) Semlogistics Milford Haven Ltd
- 9) South Hook LNG Terminal Company Ltd
- 10) Valero Energy Ltd

PREAMBLE

The Milford Haven Waterway is an extensive natural inlet of the sea with a long and distinguished maritime history. Its deep waters provide a natural harbour of significant economic importance as a port handling strategic energy resources and ferry services sustaining many valuable long-term jobs in Pembrokeshire. It is one of the best examples of a ria system in Britain and supports a particularly diverse range of high quality marine and estuarine habitats and biological communities.

RECITALS

- (A) The Group Members agree to work collaboratively in a non-binding knowledge collaboration as the **Milford Haven Waterway Environmental Surveillance Group** in order to provide high quality environmental information to the Group Members, so enabling the Group Members to contribute to the maintenance and enhancement of the rich and diverse marine environment of the Waterway whilst sharing this information with the local and scientific communities, and to perform the objects set out in clause 3.2.
- (B) This Agreement serves to continue the successful collaborative Milford Haven Waterway Environmental Surveillance Group that began with establishment of the Milford Haven Waterway Environmental Monitoring Steering Group in 1991 and resulted in a Memorandum of Agreement being entered into by the members of the Group on 1 July 2004.
- (C) The Memorandum of Agreement has gradually been overtaken by time and is now recognised as being insufficiently flexible for an evolving membership.
- (D) Accordingly, on the date of this Agreement the Group Members have agreed to terminate the Memorandum of Agreement on the basis that the Group would be reconstituted as a non-binding knowledge collaboration Group in order to continue fulfilling the Objects of the Group.

- (E) Consequently, the Group Members have agreed to enter into this Agreement on the terms and conditions set out below.

The Group Members agree as follows:

1 INTERPRETATION

- 1.1 In this Agreement, unless there be anything in the context inconsistent therewith the following expressions shall have the following meanings:

“Committee” has the meaning ascribed to it by clause 4.1;

“Group” means the Milford Haven Waterway Environmental Surveillance Group reconstituted under this Agreement and any agreement supplemental to it;

“Group Members” means all of the parties listed on page 2 of this Agreement and Group Member shall have a corresponding meaning;

“Intellectual Property” means all intellectual property rights of whatever nature including without limitation copyright, patents, know-how, trade secrets, trademarks, trade names, design right, get-up, database right, utility models, service rights, moral rights, domain names and all similar rights and, in each case:

- a) whether registered or not;
- b) including any applications to protect or register such rights and the right to make such applications;
- c) including all renewals, continuations and extensions of such rights or applications;
- d) whether vested, contingent or future; and
- e) wherever existing;

“IP Rights” all rights which may now or in the future subsist in respect of or derived from any Intellectual Property.

“Memorandum of Agreement” means the Memorandum of Agreement dated 1 July 2004 entered into between the parties;

“Objects” means the objects of the Group itemised in clause 3.2;

“Waterway” means the waters, seabed and foreshore of the Milford Haven Waterway and the Dagleddau Estuary from a line between St Anne’s Head and Sheep Island to the tidal reaches of the Eastern and Western Cleddau Rivers and other tributaries to the normal tidal limits.

2 TERMINATION OF THE MEMORANDUM OF AGREEMENT

- 2.1 The Group Members agree that as at the date of this Agreement the Memorandum of Agreement shall immediately terminate and be replaced by the terms and conditions contained in this Agreement.

- 2.2 From the date of this Agreement any monies held pursuant to the Memorandum of Agreement shall be subject to this Agreement and in particular the terms of clause 5.2.

3 SCOPE OF THE COLLABORATION

- 3.1 The Group Members agree with one another to enter into this Agreement to generate and share high quality environmental information to assist the Group Members to contribute to the maintenance and enhancement of the rich and diverse marine environment of the Waterway and to perform the objects set out in clause 3.2 under the terms of this Agreement.
- 3.2 The Objects of the Group are to maintain surveillance of the quality of the marine physico-chemical environment, marine biology and ornithology of the foreshore, seabed and waters of the Milford Haven Waterway, by:
- a) keeping under review all relevant surveys, surveillance and monitoring;
 - b) undertaking surveys to improve current knowledge and establish baselines;
 - c) undertaking surveillance projects;
 - d) maintaining a literature and information database.
- 3.3 The Group will:
- a) maintain under review a work programme of agreed projects;
 - b) share technical output equally under joint ownership and copyright;
 - c) function as a technical, science based, group;
 - d) make its findings available to the wider community in addition to the Group Members.
- 3.4 Membership of the Group comprises statutory authorities, industry and others with an interest in the environmental quality of the Waterway. Membership will be at the invitation and discretion of the Group's existing members.
- 3.5 Any Group Member may, at their discretion, share with the other Group Members any information and /or data generated by their own environmental survey, monitoring or surveillance activities. In these instances, any such member shall retain its IP rights to that information or data. However, for the avoidance of doubt, this clause does not constrain the Group's use of information provided by any member to regulatory authorities, for example to meet statutory consenting processes, which has thereby entered the public domain.
- 3.6 For the avoidance of doubt:
- a) any survey, surveillance and monitoring agreed by the Group will be limited to crown foreshore, seabed and/or waters of the Waterway and will specifically exclude the premises, whether freehold or held under the terms of a commercial operating lease or license of any Group Member;
 - b) nothing in this Agreement shall be deemed to override or in any way restrict the statutory obligations of any of the Group Members;
 - c) the identification and consideration of political and management issues or the setting of environmental standards are specifically excluded from this Agreement. However, Group members are free, and are expected to use the Group's outputs, to help meet their own requirements.

4 CONTROL AND MANAGEMENT

- 4.1 A Committee comprising of one or more representatives nominated by each of the Group Members will be maintained for the purposes of:
- a) discussing, determining and approving the purpose, terms of reference and work programme of the Group;
 - b) exchanging information;
 - c) implementing the agreed work programme;
 - d) reporting on progress, including publishing an annual report that comprises of a summary of all work undertaken for the year and work planned for the forthcoming year.
- 4.2 Each Group Member shall notify the Chairperson, or Secretary, in writing of their nominated representative and shall be entitled to appoint alternative representatives.
- 4.3 The Committee shall appoint a chairperson from its number to chair Committee meetings and a vice chairperson to chair committee meetings in the absence of the chair. In the absence of both the chair and the vice chair those nominated representatives present shall appoint one of their members present to act as chair for that particular meeting. The appointment of the chair and the vice Chair will be subject to biennial review, at which time the incumbent vice chair will normally be expected to assume the role of chair and a new vice-chair appointed, subject at all times to principles of good governance and best practice. Notwithstanding the above and subject to the agreement of Committee representatives, the term of the serving chair may be extended or any other representative appointed chair, depending on the circumstances then prevailing.
- 4.4 The quorum for meetings of the Committee shall be 5 nominated representatives of the Group Members. Notes of all meetings of the Committee shall be taken and copies of such notes circulated to Group Members as soon as practicable after each meeting.
- 4.5 Every effort will be made to ensure Committee business is conducted by consensus. In the event of issues arising at a meeting of the Committee that cannot be resolved by consensus, they shall be decided by a majority of votes and each nominated representative shall have one vote. In the case of an equality of votes the chairperson of the meeting shall have a casting vote.
- 4.6 The Committee may delegate any of its functions to sub-committees or to other persons as it considers appropriate for the task; provided that the delegation and the reasons therefore are recorded in writing.
- 4.7 The Committee will meet as often as necessary or desirable for the purposes of achieving the Objects at a convenient time and venue.
- 4.8 The Group Members shall at all times co-operate with each other and act in good faith to enable the Objects to be attained.

5 RESOURCING

- 5.1 Each of the Group Members will provide either a monetary contribution and/or some other contribution, e.g. services, premises, that shall be agreed by all the Group Members for the furtherance of the Objects of the Group in accordance with the work programme

referred to in clause 3.3(a). The contributions are to be provided promptly within the time frame agreed for contributions.

- 5.2 Milford Haven Port Authority shall receive all financial contributions by Group Members and shall keep such monies in a separate interest bearing bank account in trust for the Group.
- 5.3 Other contributions for the furtherance of the Objects of the Group, as identified in clause 5.1, may include (where applicable) the sharing of environmental surveillance or monitoring data, information or reports collected by members for their own purposes or to meet legal obligations, as identified in clause 3.5.

6 CONTRACTS

Under the terms of this Agreement, the members agree that:

- 6.1 Milford Haven Port Authority shall have the authority to, and be the sole Group member to let contracts with third parties on behalf of the Group in order to achieve the Group's Objects, including the appointment of professionals, advisers and consultants on behalf of the Group, subject to request from and prior approval of the Committee, and clause 6.3. MHPA shall only let contracts with third parties on behalf of the Group upon written instruction from Group compliant with the terms of clause 7.1. Responsibilities and liabilities arising from contracts will be owned by the Group; MHPA is the contract letting agent for administrative purposes.
- 6.2 Milford Haven Port Authority shall make payments on behalf of the Group in respect of contracts agreed at clause 6.1 but may not make any other payments or commitments on behalf of the Group without the prior approval of the Committee. Milford Haven Port Authority shall provide regular statements to the Committee in respect of such account.
- 6.3 No such contract shall be entered into unless there are sufficient funds available within the interest bearing bank account referred to in clause 5.2 to meet the obligations of Milford Haven Port Authority acting on behalf of the Group under the relevant contract.
- 6.4 Consultants and/or contractors will be engaged pursuant to MHPA's contract Terms and Conditions.

7 LIABILITY

- 7.1 Risk of liability will be minimised by:
 - a) agreeing to works and requesting contracts be let only when sufficient funds are available as set out in clause 6.3;
 - b) ensuring prospective contractors have appropriate levels of expertise, experience, competence and responsibility,
 - c) requiring contractors to carry appropriate liability insurance for damages arising as a result of fieldwork (prior to letting contracts (as stipulated in clause 6.1) and excluding liability arising from force majeure (as defined in clause 7.3);
 - d) requiring Contractors to submit an appropriate Risk Assessment and Method Statement prior to the commencement of works;
 - e) review and approval of Contractor's Risk Assessment and Method Statements by appropriate Group members, and / or delegated individual(s), most suited to the task, and maintaining written records of such reviews and approvals;

- f) ensuring appropriate oversight of fieldwork and Contractors adherence to Risk Assessment and Method Statements by appropriate Group members, and / or delegated individual(s), most suited to the task, and maintaining written records of such oversight;
 - g) including a liability exclusion statement in all Group reports.
- 7.2 The costs or consequences of any legal action against the Group or against MHPA in connection with the activities of MHSWEG will be shared equally and the MHPA's risk as the party letting contracts will be mitigated through the measures set out in clause 7.1.
- 7.3 Consequently, as at the date of this Agreement the Group Members shall ensure that the Group has effected public liability insurance with a minimum limit of liability of £5,000,000 (five million pounds) in respect of each and every occurrence to cover the potential liability of the Group Members in relation to this Agreement and shall maintain such insurance until the date of termination of this Agreement.
- 7.4 The Group shall not be liable for losses, damages, costs and/or expenses incurred as a result of force majeure which shall include without limitation any failure or delay attributable to facts beyond the control of the Group such as wars, hostilities, boycotts, embargoes, public disorders, sabotage, strikes, lockouts, floods, fires or acts of God.

8 INTELLECTUAL PROPERTY RIGHTS

- 8.1 All IP Rights developed or generated by the Group in pursuance of the Objects shall be owned by the Group Members jointly.
- 8.2 Any Group member that withdraws from the Agreement will retain joint ownership of Group IP Rights developed or generated during the period of their membership of the Group.
- 8.3 Any Group Member shall be entitled to use any IP Rights free of charge provided that any such use shall not compromise the Objects of the Group and provided further that if any Group Member wishes to license or authorise any third party to use or exploit any IP Rights owned by the Group, the Group Members shall jointly agree and grant such a licence to such third party and such third party shall be required to pay a licence fee.
- 8.4 All costs and expenses and all receipts in respect of any IP Rights owned jointly by the Group Members shall be shared equally by the Group Members.
- 8.5 Each Group Member shall retain all rights to Intellectual Property in all materials, information etc. contributed by that Group Member as stipulated in clause 3.5.

9 TERM AND TERMINATION

- 9.1 The provisions of this Agreement shall come into force on the date stated above.
- 9.2 A Group Member may at any time terminate its participation in respect of this Agreement subject to having given notice in writing to the Chairperson with no right of return of financial contributions.
- 9.3 In the event that any Group Member is in breach of this Agreement which they fail to remedy within 14 days of written request by the Committee then such Group Member's involvement in the Group may be terminated by notice given to them by the Committee at any time following expiry of the said period of 14 days, with no right of return of financial contributions.

9.4 Subject to clauses 8.2 and 8.3 this Agreement will terminate on completion of the Objects stated in clause 3.

9.5 Upon termination of this Agreement the Group shall either be:

- a) reconstituted as appropriate to fulfil the Objects of the Group; or
- b) terminated forthwith and the Group Members shall take such further steps as may be necessary in order to wind up the Group in a fair and reasonable manner.

The financial assets of the Group at winding up should be distributed or shared pro rata to the direct financial contributions by Group Members.

9.6 If a Group Member's participation in the Group is terminated in accordance with clause 8.2 or 8.3 the provisions of clauses 6.1 to 6.3 shall no longer apply in respect of that Group Member.

10 THIRD PARTIES

10.1 Nothing in this Agreement shall create any rights for third parties under the Contracts (Rights of Third Parties) Act 1999. No variation to this Agreement and no supplemental or ancillary agreement to this Agreement shall create any such rights unless expressly so stated in any such agreement by the Group Members to this Agreement. This does not affect any right or remedy of a third party that exists or is available apart from that Act.

11 NO BINDING PARTNERSHIP

11.1 Nothing in this Agreement shall be construed as establishing or implying any legally binding partnership between the Group Members.

12 SUCCESSORS

12.1 References in this Agreement to the Group Members shall include their respective heirs, successors in title, permitted assigns and personal representatives.

13 ASSIGNMENT

13.1 No Group Member should assign its interests in this Agreement without prior approval of the Committee (not to be unreasonably withheld) except that no such approval is required for an assignment to a company in the same group as the Group Member.

14 GENERAL

14.1 Provisions which by their terms or intent are to survive termination of this Agreement will do so.

14.2 No amendment or variation of this Agreement will be valid unless agreed in writing by an authorised signatory of each party.

14.3 Unless otherwise expressly agreed, no delay, act or omission by either party in exercising any right or remedy will be deemed a waiver of that, or any other, right or remedy.

14.4 Each party will do all further acts and execute all further documents necessary to give effect to this Agreement.

15 INFORMATION SHARING AND DATA PROTECTION

15.1 Several members of the Group (public bodies) are subject to the Freedom of Information (FoI) Act and Environmental Information Regulations (EIR) whilst others (industry bodies) are not. Whilst circumstances under which valid FoI and/or EIR requests may

be submitted to the Group are anticipated to be limited since the Group operates transparently, places all outputs in public domain, and commercial tender assessments and contract details are protected by confidentiality exemptions, every effort will be made to meet any such request, taking into account advice and guidance from the Information Commissioner's Office and the obligations on public bodies.

15.2 The Group will comply with the Data Protection Act and adhere to the data protection principles to ensure personal data is safeguarded.

16 REVIEW

This Agreement will be subject to review and reaffirmation at five yearly intervals from the date of the Agreement.

17 COUNTERPARTS

This Agreement may be executed in any number of counterparts, each of which is an original and which together have the same effect as if each Group Member had signed the same document.

Appendix 3: Chronological list of MHWEMSG / MHWESG² reports**1992**

Hobbs, G and Morgan, C I (eds.) (1992). *A review of the current state of environmental knowledge of the Milford Haven Waterway*. Report from Oil Pollution Research Unit; xi & 140pp

Hobbs, G and Morgan, C I (eds.) (1992). *A review of the current state of environmental knowledge of the Milford Haven Waterway; Executive Summary*. Report from Oil Pollution Research Unit, 12pp

MHWEMSG (1992). *Report of the Milford Haven Waterway Environmental Monitoring Steering Group 1992*. 6pp

1993

Hodges, J E (1993). *Daugleddau Estuary and Milford Haven Waterway annual shelduck survey: report for 1993*. Report from Pembrokeshire Coast National Park Authority, 8pp + appendices

1994

Ellis, R & Poole, A (1994). *Cleddau Estuary wader and wildfowl counts 1993 – 94*. 20 pp + appendices

Hodges, J E (1995). *Daugleddau Estuary and Milford Haven Waterway annual shelduck survey: report for 1995*. Report from Pembrokeshire Coast National Park Authority, 8pp + appendices

Levell, D, Smith, J and Hobbs, G (1994). *Milford Haven macrobenthic survey October 1993*. Report from Oil Pollution Research Unit; xii, 26pp + figures, tables & data appendices.

MHWEMSG (1994). *Report of the Milford Haven Waterway Environmental Monitoring Steering Group 1993/94*. 20pp

Smith, J and Hobbs, G (1994). *Metal concentrations in Milford Haven sea bed sediments - data storage, analysis and initial interpretation*. Report from Oil Pollution Research Unit; v, 8pp + tables & maps

1995

Hodges, J E (1995). *Daugleddau Estuary and Milford Haven Waterway annual shelduck survey: report for 1995*. Report from Pembrokeshire Coast National Park Authority 10pp + appendices

Howe, M (1995). *Monitoring of eelgrass populations in the Milford Haven waterway and Daugleddau Estuary*. Report from Pembrokeshire Coast National Park Authority; 7pp

MHWEMSG (1995). *Report of the Milford Haven Waterway Environmental Monitoring Steering Group 1994/95*. 19pp

Poole, A & Ellis, R (1995). *Cleddau Estuary including Milford Haven Waterway: wildfowl and wader counts 1994 – 95*. 30pp

Rostron, D M (1995). *The macrobenthos of the foreshore soft sediments of Milford Haven, 1994*. Report from SubSea Survey; 2 vols, 17pp + maps, figures & data appendices

² The Group changed its name in 2000

1996

Hodges, J E (1996). *Daugleddau Estuary and Milford Haven Waterway annual shelduck survey: report for 1996*. Report from Pembrokeshire Coast National Park Authority, 8pp + appendices

MHWEMSG (1996). *Report of the Milford Haven Waterway Environmental Monitoring Steering Group 1995/96*. 14pp

Poole, A (1996). *Milford Haven and Cleddau Estuary wetland bird survey 1995-96*. 18pp

1997

Hodges, J E (1997). *Daugleddau Estuary and Milford Haven Waterway annual shelduck survey: report for 1997*. Report from Pembrokeshire Coast National Park Authority. 10pp + tables & appendices

MHWEMSG (1997). *Report of the Milford Haven Waterway Environmental Monitoring Steering Group 1996/97*. 36pp

Moore, J J (1997). *Rocky shore transect monitoring in Milford Haven, October 1995*. Report from Oil Pollution Research Unit. OPRU Report No OPRU/14/96. 36pp + appendices

Poole, A (1997). *Milford Haven Waterway and Cleddau Estuary bird survey 1996-97*. 13pp + appendices

1998

Hodges, J E (1998). *Daugleddau Estuary and Milford Haven Waterway annual shelduck survey – report for 1998*. Report from Pembrokeshire Coast National Park Authority. 9pp + tables & appendices

Munro, C (1999). *Monitoring of the rocky sub-littoral of Milford Haven: May-July 1998*. Report from Marine Biological Surveys. v, 38pp + appendices, photographs and videorecording

Poole, A (1998). *Milford Haven Waterway and Cleddau Estuary bird survey 1997-98*. 12pp + appendices

1999

Hodges, J E (1999). *Daugleddau Estuary and Milford Haven Waterway annual shelduck survey – report for 1999*. Report from Pembrokeshire Coast National Park Authority. 8pp + tables & appendices

Kitts, H (1999). *Quantification of inputs to Milford Haven*. Report from Hyder Ltd. 29pp + tables & appendices

MHWEMSG (1999). *Report of the Milford Haven Waterway Environmental Monitoring Steering Group 1997 - 1999*. 25pp

Poole, A (1999). *Milford Haven Waterway and Cleddau Estuary Bird Survey 1998-99*. 13pp + appendices

Posford Duvivier (2000). *A survey of subtidal Zostera beds in Milford Haven*. 36pp + appendices

2000

Bent, E J (2000). *A review of environmental studies in Milford Haven Waterway 1992 – 2000*. iv, 65 pp + tables & maps

Hodges, J E (2000). *Daugleddau Estuary and Milford Haven Waterway annual shelduck Survey – Report for 2000*. Report from Pembrokeshire Coast National Park Authority. 10pp + tables + appendices

MHWESG (2000). *Milford Haven Waterway Environmental Surveillance Group Annual Report 1999 - 2000*. 20pp & appendices

Poole, A (2000). *Milford Haven waterway and Cleddau Estuary Bird Survey 1999-2000*. 15pp + appendices

2001

Hodges, J E (2001). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2001*. Report from Pembrokeshire Coast National Park Authority. 8pp + appendices

Poole, A (2001). *Milford Haven Waterway and Cleddau Estuary bird survey 2000-01*. 14pp + appendices

2002

Hodges, J E (2002). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2002*. Report from Pembrokeshire Coast National Park Authority. 8pp + appendices

Poole, A (2002). *Milford Haven Waterway and Cleddau Estuary bird survey 2001-02*. 12pp + appendices

2003

Bent, E J (2003). *Milford Haven Waterway review of work programme 2000 – 2010*. 32pp

Hodges, J E (2004). *Daugleddau Estuary and Milford Haven waterway surveillance of summer shelduck populations: report for 2003*. Report from Pembrokeshire Coast National Park Authority. 9pp + appendices

Poole, A (2003). *Milford Haven Waterway and Cleddau Estuary bird survey 2002-03*. 16pp + appendices

Prosser, M V & Wallace H L (2003). *Milford Haven salt-marsh survey 2002*. Report from Ecological Surveys (Bangor). 2 vols. 58pp + appendices, photographs & maps

2004

Hodges, J E (2004). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2004*. Report from Pembrokeshire Coast National Park Authority. 7pp + appendices

Haycock, A (2004). *Milford Haven Waterway and Cleddau Estuary Bird Survey 2003-04*. 14pp + appendices

2005

Atkins (2005). *Development of an Inputs Budget for Milford Haven Waterway*. 68pp + cd database & GIS data

Hodges, J E (2005). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2005*. Report from Pembrokeshire Coast National Park Authority. 8pp + appendices

Haycock, A (2005). *Milford Haven Waterway and Cleddau Estuary Bird Survey 2004-05*. 7pp + appendices

2006

Hodges, J E (2006). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2005*. Report from Pembrokeshire Coast National Park Authority. 8pp + appendices

Haycock, A (2006). *Milford Haven Waterway and Cleddau Estuary Bird Survey 2004-05*. 7pp + appendices

Warwick, R (2006). *Review of benthic and intertidal sediment macrofauna data and development of a surveillance programme*. 105pp + electronic data annex

2007

Hodges, J E (2007). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2006*. Report from Pembrokeshire Coast National Park Authority. 8pp + appendices

2008

Haycock, A (2008). *Wildfowl and wader counts on the Milford Haven Waterway 2006-07* 20pp

Haycock, A (2008). *A review of the status of wetland birds in the Milford Haven waterway and Daugleddau estuary*. A report to the Milford Haven Waterway Environmental Surveillance Group. 122pp

Hodges, J E (2008). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2008*. Report from Pembrokeshire Coast National Park Authority. 26pp + appendices

2009

Haycock, A (2009). *Wildfowl and wader counts on the Milford Haven Waterway 2007-08* 20pp

Hodges, J E (2009). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2009*. Report from Pembrokeshire Coast National Park Authority. 9pp + appendices

Langston, W J, O'Hara, S, Imamura M & Pope, N D (2009) *Bioaccumulation surveillance in Milford Haven Waterway 2007-2008*. Report to the Milford Haven Waterway Environmental Surveillance Group from the Marine Biological Association Plymouth. 66pp + appendices

Little, D I (2009) *Sediment Contaminants & Transport Review*. A report to the Milford Haven Waterway Environmental Surveillance Group. 368pp + appendices

2010

Haycock A (2010). *Wildfowl and wader counts on the Milford Haven Waterway, 2009-10*. A report to the Milford Haven Waterway Environmental Surveillance Group. 24pp

Hodges, J E (2010). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2010*. Report from Pembrokeshire Coast National Park Authority. 8 pp + appendices

Mieszowska, N. (2011). *Reestablishment of intertidal rocky surveillance*. A report to the MHWESG from the Marine Biological Association on ot the UK. 54pp + appendices.

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Haycock A (2011). *Wildfowl and wader counts on the Milford Haven Waterway, 2010-11*. A report to the Milford Haven Waterway Environmental Surveillance Group. 24pp

Hodges, J E (2011). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2011*. Report from Pembrokeshire Coast National Park Authority. 8pp + appendices

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Fugro-ERT (2012). *Investigation into the source of hydrocarbons present in sediment samples from Milford Haven waterway*. Report to the Milford Haven Waterway Environmental Surveillance Group from the Fugro-ERT (Fugro Geoconsulting). v&40pp + appendices

Hodges, J E (2012). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2012*. Report from Pembrokeshire Coast National Park Authority. 9pp + appendices

Langston, W J, O'Hara, S, Davey, M, Shortridge, E, Pope, N D, Harino, & Vane, C H. (2012) *Bioaccumulation surveillance in Milford Haven Waterway Phase II (2010)* Report to the MHWESG from the Marine Biological Association UK. 85pp + appendices

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Germano & Associates (2013). *Sediment-Profile Imaging Survey of Milford Haven Waterway, Wales, UK - May 2012*. Report to the Milford Haven Waterway Environmental Surveillance Group from Germano & Associates, Inc., Seattle, Washington, USA. vii&34pp + tables, figures and appendices

Haycock, A (2013). *A review of the status of wetland birds in the Milford Haven Waterway and Daugleddau Estuary 2013* A report to the Milford Haven Waterway Environmental Surveillance Group. 123pp

Hodges, J E (2013). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2013*. Report from Pembrokeshire Coast National Park Authority. 9pp + appendices

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Galperin, Y & Little, D I (2014). *Forensic Evaluation Of Milford Haven Sediment Hydrocarbon Contamination: Supplemental Report*. Report to Milford Haven Waterway Environmental Surveillance Group from EGC Consulting California USA & David I. Little; 60 pp.

Haycock, A (2014). *A review of the status of wetland birds in the Milford Haven Waterway and Daugleddau Estuary 2013-14*. A report to the Milford Haven Waterway Environmental Surveillance Group; 24 pp.

Hodges, J E (2014). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2014*. Report from Pembrokeshire Coast National Park Authority. 11pp + appendices

Morrell, S (2014). *Rocky Shore Surveillance 2013*. Report to Milford Haven Waterway Environmental Surveillance Group from the Field Studies Council Dale Fort Field Centre; 50 pp.

Little, D I & Galperin, Y, 2014. *Milford Haven sediment hydrocarbon and metals contamination: supplemental report on recent contaminant trends*. Report to Milford Haven Waterway Environmental Surveillance Group

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Haycock, A (2015). *A review of the status of wetland birds in the Milford Haven Waterway and Daugleddau Estuary 2014-15*. Report to the Milford Haven Waterway Environmental Surveillance Group.

Hodges, J E (2015). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2015*. Report to MHWESG from Pembrokeshire Coast National Park Authority.

Rumney H S, K Potter, P Mellor & P Bersuder (2015). *Analysis of Sediment Contaminants in Milford Haven Waterway Total Hydrocarbon (THC) concentration in sediments*. Data report to MHWESG from Centre for Environment, Fisheries & Aquaculture Science, Lowestoft.

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Clough, R (2016). *Determination of Multiple Analytes in Sediment Samples*. Data report to MHWESG from Analytical Research facility, University of Plymouth.

Haycock, A (2016). *Review of the status of wetland birds in the Milford Haven Waterway and Daugleddau Estuary 2016*. Report to the Milford Haven Waterway Environmental Surveillance Group.

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Warwick, Richard M (2016). *Milford Haven Waterway sediment macrobenthos data analysis & review 2008-15*. Report to the Milford Haven Waterway Environmental Surveillance Group, Plymouth Marine Laboratory.

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Archer-Thomson, J H S and Morrell, S L (2018). *Milford Haven Waterway rockshore surveillance 2017*. Report to the Milford Haven Waterway Environmental Surveillance Group.

Haycock A (2017). *Wildfowl and wader counts on the Milford Haven Waterway, 2016-17*. A report to the Milford Haven Waterway Environmental Surveillance Group.

Hodges, J E (2017). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2017*. Report to the Milford Haven Waterway Environmental Surveillance Group.

Little, D I (2017). *Sediment contaminant concentrations in Milford Haven waterway: data conversion and timeline*. Report to the Milford Haven Waterway Environmental Surveillance Group.

Unsworth, R K F, Bertelli, C M, Robinson, M, Mendzil, A (2017). *Status review and surveillance recommendations for seagrass (Zostera species) in Milford Haven Waterway*. Report to the Milford Haven Waterway Environmental Surveillance Group.

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Haycock A (2018). Wildfowl and wader counts on the Milford Haven Waterway, 2017-18. A report to the Milford Haven Waterway Environmental Surveillance Group.

Hodges, J E (2018). Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2018. Report to the Milford Haven Waterway Environmental Surveillance Group.

Birkhead, T R (2018). The Value of Long-term Monitoring and Long-term Research. A report to the Milford Haven Waterway Environmental Surveillance Group.

