MILFORD HAVEN WATERWAY ENVIRONMENTAL SURVEILLANCE GROUP

REPORT 2000 - 2006

MILFORD HAVEN WATERWAY
ENVIRONMENTAL SURVEILLANCE GROUP

GRŴP CADW GOLWG AMGYLCHEDDOL
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REPORT 2000-2006

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Milford Haven Waterway Environmental Surveillance Group
Report 2000-2006

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CHAIRMAN'S FORWARD

1. INTRODUCTION

This is the eighth business report of the Milford Haven Waterway Environmental Surveillance Group (formerly the Milford Haven Waterway Environmental Monitoring Steering Group). It covers the period 1 April 2000 to March 2006.

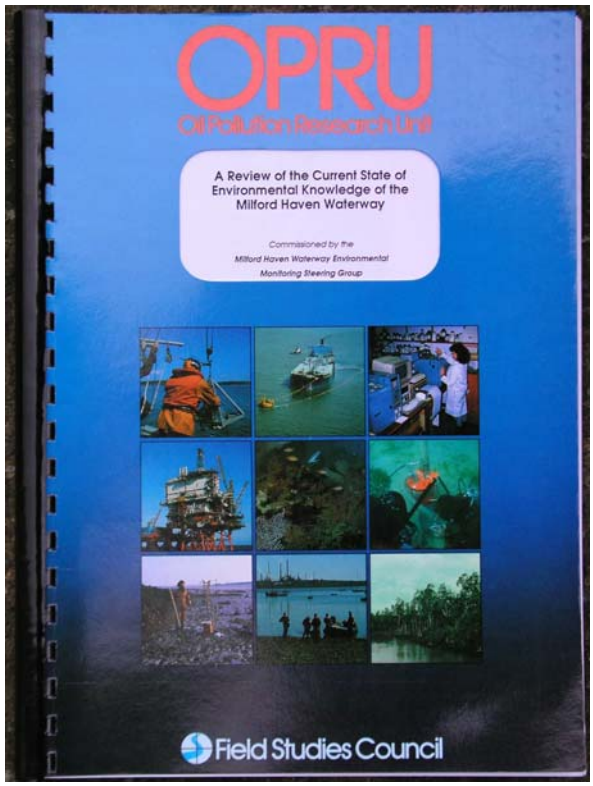
The Milford Haven Waterway Environmental Monitoring Steering Group was established in January 1992 following a highly successful conference to examine the issue of pollution, with particular reference to the Milford Haven Waterway, organised by Dyfed County Council in September 1991.

The Group was initially chaired by the Pembrokeshire Coast National Park Officer and subsequently by the Dyfed County Council Oil Pollution / Emergency Planning Officer. Membership included representatives of Dyfed County Council, Dwr, Cyrnru/Welsh Water, the two District Councils, Countryside Council for Wales, National Rivers Authority, the oil companies operating around the waterway and the Field Studies Council Research Centre at Fort Popton. Membership was subsequently extended to include representatives from the Milford Haven Port Authority and National Power.

The Group's original terms of reference were to consider:

- the extent of existing environmental monitoring and whether there was a need for additional work in this respect;
- how the data derived fiom the existing monitoring, and any proposed additional monitoring exercises could be best collated and interpreted;
- how advice based on data obtained could be formulated and presented in a manner which will enable the agencies with statutory responsibility for activities centred on the waterway to produce co-ordinated plans for the management of the Haven; and
- the estimated cost of any additional monitoring or new administrative arrangements, with suggestions as to how these costs should be met.

In 1992, the Group commissioned and published a *Review of current environmental knowledge of the Milford Haven Waterway,* which included a description of the nature and extent of monitoring being undertaken on the Waterway at that time. The review made recommendation as to prioritised work plans for the future, covering obvious gaps and omissions in existing monitoring, and this formed the basis of projects contracted by the Group in the following years.



The Group focusses on the collection of high quality environmental information to enable its members to contribute to the maintenance and enhancement of the rich and diverse marine environment of the waterway. It achieves this through commissioning a series of projects into littoral and sub-littoral marine biology, ornithology, sediment chemistry and chemical/nutrients input into the Haven waterway.

Studies are resourced by Group members contributing either directly in monetary terms or in kind, and by undertaking or supporting survey and surveillance projects carried out by Group members directly. Technical project management is devolved to a Project Sub-Group.

The Group's project outputs proved to be of substantial worth following the Sea Empress oil spill in 1996 when they provided recent baseline data to aid in assessment of the effects of the spill.

In 1999, under the new chairmanship of the Milford Haven Port Authority, the Group reviewed and revised its original terms of reference and future work direction, and changed its name to the Milford Haven Waterway Environmental Surveillance Group to reflect the revised terms of reference.

The Group also commissioned a report to review and assess in detail the work undertaken by the Group and by others since 1991, including the studies carried out under the auspices of the Sea Empress Environmental Evaluation Committee (SEEEC) following the Sea Empress Oil Spill in 1996. The review, undertaken by Dr Edward Bent, included recommendations for a prioritised future work programme.

During the 2000 to 2006 period, the surveillance and monitoring obligations on several public bodies, in particular those arising from European directives, have developed and become clearer; for example, the monitoring requirements of the Habitats & Species and the Water Framework Directives. Whilst the Group welcomes the use of the data it collects to inform such monitoring, it does not wish to duplicate the efforts of public bodies or be seen to be undertaking their obligations. Rather, it wishes to fill the gaps between such work, focus on tasks of the widest common interest to its members, and to synthesise and summarise the information available on the environmental health of the waterway.

Also during the period covered by this report, the need to strengthen and increase the formality of the Group's constitution, not least for reasons of financial management and VAT recovery, became increasingly clear. The development and agreement of a formal Memorandum of Agreement that met the needs and business concerns of all members of the Group took a considerable time. Now that the MoA has been ratified and signed by all the Group's members, financial management of the Group will transfer from Pembrokeshire County Council to Milford Haven Port Authority enabling, *inter alia*, recovery of VAT by MHPA on behalf of the Group.

2. REPORT FOR PERIOD 2000 - 2006

2.1. INTRODUCTION

The Group's outputs for the period are summarised in the following sections.

The Group has undergone a period of consolidation and review during this years covered by this report. For this reason and others, there have been fewer outputs than in previous years and, with notable exceptions, the outputs are focussed more strongly on desk-studies than field-based data collection.

The review of Group work and outputs conducted in 2000 (Bent, 2000 [1]; included as Appendix 4 in the MHWESG report for 1999-2000) resulted in a re-evaluation of the Group's priorities and the development of a revised work programme. Amongst the key tasks identified were the thorough evaluation, assessment and interpretation of available information and data for several topic areas, both to provide summarised overviews of each topic and to enable the refinement and improved targeting of future work. Three of these reviews have been completed and a contract for a fourth is anticipated as being let in the near future.

The first of these reviews (the first phase of development of an inputs budget for Milford Haven [2]) proved to be a substantially more complex and longer task than anticipated. Planned as a six month contract, it eventually took a little over two years to complete due, in no small part, to the amount of water quality and inputs data available for the waterway. The outputs from this review and data collation task were required to inform the specification of subsequent priority projects and the protracted time taken resulted in delays in progressing contracts for these projects.

[1] Bent, E J (2000). *A review of environmental studies in Milford Haven Waterway 1992 – 2000*.

[2] Atkins (2005). *Development of an Inputs Budget for Milford Haven Waterway.*

2.2. MILFORD HAVEN SALTMARSH SURVEY 2002

M V Prosser & H L Wallace, Ecological Surveys (Bangor)

Executive summary

Following the Sea Empress oil spill of February 1996 and the subsequent ecological damage assessment survey conducted in 1996 and 1997 by the Centre for Ecology and Hydrology (CEH), a follow-up study was commissioned to repeat the CEH work six years after the incident. Seventy-eight of the original 82 permanent quadrats established in 1996 were relocated, the saltmarsh vegetation studied and comparisons made with the original results. The saltmarshes at Crabhall, Sandyhaven, Milford Haven, Pembroke River, Martin's Haven and Angle Bay were re-surveyed and mapped; the NVC units recognized were compared with those obtained for the same areas in 1996 and 1997 and also with the results of the original comprehensive survey conducted in 1982 as part of the Inventory of British saltmarshes.

The conclusion is reached that the saltmarsh vegetation of the Haven is no longer influenced by the effects of the oil spillage.

The National Vegetation Classification (NVC) survey was extended to cover all areas of saltmarsh east of the Cleddau Bridge to the tidal limits of the arms of the Estuary. Separate maps and area statements were prepared for the Eastern and Western Cleddau, Daugleddau, the Carew and Cresswell Rivers and for Cosheston Pill.

A total of 287ha of saltmarsh was mapped on the Waterway together with 43ha of associated vegetation, mostly forms of saline-freshwater transition. Twenty five NVC communities were represented with 30 units recognized at the level of sub-community; in addition, two recognized variants of sub-communities and two newly defined associations were described and mapped.

The area of saltmarsh encountered was substantially less than that mapped in1982. Virtually all of the decrease can be attributed to a reduction in the area supporting *Spartina anglica* saltmarsh. Evidence is produced for a measure of succession whereby middle marsh communities are expanding into low marsh zones and areas of the middle-upper marsh transition are sequentially developing at the expense of middle marsh vegetation i.e. the system appears to be in a maturing phase.

The baseline for study of future changes has been expanded through the establishment of 38 new permanent quadrats on sections of the Waterway east of the Cleddau Bridge.

In addition to the NVC maps, the locations of 14 species of interest are mapped; also mapped are the sections of the shoreline where the active erosion of saltmarsh vegetation was noted.

Following sections dealing with field survey, data processing and presentation and with map production, the central section of the report presents an overview of the vegetation communities described. Details of the changes in saltmarsh communities are presented with a separate section dealing with the analysis of changes occurring in the permanent quadrats established in1996. Each species of interest is discussed with the discovery of *Alopecurus bulbosus*, a new record for Pembrokeshire, highlighted.

The report concludes with a brief section containing recommendations for future work followed by five appendices presenting the NVC quadrat data array, similar information for both old and new permanent quadrats, a list of grid references for these quadrats, the photographic record and the field work timetable.

An addendum to the report places the diversity of the saltmarshes of the Waterway into the wider local context through the production of a map showing the total number of saltmarsh communities and, separately, the number of types of associated transitional vegetation on the basis of individual 10km squares in Pembrokeshire, Carmarthenshire and Swansea.

The series of maps are separately bound and constitute Volume 2 of the report.

ADDENDUM: Diversity and distribution of saltmarsh communities of the Waterway in the wider local context.

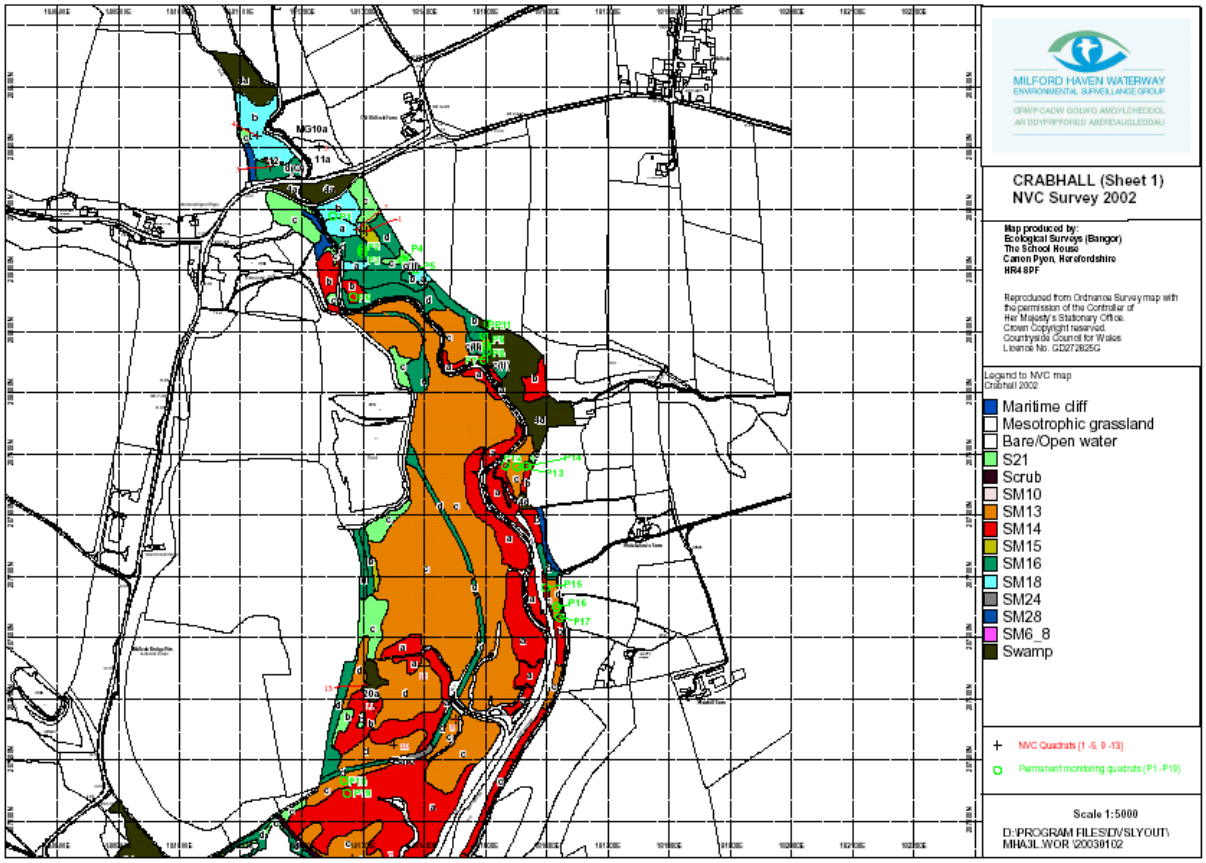
Rodwell (2000) presents a figure giving the distribution of saltmarsh vegetation types around the coasts of Great Britain based on the number of the 28 recognised NVC saltmarsh units in each 10km square. The listing is incomplete since, as a local example, no saltmarsh communities are mapped for squares SN31, SN41 or SS59 in the general area of the Burry Inlet and Carmarthen Bay. The figure does however provide an insight into those areas supporting the greatest diversity of halophytic communities. The highest number of communities per 10km square is given as 14 and this level of diversity appears to be concentrated on the north Norfolk coast.

A similar presentation, limited to those areas of the Pembrokeshire, Carmarthenshire and Swansea estuaries recently surveyed by the authors forms the Addendum figure.

The values in bold refer to the number of NVC saltmarsh communities present whilst those in italics are the similar totals for non-SM communities associated with the areas of saltmarsh. Communities associated with saltmarshes are numerous and varied: the following have either been recorded in local saltmarshes or are known to occur in transitional saltmarsh zones and it is from this list that the ‘associated communities’ score is derived.

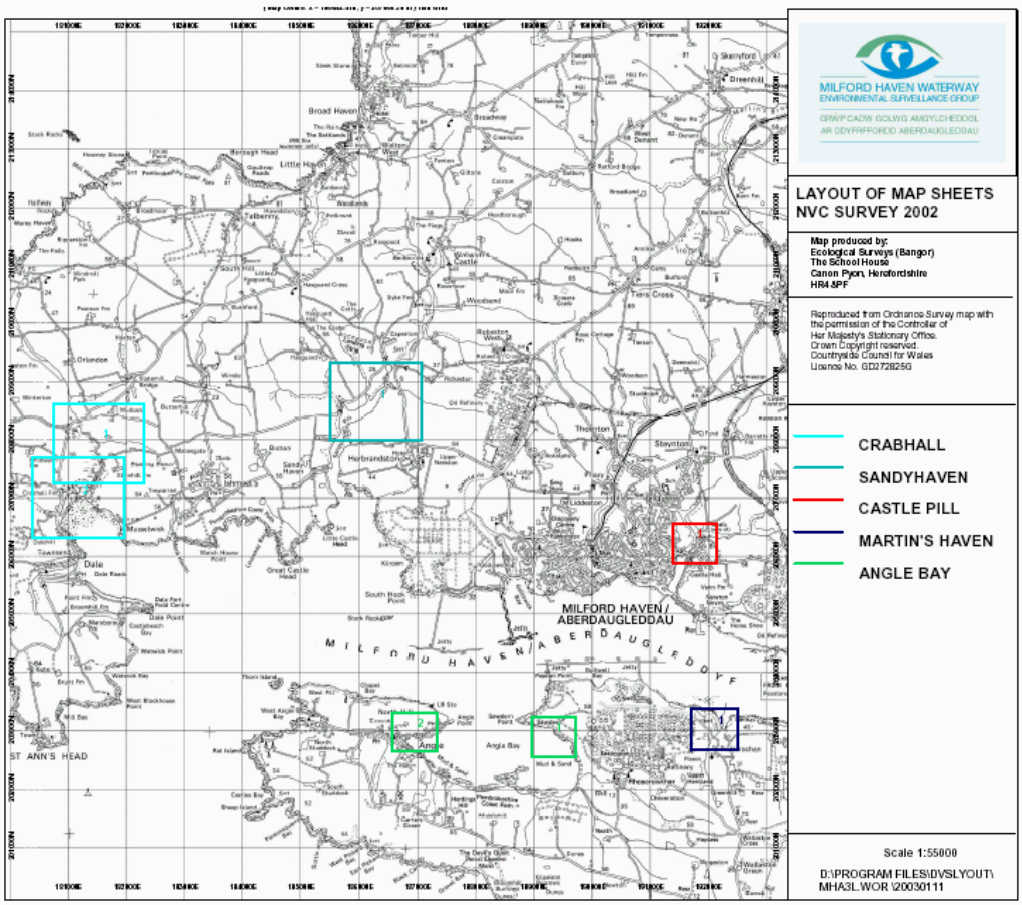
Though the Waterway contains more ‘inland’ situations than does the Burry Inlet cSAC with its shorter tidal rivers, the diversity of saltmarsh vegetation is high with 10 or more communities present in all five 10km squares compared with three squares in the more eastern complex. Thus, though the overall variation is no greater at Milford Haven, the high level of diversity extends over a much greater area. The transitions at Crabhall saltings are notable and

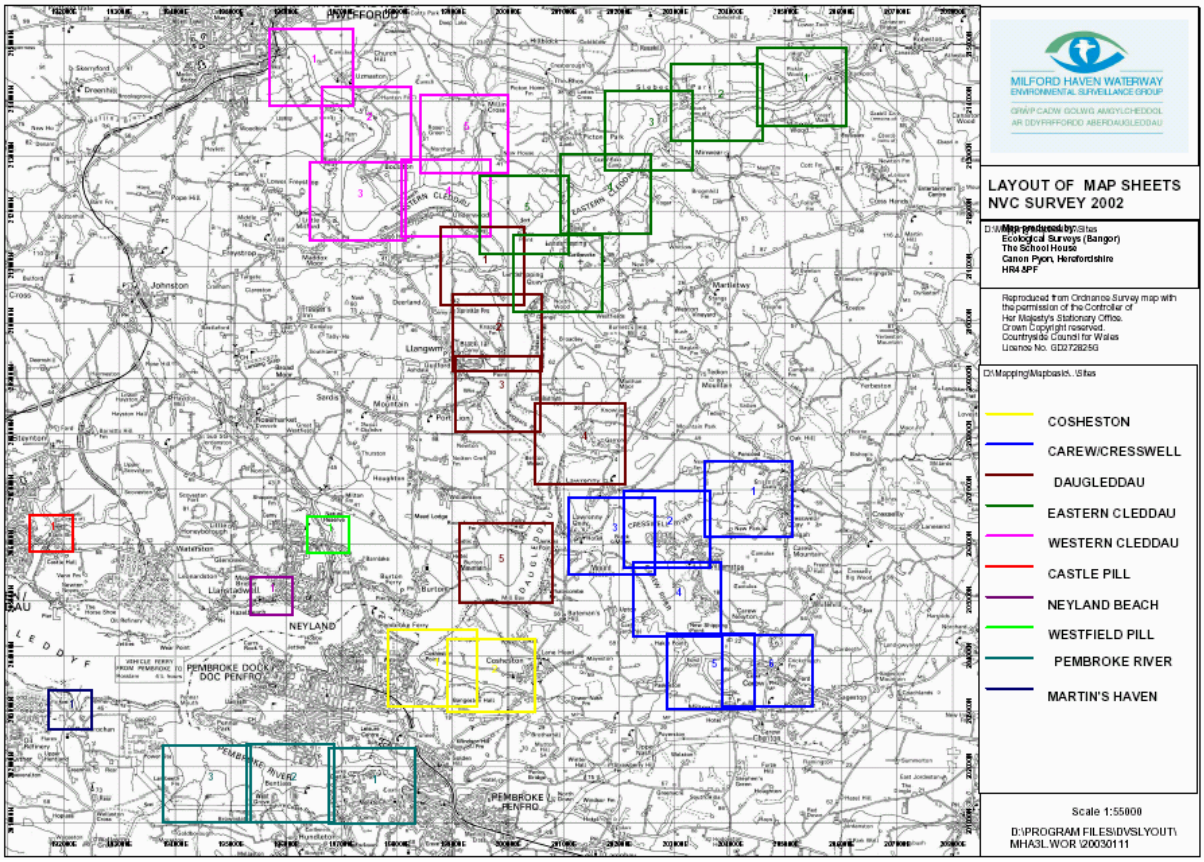
compare with those on the Gwendraeth and at Whiteford Burrows on the Gower. At Crabhall the freshwater transitions are better developed but there are less extensive saltmarsh –dune transitions.



MAP 1. Sample map showing salt-marsh distribution in the upper Gann Estuary

MAPS 2 & 3. Distribution of areas of salt-marsh surveyed during 2002.





2.3. DEVELOPMENT OF AN INPUTS BUDGET FOR MILFORD HAVEN WATERWAY

Atkins, 2005

Executive summary

Atkins was commissioned by the Milford Haven Waterway Environmental Surveillance Group (MHWESG) in May 2002 to review and further the understanding of pollutant inputs to the Milford Haven Waterway in Pembrokeshire, south west Wales. The Waterway is important for both its conservation and commercial interest, and the MHWESG therefore consider it essential to have an overall understanding of pollutant loads to the Waterway.

The objectives of this project, as set out in the brief, were to:

i. Confirm the location, type and quality of inputs data for Milford Haven Waterway

ii. Review the analysis and interpretation of existing inputs data and, where necessary, re-analyse data

iii. Where possible acquire input data and archive in secure form

iv. Where there are significant gaps in the data make recommendations for survey work to meet shortfalls

The project has been conducted with regards to the broader aims of the MHWESG. Care was taken to ensure the project did not become solely a data collection exercise. Furthermore, effort has been made to collate data, produce systems and make recommendations that are transparent and easily updateable and which will provide real value to the MHWESG in the longer-term development of a pollution inputs budget.

Four data inventories have been developed, each tailored to reflect the nature of the data stored. Three databases describe the key data held in relation to the Waterway and the Cleddau catchments - holding information on continuous discharges, pollution incidents and risk data respectively. In addition, a further bibliographic database has been developed which holds records of articles, reports and books relating to the Waterway or to inputs studies. The four inventories are stored on a CD (Appendix C). Where possible input data have been acquired and archived in secure form. All electronic data has also been saved on the CD.

During the assessment of the information held it was found that 82% of the datasets for continuous discharges could be considered useful for an inputs budget. Pollution incident data were gathered from various sources including a comprehensive dataset on oil spills in the Haven which showed that many spills were associated with common locations, mainly next to jetties or anchorages.

Substances were categorised into common name groups so that discharges and pollution incidents belonging to a particular substance category could be highlighted at the same time. It was noted that there are some obvious gaps in the monitoring for particular substances and geographical areas.

Tools for undertaking an inputs budget were considered at a technical seminar. Experts assessed the models and tools that may be used for an inputs budget and produced summary tables. The technical issues and list of substances have been evaluated along with the suitability of current data and the need for further data requirements. This includes an initial assessment of the implications of the Water Framework Directive (WFD).

We have eight recommendations to the Group, covering the management of data, refining substances of interest, implications of the WFD and the next steps towards an inputs budget. These are:

Recommendation 1: that the inventories become the focus for information about data (meta-data) and reports that are of interest to MHWESG. The inventories should be updated periodically to include new records and to edit details of existing records.

Recommendation 2: that current and new data is left with the host organisation and only obtained by MHWESG when needed. Information regarding these host organisation databases should be updated periodically on the MHWESG Meta-Databases. This process is more efficient and ensures that the only relevant and up-to-date data is used for a particular purpose.

We have assessed the models and tools that may be used for an inputs budget and produced summary tables (Tables 9-1 and 9-2). The technical issues and list of substances have been evaluated along with the suitability of current data and the need for further data requirements.

Recommendation 3: that a review of the spread of monitoring for the more exotic substances, metals, biocides etc is undertaken to see whether any additional monitoring in the geographical gaps is justified.

Recommendation 4: that a review on the geographical spread of monitoring is carried out, particularly the inputs from some of the smaller streams and rivers around the Haven which appear to be under-represented (identification of these, together with a review of potential monitoring should be considered).

Recommendation 5: that the MHWESG narrow down the substances of interest, while also focussing on the problem areas. This twin-track approach will allow a more streamlined assessment of data capability and help identify further data requirements. It should also inform more detailed modelling that the MHWESG may wish to consider in the future.

Recommendation 6: as a next stage a coarse inputs budget should be conducted. This should follow implementation of recommendation number 5 and would come before any detailed modeling. A coarse inputs budget would provide an understanding of catchment pollutant sources and pathways and impacts within the Waterway itself. This could be a useful lead-in to one or more detailed input budgets, perhaps involving an estuary model. Conducting a coarse inputs budget would also further assess current data capability and help identify any additional data or monitoring/surveillance requirements. Providing a focus on key areas, parameters and sources, would inevitably save money if a more detailed approach is considered in the future.

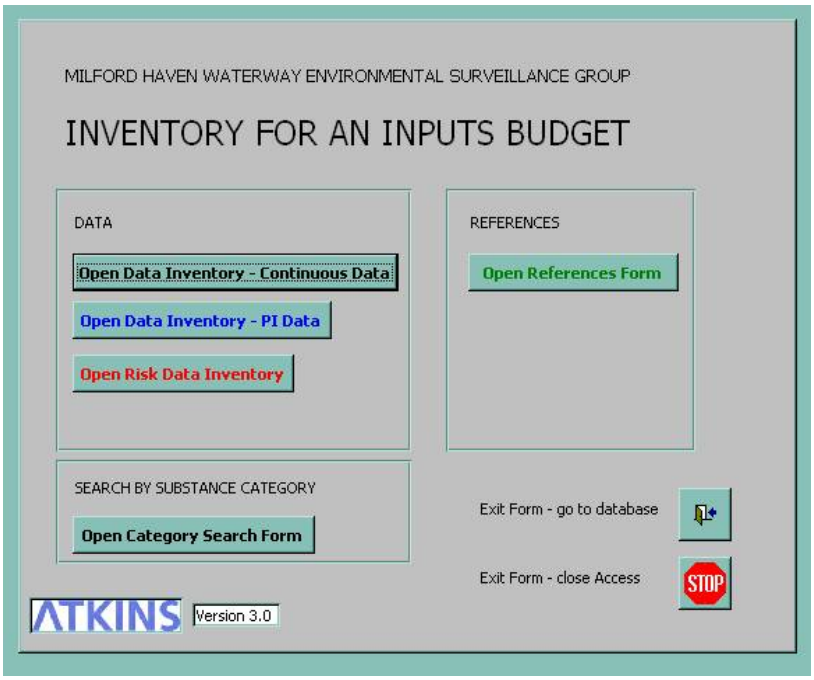
Recommendation 7: the MHWESG should be aware of the work that the Agency are doing for the WFD as the steps involved should parallel the work towards an inputs study of the area (the steps are summarised in Figure 10-1). During the characterisation stage (up to the end of 2004) the following aspects will be pulled together, all of which will be useful to MHWESG:

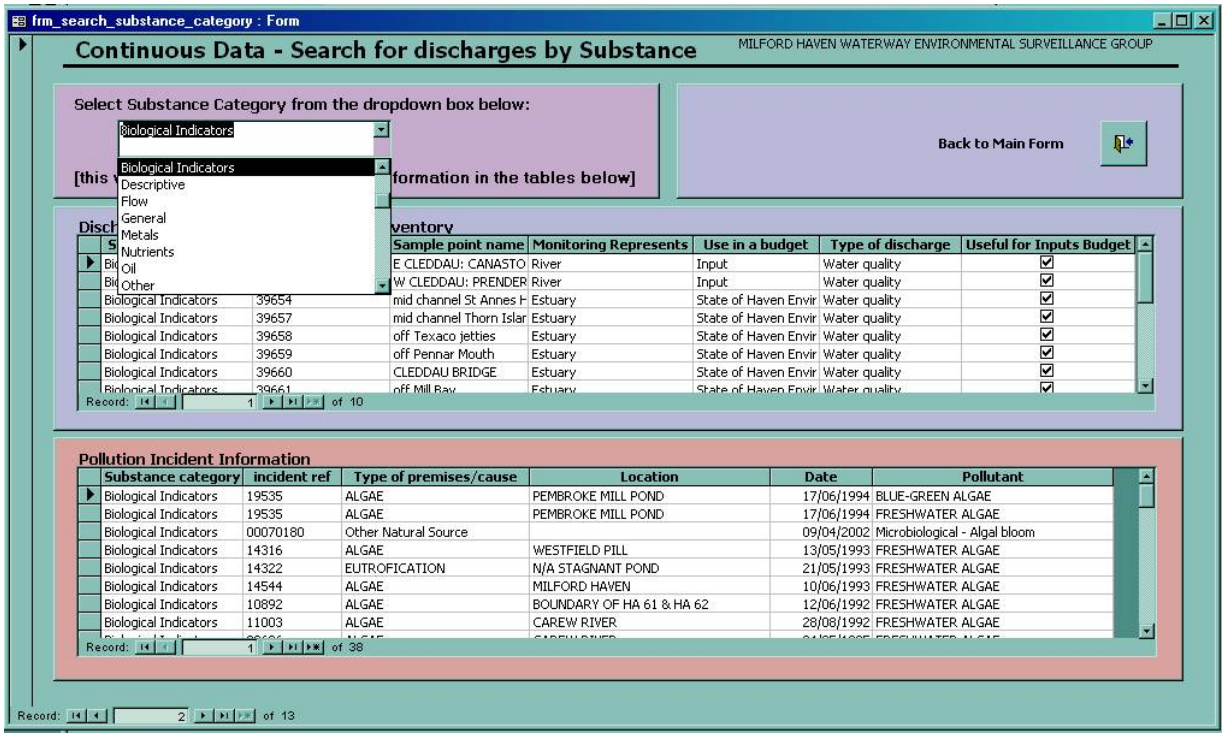
- Delineation of water bodies and typing
- Collation of pressure information for the catchment, including where significant pollutant sources are likely to come from
- Assessing impacts within the Haven itself, including some assessment of provisional status
- Whether the Haven is thought to be at risk of failing the Directive's Objectives or not

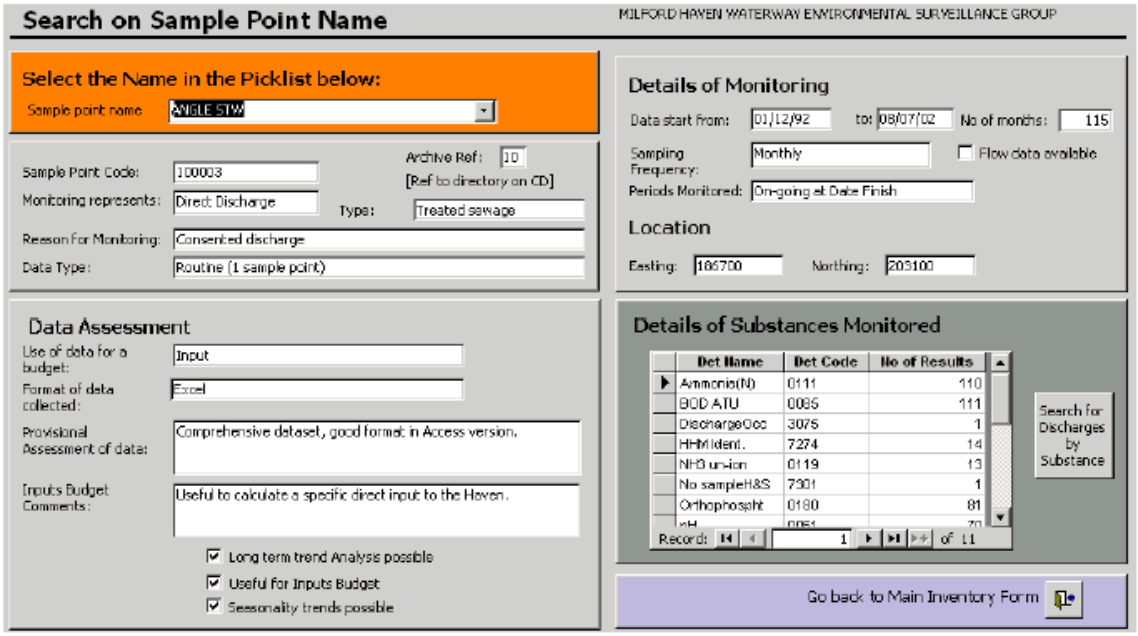
- Where monitoring should be targeted and direction for setting up a Programme of Measures to deal with any identified problems.

Recommendation 8: it is recommended that the Group should review the output from the pressures and impacts WFD work undertaken by the Agency, to see if there are any messages that are useful for highlighting future monitoring work, and to harness information on the methodologies used which may be useful for an inputs budget approach. It would also be an opportunity to provide feedback to the Agency on their approach.

FIGURES 1 - 4. Screenshots from inventory database



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MILFORD HAVEN WATERWAY ENVIRONMENTAL SURVEILLANCE GROUP
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Sample Point Code: 100003
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Type: Treated sewage
Reason for Monitoring: Consented discharge
Data Type: Routine (1 sample point)
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Sampling Frequency: Monthly
Flow data available
Periods Monitored: On-going at Date Finish
Location
Easting: 186700 Northing: 203100
Data Assessment
Use of data for a budget: Input
Format of data collected: Excel
Provisional Assessment of data: Comprehensive dataset, good format in Access version.
Inputs Budget Comments: Useful to calculate a specific direct input to the Haven.
Long term trend Analysis possible
Useful for Inputs Budget
Seasonality trends possible
Details of Substances Monitored
Det Name | Det Code | No of Results
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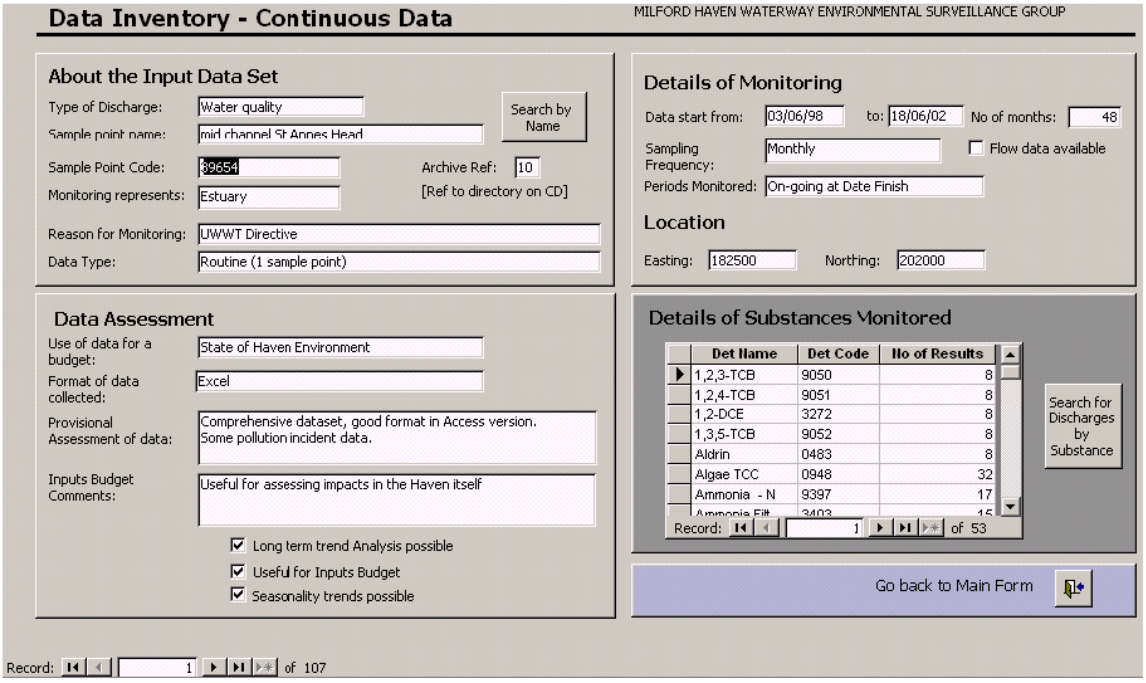
BOD ATU 0085 111
DischargeOcc 3075 1
HHMIdent. 7274 14
NH3 un-ion 0119 13
No sampleH&S 7301 1
Orthophosph 0180 81
Record: 1 of 11
Search for Discharges by Substance
Go back to Main Inventory Form


Data Inventory - Continuous Data
MILFORD HAVEN WATERWAY ENVIRONMENTAL SURVEILLANCE GROUP
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Sample Point Code: 89654
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Data Type: Routine (1 sample point)
Details of Monitoring
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Sampling Frequency: Monthly
Flow data available
Periods Monitored: On-going at Date Finish
Location
Easting: 182500 Northing: 202000
Data Assessment
Use of data for a budget: State of Haven Environment
Format of data collected: Excel
Provisional Assessment of data: Comprehensive dataset, good format in Access version. Some pollution incident data.
Inputs Budget Comments: Useful for assessing impacts in the Haven itself
Long term trend Analysis possible
Useful for Inputs Budget
Seasonality trends possible
Details of Substances Monitored
Det Name | Det Code | No of Results
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1,2,4-TCB 9051 8
1,2-DCE 3272 8
1,3,5-TCB 9052 8
Aldrin 0483 8
Algae TCC 0948 32
Ammonia - N 9397 17
Record: 1 of 53
Search for Discharges by Substance
Go back to Main Form
Record: 1 of 107

2.4. ANNUAL WADERS & WILDFOWL SURVEYS 2000 – 2005

A Haycock

Amalgamated and condensed executive summaries

The Milford Haven Waterway and Cleddau Estuary hold large numbers of waterfowl (wildfowl and waders) during the winter months. Numbers of shelduck, wigeon, teal, dunlin, and curlew have reached levels of national importance in recent years.

Monthly counts of waterfowl are carried out throughout the autumn and winter (September to March) as part of the national Wetland Bird Survey (WeBS). Since the winter of 1993-94 these counts have also been incorporated into a rolling programme of research and survey initiated by the MHWESG.

The estuary is divided into fifteen count sectors and waterfowl are counted by a team of observers. Counts normally take place within two hours either side of high tide, when most species are assembled in high tide roosts. Sectors are counted by a combination of walking the shore and counting from fixed points, depending on accessibility.

2000-2001

Survey count coverage was almost complete, though no counts were undertaken in March due to Foot and Mouth Disease restrictions.

Forty-five species of waterfowl were recorded (excluding gulls), including ten species of duck and twenty-one of waders. Divers, grebes, herons, cormorants and geese were also represented, together with mute swan, water rail and moorhen. Unusual species included Slavonian grebe and red-throated diver.

During the peak winter period between November 2000 and February 2001, mean monthly totals were 5498 for wildfowl and 5666 for waders. The peak monthly count for wildfowl was 6933 in December, and 6388 for waders in January. Dunlin was again the most numerous wader species, though with far fewer birds recorded than in recent years.

Maximum counts of nationally important species:

little grebe: 66 (November)	teal: 2427 (January)
shelduck: 655 (February)	dunlin: 2699 (February)
wigeon: 3611 (November)	curlew: 1167 (December)

The combined peak counts for all species (including gulls) in between November and February was 21,545, thus maintaining the estuary at the level of international importance for its overall bird populations.

Mean midwinter monthly totals of waders and wildfowl were lower than in recent years. All of the nationally important species showed a decline when compared with the 1999-2000 season. Shelduck and dunlin numbers showed a considerable decrease. Less common species, such as pintail, shoveler and tufted duck, were present in only very small numbers. Redshank numbers increased for the second consecutive year to reach their highest level since 1993-94. Canada goose numbers were the highest ever recorded with 1080 present in December 2000.

2001-2002

Survey count coverage was almost complete.

Forty-eight species of waterfowl were recorded (excluding gulls), including twelve species of duck and twenty-two of waders. Divers, grebes, herons, cormorants and geese were also represented, together with mute swan, water rail, coot and moorhen.

During the peak period winter between November 2001 and February 2002, mean monthly totals were 5216 for wildfowl and 7520 for waders. The peak monthly count for wildfowl was 6368 in December, and 11033 for waders in January. Dunlin was again the most numerous wader species, with lapwing a close second.

Maximum counts of nationally important species:

little grebe: 57 (January)	teal: 1926 (December)
shelduck: 762 (February)	dunlin: 3481 (December)
wigeon: 3192 (November)	curlew: 1138 (November)

The combined peak counts for all species (including gulls) in between November and February was 23,352, thus maintaining the estuary at the level of international importance for its overall bird populations.

Mean midwinter monthly totals of wildfowl were lower than in recent years. Wigeon and teal numbers showed declines when compared with the 2000-01 season, but shelduck showed a slight increase. Dunlin numbers recovered a little from the low of 2000-01, while curlew numbers showed a decrease. Overall wader numbers were considerably boosted by an influx of nearly 3,500 lapwing in January. Both grey herons (33) and little egrets (64) were present in record numbers in midwinter. Redshank numbers appear to have stabilised, while greenshank numbers were the highest since 1984-85.

2002-03

Survey count coverage was almost complete except for several of the major sectors not being counted in September.

Fifty-three species of waterfowl were recorded (excluding gulls), including eight species of duck and twenty-four of waders. Divers, grebes, herons, cormorants and geese were also represented, together with mute swan, water rail and moorhen. Unusual species included Slavonian and rednecked grebes, and great northern and red-throated divers.

During the peak period winter between November 2002 and February 2003, mean monthly totals were 4931 forwildfowl and 7426 for waders. The peak monthly count for wildfowl was 6374 in December, and 9381 for waders in February. Dunlin was again the most numerous wader species, with more birds recorded than in the previous three years.

Maximum counts of nationally important species:

little grebe: 37 (January and February)	teal: 1691 (December)
shelduck: 655 (February)	dunlin: 5417 (February)
wigeon: 3871 (December)	curlew: 1022 (November)

Mean midwinter monthly totals of waders and wildfowl were slightly lower than in the 2001-02 season. Little grebe numbers were particularly low: the lowest since 1994-95. Most wildfowl species were present in lower numbers than in recent years. Wader numbers were considerably boosted by an influx of dunlin in February, and oystercatcher numbers continued to increase. Less common species, such as shoveler, red-breasted merganser and divers, were present in larger numbers. Canada goose numbers fell for the second consecutive year, but as they often feed away from the estuary, it is difficult to yet determine if this is a definite trend.

2003-04

Survey count coverage was almost complete.

Fifty-four species of waterfowl were recorded (including gulls), with ten species of duck and twenty-one of waders. Divers, grebes, herons, cormorants and geese were also represented, together with mute swan, water rail and moorhen. Unusual species included snow goose (probably feral), American wigeon, and goosander. There was also an influx of over 100 brent geese in February.

During the peak winter period between November 2003 and February 2004, mean monthly totals were 6477 for wildfowl and 7396 for waders. The peak monthly count for wildfowl was 9763 in December, and 8973 for waders in February

Maximum counts of nationally important species:

wigeon: 6045 (December)	teal: 2129 (December)

Maximum counts of previously nationally important species now below the threshold for national importance:

little grebe: 55 (November)	dunlin: 3234 (February)
shelduck: 700 (January)	curlew: 727 (November)

Mean midwinter monthly totals of waders were higher, and wildfowl were slightly lower than in the 2002-03 season. Little grebe numbers appear to have recovered from the low in 2002-03. Most wildfowl species were present in higher numbers than the previous winter. Wigeon was the most numerous waterfowl species, with over 50% more than in recent years. Dunlin was again the most numerous wader species, although numbers were again low (*cf*

2000-01 and 2001-02). Oystercatcher numbers declined considerably after four consecutive increases. The peak count of curlew fell for the fifth consecutive season

2004-05

Survey count coverage was almost complete.

Fifty-six species of waterfowl were recorded (including gulls), with eight species of and twenty-two of waders. Divers, grebes, herons, cormorants and geese were also represented, together with mute swan, water rail and moorhen. Unusual species included snow goose (probably feral) and ring-billed gull.

During the peak winter period between November 2004 and February 2005, mean monthly totals of 7562 wildfowl and 10,030 waders were present. The peak monthly count for wildfowl was 10,914 in November, and 14,503 for waders in February.

Maximum counts of nationally important species:

wigeon: 8468 (November) teal: 2129 (January)

Maximum counts of previously nationally important species now below the threshold for national importance:

little grebe: 43 (December) dunlin: 4251 (December)

shelduck: 757 (January) curlew: 877 (December)

Mean midwinter monthly totals of waders and wildfowl were higher than in the 2003-04 season. Most wildfowl species were present in higher numbers than the previous winter, giving the highest total (max counts of each species combined) since the hard winter of 1986-87. Wigeon was the most numerous waterfowl species, with over 50% more than in recent years. Waders had the highest total since counts began, largely due to an influx of over four thousand golden plovers. The peak count of curlew rose after five years of decline.

2.5. ANNUAL SHELDUCK SURVEYS 2000 – 2005

J E Hodges, PCNP Ecologist

Amalgamated and condensed executive summaries

The Daugleddau Estuary and Milford Haven Waterway hold nationally important numbers of shelducks during the winter months. In addition, there is a small summer population that has been the subject of annual, boat-based, surveys carried out since 1991. The summer boat surveys were repeated in June and late July, 2000 to 2005, as part of a co-ordinated programme of environmental surveillance in the estuary system. The aims, and objectives, methods used and results obtained during these surveys are described in these reports.

In 2000, the number of shelduck broods recorded in the estuary system was greater than in 1999, though predation by ground predators such as foxes continued to be a significant factor affecting the survival of young ducklings from hatching to fledging.

In terms of numbers of shelduck broods recorded, 2001 was slightly less successful than 2000, although average brood sizes were significantly larger than in 2000.

The results indicated that 2002 was a relatively poor year for shelducks, both in terms of numbers of broods and the average size of broods. Poor weather in May and June and possible localised disturbance were thought to be contributory factors.

In contrast, 2003 was a much better year for shelducks in the estuary system than 2002. The number and average size of broods were significantly higher and larger than in the previous year. Poor weather in May and early June, and possibly localized disturbance were thought to influence the numbers and size of broods, and also survival of ducklings to fledging.

2004 was a better year for shelducks in the estuary system than the previous two years. The number of broods was higher than in 2002 and 2003, although average brood size was relatively low. Poor weather in June and July was thought to be a significant factor influencing the number, size and rate of survival of broods.

2005 was one of the least successful years for shelducks since the early 1990s, both in terms of numbers of broods recorded during the survey.

Localised disturbance, both from the water and land, and periods of poor weather at critical times were considered to be significant factors affecting brood numbers, sizes and rate of survival of young. Predation by ground predators was consistently regarded as a key factor in survival of ducklings to fledging.

Throughout this period, data collected for other wetland birds once again confirmed the importance of the estuary system during the autumn migration period, especially for species such as curlew.

The reports conclude with a recommendation for the continuation of the annual surveillance of summer shelduck populations in the estuary system, as part of the MHWESG annual work programme.

2.6. MILFORD HAVEN SEDIMENT MACROBENTHOS REVIEW

R Warwick, 2006

Executive summary

3. OTHER RELEVANT REPORTS

3.1. ASSESSMENT OF EUTROPHICATION RISKS AND IMPACTS IN THE MILFORD HAVEN WATERWAY

Summary of Environment Agency internal report by Paul Edwards, Ecological Appraisal Specialist, EA Wales.

The report summarises appropriate assessments of the 159 discharges carried through to the third stage of the Review of Consents for the Pembrokeshire Marine SAC. The report focuses on Milford Haven as it is the only major estuary in Pembrokeshire Marine SAC (Figure 1).

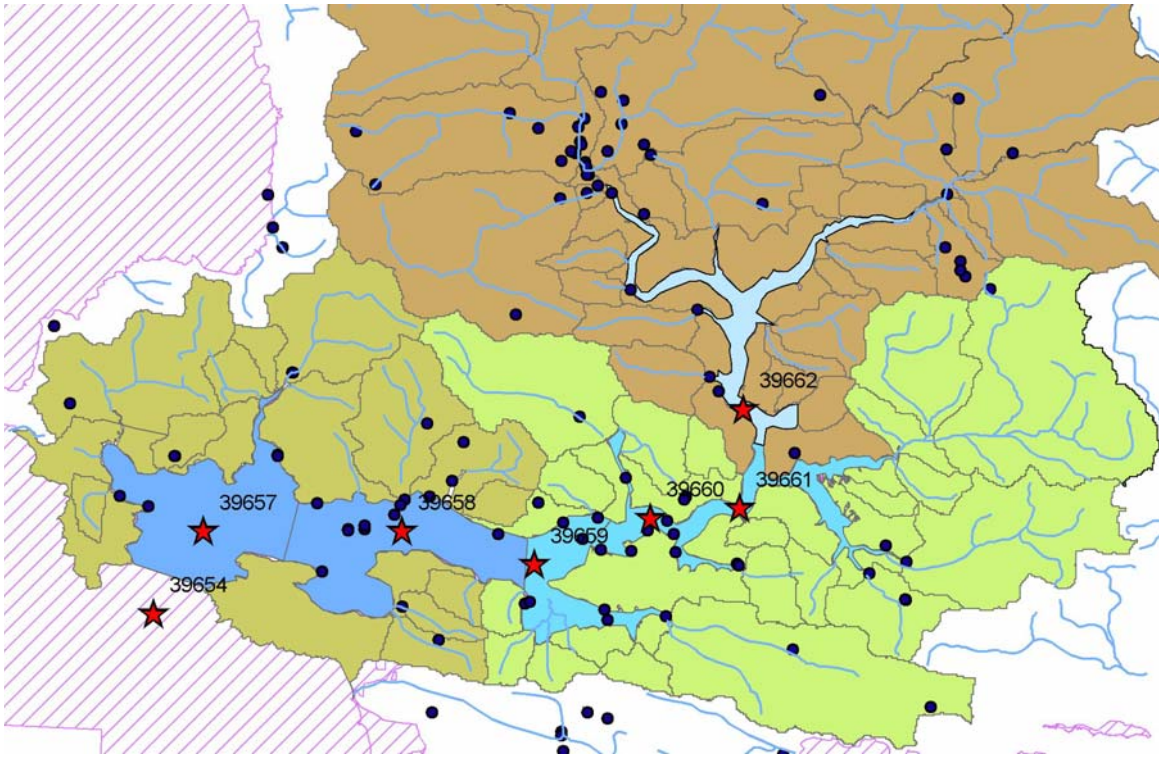

FIGURE 1. Hydrological catchment areas, discharges (blue spots) and sample points (red stars)

The report concentrates mainly on toxic contamination and nutrient enrichment as there is little or no evidence to suggest that existing discharges are significantly altering the pH, salinity, thermal regime or turbidity within the SAC, or are causing siltation or physical damage. Furthermore, no consent limits and insufficient monitoring data are available to assess these impacts should they be occurring.

Specific assessments comprised:

- toxic contamination in the water column
- dissolved oxygen
- sediment quality
- unionised ammonia
- nutrients
- intermittent discharges

Assessment of toxic contamination in the water column

Toxicity assessments were carried out on all available data for all substances identified as having a likely significant effect on the Pembrokeshire Marine SAC at the previous assessment stage. All consent limits and monitoring data were compliance-tested for each of the identified substances with the appropriate environmental quality standards (EQSs).

Monitoring data from discharges assessed suggest that the ammonia EQSs were the only water quality EQSs to be exceeded between January 2000 and December 2004. As the EQSs are relevant to the receiving saline water, rather than discharges, and discharge concentrations are diluted in the receiving water, the assessment therefore adopted a precautionary approach to screening that does not take dilution into account. Impacts from ammonia were further assessed.

One discharge (Merlin's Bridge STW) is consented to discharge metals (zinc, lead, copper, nickel and chromium) at concentrations higher than the respective EQSs. However, mass balance calculations showed that maximum consented values for each of the metals from this STW are significantly lower than the concentrations needed to exceed the respective EQSs in the Western Cleddau downstream.

Other than Merlin's Bridge STW, no discharges had numerical consent limits in excess of EQS values for toxic substances other than ammonia. Five discharges are consented to discharge oil and grease at concentrations up to 15 mg/l, but no EQS is available for these determinands.

Assessment of Dissolved Oxygen

All available data for dissolved oxygen in Milford Haven Estuary held be the EA for the period January 2001 to August 2005 were assessed. The threshold level determined for triggering likely significant effect for dissolved oxygen in saltwater is 5 mg/l.. Minimum readings for all sample points within Milford Haven were greater than 5mg/l and, therefore, it is possible to conclude no adverse effect on site integrity from low dissolved oxygen concentrations.

Assessment of sediment quality

Research on Milford Haven sea bed sediments in 1993 (MHWEMSG report: Smith & Hobbs 1994) showed that sediments contained copper and zinc in concentrations above the predicted effects level (PEL). Lead, nickel, chromium and mercury were in concentrations lying between the respective threshold effects levels (TELs) and PELs. The PEL is the lowest level to have been associated with adverse biological effects, while the threshold effects level (TEL) is the level below which substances are not considered hazardous. However, there is no evidence to link these metals in sediments to current consented discharges, as consented and observed concentrations of metals in the discharges were not high enough exceed EQS values.

Assessment of unionised ammonia

No samples from the Milford Haven waterway exceeded the EQS for total ammonia or unionised ammonia during the review period from 2000 to 2005. The results of this assessment therefore suggest that ammonia does not have a likely significant effect on the Pembrokeshire Marine SAC.

Nutrients assessment

The aim of this assessment was to quantify the nutrient contributions from individual consented discharges and diffuse sources, and to assess the effect of these nutrients on the trophic status of the waterway and estuary system. The study involved estimation of nutrient inputs from point and diffuse sources, analysis of estuary monitoring data, assessment of temporal trends and application of a decision-support model to predict the biological response to nutrient inputs into the waterway.

It was estimated that approximately 95% of the dissolved available inorganic nitrogen (DAIN) load to the Milford Haven waterway comes from sources other than continuous discharges (Figure 2). In contrast, approximately 61% of the dissolved available inorganic phosphorus (DAIP) load comes from discharges. The main point sources of DAIP are Milford Haven sewage treatment works (STW) (18%), Pembroke Dock STW (13%), Merlin's Bridge STW (11%), Neyland STW (5%) and Narberth STW (5%) (Figure 3).

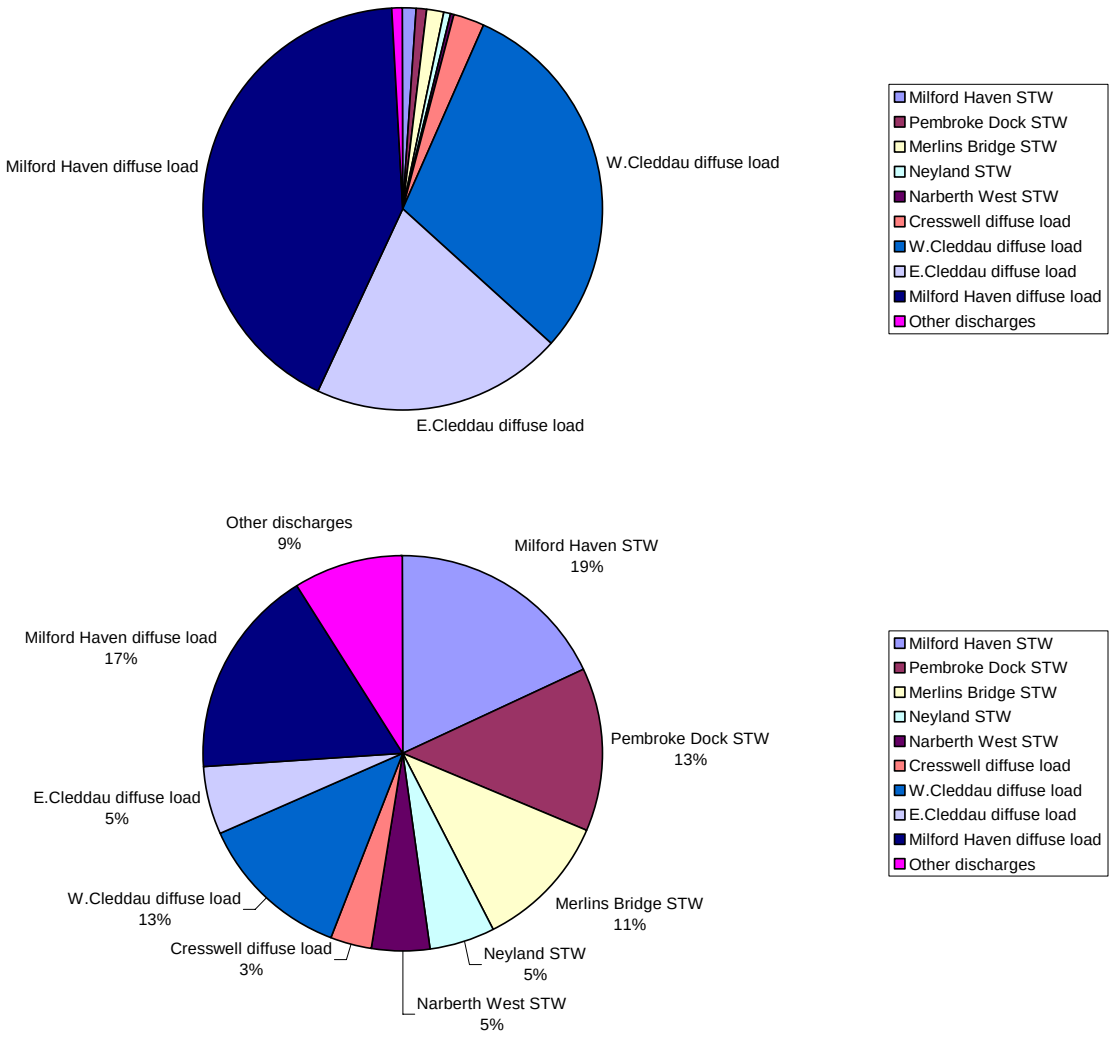

FIGURE 2. Relative contributions of dissolved available inorganic nitrogen (DAIN)(top) and dissolved available inorganic phosphorus (DAIP)(bottom) from point and diffuse sources in the Milford Haven catchment.

There is a gradient of decreasing mean nutrient and chlorophyll concentrations and increasing salinity from the upper estuary to the mouth of the waterway (Figures 3 - 5). Chlorophyll concentrations and algal cell counts tend to peak around June, but rarely exceed concentrations that would trigger concern about an undesirable disturbance.

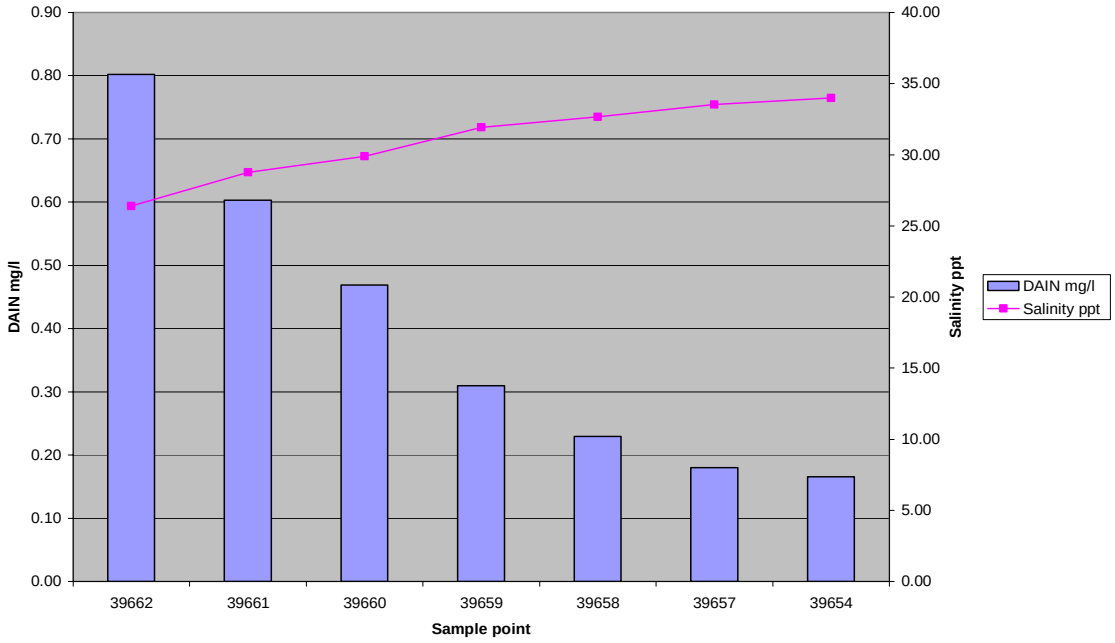

FIGURE 4. Mean dissolved available inorganic nitrogen (dain) concentrations and salinity in the Milford Haven waterway from upper to lower estuary (left to right – see Figure 2 for sample point locations)

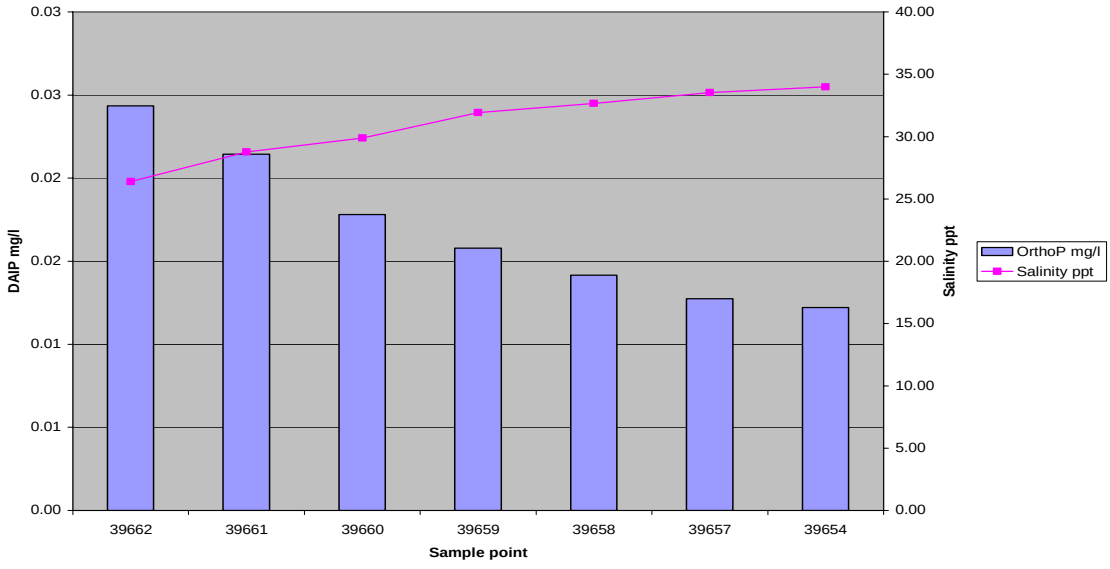

FIGURE 5. Mean dissolved available inorganic phosphorus (DAIP) concentrations and salinity in the Milford Haven waterway from upper to lower estuary (left to right)

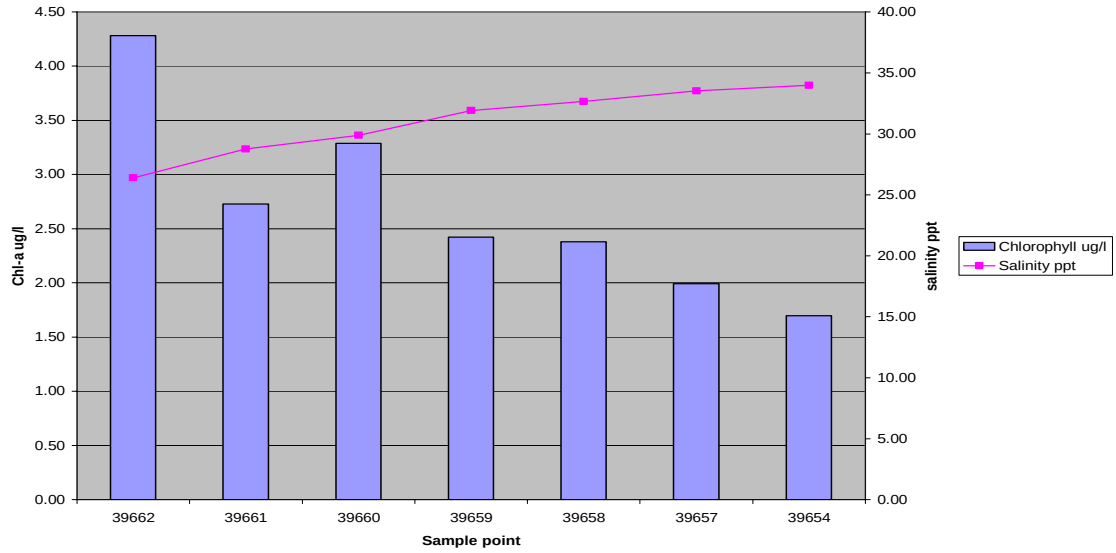

FIGURE 6. Mean chlorophyll concentrations and salinity in the milford haven waterway from upper to lower estuary (left to right).

Temporal trend analysis showed a slight decline in orthophosphate concentrations in the Milford Haven waterway since the current monitoring programme began in 1998/99, but otherwise there were no significant trends. There were reductions in ammonia-N and orthophosphate in the discharge from Merlin's Bridge STW and an overall decrease in orthophosphate concentrations in the Pembroke Dock STW discharge during the last 10 years. In contrast, there were increases in ammonia concentrations in the Narberth West and Milford Haven STW discharges in the same period.

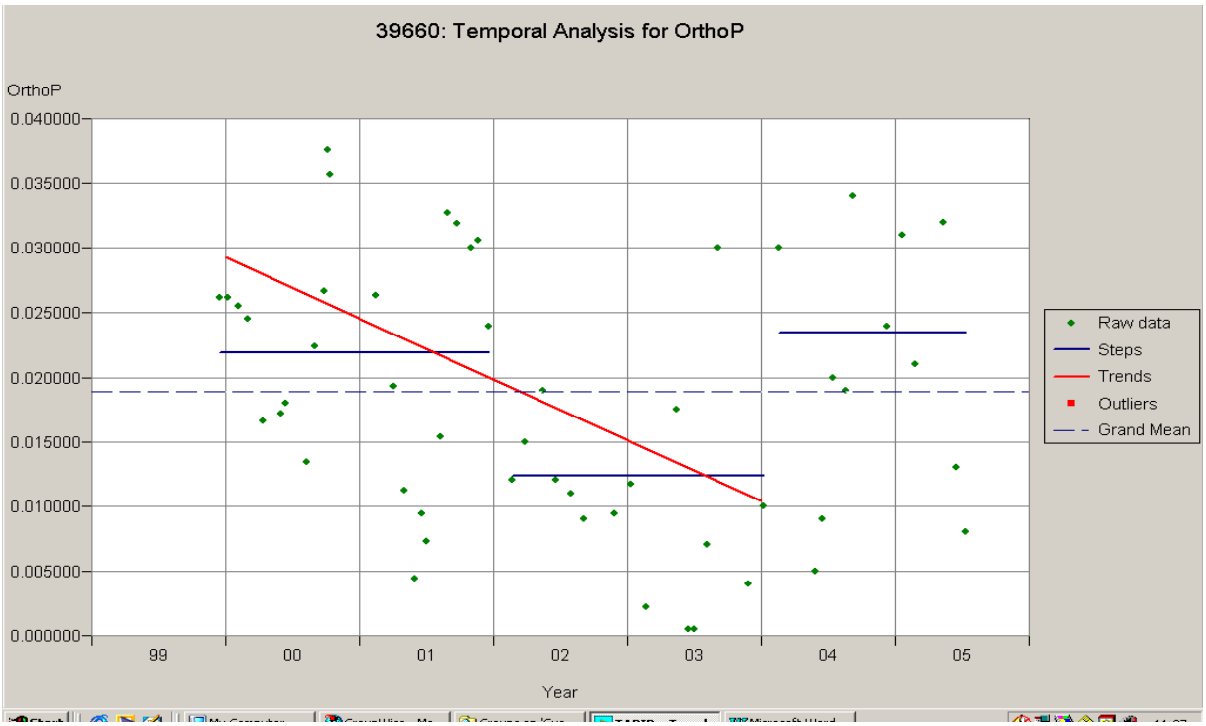

FIGURE 7. Temporal trends in orthophosphate in the Milford Haven waterway at sample point 39660 (near Neyland)

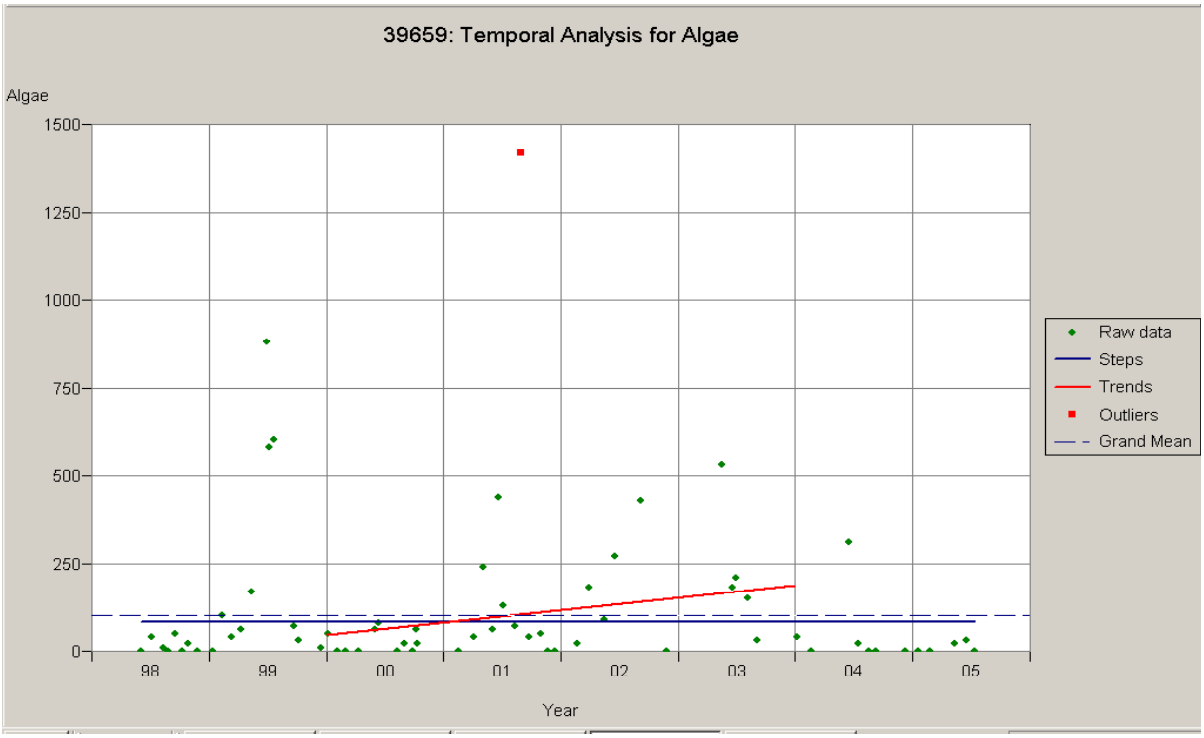

FIGURE 8. Temporal trends in algal cell counts in the Milford Haven waterway at sample point 39659 (near Pembroke Dock).

The modelling results indicate that the waterway is phosphorus-limited, especially the upper estuary. The waterway is mainly mesotrophic, apart from the outer estuary, which is on the border between mesotrophic and oligotrophic. Model runs without the phosphorus load from STW effluents indicated that the trophic status of the whole waterway would be on the border between oligotrophic and mesotrophic under this scenario. This suggests that the trophic status of the waterway is sensitive to nutrient inputs from STW effluents, but even a complete removal of these P inputs would not necessarily result in a change from mesotrophic to oligotrophic.

CCW has raised concerns about the risk of a long-term build up of phosphorous in the sediments associated with raised rates of input related to the sewage discharges. However, sewage-derived phosphorus inputs have, if anything, reduced in recent years and there is currently no evidence of an ongoing increase in sediment phosphorous concentrations, or any reason to believe that equilibrium has not been reached.

Overall, the risks and impacts of nutrient inputs appear to be either low or moderate, so it should be possible to conclude no adverse impact on site integrity.

Summary conclusions

The available data suggest that there is no adverse impact on the integrity of the Pembrokeshire Marine SAC from consented discharges. This is based on the assumption that the environmental quality standards used in this report are applicable to the SAC features and that discharges do not exceed their numerical consent limits or contain harmful substances that have not been specified on the consent. It is also based on the assumption that there is no ongoing accumulation of phosphorus in the sediments of the Milford Haven waterway.

3.2. BATHING WATER QUALITY

3.3. REPORT ON THE RESULTS OF SAMPLING MILFORD HAVEN HERRING DURING THE 2002 SEASON

J. R. Ellis and S.I. Rogers (2003), CEFAS, Lowestoft

Executive summary

Following the grounding of the Sea Empress off Milford Haven on 15 February 1996, approximately 72,000 tonnes of crude oil and 360 tonnes of heavy fuel oil were released into the marine environment. Subsequently, chemical dispersants were sprayed over coastal areas of South Wales. There were many concerns regarding the potential environmental damage to marine ecosystems in the area, including the possible effect on the herring in the Milford Haven estuary. There were, however, no records of herring mortalities in the estuary at the time of the incident, and the lack of actual catch statistics meant that it was not possible to assess whether the incident affected the size of the spawning population. The year class that was spawned at the time of the Sea Empress oil spill (6-year old fish in 2002) was present and within expected limits of abundance. There was no evidence from mean length, weight, gonadosomatic index or condition factor that the 1996-year class was different from the same age group sampled in 1997 and 1998. Hence, there is no evidence that the Sea Empress incident affected the abundance of the herring year class spawned in spring 1996.

4. FUTURE WORK PROGRAMME

Following completion of the necessary reviews of previous Group work and other information and data, the priorities of the Group in 2006 are to complete the review tasks, refine project specifications and recommence more field-based projects in addition to desk-studies.

The Group's priorities for the current year are to:

- Review of sediment contamination and sediment transport pathways in Milford Haven and development of recommendations for sediment contaminant monitoring. Specification currently out to tender.
- Re-establish of former NRA / EA contaminant bioaccumulation programme. Specification currently out to tender.
- Develop specification for targeted macrobenthic surveillance taking into account the outputs and recommendations from the macrobenthic review [3], invite tenders and let contract.
- Continue annual summer shelduck breeding surveillance and wetland bird data collation and reporting.
- Review the requirements for future water quality surveillance by the Group in light of EA monitoring for the Water Framework Directive; revise specification and recommence revised programme.
- Develop specification for phase II of inputs budget development.
- Develop and make available an electronic archive of Group reports.

Priorities for future years include

- Repeat rocky shore baseline surveillance
- Maintain routine bioaccumulation, targeted macrobenthic, sediment and water quality, and ornithological surveillance programmes
- Repeat broad scale macrobenthic survey
- Complete development of literature database

[3] Warwick, 2000

5. FINANCIAL STATEMENT

APPENDICES

APPENDIX 1: PURPOSE AND TERMS OF REFERENCE

Preamble

The Milford Haven Waterway[4] 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.

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'.

[4] 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.

APPENDIX 2: CURRENT MEMBERSHIP

Chevron-Texaco Ltd
Countryside Council for Wales
Environment Agency Wales
Dwr Cymru-Welsh Water
Milford Haven Port Authority
Pembrokeshire Coast National Park Authority
Pembrokeshire County Council
Petroplus Tankstorage Ltd
Total Oil (UK)
South Wales Sea Fisheries Committee (corresponding)
Wildlife Trust West Wales (corresponding)
Welsh Assembly Government Environment Division (observer)

APPENDIX 3: MEMORANDUM OF AGREEMENT

APPENDIX 4: CHRONOLOGICAL LIST OF MHWEMSG / MHWESG[5] 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, 11pp + 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, 10pp + 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

[5] Group name change in 2000.

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

1996

Hodges, J E (1996). *Daugleddau Estuary and Milford Haven Waterway annual shelduck survey: report for 1996.* Report from Pembrokeshire Coast National Park Authority, 17pp + 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+ appendices

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

Irving, R and Worley, A (1999). *Survey of sublittoral Zostera marina bed in Milford Haven. Field Report*. Report from Posford Duvivier. 4pp

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. 10pp + 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*. 14pp + 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*. 15pp + 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

Poole, 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

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

2006

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

Warwick, R (2006)