

APPENDIX A1.1
PROJECT INVESTMENT APPRAISAL

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1. R & D Commission - CONSERVATION F

Topic - Conservation

Project Title - Environmental opportunities under a scenario of climate change and sea level rise

Proposed No. F01.41

Project Number.

Classification of R & D - Applied research with specific aims

2. Project Leader - Dr Andrew Brookes Tel: 0734 535712
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NRA Thames Region
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Kings Meadow Road
Reading RG1 8DQ

3. Research Contractor - Posford Duvivier Tel: 0733 334455
Environment Fax: 0733 262243
Rightwell House
Bretton Centre
Peterborough PE3 8DW

Contract Signatory - to be appointed

Project Manager - Ms Jan Brooke

4. Contract Details

Review and recommendations

Start Date 01.10.90

End Date 31.03.91

5.0. Objectives

5.1. Overall project objective

To develop a methodology which ensures that the potential environmental opportunities associated with sea level rise are properly identified, assessed and evaluated.

5.2. Specific objectives

The project will include the following objectives:-

- a). to define the likely scale of the problem and hence the scope of the study
- b). to review the objectives and status of ongoing research dealing with both the implications of climate change and with habitat creation/ restoration techniques
- c). to review the likely implications of both sea level rise and other possible coastal changes likely to be associated with greenhouse warming
- d). to ascertain the likely nature of environmental opportunities (and limitations) in low-lying areas of England and Wales; in particular, to identify and investigate possible habitat creation opportunities for areas where the maintenance of existing sea defence structures/ standards will no longer be economically viable
- e). to determine, in principle, the technical viability of any enhancement, restoration or creation options identified in (d) above
- f). to establish the economic principles involved in terms of the likely costs and benefits of the options identified; to identify a methodology by which these might be assessed
- g). to define the legal situation, in particular the constraints likely to be imposed upon the National Rivers Authority in respect of the 'retreat' option
- h). to determine the possible funding arrangements of technically, economically and legally viable options

- i). to identify subject areas in which further research may be required
- j). to identify critical sites at which problems in justifying continued defence are likely to arise in the near future
- k). to identify environmental agencies and other organisations likely to have an interest in the study
- l). to investigate appropriate methods of data storage for possible subsequent use on Geographical Information Systems (GIS) in studies relating to the impacts on nature conservation interests of climate change and sea level rise

6. Background

Although predictions for both the rate and extent of rise of sea level and the extent of any increase in storminess resulting from climatic change are still unconfirmed, it is widely forecast that sea level will rise as a result of global warming over future decades. Various studies are underway to identify specific problems, including those reported by the Inter-governmental Panel on Climate Change (IPCC). Under a scenario of sea level rise it is anticipated that continued expenditure on maintaining existing sea and tidal defences for areas of land will become increasingly difficult to justify. Indeed in some low-lying agricultural areas the economic justification of this type of scheme is already very difficult. An option in these circumstances is to "do nothing" and allow retreat from the existing line of defence.

In cases where the "do nothing" option is examined it should be recognised that there are a number of alternatives to simply abandoning the land in question to the sea. Considerable opportunities exist in such areas for the development of environmental resources through a process of 'managed' retreat. It may be viable to promote the creation of nature conservation assets, the provision of amenity/ informal recreation facilities, and the enhancement of landscapes.

A methodology is therefore required to ensure that the potential implications of sea level rise are properly identified, assessed and evaluated. A consistent and coordinated approach will ensure that creation and enhancement opportunities are maximised and that the loss of critical sites is avoided wherever possible.

6.1. Context

There are a number of research projects and operational investigations either completed or currently being funded by the National Rivers Authority that will need to be considered in the context of this project, particularly where these relate to environmental opportunities. The project will be deemed to be complimentary to this work and will not duplicate it.

Within the Flood Defence Commission there are several projects concerned with the the design of coastal and estuarine works/ structures. Topic C7 is concerned with the response to climatic change and includes a project on the sensitivity of different types of sea defence structure to changes in mean sea level and storm wave height. Project C7.1 specifically deals with the "Economic appraisal of the consequences of climatic-induced sea level rise". Project C6.2 "Saltings as sea defence" should also be considered since saltings could be both a defence against sea level rise and a consequence. There are numerous projects within the Conservation Commission which are relevant, including the project on restoration and protection of grazing marsh; restoration of the Norfolk Broads by bio-manipulation; the coastal wildlife database; studies on the conservation value and ecological status of the Welland and Witham estuaries etc. There are links to other Commissions, including the work by WRC on 'Climatic change and its potential effect on UK water resources'. There are also a number of operational investigations either being carried out or completed in the Anglia Region, including the Sea-defence Management Study.

There are several projects being undertaken independently of the National Rivers Authority by bodies such as the Ministry of Agriculture, Fisheries and Food, Department of Environment and Countryside Commission. MAFF are funding the University of East Anglia Hunstanton to Felixstowe Study. Research has been or is currently being carried out by the Universities of Durham and East Anglia, amongst others. Both the Natural Environment Research Council and European Community fund projects in these areas.

Guidance produced by this project will be nationally applicable. The project will also be vital to other British environmental agencies who require a positive and proactive strategic response to sea level rise in order to ensure that such opportunities are identified and maximised.

7.0. Strategy

7.1. Method

Although essentially a desk exercise extensive consultation and liaison will be undertaken with sponsoring agencies and other concerned bodies as appropriate. This will include:-

a). a literature search and review. An extensive review of relevant work on climatic change, sea level rise, economic, political, social and environmental consequences, and management strategies. To include previous work in North America, European experience (eg. Dutch) and previous or ongoing work in the UK (eg. Tees Estuary, Cleveland; Anglia Region). Consultation is required with concerned individuals in each of the 10 NRA Regions and with staff in other organisations (eg. by means of a questionnaire). Identification on a regional scale of sites of existing nature conservation interest and areas of low-lying agricultural land

b). assessing available literature and contacting leading researchers and workers in the field. An appraisal of research which aims to justify in economic terms the continued protection of 'key' sites of existing environmental interest (ie. sites at which sea level rise could lead to the degradation or loss of valuable/ designated assets)

c). a review of changes which include increased storminess and saline intrusion. Various reports will be appraised in this respect, including the Inter-governmental Panel on Climate Change (IPCC) report due later in 1990

d). assessment of the types of creation and enhancement opportunities (based on experience in UK and elsewhere) to include:-

- salt marsh regeneration/ creation
- tidal mudflat and intertidal habitat development
- sand dune creation/ restoration
- other 'soft' engineering options
- fish nursery areas/ angling benefits
- informal recreation/ amenity provision (ie. footpaths)
- opportunities for the promotion of formal recreation
- any other relevant opportunities

The types of opportunities will cover 'real world' examples wherever possible, such as those already identified in the UK (eg. Wessex/ Anglia), Europe (eg. Netherlands) and North America (eg. Maine; North Carolina). The project will also cover those areas where, at present, there are no sea defence

structures but where it may be advantageous to allow the land to flood in the future in order to create new habitats. The "do nothing" option will also be appraised

e). assessment of the technical viability of options given in (d) above

f). investigation of the costs of restoration/ replacement/ creation; calculation of management and other engineering costs. Review of techniques available for the economic evaluation of environmental benefits

g). consultation to establish the legal situation. However this cannot be done in isolation from a consideration of the social and political sensitivity of proposals to abandon land. This will need to be undertaken with the advice of NRA staff.

h). consultation/ interviews with relevant officers

i). literature review etc. will indicate areas requiring further research

j). identification of critical sites through consultation with engineering/ conservation staff and data collection exercise

k). consultation to establish which organisations/ individuals have an interest in the study, indicating the nature of the interest, and listing these

l). investigation of appropriate forms of data storage including the types of data (map-based and alpha numeric) which will be recorded. The GIS aspects (if applicable) will take due account of recommendations from the NRA's GIS working group, R&D Topic Area G3 and the NRA's I.T. Strategy)

7.2. Monitoring

The project will be multi-funded and each funding agency will be represented on the Steering Group. The NRA will be the head commissioner and the Project Leader will chair the Steering Group.

The Steering Group will appraise the objectives of the project, satisfy itself as to the deployment of funds, the arrangements for payment of the Contractor, review progress, receive and approve the draft and final reports and make recommendations for future phases.

Project monitoring to be undertaken by the Project Leader. Project contacts will be established in each NRA Region as appropriate for reference/ advice/ review as follows:-

a). Project Leader/ Topic Leader/ Regional Project contacts to review draft report (guidance and recommendations) based on the desk study

b). Project Leader/ Topic Leader/ Regional Project contacts to decide if research should progress to any subsequent stages based on recommendations of the initial study

8. Targets and timescales

Desk study including guidance to be completed and reviewed before March 1991. Draft report available by mid February 1991, final report by late March 1991. In addition the following meetings/ key dates are programmed:-

Mid November 1990	- Steering Group Meeting
Late December 1990	- Steering Group Meeting
Early January 1991	- Submission of ideas for further phases of work (as appropriate)
Mid February 1991	- Production and distribution of draft report
Mid March 1991	- Steering Group Meeting prior to final report; further discussion of way forward
Late March	- Presentation of results

9. Outputs

15 Copies for the NRA

- a). Draft report - One per consultee, [^]one copy per steering group member and one top copy
- b). Final report - 10 copies plus one top copy

10. Costs

Phase I study: fixed fee of £33,000 plus VAT.

Funding. It is anticipated that the funding of Phase I will be:-

NRA	15000
DOE	10000
CC	4000
NCC	4000

£33000 plus VAT

11. Benefits

a). there is considerable concern about the environmental implications of both sea level rise and the continued deterioration of defence structures. By developing an effective management strategy to counter these problems, preservation, creation and enhancement opportunities for the environment can be maximised. This will be of benefit not only to managers in the NRA but also other environmental agencies such as the Department of the Environment

b). the project will review the present situation to highlight deficiencies and make recommendations for further work on the implications of sea level rise

c). collaborative project between National Rivers Authority, Department of Environment, the Nature Conservancy Council and Countryside Commission

12. Assumptions and Risks

A valuable project to be undertaken by a qualified contractor. Costs and programme of work are most likely to be adhered to. The project relies on effective consultation/ liaison with interested parties. Response from the 10 NRA Regions can be prompted through the Project/Topic Leaders.

13. Overall Appraisal

A valuable and worthwhile project with very practical results which can be applied across the 10 NRA Regions potentially affected by sea level rise or continued deterioration of defence structures. Direct relevance to external organisations. Any risks are outweighed by the potential benefits.

Dr Andrew Brookes
5 October 1990

APPENDIX A1.2

LIST OF ORGANISATIONS AND INDIVIDUALS CONTACTED

LIST OF CONTACTS

Name	Organisation	Office	Post
*Mr. A. Merritt	Avon Wildlife Trust	Bristol	Conservation Officer
Mr. S. Hodgison	British Trust for Conservation Volunteers		Conservation Director
Mr. P. Fox	British Association for Shooting and Conservation	Wrexham	Head of Conservation
Ms. P. Sneddon	Cambridge University	Geography Department	
Mr. T. Badman Mr. G. Barrow Mr. J. Dyke	Centre of Environmental Interpretation		Landscape Architect
*Ms. J. Begg	Cheshire Conservation Trust	Northwich	Reserves Officer
Dr. R. Warrick	Climatic Research Unit, UEA	Norwich	
Mr. T. Allen Ms. J. Feline Mr. N. Holladay Ms. L. Leeson Mr. R. Ward Mr. J. Worth	Countryside Commission	Cheltenham Cambridge Cheltenham London Yorkshire and Humberside Cheltenham	
Mr. T. Burton	Council for the Preservation of Rural England		Senior Planner
*Mr. P. Kirkland	Cumbria Wildlife Trust	Ambleside	Assistant Conservation Officer
Dr. O. Pilkey	Duke University	Durham, North Carolina, USA	Professor
Mr. D. King	Dennis King Associates	Washington D.C., USA	Director
Ms. F. Christie Mr. J. Corkindale Dr. J. Fisher Mr. J. Winpenny	Department of Environment	London London London	Economist

Name	Organisation	Office	Post
Ms. N. Lavigne	Environment Canada	Montreal, Canada	Co-ordinator, State of the Environment
Mr. R. Fischman	Environmental Law Institute	Washington	
*Dr. C. Miles	Essex Wildlife Trust	Colchester	Conservation Officer
*Ms. J. Harper	Gwent Wildlife Trust	Monmouth	
Mr. C. Cuthbert	Hampshire County Council		Recreation Department
*Mr. C. Chatters	Hampshire & Isle of Wight Naturalists Trust	Romsey	Conservation Officer
*Mr. A Cooper	Herts. & Middlesex Wildlife Trust	St. Albans	
Dr Alan H Brampton	Hydraulics Research Ltd	Wallingford	
Mr. B. McWilliams	Irish Meteorological Service	Dublin	Deputy Director
Dr. L. Boorman	Institute of Terrestrial Ecology	Monks Wood	
*Mr. M. Crick	Lincolnshire & South Humberside Trust for Nature Conservation	Alford	Conservation Officer
Dr. S. Gubbay	Marine Conservation Society	Ross-on-Wye	Conservation Officer
Mr D Ayres Mr. B. Edwards Mr. S. Lockwood Mr. C. Northener Mr. R. Purnell Mr. Reegan Mr. I. Ward Mr. P. Whitehead Mr. T. Yates	Ministry of Agriculture, Fisheries and Food	Taunton London Conwy London London London London London London	Regional Engineer Fisheries IIA Fisheries Estates Division Chief Engineer Food and Environment Protection Act Environmentally Sensitive Areas Environmentally Sensitive Areas Flood Defence Division

Name	Organisation	Office	Post
Mr. P. Cook	Consultant	Lincoln	Former MAFF Regional Engineer
Mr. J. Burgon	National Trust	Cirencester	Chief Advisor on Nature Conservation
Mr. J. Harvey		Cirencester	Advisor on Coast and Seaside
Ms. C. Howard		Cirencester	Chief Advisor on Nature Conservation
Mr. R. Jarman		Cirencester	Ecologist
Ms. T. Bennett	Nature Conservancy Council	Peterborough GBHQ	Coastwatch Officer
Mr. S. Bilsborough		Peterborough GBHQ	Economist
Dr. A. Brown		York	Senior Officer
Ms. F. Burd		Peterborough GBHQ	
Dr. T. Cadwalladr		Cardiff	Regional Officer
Mr. A. Deadman		Blackwell	Deputy Regional Officer
Dr. P. Doody		Peterborough GBHQ	Chief Scientist
Ms. J. Forbes		Taunton	Directorate, Coastal ARO
Mr. M. Felton		Peterborough GBHQ	Head, Land Use Policy
Mr. C. Fuller		Aberystwyth	Deputy Regional Officer
Dr. C. Gibson		Colchester	ARO
Mr. R. Gomm		Taunton	Deputy Regional Officer
Mr. R. Hamilton		Colchester	Senior Officer
Mr. B. Harrison		York	Warden Humber Wildfowl Refuge
Dr. M. Labern		Peterborough (East Region)	Regional Officer
Mr. C. Lumb		Blackwell	ARO
Mr. J. Morley		Norwich	Deputy Regional Officer
Mr. G. Radley		Peterborough	Sand Dune Survey
Dr. R. Rafe		Peterborough EHQ	Policy Officer
Mr. P. Sargeant		Truro	ARO
Dr. M. Smith	Bangor WHQ	Head Science and Policy (Wales)	
Ms. H. Stace	York	ARO	
Mr. C. Tubbs	Lyndhurst	Senior Officer	
Mr. R. Wolton	Okehampton	ARO	
Mr. S. Warman	Truro	ARO	
Mr. J. White	Arne	ARO	

Mr. D. Alsop Mr. K. Annand	National Rivers Authority	Wessex	Flood Defence Information Technology Operations
Mr. J. Ash Mr. R. Bailey Mr. T. Barber Mr. C. Birkes Dr. A. Brookes Ms. K. Bryan Mr. G. Bull Mr. M. Child Mr. A. Clark Mr. D. Cragg Mr. M. Diamond Mr. A. Driver Mr. Q. Gray Mr. B. Hatton Mr. A. Heaton Mr. D. Hickey Mr. J. Hogger Mr. J. Hounslow Mr. R. Howell Mr. R. Horrocks Mr. A. Hunter-Blair Ms. L. Jenkins Mr. K. Jeynes Mr. P. Johnson Mr. D. Leggett Mr. T. Linford Mr. G. Llewelyn		Anglian Severn-Trent Wessex Northumbria Thames Severn-Trent Exeter North West Northumbria North West North West Thames South West South West Severn Trent Severn Trent Northumbria Thames Welsh Wessex Anglia Wessex Yorkshire Thames Anglian North West Head Office	Flood Defence Flood Defence Flood Defence Project Leader Conservation Flood Defence Flood Defence Conservation Conservation Conservation Solicitor Flood Defence Conservation Conservation Conservation Conservation Flood Defence Flood Defence Conservation Flood Defence Flood Defence Operations Research and Development Flood Defence Flood Defence Conservation Flood Defence Flood Defence Conservation Conservation Conservation Technical Assistant Flood Defence Flood Defence Flood Defence Research and Development Flood Defence Flood Defence Flood Defence
Mr. R. Mains-Smith Mr. D. Martin Mr. J. Morgan Mr. K. Nash Mr. C. Newton Dr. P. Nicholson Dr. K. O'Grady Dr. D. Prigmore Mr. J. Pygott Ms. A. Rogers Mr. D. Rook Mr. N. Stevens Mr. B. Tinkler Mr. R. Venables		Severn Trent Southern Southern Welsh Warrington South West Head Office Anglian Yorkshire Head Office Yorkshire Wessex Wessex Thames	Flood Defence Flood Defence Conservation Flood Defence Flood Defence Conservation Conservation Conservation Conservation Conservation Technical Assistant Flood Defence Flood Defence Flood Defence Research and Development Flood Defence Flood Defence Flood Defence
Mr. M. West Mr. I. Whittle Mr. T. Widnall		Southern Head Office Welsh	Flood Defence Flood Defence Flood Defence

Name	Organisation	Office	Post
Dr. R. Hobbs	Norfolk Naturalists Trust	Norwich	
Mr. P. Williams Mr. P. Goodwin	Philip Williams Associates Consulting Hydrologists	San Francisco, California, USA	Director Principal
Mr. G. Alcock Mr. P. Woodworth	Proudman Oceanographic Institute	Birkenhead Birkenhead	
Mr. G. Jan Verkade Mr. R. Misdorp	Rijkswaterstaat	Delft, Netherlands Hague, Netherlands	
Dr. C. Steel	Royal Society for Nature Conservation	Lincoln	Conservation Officer
Mr. R. Buisson Dr. P. Rothwell Dr. G. Thomas Dr. M. Clarke	Royal Society for the Protection of Birds	Sandy Sandy Sandy South East	Conservation Planning (Water) Coastal Policy Head of Ecology Conservation Officer
Ms. J. Zedler	San Diego State University	California, USA	
Mr. B. Batha Mr. J. Blanchfield	San Francisco Conservation and Development Commission	California, USA	Wetlands Biologist
Mr. L. G. Buck Mr. I. Townend	Sir William Halcrow & Partners	Swindon Swindon	
Mr. J. B. Edmondson	South Central Planning & Development Commission	Louisiana, USA	Executive Director
Dr. M. Clark Ms. J. Davenport Mr. C. Hill	Southampton University	Dept. of Geography Dept. of Geography Dept. of Geography	Consultant Scientist Research Scientist Research Scientist
Mr. T. Collins	Spurn Heritage Coast Project		
Dr. C. Beardall	Suffolk Wildlife Trust		

Name	Organisation	Office	Post
Mr. J. Titus	US Environmental Protection Agency	Washington D.C., USA	Sea Level Rise Co-Ordinator
Mr. A. Col-King	Ulster University	Dept. Maritime Geography	
*Ms. J. Smith	Ulster Wildlife Trust	Belfast	Assistant Conservation Officer
Dr. I. Shennan	University of Durham		
Mr. R.K. Turner	University of East Anglia	Norwich	Senior Lecturer
Mr. E. Moselman Mr. G. Oude-Essink	University of Technology	Delft, Netherlands Delft, Netherlands	
Mr. Stuurman	Institute of Applied Geoscience	Delft, Netherlands	
Dr. M. George	Formerly NCC	Norwich	Regional Officer
Dr. N. Hulton	University of Edinburgh - Department of Geography	Edinburgh	
Dr. W. Carter	University of Ulster	Coleraine	
Mr. M. Ounsted	Wildfowl and Wetland Trust	Slimbridge	Director of Conservation Developments
Dr. M. Havard	Worldwide Fund for Nature	Godalming	Marine Officer

* Contacted indirectly through RSNC