



**NUMERICAL MODELLING**



**Proudman  
Oceanographic Laboratory**

NATURAL ENVIRONMENT RESEARCH COUNCIL



**British Oceanographic  
Data Centre**

NATURAL ENVIRONMENT RESEARCH COUNCIL



**OCEAN OBSERVATION**

# Science and Management Audit 2004



**DATA MANAGEMENT**



**SEA LEVEL SCIENCE**

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**Science and Management Audit of Proudman Oceanographic Laboratory  
15 to 18 November 2004**

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SMA Report of POL 2004  
**Science and Management Audit of the NERC  
Proudman Oceanographic Laboratory**

### **Background to the Review**

3. A Science and Management Audit (SMA) is an external and independent evaluation of scientific and management performance of a Research or Collaborative Centre funded by NERC. It provides an assurance for the NERC Accounting Officer (i.e. Chief Executive) and for Council that the science or service is managed well. The SMA Team membership for the Proudman Oceanographic Laboratory was independent of NERC.
4. The Proudman Oceanographic Laboratory (POL) is a Research Centre wholly owned and managed by NERC and its staff are employed by NERC. POL provides services that underpin national operational functions (for example, coastal flood forecasting) and undertakes a NERC-funded strategic research programme in ocean physics and geodesy. POL also hosts several services and support functions as part of NERC's mission in long-term monitoring, curation and supply of data, these independent facilities are;
  - British Oceanographic Data Centre (BODC),
  - Permanent Service for Mean Sea-level (PSMSL),
  - UK Tide Gauge Inspectorate,
  - POL Applications Team.
5. POL is led by a Director and is organised into Science and Engineering Groups, the independent facilities listed above and local support services (Administration, IT and Library). An organisation diagram is at Appendix 4.
6. The SMA Team visited the laboratory between Monday 15<sup>th</sup> November and Thursday 18<sup>th</sup> November. The Terms of Reference for the POL SMA are found at Appendix 1. The membership list can be found at Appendix 2. The timetable for the visit is at Appendix 3.

### **Mission of Proudman Oceanographic Laboratory**

7. POL's mission is to:
  - Undertake strategic and applied research and technology development,
  - Develop and support sustained ocean observing systems,
  - Host national and international facilities and services including the British Oceanographic Data Centre and the Permanent Service for Mean Sea Level,
  - Safeguard and develop critical mass of expertise in key areas of national capability,
  - Provide independent advice,
  - Transfer its knowledge to users,
  - Coordinate and manage complex projects,
  - Engage wider society with its work,
  - Train and develop skilled people for the future,
  - Invest in and maintain suitable equipment, infrastructure to undertake these roles.

8. To achieve its mission POL has the following vision:

*To be the national focus for sea level science, modelling and measurement of the physical processes in ocean margin seas and for marine data management. As a science-driven organisation, undertaking strategic research and hosting a variety of science underpinning functions, we will make excellent, relevant and distinctive marine contributions to the global earth system science endeavour – which is about understanding our changing environment, finding solutions, providing advice, getting new knowledge exploited and engaging all citizens with the issues - to help humankind live more sustainably.*

*To be genuinely science driven we will:*

- *Create and develop the right context and culture (for POL, owned by a Research Council and located on a University campus) - so science and its support has a sound framework and stimulating environment in which to thrive.*
- *Drive the funding, organisation and delivery of our science programmes through question-led projects, with an emphasis on using big teams when needed, and collaborating with others – so we are led by science need.*
- *Ensure we maintain a healthy balance between NERC and external sources of funding for science, science support services and infrastructure - so that our quest for external funding is truly driven by a strategic science agenda.*

*We will also*

- *Value and ensure the health of important science underpinning functions in our care, such as measurement and modelling capability and technology and data management - because the sustainability of the science endeavour depends upon them.*

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**Executive Summary**

9. The SMA team was highly impressed with the vision and leadership shown by the Director of the Proudman Oceanographic Laboratory, Dr. Ed Hill. The team recognised that the substantial period of turmoil beginning with the closure of CCMS and ending with the delayed move to the Liverpool University Campus had made both scientific and management leadership extremely difficult and Dr. Hill was to be commended for ensuring that the laboratory had retained its pre-eminence in its scientific field and that staff morale was high.
10. One overriding feature that the team noted during its audit was the concept of the “POL family” – this embraced all those who worked in the laboratory including scientific as well as support staff and also those working in the British Oceanographic Data Centre. The team felt this family concept was operating in the interests of efficiency and also as a significant cultural force.
11. The SMA team was impressed with the science undertaken at POL, it considered it a close fit to NERC priorities and that it offered excellent value for money. The team thought highly of the POL Policy Statement, considering it a model of an excellent strategic document.
12. The team was concerned that the management organisation as currently constituted did not fully understand or communicate the agreed vision to staff. It recommends that a senior management team is set up to make decisions on strategic priorities, communications, people management and the transition between Directors. It further recommends that the new Director produces a management plan within 6 months of appointment and that this is reviewed and approved by NERC.
13. The SMA team recognises the significant potential to both POL and to Liverpool University following the co- location of POL and recommends that both parties continue to develop this potential and in particular recommends that the Joint Co-ordination Board develops a more strategic role.
14. The team considered that BODC was operating as an essential and cost-effective national service and that it offered excellent value for money. It felt that there were clear benefits of POL and BODC sharing administrative services and acknowledged the important scientific synergy with POL.
15. BODC should incorporate its strategy within its Business/Operating Plan. This will simplify its preparation for subsequent core-funding bids.
16. The Staff Potential and Equality Group (SPEAG) will be making various recommendations and the SMA team recommends that there is a formal response to the group, that a review is undertaken and that this review is communicated to staff by means of a communications forum.

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**Report against the Terms of Reference**

***Term of Reference 1***

***To assess the effectiveness of the scientific and management leadership and process for cultivating long-term vision/mission and strategy, and the extent to which the POL's long-term vision/mission and strategy contribute towards the NERC mission and 5-year Strategy – including an assessment whether POL provides a national capability and source of advice to Government and its agencies and statutory bodies. QQR 3.12 i. & QQR 3.11 (iv)***

17. The papers put to the SMA team and discussed with the POL Director and staff emphasised POL's distinctive strengths as: sea level science, numerical modelling of ocean margin seas, marine data management and science, engineering and technology for in situ physical oceanographic measurement. The SMA team was particularly impressed with the POL Policy/Strategy Statement 2004/9, it considered this to be a well-articulated document that fully described POL's challenges, priorities and methods of measuring success.
18. POL's scientists have mostly been trained in physics, mathematics or engineering so there is critical mass in the physical marine sciences, although a significant strength, the "mono-discipline (physics)" basis of POL is also potentially a weakness (lack of an inter-disciplinary culture) and addressing this concern was a major driver in the case for POL's relocation to the University of Liverpool campus. POL contains a number of support functions and services that underpin the wider scientific community and key stakeholders. These underpinning "service" roles are not far short of 50% of overall activity and include;
  - the British Oceanographic Data Centre (BODC),
  - the Permanent Service for Mean Sea Level (PSMSL),
  - the National Tidal and Sea Level Facility activities (NTSLF),
  - operational shelf sea modelling support and development for the Met Office,
  - the POL Applications Group.
19. The strategic vision was formed around the key drivers; the ongoing need to be adaptable and alive to new opportunities in the rapidly evolving research environment, the need to be "customer focussed" rather than "product-driven" and the need to maintain transparency and distinctiveness so that it is clear what is done and why POL is best placed to do it.
20. The SMA team found that POL has a significant national capability. The documentation presented to the team was extensive and showed ample evidence of the multiplicity of links with all other marine research centres, NERC Research Centres and university groups. POL hosts the National Tidal and Sea Level Facility, this includes managing the UK tide gauge network and additionally, developing and updating the flood forecasting model for the Met Office. Its hosting of BODC and PSMSL are further indications of this national capability.
21. The SMA team was not clear that the management organisation as currently constituted was either an effective strategic decision-making body or the right mechanism to ensure implementation of corporate NERC policies in POL. The laboratory was seen as having extremely strong leadership from the Director but the SMA team expressed concern that the next management level, currently composed of cost centre heads, had not fully understood or assumed the important



task of communicating an agreed vision for the future to staff. The SMA team **recommends** that a senior management team is set up urgently with the ability to make decisions on strategic priorities, communications, people management and also to manage the transition between Directors. This team should consist of: the Director, the three programme leaders, the Administration Manager and the Head of BODC. The SMA team further **recommends** that the new Director produces a management plan within 6 months of appointment and that this is reviewed and approved by NERC.

***Term of Reference 2***

***To assess the effectiveness of arrangements to set research aims and objectives (including monitoring, survey and data management objectives), monitor progress and evaluate output.***

**NERC Strategic Science Programme**

22. The NERC strategic science programme at POL represents a major proportion (65%-70%) of research activity, and this dominates arrangements for the setting of science aims. The NERC strategic funding is presently £1.6 million per year (including research staff costs but excluding infrastructure costs). In practice, therefore about £400k is available annually for capital and other recurrent resource spend via the NERC science funding.
23. The formulation of the existing POL science programme (2001-2006) took place on a relatively short timescale, following the disbandment of CCMS. The emphasis throughout was on tackling major science questions where POL had strong expertise and which would be of enduring significance. The science was drawn together under the unifying “slogan” that the common thread through it all was undertaking “*today’s science for tomorrow’s operational systems*”. The intention was that much of the science could be capable of being made operationally relevant (or at least a systematic scenario testing framework) in due course. The development of the programme, in 2000, took place before the NERC Strategy, *Science for a Sustainable Future*, had been developed. In the event, the science fitted well into the new NERC strategy.

**Management of the Science Programme**

24. The Programme Leaders have overall responsibility to ensure delivery of the programme aims. POL operates a simplified “matrix management” structure within the science teams. Resource groups are “discipline based” and provide a basis for line-management, career development and cost control (i.e. they are cost centres). On the other hand the science programmes cut through resource groups enabling programme and theme leaders to draw on flexibly built teams. Theme leaders are also able to focus on science management rather than line-management responsibilities.
25. Theme and Programme Leaders have devolved budgetary authority for recurrent allocations and resources groups retain staff and capital budget responsibility, this is a common method in a matrix management system. The theme and programme leaders are allocated virtually all of the NERC-POL Science Programme budget annually. The nominal staff cost budget is used to “buy” staff time for programmes from resource groups. Programme and Theme Leaders have direct

control of recurrent resource allocations. This process of buying staff time is intended to ensure that;

- project goals are realistically matched to available resource,
- staff are utilised on projects on the basis of science need.

### **Monitoring Progress**

26. Monitoring progress of the science programme delivery takes place by a variety of mechanisms. Individual programmes hold regular update meetings, the Science Programme Managers Group (chaired by the Director) meets every two months and a traffic light system is used to monitor progress on all projects. The Science Programme Managers Group also inspects (every other meeting – 4 monthly) a risk register for high-level programme objectives set at the beginning of each year. POL has moved to a more formal Operating Plan that, at 4-monthly intervals, takes more of an overview of progress with higher level theme/programme objectives. PRINCE 2 project methodology (in line with NERC policy) is applied to all science themes and some larger projects with review every six months. Formal Project Boards have been established for each of these (in line with PRINCE 2 methodology). The Coastal Observatory Programme has a Steering Group which includes external stakeholders and this provides an important opportunity for outside input. The PSMSL reports annually to its sponsor body and reports are available on the internet which provides other opportunity for external scrutiny.
27. On the disbandment of CCMS, a conscious decision was taken not to introduce a series of annual reviews (programme review groups) at that stage until the “light touch” mid-term review of the Science Programme that the NERC STB indicated in 2001 that it wished to see. In the event, that mid-term review was postponed and was embedded in the present SMA. The SMA team discussed the option of a mid-term review but considered that the 5-year SMA programme was most appropriate. The use of an Advisory Group was discussed, similar to the model that POL uses for its Coastal Observatory. The SMA Team **recommends** the setting up of an Advisory Group for POL science, probably meeting annually and consisting of international members, stakeholders and representatives of other NERC Marine Centres.

### **Evaluation**

28. The annual scientific output is measured by the NERC Output and Performance Measures (OPM) exercise (see ToR 3 below). BODC (ToR 12) submits separately to this exercise. The SMA team was impressed with the range of measures provided by POL for evaluating its output, financial information was clearly presented and the funding, personnel and publications information from each Programme was instrumental in understanding the operations at POL.

#### ***Term of Reference 3***

***To evaluate the achievements and productivity of POL’s programme for scientific research (including monitoring, survey and data management activities) and to grade the overall quality of the programme informed by previous evaluations and international benchmarks.***

29. POL’s science is grouped into three programmes, these are sub-divided into several themes. The programmes are:
- Sea level, Bottom Pressure and Space Geodesy,

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- Shallow Seas: Function and Impacts of Change,
- Modelling and Observation Systems for Coastal Seas.

The team also considered the performance of National Tidal and Sea Level Facility (NTSLF) and also the Permanent Service for Mean Sea Level (PSMSL) under this ToR. Both were considered under the “Shared Services and Facilities” criteria

30. The science assessment was made as follows:

		Theme	Excellence	Fit to NERC	Risk-Reward	Value
Prog.	<b>Sea level, Bottom Pressure and Space Geodesy</b>					
1	Changes in global and regional sea/land levels	1	$\alpha 4$	A	2	IV
1	Sea level variability and extremes	2	$\alpha 4$	A	2	IV
1	Continuous ocean measurement (using sea level and bottom pressure)	3	$\alpha 4/\alpha 5$	A	3	V
	<b>Shallow seas: Functions and Impacts of Change</b>					
2	Shelf sea processes	4	$\alpha 5$	A	5	V
2	Coastal sea sediment processes	5	$\alpha 4$	B	2	IV
	<b>Modelling and Observation Systems for Coastal Seas</b>					
3	POLCOMS	6	$\alpha 4$	A	2	IV
3	Coastal observatory	7	$\alpha 4$	A	4	IV
	<b>National Tidal &amp; Sea Level Facility/Permanent Service for Mean Sea Level</b>					
	NTSLF		$\alpha 5$	A	5	V
	PSMSL		$\alpha 5$	A	4	V

31. The SMA team discussed programme 1 as a whole but graded the themes separately, although it was noted that the distinction between themes 1 and 2 is relatively arbitrary. The team considered themes 1 and 2 in Programme 1 as **excellent** science making a significant contribution to scientific knowledge, so were graded in the  $\alpha 4$  category. Theme 3 was considered to be science of an **excellent** quality, bordering on the outstanding and was graded at  $\alpha 4/\alpha 5$ . All three themes were considered to be a complete fit to NERC priorities and were classed as A. Themes 1 and 2 were funded with a combination of NERC Core and external finance and were seen as offering very good value for money and graded at IV. Theme 3 additionally brings in other NERC funding and was graded at V.
32. The SMA team was very impressed with the vision shown in theme 4 and felt that this was science of the highest order. It graded the science as outstanding. The SMA team was equally impressed by the publication record in theme 4 and noted the links that this theme has with PML and CASIX. The team noted that this is an ambitious project and likely to run well beyond the current five-year science plan.

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There are links between this theme and the QUEST initiative and POL is an applicant to the QUEST programme, although QUEST and the POL science plan are slightly out of phase at present.

33. Theme 5 was judged to be operating in the excellent category with the work being conducted at the forefront of its field. There was particular concern that the model did not include chemical and biological processes but the team was informed that these will be incorporated into the next science plan. There were difficulties in the funding mechanism in this area – the theme falls across both NERC and EPSRC funding and was given a B category for fit to NERC priorities. POL had been unable to bid for EPSRC funds. Further investigation after the SMA found that the rules are: In responsive mode, NERC research centres are only eligible to apply to NERC and BBSRC (subject to a funding cap). In directed/thematic mode, they are eligible to apply to EPSRC, ESRC and in some circumstances MRC (after discussion with MRC and where invited to do so). A report in 2003 by the Research Council Institute and PSRE Sustainability Study (RIPSS) did recommend that “Research Councils should consider relaxing their eligibility criteria for academic analogue status to admit such niche capabilities of GREs (Government Research Establishments)”. However, no decisions have been made yet.
34. The team was impressed with the co-operation with PML on the 3-D model (POLCOMS – theme 6) and noted that a lot of groups around the world have an interest in this area. One significant aspect for this theme (and theme 4) is the use of supercomputing facilities – theme members had good access to the facilities at Daresbury and supplemented this with use of local resources. The SMA team **recommends** that POL initiates active collaboration with the biological and chemical modellers that are operating in this field by continuing to develop its links with PML. The SMA team was impressed that theme 6 provides the Met Office operational forecasting service, a major contribution to national capability. The Coastal Observatory (theme 7) work was seen as a leader in its field and a unique “selling” point of the laboratory. The SMA team considered that the Coastal Observatory and its Advisory group should develop a long-term strategy to foster this scientific leadership.
35. The National Tidal and Sea Level Facility (NTSLF) and the Permanent Service for Mean Sea Level (PSMSL) were considered under the “Shared Services and Facilities” criteria. In both instances the team considered that the facilities were offering an essential and unique facility performed at an outstanding level and also were seen as offering excellent value for money.
36. There are 39 scientists at POL delivering the research programme part of POL’s mission (excluding engineering and technical support). 29 of these staff are “research active” (i.e. expected to be Research Assessment Exercise (RAE) returnable in a university context). There was some discussion with the SMA team over the definition of “research active staff”. NERC defines research active staff as science graded staff in bands 4 to 6 inclusive. For this SMA the team agreed with the POL definition although the numbers are fewer than those used by the NERC OPMs as many BODC staff in those grades are employed in data management rather than “research active” science.
37. POL encourages targeting publication in ISI-listed journals as opposed to various forms of “grey literature”. The *Strategy and Policy* document states that, whilst other forms of publication outlets (software, reports etc) may be valuable or

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necessary products research, they must not be viewed as a substitute for peer reviewed publication in ISI-listed journals if that it possible. Researchers have been encouraged to target the key journals in the field, particularly:

- *Journal of Geophysical Research*
- *Geophysical Research Letters*
- *Journal of Physical Oceanography*
- *Progress in Oceanography*

38. A detailed table of publication details is produced in Appendix 5, as is the breakdown of resources for each theme of POL's programmes.
39. While the number of peer-reviewed articles that POL scientists saw published in top journals in the 1999-2004 period is laudatory, the SMA team noted that **quality** of publications—and not quantity—should be a primary determinant of output value. By this yardstick, the POL has enjoyed very significant success in the last five years. This output is consistent with the international reputations of a number of POL scientists, five of whom have Individual Merit Promotion (IMP) status.
40. The POL policy on publications was noted and there was significant discussion on the policy. The SMA agreed with POL that the 4 Journals noted in Paragraph 27 were appropriate and sufficiently high profile. Given the very high profile and broad international readership of Nature, the SMA team encourages POL scientists to pursue actively publication in that journal—in addition to the more specialist journals like GRL — as a means to highlight the excellence of their science. In the course of this discussion the SMA did express its concern that much of POL science did not highlight its excellence on the national and international field as much as its science deserved. Consequently, the SMA team **recommends** that more POL scientists take an active lead in national and international science affairs, as this will additionally contribute to reinforcing the reputation of the laboratory.
41. Some concerns and comments were common to all three programmes, in particular the availability of sufficient technical staff. Technical support is crucial to the themes and the SMA team was concerned that too low a number of technical staff might restrict science development. This was seen as a problem although normally any conflict of priorities was resolved between theme leaders without higher intervention and the themes were not compromised. It was noted as a potential threat to the science programme.

### ***Term of Reference 4***

***To review the extent and productivity: of POL's national and international scientific links, including the focus the Centre provides for international cooperation; for technology expensive projects; for coordinating distributed major programmes solving complex scientific problems; and for fostering a co-operative multidisciplinary approach. [QQR 3.11 (iii)]***

### **National/International**

42. The SMA team noted that POL recognises that major earth system science requires collaboration as no single institution has all the necessary expertise to apply to these problems. The most deep-rooted and extensive international links and networks stem from its expertise in sea level science and marine geodesy (Programme 1).

43. POL hosts the Permanent Service for Mean Sea Level (PSMSL) on behalf of the International Council for Science; PSMSL is the global data bank of monthly mean sea level from 1,800 coastal tide gauges world-wide. The service receives and disseminates data globally. At the European level, POL is an active participant in a programme to develop a coherent European Sea and land-level observing network (ESEAS).
44. Scientists from Programme 1 have been actively and influentially involved in international working groups concerning the design of the GRACE and GOCE satellite gravity missions on account of their expertise in the relationship between satellite gravity measurements and ocean bottom pressure signatures. POL has membership of a variety of international bodies and working groups concerned with earth tides and geodetic observing networks.
45. At the institutional level POL is a member of the *Partnership for Observation of the Global Ocean (POGO)* within a UK consortium including SOC, PML and SAMS. The SMA team noted that although POL makes a distinctive contribution in this field it is not particularly aware of the Global Earth Observation System of Systems (GEOSS).
46. The *British Oceanographic Data Centre* participates in “institutionalised” international collaboration. BODC is part of the IOC’s network of national data centres and its staff participate in associated international bodies and programmes (see TOR 12). Of particular note, Dr Lesley Rickards (BODC) is presently Chair of the IOC/WMO International Oceanographic Data Exchange Committee (IODE).

### **International/Cooperation**

47. POL has extensive international links and scientific collaborations. The laboratory collaborates with the Intergovernmental Oceanographic Commission (IOC), the International Panel on Climate Change (IPCC), the European Commission (EU), the Department for Environment Food and Rural Affairs (Defra), the Environment Agency and the Met Office, the Ministry of Defence, Local and Regional Government and Universities. POL also plays a key role in the Global Sea Level Observing System (GLOSS) of which Professor P.L. Woodworth was chair. GLOSS is a programme of UNESCO’s Intergovernmental Oceanographic Commission (IOC) and POL staff participate fully in the work of that body.
48. POL has been, and is, involved in the coordination of a number of large and technologically complex projects. The largest such programme currently is the collaborative programme with Woods Hole (and Bedford Institute of Oceanography, Canada) involving deployment of a monitoring array on the North Atlantic western boundary as part of the NERC RAPID programme. The technology element has involved development, construction and deployment of RAPID bottom pressure recorders (BPRs) and rapidly deployable landers for this programme.
49. POL has played a major role in the past decade in coordinating major national projects (LOIS SES) and international (EU) projects (e.g. PROVESS). International Conferences in which POL regularly participates include
  - *American Geophysical Union (AGU) meetings (annual)*

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- *International Union of Geodesy and Geophysics IUGG meetings (quadrennial)*
- *European Geosciences Union (EGU) (annual)*
- *Liege Hydrodynamics Colloquium (annual)*
- *JONSMOD (biennial)*

50. The SMA team concluded that POL has an excellent network of links and collaborations but seemed content to be an enthusiastic participant rather than a leader in these areas and suggests that more POL scientists take an active role in national and international science.

### ***Term of Reference 5***

***To assess POL's knowledge transfer activities and take-up by users from research. Including survey and monitoring programmes, new products and services, data, information, advice (particularly to government) training and communications. [QQR 3.11(i)]***

51. The SMA team considered POL's knowledge transfer activities under the five headings below.

### **Evidence-based policy and advice to Government**

52. Programme 1 science and the work of the PSMSL contribute most strongly in this area. Much of this work has been from POL to the sea level chapter in the IPCC assessments. During the past two years POL has contributed to the UK Government Foresight Programme (Flood and Coastal Defence) initiated by the Government Chief Scientific Advisor. The lead Department for championing the recommendations in policy terms is Defra. A more routine form of "advice to Government" takes place through periodic consultations, POL's input usually forms part of a consolidated NERC response. Consultations that POL had contributed to were provided in the paperwork for the SMA team.

### **Environmental regulation and management**

53. The prime activity is the development of the POLCOMS modelling system coupled to the ERSEM ecosystem model with PML. POL has a close link with the Met Office, which has been providing funding for specific model developments in shelf sea models ahead of their being used operationally. The drive towards better operational environmental forecasting within Europe is the major thrust of the EU-GMES MERSEA programme in which POL and the Met Office are participating. The Met Office, POL, PML and Defra are in discussion about the use of such models (in scenario test mode) for use within ecosystem based management approaches.
54. A very specific use of modelling (jointly involving Programme 3 science and the POL Applications Group) in the past year has been POL's contribution with others to the preparation of an *Atlas of Marine Renewable Resources* for the Department of Trade and Industry. This will contribute to Strategic Environmental Assessments for future and present offshore renewable energy projects.
55. The Coastal Observatory (ToR 4 above) pilot project is aimed at demonstrating the scientific and practical benefits of timely (near real time) and readily available Marine Information from sensitive regions. The Coastal Observatory entails both

measured data and model forecasts. Model results from POLCOMS in the Irish Sea (as part of the Coastal Observatory) have been used within the Defra sponsored “Irish Sea Pilot” conducted by JNCC.

### **Wealth protection**

56. Within Programme 1 the flagship activity is work in flood defence relating to storm surges. POL operates (for Defra and now the Environment Agency (EA) directly) the UK tide gauge network (the frontline) monitoring for sea flood defence and also maintains and develops the storm surge forecast models used by the Met Office as the basis for issuing flood warnings by the EA. The NERC Science in Programme 1 (Theme 2) is concerned with extreme events and there is strong pull through of innovations into the operational systems. With the NERC Centre for Atmospheric Sciences (NCAS) and the Centre for Ecology and Hydrology, POL has worked to develop the recently funded NERC Thematic Programme, “Flood Risk and Extreme Events (FREE)”.
57. The Applications Group provides information on coastal and offshore tides and extreme sea level statistics. The usages of such data are numerous but include Offshore and Coastal Engineering projects.

### **Wealth creation**

58. POL has created an Applications Group whose aim is to provide customers with easy-to-use products and their readiness to tailor these to specific customer needs. POL considers this group to be an effective vehicle to conduct knowledge transfer in the form of information products. Since 2000 the group has been a self-financing cost centre with a team of 4 and works primarily in the areas of offshore data and consultancy, marine software and royalty agreements.
59. The SMA team felt that the Applications Group was producing a good return for POL. The Group was very much part of the POL “family” (a term that recurred throughout the audit) and additionally was the POL window to the outside world, answering some 5000 phone calls per year on a variety of POL science associated matters.
60. The SMA team was also presented with information about the provision of basic sea level data. In conjunction with Defra, the National Tidal and Sea Level Facility and BODC have engaged in a scheme to make basic sea level data from the UK national tide gauge network available at zero cost via the web. Previously the costs of quality control (QC) of sea level data by BODC were recovered by a charging regime. Defra agreed to cover the costs of QC in order that the data might be disseminated free of charge (after a three month period allowed for QC). Data that is less than three months old can be obtained but at a cost. The team discussed with POL the evidence that even minimal charging regimes for basic data do tend to suppress demand for environmental evidence. There was discussion of the North American model where data is made available at a nominal cost but business then develops applications and returns a value to the taxpayer through taxation.
61. The SMA team considered that the Applications Group was developing a significant return for POL. The team did consider that NERC needs consistent



policies in this area and suggested that NERC should review this issue with its centres and collaborative bodies.

62. An area of knowledge transfer where POL recognises there may be important potential for growing new information based businesses, is in generating GIS compatible outputs for synthesis with other environmental data products. POL will be pursuing this with the NERC exploitation scouts and any future NERC commercialisation partner.

### **Technology Transfer**

63. The SMA team received a presentation from the Ocean Engineering and Technology Group (OETG). Additionally a sub-group of the team visited the Kempston Street Annex where the OETG is located. The OETG is a group where the emphasis is more on the production of instruments and platforms, its primary function is to serve the demands of the POL science programme and services, in the course of that work the group occasionally develops novel instrument platforms (on which “off the shelf” instrumentation is normally mounted). In this context, OETG is specifically charged with being alive to the scope for commercialisation and licensing of its work. The SMA team was very impressed with the expertise of the OETG and the facilities available at Kempston Street.

#### ***Term of Reference 6***

***To assess whether efficient, effective and economic use is being made of resources (including manpower, facilities, data and equipment) in order to successfully manage POL and examine the value for money of POL activities in comparison with other providers, where this would be practicable. [QQR 3.15(iv)]***

64. At POL the overall body with ownership of resource management matters is the Head of Cost Centres Committee, this body comprises the heads of all resource and infrastructure groups and is chaired by the Director. POL is subject to an annual audit by the *Research Council Internal Audit Service (RCIAS)*. The methods of recording staff time and costs were presented to the team in the accompanying paperwork. The SMA team welcomed POL’s moves in piloting a corporate resource management tool (RMS).

#### ***Facilities: POL Workshop***

65. The POL Engineering Workshop (now relocated to Kempston Street, Liverpool) is a heavily utilised facility. POL uses a mixture of outsourcing and in-house fabrication to deliver its requirements for machined parts. The major users of this facility are the POL Science Programme and the Tide Gauge Inspectorate. POL occasionally provides services to other academic users (most recently in 2004 for the University of East Anglia for construction of a frame for a specialist water sampler).
66. The SMA team had lengthy discussions with the Workshop team and how it might interact with the workshop facilities within the University. There was some concern on how the charging mechanism might operate and the SMA team **recommends** an early resolution to this question through negotiation with the University. In particular POL should be considered as ‘internal’ by the University and not as an external commercial contractor in the pricing basis for use of facilities, e.g. workshops in other departments.

***Facilities: POL Library***

67. POL and the University of Liverpool agreed at the outset of the relocation project that it would be desirable to operate a fully integrated service. Consequently, the POL library stock has been re-catalogued onto the University system. Both parties have made savings in rationalising overlapping stock. The University libraries are now accessible to all POL staff. Similarly, University staff and students have full access to the POL library, which now also includes the Department of Earth and Ocean Science's oceanography collection. Unlike at Bidston, the POL library now operates as a lending library with issue desk facilities. These initiatives will increase the utilization of POL library collections. The SMA team noted that there were different access arrangements to e-journals for POL staff and University staff. It is strongly **recommended** that this disparity is investigated and removed as soon as is practicable. The team understands that this matter is out of POL and the University's hands but nevertheless wishes to draw attention to the issue and suggests that POL makes the high-level meetings of the Research Councils and the Higher Education Funding Councils aware of the feelings of the SMA.

***Facilities: POL Buildings***

68. Occupation of the new Joseph Proudman Building at the University was delayed by 12 months. The reasons are well documented and have been regularly reported to the NERC Executive Board and to Council. Delay to occupation has stemmed from serious building defects and severe difficulties in having these acknowledged and corrected by consultants and contractors. The POL Director refused to move staff into the facility until there was a firm programme to remedy defects. The SMA team concurred with the Director's view and welcomed the move into the new building a few days after the completion of the team's visit.
69. The open plan layout of the new building has not been universally welcomed and for POL staff this is a new venture. The POL management view is that the layout allows for major space savings and offers numerous other benefits that need to be weighed against the perceived disadvantages. The SMA team **recommends** that the effectiveness of the open-plan working environment be monitored closely and that a review be conducted after 12 months. The SMA team noted the intention to utilise additional space in an adjacent building (Nicholson) and suggest that consideration be given to quiet-working areas in this building. This might lead to a new balance of home working to laboratory presence.

**Risk Management**

70. POL conforms to corporate NERC policy on risk management. POL has a designated risk coordinator (Colin Stephens). The local risk register is reviewed by the Heads of Cost Centres and these risks are fed into the corporate risk register, which is reviewed by the NERC Executive Board (NEB).
71. POL has an emergency response plan with a designated team (POL Emergency Response Team, PERT) to manage such incidents. POL consulted with colleagues at the British Antarctic Survey (who have well developed and tested emergency procedures) in developing its risk management plans. It has a "disaster recovery plan" for IT systems. Data (including that of BODC) are backed up regularly and POL has duplicate storage of data (both on and off site).

## Health and Safety Management

72. POL abides by the corporate NERC Health and Safety Policy. The POL Strategy and Policy document sets out the highlights of the POL policy. POL has a local Health and Safety Adviser (John MacKinnon). He participates in the network of NERC H&S Advisers. The Deputy Director of POL is a member (ex officio) of the NERC Health and Safety Management Team and Committee. Health and Safety is a standing item on all POL management meetings (Heads of Cost Centres and Science Programme Managers Meetings).
73. There were some concerns over the distance of the Kempston Street Annex from the main building, about 10 minutes walk away and across a very busy main road giving rise to health and safety concerns. The SMA team **recommends** that POL produces a map that shows the recommended, safe route and also briefs visitors to use this route, which includes pedestrian crossings. In the longer term, notwithstanding the investment in the Annex it is suggested that POL investigates suitable buildings within the University campus as venues to house the OETG.

## Environmental Management

74. POL has an environmental management policy and is engaged with development of the NERC environmental strategy. The latter is striving to reduce the “environmental footprint of NERC”. The new POL building in Liverpool has been designed with a number of “green” features which include:
- natural ventilation,
  - automated building management system,
  - rainwater harvesting,
  - recycled building frame,
  - “very good” BREEAM (British Research Establishment’s Environmental Assessment Method) rating design specification.

## Administration

75. There are approximately 10 full-time-equivalent administrative staff out of a total staff population of about 100 (i.e. 10% by numbers). In terms of administrative cost the figure is lower (nearer 5%). Recent RCIAS audit reports have stressed the need for professional accountancy support for POL and a part-time accountant with extensive NERC experience has recently been employed to fill this requirement. This move was welcomed by the SMA team.

### *Term of Reference 7*

*To assess whether POL effectively invests in the development and support of major capital equipment, facilities, services and support staff. [QQR 3.11 (viii) and (ix)]*

76. The SMA team was presented with detailed information on the funding sources and spending priorities for POL from 2001. The broad priorities for major capital investment since 2001 have been:
- Support of the Science Programme.
  - IT Infrastructure.

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- Building furnishing.
  - Ocean Engineering facilities (Kempston Street facility)
77. The context for investment in Information Technology was provided to the SMA team in supporting documentation. The team was provided with extensive details of POL's sources of funding for major investments. The major investment in POL since 2001 has been in new buildings and facilities for the Centre. The total investment is over £5 million. POL also discussed its broad priorities for the next three years, these are:
- Additional expansion space (top-floor Nicholson Building refurbishment).
  - Further IT infrastructure.
  - Coastal Observatory infrastructure
78. The SMA team was asked to comment on the size of the IT group. The IT support group at POL is a team of six. POL has no plans to alter this level of support. The SMA team, based on its discussions and on the presentations received, took the view that the current complement is adequate to the task.
79. POL's major investments in support staff have been in Ocean Engineering and Technology (OETG). POL has also begun a new initiative in NERC by taking on an apprentice into the Engineering Workshop. This is the first apprenticeship in NERC in recent times and the move was welcomed by the SMA team. It was noted that there had been some difficulty in recruiting a suitable member of the technical staff for an electronics post. The team suggests that the full range of measures within NERC for recruitment and retention be explored in this instance.
80. The SMA team was satisfied that POL invests effectively in the development and support of major capital equipment, facilities, services and support staff.

### *Term of Reference 8*

*To form a view as to the risks inherent in the balance of funding within POL and the advantages and disadvantages of the income portfolio.*

81. POL has shifted its funding ratio from a 50:50 balance (NERC/External) in the 1990s to one of 70:30 by 2003/04. It seeks to maintain an overall ratio of science to external funding of between 60:40 and 70:30 (preferably at the 70:30 end of the spectrum). Additionally it maintains NERC Infrastructure and other NERC funding lines separately and avoids short-term contracts.

### **NERC funding**

82. POL has a high proportion of its income from NERC funding, this makes the laboratory particularly susceptible to any future fluctuations in NERC strategic funding. However, this risk is significantly mitigated as POL is a wholly owned centre and NERC Council has ownership of the implications of its own funding decisions.
83. The SMA team discussed the implications of the progressive move to full economic costing (FEC) of NERC grants. POL did not see this as a major risk due to its high proportion of NERC Core funding. In contrast the SMA team initially showed significant concern in this matter, however further investigation following the SMA suggests that FEC is unlikely to impact adversely on POL's

finances. However, when applying for external grants, POL will be treated as any other HEI and the implications of FEC will be more evident.

84. Prospects for external funding or other competitive forms of NERC funding (e.g. Thematic Programme grants, standard NERC Research Grants, Consortium grants) are examined against whether they align to the overall thrust of the programme. These decisions are usually made by Programme Leaders, though the Director is normally consulted.

### **External Funding**

85. POL recognises potential “over-reliance” on one funder (Defra) in supporting the Tide Gauge Network. This risk exposure is heightened because management of this contract is passing in 2004 from Defra to the Environment Agency (EA) with associated uncertainties. The SMA team noted the extensive work being undertaken by POL staff to cultivate relations with the EA.
86. POL had been experiencing low success rates with EU funding proposals. POL is now better able to mitigate the risks of the EU shared costs model by being clearer how NERC science funding from existing projects is used to match the EU contribution.
87. POL’s position has shifted since the time of the last SMA; infrastructure costs are now funded to a much higher degree by NERC than was previously the case. The effect of this is that the drive to win external funding merely to cover unfunded infrastructure costs (i.e. to earn overhead) has eased. Consequently POL is able to be discerning about the external funding it seeks for the purpose of strategically enhancing a programme. The SMA team welcomed this evolution.

### **Employment conditions**

88. POL as a wholly owned NERC Centre uses open-ended appointments in the majority of cases, there are clear benefits in this approach and the SMA team noted POL’s efforts in managing its staffing profile. The change in employment law relating to retirement (in effect from autumn 2006) will also have an impact on staffing, and it is a substantial financial risk for POL, as senior (and more expensive) staff continue in work longer than had initially been anticipated. POL had measures in place to alter its demographic profile but the impending change in employment law may constrain this.

#### ***Term of Reference 9***

***To assess whether POL has internal processes of change and rejuvenation ensuring a good flow of ideas and people working across boundaries, and that they offer career paths and opportunities that may not be available in university and faculty structures. [QQR 3.11 (vii)]***

89. POL, along with SAMS and PML, has undergone a significant period of turmoil and change since 1999 associated with the closure of CCMS. Additionally POL has been planning the move to the Liverpool University Campus from its Bidston site. The Director of POL is to be commended for retaining staff trust and morale throughout this difficult period.

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90. Since the closure of CCMS the director has sought to forge a closer relationship with NERC in a corporate sense and has developed an excellent working relationship between POL and NERC in its Swindon Office. The SMA team discussed with the Director and a range of POL staff the following drivers to change and rejuvenation initiatives:
- embracing NERC corporatism,
  - POL to Liverpool relocation project,
  - managed succession,
  - career management.
91. POL had felt particularly vulnerable to potential closure as CCMS was disbanded, given that it is relatively geographically isolated and depends on a mono-discipline science base. The Director sought to raise the profile of the laboratory within national and international science circles and also with NERC Swindon Office. The SMA team noted that NERC is investing heavily in the relocation of POL and concurs with the Director that this should be seen as a significant vote of confidence in the future science development at POL. The concerns that a small centre has when becoming fully involved in all, relevant, NERC corporate affairs are noted (see above ToR 6) but to some extent that may be seen as the price of successfully embedding POL within the NERC structure.
92. The SMA team voiced some initial concern over the relationship with the University once the move had been completed, as it had not been a major feature in the paperwork. Following the initial meeting with the Director an additional meeting was arranged with the Pro-Vice Chancellor of Liverpool University. The SMA team was delighted to hear that the University sees POL as a major benefit and has invested significant sums in capitalising on this potential. The Pro-VC described their major investment in marine civil engineering, which had been driven by the POL relocation - £13 million over the next 3 years – including a chair of maritime civil engineering. These changes would increase the opportunities for collaboration arising from the POL relocation. Both parties seemed, to the SMA team, to be approaching the opportunities inherent in the co-location in a strategic and positive manner and the team felt the governance model that had been adopted was the most appropriate for the circumstances. The SMA team noted the various collaborative initiatives already in place and in addition to those suggested that POL looks to forge links with medicine and also social sciences. The SMA **recommends** that POL, in conjunction with the University, continues to develop the excellent potential offered by co-location. In particular the team **recommends** that the Joint Co-ordination Board (JCB) develops a more strategic role.
93. The team noted that succession planning and career development was a feature of POL management. The Director had indicated that there had been a deliberate policy to manage the age/seniority profile with a recruitment drive for junior and middle bands while there remained a significant number of experienced (and expensive) staff still employed. The view had been that with the retirement age at 60 then a balanced demographic profile would re-establish itself. The change of legislation to a later retirement age will mean that POL will have to manage the process extremely carefully.
94. The SMA team noted that there are 5 staff holding Individual Merit Promotions in POL and encourage POL to continue to foster this critical mass of senior scientists.

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Given the legislative changes noted above then it is suggested that POL should consider ways to utilise the skills of this group possibly by means of joint appointments with Liverpool University.

95. The SMA team had a discussion with representatives from the Staff Potential and Equality Action Group (SPEAG), which is a group of volunteers with concerns about equality and promotion. The Group will be making various recommendations when it presents its final report and is concerned that these recommendations may not be acted on as the Group is now disbanding and the Director is leaving. The SMA team commended the work of SPEAG. The SMA team **recommends** that there is a formal response to SPEAG's recommendations, that there is a review of this response after 6 months and the output of the review is communicated to POL staff by means of a communications forum.
96. The SMA team found that there are career options at POL that would not normally be found in Universities. There are approximately 30 staff engaged in data management and similar activity, and 15 or so providing sea-going engineering and technical support (a group not strongly represented in universities). These figures indicate that just under half of POL staff are engaged in career activities not found in the University sector, additionally there are staff engaged in research activities generally not well represented in Universities (e.g. sea level science operational modelling).
97. The NERC Merit promotion scheme was operating within POL and open to all staff from whatever discipline. One concern voiced by the OETG staff was that the scheme did not seem to favour engineers. Senior staff comment was that technical staff have not yet become fully familiar with the intricacies and nuances of the scheme and once they have done so the number of promotions should increase. The SMA team **recommends** that POL management discusses, with its staff, the Merit Promotion Scheme and ensures that all are familiar with the process.
98. The gender balance at POL is 60:40, men to women. Within the science groups, women represent 25% of staff. The gender balance is skewed towards men in the more senior bands (5 to 2), and is skewed towards women in the most junior bands (7 and 8). There is almost equal representation at Band 6. The Director's view is that more women are achieving promotion and that open-plan working will emphasise the numbers of women at POL but that no additional action is required. The SMA Team agreed that no further action was required other than in response to the current work of SPEAG.
99. The SMA team noted with approval that POL seeks to place researchers abroad undertaking sabbatical visits, secondments and extended study visits. In particular they noted the most recent appointments to Brazil, Japan, USA and France.
100. One other issue that was considered under this ToR was that of communications. The recommendation for a senior management team was discussed above and the SMA team **recommends** that a post of Communications Manager be set up, drawing on existing resources by seeking out a "Communications Champion". It was noted that at present the Director is a clear leader with vision and energy but that the senior management level needs a clearer role in strategic decision making and issues of corporate relevance, and has an important role as line managers in communicating decisions and vision.

***Term of Reference 10***

***To consider whether there are areas of activity undertaken by POL that would benefit from being open to greater competition.***

101. POL is a wholly owned NERC Research Centre and exists to fulfil a distinctive role, i.e. a long-term national requirement in sea level and allied science. The SMA team concurred with the POL view that POL’s mission is distinctive and aligns well with Quinquennial Review criteria. It is this strong focus that justifies NERC’s use of direct strategic funding into the organisation for activities that cannot reasonably be obtained elsewhere. Competition for funding for data management, for example, would be inappropriate as it undermines the whole concept of a designated facility to serve an entire science community.
102. The SMA team considered various aspects of competition under this ToR, it noted that POL already wins in “head to head” competition of order 30-40% of its funding including;
- Externally funded research
  - NERC Thematic, non-Thematic and Consortium Grants
  - Capital grants
103. The SMA team agreed with POL that the peer review process provides a suitable external and independent audit for funding awards. The team felt that POL was successfully implementing the recommendations of the Baker Report for Public Sector Research Establishments (PSREs). The SMA team **recommends** that POL continues to operate with its current mix of activity in this area. The SMA team was impressed with the work of the Applications Team, which provided a range of skills that generated an additional income for POL and also offered a “shop-window” for POL products that enabled the laboratory to compete in the market-place whilst meeting its science remit.

***Term of Reference 11***

***To consider the appropriateness of the duration of funding for all areas of activity in POL and the frequency with which funds should be sought from sponsors.***

104. The SMA team was presented with the following summary of POL’s major funding streams:

<b>Funding Stream (NERC funding category)</b>	<b>Typical Duration</b>
1. NERC Strategic Science (category 1, 3, 5, 10)	5 years
2. NERC Infrastructure (funding category 7)	5 years
3. NERC non Thematic Grants (category 5)	3 years
4. NERC Thematic Grants (category 5)	3-4 years
5. NERC Studentships (category 4)	3 years
5. Defra (tide gauge) (external category 1)	1 year rolling
6. Government commissions (external category 1,5)	1-3 years
7. Applications Group Income (external category 6)	sales and 1 year licence fees

105. After lengthy discussion centred on the NERC criteria guidance of the nature and state of development of the scientific field, the SMA team **recommended** that the duration of funding for strategic science and infrastructure should continue to be



five years. The team is aware that this outcome is not ideal for supporting the handling and archiving of long-term data sets such as those generated by NTSLF and PSMSL and for such data the SMA team **recommends** a 5-year rolling funding cycle. A similar consideration would apply to the work of the Technology group, which would allow for the development of newer, innovative instruments. The team also **recommends** the Coastal Observatory Project is similarly subject to a 5-year rolling funding cycle.

*Term of Reference 12*

*To consider the role of the British Oceanographic Data Centre (BODC) which is hosted by POL on behalf of the marine science community. BODC is NERC's designated data centre for marine science, it coordinates the data holdings of UK Government departments and is one of the Intergovernmental Oceanographic Commission's international network of oceanographic data centres. BODC will fall within the scope of the POL SMA and be considered as appropriate under the ToRs above, the SMA will have regard for these wider roles.*

106. The SMA team received a presentation on the British Oceanographic Data Centre, the team visited the Bidston site and toured the BODC offices. A sub-group of the SMA team then considered BODC in more detail. Details of membership and timetabling are given in Appendices 2 and 3.
107. BODC deals with biological, chemical, physical and geophysical data. Its databases contain around 10,000 different parameters. BODC is involved in the end-to-end management of many projects and has had the responsibility of collating and checking the data collected and making it available to a wider audience. BODC distributes its quality controlled and documented data via six routes:
  - Direct interaction with customers through its enquiry service.
  - The BODC Web.
  - CD-ROM and bespoke explorer software.
  - Management of NERC Thematic and Consortium projects.
  - Through its role as host of the Marine Environmental Data Co-ordinator, under the auspices of IACMST.
  - Delivery of data to the World Data Centre (Oceanography), the International Council for Exploration of the Seas, and the UK Hydrographic Office.
108. BODC has an independent funding line as a core strategic programme, and its mission is 'to act as the UK and a world centre of excellence for marine data management'. BODC is one of NERC's 7 designated data centres. BODC has seen a dramatic increase in the demand for data, especially for tide gauge data, which is funded by Defra. Data are provided for free, with a three-month delay for processing and quality control. If customers require data within the three-month period, the request is subject to a charge.
109. BODC has 30 staff and is currently working on around 30 projects. The SMA sub-group considered the Unit to be well managed, with staff at various levels having project management responsibility. Staff meet regularly to discuss their work and exchange information.

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110. The BODC budget has been affected by NERC's policy that aims to place staff in the upper pay quartile. This policy came into force since BODC's last funding bid, and meant that BODC has had to find the pay increases out of its existing budget. This policy has especially benefited Band 6 staff, of which make up over half of BODC's staff complement. BODC intend to address this shortfall in its next funding bid.
111. BODC has a policy of appointing specific members of staff to liaise with many of the NERC Research and Collaborative Centres. The duties include:
- Liaising with project scientists, and establishing their data needs.
  - Attending project meetings.
  - Distribution of data.
  - Gathering of data from other sources.
  - Data quality control.
112. The SMA sub-group reviewed BODC by means of a series of themed presentations and discussions.

### **The BODC Website**

113. BODC is currently in the process of updating its website. Following discussions with external consultants and BGS, a team of specially trained BODC staff has carried out the work. This included the development of a custom-built content management system, which after investigation of 'off the shelf' systems, was thought best to meet BODC requirements. The SMA Team was most impressed with the work of the Web Team and the thought they had given to specific matters such as disability requirements.

### **Tagging of data anomalies**

114. The Team was given a brief presentation of one form of quality control work. BODC staff analyse data and manually flag obvious/potential errors on behalf of the end users. Analysis of some cruise data can take up-to two weeks. The software currently being used is now around 15 years old and the Silicon Graphics machines on which it runs are obsolete. The software is being upgraded for Linux platforms and will be trialled in June 2005. The SMA Team agreed in the Closed Session that flagging errors on behalf of the scientists had its benefits and freed-up the scientist's time, however they felt the method employed was very labour intensive and felt that BODC should be looking to use more automated software to tag anomalies. In further discussions, BODC acknowledged this and said it had considered using such software, but had found in the past that using automated software also presented problems. BODC plans to move to a mixture of automation and visual checking.

### **The NERC DataGrid**

115. NERC DataGrid (NDG) is a programme funded jointly by NERC and the UK Research Councils e-Science Core Programme to address data accessibility issues using e-Science technology. BODC has joined with BADC and CCLRC with the aim of developing grid technology to improve data discovery and delivery. In parallel with this BODC are developing a dictionary/thesaurus of parameters which will be crucial when searching the Web.

### **Handling of RAPID Data**

116. BODC is handling the data management of the NERC RAPID Climate Change thematic programme, in partnership with BADC. The programme is due to run from 2003 – 2009. The 21 projects planned for the programme include observations of present day conditions, measuring past conditions through palaeo records in ice sediment, bog and coral cores, and modelling past events. Tasks for BODC include liaison with PIs to discuss what type of data will be produced, sourcing data for current projects, obtaining additional data sets from various sources, processing data from research cruises – 6 have been undertaken in the past year, preparing Web pages and enabling users to down-load data. RAPID data is made available to the public after a period of two-years.
117. The SMA Team was impressed with the work being undertaken on RAPID. There appeared to be good interaction with BADC. Collaboration with BADC also meant many standard procedures were being introduced.

### **Liaison Officers**

118. BODC appoints liaison officers for the following Research and Collaborative Centres: POL, SAMS, PML and SOC. The duties include meeting with scientists to determine what their data collection and management requirements are, attending science, fieldwork, and cruise meetings, in order to gain an insight of the projects. BODC informed the SMA Team that all NERC Research and Collaborative Centres should each have a dedicated funding line for data. The SMA sub-group agreed that the work of the liaison officers released valuable time for scientists and was therefore cost effective.

### **Examples of work on Sea-Level Data at BODC**

#### **National Tidal and Sea-Level Facility**

119. The UK Tide Gauge Network, part of the National Tidal and Sea-Level Facility, was established in 1953, as a result of severe flooding along the east coast of England. Today it is funded by the Environment Agency and consists of over 40 gauges. Data are collected, processed and banked centrally to provide long time series of reliable and accurate sea levels. The data are used for tidal analysis and prediction, oceanographic research, coastal defence and storm surge warning systems. Daily checks are kept on the performance of the gauges and the data are downloaded weekly. BODC performs quality control checks and archives the data, which are then made freely available via the Web after three months.

#### **European Sea-Level Service**

120. The European Sea-Level Service (ESEAS) is an international collaboration of governmental and non-governmental organisations operating tide gauges along European coasts or providing sea-level relation information originating from other sources such as satellite altimetry, GPS and absolute gravity measurements at tide gauges. The EU funded ESEAS-RI project was established by ESEAS to support the research infrastructure of ESEAS and facilitate full scientific exploitation of European sea level observations. BODC is one of the partners involved on the quality control work package, which aims to standardise quality control methods.

## **ARGO**

121. ARGO is an international project that aims to maintain a global array of 3,000 free-drifting floats by 2006. Each year 100,000 profiles of temperature and salinity from the top 2 kilometres of ocean are reported. This global array of profiles will result in the systematic measurement of the physical state of the upper ocean as well as enabling assimilation of data in near real time. UK ARGO is funded by the MoD, Defra and NERC. It is undertaken by a partnership of the Met Office (who also manage the project), Southampton Oceanography Centre, BODC and the Hydrographic Office.
122. BODC acts as the Data Assembly Centre for all UK floats, and as the Southern Ocean Regional Data Centre for all float data in the Southern Ocean (south of 35°S). Data are received within 24 hours of the float surfacing. The data are processed and real-time quality control checks are performed before serving to the Global Data Centres. The UK Argo Data website allows near real-time access to all UK Argo data and has an interactive map that provides information about each UK float as well as general project information.
123. The SMA team was very impressed with the level of collaboration and interaction with outside agencies shown by BODC, in particular with respect to ARGO but also more generally with sea-level data.

## **Global Sea-Level Observing System (GLOSS)**

124. Global Sea-Level Observing System (GLOSS) is an international programme conducted under the auspices of the Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM) of the World Meteorological Organisation (WMO) and the Intergovernmental Oceanographic Commission (IOC). GLOSS aims at the establishment of high quality global and regional sea level networks for the application to climate oceanographic and coastal sea level research.
125. BODC acts as a GLOSS Archiving Centre for delayed-mode high frequency - hourly, 15 minute, and 6-minute – data in partnership with the University of Hawaii ‘fast delivery’ centre. BODC also maintains the GLOSS Station Handbook which provides information on the tide gauges that make up the GLOSS Core Network and coordinates the GLOSS Sea Level Archaeology Project, which aims to catalogue and ‘rescue’ historical sea-level data in paper form. The SMA sub-group was impressed with the sea-level work, which aimed toward establishing consistent practice within the community.

## **Discussion**

126. The SMA sub-group met the Director of BODC, Dr Juan Brown, and his senior staff Dr Lesley Rickards and Dr Roy Lowry. BODC reported that most of the NERC marine community does recognise it to be the central data centre, however, BODC and NERC need to be proactive in ensuring that data needs to be fed to data centres – perhaps by applying penalties, such as withholding 10% of the final grant payment, until data has been submitted.
127. Only one person deals with SOC data at present, but this situation is under review – BODC need to ensure that SOC data, arising from NERC funded work, is

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handled by them rather than University of Southampton. BODC reported that they did not have the capacity to carry quality control checks on all the data produced by the community and advised that scientists did undertake their own checks.

128. BODC recognises it needs to address the gaps in the support of the Sea Mammal Research Unit and BAS, the palaeo community, and marine geophysics. Support for SMRU, BAS, and marine geophysics will be included in its next funding bid. RAPID palaeo data is being covered, but a community meeting is needed to discuss the needs of the wider palaeo community.
129. BODC had not experienced any issues with the size of its organisation in relation to POL. BODC would be arguing for additional funds to take into account its expansion, in its next core-funding bid. About 10% of BODC's was EU funded and it did not foresee any sizeable increase in this area. Current EU work was mainly to raise its profile/reputation. There are around 6 other data centres worldwide equivalent to BODC.
130. BODC acknowledged that manual tagging could be time consuming and stated that they plan to move to a mixture of automation and visual checking. Experience had shown that automated tagging had not been entirely successful and BODC believe that the visual element cannot be entirely dispensed with.
131. BODC was graded under the shared services and facilities category as follows:

Excellence	Fit to NERC Priorities	Risk/Reward	Cost Effectiveness
<b>α4</b>	<b>A</b>	<b>4</b>	<b>V</b>

The centre was considered an essential and cost effective national service operating at a high quality and was given an overall rating of α4. Some work had elements of α5, e.g. ARGO, NERC Data Grid, and thematic work. BODC was considered an essential national service that was fully aligned to NERC's highest priorities. BODC was felt to be operating in a medium risk and high reward capacity and was seen as offering excellent value for money.

### Comments and Recommendations

132. The SMA sub-group was impressed by the quality of the presentations seen and pleased to see the involvement of several younger staff, this point had also been noted in the stakeholder survey and so was clearly a significant part of staff development within BODC. The group was keen to acknowledge BODC's important scientific synergy with POL.
133. As a benchmark for the review process, the BODC Business Plan presented to the SMA team was that written in 2002. The SMA team highlighted the need for an annual Business/Operating plan, it further **recommended** that BODC develops and produces its strategy in the annual Business Plan. BODC concurred, stating that a Business Plan was maintained and agreed that the document should contain the strategy.
134. The SMA team was not clear about the cost of shared facilities with POL, in particular administrative support and computing services. The SMA team considered that BODC needs to be able to identify these costs. Subsequent

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investigation made it clear to the team that the costs were known and these were £424,243.

135. The SMA team considered that BODC had good links to the national and international community but did not feel that these collaborations were as strong as possible. In particular, the SMA team **recommends** that BODC seeks to serve a wider national and international community.
136. The team **recommended** that there should be fuller collaboration with the Hadley Centre building on the links already established.

Acknowledgements

The Team acknowledges the help in the SMA it received from the various members of Proudman Oceanographic Laboratory and the British Oceanographic Data Centre who put together the list of documents and those who helped in both Liverpool and Bidston. A particular mention is given to the members of POL/BODC who organised the excellent logistical arrangements

The Secretariat would also like to acknowledge the help given by the SMA Team members throughout the review.

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<b>Summary of Findings &amp; Recommendations</b>		
ToR 1	That a senior management team is set up with clear responsibility for corporate affairs	Paragraph 21
ToR 1	That a management plan is produced within 6 months of a new Director taking up post	Paragraph 21
ToR 2	An advisory group is set up for POL Science	Paragraph 27
ToR 3	Collaboration is developed with biological and chemical modellers	Paragraph 34
ToR 3	More POL Science Staff take a stronger scientific lead in national/international initiatives	Paragraph 40
ToR 6	OETG engages with University Technical Staff to develop potential and to resolve charging mechanisms	Paragraph 66
ToR 6	An investigation and resolution (as much as possible) of differential library access for e-journals	Paragraph 67
ToR 6	Open-plan working is closely monitored and formally reviewed after 1 year	Paragraph 69
ToR 6	That POL produces a map that shows the recommended, safe route and also briefs visitors to use this route, which includes pedestrian crossings	Paragraph 73
ToR 9	POL continues to develop the excellent potential of the co-location with Liverpool University	Paragraph 92
ToR 9	There is a formal response to SPEAG recommendations	Paragraph 95
ToR 9	That staff are made familiar with the Merit Promotion Scheme	Paragraph 97
ToR 9	A Communications Manager post be instigated	Paragraph 100
ToR 10	POL continues to operate with its current mix of competitive activity	Paragraph 103
ToR 11	NTSLF, PSMSL, the Coastal Observatory and the Technology group are subject to a 5-year rolling funding cycle	Paragraph 105
ToR 12	That BODC should include its strategy with the annual Business/Operating Plan	Paragraph 133
ToR 12	That BODC seeks to serve a wider national and international community.	Paragraph 135
ToR 12	That there should be fuller collaboration with the Hadley Centre building on the links already established*.	Paragraph 136

\*

Further discussion following the publication of the report has clarified the issue over BODC links with the Hadley Centre. The Review Team Secretariat has agreed that these links were meant to refer to Programme 1 and the Hadley Centre and subsequent Evaluation Team follow ups will be based on the final recommendation on P32 reading:

ToR 3 "That there should be fuller collaboration with the Hadley Centre and Programme 1 building on the links already established"



Appendix 1

REVIEW OF THE PROUDMAN OCEANOGRAPHIC LABORATORY – 2004

Terms of reference

These terms of reference largely draw from, or relate to, the criteria that define the variety of purposes for institutes as set out in the November 2001 report of the Quinquennial Review of the Grant Awarding Research Councils (stage 2). This is considered appropriate given that NERC is a core funder of POL. The terms of reference are:

1

To assess the effectiveness of the scientific and management leadership and process for cultivating long-term vision/mission and strategy, and the extent to which the POL's long-term vision/mission and strategy contribute towards the NERC mission and 5-year Strategy – including an assessment whether POL provides a national capability and source of advice to Government and its agencies and statutory bodies. QQR 3.12 i. & QQR 3.11 (iv)

2

To assess the effectiveness of arrangements to set research aims and objectives (including monitoring, survey and data management objectives), monitor progress and evaluate output.

3

To evaluate the achievements and productivity of POL's programme for scientific research (including monitoring, survey and data management activities) and to grade the overall quality of the programme informed by previous evaluations and international benchmarks.

4

To review the extent and productivity: of POL's national and international scientific links, including the focus the Centre provides for international cooperation; for technology expensive projects; for coordinating distributed major programmes solving complex scientific problems; and for fostering a co-operative multidisciplinary approach. [QQR 3.11 (iii)]

5

To assess POL's knowledge transfer activities and take-up by users from research. Including survey and monitoring programmes, new products and services, data, information, advice (particularly to government) training and communications. [QQR 3.11(i)]

6

To assess whether efficient, effective and economic use is being made of resources (including manpower, facilities, data and equipment) in order to successfully manage POL and examine the value for money of POL activities in comparison with other providers, where this would be practicable. [QQR 3.15(iv)]

7

To assess whether POL effectively invests in the development and support of major capital equipment, facilities, services and support staff. [QQR 3.11 (viii) and (ix)]

8

To form a view as to the risks inherent in the balance of funding within POL and the advantages and disadvantages of the income portfolio.

To assess whether POL has internal processes of change and rejuvenation ensuring a good flow of ideas and people working across boundaries, and that they offer career paths and opportunities that may not be available in university and faculty structures. [QQR 3.11 (vii)]

To consider whether there are areas of activity undertaken by POL that would benefit from being open to greater competition.

To consider the appropriateness of the duration of funding for all areas of activity in POL and the frequency with which funds should be sought from sponsors.

To consider the role of the British Oceanographic Data Centre (BODC) which is hosted by POL on behalf of the marine science community. BODC is NERC's designated data centre for marine science, it coordinates the data holdings of UK Government departments and is one of the Intergovernmental Oceanographic Commission's international network of oceanographic data centres. BODC will fall within the scope of the POL SMA and be considered as appropriate under the ToRs above, the SMA will have regard for these wider roles.

Appendix 2

Membership

Professor Jan W de Leeuw – Chair - Royal Netherlands Institute for Sea Research  
Dr. John A Church - CSIRO Marine Research, Tasmania  
Professor Mike Cowling - Glasgow Marine Technology Centre, University of Glasgow  
Miss Jane Dalglish - Wildlife and Habitats Division, Scottish Executive  
Dr Chris Gordon - The Hadley Centre, Met Office  
Dr Trevor Guymer - Secretary, Inter-Agency Committee for Marine Science and Technology  
Professor Nick McCave - University of Cambridge  
Professor Thomas Pedersen - University of Victoria, Canada  
Professor Alan Thorpe - NERC Centres for Atmospheric Science

BODC sub-group

Dr Howard Cattle – Chair BODC sub-group (for BODC only) CLIVAR Project  
Professor Mike Cowling  
Dr Chris Gordon  
Dr Trevor Guymer  
Professor Alan Thorpe

OETG sub-group

Professor Jan W de Leeuw  
Dr. John A Church  
Miss Jane Dalglish  
Professor Nick McCave  
Professor Thomas Pedersen



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Appendix 3 Timetable

	End	Location	Topic	Lead and attending
<b>Monday 15 November</b>				
1545	1615	Thistle Hotel	Chairman's brief	Chairman plus Secretariat
1615	1700	Thistle Hotel	Team brief	SMA team
1830	1930	Thistle Hotel	Director's Presentation	E Hill
1930	2000	Thistle Hotel	Team meets for dinner	SMA Team plus E Hill
2000	2200	Thistle Hotel	Working dinner	Discussion with Director
Start	End	Location	Topic	POL Lead and attending
<b>Tuesday 16 November</b>				
<b>SMA will take place in the Joseph Proudman Building Brownlow Street</b>				
0820	<b>Transport from Hotel</b>			
0845	0900	Doodson Room	Welcome: to include domestic arrangements and fire drill	John Murray
0900	0915	Doodson Room	Closed Session	
0915	1015	Doodson Room	Themes 1+2 presentation – sea level	Philip Woodworth, theme leaders & team
1015	1030	Doodson Room	Closed session	
1030	1100	Cath Allen Room	Coffee with Union Side	Polly Habziadbic & Whitley US
1100	1145	Doodson Room	Theme 3 presentation – ocean measurements	Chris Hughes & team
1145	1200	Doodson Room	Closed Session	
1200	1300	Cath Allen Room	Lunch with 'new' staff	
1300	1330	J.P.Building Tour	Esp. floors 3, 2; computer room, library	Colin Stephens, Julia Martin
1330	1415	Doodson Room	Theme 6 presentation - POLCOMS	Jason Holt & team
1415	1430	Doodson Room	Closed Session	
1430	1500	Cath Allen Room	Tea with Individual Merit Promotions (IMPs)	David Prandle, Philip Woodworth, Peter Thorne, Alan Davies, Trevor Baker
1500	1545	Doodson Room	Theme 7 presentation – Coastal Observatory	Roger Proctor, John Howarth & team
1545	1615	Doodson Room	Closed Session	

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Start	End	Location	Topic	POL Lead & Attending		
1615	1645	Doodson Room	Preparation of questions for Senior POL staff (Opportunity for private session with SMA team)			
1645	1730	Doodson Room	University staff	Prof. George Wolff – Department of Earth Sciences & other department staff		
1730	<b>Depart for Hotel</b>					
1930	2200	Hotel	Dinner with senior POL staff	Juan Brown, John Huthnance, John Murray, Roger Proctor, Philip Woodworth, Vera Burgess, Julia Martin		
<b>Wednesday 17 November</b>						
<b>SMA will take place in the Joseph Proudman Building Brownlow Street (until 1100)</b>						
0820	<b>Transport from Hotel</b>					
0845	0900	Doodson Room	Closed Session			
0900	0945	Doodson Room	NTSLF and PSMSL presentation	Philip Woodworth & teams		
0945	1000	Doodson Room	Closed Session			
1000	1045	Doodson Room	POL Applications, models, MetO presentation	Colin Bell, Roger Proctor & teams		
1045	1100	Doodson Room	Closed session/ Coffee			
1100	<b>Transport to Bidston Site</b>					
1130	1215	Seminar Room	BODC presentation	Juan Brown, BODC staff		
1215	1230	Seminar Room	Closed session			
1230	1330	Bidston Canteen	Lunch with “all” staff			
1330	1400	Bidston	Tour Bidston site			
SMA team splits into parallel afternoon sessions: Technology “T” and BODC “B”						
<b>Liverpool group (Technology)</b>			<b>POL Lead</b>	<b>Bidston Group (BODC) (nb BODC lead Juan Brown) Observatory Area</b>		
T1400	<b>Transfer to Liverpool</b>			B1400	1500	Infrastructure (the BODC data handling and delivery systems). Kay Thorne, Karen Vickers, Mary Mowatt, Roy Lowry, Steve Loch, Ray Cramer, Mike Hughes

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T1430	1515	Doodson Room	Technology presentation	John Humphery & OETG/TGI staff	B1500	B1515	Closed Session – with tea/coffee	
T1515	1545	Doodson Room	Commercialisation	Dave Gunn	B1515	1615	Data Management of Projects	Lesley Rickards, John Lawson, Robin McCandliss, Julie Collins, Liz Bradshaw, Libby Macleod
T1545	1600	Doodson Room	Closed Session		B1615	1630	Closed Session	
T1600	1630	Cath Allen Room	Tea with Health & Safety reps	John Mackinnon & US	B1630	1715	External Links - (examples of National, International and EU)	Lesley Rickards, Gaynor Evans, Roy Lowry, Steve Loch, Karen Vickers
T1630	1700	Ground Floor	Visit Electronics, Sediment labs		B1715	1745	Closed Session – to include team summary for discussion with remainder of SMA team at dinner	
T1700	1730	Kempston Street	Visit workshop, cruise prep etc.		B1745	<b>Depart for Hotel</b>		
T1730	<b>Depart for Hotel</b>							
1930	2200	Hotel	Team Dinner	<b>To review SMA to date</b>				
<b>Start</b>	<b>End</b>	<b>Location</b>	<b>Topic</b>	<b>POL Lead and Attending</b>				
<b>Thursday 18 November</b>								
<b>SMA will take place in the Joseph Proudman Building Brownlow Street</b>								
0820	<b>Transport from Hotel</b>							
0845	0900	Doodson Room	Closed Session					
0900	0945	Doodson Room	Theme 4 presentation – shelf seas	Jonathan Sharples & team				
0945	1000	Doodson Room	Closed Session					

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1000	1045	Doodson Room	Theme 5 presentation – sediments	Jon Williams, Alex Souza & team
1045	1115	Doodson Room	Closed Session/ Coffee	
1115	1145	Cath Allen Room	SPEAG	Karen Vickers and SPEAG (Staff Potential and Equality Action Group)
1145	1215	Doodson Room	Admin, library, computing	John Murray, Julia Martin, Colin Stephens & teams
1215	1230	Doodson Room	Closed Session	
1230	1330	Cath Allen Room	Lunch with students	
1330	1500	Doodson Room	Review ToR, agree findings. Include tea at 1445	
1500	1530	Doodson Room	Directors Update	Ed Hill
1530		Doodson Room	Depart	Nb Team need to depart at 1530 to meet confirmed train/flight departures



## Appendix 4

### Organisation

- POL Director – Dr. Ed Hill.
- Science and Engineering,
  - Sea Level Group – Prof. Philip Woodworth,
  - Coastal Processes Group – Prof. John Huthnance,
  - Modelling Group – Dr. Roger Proctor,
  - Ocean Engineering and Technology – John Humphery.
- Administration – John Murray.
- Independent Facilities,
  - British Oceanographic Data Centre – Dr. Juan Brown,
  - Permanent Service for Mean Sea-level (PSMSL) – Prof. Philip Woodworth,
  - UK Tide Gauge Inspectorate – David Smith,
  - POL Applications Team – Colin Bell.

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Appendix 5 Publication and resource details

	<b>All referred papers</b>	<b>ISI-listed papers</b>
All Papers Jan 1999-Sept 2004	308	233
Papers by non research active staff and leavers up to 2004	21	18
Net Papers 1999-2004 by Research Active staff in post in Sept 2004	287	215
Research Active Staff in post in 2004	29	29
Research Active Staff not in post long enough for papers to appear with POL affiliation	4	4
Net Research Active staff in Sept 2004	25	25
Net Publication 1999-2004 per Net research active staff	2.08	1.56

Table 1

**Summary of resources and outputs for Theme 1**

	<b>NERC Core</b>	<b>Other NERC Grants</b>	<b>External</b>
<b>Staff</b> (£k/year)	172	0	65
<b>Recurrent</b> (£k/year)	59.4	0	33
<b>Staff</b> (Person years/year)	4.5	0	1.8

Total ISI papers 2001 – present: 23

Total other refereed papers 2001 – present: 14

**Summary of resources and outputs for Theme 2**

	NERC Core	Other NERC Grants	External
Staff (£k/year)	30	0	52
Recurrent (£k/year)	6	0	5.3
Staff (Person years/year)	0.8	0	1.3

Total ISI papers 2001 – present: 9

Total other refereed papers 2001 – present: 5

**Summary of resources and outputs for Theme 3**

	NERC Core	Other NERC Grants	External
Staff (£k/year)	168	39.8	0
Recurrent (£k/year)	39.4	187	0
Staff (Person years/year)	4.3	1	0

Total ISI papers 2001 – present: 20

Total other refereed papers 2001 – present: 2

**Summary of resources and outputs for Theme 4**

	<b>NERC Core</b>	<b>Other NERC Grants</b>	<b>External</b>
<b>Staff</b> (£k/year)	173.7	0	26
<b>Recurrent</b> (£k/year)	17	0	1
<b>Staff</b> (Person years/year)	3.3	1.1	0.5

Total ISI papers 2001 – present: 53

Total other refereed papers 2001 – present: 4

**Summary of resources and outputs for Theme 5**

	<b>NERC Core</b>	<b>Other NERC Grants</b>	<b>External</b>
<b>Staff</b> (£k/year)	226	8	86
<b>Recurrent</b> (£k/year)	51	0	14
<b>Capital</b> (£k/year)	20	243	
<b>Staff</b> (Person years/year)	5.5	0.2	1.7

Total ISI papers 2001 – present: 29

Total other refereed papers 2001 – present: 15

**Summary of resources and outputs for Theme 6**

	<b>NERC Core</b>	<b>Other NERC Grants</b>	<b>External</b>
<b>Staff</b> (£k/year)	169	65	99
<b>Recurrent</b> (£k/year)	26.2	4	14.2
<b>High performance computing</b> (£k/year)	233	40	
<b>Staff</b> (Person years/year)	3.7	2	2.5

Total ISI papers 2001 – present: 23

Total other refereed papers 2001 – present: 5

**Summary of resources and outputs for Theme 7**

	<b>NERC Core</b>	<b>Other NERC Grants</b>	<b>External</b>
<b>Staff</b> (£k/year)	240	0	134
<b>Recurrent</b> (£k/year)	183	0	7.3
<b>Capital</b> (£k/year)	80	950	
<b>Staff</b> (Person years/year)	6.5	0	2.6

Total ISI papers 2001 – present: 6

Total other refereed papers 2001 – present: 2

Website: 29 000 unique visitors