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### **Contributors**

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DEPARTMENT OF THE ENVIRONMENT

## INFORMATION

DOE RESEARCH MARKET: 1996

Office of the Chief Scientist

Science and Technology Information Note: 1/96

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### FOREWORD

This Research Market describes the areas of research in which the Department will be commissioning research during 1996/97. It compliments the Department's entry to the 1996 Forward Look of Government-funded Science Engineering and Technology, and serves as an introduction to the Research Newsletters detailing prospective new projects which are issued in each subject area.

The Department is committed to using competitive tendering procedures as the normal mechanism for placing work, unless there are significant costs or wider value for money considerations that justify alternative action. It is hoped that this annual paper, taken together with other publications, will continue to provide a source of information for potential contractors to and others interested in the Department's programmes.

DJFISK

Chief Scientist

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### INTRODUCTION

1. The Department of the Environment aims to promote good government, sustainable development, the quality of the natural and built environment and economic competitiveness. It encourages and funds Science, Engineering and Technology in support of Departmental policy, statutory, operational, regulatory and industrial sponsorship responsibilities. Wherever possible it involves and co-operates with others in meeting these responsibilities and ensures that the public has access to the results of the Department's research.

### DOER & D 1996/97: GENERAL BACKGROUND

- 2. The DOE's main policy responsibilities cover Environment Protection, Local Development, Housing, Construction, Planning and Countryside. Responsibility for research undertaken by Radioactive Substances, Waste Management and Contaminated Land has been divided between these Divisions and the Environment Agency since 1 April 1996. The Department also sponsors 35 non-Departmental public bodies. Three of these fund substantial research programmes in support of their statutory duties. DOE has now taken over responsibility for the Health and Safety Commission and Executive which also sponsors considerable amounts of research.
- 3. Planned expenditure in 1996/97 is detailed in Table 1. This excludes funds allocated for research by bodies receiving grants-in-aid from the Department. But it includes the research elements of the DOE share of the DTI/DOE Environmental Technology Best Practice Programme and of the Energy Efficiency Best Practice Programme.
- 4. The Department's sole research establishment the Building Research Establishment (BRE) is currently an executive agency, and research placed with BRE is market tested where appropriate. DOE's expenditure can therefore be treated formally as "extra-mural", let by competitive tendering wherever possible. This applies not only to R&D but also to long term monitoring and surveillance which are identified separately in each research programme.
- 5. It is DOE policy to set out for the Research Councils, a statement of the Department's forward programme such that opportunities for complementary Science Base activity and for bids from Research Council laboratories to carry out research for DOE, can be readily identified. Assessments of likely income from commissioned research to each sector can then be made by the Research Councils. This applies also to other bodies such as universities and private and agency laboratories (eg. the Soil Survey and Land Research Centre, Water Research Centre, Atomic Energy Authority Technology, including the National Environmental Technology Centre).

6. The following sections describe the DOE research market by Divisional programmes, including work funded on a GB or UK basis in consultation with Territorial Departments and their agencies. Key goals are also identified.

### ENVIRONMENT PROTECTION

7. The challenge for Global Atmosphere policy (£13.8m) is to develop responses to stratospheric ozone depletion and man-made climate change through appropriate international fora. The Hadley Centre provides a major focus for climate change research which is aimed at defining the long-term environmental objective. This will underpin negotiations under the Framework Convention on Climate Change and will also be reflected in the 1999 Report of the Intergovernmental Panel on Climate Change. Provision of estimates of the risk posed by ozone depletion over the next ten years is a key task in the context of the Montreal Protocol on Substances that Deplete the Ozone Layer.

- to provide effective technical input on response strategies inventories and underpinning science for the UK's negotiating position on the development of a protocol under the Framework Convention on Climate Change.
- strengthen the international dimension of the climate prediction programme;
- develop a coordinated approach to the assessment of climate change impacts in the UK;
- assess the risk of increased UVB radiation due to ozone depletion over the next 10 years.
- 9. The major challenge for Air Quality (£10.1m) is to develop policies to minimize the risks to health and the environment from exposure to air pollutants, particularly in urban areas. Much of the work takes place in the international arena. The challenge for research is to quantify these risks, to determine the contributions of sources and to develop cost-effective air quality management strategies for inclusion in the national air quality standards.
- 10. In the international context, within the EU and UNECE, the research programme informs the development of policies to manage transboundary pollutants such as ozone, those leading to acidification and eutrophication, persistent organic pollutants and heavy metals.

### 11. Key goals for 1996/2000 are:

- the formulation and periodic revision of a strategy for air quality management, including the formulation of standards and targets and timescales for their achievement;
- the establishment of the system for reviews and assessments of local air quality in the UK, as required by the Environment Act 1995;
  - support for policy discussions on air quality limit values, guide values and monitoring in EC Daughter Directives, under the EC Ambient Air Quality Assessment and Management Directive;
  - support for the formulation of cost effective strategies for ozone, acidification and eutrophication, persistent organic pollutants and heavy metals within the EU and UNECE.
- 12. The strategy for research on Noise (£0.6m) aims to provide the understanding of noise problems necessary to ensure the effective implementation of the Department's policy of seeking to minimise the impact of environmental noise on people. As part of this strategy the programme will investigate the occurrence and effects of neighbourhood and other noise and the health risks of exposure to noise.

- to monitor trends in environmental noise
- to develop better measurement techniques of environmental noise
- to improve understanding of the health and economic impact of exposure to environmental noise
- to develop techniques to control the impact of noise
- 14. The Chemicals and Biotechnology (£3.6m) research programme will continue to support the Department's policy of ensuring that UK legislation and international agreements protect human health and the environment from the release of harmful products. A key element is the evaluation of the links between human health and environmental exposure to hazardous substances including research on indoor air quality.
- 15. Research on Genetically Modified Organisms (GMOs) provides the scientific basis to underpin the risk assessment of the release of GMOs to the environment required by statutory control. The results of a recent review of GMO research will be used in the formulation of future programmes.

### 16. Key goals for 1996/2000 are:

- to ensure effective operation of the New Chemicals Notification Scheme and improving knowledge of the environmental effects of chemicals as part of OECD and EC initiatives;
- to ensure that environmental damage caused by pesticides (including antifoulants) is limited and promoting the use of integrated crop management as an element of pesticide minimisation policy;
- to assess the environmental consequences of major chemical accidents;
- examining possible relationships between human health and environmental contamination;
- to assess the significance of human exposure to toxic substances (including lead, cadmium, asbestos, man made mineral fibre, indoor air pollutants) and to ensure that such exposure is minimised;
- to provide the scientific knowledge required to design proper controls on the release of genetically modified organisms.
- 17. The main policy challenge for Radioactive Substances (£0.8m) is to develop a national high level waste and spent fuel disposal research strategy as committed to in 'Review of Radioactive Waste Management Policy. Final Conclusions' (Cm 2919). This will be done through studies in conjunction with industry and regulators.

- to complete research and monitoring requirements identified by the radioactive Waste Management Policy Review;
- to update the UK national radioactive waste inventory and related waste models;
- to review the coverage and consistency of radiological standards and identify possibilities for improvement;
- to complete the review of current monitoring activities and, where appropriate arrange transfer to the new Environment Agency.
- 19. The Department recently published a strategy for sustainable Waste Management in England and Wales over the next ten years. The aim is to ensure that the principle of best practical environmental option (BPEO) is used to manage wastes and also that the pollution potential of such wastes is dissipated within a generation. The bulk of the waste management and contaminated land programmes transferred to the Environment Agency in 1996. DOE research (£1.2m) will inform specific policy initiatives and

guidance to be provided in support of the strategy.

- 20. The main research goals will be to develop life-cycle analysis techniques in order to assess the BPEO for the management of individual waste streams, improve data on the amount and composition of household, industrial and commercial wastes, demonstrate accelerated stabilisation of landfilled wastes, develop a geographical information system of UK waste management facilities and develop a protocol for measuring methane emissions and recommendations for landfill management practices.
- 21. The challenge for Contaminated Land policy is to identify unacceptable risk to health and the environment associated with contaminated land and measures to bring it back into use. This has been emphasised by publication of 'Framework for Contaminated Land' and section 57 of the Environment Act 1995. Increased interaction is occurring between industry, regulators and researchers in seeking solutions to the problems of contaminated land.

- effective provision of information on identification of land contamination;
- development of assessment procedures, including sampling, analysis and other issues associated with risk assessment, including derivation of guideline values for contaminants in land for protection of human health and the development of methods for risk assessment of ground and surface waters;
- evaluation of remedial treatments and engineering solutions and their long-term integrity and cost effectiveness; and
- review and development of quality assurance procedures relevant to contaminated land management.
- 23. The challenge for Water policy continues to be the safe and effective management of water supplies and improvement and protection of the freshwater and marine environments. Research (£3.6m) will be related primarily to support for the development of European and domestic legislation and to meet the assessment and monitoring needs of frameworks of pollution control. The results will be reflected, during the next decade, in the continued guidance on freshwater and drinking water standards, the maintenance of reservoirs and within quality assessments of regions of the North East Atlantic.
- 24. Programmes likely to require specific development in the future are those to monitor the effects of strategies aiming to meet indicative environmental targets and for broad-based investigation into such issues as the potential of contaminants for endocrinal disruption within freshwater and marine environments.

### 25. Key goals for 1996/2000 are:

### **Drinking Water Quality and Health**

- to support the negotiation of the EC Drinking Water Directive currently under revision and to establish the effect of these proposals on UK Regulations;
- to continue assessment of production of hazardous compounds during disinfection processes;
- to continue studies of effects of materials in contact with water;
- to extend the study of protozoal and microbial contamination of sources and supplies and to develop tests of the effectiveness of treatment processes.

### Sewage Sludge Utilisation and Disposal

- to continue development of safe control limits for heavy metals to protect soil fertility, crops and grazing livestock where sludge is used in agriculture;
- to determine priority organic pollutants in sewage sludge and their source and fate during sewage transport and treatment.

### Freshwater and Marine Water Quality

- to continue to work on the effects of trace organics on the aquatic environment;
- to continue studies on the effects of contaminants on river water quality;
- to assess the biological effects of contaminants on estuarine and marine organisms;
- to develop environmental standards and ecotoxicological impact assessments for priority substances under EC/UK legislation;
- to continue work on the health effects of sea bathing.

### Reservoir Safety

- to prepare structural safety guidance;
- to provide reservoir flood guidance;
- to make available advice on embankment dam safety.

### Marine

- to contribute to assessment of Celtic Seas by addressing priorities for research and monitoring identified by the Irish Sea Science Co-ordinator;
- to take forward issues identified in the North Sea Quality Status Report for inclusion in the Quality Status Report update;
- to support the development and deployment of biological monitoring techniques;
- to extend sediment and atmospheric contaminant studies;
- to continue the study of nutrient processes;
- to study the impact of long-term changes on marine ecosystems;
- to develop whole water sampling systems suitable for use with the Continuous Plankton Recorder;
- to ensure the continuance of suitable arrangements for marine biological and chemical analytical quality control procedures;
- to accelerate the development of physio-chemical and water quality models of the Irish Sea.

26. The main challenge for the Environmental Policy Analysis research programme (£0.5m) is to strengthen economic and statistical analysis of environmental issues in support of the Government policy of Sustainable Development. Key objectives will be to improve methodologies for collecting the data needed to underpin the development of indicators of sustainable development and support the development of environment/economy models which increase our understanding of the wider implications of environmental policy. Further work on the valuation of environmental externalities and the effectiveness of economic instruments will assist in finding the most efficient and cost effective way of implementing existing and proposed policies.

- to integrate the assessment of environmental costs and benefits into policy appraisal;
- to obtain better basic information to test the potential impact of policy options and for identifying unconstrained trends;
- to seek appropriate market based solutions to environmental problems;
- to ensure that environmental costs and benefits are reflected in national

accounts.

In the longer term there will be a need:

- to return to methodological issues surrounding data collection and interpretation;
- to validate the assumptions underpinning valuation of the environment and the measurement of costs associated with environmental policy;
- to reassess the effectiveness of market based instruments;
- to refine and develop the preliminary set of indicators of sustainable development, published in March 1996, through improvements in methodologies for collecting, interpreting and presenting environmental data.
- 28. The Energy Efficiency Best Practice Programme promotes energy efficiency through the transfer of technical information. It is well on its way to achieving its goal of generating additional energy savings worth £800 million a year by 2000. From 2000 the upward momentum in energy savings is expected to be sustained through continued interaction with the market and end users which will take account of the potential benefits of new technology and management techniques. Research accounts for £2.0m of a total spend.

- funds permitting, greater emphasis on innovative projects to counterbalance the growing maturity of existing mainstream material;
- to pursue further opportunities to work with professional trade bodies;
- to promote of energy management techniques and the new national benchmark standards for energy efficiency professional training;
- general initiatives to help small to medium enterprises improve their energy efficiency performance.
- 30. The object of the Environmental Technology Best Practice Programme, jointly funded by the DOE and DTI, is to encourage greater uptake of environmental technology and techniques to enable industry to reduce environmental impact and save costs at the same time. The Programme collects and analyses information and disseminates it to businesses. Planned spend in 1996/97 is £4.9m (DTI and DOE together) within which a small element (£0.2m) can be allocated to R & D support. The Programme is currently planned to run until 1999 and is constantly monitored for effectiveness. A decision on whether to extend the Programme beyond 1999 will be taken during 1996.

- 31. The key goal for 1996/2000 is:
  - to complete the generation of projects under eleven programme strategies, sufficient to stimulate annual cost savings for industry rising to at least £160m by 2010.
- 32. The Darwin Initiative for the Survival of Species is now a £3m a year programme which funds UK expertise in biodiversity to help developing countries meet their obligations under the Biodiversity Convention. So far £12m has been committed to 116 projects involving over 70 UK institutions with links to more than 60 countries.
- 33. The aims of the Initiative are to encourage high standards of biodiversity research in developing countries and to increase the levels of collaboration and training in order to facilitate transfer of technology and know-how from the UK. A key feature is the current independent exercise to monitor and evaluate individual projects and provide advice on the development of the Initiative.
- 34. LONG TERM MONITORING. It is estimated that £8.7m will be spent by Environment Protection Divisions on long term monitoring and surveillance.

### LOCAL DEVELOPMENT

35. Local Government policy aims to promote a system of local government that can respond effectively to the needs of local taxpayers and citizens. Research (£0.8m) is investigating responses by local government to extended compulsory competitive tendering, the barriers to private sector bidding for contracts, the growth, under the Private Finance Initiative, of local authority companies and challenges made to auditors about local authority accounts. Improvements to the calculation of standard Spending Assessments are also being examined.

- to commission new research into the impact on employers of releasing people for council duties; the effect on businesses and business decisions of having to pay rates on empty properties; and the conduct of the pilot bidding round for Capital Challenge funding;
- to complete current studies about compulsory competitive tendering in order to inform competition policy;
- to complete an initial project on how Government Departments forecast new .burdens. on local authorities and consider whether further research is feasible and desirable;
- to produce good practice guidance on the formation and management of joint local authority/private sector companies from current research on this topic;

 to complete current projects investigating possible improvements to the methodology of Standard Spending Assessments and consider whether further work is needed.

### HOUSING, CONSTRUCTION, PLANNING AND COUNTRYSIDE

- 37. Regeneration (£1.3m) policy aims to improve the quality of life in urban areas through economic, social and environmental regeneration. Current research aims to evaluate a range of regeneration initiatives, in particular the Single Regeneration Budget, Urban Development Corporations and the Safer Cities Initiative. A second important theme is to provide good practice guidance to organisations promoting regeneration on urban parks, and from the lessons learnt from Task Force projects.
- 38. The priority aim of Housing policy is to bring a decent home within reach of every family through promoting home ownership, the private rented sector and better value for money in the public rented sector. The housing research (£7.7m) programme supports both policy development and evaluation through studies of social and technical issues and of the economic, financial, and management aspects of housing.
- 39. Current goals include undertaking the 1996 English House Condition Survey, completing studies of demand for housing in rural areas and of the care and maintenance of non- traditional housing, undertaking an assessment of the impact of changes to the renovation grant system and to begin work on community care and housing issues. A substantial programme of work on energy efficiency in housing contributes to the Department's goal of encouraging sustainable development. International cooperation on housing research is through the European Network for Housing Research.
- 40. The priority challenge in **Construction** is to foster a forward-looking, competitive and environmentally aware construction industry at home and overseas. The Department seeks to stimulate and support best practice, research and development, innovation in quality, design, procurement and management through working with the industry to develop and implement a whole industry research strategy.
- 41. One aim of the research programme (£23.8m) is to promote competitiveness, improved productivity, better performance, innovation, enhanced quality and best environmental practice in the construction industry and to protect the interests of building occupants, operators and owners. Work will be focused on improvements in the construction process to ensure that clients can have greater confidence in the quality and performance of the built work, as well as better value for money. The Department has accepted industry's target to reduce real costs by 30% by the year 2000.
- 42. The second aim is to enable Building Regulations to address their purpose through soundly-based Approved Documents and provision of clear guidance on compliance. Research will examine the relationship between buildings and health; address environmental issues with implications for regulations and assess provision for the

disabled. Research on fire protection measures will underpin the development of the fire regulations.

### 43. Key goals for 1996/2000:

- future work in the <u>Construction Industry Sponsorship area</u> will be focussed on improvements in the construction process. The aim will be to ensure that construction clients can have greater confidence in the quality and performance of the built work, as well as better value for money. A reduction in real costs of 30% by the year 2000 is considered to be a realistic target.
- work in the <u>Building Regulations research area</u> will examine the relationship between buildings and health; address environmental issues with implications for regulations and assess provision for the disabled. Research on fire protection measures will underpin the development of the fire regulations. The harmonised Eurocodes for the structural design for buildings will be assessed and implemented through the preparation of National Application Documents within the next three years.
- 44. The principal Land Use Planning policy challenge to the Department over the next ten years will be to reconcile development which is necessary to provide homes, investment and jobs with conserving and enhancing the built and natural environment. To respond to this the research programme (£1.9m) aims to guide the development of sustainable and effective planning policy through research on the organisational basis of planning, the delivery systems by which planning can promote sustainable development, the response of the planning system to changes in economic structures and its role in economic regeneration, implications of social and demographic change on planning, partnership in planning and improving the planning database.

- to develop good practice guidance on the application of sustainable development principles to the planning system;
- to investigate ways of making the most of our villages, towns and cities, to promote the vitality and viability of existing centres and reduce the need to travel;
- to review the effectiveness of the plan-led system;
- to promote quality in town and country.
- 46. The main challenge in the Minerals Planning and Land Instability Research Programme is to secure sustainable development of mineral resources by meeting current needs at the least environmental and economic costs, and by safeguarding a stock of resources for future generations. Research (£1.8m) is addressing this challenge

by consolidating information on mineral resources; examining alternatives to traditional sources of supply of aggregates, especially through marine dredging and recycling of wastes; and establishing good practices for control for environmental impacts of mineral working. A further challenge is to ensure that land instability is taken into account early in the planning process in order to secure safe, cost-effective development.

### 47. Key goals for 1996/2000 are:

- to complete the collation of mineral resource information for use in Minerals Local Plans;
- to establish the extent to which recycled materials can offset the need for extraction of aggregates from the ground;
- to secure the environmental basis for assessment of applications for licences to dredge for marine aggregates;
- to extend and consolidate advice on good practices for management of minerals workings and for rehabilitation of sites when working is completed;
- to complete the development of technical and administrative responses for dealing with unstable land.
- 48. Countryside policy is to protect and enhance the beauty and diversity of the countryside and conserve its wildlife while encouraging a thriving rural economy and improving opportunities for public enjoyment. The 1995 Rural White Paper emphasised that sound decisions about the management of the countryside environment require reliable information about the state of the environment and the many factors which impact on it. The Biodiversity Steering Group Report recommended specific steps to improve the co-ordination and accessibility of existing information on native plants and animals. The research programme (£1.3m) aims to set in place strategies for the long term monitoring of biodiversity and the impacts of land use change, including a repeat of Countryside Survey in the year 2000.

- to support the Department's statutory and regulatory obligations, including commitments to research under international agreements for which the Department has lead responsibility such as the EU Birds and Habitats Directives, the Agreement on Small Cetaceans in the Baltic and North Sea and the European Bats Agreement;
- to improve our ability to report on the UK countryside and biodiversity into national and international reporting frameworks including UK indicators of sustainable development and the EIONET databases being drawn up by the European Environment Agency;

- to support biodiversity targets and data requirements by commissioning the preparation of a new plant atlas for the year 2000, initiating a scoping study for a mammal surveillance programme, and monitoring of selected bat species within the UK;
- to improve understanding of interactions between protected bird species and other wildlife and commercial and sporting interests in the countryside;
- to improve the co-ordination and accessibility of important data sets on biodiversity and the countryside;
- to advance our understanding of the causes of the changes reported in Countryside Survey 1990 and their significance for wildlife and biodiversity; to improve the relevance, reliability, efficiency and cost-effectiveness of survey techniques in preparation for Countryside Survey 2000;
- to refine methods for predicting the consequences of land-use and environmental change for wildlife, landscape and rural development;
- to develop improved methods for assessing the health of amenity trees and for reconciling their needs with those of other users of the urban environment;
- to develop improved forensic methods for detecting wildlife crime and regulating the use of endangered species held in captivity.
- 50. LONG TERM MONITORING. Construction, Planning and Countryside Divisions plan to spend c. £0.4m on long term monitoring and surveillance in 1996/97. This does not include preparatory projects for the Countryside Change Survey 2000.

### CONTACT POINTS

Initial contact for further information on the DOE Research Market, 1996:

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### Planning research and Minerals research newsletter:

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### Housing and Urban research newsletter:

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### Local Government research newsletter:

London SWIP 3EB

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| Global Atmosphere:                                     | Mr D Warrilow                            | Rm B2.52, RH<br>Tel: 0171-276-8339                        |
| Chemical & Biotechnology:                              | Dr L Smith                               | Rm A3.32, RH<br>Tel: 0171-276-8609                        |
| Water Resources and Marine:                            | Mr A Lloyd                               | Rm B1.48, RH<br>Tel: 0171-276-8200                        |
| - Drinking Water & Health                              | Mr M Smith                               | Rm B1.53 RH<br>Tel: 0171 276 8686                         |
| - Fresh Water Quality &<br>Sewage Sludge               | Mr E McIntosh                            | Rm A4.11 RH<br>Tel: 0171 276 8855                         |
| - Marine   | Dr M Roberts                             | Rm B4.52 <b>RH</b><br>Tel: 0171 276 8834                  |
| - Reservoir Safety                                     | Mr R Vincent                             | Rm A4.39 RH<br>Tel: 0171 276 8141                         |
| Radioactive Substances:                                | Dr R L Jackson                           | Rm A5.32 RH<br>Tel: 0171-276-8138                         |
| Noise:   | Mrs M Dyer                               | Rm B2.40, RH<br>Tel: 0171-276-8482                        |
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| Controlled Waste<br>Management:                        | Mr D Short                               | Rm A2.03, RH<br>Tel: 0171-276 8301                        |
| Land Use Planning<br>and Minerals Planning:            | Mr P J Bide                              | Rm C15/16, MS<br>Tel: 0171-276-3956                       |
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| Darwin Initiative                                      | Mr T Riordan                             | Rm A3.03 RH<br>Tel: 0171 276 8107                         |
|  |  |   |

Contacts in Romney House will be reolocated in Ashdown House, 123 Victoria Street from early 1997, and those in 2 Marsham Street in Eland House, Bressenden Place, Victoria from late 1996.

TABLE 1. Planned DOE Expenditure on Science and Technology (£m)

| RESEARCH AREA                           | PROVISION<br>1996/97 | PLAN 1997/98          | PLAN 1998/99 |
|---|----------------------|-----------------------|--------------|
|   |                      | A STREET AND A STREET |              |
| Air Quality                             | 10.1                 | 10.2                  | 10.2         |
| Global Atmosphere                       | 13.8                 | 14.1                  | 13.7         |
| Radioactive Substance                   | 0.8                  | 2.0                   | 2.0          |
| Water                                   | 3.6                  | 4.3                   | 4.3          |
| Chemicals & Biotechnology               | 3.6                  | 3.9                   | 3.9          |
| Noise                                   | 0.6                  | 0.6                   | 0.6          |
| Environmental Policy Analysis           | 0.5                  | 0.6                   | 0.6          |
| Waste Management &<br>Contaminated Land | 1.2                  | 0.5                   | 0.5          |
| Planning & Minerals                     | 3.7                  | 3.7                   | 3.6          |
| Countryside                             | 1.3                  | 1.4                   | 1.4          |
| Darwin Initiative                       | 3.0                  | 3.0                   | 3.0          |
| Local Government                        | 0.8                  | 0.6                   | 0.6          |
| Housing and Urban                       | 9.0                  | 9.0                   | 6.9          |
| Construction                            | 23.8                 | 22.9                  | 22.2         |
| Environment Technology<br>ETBPP & ETIS  | 0.2                  | 0.1                   | 0.1          |
| Energy Efficiency                       | 2.0                  | 3.0                   | 3.0          |
| Administration                          | 3.2                  | 3.2                   | 3.2          |
| TOTAL<br>Research & Development         | 81.3                 | 83                    | 79.7         |
| Transfer Technology                     |                      | Add Parties           | and the      |
| Construction                            | 0.5                  | 0.5                   | 0.5          |
| Environment Technology<br>ETBPP & ETIS  | 1.8                  | 1.9                   | 1.9          |
| Energy Efficiency                       | 15.3                 | 15.7                  | 15.7         |
| TOTAL<br>Science & Technology           | 98.8                 | 101.2                 | 97.9         |

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(GRADE 1)

ANDREW TURNBULL

| SSNOR DESCTOR  |  |  |   |   |   |   |
|--|--|--|---|---|---|---|
| CHRIS BREAKLEY  CHRIS BREAKLEY  Director  Local Government Director  Local Government Policy  (Grade 3)  Mil Kinghan  Mil Kinghan  Mil Kinghan  (Grade 3)  (Grade 4)  (Grade 3)   | SENIOR DIRECTOR ENVIRONMENT PROTECTION             | SENIOR DIRECTOR LOCAL DEVELOPMENT                              |   |   |   | SENIOR DIRECTOR<br>HOUSING, CONSTRUCTION<br>PI ANNING AND COLLEGE VICES |
| Clief Schoolst   Content of Con | (GRADE 2)  | (GRADE 2)  |   |   |   | (GRADE 2)   |
| Director   Director  | DINAII NICHOLS                                     | CHRIS BREARLEY   |   |   |   | MAVIS McDONALD  |
| Clade 3)   Clade 3)  | Director Environment and International             | Director<br>Local Government                                   | Calef Executive Building Research Establishment Executive | Ohlef Sclendst Office of the Chlef Sclendst | Chlef Economist Office of the Chlef Economist | Director Hearing Private Policy and Analysis                            |
| Director  Local Government Flance Policy  (Grade 3)  Michael Galegan  Director  Regeneration  (Grade 3)  Michael Galegan  Director  Regeneration  (Grade 3)  Michael Galegan  Gavin Watton   | (Grade 3)  | (Grade 3)  | Agency<br>(Grade 3)                                       | (Grade 3)                                   | (Grade 3)                                     | (Grade 3)   |
| Director  Coracl Government Finance Policy  (Grade 3)  Michael Gabagan  (Grade 3)  Michael Cabagan  Michael Light Rallway  (Grade 3)  (Grade 3)  | David Fisk   | Angela Heath   | Boger Couriney  | David Fuk                                   | Chris Riley                                   | Paul Evans  |
| (Grade 3)  Nell Kinghan  Director  Regeneration  (Grade 3)  Mitchael Gahagan  Director Environment Regional Link and Docklands Light Raliway  (Grade 3)  | Director Environment Protection Strategy and Waste | Director Local Government Finance Policy                       |   |   |   | Director<br>Housing Social Policy<br>and Resources                      |
| Michael Galegon  Michael Galegon  Michael Galegon  Michael Link and Docklands Link and Docklands Light Rallway  (Grade 3)  | (Grade 3)  | (Grade 3)  |   |   |   | (Grade 3)   |
| (Grade 3)  (Grade 3)  Michael Gahagan  Michael Cahagan  Director  Einvironment Regional Link and Docklands Light Raliway  (Grade 3)  | Paul Britton                                       | Nell Kinghan   |   |   |   | Diane Phillips  |
| Michael Gahagan  Michael Gahagan  Director Eindronnen Regional Link and Docklands Light Rallway  (Grade 3)   | Director<br>Water and Land                         | Director<br>Regeneration                                       |   |   |   | Director<br>Construction Sponsorship                                    |
| Mitcheel Ghagen  Director Ehvironmenk Regional Link and Docklands Light Rallway (Grade 3)  Gavin Watson  | (Grade 3)  | (Grade 3)  |   |   |   | (Grade 3)   |
| Eindronnent Regional Link and Docklands Light Rallway (Grade 3)  Garde Watson  | Nell Summerton                                     | Michael Gahagan  |   |   |   | Phillip Ward  |
| (Grade 3) Gavia Watson   | Director Environmental and Energy Management       | Director Environment Regional Link and Docklands Light Railway |   |   |   | Director<br>Town and Country Planning                                   |
| Gavia Watson   | (Grade 3)  | (Grade 3)  |   |   |   | (Grade 3)   |
| Director Wildlife and Countyside   | John Hobson  | Gavia Watson   |   |   |   | John Ballard  |
|  |  |  |   |   |   | Director<br>Wildlife and Countryside                                    |

John Plowmen

(Grade 3)

