THE DEVELOPMENT OF ENVIRONMENTAL ASSESSMENT PROCESSES FOR PROJECTS WITHIN THE WATER ENVIRONMENT

Volume II

by

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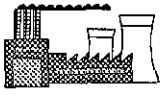
Acronyms used in the Text

ANOB	Area of Outstanding Natural Beauty (UK)
BATNEEC	Best Available Technology Not Exceeding Excessive Cost (UK)
BTO	British Trust for Ornithology (UK)
BTCV	British Trust for Conservation Volunteers
CBA	Cost-Benefit Analysis
CCW	Countryside Council for Wales (UK)
CEQ	Council for Environmental Quality (USA)
EA	Environmental Assessment (= EIA in USA)
EAO	Environmental Assessment Officer
EAP	Environmental Action Plan
EC	European Commission
ECW	Environmental Clerk of Works
EEC	European Economic Community (now EU)
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement (USA)
EN	English Nature (UK Government Agency responsible for nature conservation)
ES	Environmental Statement
ESA	Environmentally Sensitive Area (UK)
EU	European Union
FAS	Flood Alleviation Scheme
FONSI	Finding of No Significant Interest (USA)
FRCN	Fisheries, Recreation, Conservation and Navigation
HMIP	Her Majesty's Inspectorate of Pollution (UK)
IUCN	International Union for the Conservation of Nature
MAFF	Ministry of Agriculture, Food and Fisheries (UK)
MCA	Multi-Criteria Analysis
NEPA	National Environmental Policy Act 1969 - USA
NOI	Notice of Intent (USA)
NRA	National Rivers Authority -UK (predecessor of the Environment Agency)

PPA	Post-project analysis/appraisal
RSNC	Royal Society for Nature Conservation (UK)
SAC	Special Area of Conservation (a Site of European Importance as designated by EC Directive)
SEA	Strategic Environmental Assessment
SEPA	State Environmental Policy Act (e.g., Washington State)
SEPA	Scottish Environment Protection Agency (UK)
SI	Statutory Instrument (UK)
SPA	Special Protection Area (a European Site as designated by EC Directive
SSSI	Site of Special Scientific Interest (UK - protected site of nature conservation or geological/geomorphological importance.
UK	United Kingdom
UN	United Nations
UNEP	United Nations Environment Programme
USA	United States of America
WCED	World Commission on Environmental and Development - UN
WHO	World Health Organisation
WTW	Water Treatment Works

Chapter Eight -
Case Study
Oakle Street
Flood Alleviation Scheme



Chapter Eight
Case Study
Oakle Street
Flood Alleviation Scheme

8.1 Introduction

This chapter will review the use of the EA good practice 'model B' which was used to prepare the ES for a flood alleviation scheme at Oakle Street, Gloucestershire.

This project was selected as a suitable case study because, firstly, the EA scoping report for this project indicated a wide range of environmental effects and associated constraints. It was important to select a case study that had a wide range of key issues to be evaluated and discussed in an ES, rather than

just a few, which would not have effectively tested the 'model B'. Secondly, the scale of the project was large in relation to the normal projects undertaken in the Midlands Region of the Environment Agency, and if 'model B' was to be effective it had to work on those projects which brought with them the problems of high volumes of information. Thirdly, the timing of the project was appropriate as it was due to progress through the feasibility stages from January 1996 to August 1996, when the ES was due to be published, which fitted in with the thesis research programme. Fourthly, the project was to be assessed by an environmental consultant who had little experience of EA as undertaken by The Environmental Agency, and hence the use of the EA guidelines could be objectively evaluated, which would provide a test of the effectiveness of the guidelines provided.

The project did not proceed entirely on schedule due to a number of factors that will be discussed later and a draft ES was not produced until November 1996. The draft ES indicated a number of environmental mitigation measures were required if the scheme was to be implemented. When these measures were costed and added into the cost benefit analysis for the project, the cost benefit ration was found to be approximately 1:1.01. With the potential benefits of the scheme only just being greater than the costs of the scheme, this meant that the scheme did not automatically justify itself on cost benefit grounds alone. So in late November 1996, works on the project ceased. As of January 1998, the project is still on hold.

8.2 Project Needs and Objectives

In reviewing the flood defence requirements of the Severn Estuary, the Environment Agency had identified a number of areas (known as flood cells) which can flood in conditions of high river flows, adverse wind speed and direction and/or high tide. The Oakle Street flood cell lies on the north bank of the River Severn, approximately 5 km (3 miles) to the west of Gloucester (see Figure 8.1).

> 'During certain adverse combinations of tide, wind and river flow, the River Severn overtops the floodbanks protecting the Oakle Street flood

cell. This last occurred on 16 February 1995 when high tide and wind conditions caused the existing floodbanks to overtop in the vicinity of the Denny Outfall, flooding the A48 and other areas behind the flood bank' (Amos, 1996, p.2).

Figure 8.1 Location of the Oakle Street Flood Cell

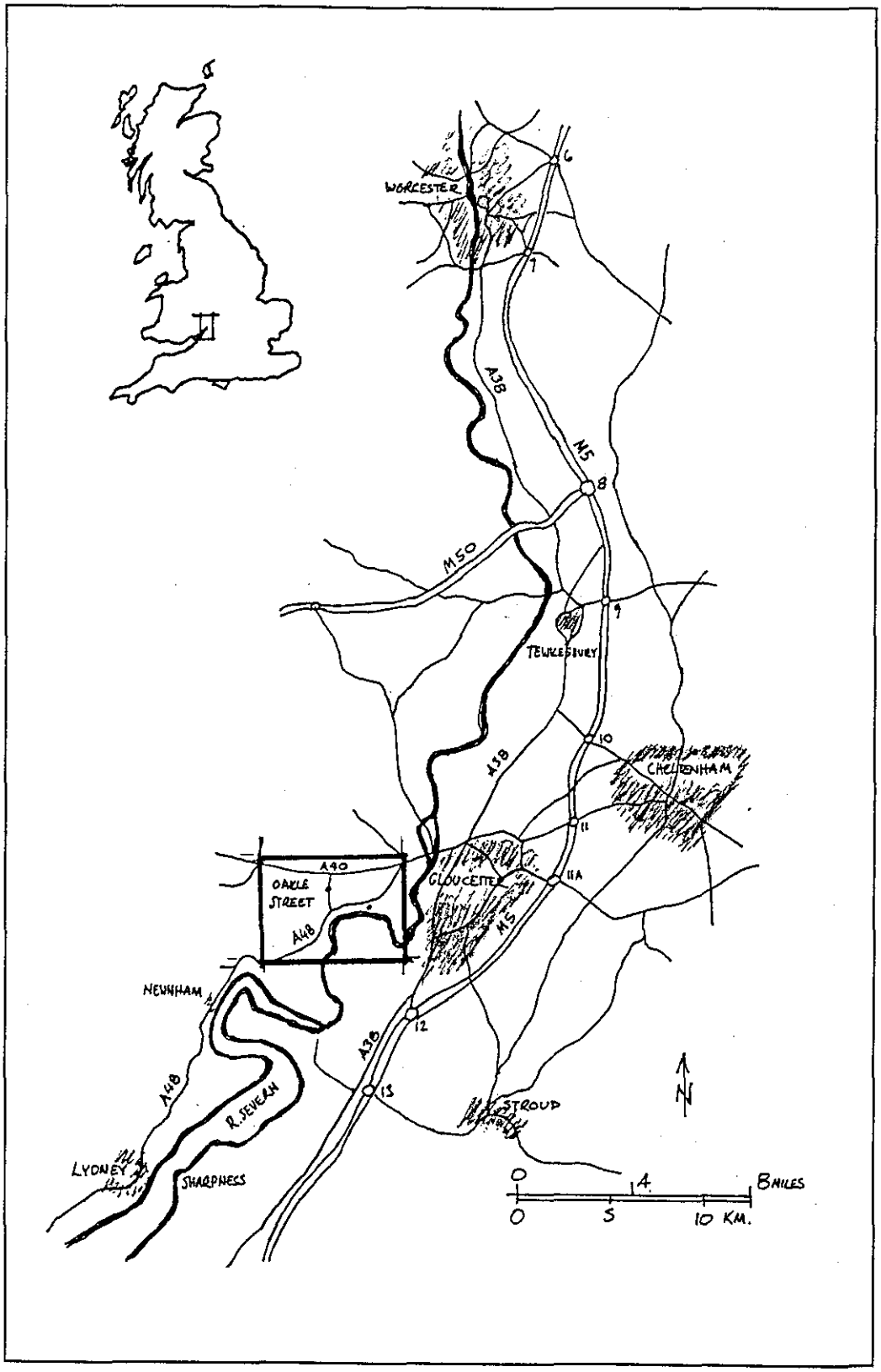
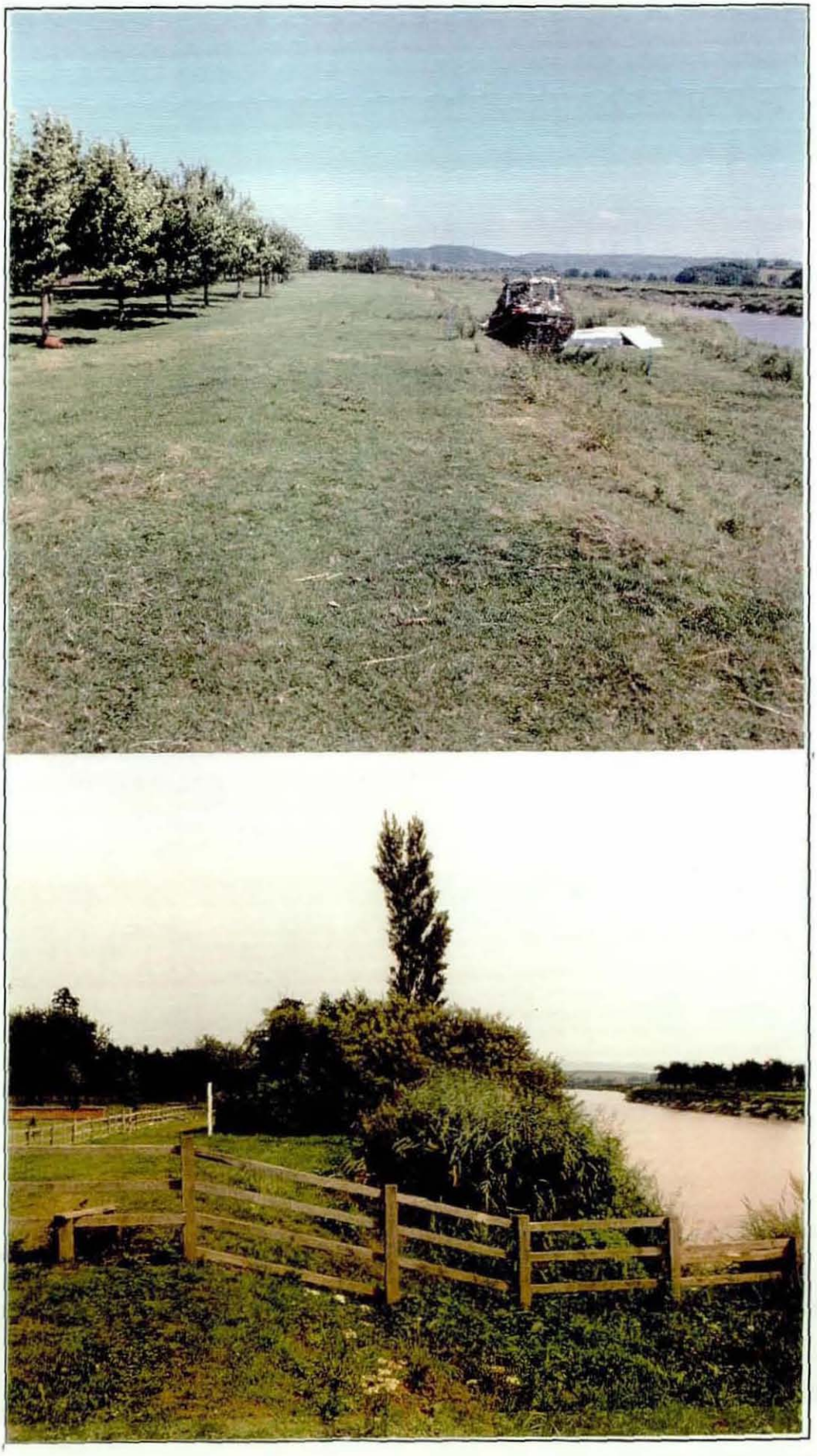


Figure 8.2 Photographs showing general views of the Oakle Street Area



Before the commencement of the feasibility study for this project an environmental scoping report was published for public consultation (Hickie, 1995b) during November 1995. This scoping report was circulated to all residents and statutory consultees for their comments. A public meeting was held in Minsterworth Parish Hall in December 1995, where a presentation of the problem and the Agency's approach to the development and assessment of possible solutions were explained. Only one person, a landowner, objected to the need to investigate possible solutions to the flooding problem, as he said he was not bothered if or when his land was flooded. Others said that they had concerns but that these had all be identified in the published scoping report.

In January 1996, Arthur Amos Associates was commissioned to assist with the implementation of the EA for this project. The feasibility study reviewed the flooding problem and identified six options (Figure 8.3) summarised below:

Option 1 Do Nothing

Option 2 Reduce the present flood protection standard

Option 3 Sustain the present standard of flood protection

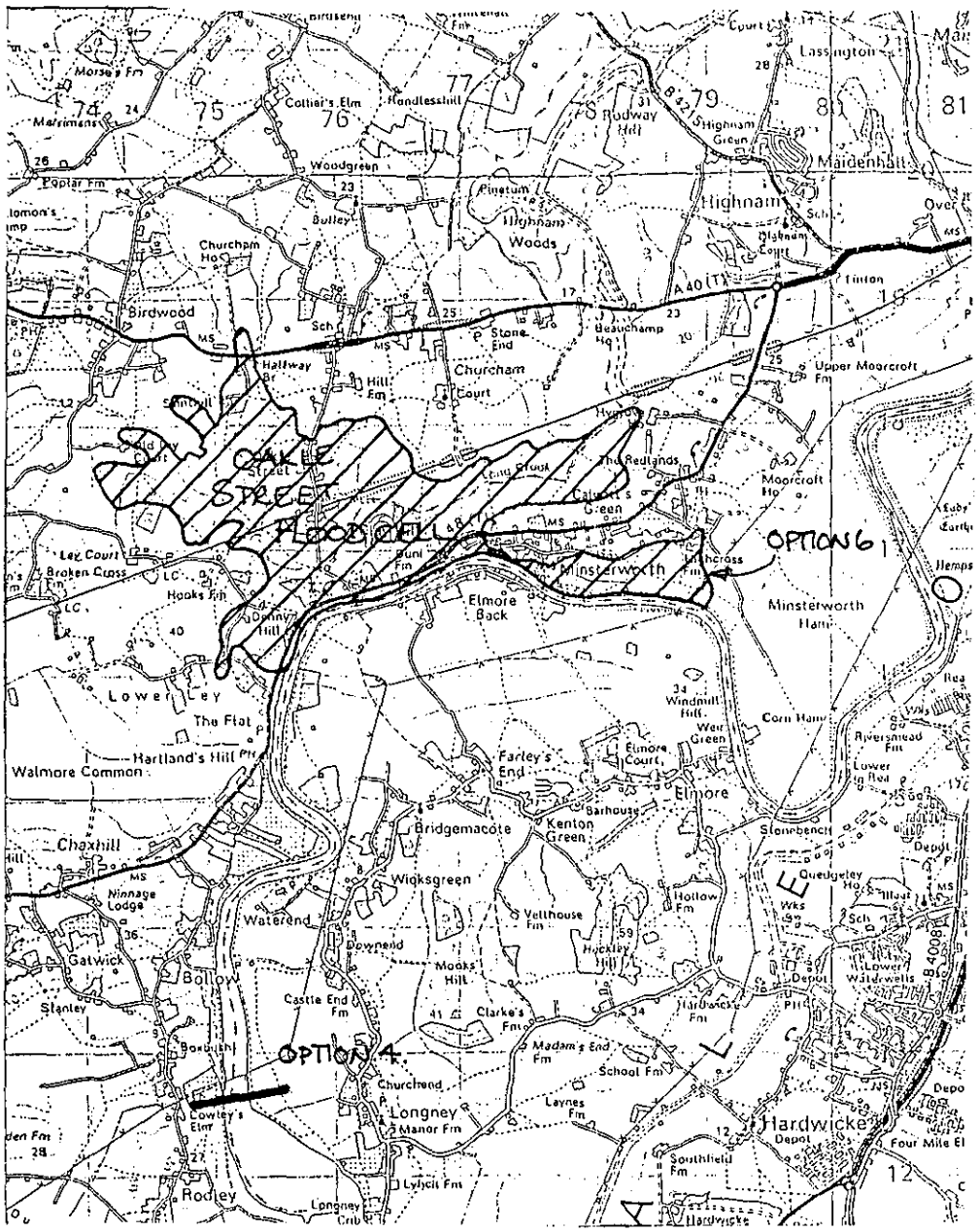
Option 4 Construct a barrage across the River Severn (downstream)

Option 5 Increase the present flood protection standard for the whole of the Oakle Street flood cell (to 1 in 100 year protection)

Option 6 Increase the present flood protection standard for the south east portion of the Oakle Street flood cell only (Minsterworth to have 1 in 100 year protection)

The 1 in 100 year event could potentially flood 39 residential properties and out-buildings, 28 agricultural buildings, and an area of agricultural land of approximately 2.4 km^2 (Amos, 1996). These six options were evaluated, with Option 5 selected as the preferred alternative on both environmental and economic grounds.

Figure 8.3 Oakle Street Project Options



Option 1:	Do Nothing
Option 2:	Reduce present flood protection standard of riverside floodbank
Option 3:	Sustain the present standard of flood protection
Option 4:	Constuct a barrage across the R. Severn downstream
Option 5:	Increase the present flood protection for the whole of the Oakle Street flood cell
Option 6:	Increase the flood protection for only the Minsterworth portion of the Oakle Street flood cell

8.3 EA Objectives

The objectives for the EA 'model B' (as discussed in Chapter Seven) will be the review criteria for the evaluation of this case study. The objectives are to:

a) fulfil the legal requirements of the UK legislation on EA (in the case of Oakle Street this was SI No. 1199 Planning EA regulations, but no ES was required by the Local Planning Authorities);

b) fulfil the requirement of MAFF for an ES or a written justification to be published for all schemes (Oakle Street will have a voluntary ES published);

c) identify and evaluate the potential environmental effects of all the reasonable alternative options for the scheme;

d) recommend an environmentally preferred option;

e) where possible, gain approval from English Nature and the Countryside Commission for the preferred option, as required by MAFF for scheme approval;

f) for the preferred option, identify the measures required to mitigate any adverse effects;

g) consult with all stakeholders associated with the flooding problem and affected by the preferred solution, and allow them to contribute to the decision, as appropriate;

h) if approved, ensure delivery and operation of the preferred option in an environmentally sensitive manner in accordance with all the agreed conditions and constraints (in the ES).

i) improve effectiveness of EA process ensuring environmental issues are taken into account in the decision-making processes at all stages of project planning, design and implementation;

j) improve efficiency of the EA process through better resource utilisation (staff and consultancy time and budgets) by the use of standardised EA procedures; and,

l) provide effective guidance for EA and project management staff for the implementation the above objectives.

Figure 8.4 Stages in the EA Procedures

Scoping Stage	Identification of scope of environmental issues and their influence on the initial choice of engineering options. This will be published as an **Environmental Scoping Report** for public consultation.
Feasibility Stage	An **Environmental Issues Report** will be produced to provide an initial overview of the environmental issues and constraints. This stage involves the identification and study of a number of options to alleviate the problem. Further informal public consultation will take place at this stage. After studying a range of options, including the 'do nothing option', a preferred option will be selected based on environmental, economic and technical criteria. A **Feasibility EA Report** including an **Environmental Action Plan** (EAP) will be produced. An **ES** will be published for public consultation, if there are potential significant environmental impacts. If there are no potential significant impacts a **Written Justification** for no ES will be published.
Decision on option to be implemented	The Environment Agency will seek MAFF approval of the agreed option.
Detailed Design Stage	The agreed option will be designed in detail and the contract documents prepared in accordance with all the agreed environmental measures detailed in the **EAP**. A **Design Review EA Report** will be produced reviewing the detailed design and contractual documents against the requirements of the **EAP**.
Contract Implementation	The engineering contract will be let to construct the agreed flood defence works and The Environment Agency will ensure that all agreed environmental protection, conservation and mitigation measures are implemented in accordance with the **EAP**.
Post Project Appraisal	The Environment Agency will appraise the constructed flood defence works to ensure that all agreed environmental measures have been implemented.

8.4 EA Methodology and Personnel

The methodology used to assess the environmental effects associated with the development of a technically, economically and environmentally acceptable

solution to the problem has been discussed in Chapter Seven ('model B'). The methodology was then published as the Severn-Trent Regional EA Guidelines (Hickie, 1995a) for use on such schemes as Oakle Street. The methodology is summarised in the stages in Figure 8.4.

EA Personnel

The management of the EA process is the responsibility of the project EA Officer who is the Environment Agency's Area Landscape Architect. For this project the EA Officer selected one of her EA term consultants (i.e. appointed for a period of time and not for specific projects) to assist with the preparation of the EA and publication of an ES. The EA consultant was Arthur Amos Associates, who had previously undertaken only one ES for the Environment Agency.

Arthur Amos Associates are primarily a firm of landscape architects which has been involved with EAs for a wide range of small-scale developments. Arthur Amos and Pippa Riddell, his assistant, were the two key staff from the consultancy working on the project and were supported by specialist sub-consultants Hilary Ludlow Landscape Science Consultancy for ecological input and Penny Cresswell Lewns for badger expertise.

8.5 Stakeholders

There were a wide range of stakeholders associated with the Oakle Street Flood Alleviation Scheme. These could be separated into two groups, internal and external to The Environmental Agency (as discussed in Chapter Five).

Internal Decision-makers

Tables 8.1, 8.2, 8.3 and 8.4 summarise the Environment Agency staff who were stakeholders in the project. These include the project client staff responsible for implementing Flood Defence strategy and maintaining flood defences; the EA team; the wider project team (feasibility and design engineers, contractors and operating staff); and the Agency's regulatory staff.

Table 8.1 The Environment Agency - Client Personnel

Client - Flood Defence

Regional Flood Defence Committee: responsible for the implementing the flood defence functions of the Environment Agency within the Midlands Region.
Regional Flood Defence Manager: responsible to the Regional Flood Defence Committee for managing the Regional flood defence strategy and funding programme for maintenance and capital works.
Area Flood Defence Manager, Lower Severn: responsible for managing the flood defence functional responsibilities within the Lower Severn Area. This includes identifying flood defence needs such as those associated with the Oakle Street flood cell.
Area Manager, Lower Severn: responsible for the integrated management of all the Environment Agency's function within the Lower Severn Area, including flood defence.

Table 8.2 Project Planning and Implementation Staff

Project Engineering Staff

Regional Engineering Services Manager: responsible for the management of the Flood Defence capital programme.
Principal Engineer Feasibility: (Project Manager - Feasibility) responsible for the management of the project from inception through to final approval by MAFF and preparation of a design brief, when the project is handed over to the design and implementation project manager.
Engineer: (Project Engineer - Feasibility) responsible to the project manager for the development of the feasibility study for the Oakle Street flood alleviation scheme.
Principal Engineer Design: (Project Manager - Design and Implementation) responsible for the management of the project from detailed design to the completion of the project.
Engineer: (Project Engineer - Design) responsible to the project manager for detailed design through to the completion of the project.
Engineering Consultant - Project Manager: (external consultant) responsible for managing the design and contract implementation on behalf of the Environment Agency.
Engineering Consultant - Project Engineer: (external consultant) responsible for design and contract implementation.
Engineering Consultant - Resident Engineer: (external consultant) responsible for site supervision of the contract implementation.

Project Contractor
The contractor, who was not to be appointed until after final design.

Project Operating and Maintenance Staff
Area Flood Defence Manager, Lower Severn: responsible for operating all flood defence measures, including structures, such as the Denny Outfall in the Oakle Street flood cell (Figure 8.1) and maintaining all such structures and floodbanks.

Table 8.3 Environmental Assessment Staff

EA Staff
Regional EA Co-ordinator: responsible for approving the ES prior to publication. **Area FRCN Manager**: responsible as line-manager for the implementation of all EA tasks within Lower Severn Area. **Area Landscape Architect**: (Project EA Officer) responsible for the technical management of all EA tasks and the management of all EA consultants. **EA Consultant**: responsible for undertaking the EA as directed by the project EA Officer.

Table 8.4 Regulatory Staff

Regulatory Staff
Technical Liaison Officer, Flood Defence (Land Drainage Consents): responsible for approving land drainage consents required for all permanent and temporary works associated with the project. **Water Quality Manager (Water Pollution Control)**: responsible for providing advice and taking legal action where a pollution of a watercourse occurs.

External Decision-makers

For a project such as Oakle Street there will be a wide range of external stakeholders. Some general stakeholders will be applicable to all projects and others will be specific to a given project (such as landowners) or where specific issues are relevant (e.g., archaeology).

The competent authority for the decision-making in relation to approval of the scheme for Oakle Street were the two district planning authorities covering the length of river effected by the preferred option. The planning authorities were the Forest of Dean District Council and Tewkesbury District Council. Both district councils had indicated that because each has a section of proposed new flood defence within their jurisdiction, they would require a planning application. However, because both planning authorities considered that there would be no significant environmental effects, even though the works are Schedule 2 projects under SI No. 1199 they would not require an ES to accompany the planning application.

Table 8.5 Competent Authority and Statutory Consultees

Competent Authority
Forest of Dean District Council and Tewkesbury Borough Council: responsible as the relevant planning authorities, but will also be interested in noise issues, listed buildings and tree preservation orders.

Statutory Consultees (SI No. 1199 regulation 8 (5))
Environment Agency: responsible for water management and pollution control
Any principal council for the area, i.e., Gloucestershire County Council: whose interests will include highways, footpaths, archaeology, landscape, general ecology.
Countryside Commission: general landscape
English Nature: need to ensure the project does not effect Walmore Common SSSI downstream of Oakle Street flood cell.

Locally Elected Bodies
Minsterworth Parish Council: local issues
Westbury on Severn Parish Council: local issues

Other Environmental Consenting Agencies
English Heritage: need to ensure no Scheduled Ancient Monuments affected
Gloucester Dock Trustees: navigation matters, e.g., working in the river, moorings, etc.

Funding Agency
MAFF: funding up to 15% of the capital costs of the scheme.

Other Agencies
Tourist Board: access to view the Severn Bore.

The Environment Agency was keen, however, to voluntarily publish an ES. This would provide for greater public consultation of the preferred option and allowed the Environment Agency to identify any potential objections which had not already been identified in the EA consultation process before submitting the planning applications. Negotiations with such objectors could either: clarify a possible misconception; agree to change the scheme slightly to accommodate the objector; or accept the objector would be sustaining their objection at the planning application stage.

Table 8.6 Non-Governmental Organisations and the General Public

Non-Governmental Organisations
Gloucestershire Wildlife Trust: change to and extent of habitats and wildlife
Council for the Preservation of Rural England: change to and extent of general landscape
Ramblers Association: temporary and permanent footpath diversions
RSPB: change to and extent of bird habitats

Other interested Groups
Minsterworth Water Ski Club: potential disturbance of use of river.

Local Community
St Peter's Church: graveyard within potential working area and potential temporary noise disturbance of services and funerals.

Commercial Interests
Farmers (grazing and orchards): temporary disturbance during construction period and permanent floodbank changes.
Severn Bank hotel/guesthouse: potential disturbance of guests.
Elver Fishermen: potential disturbance of access to river.
Salmon Fishermen: potential disturbance of access to river.

Local Individuals
Local residents: temporary disturbance during construction period and permanent floodbank changes.
Walkers: restricted or diverted access to riverside
Coarse Fishermen: potential disturbance of access to river.
General Public: temporary disturbance of access to riverbank during construction period and permanent floodbank changes. Restricted access to view the Severn Bore during construction period.

8.6 Review of ES

The draft ES was prepared by Arthur Amos Associates. The evaluation of the ES has been based on the fulfilment of the objectives for the EA process discussed earlier in this chapter. The adherence to the EA good practice 'model B' guidelines will also be evaluated.

Environmental Statement

The EA guidelines suggest that an ES will normally consist of three separate documents:

Part I	The Non-technical Summary
Part II	The ES
Part III	Appendices for the ES' (Hickie, 1995a)

The draft ES for Oakle Street was provided in two volumes: the ES and appendices. As this was the draft edition of the ES, the consultant had left the non-technical summary for the final draft. The format of the ES document was as recommended in the EA model, with the exception of the environmental issues topic list analysing the environmental effects. These changes will be discussed in detail later in this chapter.

Compliance with EA Legal Requirements

In reviewing the EA objective to fulfil the legal requirements of the UK legislation on EA, schedule 2 provides a list of mandatory information to be included in an ES (see Table 8.7). The ES complies with all the mandatory requirements, except that it does not yet have a non-technical summary in this draft edition.

In addition to the list of mandatory requirements, there is a list of additional information that may be provided in an ES (Table 8.9).

Table 8.7 Review of Compliance with Mandatory Information Requirements for Oakle Street Draft ES

SI No. 1199 Schedule 3 (paragraph 2)		**Oakle Street ES**
2.	The specified information is:	
(a)	a description of the development proposed, comprising information about the site and the design and size or scale of the development;	✓
(b)	the data necessary to identify and assess the main effects which that development is likely to have on the environment;	✓
(c)	a description of the likely significant effects, direct and indirect, on the environment of the development, explained by reference to its possible impact on-	✓
	human beings;	✓
	flora;	✓
	fauna;	✓
	soil;	✓
	water;	✓
	air;	✓
	climate;	✓
	the landscape;	✓
	the inter-action between any of the foregoing;	✓
	material assets;	✓
	the cultural heritage;	✓
(d)	where significant adverse effects are identified with respect to any of the foregoing, a description of the measures envisaged in order to avoid, reduce or remedy those effects; and	✓
(e)	a summary in non-technical language of the information specified above.	X

Key Compliance - ✓ Non-compliance - X

Table 8.8 Review of Compliance with Non-mandatory Information Requirements for Oakle Street Draft ES

SI No. 1199 Schedule 3 (paragraphs 3 and 4)		**Oakle Street ES**
3.	An ES may include, by way of explanation or amplification of any specified information, further information on any of the following matters:	✓
(a)	the physical characteristics of the proposed development, and the land-use requirements during the construction and operational phases;	✓
(b)	the main characteristics of the production processes proposed, including the nature and quality of the materials to be used;	✓
(c)	the estimated type and quantity of expected residues and emissions (including pollutants of water, air or soil, noise, vibration, light, heat and radiation) resulting from the proposed development when in operation;	✓
(d)	(in outline) the main alternatives (if any) studied by the applicant, appellant or authority and an indication of the main reasons for choosing the development proposed, taking into account the environmental effects;	✓
(e)	the likely significant direct and indirect effects on the environment of the development proposed which may result from-	
	(i) the use of natural resources;	✓
	(ii) the emission of pollutants, the creation of nuisances, and the elimination of waste;	✓
(f)	the forecasting methods used to assess any effects on the environment about which information is given under subparagraph (c); and	X
(g)	any difficulties, such as technical deficiencies or lack of know-how, encountered in compiling any specified information.	X
In paragraph (c) "effects" includes secondary, cumulative, short, medium and long term, permanent, temporary, positive and negative effects.		
4.	Where further information is included in an ES pursuant to paragraph 3, a non-technical summary of that information shall also be provided.	X

Key Compliance - ✓ Non-compliance - X

The Oakle Street ES provides for all the additional requirements except for

detailing the methodologies used in evaluation and listing any uncertainties or unknowns. The evaluation of the assessment of effects used in the ES is discussed later in this chapter. The lack of any comments on unknowns is typical of EA consultants reports as discussed in the review of the 14 ESs in Chapter Six of this thesis.

Comparison of the Oakle Street and the 'Model B' ESs

The initial comparison of the ES format is summarised in Table 8.9. This shows that most of the elements of the model ES were provided. However, the cover sheet did not include a short abstract and quality assurance information; no non-technical summary was provided as yet; and there was no list of references, glossary or index.

Table 8.9 Comparison of EA 'Model B' and Oakle Street Draft ES

EA Model	**Oakle Street ES**
Cover Sheet:	✓
The cover sheet should include details of responsible agencies, title of the project and reference number, designation of ES, i.e. draft or final, quality assurance details, an abstract, and date by which comments must be received.	Quality assurance details and abstract not provided
Summary:	X
Synopsis of major conclusions, areas of controversy and issues to be resolved. To be 1-2 pages long.	Non-technical summary not included in draft edition
Table of Contents:	✓
Sections:	
Section 1 - Information describing the project	
Section 2 - Information describing the site and its environment	✓ ✓
Section 3 - Assessment of effects	
Section 4 - Mitigation measures	✓
Section 5 - Risk of accidents and hazardous development	✓
Section 6 - Environmental Action Plan	✓
References	X
Glossary	X
Index	X

Key Compliance - ✓ Non-compliance - X

A comparison of environmental topics covered by the EA Model and the Oakle Street ES are shown in Tables 8.10 and 8.11.

Table 8.10 Section 1: Information describing the project

EA Model			Oakle Street ES
1.1	a	Purpose of the EA and legislative background.	✓
	b	Define the objective of the proposed project.	✓
1.2	Processes and operational features of the proposed project:		
	a	during construction;	✓
	b	*when operational;*	✓
	c	when being maintained;	✓
	d	after use has ceased (where appropriate);	N/A
	e	type and quantities of raw materials, energy and other resources consumed;	✓
	f	residues and emissions by type, quantity, composition and strength including:	✓
		i discharges to water;	✓
		ii emissions to air;	✓
		iii noise;	✓
		iv vibration	✓
		v light;	✓
		vi heat;	✓
		vii radiation;	✓
		viii deposits/residues to land and soil;	✓
		ix others.	N/A
1.3	Land use requirements, details of proposed access, approximate numbers to be employed and where they will come from:		
	a	during construction;	✓
	b	when operational	✓
	c	when being maintained	✓
	d	after use has ceased (where appropriate).	N/A
1.4	Main alternative to be considered. A minimum of four options should be considered including:		
	a	Do Nothing;	✓
	b	Reduce flood protection standard;	✓
	c	*Sustain present standard of flood protection;*	✓
	d	Improve standard of flood protection; as well as different location and design options.	✓

Key Compliance - ✓ Non-compliance - X Not applicable - N/A

Table 8.11 *Section 2: Information describing the site and its environment* - natural environment

EA Model		Oakle Street ES
2.1 Natural Environment		
2.1.2 Earth		
2.1.2.1	Geology	✓
2.1.2.2	Soils	✓
2.1.2.3	Geomorphology	✓
2.1.2.4	Erosion/enlargement (accretion) of land area	✓
2.1.2.5	Topography	✓
2.1.2.6	Unique physical features	✓
2.1.3 Air		
2.1.3.1	Air quality	✓
2.1.3.2	Odour	X (covered in 2.1.3.1)
2.1.3.3	Climate	✓
2.1.4 Water		
2.1.4.1	Surface water movement/quantity/quality	✓
2.1.4.2	Runoff/absorption	X (covered in 2.1.4.1)
2.1.4.3	Floods	✓
2.1.4.4	Groundwater	✓
2.1.4.5	Public water supplies	X
2.1.4.6	Water Discharges	X (covered in 2.1.4.1)
2.1.5 Plants and Animals		
2.1.5.1	Fisheries	✓
2.1.5.2	Flora	✓
2.1.5.2.1	River Corridor Survey	X
2.1.5.2.2	*Species of note.*	✓
2.1.5.2.3	Trees	✓
2.1.5.3	Fauna	✓
2.1.5.3.1	Invertebrates	✓
2.1.5.3.2	Birds	✓
2.1.5.3.3	Mammals	✓
2.1.5.3.4	Amphibians	✓
2.1.5.3.5	Habitats	✓
2.1.5.3.6	Fish or wildlife migration routes	X (covered in 2.1.5.1.)

Key Compliance - ✓ Non-compliance - X

Table 8.11 (continued) Section 2: Information describing the site and its environment - built environment

EA Model		Oakle Street ES
2.2	**Built environment**	
2.2.1	**Environmental Health**	
2.2.1.1	Current noise levels	✓
2.2.1.2	Water Quality	✓
2.2.1.3	Existing releases or potential release to the environment affecting public health, such as toxic or hazardous materials	✓ (Septic Tanks)
2.2.2.	**Land and River use**	
2.2.2.1	Relationship to existing land-use plans and to estimated population.	✓
2.2.2.2	Housing	✓
2.2.2.3	Existing light and glare	✓
2.2.2.4	Landscape assessment	✓
2.2.2.5	Recreation - Survey	✓
2.2.2.6	Historic and cultural preservation	✓
2.2.2.7	Agricultural land use	✓
2.2.3	**Transportation**	
2.2.3.1	Transportation systems	✓
2.2.3.2	Vehicular traffic	✓
2.2.3.3	Waterborne, rail and air traffic	✓
2.2.3.4	Parking	✓
2.2.3.5	Movement and circulation of people or goods	X
2.2.3.6	Traffic hazards	X (covered in 2.2.3.1)
2.2.4	**Existing Public services and utilities**	
2.2.4.1	Fire	X
2.2.4.2	Police	X
2.2.4.3	Schools	✓
2.2.4.4	Parks or other recreational facilities	✓
2.2.4.5	Maintenance	X
2.2.4.6	Communications	✓
2.2.4.7	Water/stormwater	X (covered in 2.2.1.3)
2.2.4.8	Sewer/solid waste	X (covered in 2.2.1.3)
2.2.4.9	Other government services or utilities	X
2.3	**Any other relevant environmental features**	No extra issues

Key Compliance - ✓ Non-compliance - X

Table 8.12 Built Environment Topic List as used in Oakle Street Draft ES

Built Environment

Environmental Health
- Noise
- Visual/physical disturbance
- Water Quality
- Septic Tank soakaway systems
- Light and Glare

Housing
- Location and numbers

Landscape Character
- General context
- Landscape Character Zones
- Character Summary

Recreation
- Public Rights of Way
- Severn Bore
- Water Ski Club
- Amenity and Commercial River Traffic

Architectural and Historic Heritage
- Sites and Monuments
- Buildings
- Orchards

Agricultural Land Use

Fishing
- Elver
- Salmon

Transportation
- A48 Road
- Minor Roads
- Parking

Public Services and Utilities
- Schools
- Playing Fields
- Communications

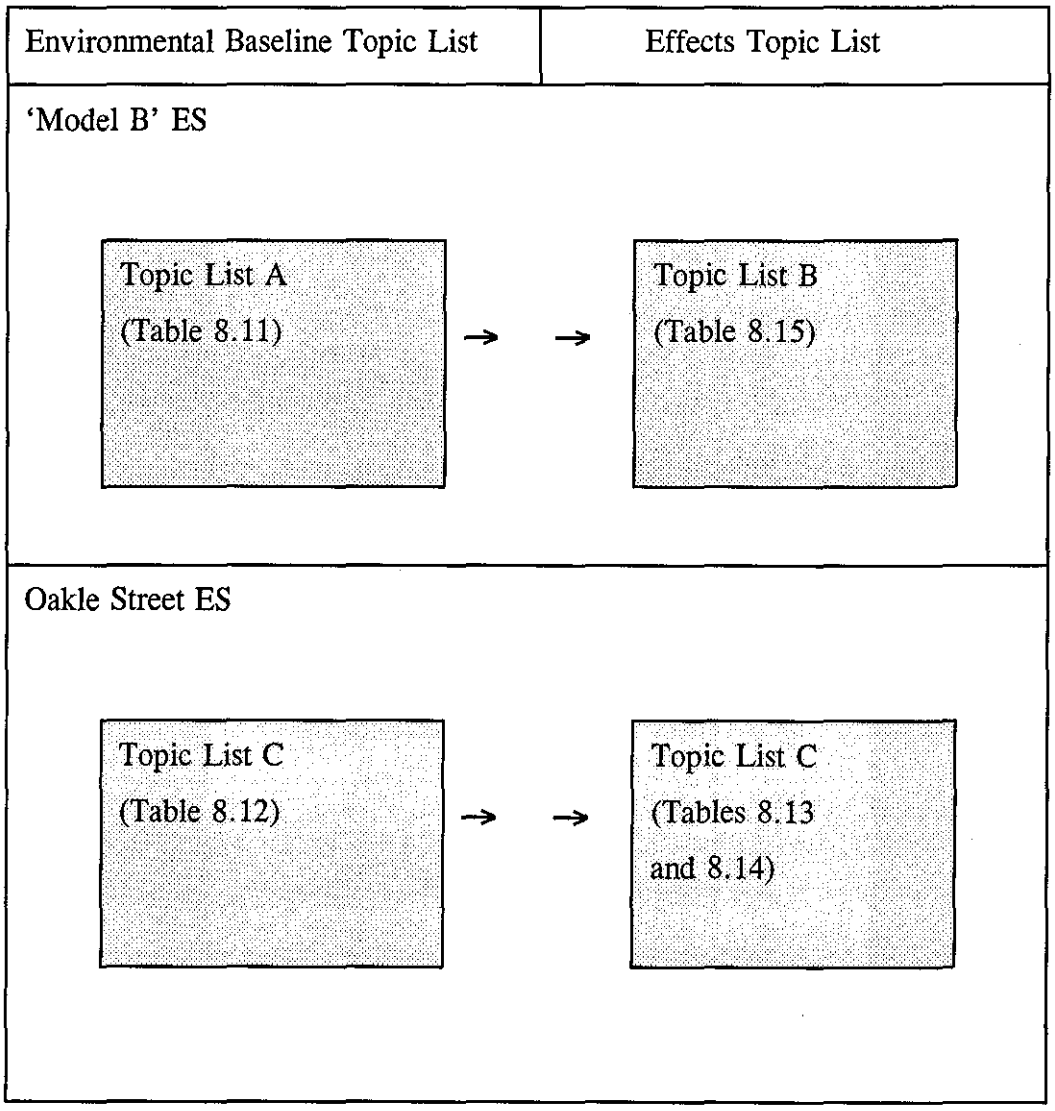
Planning Considerations
- Structure Plan
- Draft Landscape strategy
- Orchard Rehabilitation Scheme

Tewkesbury Borough Local Plan

Variation in Topic List used for Built Environment

The topic list used for Oakle Street (Table 8.12) varies from the recommended EA model (Table 8.11), as shown in Figure 8.5 as topic lists A and C. However, the topic list used in the ES was similar to the list of issues provided in the Oakle Street Scoping Report (Hickie,1995a) which needed to be followed up in the feasibility stage of the EA. Therefore, the consultant had used the scoping report to provide the list of topics to be covered in the ES.

Figure 8.5 Topic Lists used in 'Model B' and Oakle Street ES



Assessment of Effects

The 'model B' required the assessment of effects as listed in Table 8.15 which was derived in Chapter Five from the Department of the Environment's booklet Environmental Assessment : A Guide to the Procedures (1989a), and

is different form the topic list for the environmental baseline (Table 8.11). Whereas the assessment of effects for Oakle Street had been based on the topic list of site and environment decriptors used in the previous section of the Oakle Street ES (Tables 8.13 and 8.14), which is shown in Figure 8.5 as topic lists B and C. This use of the same topic list for the environmental baseline description section and analysis of effects section does have some merit and will be discussed later in this chapter.

Table 8.13 List of Effects as used in Oakle Street ES - Natural Environment

Natural Environment

Effects on Land
- Geological features
- Chemical emissions and deposits on soil
- Geomorphological processes
- Erosion of land
- Deposition
- Topography
- Unique physical features

Effects on Air and Climate
- Air quality
- Microclimate
- Dust
- Offensive odours

Effects on waters
- Drainage pattern
- Flooding
- Groundwater
- Water quality

Effects on Ecology and Habitats
- Walmore Common (SSSI)
- Flora
- Mammals
- Birds
- Invertebrates
- Amphibians
- Fish

Effects on Trees
- Trees covered by Tree Preservation Orders
- Summary of effects on vegetation

Table 8.14 List of Effects as used in Oakle Street ES - Built Environment

Human Beings, Buildings and Man-made Features

Environmental Health
- Noise
- Visual/physical disturbance
- Water Quality
- Septic tanks
- Light and Glare

Population

Visual effects on the surrounding area and landscape
- Construction effects: visual components
- Construction effects: visual receptors
- Post-construction effects: visual components
- Post-construction effects: visual receptors
- Post-construction effects: character change

Effects on Recreation

Architectural and Historic Heritage
- *Listed and historic buildings*

Effects on Agricultural Land Use
- Orchards
- Grazing
- Cultivation of land

Effects on Fishing
- Elver
- Salmon

Effects on Local Roads and Transport

Effects on Public Safety

Effects of Temporary Works on environment

Table 8.15 Model Topic List for Assessment of Effects

3.1	**Effects on human beings, buildings and man-made features**
3.1.1	Change in population arising from the project, and consequential environmental effects.
3.1.2	Visual effects of the project on the surrounding area and landscape. Details of how this may change with time should be given.
3.1.3	Levels and effects of emissions from the project during normal operation.
3.1.4	Levels and effects of noise from the project.
3.1.5	Effects of the project on land-use local roads and transport.
3.1.6	Effects of the project on buildings, the architectural and historic heritage, archaeological features, and other human artefacts, e.g., through pollutants, visual intrusion, vibration.
3.1.7	Effects on land and water rights and navigation.
3.1.8	Effect of project on public safety.
3.1.9	Effect of changed water flows and levels on recreational use.
3.2	**Effects on flora, fauna and geology**
3.2.1	Impact on habitats and plant and animal species.
3.2.2	Impact on geological, palaeontological and physiographic features.
3.2.3	Impact on geomorphological processes.
3.2.4	Other ecological consequences
3.3	**Effects on land**
3.3.1	Physical effects of the project, eg. change in local topography, effect of earth-moving on stability, soil erosion, etc.
3.3.2	Effects of chemical emissions and deposits on soil of site and surrounding land.
3.3.3	Land use/resource effects: a quality and quantity of agricultural land to be taken; b sterilisation of mineral resources; c other alternative uses of the site, including the 'do nothing' option; d effect on surrounding land uses including agriculture; e waste disposal.
3.4	**Effects on waters**
3.4.1	Effects of project on drainage pattern in the area.
3.4.2	Changes to other hydrographic characteristics, e.g., ground water level, water courses, flow of underground water.
3.4.3	Effects on coastal or estuarine hydrology.
3.4.4	Effects of pollutants, waste, etc. on water quality.
3.5	**Effects on air and Climate**
3.5.1	Level and concentration of chemical emissions and their environmental effects.
3.5.2	Particulate matter.
3.5.3	Offensive odours.
3.5.4	Any other climatic effects.
3.6	***Other indirect and secondary effects associated with the project***
3.6.1	Effects from traffic (road, rail, air, water) related to the project.
3.6.2	Effects arising from the extraction and consumption of materials, water, energy or other resources by the project.
3.6.3	Effects of other project associated with the project, e.g., new roads, sewers, housing, power lines, pipelines, telecommunications, etc.
3.6.4	Effects of association of the project with other existing or proposed development.
3.6.5	Secondary effects resulting from the interaction of separate direct effects listed above.

Mitigating Measures

The mitigating measures have been split into two sub-sections, one for general measures applying throughout the project area (Table 8.16) and site specific measures detailing the requirements for individual plots. The list of topics is again similar to the sit descriptors and assessment of effects.

Table 8.16 General Mitigation Measures Topics Covered in the Oakle Street Draft ES

Pollution to soil, air or water
- Fuel/Oil/Concrete waste spills
- Exhaust fumes/fires
- Dust
- Litter

Microclimate
- Loss of wind shelter

Ecology and Habitats
- Derelict building (retention)
- Species rich turf
- Mammals
- Birds
- Amphibians

Trees and Shrubs
- General tree protection measures
- Tree replacement measures
- Tree protection/action schedule

Noise

Visual/Physical Disturbance
- Disturbance to residents
- Disruption to use of St Peter's Church
- Disruption to visual/general amenity for residents and visitors

Landscape Character

Recreation
- Public rights of way
- Severn Bore
- Water skiing
- Launching of boats/private access to river

Architectural and Historic Heritage
- The listed Fish Hut
- St Peter's Church
- The Naight
- Archaeological remains
- Ridge and Furrow Orchards

Agricultural Land Use
- Orchards
- Grazing land

Fishing

Local Roads

Public Safety
- General
- Hazardous materials
- Traffic

Table 8.17 Comparison of EA Model Mitigation Topics and the Oakle Street Draft ES

EA Model			Oakle Street ES
4.1	Where significant adverse effects are identified, a description of the measures to be taken to avoid, reduce or remedy those effects, and will include:		✓
a	site planning; location, orientation and alignment.		✓
b	technical measures, e.g.:		
	i	design selection;	✓
	ii	recycling;	X
	iii	pollution control and treatment;	✓
	iv	containment (e.g., bunding of chemical and fuel storage vessels).	✓
c	landscape and ecological measures, e.g.:		
	i	design in keeping with local landscape character;	✓
	ii	design and colour of structures, etc.;	✓
	iii	conservation of local natural habitats;	✓
	iv	tree, shrubs, and grassland establishment;	✓
	v	measures to preserve particular habitats or create alternative habitats;	✓
	vi	recording of archaeological sites;	✓
	vii	measures to safeguard historic building or sites.	✓
	viii	Environmental Action Plan to ensure all environmental protection and mitigation measures are implemented.	✓
4.2	Assessment of the likely effectiveness of mitigating measures.		X
4.3	Assessment of the likely impacts of mitigating measures.		X

Key Compliance - ✓ Non-compliance - X

Risks of accidents and hazardous development (Section 5 of EA Model)
This section had not been written for the draft ES.

Environmental Action Plan (Section 6 of EA Model)
The EAP conforms to the overall format of the 'model B' EAP (Hickie, 1996d). The EAP should detail how all the environmental issues and constraints are to be implemented at the detailed design, construction and operational stages of the project, together with all monitoring requirements. However, when issues were checked for their presence or absence in the effects, mitigation and EAP sections, a number of anomalies were found. A number of issues were identified as potential adverse effects and then not covered in the mitigation and EAP sections (e.g., trees protected by Tree Preservation Orders). Other issues were covered in the mitigation and EAP sections, but not identified as a potential adverse effect (e.g., disturbance to bat roosts in old trees). Some issues were covered in the EAP but not mentioned in the effects or mitigation sections (e.g., potential disturbance to badger setts in the existing floodbank). These inconsistencies can be seen in evaluation of the linkage of effects from assessment to EAP in Table 8.18.

Table 8.18 Linkage of Effects from Assessment Section to EAP

(NP = None Predicted)

Effect:	Mitigation	EAP
Natural Environment		
Effects on Land		
Geological features (NP)	-	-
Chemical emissions and deposits on soil (potential local spillages during works)	✓	✓
Geomorphological processes (NP)	-	-
Erosion of Land (NP)	-	-
Deposition (NP)	-	-
Topography (local changes - potential changes in landscape character)	✓	✓
Unique physical features (NP)	-	-
Effects on air and climate		
Air quality (emissions during works)	✓	✓
Microclimate (reduced wind shelter)	✓	
Dust (localised effects)	✓	✓
Offensive Odours (NP)	-	-
Litter (not covered in effects)	✓	✓
Effects on waters		
Drainage Pattern (NP)	X	✓
Flooding (decreased flooding)	-	-
Groundwater (NP)	-	-
Water Quality (potential localised pollution incidents during works)	✓	✓
Effects on Ecology and Habitats		
Walmore Common (SSSI) (NP)	-	-
Flora (Turf, trees and orchards)	✓	X
Mammals - badgers (not in effects)	X	✓
- bats (not in effects)	✓	✓
(potentially disturbed during works)		
Birds (nesting birds potentially disturbed during works) (nesting not in effects)	✓	✓
Invertebrates (short term loss of habitat)	-	-
Amphibians (borrow pit areas should be checked before excavation starts)	✓	X
Fish (NP)	-	-
Effects on Trees		
Trees covered by TPOs (potential damage to canopies by vehicle access)	X	X
Summary of effects on vegetation by land ownership plot	✓	X

Key Included - ✓ Not mentioned - X

Table 8.18 (continued) Linkage of Effects from Assessment Section to EAP
(NP = None Predicted)

Effect: **Human Beings, Buildings and Man-made Features**	**Mitigation**	**EAP**
Environmental Health		
Noise (localised adverse effects)	✓	✓
Visual/physical disturbance (large scale disturbance of floodbank and gardens)	✓	✓
Water quality (none predicted (NP))	-	-
Septic tanks (NP)	-	-
Light and glare (potential localised lighting during works)	X	X
Population (NP)	-	-
Visual effects on the surrounding area and landscape		
Construction effects: visual components	✓	✓
Tree works (potential loss of landscape character)	X	✓
Turf and soil strip (potential loss of plant diversity)	X	✓
Soil storage (potential loss of soil structure)		
Temporary fencing (NP)	-	-
Temporary access tracks (low impacts during works)	✓	✓
Site compound (potential disturbances)	✓	✓
Materials transportation (potentially noise and dust during works)	✓	✓
Temporary flood defence works (potentially untidy appearance during works)	✓	X
Newly constructed flood bank (bare for a short time)	✓	X
Construction effects: visual receptors		
Post-construction effects: visual components	-	-
New flood bank (potential loss of landscape character)	✓	✓
New fencing/stiles (ditto)	✓	✓
Additional/higher flood banks (ditto)	✓	✓
New Denny outfall (ditto)	✓	✓
Loss of vegetation (ditto)	✓	✓
Post-construction effects: visual receptors	-	-
Post-construction effects: character change	-	-
Site features (potential loss of landscape character)	✓	✓
Effect on character zones (ditto)	✓	✓

Key Included - ✓ Not mentioned - X

Table 8.18 (continued) Linkage of Effects from Assessment Section to EAP
(NP = None Predicted)

Effect: **Human Beings, Buildings and Man-made Features (continued)**	**Mitigation**	**EAP**
Effects on Recreation		
Public rights of way (footpath diversion)	✓	✓
Severn Bore (potential disturbance of spectators and parking)	✓ ✓	✓
Water Skiing (potential conflict of use)	✓	✓
River traffic (NP)	-	-
Launching of boats (potential lack of access)	✓	✓
Architectural and Historic Heritage		
Listed and historic buildings (potential damage during works)	✓	✓
Orchards (potential loss of some of orchard)	✓	✓
Effects on Agricultural Land Use		
Orchards (potential disturbance to orchards)	✓	✓
Grazing (loss of grazing during works)	✓	✓
Cultivation of Land (restriction of cultivation)	-	-
Effects on Fishing		
Elver (potential lack of access to river)	✓	✓
Salmon (potential lack of access)	✓	✓
Effects on Local Roads and Transport		
(Highways restriction to works traffic)	✓	✓
Effects on Public Safety		
(potentially hazardous working areas)	✓	✓
Effects of Temporary Works		
(potential flooding risk)	✓	✓

Key Included - ✓ Not mentioned - X

ES Review Questionnaire

The Oakle Street draft ES was evaluated using the standard review questionnaire developed in Chapter Six. The overall grade was determined to be 'good: only minor omissions and inadequacies'. The fact that ES reviewed was the penultimate draft and that the consultant was aware that the non-technical summary had yet to be provided, was taken into account in the review process. Table 8.19 shows the omissions and inadequacies identified in the review.

Table 8.19 Omissions and Inadequacies identified in ES Review

Omissions: - non-technical summary (identified as task to complete); - no photographs at the start of the document to provide a visual context and reference for the reader; - badgers and bird nesting season covered in EAP but not in assessment section; - the EAP failed to follow through the concept of potential borrow pits requiring amphibian surveys before works commence; - no provision of any actual magnitudes of potential effects, except for noise; - no regional plan - no indication of how long the construction period would last; - no indication of uncertainty or additional data required; - sources of data (who and when) not provided; - no reference to coarse fishing; - no mention of wide consultation with the Environment Agency staff; - no mention of the potential effects of site investigation; - lack of keys on all maps.
Inadequacies: - many sections were written using unnecessary technical language and jargon; - additional diagrams required to help the reader clearly understand some of the proposals and terms; - lack of matrices or tables summarising information and analysis.

In summary, the draft ES provided a good starting framework for the final ES. The final edition would require a few more graphics in the text to help communicate the ideas more clearly, and the provision of summaries in plain English for the more technical passages. The remaining omissions and inadequacies (Table 8.19) needed to be addressed to provide a final good clear ES.

8.7 Discussion of the Case Study Review

EA Process and Project Management

The new EA process had been developed from first principles relating to the objectives of the EA process and from the practicalities of operating such a system in the real world. The Oakle Street project had shown the advantages of using a system which starts at the scoping stage, identifying the issues to be addressed using a standard topic list. One of the flaws in the process identified by the Oakle Street ES was the lack of follow through of some of the issues through to the EAP stage. It is essential that all relevant issues are included in the EAP as this forms the basis of the contractual brief for the design and

supervision of the project following the approval stage. Table 8.18 in the effects ecology and habitats, shows that the potential conflict of excavating a borrow pit and the retention of amphibian habitats was identified as a potential adverse effect, which necessitated the survey of these sites before works began. However, this requirement was not included in the EAP. Conversely the need to take account of badgers as a protected species was identified in the EAP, but not mentioned in the sections on analysis of effects and mitigation requirements. This flaw could have been overcome if a table had been provided in the EAP, summarising all the effects (beneficial, adverse and none predicted); identifying whether mitigation measures were required; and identifying the EAP objective and target for such a mitigation measure. This would provide the necessary checklist for all such issues and provide a quick index of all issues and the EAP references.

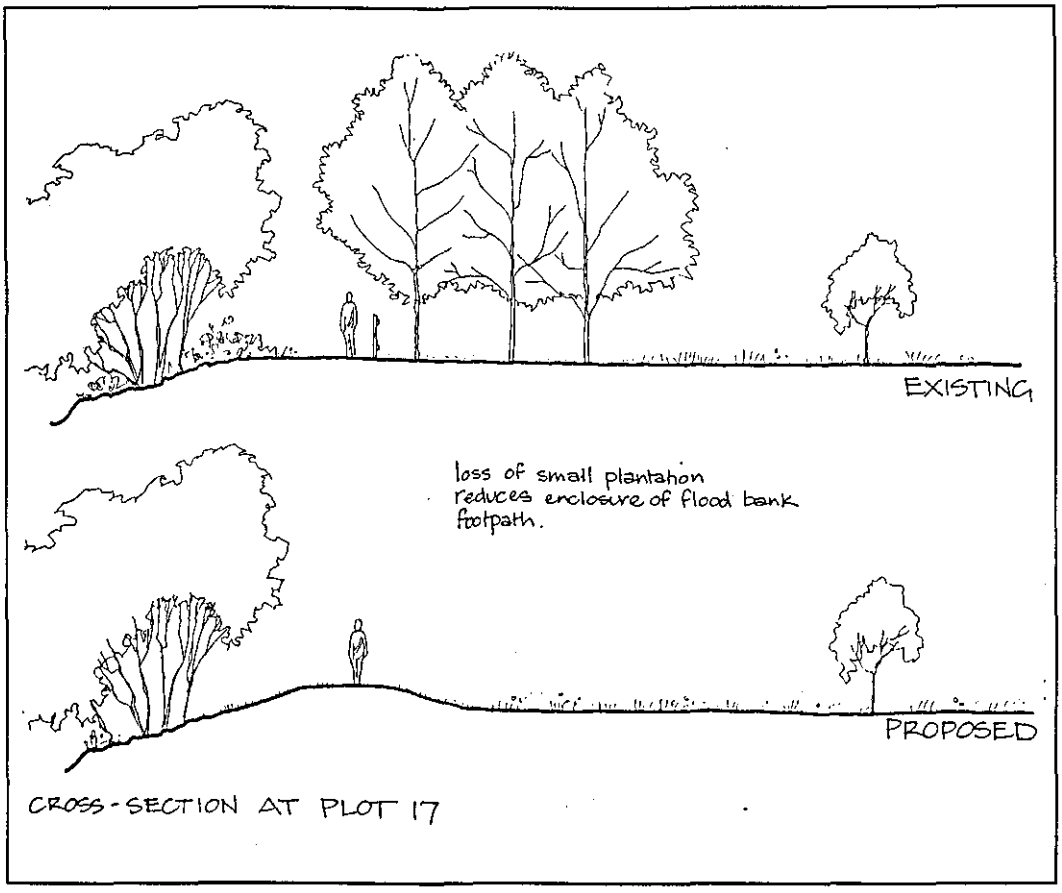
The Oakle Street ES had not followed the EA model topic list for the analysis of effects (Figure 8.5). There is potential for confusion when the topic list in the environmental baseline section changes to a different list in the assessment and mitigation sections. This increases the chances of issues being left out and not followed through to the EAP section of the ES. It is, therefore, suggested that all sections should provide continuity of topic sequence, enabling the reader to follow through issues throughout the sections of the ES; but also to find issues within individual sections more easily. The checking of issues that had not been followed through would be made easier using the recommended changes in topic listing, with the continuity of listing throughout the document.

Use of Model EA - Communication of Ideas and Information

The general content of the Oakle Street ES provided the majority of the information required by a reader to follow the ES document (with the exception of those omissions already noted in Table 8.19) but was not necessarily laid out in the best manner to enable the general reader to follow the EA process within the document. At the beginning of the document (as identified in the review of the 14 ESs in chapter six) the reader should be provided with a clear understanding of what the need is, where it is, what are the reasonable alternatives to solve the problem. This can be best done by using a mixture of text and graphics, including maps and cross-sections to

provide the reader with context and a clear indication of what is proposed. The improvement of the communication of information is an area of study that cannot be addressed within the remit of this present thesis, but should be the remit of future studies.

Figure 8.6 Figure 29 from Oakle Street ES (Amos, 1996)



The general guidelines of clear maps, starting at a regional scale and coming down to a more detailed level with associated photographs and sketches should be provided at the front of the document. The Oakle Street ES provided some excellent examples of how the predicted changes in the environment can be provided for the reader, as shown in Figure 8.6. All text should be written so as to be understood by a non-technical reader. As an ES can cover so many technical subjects, from hydrology to ecology and archaeology to noise assessment, not all readers can be expected to be able to master all the technical issues and unavoidable jargon. Therefore, a summary in non-technical English is required by the majority of readers, who may include all the stakeholders identified in Tables 8.5 to 8.9. The readability of the

document could be enhanced for a wider range of readers, including those who do not wish to read the whole document, by providing matrices or tables summarising information and analysis.

Fulfilment of Legal Requirements

The Oakle Street ES demonstrated that both the EA model and this particular case study fulfilled all the mandatory requirements of the UK (SI No. 1199 Planning EA regulations) once the non-technical summary has been produced for Oakle Street. However, not all the non-mandatory requirements had been fulfilled (Table 8.10). Oakle Street, along with the majority of the 14 ESs reviewed in Chapter Six, had not provided any details of the forecasting methods used to assess any effects or indicate any unknowns or uncertainties. Whilst the EA model guidelines do not specifically request details of forecasting methods, it does refer to the requirement for all assessments to be 'quantified where possible, showing ... the range of uncertainty' (Hickie, 1995a, p.20). In the ES questionnaire, which should be used by all EA consultants as part of their internal quality assurance systems, 'uncertainty of prediction' and 'explanation of methodologies' are included in the criteria checklist.

Identification and evaluation of the potential environmental effects of all the reasonable alternative options for the scheme

The Oakle Street ES addressed six alternatives, including one suggested by locals at a public meeting to discuss the scoping document held in December 1995. This particular option (Option 4, see Figure 8.3) was the construction of a barrage across the Severn downstream of Minsterworth. This option was not considered to be a feasible option by the project team as it would be very expensive and highly disruptive of the existing hydrology and ecology of the Severn Estuary. However, it was important not to brush the option aside. It was important for this option be initially assessed along with the other feasible options. Failure to address this option could have led to objections to the ES because some may have considered that not all the options had been properly considered; and some members of the public would consider that issues raised in the consultation process were not being treated seriously.

All the options were evaluated in section 1.8 of the ES (Amos, 1996, p.9),

with the beneficial and adverse environmental effects of each option being signified from +2 (major positive effects) to -2 (major negative effects), with both the short-term and long-term effects. The preferred option 5 (increase the flood protection standard for the whole of the flood cell) being evaluated as the only option without major negative effects. The evaluation of the option could have been improved by the use of maps and diagrams simply explaining all options, whereas, maps were only provided for options 5 and 6.

The assessment process in the EA model requires the identification of all 'direct and indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the project ... all assessment should be quantified where possible, showing the change from the base-levels and the range of uncertainty ... matrices with associated notes can be used effectively to show such information' (Hickie, 1995a, p.20). Whilst most effects were identified as either short-term or long-term, positive or negative and localised or regional in character, for example 'exhaust fumes ... would be likely to cause localised, temporary, and minor reductions in air quality during the works', there was little discussion of either secondary or cumulative effects. The quantification of effects was limited to description of tree and shrub removal, pollarding or branch removal. Even in the section discussing the effects of noise, no quantification of noise levels was provided. 'Noise levels during construction from static and mobile diesel powered plant and piling operations would be likely to be high in relation to the normal ambient noise levels on the site' (Amos, 1996, p.42). This statement provided no indication as to what levels are unacceptable and implies that there will be no limits for noise. Machinery would have to be used in the back gardens and within metres of many residential properties along the line of the floodbank. The lack of references to any constraints is an apparent failing of the ES. However, in the appendices of the ES (a separate document) there are specific guidelines provided by Tewkesbury Borough Council, as to what are the acceptable control limits for noise and vibration. These guidelines were not referred to in the EAP which only referred to the need for all works to comply with BS 5228 - Noise Control on construction and open sites (British Standards Institution, 1984).

All other references to effects in the ES normally used the qualitative phrase 'minor effects'. Whilst in the case of what would be considered by most

people to be fairly insignificant effects such as the exhaust fumes example quoted earlier, this may be acceptable. For effects such as noise and water quality there are readily available methodologies for the determination of significant effects and control levels, but many other effects are not so easily quantified. If a qualitative prediction of the effect has to be used, it should be described in relation to significance levels which should be defined. An example based on Oakle Street ES could be the disturbance of the species rich floodbanks in plots 8 and 10 which will result in the loss of some plants which in the long-term would only be a minor adverse effect. In this case the significance level of this effect could be defined, for example, as the long-term loss of 50% by area of plants which are rare in the local area of Minsterworth, associated with the use of low risk (5% failure risk) mitigation measures, i.e. the turf removal and relaying methods that will ensure the long-term re-establishment of at least 50% of any such plants on the new floodbank. The figures of significant plant losses would be dependent upon species involved. The complete loss of these plants without any mitigation measures to re-establish them would be a major adverse effect. In this case the loss of 50% or more would be defined as an adverse effect. The qualitative value ranking system discussed in Chapter Two could be used to provide a value system with some quantified parameters, i.e. not the entirely subjective descriptors of minor or major used in the many of the 14 ESs reviewed in Chapter Six. The effects should also be summarised in a matrix or table, identifying those effects that were direct/indirect, short-term/long-term, beneficial/adverse and their quantitative or qualitative magnitude.

The Oakle Street ES has highlighted the advantages of ensuring that the site description, effect, mitigation and EAP topic lists are the same. The 'model B' prescribes a different topic sequence for site description and effects (Figure 8.5), with no topic sequence recommended for mitigation or EAP sections. It would be logical to use one topic sequence throughout the document which will aid the reader in locating topic information and help to ensure that issues can be followed through the document all the way to the EAP section. The latter is an important section which should be stand alone. It will be used independently of the ES as part of the design brief for engineering consultants.

Recommendation of an environmentally preferred option

The EA process had identified the required environmental constraints, both through site survey and discussions with a wide range of stakeholders. The environmental mitigation measures required by the preferred option decreased the cost-benefit ratio from approximately 1:1.2 to 1:1.1. The key costly mitigation measures were the limiting of the foot-print of the flood bank around the many mature trees, the orchards and gardens along the existing flood bank. The works around two historic fish-huts and in the graveyard of St Peter's Church (a grade II* listed building) had also increased the estimates for the works.

Gain approval from English Nature and the Countryside Commission

The MAFF policy requires that 'Grant-aid will be offered only for schemes which are judged environmentally acceptable ... schemes will not be approved if they are considered unsatisfactory (by English Nature, Countryside Commission or English Heritage) ... although the Ministry ... reserves the right to take their own view on the balance of interests in meeting the overall policy aim' (MAFF, 1993c, p.27). Written approval from the respective agencies is required.

The EA consultant had been consulting English Nature from the start of the feasibility stage and they had indicated that their prime concern was that there should be no effect on the hydrology of Walmore Common SSSI (Figure 8.1). The assessment of the preferred option predicted that there would be no effects on the Walmore Common site and therefore English Nature had indicated that they would provide written approval at the appropriate time. The Countryside Commission had been consulted and they had indicated that they had no comments to make in particular. Their reply to such consultation is normally a standard letter which confirms that it is not their policy to comment on development works. As there were no listed buildings or structures of Grade I status within the study area, English Heritage had indicated that they had no comment to make at this stage.

As the written approval of English Nature and the Countryside Commission are essential milestones in the EA process (with English Heritages written approval being necessary when there are scheduled ancient monuments or grade I listed building or structures) it is essential to start the consultation

process with these agencies as early as possible and define agreed constraints during the mid-part of the Feasibility stage so that acceptable options can be chosen and studied in more detail. This will then reduce the risk of these agencies holding up the development programme at the eleventh hour, whilst they decide whether or not the proposals are acceptable with the possible need for subsequent changes.

Mitigation Measures for all Adverse Effects

As discussed earlier in this chapter, the Oakle Street ES did highlight the problem that not all of the adverse effects identified in the assessment section had mitigation measures provided for them, or were covered in the EAP. It is important, therefore, to ensure that all effects, mitigation measures and EAP objectives and targets are linked through by some form of checklist that ensures that such issues are not overlooked at any of the stages in the EA process.

Consultation with all stakeholders associated with project

The consultation with all stakeholders associated with the flooding problem and affected by the preferred solution is essential. Firstly, to ensure that all the appropriate issues are taken into account, and secondly, very often local knowledge and experience can add greatly to the understanding of both the technical and environmental issues associated with the project. For example, the Severn Bore viewing locations and parking would not be apparent during most site visits by any of the Environment Agency project staff or EA consultant, who had to discover information concerning viewing locations and where sightseers park from local residents. Consultation with stakeholders can also reveal misunderstandings or mis-information about the proposed project, which can either be dealt with by discussing it directly with a stakeholder or ensuring that the matter is clarified in the ES document. An example of this is the Severn Barrage option proposed by a number of locals and discussed earlier in this chapter.

The early public consultation of the Environmental Scoping Report in October 1995 and the public meeting in Minsterworth in December 1995 allowed the general public and local residents an initial opportunity to hear how the Environment Agency would be approaching the flooding problem at

Oakle Street; explaining the EA process and consultation opportunities for all to contribute their comments before any decision was made. This early consultation identified key stakeholders, who then could be visited individually to discuss their comments or worries in greater detail. This information gathering exercise continued through the feasibility stage, initially as baseline information and latterly as confirmation that the proposed scheme had taken all their issues into account, and identifying any potential objectors to the final scheme.

Ensure delivery of the preferred option in an environmentally sensitive manner
The EAP for Oakle Street should ensure that all agreed conditions and constraints are integrated into one plan. The EAP had been written in the current model format. The case study in the following chapter will try to evaluate the successes and problems associated with the implementation of the EAP in practice. However, as discussed earlier, not all the issues have been included in the EAP as discussed earlier in this chapter, which is a flaw in the present EA model.

Improved effectiveness of EA process
The case study does show that when information is provided to decision-makers it will generally be used. The issues and constraints identified in the Oakle Street scoping report stage of the EA did influence both the choice of options considered and the final preferred option selected. A great deal of time and effort was spent by the feasibility design engineers in reducing the effects of the preferred option and taking account of the constraints such as the proximity of orchards, mature trees, gardens and historic buildings to the technically preferred line of the flood defence. The preferred option was the most environmentally sensitive option and the development of that option had taken into account all the required environmental constraints and mitigation measures identified in the ES. What this particular case study did also highlight was the problem of providing the right information at the right time. Information had been collected and evaluated by the environmental consultant but had not been passed on to the engineer working on the technical and economic constraints at an early stage in the feasibility study. In this particular project this was not a problem as the feasibility stage was behind programme

for a number of external reasons. However, it is suggested that realistic programming and delivery of the communication of EA information, as reports or just notes at the relevant stages, will improve the effectiveness of the EA process.

Improved efficiency of the EA Process

The use of standardised EA procedures has enabled an EA consultant, who was new to the Environment Agency's project procedures to complete the EA process to an acceptable standard. However, as discussed earlier better project management in terms of EA programming and budgetary control is needed to further improve this process.

Provision of effective guidance for EA

'Model B' in the form of the EA guidelines provided a procedural framework for the implementation of EA; details what outputs and the standards of information that are required. In an informal interview with the consultant it was revealed the consultant thought the guidelines were clear but that they could be improved by additional guidance as to how the procedures and final outputs could be achieved. The key area for improvement is the communication of information in a written format. The guidelines need to highlight this and provide examples of good practice.

Quality Assurance

The EA consultant did not use the standard review questionnaire as recommended in the EA guidelines, or any other quality assurance measures. Many of the problems associated with the lack of adherence to the recommended guidelines and the lack of consistency of issues followed through from assessment to EAP could have been picked up by adequate quality assurance systems. This requires a combination of the use of the review questionnaire and the development of a system to track the issues through all the sections in the ES.

Training

The issue of training is important in the delivery of the EA procedures. Many of the problems discussed in this case study derive from inadequate

understanding of the EA processes and procedures which provide the framework for improved effectiveness and efficiency. The issues of training and the introduction of new systems and procedures for in-house staff and external consultants need to be addressed, but are outside the scope of this thesis.

8.8 Conclusions

The basic EA model has been shown to work in practice, providing the EA consultant and the reader with the appropriate framework for the EA process. However, there are some weaknesses that need to be addressed.

Firstly, there is a need to improve the planning of the EA process and preparation of the appropriate EA reports at the right time. This could be provided by the development of new a proforma to assist the EA Officer in planning and managing the EA process, identifying appropriate EA milestones and programming in the consultation process, especially statutory consultees and other key stakeholders identified at the scoping stage.

Secondly, the EA reports need to be produced in a way that communicates the information in a way that can be easily understood by all the stakeholders. If a report cannot be understood by some of the readers, it will effectively disenfranchise them from a prime objective of the EA process, that is the ability of the stakeholders to contribute to the decision-making process. There is, therefore, a need to develop more effective ways of communicating the information and concepts within the EA report (less technical language; more maps, diagrams and photographs, more summaries and use of tables and matrices to summarise information). The further development of such guidelines is outside the scope of this present thesis.

Thirdly, the sequence of topics in the document needs to be standardised for all sections of the report. This will improve the ability of readers to follow topics and find information in the document; and aid internal quality control of issues being followed through in all the appropriate sections of the report.

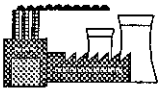
Fourthly, the assessment of effects should provide quantitative values where possible, use defined qualitative values where not; and provide an indication of uncertainties and unknowns. Effects should be summarised in tables or

matrices to provide a clear overview of the effects of the proposed project.

The integrated EA process, commencing with the scoping stage and finishing with post-project appraisal, including communication plan; project management systems; and EAP; has been shown to provide a more effective and efficient EA system that benefits the developer (the Environment Agency). Such benefits include projects delivered on time; on budget in an environmentally sensitive manner; with less hold-ups and problems due to environmental issues. When the environmental issues are identified, assessed and taken account of in an integrated design process; involving good internal and external communication with all the stakeholders; the competent authority (for SI No. 1217 this is Minister for Agriculture, Fisheries and Food and for SI No. 1199 it is the local planning authority) will normally benefit because the consequences of project will be clearly laid out making for better decision-making (as discussed in Chapter Two of this thesis). The external stakeholders will benefit form this process because if they are consulted from the early stages, with liaison and discussions continued through the development process as necessary, many of the potential conflicts of can be identified and taken into account in the design process, ensuring that such issues seldom become intractable problems.

Integrated EA processes can only work where all the staff are not only committed to the process but also understand the process. They will also require help to respond to new needs, regulations and working practices which will evolve in the future.

Chapter Nine - EAP Case Study New Cut Argae



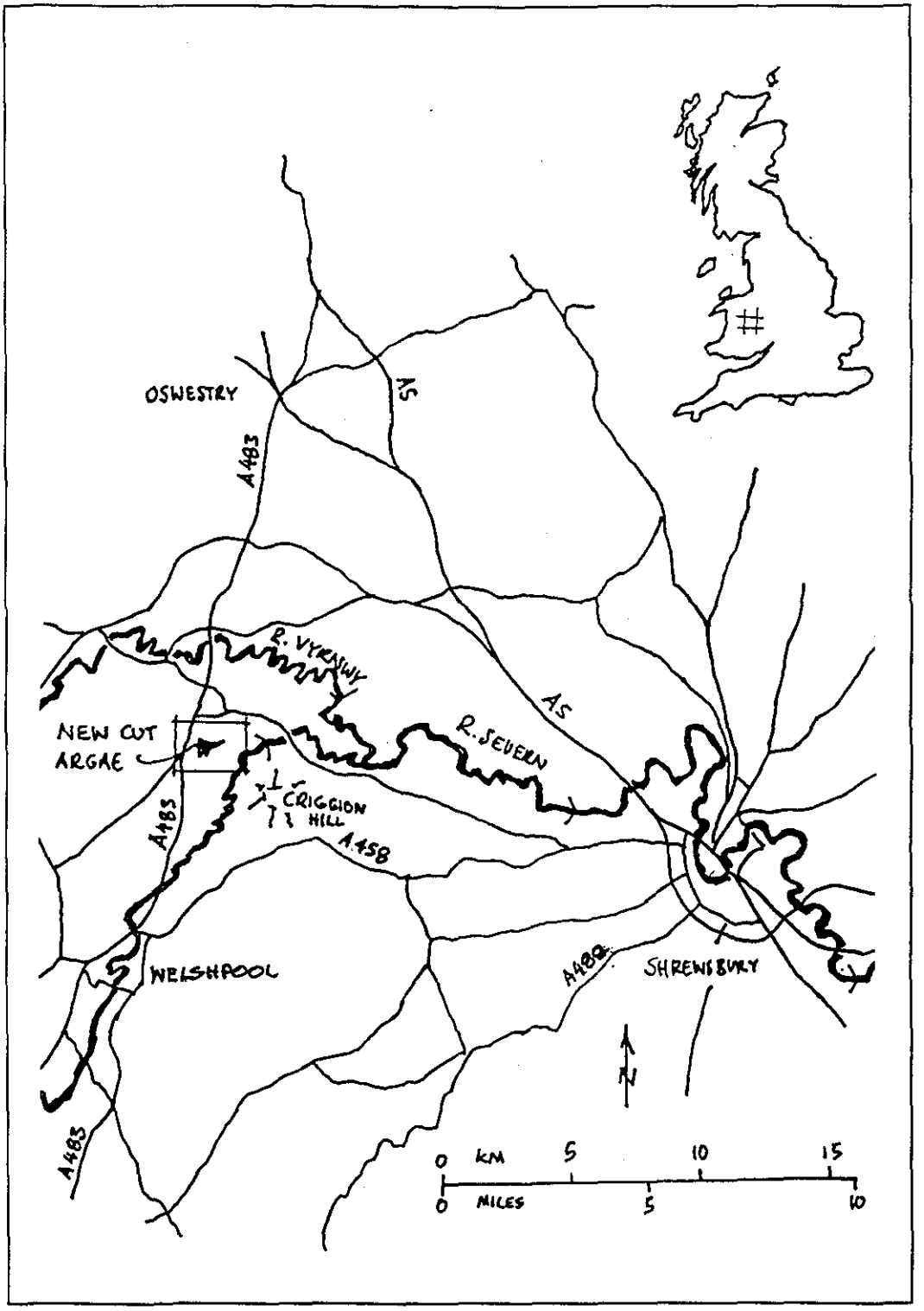
Chapter Nine
EAP Case Study - New Cut Argae

9.1 Introduction

I turned off the main road from Shrewsbury to Welshpool, down a typical Welsh border-country lane, narrow with high hedgerows on either side. The final six miles to the New Cut Argae flood defence project was a pleasant change from the motorway and A-road driving. The landscape had changed from large open arable fields and parkland to small enclosed pastures in a rolling landscape, with the occasional hamlet strung out along the narrow lane. The craggy Criggeon hill dominated the landscape to my left, tree covered from this side. The winding lane straightened out for the approach to the bridge across the River Severn. Every time I cross the river at this point I am surprised how deep the channel actually is. In late summer the Severn flows like a sleeping dragon down its meandering channel across the wide valley

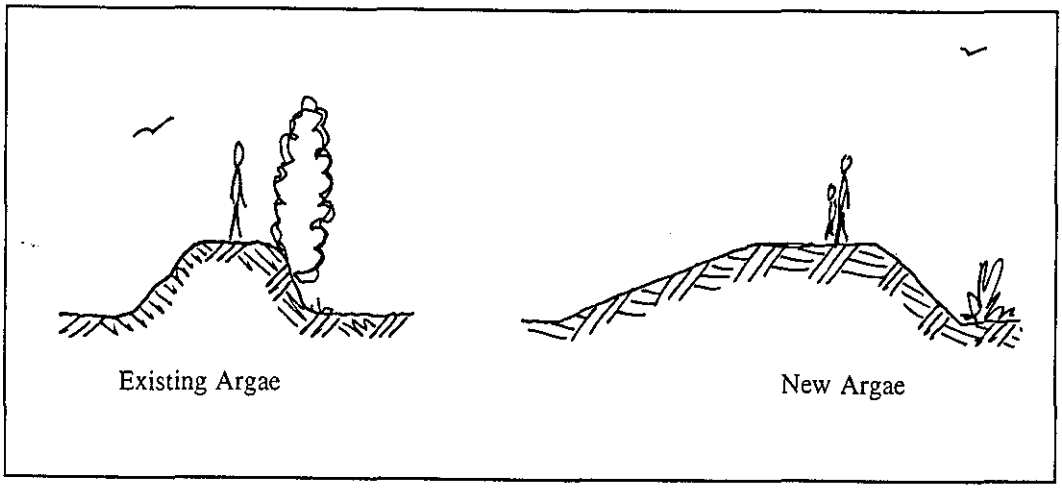
towards Shrewsbury and eventually into the Bristol channel. As you look down into the deep wide channel you can image the millions of gallons of water that flow down the Severn, or the Afon Hafren as it is known in Welsh, when it is in full flow and you get some appreciation of the potential power of that water which is held in check by such seemingly flimsy flood defences.

Figure 9.1 Regional Map showing location of New Cut Argae



The New Cut Argae project is a flood defence improvement scheme on the Welsh border in the middle reaches of the River Severn. The project is approximately 10 km (7 miles) downstream of Welshpool and 17 km (12 miles) upstream of Shrewsbury, in an area known as the Severn/Vyrnwy confluence area, where these two rivers meet. This area of farmland is regularly inundated in times of high floods. Historically the area has many flood defence embankments, known locally as argaes, which have been built over the years to protect the flood cells. The argaes are designed to overtop at a certain flood level and allow the flood cells to fill up with floodwater, to attenuate the flooding downstream in the town of Shrewsbury and beyond. Over the past 10 years there has been a programme to upgrade the defences, which are in some places below the required flood protection levels, very narrow in profile and prone to breaches in times of high flooding.

Figure 9.2 Sections through Existing and New Argaes.



The historic argae system includes Offa's Dyke, built to delineate the extremities of Offa's Kingdom in the 6th century, which now forms part of the argae along the northern bank of most of this stretch of the River Severn.

I swung off the lane into the site and drove past the newly harrowed floodbanks ready for seeding any day now. In the site compound, contractors were starting to load some of the temporary site offices onto a lorry. I selected a suitably rough looking piece of floodbank rather than newly harrowed bank to park my car on and walked towards the Resident Engineer's office. The earlier grey clouds and prospect of rain had disappeared and it was turning into a pleasant day.

Figure 9.3 Photographs showing general views of the New Cut Argae Area

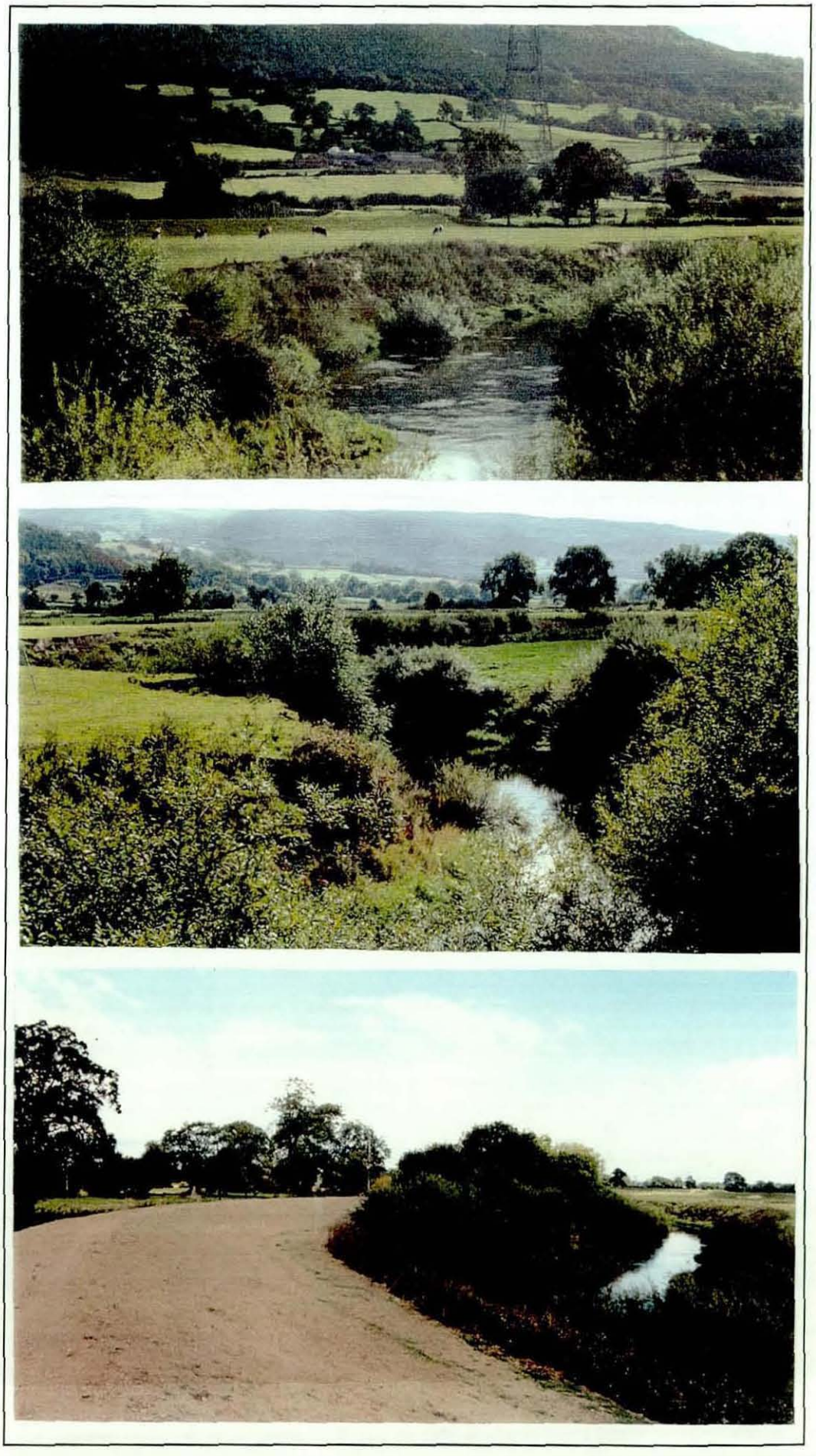
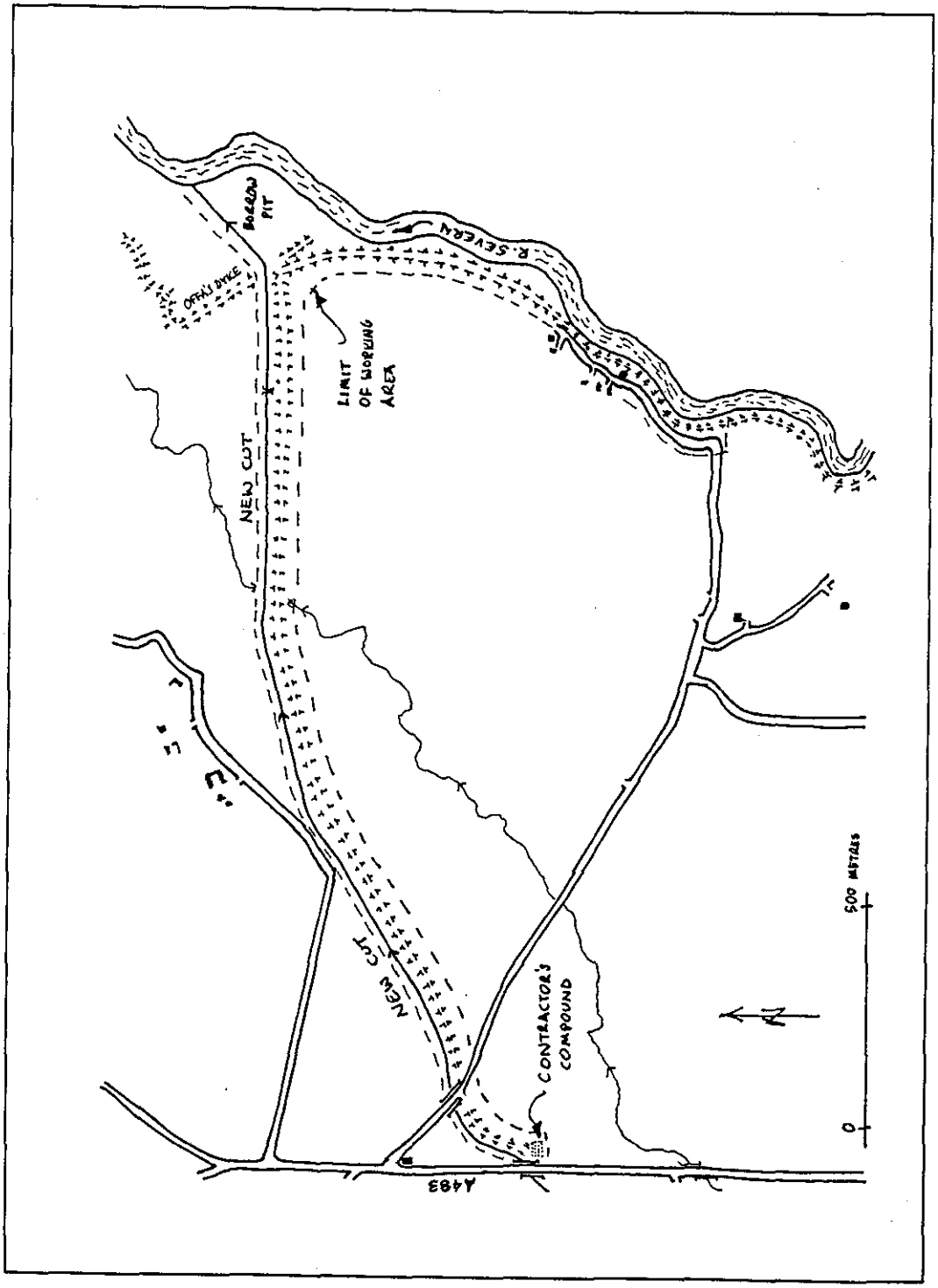


Figure 9.4 Photographs showing general views of the New Cut Argae Area

John, our Resident Engineer, greeted me in his usual cheery manner (the names have been changed for the purposes of this thesis). A lean ruddy faced Londoner, in his late forties, blue and red check shirt with matching red tie, he offered me a chair. "Quick... tea or coffee?...they're just about to cut off the power." I had arrived today just as the works were coming to an end, to have a quiet informal interview with John to discuss the EAP for this job.

Figure 9.5 New Cut Argae - Working Area.



9.2 The Use of a Qualitative rather than a Quantitative Approach

A qualitative research study technique was chosen to help evaluate the use of the EAP because of the limitations of the traditional quantitative or so-called scientific approach, which seeks to discover a cause and effect relationship. The inappropriateness of the use of traditional quantification methods for some forms of project evaluation has been raised by Cronbach and Associates (1980). As each project has a different situational and political context, a traditional statistical, science-based approach is not always appropriate.

In qualitative analysis, the researcher seeks a greater understanding of the case being studied. The uniqueness and complexity of the case study, its embeddedness and interaction within a particular context, all need to be addressed. The EAP process involves a wide range of people identifying problems, investigating possible solutions and seeking agreements with third parties. They are assessing whether procedures are being implemented within certain parameters, managing the assessment of changes within a project and dealing with new issues when the project is being implemented, all of which involves a high degree of teamwork. Qualitative methods seek to use an interpretivist paradigm, which portrays a world that is socially constructed, complex and ever changing (Glesne and Peshkin, 1992) and to understand the complex inter-relationships that exist in a particular case (Von Wright, 1971).

For a process which requires a number of people to work together at different levels, with different responsibilities, making valued judgements and decisions as to what should be done and when, to suggest that a convergent reality could be derived, would be somewhat simplistic. The work involves a great many levels of reality including, understanding, commitment and working relationships, and lines of communication, all of which affect the final outcome.

A qualitative case study seeks to describe in depth a moment and place in time (Stake, 1995). Von Wright (1971) suggests that qualitative research should try to establish an empathy with the reader, conveying some of the experience of actually being at a moment and place in time, by means of description, allowing the reader to validate the researcher's assertions. The use of narratives optimises the opportunity for the reader to gain an understanding

of the case and a personal interpretation of events by immersion in the case study.

However, qualitative research does have its drawbacks. It is subjective and it can take more time and money than traditional scientific approaches. A summary of some of the differences is shown in Table 9.1.

Table 9.1 Summary Comparisons of the Quantitative and Qualitative Paradigms (based on Guba and Lincoln, 1981; and Glesne and Peshkin, 1992)

Assumptions about:	**Quantitative/Scientific**	**Qualitative/Naturalistic**
Reality	Singular, convergent fragmentable.	Multiple, divergent, inter-related.
Inquire/subject relationship	Independent	Inter-related
Point of View	Etic (outsider's point of view)	Emic (insider's point of view
Nature of Truth Statements	Generalizations- statements - focus on similarities	Working hypotheses-statements - focus on differences

All EAPs relate to projects, people and the environment. Each one will have a number of features common to all EAPs and each one will also have a number of unique features. It is important to explore both their uniqueness and their commonality (Stake, 1995). The case study selected has not been chosen to be specifically representative, but to provide a tool to help examine how the EAP operates in practice and the problems it faces. Stake suggests that the role of the case study is not to generalise understanding, as a single case study is a poor basis for generalisation, but to particularise understanding (Stake, 1995). Rather than generating generalisations, which are far better developed using comparative studies, the case study can help modify generalisations, in terms of rethinking generalisations, using methods such as the triangulation of information from the particular case study. Some suggest that generalisations are not particularly useful because they decay over time (Cronbach, 1975; Guba and Lincoln, 1981). Examples are cited such as the failure of DDT to control mosquitoes, the change in star courses which render star maps obsolete

over time, and changes in voting patterns over time, as reasons for being wary of generalisations, especially where people are involved, with changing social, political and organisational influences.

A quantitative study will seek a relationship between a small number of variables. In qualitative studies, patterns of unanticipated and anticipated relationships will be sought.

The aim of the study is to identify who the stakeholders are, how they interact and how they perceive the EA process from their point of view. In the development of any project management tool, the detailed evaluation of how it is used by the various actors in practice, i.e. the development of a model of reality, enables us to compare the abstract model with the real model and understand the limitations and effectiveness of the EAP model.

The EAP seeks to mange the situation so that the eventual outputs are sensitive to the environmental considerations identified earlier in the EA process (see Chapter 7, section 7.5). The main issues relating to the use of EAP are people centred. The basic aim of the EAP is to affect a cause and effect relationship (a more environmentally sensitive project delivered because an EAP was used), but the mechanisms for this process require a number of people to interact and communicate with each other, which is the focus of this case study.

9.3 Objectives of the Study

The objective of this phase of the study is to evaluate the use of the EAP in the management of environmental issues within the context of the Environment Agency culture and working relationships; a real project; and real environmental issues. This study asks the question: whether or not the EAP fulfils the needs for an EAP as discussed in Chapter Seven, and to discover whether there are any other issues or needs associated with its implementation in practice. Do there appear to be limiting factors for use of EAP, for example, project management, contractual or financial systems; personnel, line management; format of EAP, or other real world issues?

Evolution of Issue Questions for the Research Study

The key issues to be addressed in the case study can be initially developed from the five reasons for the EAP being developed in the first place. I shall use the notation developed by Stake (1995) to represent an issue relating to the specific case, using the Greek letter ϑ (iota), as it is useful to provide a clear indication of the research issues within the overall text.

The EAP was devised as a means of dealing with the five needs summarised below (Hickie and Wade, 1997 ; Appendix A - 19):

(a) summarising the environmental issues and constraints for the design team and external readers;

(b) explaining how the environmental constraints and mitigation measures are going to be implemented, and providing the policing mechanism to ensure delivery;

(c) explaining how any post-ES/EA report changes will be assessed and approved; and,

(d) providing details of environmental parameters and constraints for work on sites designated as being sensitive to damage;

(e) identifying objectives and targets for successful post project appraisal.

These may be developed into a number of Issue Questions:

ϑ_1: Does the EAP clearly provide details of the essential environmental constraints on the project to all who read it, in a manner that is accessible and understandable?

ϑ_2: Does the EAP effectively summarise the environmental constraints to enable the design team to understand and implement the constraints in the final design and contract documentation?

ϑ_3 : Does the EAP explain in an accessible and believable fashion, how the environmental constraints are going to be implemented, and how these will be delivered?

ϑ_4 : Does the EAP explain how post-ES/EA report changes would be assessed and approved?

ϑ_5 : Were the objectives and targets established in relation to constraints and

mitigation measures appropriate and sufficient for the post project appraisal process?

The Choice of New Cut Argae for the Case Study

The objective of the New Cut Argae flood defence scheme was is to upgrade an 'L' shaped length of argae adjacent to the northern bank of the River Severn and western bank of the New Cut, from its confluence with the Severn to the A 483(T) road bridge (Figure 9.5). This project was selected because it had:

1. An EAP prepared for the project;

2. The need for EAP or similar, to manage the implementation of a range of significant environmental issues associated with this project including, archaeological, landscape, recreation, ecology and geomorphology; and

3. A 20 week construction period during the summer of 1996, appropriate for the timescale of the evaluation study.

The EAP for New Cut Argae was not written entirely in the recommended model EAP format. Some items are missing and others covered in greater detail than the model EAP recommends. Whilst initially this was considered to be a disadvantage in terms of the case study, it is felt that it could actually be an advantage to evaluate the problems and successes of the EAP associated with the a real project, as it was likely to highlight any potential problems associated with the initial model EAP. The case study also provided the opportunity to also evaluate the problems involved in introducing a new procedure such as the EAP, in relation to such issues as understanding, training and commitment.

General Background to the New Cut Argae Project

In the Severn-Vyrnwy area, the existing argae system is the result of at least 200 years of intermittent construction, erosion, improvement and

reconstruction. The present network of flood embankments extends to nearly 41 km in length, protecting an area of up to 50 km^2 from flooding, which would otherwise occur between four and six times a year. The flood banks are designed to provide a one in five year protection to this area. In addition the argae system also plays an important part in the protection of the town of Shrewsbury by holding back flood waters in the flood plain of the Severn-Vyrnwy confluence until it is released back into the river via a series of flap gates as the flood levels subside.

Many of the existing older argaes have steep sides with slopes between 1:1.5 and 1:2, with a crest of less than 2 metres wide. In many places the argae has been worn down by grazing animals and the banks damaged by burrowing animals. The Environment Agency has a programme for the rebuilding of those sections of the 41 km length which do not conform with the required level of flood defence with a preferred embankment profile of 1:5 slopes and a 3 metre crest (allowing safe vehicular access along the top of the argae).

The argaes in the New Cut area have been rebuilt to the new standards, except that because of the severely limited space on the riverside of the argae, these slopes have been rebuilt to 1:3 slopes. In those areas adjacent to riverside properties where a 3 metre wide crest and 1:3 slopes were not feasible, even steeper slopes have had to be used.

9.4 New Cut Argae

We made ourselves comfortable in the Environment Agency's Resident Engineer's porta-cabin. John's desk was covered with an orderly mess of files, notes and claim forms. The project programme and a large plan of the site covered the grey walls of his office. John led a nomadic life, moving from one site to another, supervising engineering contracts on site; twenty weeks here, sixteen weeks there. His previous project had been at Gainsborough, where we had first met earlier in the year. He had a wealth of experience working on projects all over the UK, and knew most of the short cuts a contractor was likely to take.

We settled down to talk about the EAP and the Environmental Clerk of Works. "Gill's been a great asset - her experience on the environmental side of things has helped enormously. Everything seemed to work quite well". Gill was the project Environmental Clerk of Works (a sub-consultant working for Engineering Consultants), and worked as part of the supervising team working for the engineering consultants, Sir William Halcrow and Partners (Halcrows). On previous visits John and I had talked through some of the problems that had occurred. No project ever goes quite as originally planned but this project seemed to have gone quite well, despite a few incidents along the way. John was happy with the way the protection of the trees and archaeological areas had gone. "All the protection works had been directed by Gill". John felt that the protection measures had been necessary and had worked well. He was a pragmatist, used to working with contractors on all types of construction works. "Contractors are not really interested in the environment. They tend to have a heads down - go for it approach to all works".

My own experience of working on large engineering projects was very similar. Contractors will assume that they have free rein to clear the whole working area unless you put some constraints on them. They will tend to expand their 'bare earth policy' into all areas that they have access too. The protection works allowed the contractors to see exactly where they could and could not go and then just get on with the job.

I steered the conversation towards some of the problem areas. The most potentially serious was the lack of early consultation with the Birmingham Angler's Association fishing club regarding the excavation of the borrow area and re-profiling of the river bank which they owned. This occurred when Agency engineering, environmental, estates and legal staff, all thought someone else was going to take the lead and liaise with the fishing club. "What could have been a very tricky situation was turned around because we knew who to contact and the Project EA Officer soon calmed things down and organised the right people to meet out on the river bank to talk things through" said John with a smile. "The fishing club were very happy with the new riverbank profile which improved their ability to fish the river, and they did not even bother so seek compensation ... but it could all have been very embarrassing". There had been other problems with the borrow pit area.

"Yes ..." said John, "a slight cock-up, but in hindsight it will be better as a lagoon with a single inlet, it will work better than an in and an out channel, which would have probably silted up the pool quite quickly". The area between the New Cut channel, the river and the flood defence (Figure 9.5) had been selected to provide some of the material for the construction of the floodbanks. The original sketch design which was submitted for planning permission was design as a simple offline pool, with an in and an out channel for water at higher flows. At normal summer flows there would be no link to the river. Normally such areas for the excavation of material, known as borrow pits, are left to the contractor to organise. But in this case, because there was an appropriate borrow area within the site, the Environment Agency staff organised the planning approvals and landowner compensation. John sighed and said "the idea of picking borrow pit area is good, but ... from a contractual point of view, we soon drift into claims, the client is seen to be responsible for any problems that arise ... The material was very wet and they needed to double handle it - to allow it to dry out before moving to its final location - this should be the contractors problem, but they soon try to claim for it".

On my previous visit, John and Gill had been faced with the problem of the contractor's staff planting some aquatic plants upside down. They were both incredulous that the labourer had not realised which way up they should have been planted. At the time John muttered to me "you don't expect you have to specify turf to be green side up, ... we thought they knew what to do...". Now discussing the incident in hindsight, John thought that perhaps we should have specified more precisely what we wanted them to do. The plants were excavated from a ditch which had to be moved about 20 metres to make way for the widening of the floodbank. The plants had been successfully dug up and put in a holding area. During the dry periods they had been watered and were ready to go back into the new ditch. A site labourer put them in the dumper to transport them to there new location and just tipped them out into the new ditch. The plants rolled over and landed upside down in the ditch. After being in the sun all day many had dried out and were dead.

"The mentality of people working on construction sites is a problem, but you would have thought local lads coming from country areas like this would

have some idea...but the attitude of mind seems to be I'm not a gardener ... it's not my job! ..." said John. We chatted about how we could overcome such problems. "It really needs to be an item in the bill of quantities, otherwise the contractor wont really take it seriously ...". John's experience is that the contractor will ensure that all items in the bill of quantities are completed satisfactorily, in accordance with the bill and specification, firstly, to claim for any extra work not specified, and secondly, to ensure that such bill items and extras are claimed for as soon as possible. Any items such as the moving of the plants which was done at no cost, as a favour by the contractor to the client, cannot be controlled in any sensible fashion.

9.5 Project Management Framework

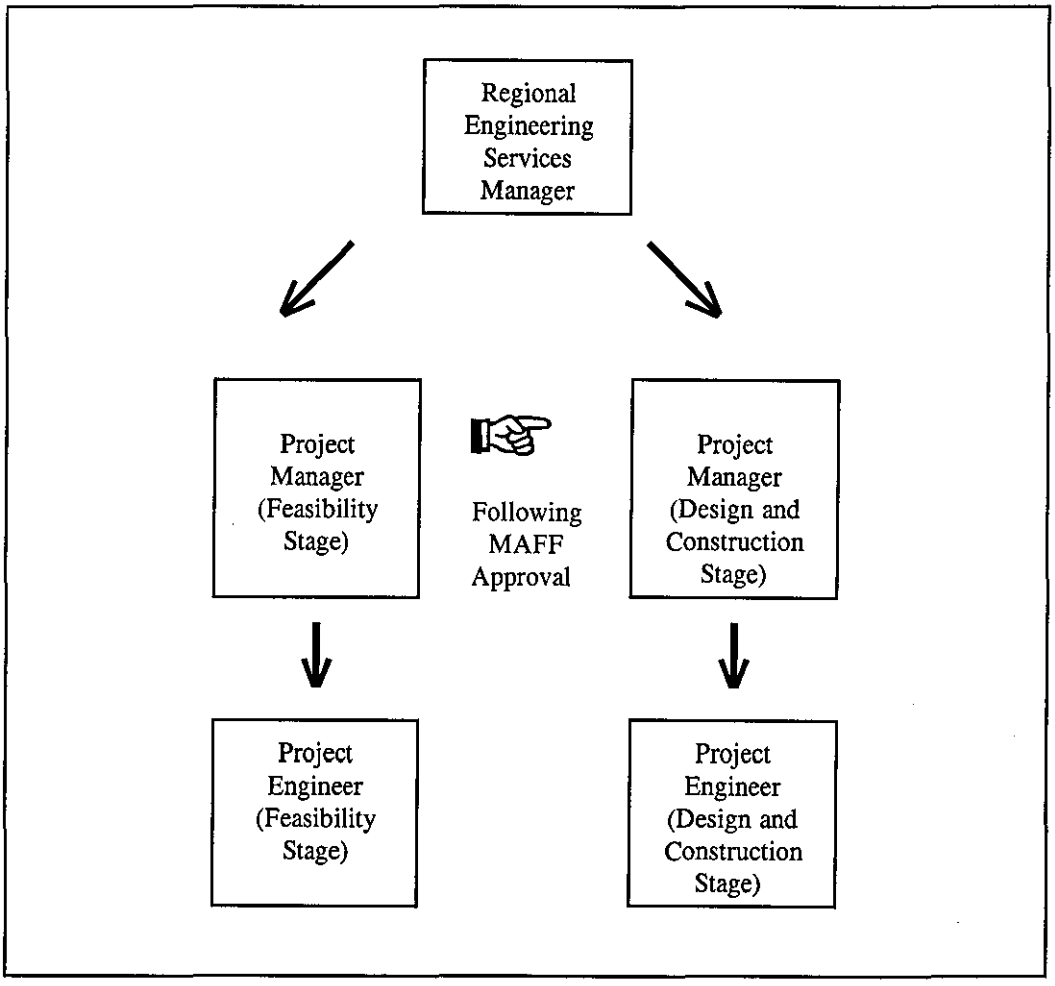
The management framework for flood defence projects in the Midlands Region of the Environment Agency is somewhat complex. The structure will be discussed in some detail to provide an overview of the lines of communication for a project such as New Cut Argae. As discussed in Chapter Seven, the overall management responsibility for implementing the Midlands Region Flood Defence capital programme lies with the Regional Engineering Services Manager. The management of an individual project is then firstly delegated to the Feasibility Project Manager who is responsible for all projects from inception through to the end of the feasibility stage during which a preferred option is selected and then approved by MAFF (Figure 9.6). Once MAFF approval is gained the project is then handed over to the design and construction stage Project Manager, who is responsible for the completion of the project.

The handover procedure includes the provision of a design brief for the project, which will include the EAP. The design and construction tasks will normally be delegated to engineering consultants, commissioned to undertake the detailed design of the project; preparation of the contract documentation and specification; and the supervision of the works on site through to the end of the maintenance period (which for civil engineering contracts is 12 months after practical completion of all the works). During this design and

construction stage there will be an Environment Agency Project Engineer managing the consulting engineers on behalf of the Project Manager.

The contractual lines of communication are from Project Engineer to engineering consultant (Figure 9.8), who is responsible for the design and supervision of the contract. The consultant will appoint a project engineer to oversee the project and who will be the day to day link to the Environment Agency Project Engineer. The consultant engineer has a design engineer responsible for designing and preparing the contract documentation. Once the project is to be constructed on site, the consultant's Resident Engineer is then responsible for supervising the project on site, with certain delegated powers.

Figure 9.6 Environment Agency Internal Project Management Responsibilities



The EAP requires the engineering consultants to appoint a Landscape Architect to undertake certain tasks and an Environmental Clerk of Works to monitor the environmental issues on site (both approved by the Project EA Officer).

Figure 9.7 Lines of Communication at Feasibility Stage

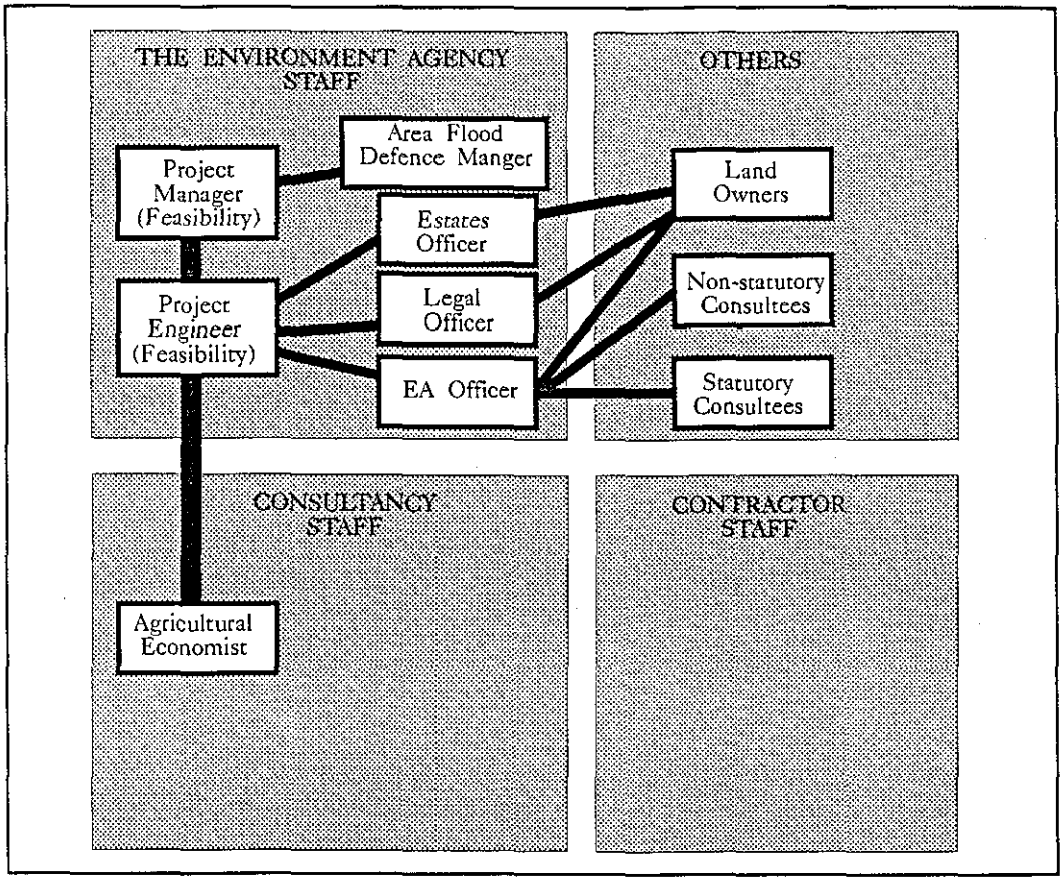
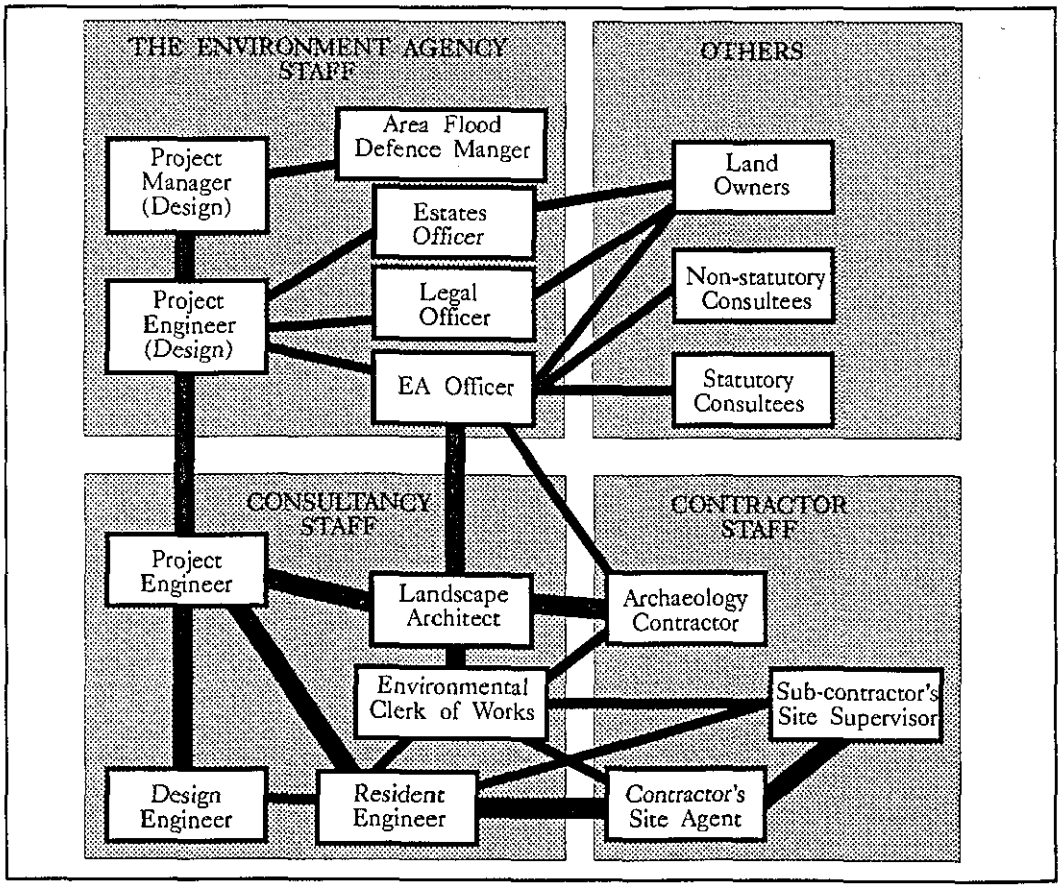


Figure 9.8 Lines of Communication at Design and Construction Stage



The responsibility of the EA process lies with the Project EA Officer, who is normally the Area Landscape Architect or delegated EA consultant; acting in an independent capacity ensuring that the project is implemented as agreed in the EAP and to approve any changes outside the parameters of the EAP defined constraints (Figure 9.8). There are no line management links from the EA staff to the Regional Engineering staff; ensuring the independence of the EA process. However, the EA staff are an integral part of the project management team and are responsible for providing the technical management of the EA process for all projects.

In addition to the EA Officer, the Estates Officers and Legal Officers are involved in dealing with landowners and any other legal issues. On any flood defence scheme, the landowners and tenants seek to claim for losses due to the construction works and losses related to, for example, agriculture and fishing. The legal section provides legal notices of entry under the Land Drainage Act 1991 and deal with all other legal matters (Figure 9.7 and 9.8).

On the Newcut Argae scheme there was a requirement to divert footpaths. The Project EA Officer liaised with the County Council Footpaths Officer to ensure all legal and practical requirements were undertaken. The County Footpaths Officer provided special notices to inform the public that the footpaths were closed.

The Project EA Officer is responsible for the technical management of the Landscape Architect and Environmental Clerk of Works on a day to day basis. All environmental issues should be reported directly to the EA officer rather than up the normal line management route to consultant Project Engineer to Agency Project Engineer and then to Project EA Officer. If there are any decisions that may require additional expenditure or any changes to the contract which may incur costs (either for doing extra work or compensation for not doing work that was planned or for standing time until a decision has been made) only the Project Manager can authorise such expenditure.

The consultant Resident Engineer is responsible for managing the project on a day to day basis and supervises the works via the contractors manager on site known as the 'Site Agent'. In many civil engineering projects the main contractor will sub-contract many of the elements of the work to a specialist sub-contractor. In the case of Newcut Argae, the main contractor sub-

contracted the majority of the work to a specialist earth-moving contractor. The sub-contractor had a supervisor on site who reported to the main contractor's Site Agent. The Site Agent was assisted by a number of surveyors who set out the works for the sub-contractor and measured all the works completed prior to submitting the claims for payment. A local fencing contractor was also used to undertake all the fencing works. The main contractor did have a few labourers on site to undertake some of the non-earthmoving tasks and to assist the surveyors. The key lines of communication in the feasibility, and design and construction stages are shown in Figures 9.7 and 9.8.

9.6 The Evolution of the EAP for New Cut Argae

The EAP for the New Cut Argae project did not develop in an ideal fashion (Figure 9.9) due to a number of reasons. Firstly, the EAP, as a project management tool, was a new concept which had been developed during the final stages of the feasibility stage of this project. This meant that the staff preparing the EAP were not familiar with its format, which also changed slightly through the feasibility and design stages of the New Cut Argae project. Also they were not experienced in using an EAP in practice during the construction stages of a project. Other than the development of the EAP model in consultation with the internal Area EA staff, no other detailed briefings were held to explain or discuss how the new procedures would be implemented due to pressure of workload.

The actual evolution of the EAP for the New Cut Argae project is shown in Figure 9.10. The initial feasibility EA report for the project was produced in June 1994 by the Area Landscape Architect acting as Project EA Officer.

The key issues identified in the non-technical summary of this initial EA report were:

a) unavoidable loss of the historic floodbank or argae;

b) loss of a thin overmature hedge, which could be moved;

c) dense vegetation around boat house should be retained;

d) key trees to be retained;

e) borrow pit location needs to be assessed which could cause access problems if fill material was brought in from off site.

In December 1994 the Feasibility Project Engineer produced the design brief for the engineering consultants. This design brief contained no EAP when first issued to the engineering consultants. However, the Feasibility Project Engineer did produce an interim EAP based on the information produced in the initial EA report.

In early August of 1995 the Regional EA Co-ordinator was asked to comment on the production of the revised EAP which had already been issued to the engineering consultants. His recommendations included the adding of specific objectives and targets which were missing from the revised EAP. The Project EA Officer added the objectives and targets to the revised EA report in the penultimate section entitled 'Objectives and Targets for Protection, Conservation and Enhancement Works' (Le Ray, 1995, p.19). The recommended changes to the EAP were never issued.

In September 1995 a brief for landscape architects to provide landscape design and supervision, together with the Environmental Clerk of Works monitoring tasks for assisting the engineering consultants was issued to a select list of consultants. On checking the brief provided to the successful consultant landscape architect, it was found that the initial version of the EAP produced by the Feasibility Project Engineer, was the one provided by the engineering consultants. The consultant landscape architect also had a copy of the final EA report, which included the objectives and targets in section 8, which the consultant said that they had used as the main reference for environmental constraints and targets.

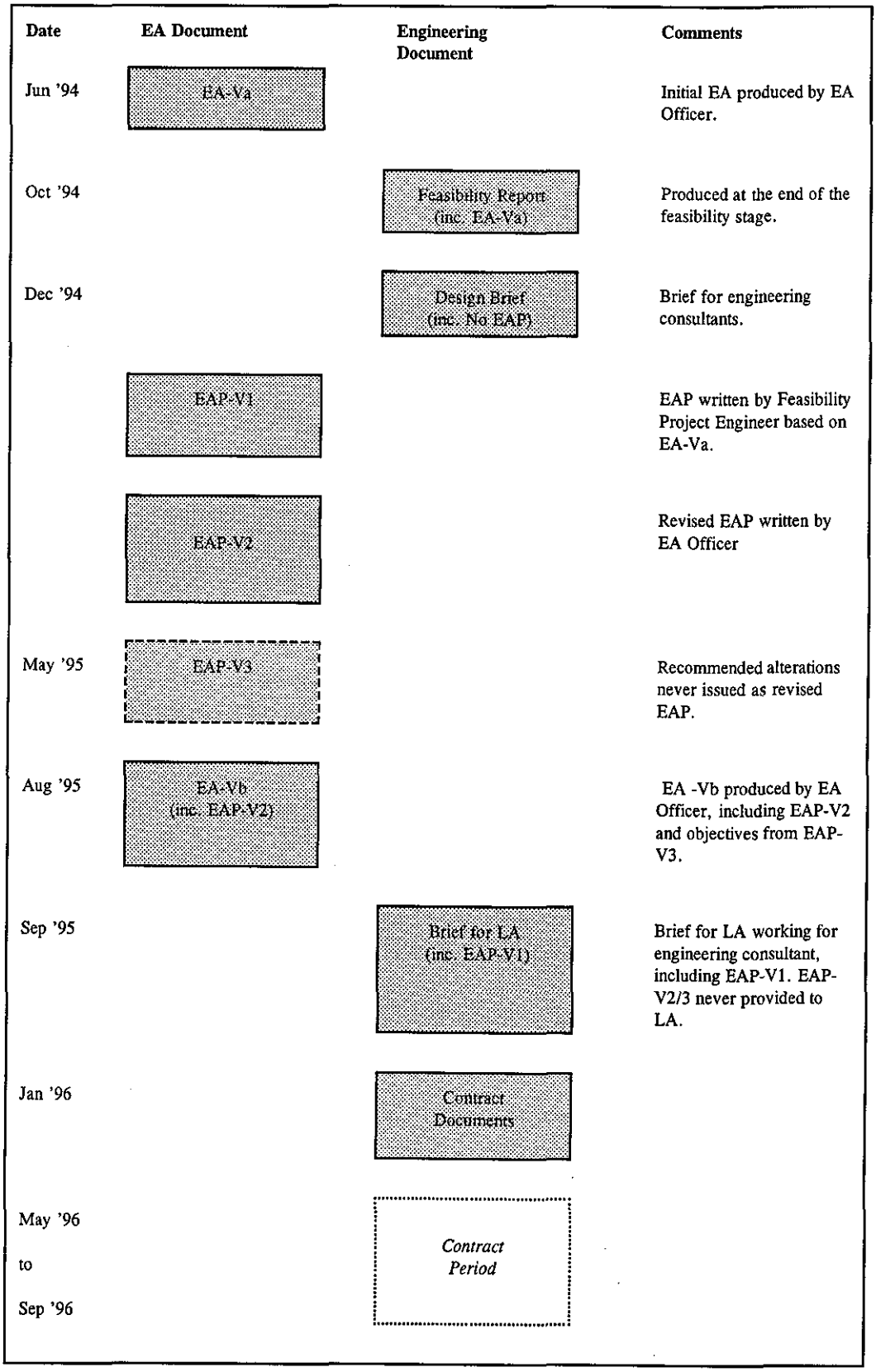
Figure 9.9 Flowchart of Ideal EAP Development for New Cut Argae

(Notes: EA-Va is Environmental Assessment Report - Version a;
EAP-V1 is Environmental Action Plan - Version 1;
Dates provided to give an idea of timescale)

Date	EA Document	Engineering Document	Comments
Jun '94	EA-Va (inc. EAP-V1)		Initial EA and EAP produced by EAO.
Sep '94		Feasibility Report (inc. EA-V1)	Produced at the end of the feasibility stage.
Oct '94	ES or EA-Va (inc. EAP-V1)		ES published or Written Justification supported by EA-Va.
Nov '94	EAP-V2		If there are conditions set or minor changes, these are included in an EAP-V2.
Dec '94		Design Brief (inc. EAP-V1/V2)	Brief for engineering consultants. EAP-V1/V2.
Jan '95		Brief for LA (inc. EAP-V1/V2)	Brief for LA working for engineering consultants. EAP-V1/V2.
Jan '96		Contract Documents	Contract contains all EAP requirements.
May '96 to Sep '96		*Contract Period*	

Figure 9.10 Flowchart of Actual EAP Development for New Cut Argae Project

(Notes: EA-Va is Environmental Assessment Report - Version a;
EAP-V1 is Environmental Action Plan - Version 1)



9.7 Analysis of the EAP for New Cut Argae

In analysing the EAP for the New Cut Argae project, a number of documents were used to provide evidence and these are shown in the Table 9.2.

Table 9.2 Written Evidence in Relation to the New Cut Argae Project

Documents:	Date:	Author:
New Cut Argae: Agricultural Benefit Assessment	Aug 94	Travers Morgan
Feasibility Report for New Cut Argae	Oct 94	PE(F)
Design Brief for New Cut Argae (includes Feasibility EA report)	Dec 94	PE(F)
Environmental Assessment Report	Undated	ALA
Environmental Action Plan (141.olt)	Undated	PE(F)
Environmental Action Plan (2105.mlr)	Undated	ALA
Environmental Action Plan (envactpl.rep)	May 95	REAC
Draft Regional Model EAP	Aug 95	REAC
Midlands Regional Model EAP	Jun 96	REAC
New Cut Argae: Site Investigation Contract	Aug 95	Halcrow
New Cut Engineering Contract	Jan 96	Halcrow
Minutes from Contract Pre-commencement Meeting Minutes	Apr 96	Halcrow
from Monthly Progress Meeting	Jul 96	Halcrow
Minutes from Monthly Progress Meeting	Jul 96	Halcrow
Minutes from Monthly Progress Meeting	Aug 96	Halcrow
Minutes from Monthly Progress Meeting	Sep 96	Halcrow
Notes from Site Meeting with Fishing Club	Aug 96	ALA
Interview Notes	Various	REAC

[PE(F) = Project Engineer (Feasibility); ALA = Area landscape Architect; REAC = Regional EA Coordinator]

Evaluation as to whether the EAP did cover all environmental conditions and constraints detailed in the EA report?

The EAP should include all environmental conditions and constraints included in the assessment and mitigation sections of the EA Report. Section 7 contains a list of eight mitigation measures arising from the preferred proposal. Section 8 has 11 objectives and targets for protection, conservation, mitigation and enhancement works. The first problem is that section 8 (objectives and targets) should include all the mitigation measures listed in section 7, however it does

not. Of the nine mitigation measures only two ares covered fully (trees and hedgerows to be protected), one is partly covered in the objectives and targets (i.e. hedgerows to be protected, but it fails to mention that a hedgerow will have to be moved) (Table 9.3); and only four are included fully in the EAP whereas three are not mentioned at all (conservation of scrub areas, gravels for spawning salmon and wetland creation in borrow area).

Table 9.3 Summary of Mitigation Measures Required by EA Report included/not included in Objectives and Target Section and EAP

Mitigation Measures in EA Report		Included in:	
Ref. No.		Objectives and Targets	EAP
7.1	All mature trees to be protected	✓	✓
7.2	All scrub areas to be conserved or managed by coppicing to allow temporary machine access.	X	X
7.3	a) Hedgerow to be protected and fenced off (240 metres).	✓	✓
	b) Hedgerow to be moved (320 metres).	X	✓
7.4	Water-side berm to be created along New Cut (2000 metres).	X	✓(but length not given)
7.5	Import gravels to New Cut to increase value to spawning salmon.	X	X
7.6	New willow planting along river banks.	X	✓
7.7	The archaeology of the area to be protected, as required by archaeologists.	X	✓
7.8	Wetland created in borrow pit area.	X	X

[✓ = is included; X = is not included]

Table 9.4 Summary of Objectives included/not included in EAP

Objective in EA Report			Comments:
8.1	Objective - Protection of Nesting Birds	✓	The EAP did refer to the 'Timing of the Works ... (which) must not be planned for their closed season ... March-July ...'(EAP, para 2.4).
		X	However, it failed to include the reference to the legal protection given to nesting birds and the assessment and approval mechanisms included in the objective in the EA report.
8.2	Objective - Protection of Spawning Salmon	✓	The EAP did refer to the 'Timing of the Works ... (which) must not be planned for their closed season ... October-April ...'(EAP, para 2.4).
		X	However, it failed to include the reference to the legal protection given to spawning salmon and the water quality protection requirements included in the objective in the EA report.
8.3	Objective - Protection of Air, Water and Soil Quality.	✓	The EAP did refer to the requirement for noise management measures and the approval of the Environmental Health Officer.
		X	The working hours specified in the EA report were not included in the EAP.
		X	The need to suppress dust was not included in the EAP.
		✓	The EAP does refer to the need for the pollution control guidelines to be followed.
8.4	Objective - Protection of Trees, Shrubs and Hedges.	✓	The EAP does include for the protection of all trees and shrubs, but refers back to the EA report for the detail drawing of how to protect trees. The EAP should be able to be used as a stand alone document and include all such required details (Hickie and Wade, 1997). The EA report requires all protective fencing to be in place before work commences and that all treeworks should be undertaken by a member of the Arboricultural Association which is also included in the EAP. The EA report includes the target for all works to be implemented in accordance with Arboricultural Association good practice, but this is not included in the EAP, which refers to BS 5837. It is better practice to refer to the appropriate BS.
8.5	Objective - Protection of Soil Structure within Working Area	✓	The EAP does include the requirement for separate topsoil and subsoil storage, with topsoil in heaps never higher than 1.5 m and not compacted, and to be replaced near to where it was excavated from.

[✓ = is included; X = is not included]

Table 9.4 (continued) Summary of Objectives included/not included in EAP

Objective in EA Report		Comments:
8.6	Objective - Footpaths and Other Access	✓ The EAP refers to the temporary diversion of Offa's Dyke during the works. X The EA report requires all footpaths and other accesses to be regularly cleared of mud, and access X for anglers will be agreed with the fishing club. These are not to be found in the EAP.
8.7	Objective - Reduce Environmental Impacts of Borrow Pit Areas	X The EAP does not contain any reference to the assessment requirements for borrow pit areas.
8.8	Objective - Minimise Impact of Site Compound and Access	✓ The requirements in the EA report are included in the EAP
8.9	Objective - Photographic Record of River Severn and New Cut	✓ The requirements in the EA report are included in the EAP
8.10	Objective - Re-planting of Area	✓ The requirements in the EA report are included in the EAP
8.11	Objective - To Ensure that the Contractor Minimises all Potential Environmental Impacts	X This list of specifications to be included in the engineering contract document was not included in the EAP.

[✓ = is included; X = is not included]

Evaluation of project compliance with Analysis of Objectives and Targets in EA Report

Current practice is that the objectives and targets are required to be included in the EAP. However, as the EAP for the New Cut Argae project was provided in the early stages of EAP concept development, the objectives and targets were put in a separate chapter of the EA report. The EA report was provided to the engineering consultants and, therefore, although the two elements were in separate sections of the EA report and EAP, they should have been taken into account. Each of the objectives was evaluated to check whether the objectives and targets had been achieved.

Objective: Protection of Nesting Birds

Implementation: In order to not disturb any nesting birds, no works on trees, shrubs, hedges, ditches and watercourses, may be carried out during the period 1st March to 31st July. Approval may be given for specific works to be carried out over a limited period, at either end of this period, when individual areas have been checked clear of any birds' nests and approved by the EA Monitoring Officer. Any required preparatory treework shall be undertaken outside the bird nesting season.

Target: No disturbance during the specified period.

Result: Non-compliance with initial part of the implementation statement. Treeworks were undertaken in the restricted months, however, the Area Landscape Architect and consultant landscape architect checked all the hedgerows and trees for nesting sites before approving treeworks. There was no evidence that any nesting birds were disturbed.

Objective: Protection of Spawning Salmon

Implementation: No works may be carried out in any watercourses between December and April. Any discharges to watercourse whether approved or accidental could pollute the water with chemicals or silt. All reasonable additional precautions to protect the water quality should be taken (including absorbent matting and bunded settlement lagoons) will be provided.

Target: No disturbance during the specified period.

Result: The timing of the works ensured that no works were undertaken in the restricted months.

Objective: Protection of Air, Water and Soil Quality

Implementation: Contractor to comply with NRA (now Environment Agency) pollution control guidelines and Environmental Health Officer's requirements for air emissions and noise. Working hours to be limited to prevent excess noise near houses. All work within 500 m of any residential dwelling to be limited to 08.30 to 17.30 hrs Monday to Friday, and 08.30 to 13.30 hrs on Saturday. All other work areas to be restricted to 08.00 to 18.00 Monday to Friday and 08.30 to 13.30 hrs on Saturday. Any additional hours to be

assessed and approved by Project EA Officer. Dust will be suppressed by preemptive action before complaints are received, especially in areas adjacent to housing and roads.

Target: No pollution of water or soil. Air and noise emissions to be within Environmental Health Officer required parameters. Noise to be kept to a minimum by working within approved hour restrictions. No complaints regarding noise and dust.

Results: Non-compliance of soil pollution, noise and dust targets. The NRA pollution control guidelines were not provided to the contractor either as part of the contract documents or subsequently whilst working on site. There was a problem of fuel spillage around the re-fuelling tank which was never adequately resolved to the satisfaction of the Environmental Clerk of Works or Resident Engineer. The minutes of the 2nd July 1996 Monthly Progress Meeting note 'Toilet overflow pipe from storage tank leaking, sewerage water giving off obnoxious smell'. The Environmental Health Officer was never approached for requirements on air and noise emissions. There were, however, no complaints about either. The restricted hours were not included in the contract, which only specified '... work shall only be undertaken within normal working hours ... a forty hour week from Monday to 12 noon on Saturday ... (and) not undertaken on public holidays' (Halcrow, 1996, p.24, para. 1.33). Monthly Progress Meeting minutes of the 7th June 1996 confirm that 'Working hours generally have been agreed as 7.00 am to 9.00pm five days per week ... Restricted hours will need to be agreed for work adjacent to Boat Cottage' (action on the main contractor to reach agreement). There are no written records of these increases in working hours being assessed by the Project EA Officer as required by the EAP implementation statement.

Objective: Protection of Trees, Shrubs and Hedges

Implementation: All trees, shrubs and hedges to be protected by protective chestnut pale fencing 1 m outside the circumference of the leaf canopy or either side of hedge centre line. Reduced protection for specific restricted working areas to be approved in writing by Project EA Officer. All fencing to be in place before any other works commence. All treeworks to be undertaken

by a member of Arboricultural Association.

Target: No damage to trees, shrubs or hedges. All required works to tree, shrubs and hedges to be implemented in accordance with Arboricultural Association good practice.

Result: The protection measures were implemented before works started to the satisfaction of the Environmental Clerk of Works. The minutes of the Monthly Progress meeting of 5th July 1996 note "tree protection completed to a good standard" (Halcrow, 1996). The treeworks, however, were not undertaken by a member of the Arboricultural Association which was a non-compliance with the EAP. The Environmental Clerk of Works did not insist on this as all the treeworks did not require specialist knowledge and were implemented in a satisfactory manner. This does beg the question as to whether this requirement was necessary, or maybe treeworks should be sub-divided into tasks that should and should not be undertaken by an ordinary contractor. It is noted that the moving of 320 m of hedgerow is not mentioned in the objectives and targets whatsoever. This oversight may be due to the hedge removal being a task undertaken as separate contract, before the main contract commenced.

Objective: Protection of Soil Structure within working area

Implementation: Topsoil and subsoil will be stripped and stored in separate heaps. Topsoil heaps shall be no greater than 1.5 m. Topsoil will not be compacted. Topsoil will be replaced where it was removed from in order to enable regeneration of flora from the seed source in the topsoil. Some designated areas to have less depth of topsoil replaced to encourage a more diverse range of grassland species.

Target: Topsoil heaps no higher than 1.5 m and never compacted. Soil structure to be returned to as near pre-works condition as possible.

Result: The Area Landscape Architect and Environmental Clerk of Works were happy with the topsoil stripping and storage, except that the mounds were compacted by a grader, which was a non-compliance item. The reason for this provided by the sub-contractor was to seal the mounds from water penetration to ensure that it would be easy to move the topsoil when required. There

appeared to be some confusion in the minds of the Area Landscape Architect and Environmental Clerk of Works as to whether this was a good reason or not, or whether it would actually reduce the water penetration into the mounds.

Objective: Footpaths and other access

Implementation: Temporary diversion of Offa's Dyke footpath to be implemented during works. All footpaths and other access routes to be regularly cleared of mud as required by the EA Monitoring Officer. Access for landowners and anglers will be agreed with the Fishing Club. 'Zebra crossing' type crossing points will be provided by contractor, as necessary. The working area will be a designated 'hard hat' area at all times during working hours.

Target: No valid complaints about the maintenance or the state of footpaths and access routes.

Result: There were no complaints about the state of the footpaths and other access on the site, however complaints were received about the overgrown state of the diversion route alongside the canal. The Area Landscape Architect contacted British Waterways, who cleared the footpath route. The footpath diversion was not particularly successful and many walkers took no notice of the diversion sign and walked along the route of Offa's Dyke across the site. Complaints were received from walkers that they did not see the signs. This was a health and safety problem that was not resolved. In discussion with the Regional Recreational Officer it is suggested that a footpath diversion management plan is drawn up to actively ensure that all such issues are properly resolved for future projects.

The phasing of the target sentence does not define who will decide whether or not any complaints will be valid or not. It is suggested that the target should define the project EA Officer as the person making such a decision.

Objective: Reduce Environmental Impacts of Borrow Pit Areas

Implementation: All areas for proposed borrow will be assessed by the contractor to ensure that they are not covered by any statutory protection. Material from any site which is designated as important for nature

conservation, landscape, archaeology or recreation by a Local Authority or County Wildlife Trust will not be imported onto site. All trees, shrubs and hedgerows within the borrow pit area and access routes will be protected to the same standard as those within the working area. The NRA will have the right to inspect all borrow pit areas to ensure that adequate EA and protection measures have been undertaken by the contractor.

Target: Minimum environmental impact of borrow pit area and access routes.

Result: Guidelines for the assessment of borrow pit areas by the contractor offsite were put in the contract documentation. However, there is no written evidence of the assessment of the borrow pit areas on site except in the EA report. In practice the borrow pit area used was negotiated and assessed by the in-house EA staff, who put in a planning application for the digging of the borrow pit. Unfortunately, the EA staff missed the fact that a public footpath crossed the edge of the proposed borrow pit area adjacent to the River Severn. However, after negotiation it was agreed that the footpath could be re-routed slightly with better provision of access across the New Cut channel for walkers.

Objective: Minimise impact of site compound and access

Implementation: The contractor shall propose a site compound location and access routes which will be assessed and approved by the Project EA Officer. The restoration work method will be approved by the Environmental Clerk of Works.

Target: No valid complaints from landowners and nearby residents regarding the siting of the compound and the access routes.

Result: There were no complaints about the site compound, however, the location of the main entrance off the main road was the subject of a complaint from the Highways Agency. The access to the site compound was re-routed off a minor lane rather than the main road direct, following assessment and agreement of the Project EA Officer.

Objective: Photographic Record of River Severn and New Cut

Implementation: The Project EA Officer will implement the requirement for a photographic record in colour prints 35mm format, copies of which will be provided to the County Archaeologist and Cadw.

Target: Provision of copies of Photographic Record to County Archaeologist and Cadw.

Result: Area Landscape Architect confirmed that this was done.

Objective: Re-planting of area

Implementation: The proposals for re-planting will be drawn up by the Area Landscape Architect in consultation with the Landowners. There will be a separate landscape contract to implement the works after the engineering works have been completed.

Target: 80% survival rate of all plants after five years.

Result: Planting was undertaken in March 1997. Survival rate not known so early after planting.

Objective: To ensure that the Contractor minimises all potential environmental impacts

Implementation: The contract documentation will contain environmental protection clauses covering:

1. Control of work areas, access and compounds
2. Restrictions to borrow material
3. Pollution
4. Seasonal working restrictions
5. Noise
6. Dust
7. Vibration
8. Protection of vegetation
9. Health and safety
10. Environmental monitoring
11. Mitigation works to be carried out in the civil engineering

contract

12. Reinstatement
13. Re-vegetation
14. Footpath diversions

A draft set of environmental clauses is included in the appendices of this EA. These will be revised following the Design Review EA Report, for inclusion in the final contract documents.

Target: Full implementation of all environmental specification in the contract documentation.

Result: Table 9.5 below identifies those items which were and were not included in the contract specification. Some items were present but not all the associated issues were specified.

Table 9.5 *Items included in the contract specification*

Specification Items:	Present in contract document	All issues covered in document
1. Control of work areas, access and compounds	✓	✓
2. Restrictions to borrow material	✓	✓
3. Pollution	✓	X
4. Seasonal working restrictions	X	X
5. Noise	✓	X
6. Dust	✓	X
7. Vibration	X	X
8. Protection of Vegetation	✓	✓
9. Health and Safety	✓	✓
10. Environmental monitoring	X	X
11. Mitigation works to be carried out in the civil engineering contract.	✓	✓
12. Reinstatement	✓	X
13. Re-vegetation	✓	✓
14. Footpath diversions	✓	✓

[✓ = included; X = not included]

Table 9.6 Summary of EAP Practical Non-compliance

Non-compliance Ref.No. Item:	**Comment**
1.4B All contractor and sub-contractors to be made aware of EA and EAP	No actual briefing of contractors or sub-contractors took place.
1.7E (a) Objectives and targets for environmental protection, conservation, mitigation and enhancement measures will be provided.	No objectives and targets provided in EAP issued (only in EA report).
1.9 Assessment of new changes to the proposals	No written evidence of any assessments on file.
1.11 Area Landscape Architect to sign off contract drawings and documents	No written evidence of sign-off on file.
1.15 Area Landscape Architect to approve working methods	Area Landscape Architect thought this occurred, however, the Resident Engineer thought it did not.
1.19 (a) Resident Engineer, Contractor and all sub-contractors will be issued with a copy of EAP	This did not occur.
1.19 (b) Resident Engineer issued with a copy of ES	This did not occur.
1.20 Engineer will provide the contractor with an Environmental Protection Schedule	This did not occur because of a change in procedures. Environmental Clerk of Works should have used Environmental Protection Schedule instead but did not.
1.32 Selection of materials to be approved by Area Landscape Architect.	Area Landscape Architect thought that this occurred. Resident Engineer confirmed that it did not normally occur.
1.33 Detailed proposals and contract documentation approved by Area Landscape Architect.	There was no written evidence on the file.
1.37 Consultant landscape architect responsible for three year contract period	The consultant landscape architect confirms that his contract was for the one year maintenance period after planting.
2.3 Footpaths to be diverted	Diversion route alongside canal was initially impassable. Continual problem of walkers ignoring footpath diversion.

Table 9.6 (continued) Summary of EAP Practical Non-compliance

Non-compliance Ref.No. Item:		**Comment**
2.4	*Timing of the works (Oct-April for salmon and March to July for nesting birds)*	No reference to this in the contract document. Treework was carried out during the restricted period.
3.3	*ii)(b) Contractor to be specialist approved by the Arboricultural Association.*	No approved contractor was used. Environmental Clerk of Works was happy with the workmanship of the contractor's labourers.
3.3	*vi)(b) Topsoil must not be compacted or left in heaps greater than 1.5 m high.*	Sub-contractor insisted on compacting topsoil piles so that they did not become waterlogged.
3.5	*(a) Background noise levels to be taken by independent consultant.*	This did not occur. This was not perceived to be an issue by the Area Landscape Architect or other staff.
3.5	*(b) All works to comply with BS 5228.*	BS 5228 (Noise control on construction sites) was not included in the contract specification.
3.5	*(c) Proposals to manage noise must be approved by Environmental Health Officer.*	Environmental Health Officer not contacted by contractor. Contract specification did not require approval.
3.6	*Pollution protection measures as shown in appendices ... are to be in operation at all times.*	Pollution guidelines not provided in contract documentation. Minor fuel and sewage pollution incidents did occur.

No items were included on such issues as seasonal working restrictions, vibration, and environmental monitoring (i.e. the work of the Environmental Clerk of Works). Of the 11 items present in the contract specification, four of these were not adequately covered, e.g., the pollution control specification item did not refer to the pollution control guidelines as required in the objectives and targets. Therefore, in practice only seven out of 14 items were covered in adequate detail.

Analysis of EAP items

The EAP (EAP-V2, Figure 9.11) has been taken to be the definitive EAP which was the final EAP formally issued for this project. This EAP does not

contain the objectives and targets for the environmental constraints which are provided in section 8 of the final EA report (EA-Vb) (Le Ray, 1995).

The EAP provided for the project was analysed for compliance, both for inclusion in the contract documentation and whether the item was complied with in practice on the ground. A summary of non-compliance and comments is provided in Tables 9.6.

Environmental Constraints in the Engineering Contract and not the EAP

The engineering contract did cover a number of environmental issues not covered in the EAP or the EA report. Most of these specifications were standard items included in all engineering contracts, but an additional requirement for action on finding Japanese Knotweed was specifically put into the contract by the Area Landscape Architect. On reviewing the contents of the engineering contract a number of environmental specification were found which had not been identified by the EA process. These items included:

- Abstraction licence (for water supply from river or any watercourse)
- Brucellosis (prevention of spread of disease, especially in cattle)
- Grass seed (specification of particular seed mixes and certification)
- Herbicide (approval methods)
- Imported topsoil (specification of what it should and should not consist of)
- Japanese Knotweed (removal of any found on the site)
- Mud (roads to be kept clear)
- Peat free (use in planting and as material for mopping up pollution spillages)
- Waste (to be controlled in accordance with the regulations)

Site Investigation Contract: Evaluation of Compliance

The site investigation contract was prepared by the engineering consultants, Halcrow, in August 1995. The scope of the works included formation of trial pits, trial trenches, "co-winuous driven sampling borehole and cable percussion boreholes with associated sampling", *in situ* testing and laboratory

testing along the length of argae and up to 3 m from the toe of the argae.

The environmental issues covered in the consultant's specification (Table 9.2) included:

a) S1.7 'Particular contract restrictions ... The exploratory (bore)holes ... are located close to Offa's Dyke. A recent archaeological survey on behalf of the NRA also identified a Bronze Age Burial Mound close to Offa's Dyke' (Halcrow, 1995, p.12);

b) S1.8 'Work shall be carried out only during the hours 08.00 to 18.00, Monday to Friday. Work may be undertaken on Saturday morning up to 12.00 ... Work shall not be undertaken on Public Holidays or Sundays' (Halcrow, 1995, p.13).

It should be noted that the specification of the acceptable working hours was contrary to the requirements in the EA report.

This site investigation specification did not cover: pollution control guidelines (the contractor would be operating vehicles and mobile plant/machinery within the area) and a note about the legal implications of disturbing nesting birds.

The lack of proper consideration of environmental issues and EA of the site investigation works has been a common problem in flood defence projects. This has often been because such works have been commissioned in the early *feasibility stage of the project before the EA team has drafted the EA report* and EAP. It is suggested that this common problem is an area that does need addressing allowing for assessment and checking of contract specification as part of the EA process.

9.8 Discussion

In starting the review of the New Cut Argae EAP, five issues questions (ϑ_1 to ϑ_5) were identified in section 9.3 of this chapter. The evaluation of the written

evidence, the review of the implementation of the project on site and interviews with staff involved with the projects led to a number of conclusions regarding these issue questions which are discussed below:

ϑ_1: Does the EAP clearly provide details of the essential environmental constraints on the project to all who read it, in a manner that is accessible and understandable?

The review of the documents available and discussions with the project staff identified a problem of a lack of consistency in the list of environmental constraints not being considered for this project. The monitoring section of the EA report had one set of issues, the objectives and targets section had another set, the EAP had another set, and the engineering contract had yet a further set. There is certainly an element of confusion as to which list was the definitive list. This highlights a lack of quality control in the EA process and specific checking that issues identified in the effects section, where covered in the mitigation section and the EAP.

The EA staff identified the archaeology associated with Offa's Dyke as the key constraint, with other constraints being no disturbance of nesting birds or the spawning salmon (which was not included in the contract specifications); the diversion of the footpath; the disturbance of local residents; and the protection of trees and hedgerows. The review identified that the parameters for key constraints were well covered for the archaeology and tree protection, with the identification of specific zones and provision of requirements before work was allowed to commence. However, constraint parameters were poorly covered for nesting birds and salmon, where no time restrictions were provided in the contract documentation; and footpath diversion problems occurred with no requirement to check alternatives, nor action to be taken in the case of failure of walkers to accept the diversion routes.

When the question "Was the information accessible?" is asked, the answer in the case of the New Cut Argae project is that the information was accessible in the documentation somewhere, but no single document provided a focus for such information, as was the planned role of the EAP. In response to the

question was it "understandable", the answer is variable. An example of this would be the requirement for the topsoil mounds to be left uncompacted. The contractor and supervising staff did not stop the sub-contractor from compacting the mounds because they did not understand why the soil was not to be compacted. The explanation from the sub-contractor, that the compaction would stop the soil being water-logged and therefore was good practice, was not questioned as it should have been by any engineering or environmental staff on site. It is, therefore, important to explain in an objective why it is being defined. This explanation may be a legal requirement, for example where the EAP failed to explain to the contractor or any other reader that it is an offence to disturb nesting birds; or for the protection or conservation of an environmental element, as in the case of topsoil structure.

ϑ_2: Does the EAP effectively summarise the environmental constraints to enable the design team to understand and implement the constraints in the final design and contract documentation?

As discussed with ϑ_1, the lack of focus for all the environmental constraints and mitigation measures in the EAP meant that it clearly failed to provide an effective summary of the issues. The importance of the failure to achieve this goal in this particular case is highlighted by the number of issues that were not effectively followed through in the implementation stage. If the design team had been provided with a clear set of environmental objectives and targets, these could have been checked at the various stages of project progression, where the Area Landscape Architect and consultant landscape architect could check that all issues had been covered. Both the Area Landscape Architect and consultant landscape architect thought that all the issues had been taken account of through to the implementation stage. The project highlights how easy it is for committed staff to loose sight of some of the environmental issues when working on a number of different projects and other tasks. The EAP did not provide a mechanism for the effective checking and follow through of all such issues to the design and implementation stages. In an

interview with staff, they did confirm that they thought some of the issues had been dealt with fully, whereas in reality, these were not taken account of in the final implementation of the project. An example of this is the approval of materials such as stone which the Project EA Officer thought were mostly approved by herself, however, the Resident Engineer confirmed that most had not been approved by the EA Officer; he had approved them himself without reference to EA staff.

The EAP was not implemented as it was originally planned due to lack of understanding of the steps required to implement the process in a successful manner. The EAP as a project management tool needs to be used as a mechanism to actively manage the environmental issues; to ensure that the issues are followed through at all the stages following publication of the ES. In this case the lack of follow-up on many issues were put down to the fact that such issues were not important. This does raise the question as to why they were identified in the first place. The model EAP calls for specifically defined objectives and targets to assist the management process. The lack of such objectives and targets in the EAP, meant that the design team (including consultant landscape architect) and the team supervising on site (Resident Engineer and Environmental Clerk of Works) did not have a clear set of objectives against which to judge their work, or to refer to when things were going wrong. The lack of a resolution of the fuel spillage incidents was put down by the Resident Engineer and Environmental Clerk of Works to a lack of a effective mechanism to follow up the problem at a higher level. They enthusiastically supported the idea of a formal incident procedure with associated incident forms which they could have submitted to higher authority if the problem had not been quickly resolved to their satisfaction. The objectives and targets provided in the EA report failed to cover seven out of nine key mitigation measures in the preceding section of the report (Table 9.3). The EAP then failed to follow through many issues identified in the objective and targets section. The failure of logical follow through can be attributed in some part to the stop-start nature of the project, starting in early 1994 and going out to contract in January 1996, nearly 24 months later. The Area Landscape Architect did mention that this had been one of the problems

of the project. Therefore the EAP will only be effective if the environmental issues are 'back-tracked' through the EA process to check that nothing has been missed. As with any management system, the EAP will only be as good as the information provided in it. The issue of quality control of issue tracking through the EA process is important and it is recommended that a formal issues check is introduced to reduce the risk of such lapses occurring.

ϑ_3 : Does the EAP explain in an accessible and believable fashion, how the environmental constraints are going to be implemented, and that these will be delivered?

As discussed in both ϑ_1 and ϑ_2, there was a mismatch between sets of environmental issues in the EA report and the EAP. The explanation of the implementation of the environmental constraints does not include 'who, what, where and when' (Interim Regional EA Guidance Note for EAPs, Aug 96). There were no actual targets that a reader can relate to, e.g., 'Opportunities to incorporate otter holts into the design must be made'. This gives no indication of how many would be acceptable. Does it refer to the engineering design or the landscape enhancement works design? One holt was included in the landscape contract implemented after the main engineering works had been completed. The consultant landscape architect did use the objectives and targets in the EA report as his main source of guidance as to the environmental requirements for the project. In such a format he felt that the 'who, what, where and when' can be clearly defined and easily understood.

ϑ_4 : Does the EAP explain how post-ES/EA report changes would be assessed and approved?

The EAP does explain how the changes will be assessed and approved (paragraph 1.12). However, the New Cut Argae project highlighted the lack of a requirement for specific written evidence for the assessment. For many of

the changes the Area Landscape Architect did assess and approve the changes, but there is no written record of such work. Therefore the management framework requires a number of appropriate outputs to ensure that there is *environmental audit trail for such assessments and approvals.*

ϑ_5 : Were the objectives and targets for constraints and mitigation measures appropriate and sufficient for the post-project appraisal process?

The EAP itself contained no such objectives and targets. However, the objectives and targets provided in the EA report are sufficient for the initial post-project appraisal and did clearly indicate a number of target non-compliances, e.g., work started in the bird nesting season; pollution control guidelines were not provided and there were oil and sewage spillages; noise management was not approved by the Environmental Health Officer; and topsoil storage piles were compacted by machinery. The objectives and targets provided a clear starting point for many of the environmental issues but needed to be broadened to include all the issues covered in the EA report mitigation section and in the EAP.

Related to these five key issues are the following:

ϑ_6 : Would the provision of objectives and targets make a difference to the design team's understanding of the environmental issues involved in the project and enable them to design and supervise the project in a more environmentally sensitive manner?

Both the feasibility and design project engineers confirmed that they felt that the EAP helped to focus attention and understanding on the environmental issues and constraints for all participants in the process. The results of the issues in the EAP and on the ground indicated that the majority of the key issues were followed through effectively. A number of environmental

mitigation measures were not followed through and the design engineers, the Resident Engineer and Environmental Clerk of Works felt that had these measures been in the EAP they would have not lost sight of such issues.

ϑ_7 Does the EAP enable the Project EA Officer to manage the environmental technical issues more effectively?

Those issues that were followed through from the EA report to EAP, and on into the contract specification were managed effectively. The lack of clear objectives and targets for many issues hampered their implementation. For example, the water-side berms on the New Cut, which were a requirement of the mitigation measures in the EA report, were not included in the objectives and targets, were mentioned in the EAP, and not included in the engineering contract specification, which was to be expected. The Resident Engineer and Environmental Clerk of Works did not have a copy of the EAP or the EA report for reference on site and, therefore, did not pick up that the berms were required. The EAP can only assist in the management of the environmental issues if all the issues are covered in the EAP and all relevant staff have access to it. In retrospect, the Project EA Officer did say that she felt that the EAP had aided her work and now that she had seen the benefits of using the EAP and was now more familiar with the concept, she could run future projects more effectively.

ϑ_9 Does the present format of the EAP provide an effective model?

The New Cut Argae project identified the age old need to ensure staff training was implemented in association with the introduction of new procedures. This case study project was implemented at an early stage in EAP development and the staff involved in using the EAP were not fully experienced in using it as a management tool. The basic framework of the EAP appears to work well. However, there are a number of improvements that are required to ensure that

the EAP can be used effectively. The key area for improvement is the need for a specific checklist, a project stage signing-off proforma and a management of change assessment proforma to be developed to assist the Project EA Officer in managing the EAP though the design and construction stages. In addition, it is noted that a drawing was not provided to summarise the issues and constraints which would have assisted the Resident Engineer and Environmental Clerk of Works in keeping track of the environmental requirements as the project was implemented.

ϑ_{10} Does the present model require additional guidelines to aid implementation?

The project does indicate that additional guidelines are required. New guidelines have been provided for the Project EA Officer's writing the EAP. Discussions with the Resident Engineer and Environmental Clerk of Works indicated the need for guidance from both perspectives for the implementation of the EAP on site. The Resident Engineer would like guidance as to the EA and EAP process, with a glossary of environmental terms; and the Environmental Clerk of Works would have liked guidance as to the construction process together with a 'who's who' on a construction site and a glossary of construction terminology.

ϑ_{11} Regional Engineering and EA Managers consider EAP will improve the effectiveness of the management of a project in an environmentally sensitive manner. Do operational Engineering and EA staff agree?

The consensus of opinion from the engineering staff was that the EAP is a very useful tool for focusing the environmental constraints and requirements within the project management process. The EAP was designed to provide the environmental parameters and boundaries within which an acceptable technical solution could be implemented. The engineering staff were keen to have

acceptable environmental parameters identified at an early stage in project development so that the design could take account of such parameters in a similar fashion to technical and economic parameters for such a scheme. The EA staff agreed that the EAP provided a mechanism for ensuring that environmental sensitivities get designed in, rather than designed out of a project.

ϑ_{12} : Does the EAP fit in with the current project management structure?

As discussed in Chapter Seven, the EAP was developed to provide a management tool which would address a number of needs and fit in with the project management structure of the Midlands Region. The EAP has evolved to provide a clear and open explanation of the environmental brief for the implementation of the project (equivalent of the technical and economic briefs) for the design team as well as all other stakeholders. It is then used as a baseline checklist to ensure all the environmental issues and constraints have been taken account of at all the appropriate project management stages of a project's development. It also details the EA staff resources and management procedures required to ensure the effective implementation of the project.

Environmental Incidents

A number of environmental incidents did occur. Ideally the EAP should seek to prevent incidents occurring by pro-active management of the potential incidents, however, in practice unforeseen incidents will often occur and the EAP is designed to ensure that the EA staff and procedures will deal with such incidents in an environmentally sensitive manner. The most potentially serious was the lack of early consultation with the Birmingham Angler's Association fishing club regarding the excavation of the borrow area and re-profiling of the river bank. This was quickly resolved amicably, because the engineering staff knew that the Project EA Officer was available to help sought out such problems with landowners and third parties.

The other problematic incident, was the failure of the contractor's labourers

to re-plant aquatic plants the right way up. This problem arose due to a lack of direct control on the activity, it was not in the contract specification or bill of rates. The task was undertaken in a half-hearted manner, without any commitment on behalf of the labourers involved to get the job right. This involved a lack of communication between the EA staff and the labourer in terms of the how to undertake the task and the importance of the success of the task. Another incident occurred when a machine driver decided for himself to leave an island in the borrow pit, because the material in one particular spot was not suitable for moving straight away, it was too wet. The island was not planned and was too near the edge to provide a successful island habitat in such a pool. The machine driver had to excavate out the island at the contractors expense.

The EAP as an Aid to Communication

The EAP should aid the communication of environmental issues arising in the EA process through to the implementation of the project on the ground. The lack of comprehensiveness of issues covered and associated objectives and targets did hinder staff in understanding the issues in context, and meant that they could not make decisions without reference to the Project EA Officer. This lack of context also hindered their lack of understanding of what needed to be referred to the Project EA Officer. An example of this is the Resident Engineer not referring materials for the Project EA Officer for approval, because he didn't perceive the need. However, the Project EA Officer thought she was approving nearly all materials and that the Resident Engineer had understood the need to get all materials approved. The Resident Engineer had not been provided with a copy of the EAP which did specify the necessity for receiving approval.

There were breakdowns in the communication of information to the fishing club. The EAP should have defined in a communications plan who was responsible for liaising with whom and when. On a more detailed level of information delivery, the failure of a contractor's labourer to properly re-plant the aquatic plants in the new ditch, stemmed from his misconception that this was an un-important task which should have been undertaken by a 'gardener'.

There was a lack of communication both in the importance of the task and the need to get the task undertaken correctly. However well tasks are specified, unless the contractor's staff actually undertaking the task are briefed, there can be no guarantee that the contractor's supervising staff will themselves adequately brief the staff undertaking the task. In retrospect, it is easy to see the need to properly brief staff who have never undertaken a task before and are not aware of the dos and don'ts. This highlights the occasional need for additional information in association with either a variation order or where a task requires site specific information which can only be provided when the task needs to be done on site. An example of this could be identification of individual limbs on a tree which need to be cut back to allow machine access.

9.9 Conclusions

The New Cut Argae project has shown that the use of the EAP can provide an effective mechanism for ensuring environmental constraints are taken account of and followed through to the completion of the project. However, if there is no check on the follow through of the issues and constraints through the EA procedure, and no provision of objectives and targets for such constraints as required by the model EAP, the potential effectiveness of the EAP can be compromised.

To be entirely effective the EAP must follow through all issues identified in the main ES or EA report and provide a comprehensive summary of how all such issues and constraints are going to be dealt with and what criteria will be accepted for success (the targets).

The study has identified the need for a summarised checklist which can be used at all stages in the design and implementation of the project to ensure that all issues are taken into account.

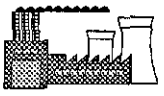
The study highlighted the lack of written documentation on file, in terms of changes in EAP objectives (either constraints or issues being added or removed from the EAP); sign-off of all contract documents (including site investigation works); assessment of changes in the design (for example, the

borrow pit area).

The New Cut Argae project highlighted the importance of communication. When all staff were fully aware of issues, such as the importance of the archaeology in the area, this was handled to the satisfaction of all concerned. When there was a lack of written documentation and discussion of issues, such as the water-side berm alongside the New Cut, such issues were not dealt with effectively neither at the design stage nor on site. The use of the EAP together with a drawing showing all the issues and constraints would have assisted not only the team supervising the implementation on site, but also the design team, preparing the contract documentation. Without the full details of the environmental requirements in the contract documentation, to add environmental requirements at the implementation stage can be an expensive, with the contractor claiming for variation payments.

The New Cut Argae project showed that EAPs can improve the effectiveness of turning environmental requirements into actions. It highlighted the problems that can occur if the EAP does not effectively provide a focus for all such issues and is not employed by all staff involved in the project as a prime reference document.

Chapter Ten - Discussion



Chapter Ten
Discussion

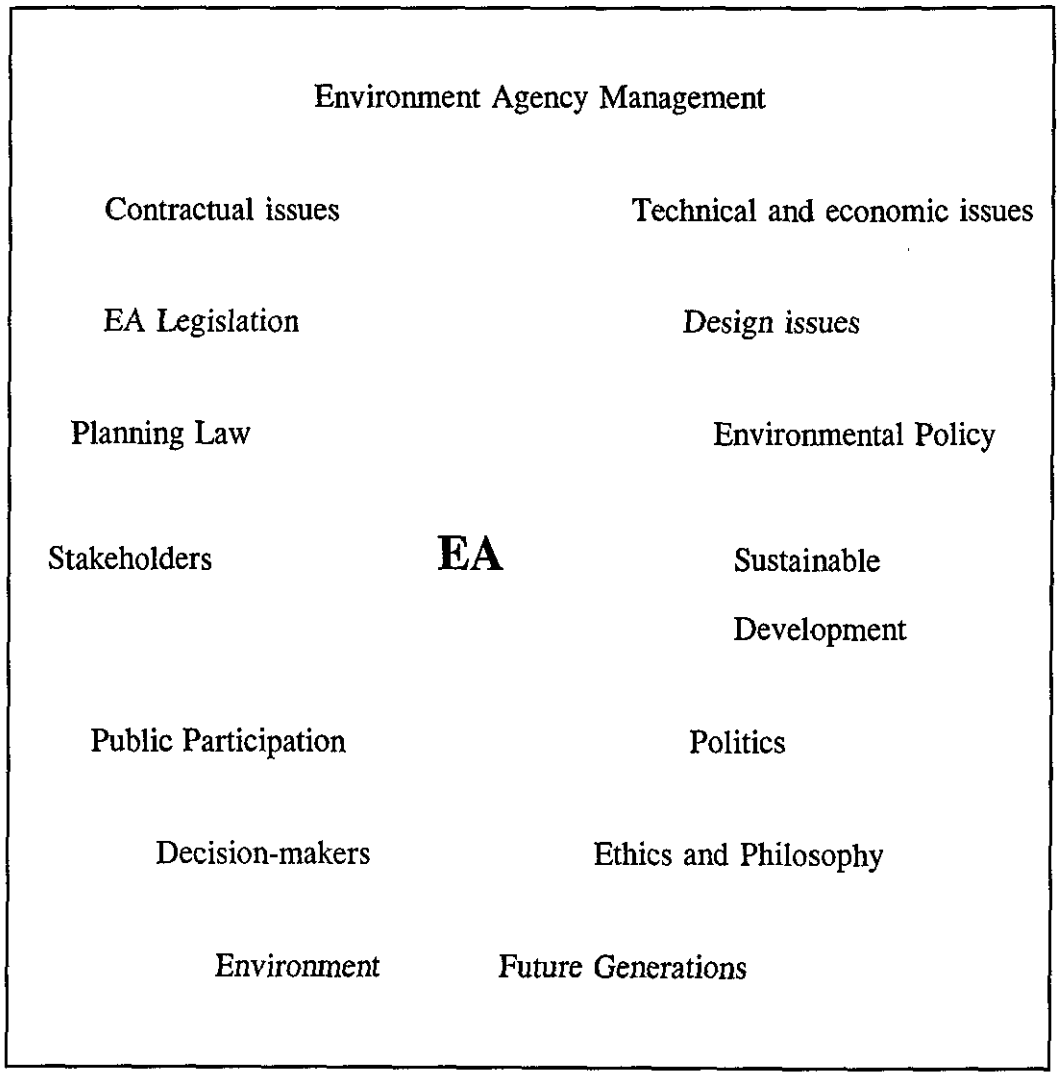
10.1 Introduction

This research project has been a voyage of discovery. Like many such voyages, the actual end goal was somewhat different than that which had been originally anticipated. In 1492 Christopher Columbus set sail westwards across the Atlantic to discover and open up a better route to India. The expedition was a result of many years of planning, reviewing current knowledge and maps, and eventually persuading the Spanish crown to back him. After sailing for thirty-three days across the uncharted Atlantic he sighted what is now known as San Salvador in the West Indies and not India as had been hoped (Parker, 1993).

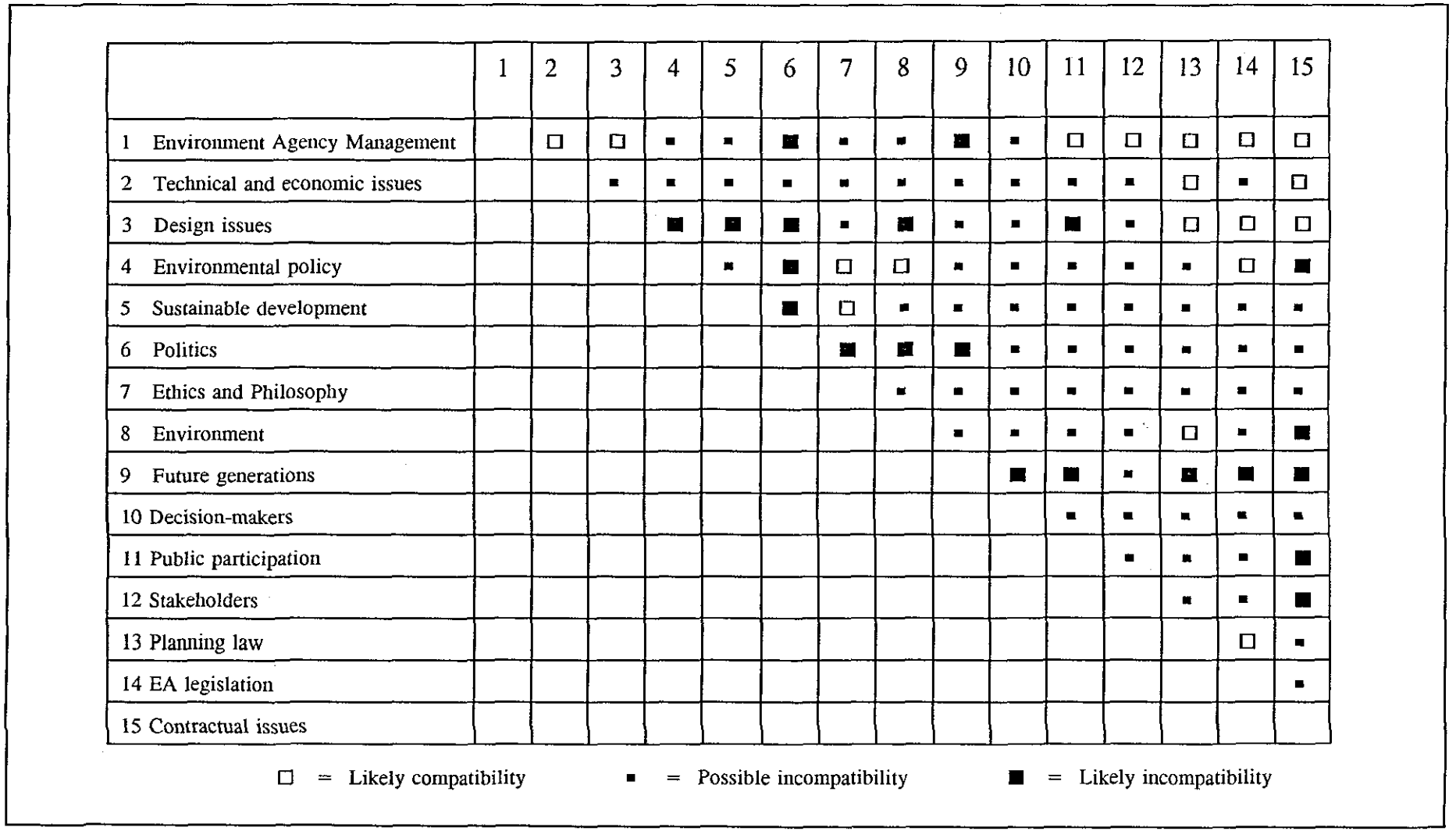
Likewise, this research project's voyage of discovery set out to determine more effective and efficient ways of implementing EA for projects in the water environment. The challenge has been to integrate a number of disparate

concepts into a cohesive model that would provide workable procedures and outputs (Figure 10.1).

Figure 10.1 Key Issues to be considered in Developing the EA process



The research sought to review and develop existing methodologies with the expectation of discovering an improved EA model. The research map was set out (Chapter One) and the building blocks of the EA process were identified and placed into a variety of new orders to see if there was a more useful framework for the EA process which could be developed to provide a better EA system. Initially, the sheer range of conflicting ideas and needs appeared to be overwhelming (Figure 10.2).



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 Environment Agency Management		□	□	▪	▪	■	▪	▪	■	▪	□	□	□	□	□
2 Technical and economic issues			▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	□	▪	□
3 Design issues				■	■	■	▪	■	▪	▪	■	▪	□	□	□
4 Environmental policy					▪	■	□	□	▪	▪	▪	▪	▪	□	■
5 Sustainable development						■	□	▪	▪	▪	▪	▪	▪	▪	▪
6 Politics							■	■	■	▪	▪	▪	▪	▪	▪
7 Ethics and Philosophy								▪	▪	▪	▪	▪	▪	▪	▪
8 Environment									▪	▪	▪	▪	□	▪	■
9 Future generations										■	■	▪	■	■	■
10 Decision-makers											▪	▪	▪	▪	▪
11 Public participation												▪	▪	▪	■
12 Stakeholders													▪	▪	■
13 Planning law														□	▪
14 EA legislation															▪
15 Contractual issues															

□ = Likely compatibility ▪ = Possible incompatibility ■ = Likely incompatibility

Figure 10.2 EA Needs Compatibility Matrix

As with any voyage of discovery, it was not a spontaneous development of the perfect model, but more a case of solving a puzzle with many different pieces. It was important to understand that 'a pattern or mental structure or understanding does not necessarily come all as a piece and in a flash, but rather is built up slowly and piecemeal as one links facts together and builds and rearranges a mental framework for the problem' (Loehle, 1996, p.36).

The research project involved the discovery of several different patterns and followed an evolutionary and iterative route through to the finally recommended EA model. In retrospect, as with the Spanish navigators, once the discovery was made, the answers to early quandaries and difficulties sometimes seemed absurdly simple.

The Move Away From the Traditional 'Technocratic' Approach to EA

The research project set out to develop a better EA model with little idea that this would involve a fundamental change in the EA process so far as myself and the Midlands Region of the Environment Agency are concerned. This fundamental change has been from a traditional 'technocratic' paradigm to a 'communications' paradigm and has resulted in a significantly improved EA process (as discussed in Chapters Eight and Nine). The 'technocratic' process tends to be solution driven where the ES report is seen to be the focus of the process, i.e. to provide the ES for the formal decision-maker. In the 'technocratic' paradigm the participation with outside parties and the accessibility of the process are recognised as important factors in helping to achieve a successful ES, but as a means to an end, rather than as an important element of the EA process in its own right. In many guidelines, the identification of stakeholders and decision-makers is seen to be of secondary importance and is barely mentioned at all (English Nature, 1994; Department of the Environment, 1995b; Royal Society for the Protection of Birds, 1995).

The identification of the importance of information as a key component of the EA process led to the reorientation of the process towards one which sought to actively fulfil the needs of all the decision-makers. The traditional 'technocratic' model fails to provide for this newly identified key need of the process. The traditional approach has developed a range of tools which analyse

and evaluate the potential environmental effects and required mitigation measures of various project alternatives (Sorenson, 1971; Dee *et al.*, 1973; Holling, 1978). These are outputted in a format which is normally technically complex and not easily understandable to most readers of an ES. The needs of the EA process are focused on providing adequate technical analysis and evaluation in accordance with the requirements of the legislation and the existing good practice guidelines. This style of approach fails to consider who needs the information, i.e. the decision-makers throughout the project life cycle and how information will be used, i.e. how the issues will be managed effectively in the design, implementation and operational phases of the project. However, these technocratic approaches will still need to be used within a wider framework of an EA information management system, but as tools which need to be used in a slightly modified format to analyse and evaluate information in an accessible fashion.

Change in Approach to Environmental Matters

It is interesting to note the change in approach to environmental matters over the last twenty years. As discussed in Chapter Three, the political climate has changed to be inclusive of environmental issues which have formed agenda items in their own right at political summits such as at Rio de Janeiro (United Nations, 1993). The Rio Summit highlighted a move towards the encouragement of direct public involvement in environmental decision-making (such as local agenda 21 initiatives) which has been promoted by many environmental groups. There has been a change away from the former conservation movement notion that an elite group of scientifically trained conservationists can determine and effectively protect the 'public interest' regarding the environment. Such a shift to a wider public involvement in the decision-making process can be seen as the defining distinction between the environmental and conservation movements (Paehlke, 1996).

In retrospect, the shift of attitude of The Environmental Agency's EA staff from being conservationists to environmentalists, has been a factor in the changes in the EA process which has been developed in this research project. The importance of stakeholders, especially the general public and residents had

been highlighted in the UK Government's policy of delivering public services in a customer oriented manner (UK Government, 1992a). The approach has been supported by the Environment Agency managers and engineers, who work within the same climate of the customer charter.

Such changes in attitudes have been mirrored in recent years by the growing environmental concerns which have led the public to be much more active and vociferous in their objections to major infrastructure development projects in the UK, e.g., Twyford Down, Newbury Bypass and Manchester Airport's Second Runway (Weldon, 1997).

Qualitative and Quantitative Research Approaches

The change in approach to EA where stakeholders are the focus of the process and, therefore, their understanding, use of information and subsequent actions are important and has meant the need for research techniques to be selected to enable the effective evaluation of the EA process within this context.

Both the qualitative and the traditional quantitative research techniques were used in this thesis. The use of qualitative techniques enables a more rounded picture of the people and the process to be drawn. With such a technique an attempt can be made to evaluate the context, people, and complex linkages. The evaluation of outputs using quantitative techniques without an evaluation of the human interactions and understanding of the meaning of the various outputs and results will not enable a proper feedback to the EA process. Quantitative techniques have been used to review criteria for the effectiveness of EA outputs and projects on the ground. The main problem of using just quantitative techniques is that the complexity and number of variables associated with the EA process mean that it is problematic for the researcher to evaluate such processes in any meaningful scientific manner. The EA process has to be implemented by people, and therefore, it is as appropriate to evaluate their interactions, attitudes and feelings, which will influence the outcomes of the process, as well as just trying to evaluate the process in a traditional quantitative manner. To try to relate cause and effect, for example, for poorly graded ESs with so many different project variables is fraught with problems. Consistent elements of poor practice have been identified by many

studies (Bisset, 1979; Ross, 1987; Wood and Jones, 1991; Department of the Environment, 1994c; King, 1996) but there appears to be a lack any evaluation in the EA literature as to why the same mistakes are being made again and again. Attempts have been made to discuss why EA is not necessarily effective (Ortolano *et al.*, 1987; Kreske, 1996; Webster, 1997) but such papers invariably do not take a quantitative approach.

This thesis sought to use a combination of qualitative and quantitative inquiries, using each in appropriate circumstances dictated by their relevant strengths and weaknesses. For example, quantitative techniques were used to identify consistent weaknesses in the outputs from EAs whereas qualitative techniques were used to try to determine why such weaknesses occurred.

The communications paradigm which focuses on the importance of the stakeholders and their relationship with the decision-making process, implies the importance of perceived or qualitative understanding rather than a strictly quantitative approach to the process. Even where the impact and effects can be defined quantitatively (such as water and air quality) the difference in importance of these effects becomes subjective when a decision-maker has to weigh up all the other considerations in the decision-making process; either using personal judgement or some type of multi-criteria analysis. As discussed earlier in Chapters Two and Three of this thesis, it is erroneous to think of the EA process as a purely scientific endeavour. There are so may unknowns and valued judgements within the process that it must be understood that EA is a tool for assisting in the political decision-making process, not a tool which will provide the 'right answers'. Dependent on the framework, objectives and assumptions within each EA project model (which is a decision-making process in its own right), there are a potential range of preferred options dependent upon these initial variables of the individual model. For example, an EA prepared by an government agency developing a project will often be very different in content from that prepared by a commercial developer for a similar project in a similar location. Issues such as public accountability, cultural values of the organisation and perceived responsibility to the environment will differ. Whilst it is accepted that some developers are producing high quality EAs because it makes sound commercial sense (transparency and public

participation often aiding the formal and informal decision-making processes in their favour), many others try to carry out only the minimum of EA required by the legislation. Others, conversely, try to overload the decision-making system with volumes of ESs. They hope that the decision-makers will feel that because it was written by experts: 'so it must be right'. Whatever the developer's tactics, whether as a government agency seeking to implement good practice or as a speculative developer, all have to communicate their intentions to a wide range of decision-makers from the general public to planning committees, and government funding agencies to private investors.

The project management and associated decision-making systems when considered in their widest sense as suggested by this thesis will inevitably be influenced by the vagaries of human and organisational behaviour within a particular political context. The eventual success or failure of the project and its associated EA process will in the end be a qualitative rather than quantitative judgement of the decision-makers including the project team and the local community.

Need for EAP and Integrated Life Cycle Management

One of the first patterns to emerge from the research analysis was the need for what has now become known as the Environmental Action Plan (EAP). As discussed in Chapter Seven and below, the seemingly disparate needs of the EA process, i.e. project management procedures, design briefs, agreement of third parties and post-project appraisal, when appraised did provide a consistent pattern of requirements for the EA process. All these needs highlighted the requirement for a clear explanation of how the project would be implemented in terms of environmental constraints, objectives and targets throughout the project lifecycle; all elements of the communication paradigm.

The EAP provided the first steps towards solving the overall puzzle. It provided a management tool for focusing environmental information within the project management process and neatly provided the tool to extend the EA process from the ES (of which it was a part) through to the implementation, operation and decommissioning stages of a project. The importance of this extension of the EA process throughout the whole lifecycle had been identified

from environmental ethics and discussions of sustainable development. The need for 'integral life cycle management' has been identified as a important factor in the development of new projects and products that seek to be truly sustainable (Ministry of Housing, Physical Planning and Environmental Management, 1989; Cramer, 1994). The idea is to manage a project in an 'environmentally benign, efficient and socially responsible way, during all phases of its life' (Achterberg, 1996, p.161). The EA process is needed, therefore, not only to assess the direct and indirect effects of the project through its life cycle, but also to assist in providing information relevant to the management process throughout that lifecycle. Key texts such as Wathern, 1988; Glasson *et al.*, 1994; Gilpin, 1995; Ortolano and Shepherd, 1995; Canter, 1996; and Sadler, 1996, note the importance of follow up environmental management but do not suggest how it will be implemented in any detail. They also fail to include the re-appraisal of environmental effects as part of such a process. It was initially unclear as to how this could be achieved, but the EAP now successfully manages these environmental management needs as discussed in Chapter Nine.

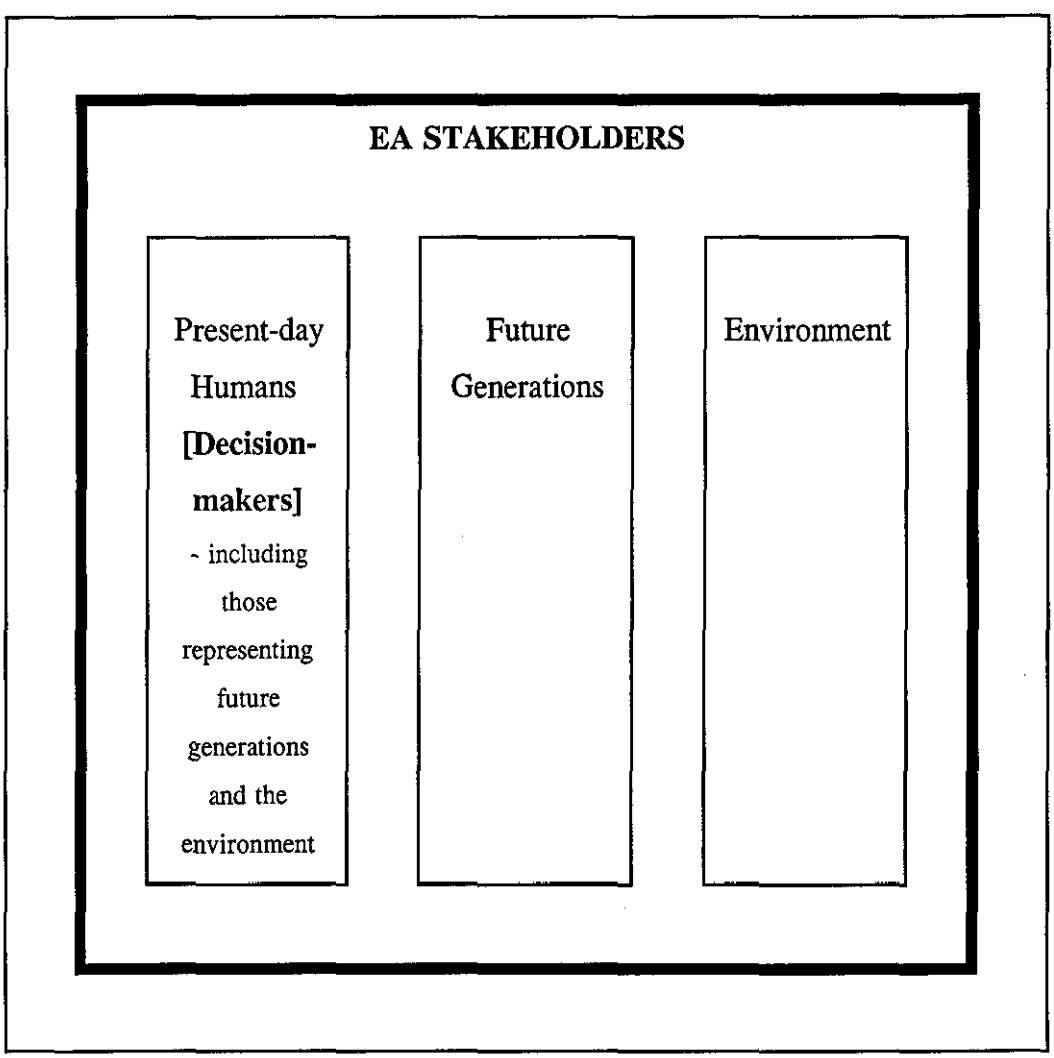
EA and the Stakeholders

One of the key concepts which has aided the development of this research project has been the identification of the stakeholders and the recognition of their importance within the EA process. From this concept new ideas have now emerged. Environmental ethics have shown that the stakeholders should include present-day humans, future generations, and the environment and that all the effects on all the stakeholders should be considered as part of the decision-making process. An analysis of the range of stakeholders identified a sub-set of present-day humans (excluding children and those unable to represent themselves) as potential decision-makers within the EA process (Figure 10.3). Other researchers have discussed the importance of decision-makers and the occurrence of decisions throughout the project stages (McMichael, 1975; Beanlands, 1988), but such researchers had not included the wider set of present-day humans in the decision-making sub-set.

One of the potential problems with stakeholder representation in the EA

process is the general anthropocentric perspective of politics, development policies and legislation. Even environmental legislation and the concepts of sustainable development tend to the anthropocentric. As discussed in Chapter Two, this means that the wider environment tends to be considered for its instrumental merits only and not for its own intrinsic value, i.e. its own right. The concepts of sustainable development have followed the anthropocentric perspective since the Brundtland report, where human welfare is referred to as 'the ultimate goal of all environment and development policies' (World Commission on Environment and Development, 1987, p. xiv).

Figure 10.3 Set of EA Stakeholders



The anthropocentric perspective also tends to favour present-day humans over future generations. This is borne out by the use of discount mechanisms which value the future worth of the resources at a fraction of their present day value

(Gowdy and Olsen, 1994). From a political perspective, future generations do not have a vote today and, therefore, the values and issues of the present voting generation tend to be uppermost in the minds of political decision-makers.

The political decision-maker such as a local councillor will often be making a personal judgement on the significance of the effects of the project and perhaps forget to take such issues into account. It is therefore incumbent upon the EA process to effectively address such issues. This can be done by the process having such elements on a checklist and to use appropriate procedures such as external consultation to take into account such issues.

Within the circle of internal stakeholders, it was found problematic to try to get those not directly involved in the project management process to contribute to development of the project. The procedures required multi-functional (departmental) involvement with all departments invited to start-up meetings and client sign-off meetings to try to ensure full organisational ownership of the project and the preferred option, however only those departments with a key interest in the projects turned up to such meetings. Both internal project staff and the EA consultants had to chase up many other Agency staff to get any response at all. It is recognised that improvements in this communication process, in both directions, needs to be made. This could aid the development of projects with both greater organisational ownership and more effective multi-functional contributions from such staff which can only be to the benefit of the development process. This avenue of investigation is outside the scope of this present project.

Public Participation

The need to include wide participation in the environmental decision-making process has been noted by others such as Paehlke (1996), who when discussing the needs of democracy and the environment suggested that:

> 'Wide participation is seen as necessary to determine essentially subjective and value-laden environmental policy objectives. Only a participatory approach to policy making can incorporate the needs of all

> segments of society, future generations and other species. Environmental values and their policy implications are best understood if all segments of society put forward their own views for themselves. The views of scientific and technical experts, whether employed by governmental or by private interests are, in this view, but one (or two) voice(s) among many' (Paehlke, 1996, p.19)

There have been problems in the past where participation (or public consultation as it is often known) has been a one way communication process, with the 'experts' telling the public what the issues and effects are with no real public participation.

The minimum legal requirement for external liaison and consultation on EA matters in UK law is the planning application ES consultation process or the consultation period of 28 days for the SI No. 1217 (Land Drainage EA Regulations). This limited consultation period provides the external decision-makers, which includes the public, with little opportunity to adequately comment on the proposals and tends to engender a confrontational 'them and us' attitude in both internal and external stakeholders. A more open participatory approach can lead not only to a more constructive discussion, but also enables local issues to be addressed and reviewed at an early stage in the EA process. Public participation in the past has been an emotive subject. Internal staff who are not used to their decisions being queried often feel that public participation implies an undermining of their professional standing as the 'experts'. The Project Managers have often preferred to keep the designs under wraps until the project has taken some sort of shape. The problem of the consultation process taking so long is also an excuse put forward for keeping consultation to a minimum. However, the experience of most people who have undertaken public participation is that the extra time taken early on in a project does actually save time overall. The Midlands Region of the Environment Agency has not quantified such savings, but examples such as the Priding Flood Defence Scheme discussed earlier in this thesis highlight the additional works required when inadequate public participation leads to ineffective coverage of issues. As from 1995 it has been part of the Midlands Regional

EA procedures for draft ESs to be sent out to the key consultees (English Nature, Countryside Commission or the Countryside Council for Wales). This was in response to earlier problems of such key consultees objecting to certain elements of the ES and after altering the proposed works, the ES then needs to be republished. This process takes at least five weeks and involves additional expenditure in republishing the ES.

With this sort of separatist attitude of 'them and us' there have been occasions when the earliest that many stakeholders heard about the proposal was when the planning application was submitted or the ES published. This separatist approach does not engender a sense of partnership and ownership in a project solution, which should be an objective for any publicly funded project. All public agencies have to ensure that they do not lose sight of their particular management role in relation to the community; which may be a nationwide community for agencies such as English Nature and English Heritage and regional/local communities for local authorities and agencies such as the Environment Agency. The 'customer' perspective has to be taken into account in public agency management process.

If the project approach is solution driven rather than a problem driven approach, the tendency for the project team will be to decide on a solution, announce it, then defend it against stakeholders adverse comments. However, if the stakeholders consider that they accept the fact that there is a problem and that they are being consulted on the development of a solution (in terms of a two-way communication process), then they are much more likely to accept ownership of the solution proposed. Such a solution will of course have taken into account the stakeholder's comments and needs before it is designed rather then trying to accommodate them after the design has been selected. Good design procedure should always take account of the known issues before the actual design commences, using the traditional 'survey, analysis and design' procedure.

The Political Context of the Project Decision-making Procedure

In discussing the needs of political decision-makers at a workshop on 'EA Communication Needs' at the International Association for Impact Assessment

conference in Portugal in June 1996, the concept of the need and ability to increase the influence of the ES in the formal political decision-making process (or increased 'market share' as suggested by Rob Sippe of the Western Australia, Environmental Protection Agency) was recognised (Figure 10.6). Many issues could influence such a decision, but an experienced EA practitioner should identify any conflicting influences and ensure that they were either discussed in the ES or that the relevant people were lobbied to try to mitigate the negative effects of such conflicting issues.

It is essential that the EA practitioner managing the EA process fully assesses the political arena in which they are initially discussing, and then formally submitting a project for consent. If they have no personal experience of a particular political context, they are advised to obtain such background information from those who are aware of such contexts. An example of this need to assess the political climate was encountered in developing the options for the Shrewsbury Flood Alleviation Scheme (Gould Consultants, 1993). One option entailed taking 10 car spaces in the Frankwell car park to provide for the new flood defence wall and a seating area for the public. This part of the project was supported by Planning Officers, but objections were forthcoming from the council committee responsible for the car parks who did not want to loose car parking spaces or the associated income. Another problem faced by the project was the impression of most of the councillors that the existing river frontage was of high aesthetic and historic quality. However, all those councillors who accepted the opportunity to join a guided tour along the river frontage expressed their surprise at how shabby most of the area was and agreed that some form of new development which could enhance the riverscape would be advantageous. They were also very keen to provide a river walkway through the centre of the town. The line of the proposed new flood defence provided an opportunity to incorporate such enhancement features as part of the development proposals. The project eventually did not get planning approval from a full council meeting due to other political issues, but if the previously discussed issues had not been addressed the project would not have received the support that it had done from many councillors.

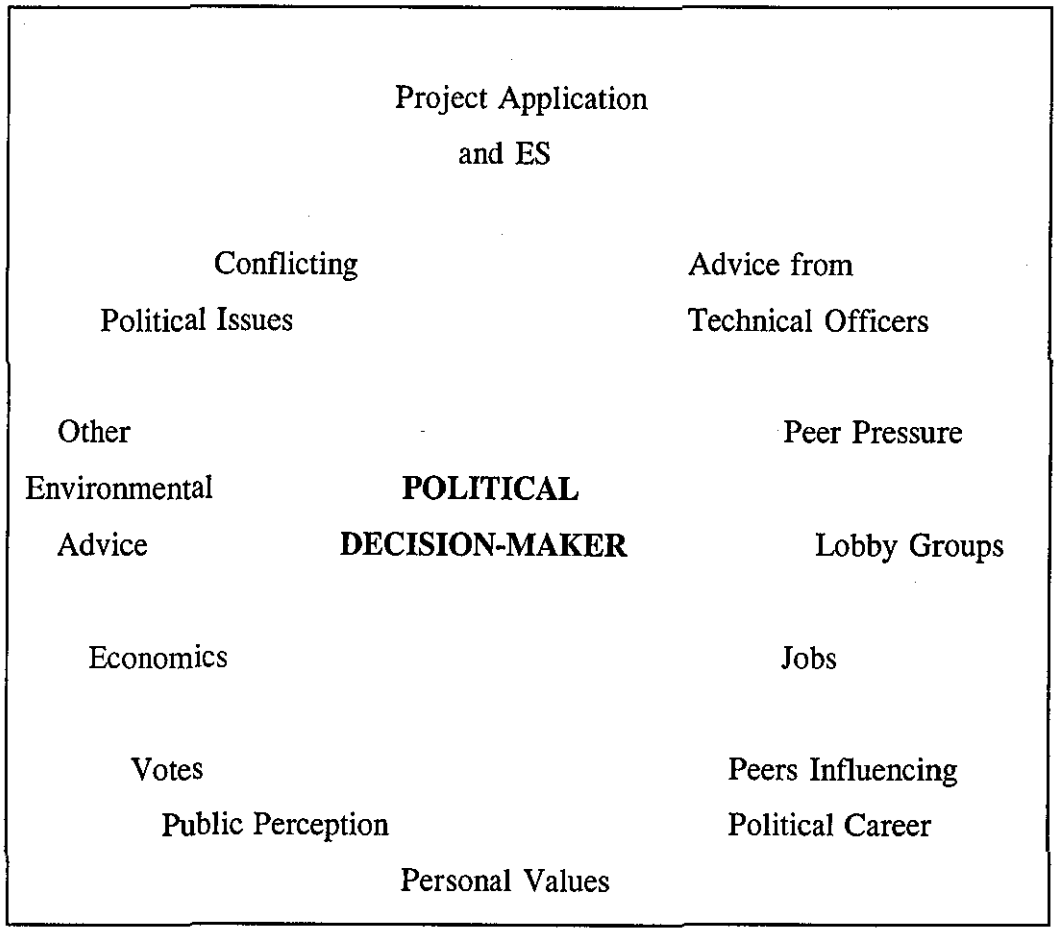
As stated earlier, an ES which fails to influence or even be read by

decision-makers (or their advisors), must be considered to have failed to achieve one of the prime objectives of EA, that of providing information to decision-makers upon which they can make an informed decision.

A political decision-maker will probably be making a number of similar decisions in parallel with the application from the project. All such applications will have a recommendation from the Chief Planning Officer and details of other comments received from other agencies and local residents. In addition to the development project and this ES, a council planning meeting may have perhaps 20 applications, along with some other major items to consider.

Within this decision-making arena there will be a wide range of factors which may influence a political decision-maker. An example of some of these factors is shown in Figure 10.4. The relative weight given to these factors by the decision-makers will vary from time to time, e.g., in relation to the proximity of elections.

Figure 10.4 Example of Factors Influencing Political Decision-making



Within this political process, it should be the objective of the EA process to influence politicians to take into account all the environmental consequences of the potential options being considered. The ES should not present a biased view of the project, masking many of the potentially adverse consequences. A clear, fair, unbiased, communication of the project proposals and their effects should be the goal of the ES.

The methods used may include the promotion of the project and the associated EA process using video as used in the presentation to councillors before the submission of the planning application for Shrewsbury Flood Alleviation Scheme (Gould Consultants, 1993).

The public participation process and project promotion process benefit from the use of public exhibitions as used in the Shrewsbury Flood Alleviation Scheme and more recently in the River Chelt Flood Alleviation Scheme (Branch Landscape Associates, 1997b). These can be implemented relatively quickly and cheaply based on text, maps and diagrams produced for EA reports.

Decision-makers can be taken on study tours to see similar projects. Such study tours not only allow for the presentation of environmentally sensitive implementation of similar projects, they also allow for the discovery of key environmental issues and values held by the decision-makers, which will need to be fully addressed in any submission. The lobbying and probing for issues of councillors and their planning officers through informal and formal presentations and meetings should be considered to be just another form of EA output and input for a development project.

Following on from this was the realisation that all potential 'objectors', i.e. the majority of the present-day humans sub-set of the stakeholders including those who seek to represent future generation or the environment are decision-makers (Figure 10.4). Normally decision-makers have been traditionally thought of as either those making an authorisation with respect to the project or the project proponent deciding to proceed with the project or not (Weston, 1997). If all potential objectors were considered to be decision-makers, i.e. they could decide either to object, support or to make no comment on a project at the various stages of development; then the EA process should provide them

with appropriate information upon which to make decisions. The EA process could potentially influence their decisions one way or the other if used in a biased manner. The question arose as to whether the EA process should be 'scientifically impartial', i.e. just providing the information or should it actively promote environmentally sound developments. Thompson (1990) argues that if the EA process provides decision-makers with a preferred option then they do not have to make any real decisions. This argument suggests that the real decisions are being made by the EA practitioners when selecting the options and manipulating the data analysis in choosing a preferred option. However, the decision-makers do have a real decision to make. The decisions are: do they approve, disapprove or put some form of conditions on their approval? The complexity of environmental and socio-economic issues in relation to the EA of any project can mean that the inexperienced decision-maker will potentially be overwhelmed by seemingly meaningless information and will tend to make their decision based on other factors that they do understand. An example of this could be a politician in an area of high unemployment tending to approve any development which will bring jobs into the area to the detriment of the wider environment. Therefore, if the EA process is to be useful, it is important that the ES is produced in a format that can be easily understood and read by such decision-makers.

Advantages of Considering a Wider Decision-making Constituency

This recognition of the needs of a wider constituency of decision-makers than that normally considered for the EA process has a number of advantages.

Firstly, it helps to fulfil the democratic ideal for accessibility to the decision-making process as derived from environmental ethics.

Secondly, the views and values of all the decision-makers are taken into account, ensuring that the project develops with a balanced view of the range of issues associated with the project. It is important that valid issues and objections are taken into account in the project development process. This may mean on the one hand that valid objections to the project lead to the early cancelation of a project. On the other hand, failure to take into account such issues may lead to problematic objections at the later stage of formal project

approval. However, if the issues are known, even if some issues cannot be accommodated, the project can progress in the sure knowledge of the what the issues are and can actively deal with potential objections associated with such issues at an early stage. Recognition of the need to identify stakeholder and decision-makers' issues within the EA process would suggest that the earlier these issues are identified the more effective the EA process will be. Failure to take account of such issues can lead to expensive abortive work, such as the Hill Pill Flood Defence project on the Severn Estuary which was discussed in Chapter One.

Thirdly, and possibly most importantly for a developer and formal decision-maker, external decision-makers may decide to object within the formal project approval process. It is preferable to reduce the risk of such objections by early consultation and taking account of their issues in the design process.

Fourthly, the EA should assist the formal decision-maker in understanding the environmental issues associated with a project and the inclusion of information on all the issues relevant to all the stakeholders provides the formal decision-maker with additional relevant information for the decision-making process. If however, the formal decision-maker does not understand the ES or bother to read the ES because it not easy to read, then the EA process may have had very little influence upon the decision-making process (Wood and Jones, 1991) perhaps only fulfilling a nominal need for an ES. From a developer's point of view this is potentially an inefficient and ineffective use of resources, and a lost opportunity. However, it is recognised that many developers do try to overload the decision-makers with many pages and sometimes volumes of an ES written by 'experts' as discussed earlier in this chapter.

Finally, it was recognised that internal decision-makers (e.g., project managers, design engineers and EA staff) are making design and management decisions throughout the project lifecycle. The EA process, therefore, needs to provide them with appropriate information in order to be able to guide such decision-makers in making decisions with a clear understanding of the issues and preferred environmental constraints.

Needs of Decision-makers

The needs of the decision-makers at first glance appear to be disparate. However, all need to be provided with information which they can understand and respond to either by taking further actions (e.g., to be able to make a design judgement) or by making a decision (e.g., that the project will not affect local residents and, therefore, they will not object to it). Such information not only needs to be accessible but also timely. There is little to be gained by providing extremely detailed analysis of complex environmental information to a member of the design team when they have just finished the final design drawings.

The analysis of stakeholders' and decision-makers' needs also leads to the conclusion that EA information management is a two-way process. The EA process and project options need to be communicated to the decision-makers. The values and comments of the decision-makers and the representatives of the other stakeholders needs to be fed back into the EA process. The whole process is iterative throughout the project development and implementation stages phases. Ideally it will continue at appropriate stages throughout the whole life cycle of the project. To ensure that this takes place an effective two-way consultation process needs to occur.

10.2 Going Back to First Principles

The research could have started with an existing EA model such as Wathern's EA framework (Wathern, 1988) and sought to develop it within the requirements of project management system of the Environment Agency. However, it was considered that it was important to go back to first principles and develop a model empirically. It was hoped that such an approach would provide a clear understanding of the conceptual needs and constraints of the EA process, and so enable a model to be developed in an iterative manner. In order to successfully review and develop the model in an iterative manner it was essential to have a clear conceptual vision for the EA process and to develop an understanding of the potential conflicting needs of the process

which would help in this development process.

As discussed earlier in this chapter, the first problem encountered was the sheer amount of information and differing concepts. In reviewing a wide range of EA literature on techniques, methodologies, review criteria and monitoring, most have tended to take a 'technocratic' approach (Bisset, 1980; Hyman and Stiftel, 1988; Lee and Colley, 1992; Glasson *et al.*, 1994; Canter, 1996; Kreske, 1996; Lawrence, 1997; Ortolano, 1997; Weston, 1997). These approaches developed methodologies and procedures to provide technical solutions which improved the implementation of the framework. They sought to provide EA information and techniques provided for the EA process defined by the NEPA legislation (or nationally equivalent system). The majority of the texts and papers have tended to address the issues of EA methodologies and a review of these methodologies rather than to develop EA theory (Lawrence, 1994) or to discuss the subject of environmental philosophy to any great extent.

This research project did not seek to provide solution driven outputs, but has worked from first principles in an iterative manner to develop a framework and process that would integrate the holistic requirements of project development and EA (Chapters Two to Seven of this thesis). It had been assumed that the end solution would be similar to those found by other researchers. Interestingly this was not to be the case.

The Identification of Key Elements in EA

There are three main elements which have to be taken into account in the decision-making process for flood defence projects in the UK; i.e. environmental, economic and technical aspects (Ministry of Agriculture, Fisheries and Food, 1993e). Traditionally the EA process has been seen by many to be separate from the economic and technical aspects of project development (Weston, 1997) but if EA is to be used to its the best of its potential, it should be used as a project management tool which helps the integration of all three aspects in the iterative planning and design development process. Environmental issues and constraints will have economic consequences and may or may not be technically feasible. For example, the

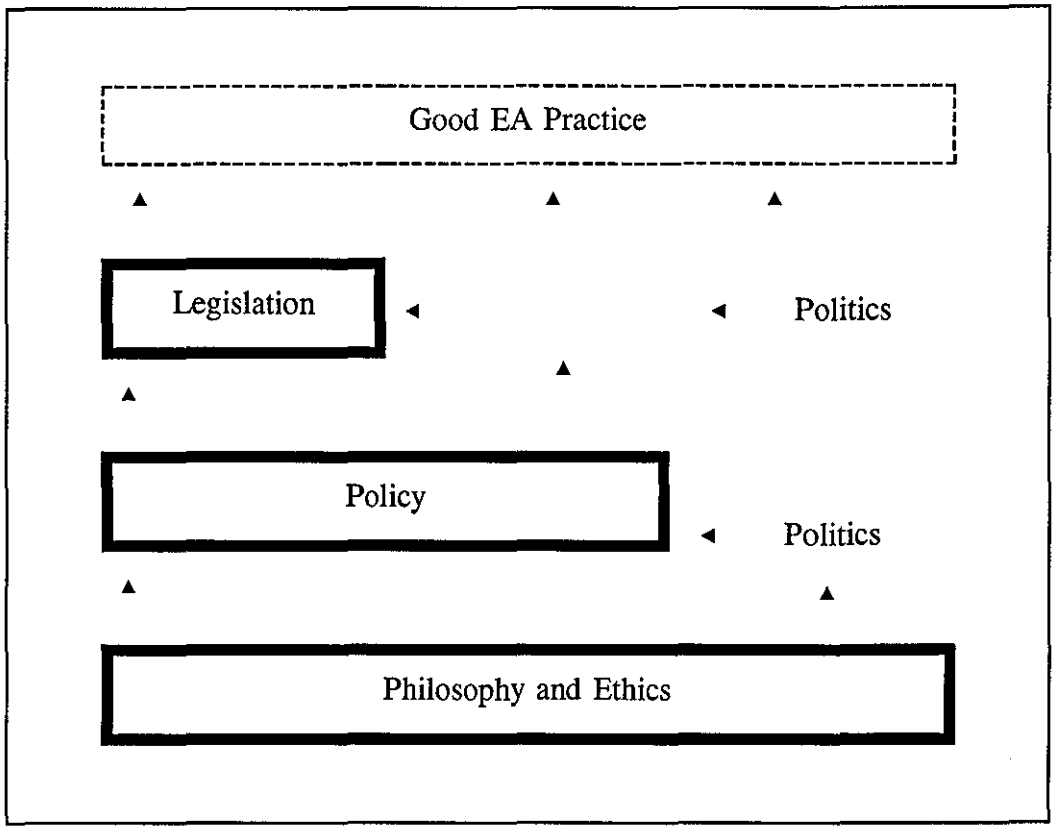
Midlands Region of the Environment Agency has a the technically preferred design slope for flood embankments of 1 in 5, for slope stability and ease of mowing the banks. However, in some circumstances steeper slopes of 1 in 3 would be preferred for banks such as those along the River Severn upstream of Shrewsbury to be floristically rich and prevent land owners farming intensively up and over the flood banks and right to the river's edge (Nicol *et al.*, 1997). In economic terms, a shallower slope will require more material and therefore be an increased capital cost, however the lack of easy mowing slopes will increase the long term revenue costs of the project. The EA process should assist the discussion of the various design options and constraints and allow an environmentally, technically and economically acceptable compromise to be achieved.

To determine the key elements in the EA process it was considered sensible to go back to first principles (as discussed in Chapters Two and Three of this thesis). The elements were identified as a) environmental legislation; b) policy; and c) politics (both internal and external); which are linked (Figure 10.5) but ultimately stem from a number of underpinning d) philosophies and ethics. From a wide range of environmental philosophies and ethics a number of policies are selected by the political process. From the policies the required legislation to deliver the policies is selected through a political process. The legislation provides some of the elements of good practice, but other elements stem from wider environmental policies and philosophies as shown in Figure 10.5. Therefore, by tracing back to the underpinning philosophies and ethics of environmental decision-making this should provide the key concepts or building blocks for the EA process.

The environmental policies are required to provide societies with some forms of guidance, and the legislation provides the legal framework to ensure the constraints required by such policies are implemented by the societies. The implementation of policies, legislation and any decision-making will be made in a political context of one sort or another. The environmental policies and principles emanating from the Rio 'Earth Summit' in 1992 occurred within an international political context of world leaders seeking to promote certain environmental issues and to discourage other issues that were politically

disadvantageous to them.

Figure 10.5 Legislation/Policy/Politics Linkages



Within the simplistic framework (Figure 10.5) there will have been some distillation and self-selection of some of the basic tenets of environmental ethics because of the particular political and historical context within which the policies and legislation have been developed.

Any decision is made within a particular political context. This context may change over time and if different personalities are involved. The formal decision-maker for a planning application operates within a traditional political environment. However, similar local political environments will exist within which local residents, landowners and tenants operate. The EA practitioner has to be aware that many of these decision-makers may have their own separate agendas unrelated to the project or its environment. Examples include: where a County Wildlife Trust is trying to extend the area of wetlands for over wintering birds by changing farming patterns, as experienced with the Severn-Vyrnwy Strategic Environmental Statement (Nicol *et al.*, 1997); or where

landowners are objecting because of unpaid claims for compensation on a separate site upstream of the current site under discussion, as with the Stanchard Pit ES (Ross, 1997). The party politics, as well as local and personal political issues can all influence the decision-makers and their preferences will often change with time. Therefore, an appreciation of the political climate and its influence upon the significance of various environmental effects is an important factor to be taken into account in the management of information inputs and outputs of the EA process.

The Need to Resolve Conflicts at Different Levels

The thesis has identified the need to resolve a number of conflicts within the EA process. These include the potential conflicts between the idealised needs suggested by environmental ethics and philosophy; the requirements of legislation; and the needs of political decision-making. There has been the conflict in approach between those who ask 'what is the minimum requirement for EA? Do we really have to publish an ES for this project?' and those who promote the implementation of good EA practice.

One of the major problems in developing the 'model A' were the conflicting needs of the EA process. A number of requirements implied that a minimalist approach was sufficient, i.e. the minimum required to satisfy e.g., environmental legislation; planning law; economic issues and cost benefit analysis. Other needs suggested a best practice approach: e.g., sustainable development and public participation; yet other needs were suggesting a basic approach in terms of simplicity (the demystifying) of environmental issues, e.g., EA outputs accessible to all decision-makers; whilst other were suggesting the need for scientifically predicted environmental effects, e.g., predicting effects of changes in water tables near SSSIs.

EA and Project Management Systems

In the Midlands Region of the Environment Agency, the good practice improvements to the existing EA systems have been welcomed by internal and external stakeholders alike. A number of problems with former EA systems meant that environmental information was not being provided early enough in

the feasibility stage of design. Environmental issues were taking a long time to be resolved at later stages in the design process or even on site during construction. In project management terms such problems were recognised as costly to the overall project budget and therefore the proposals to spend more time and money early on in the project development cycle were welcomed by Project Managers as an overall cost saving for all projects.

In determining the appropriate improvements to be made, it was necessary to balance the needs of good environmental practice with the practical needs of effectiveness and efficiency of the project management process. The general philosophy has been to try to implement good practice whenever possible. This has been successfully achieved because good environmental practice procedures have been selected and developed using the criteria of EA effectiveness and efficiency. There will always need to be a trade-off between cost and environmental effectiveness. A 'Rolls Royce' style EA would be inappropriate expenditure of public funds and therefore, an EA process which can deliver the appropriate level of assessment and outputs to an agreed standard is what is required. As the Environment Agency is the UK's lead agency for sustainable development (UK Government, 1995a) and an environmental protection agency, the standard selected has been 'good' rather than 'satisfactory', and 'excellent' where possible without additional expenditure of resources (Hickie, 1995a). This followed the Environment Agency's unwritten management philosophy of internal resource expenditure in line with the philosophy of 'best available technology not entailing excessive cost' (BATNEEC). The internal debate on the appropriate levels of resource expenditure for such work continues to this day.

The increased project expenditure in terms of staff resources and time on the EA process has been balanced by the benefits of implementing these additional measures. These have included more environmentally sensitive projects. Project management benefits have included better planning of the EA process in terms of resource budgeting and time planning; identification of appropriate, timely and accessible information for internal decision-making; reduced wasted time where consultants and contractors have to await resolution of environmental problems.

A number of projects were abandoned after early EA indicated either that excessive mitigation costs would be required (Stratford-upon-Avon Flood Defence Scheme) or that the local population did not perceive the flooding problem to warrant a solution which would have changed their riverside landscape considerably (Bewdley Flood Defence Scheme on the River Severn).

There have been a reduced number of objections to projects because decision-makers' issues are generally understood and taken into account in the EA process by project design changes, and the EA outputs are appropriate and understandable.

Applicability of the EA Model

In the late 1980s and early 1990s the implementation of ESs in the Midlands Region of the Environment Agency followed the basic pattern of mandatory and preferred outputs laid down in the UK Government guidelines (Department of the Environment, 1989a). There was no real integrated model as such for an ES only the prescribed output content and a flowchart of EA steps (Wathern, 1988). This 'technocratic' model provided an indication of the 'what' and to some extent the 'when' and the 'who'. However, this early model was hollow in that it did not address the 'why'. The innovation of this thesis has been to go back to first principles and to address the 'why' and to provide an integrated model which has identified stakeholders and the communication of information as key elements within the model. A traditional 'technocratic' model which commences with the 'what' (Figure 5.2), i.e. the prescribed outputs, inevitably will not be applicable to all projects. The applicability of such a model requires a screening of projects in order to decide which need a formal ES (Barrow, 1997; Weston, 1997), using tests of significance or thresholds, e.g. local roads within 100 m of a SSSI or conservation area (Department of the Environment, 1988b). However, the model developed by this thesis which starts with the 'why' and 'who' is applicable to all manner of projects. The 'what', 'where' and 'when' can be fashioned to accommodate a particular project and context.

There has been a suggestion from some that every project, and therefore, each EA will be unique (Lawrence, 1994). Whilst this is ultimately true, this

thesis has shown that there are a set of underlying principles which apply to the EA of all projects. It has also been suggested that the topic list covered by EA should be reactive to the range of project specific issues which need be assessed. Whilst it is agreed that for each project the key environmental issues will be different, it is important that the full range of topics is assessed for potential effect to ensure that none is left out or that indirect or cumulative effects are not missed. It is noted that the decision-maker will be very often just as influenced by the fact that there will be no effects from a project as by the fact that there are particular adverse effects. For example, no job losses or no adverse noise effects on local residents could be key issues for a politician.

The original research plan did not specifically set out to develop an EA system that would be appropriate for all types and sizes of projects. However, as the research work has progressed it has been realised that the principles of EA and project management will be similar whatever the scale of the project. This thesis has developed an EA procedure which starts from a 'problem oriented' rather than a 'solution oriented' approach. Therefore the principles will be similar whatever the size of the project or significance of the project. The thesis has developed standardised EA components which can be used in an effective manner (targeting why, who, what, where and when) and an efficient manner (use of standard communications plan, EA topic lists and model EAP which are all on wordprocessor files). This thesis has used water related projects as a vehicle to develop the principles of EA but such principles will be applicable for any type or scale of project in any location. Experience of the use of the model for strategic ESs by the Midlands Region of the Environment Agency (Branch Landscape Associates, 1997b; Nicol *et al.* 1997) confirms the applicability of the model for programmes of projects. Although it yet has to used for the EA of policies and plans, I would expect that the 'communication paradigm' approach to such work would be just as successful.

Ideally policies would link though from national to regional and local land-use planning which would have involved an EA input at all levels. The current Environment Agency policy planning tool is the Local Environment Agency Plan based on a water catchment or sub-catchment. Ideally this should be inputting integrated environmental issues into the local authority land-use

planning process, but to date they have tended to be function (department) orientated rather than a truly integrated document, and have had any proper EA of the issues and proposed policies. The EA process could assist not only in assessment of the policies and some of the proposed solutions, but also in identifying the issues and potential solutions in a much more integrated fashion. Such discussion of possible developments are beyond the scope of this research project, but it has highlighted one possible way forward.

EA Policy and Legislation

From EA policy and legislation there arise a number of mandatory requirements. The EA legislation requires an ES to be published for projects where there is likely to be a significant environmental effect. The guidance definition for significant effects is provided in the Circular 15/88 (Department of the Environment, 1988b) for projects subject to the planning EA regulations. The three main criteria for significance being scale of project; environmentally sensitive location; and adverse or complex effects. For projects covered by the SI No. 1217 Land Drainage EA regulations there is no specific UK government guidance and the planning EA regulations definition is taken to apply in these cases. It has been practice of the Midlands Region of the Environment Agency to apply the reverse criteria for establishment as to whether an ES is required. That is the justification for no ES, i.e. it is certain that there are no likely significant effects arising from the project. It has been the practice that all projects that were near a designated conservation site such as a SSSI or Scheduled Ancient Monument should normally have an ES prepared for them.

Over and above the mandatory elements, there are a number of good practice elements which should be included in the EA process. The scoping stage was recognised to be an important good practice step in the EA process and has been introduced as an open consultation stage in the 'model B' with some success, as in the Oakle Street case study discussed in Chapter Eight. The opportunity for outside bodies to contribute and comment on the scope of the EA has promoted a greater trust in the Environment Agency's commitment and ability to deliver projects in an environmentally acceptable manner. A

large number of projects have been successfully implemented in some very sensitive locations such as the Severn Estuary SSSI, which is also designated as a Ramsar site, i.e. of international importance, with excellent co-operation from English Nature.

Uncertainty

The process of EA is full of uncertainties. The ability of any EA process to accurately predict direct and indirect effects on any environmental system is always open to question. Many parameters can be objectively measured and predicted with some element of certainty. Noise, water quality and quantity are parameters which have been the subject of intense research over many years and such effects can be predicted with some degree of reliability. Many other parameters, such as ecology, archaeology, visual aesthetics, require a more subjective approach. Starting with baseline data and trends, most of the topics covered in the EA process (as discussed in Chapter Eight) are hard to quantify objectively. The EA process normally does not have the resources or time to objectively quantify such parameters in any detail. The evaluation phase of the process is very subjective for most parameters. To be able to predict the direct and indirect effects of a project on, for example, a wetland area when the key determinants for the wetland ecosystem are not objectively known, will be an entirely subjective process. Therefore, best professional judgements come into play in the EA process. The monitoring of appropriate parameters to learn if such professional judgements were correct would be good practice, but have been seldom specified in ESs, as the review of 14 ESs in this thesis revealed. Such monitoring objectives may be specified in the Environmental Action Plan as used for the New Cut Argae project and discussed in Chapter Nine.

However, the idea of uncertainty seems to be a concept that many consultants consistently fail to discuss, as discovered in the ES reviews in Chapter Six. It is concluded that they see the admission of uncertainty as a reflection upon their professional expertise and perhaps more importantly they think that the client will not want any uncertainties highlighted as it may weaken their case.

It is scientifically a sign of poor technique if the concept of uncertainty is

not addressed. If the discussion is phrased sensibly it will be read not as a weakness but as a strength of the report. To pretend that the data and evaluation techniques will provide a precise statement of the predicted effects is being economical with the truth. Uncertainty is a fact of life and will be understood by all readers if it described in clear simple manner. However, it is suggested that if it is reported in a purely scientific manner, this will not necessarily be understood by the readers and can lead to a mistrust of everything else in the document.

The Research Project in Relation to Other Studies

The initial review of ESs in this research project revealed many similar deficiencies as highlighted in other ES review studies (King and Wathern, 1991; Wood and Jones, 1992; Glasson *et al.*, 1997). Most of these studies have highlighted a number of 'technocratic' procedures which could be applied to help improve the quality of ESs. The existing conceptual model of the EA is not really queried in these studies which fail to address the issue of the EA process after the ES publication stage.

The concept of an EAP or similar plan is not entirely new. Others have recognised the need for such a tool (World Bank, 1995; Goodland *et al.*, 1996) but only one other case study has been found which describes how they are implementing an EAP or environmental management plan as it is sometimes known. The other environmental management system is that developed by the Environmental Protection Department of the Hong Kong Government (Sanvicens and Baldwin, 1996) which is similar to the EAP in that a stand alone Environmental Monitoring and Audit (EM&A) Manual is prepared which includes project background, implementation schedule, mitigation measures, action reporting procedures and monitoring programmes. However, it does not include environmental objectives and targets, which are seen as the most important component of the EAP. Papers have been given at three international conferences between May 1996 and June 1997 and the EAP was recognised as a new concept which had not been put into practice anywhere else in the world with the exception of the Hong Kong Environmental Monitoring and Audit Manual.

A review of current EA guidelines in the UK (English Nature, 1994; Department of the Environment, 1995b; Royal Society for the Protection of Birds, 1995) and from other countries such as South Africa (Department of Environment Affairs, 1992a), New Zealand (Ministry for the Environment, 1992) and Washington State, USA (Department of Ecology, 1993), shows evidence of the promotion of the traditional 'technocratic' approach to EA. The need for public participation is highlighted in all these guidelines but none actually discuss the identification and focus on stakeholders as this thesis suggests. A number of texts have discussed the need to widen the concept of 'decision-makers' from the traditionally held view of authorisation decision-makers to encompass the proponent of the development (Wathern, 1988; Weston, 1997). Webster (1997) does discuss the decision-making paradigm related to the stages in the EA process. The concept of active public participation is discussed in many texts (Wathern, 1988; Barrow, 1997; Weston, 1997) but the link between public participation and decision-making is not highlighted. Ortolano (1997) discusses the role of citizens in the planning and decision-making in relation to public sector planning, but not in relation to private sector project planning. The logical extension of the concept of active public participation is to consider the public as a decision-maker within the framework of the project development process. The decision to object, support or have no comment on a particular development may only be expressed at one point in the project development cycle, but under UK planning legislation (as discussed in Chapter Three) this is exactly the same as for authorisation decision-makers such as the local planning authority.

The importance of social impact assessment (Burdge, 1994; Ortolano and Shepherd, 1995) and public participation in the context of EA and the move to greater public involvement in decision-making (United Nations, 1993) suggests that the focus given to stakeholders and the communication process by this thesis will be a common theme in future EA work.

10.3 The Development Process for an EA Model

Where had the thesis started from?

In the water environment there were a number of UK guidelines for EA implementation (Department of the Environment, 1989a; Ministry of Agriculture, Fisheries and Food, 1992). These provided limited assistance to EA staff, outlining the minimum legal requirements and the format of an ES being prescribed in terms of mandatory and additional information that could be provided if the developer so wished (as discussed in Chapter Three). The Department of the Environment's latest guidelines on EA, Preparation of Environmental Statements for Planning Projects that require Environmental Assessment (Department of the Environment, 1995b) does provide more guidance on how to plan and undertake an EA, but it fails to provide advice on what should happen beyond the planning approval stage. It implies a traditional 'technocratic approach', defining EA to be 'the systematic analysis and presentation of information about environmental effects (of a project) ... to allow the importance of the effects, and the scope for modifying or mitigating them, to be properly evaluated by the planning authority before a decision is taken' (Department of the Environment, 1995b, p.7). This common approach (Department of the Environment, 1995b; Institute of Environment Assessment, 1995; Glasson *et al.*, 1994) implies that the project type, scale, location, and processes are generally decided before the EA process starts. This approach is the normal *modus operandi* for many developers and EA consultants. An example of this mind set was encountered when the EA consultants for the Oakle Street ES started work and were asked to report on their initial progress. They responded that they could not proceed with the EA until the engineering team had come up with some project proposals for them to assess. the Environment Agency's pro-active approach to EA and project management was explained to the consultants and they proceeded using the 'model B' (Chapter Severn) to implement the EA process to a reasonable standard. This example highlights the preconceived ideas of many, who still consider that the prime functions of the EA are the identification, analysis and evaluation of environmental effects of a pre-determined project which can then be mitigated

to some extent or other.

Whilst the importance of the EA process in relation to the critical project approval stage is recognised, there is a more over-arching role that EA plays in project development and operation. EA can provide an environmental management tool which if used effectively can assist in the development of environmentally sensitive solutions for specified project needs. For example, within the water environment these needs may be to consider the problem of a community being flooded or the problem of summer droughts effecting a water resource system such as the River Severn.

The choice of alternatives or options will be an important concept for all decision-makers. Internal decision-makers will wish to minimise the number of alternatives to consider but in terms of rational planning to develop effective solutions they will need to initially explore a wide range of options, which will then be narrowed down by a number of criteria based on environmental, economic and technical factors. The option of 'do nothing' is always a possible option but the consequences of such an option needs to be understood by the appropriate stakeholders and decision-makers. It is noted that the 'do nothing' option normally means 'no change' rather than actually 'doing nothing'. An example of this could be the 'do nothing' option to maintain a sea defence which would explicitly mean that the defences will eventually fail when no action is taken to repair them. This is a different option from the maintenance of the sea defence as it they are, including repairing breaches in the defences, which may be the 'do nothing to change the *status quo*' option. In conversations with project engineers the 'do nothing' option is often used as shorthand for 'do nothing to change the *status quo*'. It is important that these options are worded carefully to enable the reader to clearly understand which option is meant. This is just one example of the use of phrases and technical jargon which can have a precise known meaning to the project team, but either mean something else or are meaningless to many readers. Others which regularly appear before editing in ESs prepared for the Midlands Region of the Environment Agency include 'left/right bank', 'batter' 'balancing facility', and 'borrow'. These words and phrases highlight the need to be careful to ensure that the ES is actually communicating the meaning intended to the reader.

Prescriptive or Reactive Guidelines

The EA framework developed in this research project has been purposely prescriptive. As discussed earlier in this chapter it is suggested that there are a number of underlying principles for EA which should be implemented for any project. In order for the EA process to be effective and efficient there are a number of steps that can be taken to optimise the EA process. Firstly, it is important to ensure that the key EA criteria for effectiveness are implemented. Secondly, these criteria should be implemented in the most efficient fashion. The best way to discover what the most effective and efficient measures are is to implement a development and review cycle for such measures. Optimum effectiveness and efficiency in the real world can only be achieved by learning from experience. The ideal is that the learning experiences of all the EA staff are fed back into the EA guidelines.

If an EA is implemented in a purely one-off reactive manner there could be problems such as it not covering all the issues and not linking into the overall project management process (lack of effectiveness); and taking longer to type out ESs sections from scratch (lack of efficiency).

The strength of using a prescriptive method is that staff are using a system with the inherent advantages of standardisation: known procedures; standard contents; and understood project management stages and linked response requirements.

Whilst standardisation can have its advantages it also can have its disadvantages, the prime one being staff implementing procedures without really understanding what they are doing. This weakness will be inherent with any procedure whether prescriptive or not. If staff do not adequately understand the EA process, a prescriptive procedure will reduce the potential number of problems that could occur as compared with a reactive procedure. However, this lack of understanding may restrict self-learning acquired from their mistakes. It must be recognised that a prescriptive approach, therefore, can mask a training need for staff to be able to adequately understand and use the underlying principles of the EA process effectively.

The prescriptive format is not cast in tablets of stone and will develop in an iterative fashion as new ways of performing the EA tasks more effectively and

efficiently are discovered.

The need for prescriptive guidelines has been hotly debated by the EA staff of the Midlands Region of the Environment Agency. Area EA staff argue that they should have the flexibility to use their professional skills to use the appropriate elements of the guidelines as they see fit for each unique set of circumstances. I have argued for the use of a standard model which effectively communicates the appropriate information at the appropriate times to the project stakeholders/decision-makers. The familiarity of approach and layout for internal decision-makers and external decision-makers who are regularly consulted, such as English Nature, County Archaeologists and County Wildlife Trusts, will aid the communication process. The prescriptive approach also frees EA staff and consultants to concentrate on the implementation of the EA process rather than to have to re-invent a slightly different model for each project. An example of this is the time spent by a consultant developing significance criteria for the Severn Drought Order ES (Applied Environmental Research Centre Ltd, 1997), which would be applicable to all EAs undertaken by the Midlands Region of the Environment Agency. In this particular case no prescriptive criteria were available and the ones developed by the consultant were not entirely satisfactory, and these will have to be further developed for use with future projects.

The Environmental Action Plan

The importance of strengthening the follow-up management and monitoring of the EA process was one of key recommendations of the recently completed International Study of the Effectiveness of Environmental Assessment (Sadler, 1996). The EAP has been developed to provide a mechanism for strengthening the EA process, from the published ES through to the completion of the project. It details how the protection, conservation, mitigation and enhancement measures for the project will be delivered by the Environment Agency and its contractors. The EAP also contributes to the overall environmental quality control mechanism for the EA process by the introduction of more formalised checklists and stages to be signed-off (Leu, *et al.*, 1996). As discussed earlier in this chapter, evidence of similar approaches

can be found in the EA of World Bank projects (World Bank, 1995) and the work of the Hong Kong Environmental Protection Department (Sanvicens and Baldwin, 1996).

The concept of the EAP has been the culmination of three years work developing and refining EA project systems to ensure effective management and delivery of water management projects in the Midlands Region of the Environment Agency (Hickie and Wade, 1997). EA is seen as a management process, not only for providing information for the decision-making process, but also for the management of the implementation of that decision and any required changes due to unforeseen circumstances, ultimately through to project decommissioning.

All new ESs in the Midlands Region of the Environment Agency now include an EAP, forming the last section of each ES. The EAP is designed to be used also as a 'stand alone' document for inclusion as a prime reference in the engineering consultants briefs; for communication of an environmental issues summary to all contractors and other staff; as a baseline document for environmental post-project appraisal; and for overall management of the EA process through to completion of the project.

Whilst a number of problems were identified in the use of an EAP for the New Cut Argae project (discussed in Chapter Nine), the overall effectiveness of the EAP was confirmed through objective outputs and staff interviews. The problems associated with the use of the EAP appeared to be human centred and related to a lack of understanding of the purpose and how to use the EAP advantageously, which are inherent in the introduction of any new system.

The use of the EAP as a component of the engineering design brief for the detailed design stage has ensured that no project has had to be re-published due to significant changes in the design. The EAP not only provides the design engineer with the environmental parameters within which he or she has to ensure the design remains, but also provides the mechanism for ensuring that the EA staff continually liaise with the engineering designer during this period and requires the final design drawings and contract specifications to be assessed and signed-off by the EA staff. Any variations in design which have been necessary have to be assessed. The use of the EAP at contractual and

post-completion stages has been most successful. This much more pro-active approach to EA project management provided by the EAP has led to improved lines of communication and defined areas of responsibility, ensuring that many potential problems are addressed before they escalate into a environmental incidents, which can result in works on site having to stop until the problem has been resolved. The results of the monitoring of the outcomes of the EAP targets have provided a new simple checklist methodology, which at the end of the construction period, ensures that all outstanding environmental issues can easily be identified and followed up.

The EAP is a tool for internal communication of information in detail, confirming procedures and feedback loops, For external stakeholders it is a guarantee of the EA approach and environmental commitments that will be delivered by the Environmental Agency as a developer. In the past there have been problems for projects such as the River Soar Flood Alleviation Scheme where County Wildlife Trusts and English Nature had little confidence in the ES or the post-ES construction stage when the mitigation measures should have been implemented (Gould Consultants, 1992). The EAP provides an open and transparent explanation which assists in promoting the Environment Agency as a responsible developer. It now helps external stakeholders to have confidence in the Environment Agency as a developer and defines targets that may be monitored if the stakeholder so wishes.

Cost of the EAP

One of the main questions that has been asked at conferences where papers have been given on EAP (Hickie, 1996a; 1996b; 1997b) is about the cost of EAP: 'Is all this extra work worth it?'. The overall cost of preparing an EAP in addition to the normal ES expenses has been found to be relatively minimal. It is estimated that the extra costs will entail no more than two days of work, approximately £500 in consultants fees per project similar to Oakle Street (Chapter Eight) in size and complexity (Ross,1996). The EAP follows on logically from the analysis of effects and the required mitigation measures, and if a standardised EAP format is used, this can be completed fairly quickly. The additional time taken at this stage to specify objectives, implementation

statements and targets saves time later on in the EA and design process.

The costs associated with the implementation of the EAP can be divided into two stages. In the detailed design stages, there are savings to be made with the use of clearer definition of environmental constraints from the beginning of the design process. In the past, some environmental issues were often overlooked during the technical design process, resulting in the need for costly additional design works. The use of the EAP constraints assists in the checking of environmental compliance against key objectives, again saving in consultancy time.

The major new additional cost has been the use of the Environmental Clerk of Works assisting the supervision of the project on site. This additional expenditure has resulted in contractual and consultancy savings due to better management of the environmental issues on site, thus reducing potential delays and needless environmental damage. Such savings by there very nature are not easy to quantify, but they are now seen by the Environment Agency to be part of the requirements of good environmental management practice.

Future use of EAPs

EAP is a project management tool, and as such, must effectively help to manage the implementation of a project. Improved integration with the mainstream project management systems will aid the future integration of environmental issues within the framework of the overall project. The EAP can also be used as a audit tool to ensure that all the requirements and commitments of the EA process have been implemented in an manner acceptable to the EA staff. This process could be widened in future, with EAPs used to improve the participation and ownership of stakeholders within the project management process by the signing off by appropriate stakeholders of the various environmental targets.

The Practical Use of EA Model Guidelines and Organisational Learning

The research project progressed successfully because of the ability to develop and review the new EA models in a real world setting which led to better outputs. However, this was a double edged sword in that the practical use of

new research models did pose a numbers of problems. At times the development of new model EA guidelines was moving at a pace faster than the organisation could keep up with. The review of the New Cut Argae Project in Chapter Nine highlighted many such problems. In retrospect, if more time had been available for additional training of all the EA staff this could have improved the introduction of the new EA good practice models across the whole of the Midlands Region of the Environment Agency.

The concept of organisational learning has been identified as an important feature of the development and implementation of good EA practice. Organisational learning has been identified as being optimised for EA when there are EA technical staff within the organisation, who then employ consultants to assist in the EA process and not to provide all the EA expertise (Sanchez-Triana and Ortolano, 1997). Where organisations rely on external EA consultants for the EA process, they have been found to fail to capitalise on the potential EA learning experience (which is only really gained by the external EA team). In organisations where they have internal EA staff managing the process, the organisation tends to learn to adapt and optimise the EA process to the overall benefit of the organisation. Additionally, internal staff help lead to the ownership and commitment to take account of environmental issues throughout the organisation.

In the Environment Agency, parallels to this organisational learning can be seen where the three Regions (Midlands, Thames and Anglian) having internal staff specifically responsible for managing the EA processes have developed the EA process and methodologies. These have been developed not only within the realm of operational water management projects, but also into other areas of the Environment Agency's activities such as improved responses to ESs for external developments. They have also developed EA processes to work in other levels of decision-making. Strategic EAs have been developed in these three Regions for water management projects such as catchment management planning (Gardiner, 1997) and strategic flood defence programmes (Nicol *et al.*, 1997).

Need for EA Training

In reviewing the 14 ESs in Chapter Six and the implementation of the model guidelines, one important conclusion is that many of the simple good practice recommendations made over the past 27 years of international EA experience were not being generally used in practice. This suggests a problem with staff training and awareness. One factor that is perhaps relevant to this problem is that most EA professionals practising today did not study the EA process as part of their college education. As the UK legislation was not introduced until 1988, any UK EA professional over 31 years in age would probably have not studied EA processes and legislation at college (assuming they took a first and second degree and finished college aged 23). The majority of their knowledge and experience has come from practical experience in undertaking EA, reading EA guidelines and textbooks, and attending continued professional development (CPD) short courses (very often only one day long).

The review of the 14 ESs together with a wider experience of reading many other ESs leads to the conclusion that many tend to be mechanistic in nature. They follow the minimum format required by legislation and include some of the concepts in the guidelines. The description of the effects of the project tend to be major or minor. There appears to be little understanding of the EA process as a whole, or the limitations of some of the techniques being used.

The effectiveness of EA training is beyond the scope of this thesis, but is an important area for further study.

10.4 Development of 'Model C'

The thesis has sought to develop a more effective and efficient EA system and has used the concept of the 'communications paradigm' as a focus for this development process. The identification of the importance of stakeholders and their views and decisions that they have to make within the EA process has led to the general use of qualitative rather than quantitative techniques to develop the model. This has led to the development of a model that is stakeholder rather than technocratically centred. As discussed earlier in this chapter, this

move away from a traditional 'technocratic' approach has mirrored similar changes in the political and environmental ideas.

The review of 'model B' in the case studies has highlighted a number of improvements that can be made to the EA model (Figure 10.6). The basic format of the model has been shown to work well. The main proposed improvement is the active use of the communications paradigm in the implementation of the EA process. In general terms this would be reflected in the process being planned from the beginning to identify 'who' the stakeholders and decision-makers are, and what information they need and what information they have that will assist in the effective implementation of the EA process. In project management terms this would be reflected in better communication of information between project staff and consultants.

Within the EA documents, one of the key improvements to be made is the use of similar topic lists for all the sections of the ES. This will help ensure that environmental issues are followed through consistently in all the sections of the documents; inconsistency being a problem that was highlighted in both case studies. This can be checked through the use of summary tables in each section of the document which will assist in quality assurance.

Another major area for improvement is the writing of EA reports. This whole area of improving written communication of information to decision-makers could be the subject of a thesis in its own right.

Figure 10.6 Model C - Summary of Modifications to Model B

1. Programming of EA Process - Staff and consultant time and budget;
2. Use of Communications Paradigm - Stakeholder centred;
3. Use of Communications Plan - as part of scoping report;
4. Standardisation of EA Topic List - used in baseline, assessment and EAP sections;
5. Use of Topic Checklist - to check follow through of issues;
6. Use of Separate Impact/Effect Definitions - for clarity of impact and effects on a range of receptors;
7. Improve Readability of EA Reports - additional guidelines.

10.5 Conclusions

This thesis has sought to discover the underlying conceptual principles of the EA process and from these basic elements to build, through an iterative process, a workable EA model. The challenge was to integrate a number of disparate concepts into a cohesive model that would provide workable procedures and outputs. The communications paradigm, as discussed in Chapter Five, was used as the underpinning ethos in this development process.

Were the Correct Underlying Principles Selected?

In retrospect, the concept of going back to first principles to try to find the key building blocks was the right approach. The potential problem with this approach is that the wrong building blocks could have been selected. The research thesis started with environmental ethics and philosophy, and investigated the political, policy and legislation elements to identify the key elements for 'model A', which led to the identification of the needs of stakeholders and finally the development of the communications paradigm.

If a slightly different approach had been taken, perhaps taking a more technocratic approach, defining the needs of the ecosystem in relation to the EA process, a different set of building blocks would have emerged.

However, it is suggested that the EA building blocks selected which were related to the stakeholders, the decision-making process and the management of information, have provided a model which is able to deliver the EA process in a successful manner, whilst incorporating the 'technocratic' approach required to evaluate the effects of the project. Information is provided to the right stakeholders at the right time. The model promotes the concept of open and transparent EA to ensure that all issues are taken into account in the internal decision-making process. It actively identifies and manages the environmental constraints to ensure that they are understood and implemented as part of the EA process.

It is recognised that the current approach has not yet fully addressed some of the EA technical issues such as evaluation and analysis; the inclusion of socio-economic and sustainable development issues; and, choice of options

where the options have similar ranges of adverse issues. The communication paradigm approach does provide a framework within which these technical issues can be addressed and suggests the use of a 'problem' rather than a 'solution' orientated approach to these issues.

The understanding of the underlying principles of the EA process enables the logical development of the process to occur. When, for example, the EA legislation changes, the process can be adapted within the wider context of the environmental ethics, policy and decision-making theory. Minimum legislative requirements will be adopted, but higher standards will be used if these are considered to be good practice. Such changes may have knock-on effects on management procedures and EA outputs. The changes in information requirements, whether it be standards of information or a requirement to undertake a task in a more sensitive manner need to be communicated within the EA process. The communication paradigm is well adapted to accommodate such changes.

The principle threat to the use of EA systems is the in-effectiveness of the process to influence project decision-making in an environmentally sensitive manner. If EA is perceived to be just another hurdle that the developer has to jump over, it will eventually be marginalised as a fast-track task that covers all the minimum requirements in the most complex manner to ensure that the decision-makers will not understand or question the ES and the real decision-making will occur in the wider political context. However, if EA is used within a project management process and helps develop feasible solutions and takes account of environmental, economic and technical considerations, it will have a long term future. The EA process can become part of the integrated project management process, as used in the Midlands Region of the Environment Agency, where it can have an effective role to play in the development of future projects in an environmentally sustainable manner.

Future Use and Developments of the EA Process

This research project has led to development a number of new concepts. The new theoretical concept of the communications paradigm has been central to the search for ways in improving the effective and efficiency of the EA

process. In turn this has led to the development of a number of tools to fulfil these tasks, such as the EAP, the communications plan and the prescriptive format for EA outputs developed as 'model C'. Such tools will need to be refined over the coming years and will evolve as circumstances change. Other tools will need to be developed.

Some of the key areas for future EA development work will be based on the needs of the EA process identified by this research project, but because of the need to focus the research on the development of guidelines, there has not been the time to follow up on all these avenues of inquiry.

These areas for future study include:

- broadening the consideration of stakeholder (especially future generations) and their involvement in the EA process, which will include extending the development of valuation systems to further contribute to the decision-making process;
- providing guidelines as to which alternatives should be considered;
- considering the concept of irreversibility in the evaluation process;
- improving public participation;
- improving the effectiveness of the communication of information within the EA process, including using the work from the field of communication theory;
- integrating the EA process throughout the whole project life-cycle, through the development of procedures to use the EAP in the operational, maintenance and decommissioning stages of a project;
- improving the use of the EAP; and,
- using qualitative research techniques to further develop the EA process.

The communications paradigm is seen to be the key underlying concept of the EA process, however, it is accepted that there may be a need to re-interpret the paradigm for future audiences and contexts.

Research Project Summary

The research project set out to develop more effective and efficient procedures to ensure that environmental issues are taken into account in project development. The hypothesis was that:

> 'good practice guidelines using the communications paradigm provide for the implementation of the EA process in the most effective and efficient manner, for the benefit of the environment and the successful completion of the project'.

This hypothesis was tested by the development of guidelines based on the use of the communications paradigm for EA rather than the traditional technocratic approach. The EA process has been traditionally seen as an information analysis and evaluation process, without specifically defining how and when the information will be used as part of the process. The output of information has been seen as an end point rather than a starting point. It is essential to plan the EA process based on the needs of the end user which are to have information that is timely, pertinent and understandable to help make their decisions.

The research has also introduced the concept that there is not just one decision-making event at the approval stage, but many events where decisions need to be made. These other decisions will occur throughout the project life cycle, but the majority of them will normally occur during the planning, design and construction stages. For some projects the operations, maintenance and decommissioning phases will also need environmental information to assist decision-makers in making environmentally sound decisions.

The research has concentrated on developing and testing a good practice model for the implementation of the EA process using the communications paradigm. A number of tools have been developed as part of the research project to assist in implementing the tasks required by the communications paradigm. The most important of these is the Environmental Action Plan, which can be used in association with project assessments in managing the delivery of the environmental objectives. This concept has now been extended

to strategic environmental statements such the Severn-Vyrnwy Strategic Environmental Statement (Nicol *et al.*, 1997).

The outcomes of the first four research objectives (Chapter One) are shown in Figures 10.7, 10.8, 10.9, and 10.10, and the fifth objective to develop final recommendations for the good practice model has been discussed in the previous section of this chapter (Figure 10.6).

Figure 10.7 Key issues related to Objective One

Objective 1:	*To identify the initial model for good practice environmental assessment procedures*

Key issues:

a) Literature search led to the identification of re-occurring issues:

- i) EA to include 'cradle to grave' issues;
- ii) Public participation at all stages;
- iii) Scoping process involving public participation;
- iv) Reasonable alternatives evaluated;
- v) Appropriate evaluation techniques used;
- vi) Management of EA process after the decision-making stage of the project
- vii) Review and quality assurance system;
- viii) Monitoring of appropriate environmental indicators.
- ix) Good practice format for EA/ES reports (need - alternatives - baseline environment - assessment - mitigation);
- x) Documents to be readable, clear and concise;

b) Need for specific topics to be covered in EA/ES report

- i) Project Information
- ii) Site and Local Environment
- iii) Assessment of Effects
- iv) Mitigating Measures
- v) Accidents and Hazards
- vii) Environmental Action Plan

c) Importance of the communication of information to and from the various parties involved in the process

Figure 10.8 Key issues related to Objective Two

Objective 2: To identify the limitations of current practice in relation to the good practice model
Key Limitations of Earlier EA Practice: Information provided in inappropriate section of EA/ES report Lack of Maps Lack of Photographs General Lack of Baseline Date Information for: Recreation, Invertebrates, Geomorphology, Legal rights and Public safety Consultation with certain consultees Lack of alternatives and evaluation of 'do nothing' Effects: Energy Resources, Irreversibility, Site Investigation No quantitative magnitude or significance provided for effects Lack of descriptions of methodologies and definitions Lack of description of uncertainty and limitations Lack of monitoring programme Non-technical summaries - too long with no maps Lack of quality assurance systems

Figure 10.9 Key issues related to Objective Three

Objective 3: To refine the good practice model
Use of standardised: Procedural framework for the implementation of EA Model format for EA/ES reports Review System to check coverage and quality of EA outputs Environmental Action Plan

Figure 10.10 Review of Good Practice Model

(✓ = Objective achieved)

Objective 4: To review implementation of good practice model

a) fulfil the legal requirements ✓
b) fulfil the requirement of MAFF ✓
c) identify and evaluate the potential environmental effects of all the reasonable alternative options for the scheme ✓
d) recommend an environmentally preferred option ✓
e) English Nature and the Countryside Commission approval ✓
f) Mitigation of the adverse effects ✓
g) Consult with all stakeholders ✓
h) Ensure delivery and operation of the preferred option in an environmentally sensitive manner ✓
i) improve effectiveness of EA process ✓
j) improve efficiency of the EA process ✓
l) provide effective guidance for EA and project management staff for the implementation the above objectives ✓

EAP Issue Questions:

ϑ_1: Does the EAP clearly provide details of the essential environmental constraints on the project to all who read it, in a manner that is accessible and understandable? ✓
ϑ_2: Does the EAP effectively summarise the environmental constraints to enable the design team to understand and implement the constraints in the final design and contract documentation? ✓
ϑ_3 : Does the EAP explain in an accessible and believable fashion, how the environmental constraints are going to be implemented, and that these will be delivered? ✓
ϑ_4 : Does the EAP explain how post-ES/EA report changes would be assessed and approved? ✓
ϑ_5 : Were the objectives and targets for constraints and mitigation measures appropriate and sufficient for the post project appraisal process? ✓

The main problem identified was the lack of quality control of issues followed through from identification of effects to inclusion in EAP.

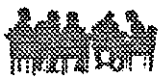
Research Conclusions

The conceptual elements of the EA process have included the needs of environmental ethics and values; the political decision-making processes; current legislation and policy; the communication of information for a range internal and external stakeholders and decision-makers; the links with technical and economic issues; and The Environmental Agency's project management systems.

Qualitative and quantitative research techniques have been used to develop the model through a number of iterative stages. Two case studies have been used to review and discuss the application of the EA model, resulting in the development of a final model and recommendations for future research work.

A number of innovative concepts have been developed; firstly the 'communication paradigm', whereby the principle feature of the EA process is considered to be the communication of information into and out of the process. This leads to the establishment of an effective framework for the EA process, resulting in the more effective influencing of project decision-making and implementation of projects on the ground. Secondly the thesis has developed the concept of 'Environmental Action Plans', which provide a focus and management tool for the effective delivery of environmental objective and constraints.

Whilst this thesis has concentrated on discussing EA for projects, the general concepts of EA discussed here can be also useful for the assessment of strategic policies, plans and programmes. It is suggested that the underlying principles are universally applicable to all types of EA.



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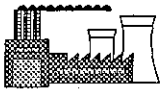

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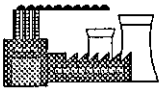
Appendices



NRA EA/ES REVIEW QUESTIONNAIRE

Project..... Ref. No. .....

EA/ES prepared by ..... Pub. Date .....

Reviewer's Name ..... Date .....

Starting Time (reading EA/ES) .....
Finishing Time (reading EA/ES) .....
Time taken .....

Starting Time (questionnaire) .....
Finishing Time (questionnaire) .....
Time taken .....

Notes for Reviewer

Please read through the EA/ES document and then complete the questionnaire below, with reference to the EA/ES document. Each section starts with a key question and then has a list of specific headings for you to review the EA/ES against.

Please tick one box per question.
The boxes - [][][][][][] - represent a rated scale response from 'very poor' through to 'excellent', ie.

[V.Poor][Poor][Unsatisfactory][Satisfactory][Good][Excellent]

These ratings are defined below, based on the Institute of Environmental Assessment Review Criteria.

Very poor:	important tasks poorly done or not attempted.
Poor:	significant omissions and in adequacies.
Unsatisfactory:	parts well attempted, but must as a whole be considered just unsatisfactory because of omissions and in adequacies.
Satisfactory:	despite omissions and inadequacies.
Good:	only minor omissions and inadequacies.
Excellent:	no task left incomplete.

If you wish to change your mind, please circle the incorrect ticked box and tick a new box.

Sections 3 and 4 have additional boxes to indicate whether you consider survey data or consultees were required, or not required. These are shown as tick boxes 'R' (required) and 'NR' (not required).

1.0 The Project

'Was sufficient data provided to enable a non-specialist to visualise the project?'

	Very Poor Excellent
1.1 Objectives	☐☐☐☐☐☐
1.2 Justifications	☐☐☐☐☐☐
1.3 Design, size, scale	☐☐☐☐☐☐
1.4 Visual impression of project	☐☐☐☐☐☐
1.5 Construction method	☐☐☐☐☐☐
1.6 Duration of construction	☐☐☐☐☐☐
1.7 Flood risks	☐☐☐☐☐☐
1.8 Link with other projects	☐☐☐☐☐☐

Comments

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2.0 Site and Local Environment

'Was sufficient data provided to enable a non-specialist to visualise the Site and Local Environment?'

	Very Poor Excellent
2.1 Maps of area directly affected	☐☐☐☐☐☐
2.2 Indication of area affected	☐☐☐☐☐☐
2.3 Photographs	☐☐☐☐☐☐
2.4 Adjacent land-use	☐☐☐☐☐☐
2.5 Site designations	☐☐☐☐☐☐
2.6 Local Plans	☐☐☐☐☐☐
2.7 Legal Rights	☐☐☐☐☐☐

Comments

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3.0 Baseline Conditions

'Were baseline surveys sufficient?'

or was [R] survey data required, but not provided?
[NR] survey data not required?

	Very Poor Excellent	R	NR
3.1 Search of existing data	☐☐☐☐☐☐	☐	☐
3.2 Recreation survey	☐☐☐☐☐☐	☐	☐
3.3 Aquatic species survey	☐☐☐☐☐☐	☐	☐
3.4 River corridor survey	☐☐☐☐☐☐	☐	☐
3.5 Terrestrial species survey	☐☐☐☐☐☐	☐	☐
3.6 Tree survey	☐☐☐☐☐☐	☐	☐
3.7 Conservation site designations	☐☐☐☐☐☐	☐	☐
3.8 Ecological survey	☐☐☐☐☐☐	☐	☐
3.9 Ornithological survey	☐☐☐☐☐☐	☐	☐
3.10 Fisheries survey	☐☐☐☐☐☐	☐	☐
3.11 Invertebrate survey	☐☐☐☐☐☐	☐	☐
3.12 Species list	☐☐☐☐☐☐	☐	☐
3.13 Rare species data check	☐☐☐☐☐☐	☐	☐
3.14 Water quality	☐☐☐☐☐☐	☐	☐
3.15 Water Flows	☐☐☐☐☐☐	☐	☐
3.16 Flood Flows and levels	☐☐☐☐☐☐	☐	☐
3.17 Biological survey	☐☐☐☐☐☐	☐	☐
3.18 Geomorphological survey	☐☐☐☐☐☐	☐	☐
3.19 Geology and soils survey	☐☐☐☐☐☐	☐	☐
3.20 Agricultural land-use survey	☐☐☐☐☐☐	☐	☐
3.21 Landscape assessment survey	☐☐☐☐☐☐	☐	☐
3.22 Archaeological survey	☐☐☐☐☐☐	☐	☐
3.23 Legal Rights survey	☐☐☐☐☐☐	☐	☐
3.24 Health and Safety survey	☐☐☐☐☐☐	☐	☐
3.25 Other survey	☐☐☐☐☐☐	☐	☐
3.26 Other survey	☐☐☐☐☐☐	☐	☐
3.27 Indication of uncertainty of data	☐☐☐☐☐☐	☐	☐
3.28 Indication of additional data required	☐☐☐☐☐☐	☐	☐

Comments

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4.0 Consultation

'Were the range of consultations undertaken sufficient?'

or was [R] consultation required, but not undertaken/recorded?
[NR] consultation not required?

	Very Poor Excellent	R	NR
4.1 English Nature/CCW	☐☐☐☐☐☐	☐	☐
4.2 Countryside Commission	☐☐☐☐☐☐	☐	☐
4.3 English Heritage/Cadw	☐☐☐☐☐☐	☐	☐
4.4 County Ecologist	☐☐☐☐☐☐	☐	☐
4.5 County Archaeologist	☐☐☐☐☐☐	☐	☐
4.6 Royal Comm. of Hist. Monuments	☐☐☐☐☐☐	☐	☐
4.7 Local Auth. County	☐☐☐☐☐☐	☐	☐
4.8 Local Auth. District	☐☐☐☐☐☐	☐	☐
4.9 Local Auth. Parish Council	☐☐☐☐☐☐	☐	☐
4.10 Local Auth. TPOs	☐☐☐☐☐☐	☐	☐
4.11 Local Auth. Listed Buildings	☐☐☐☐☐☐	☐	☐
4.12 Local Auth. Local Plans	☐☐☐☐☐☐	☐	☐
4.13 Local Auth. Highways	☐☐☐☐☐☐	☐	☐
4.14 Local Auth. Env. Health	☐☐☐☐☐☐	☐	☐
4.15 Local Auth. Other	☐☐☐☐☐☐	☐	☐
4.16 County Wildlife Trust	☐☐☐☐☐☐	☐	☐
4.17 RSPB	☐☐☐☐☐☐	☐	☐
4.18 British Trust for Ornithology	☐☐☐☐☐☐	☐	☐
4.19 Local Wildlife Groups	☐☐☐☐☐☐	☐	☐
4.20 Environmental Groups	☐☐☐☐☐☐	☐	☐
4.21 CPRE/W	☐☐☐☐☐☐	☐	☐
4.22 Angling Clubs	☐☐☐☐☐☐	☐	☐
4.23 Local User Groups	☐☐☐☐☐☐	☐	☐
4.24 Ramblers Association	☐☐☐☐☐☐	☐	☐
4.25 Nation Trust	☐☐☐☐☐☐	☐	☐
4.26 Navigation Authority	☐☐☐☐☐☐	☐	☐
4.27 Land owners	☐☐☐☐☐☐	☐	☐
4.28 Local residents	☐☐☐☐☐☐	☐	☐
4.29 Owners of Legal Rights	☐☐☐☐☐☐	☐	☐
4.30 Other	☐☐☐☐☐☐	☐	☐
4.31 NRA Area Flood Def. Ops	☐☐☐☐☐☐	☐	☐
4.32 NRA Area Flood Def.Tech Liais.	☐☐☐☐☐☐	☐	☐
4.33 NRA Area Environmental Quality	☐☐☐☐☐☐	☐	☐
4.34 NRA Area Biologist	☐☐☐☐☐☐	☐	☐
4.35 NRA Area Catchment Mgt	☐☐☐☐☐☐	☐	☐
4.36 NRA Area Planning Liaison	☐☐☐☐☐☐	☐	☐
4.37 NRA Area Fisheries	☐☐☐☐☐☐	☐	☐
4.38 NRA Area Conservation	☐☐☐☐☐☐	☐	☐
4.39 NRA Area Recreation and Nav.	☐☐☐☐☐☐	☐	☐
4.40 NRA Estates	☐☐☐☐☐☐	☐	☐

	Very Poor Excellent	R	NR
4.41 NRA Legal	☐☐☐☐☐☐	☐	☐
4.42 NRA Estates Terrier	☐☐☐☐☐☐	☐	☐
4.43 NRA Other	☐☐☐☐☐☐	☐	☐
4.44 NRA Other	☐☐☐☐☐☐	☐	☐
4.45 NRA Other	☐☐☐☐☐☐	☐	☐
4.46 Comments included in EA/ES	☐☐☐☐☐☐	☐	☐
4.47 Public Consultation	☐☐☐☐☐☐	☐	☐
4.48 Specific meetings held	☐☐☐☐☐☐	☐	☐
4.49 Public awareness of EA process	☐☐☐☐☐☐	☐	☐
4.50 Press releases	☐☐☐☐☐☐	☐	☐

Comments

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5.0 Impacts

'Were the full range of impacts sufficiently identified?'

	Very Poor Excellent
5.1 Key issues identified	☐☐☐☐☐☐
5.2 Effects of site investigation	☐☐☐☐☐☐
5.3 Effects of design, size, scale	☐☐☐☐☐☐
5.4 Effects of construction	☐☐☐☐☐☐
5.5 Effects of operation of project	☐☐☐☐☐☐
5.6 Effects of maintenance works	☐☐☐☐☐☐
5.7 Temporary effects	☐☐☐☐☐☐
5.8 Permanent effects	☐☐☐☐☐☐
5.9 Direct effects	☐☐☐☐☐☐
5.10 In-direct effects	☐☐☐☐☐☐
5.11 Cumulative effects	☐☐☐☐☐☐
5.12 Short term effects	☐☐☐☐☐☐
5.13 Long term effects	☐☐☐☐☐☐
5.14 Uncertainty of prediction	☐☐☐☐☐☐
5.15 Explanation of methodologies	☐☐☐☐☐☐
5.16 Checklists used	☐☐☐☐☐☐
5.17 Use of Matrices	☐☐☐☐☐☐
5.18 Conflicting impacts	☐☐☐☐☐☐
5.19 Beneficial effects covered	☐☐☐☐☐☐
5.20 Adverse effects covered	☐☐☐☐☐☐
5.21 Safety implications	☐☐☐☐☐☐
5.22 Energy Resources	☐☐☐☐☐☐
5.23 Material Resources	☐☐☐☐☐☐
5.24 Reversibility	☐☐☐☐☐☐

Comments

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6.0 Impact Prediction, Magnitude and Significance

'Were the indications of the likely magnitude and potential severity of the impacts sufficient?'

	Very Poor Excellent
6.1 Magnitudes	☐☐☐☐☐☐
6.2 Significance	☐☐☐☐☐☐
6.3 Reference to quality standards	☐☐☐☐☐☐
6.4 Ranges of uncertainty stated	☐☐☐☐☐☐
6.5 Subjective statements minimised	☐☐☐☐☐☐

Comments

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7.0 Alternatives

'Were all reasonable alternatives identified, assessed and their rejection justified sufficiently?'

	Very Poor Excellent
7.1 All alternatives identified	☐☐☐☐☐☐
7.2 'Do Nothing' option considered	☐☐☐☐☐☐
7.3 Alternative locations considered	☐☐☐☐☐☐
7.4 Alternative designs considered	☐☐☐☐☐☐
7.5 Valid rejection reasons	☐☐☐☐☐☐

Comments

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8.0 Mitigation Measures

'Were all adverse effects mitigated and is the justification for any which are not sufficient?'

	Very Poor Excellent
8.1 Mitigation measures relevant	☐☐☐☐☐☐
8.2 Effectiveness of mitigation	☐☐☐☐☐☐
8.3 Details of implementation	☐☐☐☐☐☐
8.4 Commitment to implementation	☐☐☐☐☐☐
8.5 Impact of mitigation assessed	☐☐☐☐☐☐

Comments

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9.0 Enhancement

'Were the enhancement measures proposed sufficient?'

	Very Poor	Excellent
9.1 Enhancement measures relevant	☐☐☐☐☐☐	
9.2 Effectiveness of enhancement	☐☐☐☐☐☐	
9.3 Details of implementation	☐☐☐☐☐☐	
9.4 Commitment to implementation	☐☐☐☐☐☐	
9.5 Impact of enhancement assessed	☐☐☐☐☐☐	

Comments

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10.0 Monitoring Programme

'Is the monitoring programme planned sufficient to ensure that the issues covered in the EA/ES will be implemented?'

	Very Poor	Excellent
10.1 Pre-start survey	☐☐☐☐☐☐	
10.2 Comprehensive programme	☐☐☐☐☐☐	
10.3 Brief for EA Monitoring Officer	☐☐☐☐☐☐	
10.4 Commitment to implementation	☐☐☐☐☐☐	
10.5 Planned liaison with third parties	☐☐☐☐☐☐	
10.6 Post-project EA appraisal planned	☐☐☐☐☐☐	
10.7 EA quality assurance system	☐☐☐☐☐☐	
10.8 EA on progress meeting agenda	☐☐☐☐☐☐	
10.9 Environmental Action Plan provided	☐☐☐☐☐☐	
10.10 Construction work monitoring	☐☐☐☐☐☐	
10.11 Liaison programme landowner etc.	☐☐☐☐☐☐	

Comments

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11.0 EA/ES Layout and Presentation

'Is the layout sufficiently clear and logical?'

	Very Poor	Excellent
11.1 List of contents	☐☐☐☐☐☐	
11.2 Clear introduction	☐☐☐☐☐☐	
11.3 Non-Technical summary	☐☐☐☐☐☐	
11.4 Technical terms and initials	☐☐☐☐☐☐	
11.5 References quoted	☐☐☐☐☐☐	

	Very Poor	Excellent
11.6 Index	☐☐☐☐☐☐	
11.7 Integrated document	☐☐☐☐☐☐	
11.8 Logical layout	☐☐☐☐☐☐	
11.9 Paragraph numbering	☐☐☐☐☐☐	
11.10 Ease of cross references	☐☐☐☐☐☐	
11.11 Impacts separated logically	☐☐☐☐☐☐	
11.12 Impacts and mitigation linked	☐☐☐☐☐☐	
11.13 Maps and diagrams clear	☐☐☐☐☐☐	
11.14 Photographs	☐☐☐☐☐☐	
11.15 Appendices used	☐☐☐☐☐☐	

Comments

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12.0 Emphasis

'Is the EA/ES a sufficiently un-biased document?'

	Very Poor	Excellent
12.1 Presentation of adverse impacts	☐☐☐☐☐☐	
12.2 Prediction of uncertainty	☐☐☐☐☐☐	
12.3 'Unknowns' stated	☐☐☐☐☐☐	
12.4 Lack of bias	☐☐☐☐☐☐	

Comments

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13.0 Key EA/ES Issues

'What do you as the reviewer consider to be the five key issues of this EA/ES, list them below. How are they handed in this EA/ES?'

	Very Poor	Excellent
13.1	☐☐☐☐☐☐	
13.2	☐☐☐☐☐☐	
13.3	☐☐☐☐☐☐	
13.4	☐☐☐☐☐☐	
13.5	☐☐☐☐☐☐	

14.0 Overall Impression of EA/ES

Reviewer's other comments (if any)

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	Very Poor	Excellent
Readability	☐☐☐☐☐☐	
Overall impression of EA/ES	☐☐☐☐☐☐	

Appendix Table 1 Spreadsheet Data from Review of 14 ESs

CRITERIA	PROJECTS I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	Mean
PROJECT															
1.01 Objectives	2.00	2.33	2.00	1.67	1.67	1.00	1.67	2.00	1.67	2.00	1.67	2.00	1.33	1.67	1.76
1.02 Justification	2.67	2.33	2.00	1.67	1.67	1.33	1.33	2.00	1.67	2.67	1.67	2.67	2.00	1.67	1.95
1.03 Design	2.67	2.33	2.67	2.00	2.33	2.00	2.00	2.00	2.00	2.67	2.00	2.33	2.00	2.00	2.21
1.04 Visual Imp	2.33	3.00	2.00	1.33	2.33	2.00	1.67	2.67	2.00	2.67	3.00	3.00	2.67	2.67	2.38
1.05 Construction	2.67	2.33	3.33	2.33	2.00	1.67	2.67	2.00	2.33	2.33	2.33	2.67	2.33	2.00	2.36
1.06 Duration	2.33	6.00	2.33	2.33	2.33	2.00	2.00	3.00	2.00	2.33	2.00	4.00	2.00	2.00	2.62
1.07 Flood Risks	2.67	4.33	3.00	2.00	1.67	1.33	3.00	3.33	2.00	2.67	2.67	3.33	2.33	2.67	2.64
1.08 Links	2.67	5.33	2.67	1.33	4.33	2.00	4.33	5.00	4.00	2.67	2.67	2.67	3.33	2.33	3.24
SITE AND LOCAL ENVIRONMENT															
2.01 Maps	2.00	2.33	1.33	1.33	2.00	1.67	2.67	1.33	2.00	2.00	2.33	2.33	2.00	2.33	1.98
2.02 Area affected	2.00	1.67	1.33	1.33	2.00	1.67	2.33	1.33	2.00	1.67	2.33	2.00	2.00	3.00	1.90
2.03 Photos	2.00	6.00	1.67	6.00	2.67	1.67	3.00	2.67	2.67	2.33	2.33	4.00	3.00	6.00	3.29
2.04 Adj Landuse	1.67	2.33	1.67	2.00	2.33	1.67	2.00	2.67	3.00	2.33	3.00	2.67	2.67	2.33	2.31
2.05 Site Designations	1.67	2.00	1.67	1.67	2.00	1.67	1.33	1.67	2.33	2.67	2.33	2.33	2.67	2.33	2.02
2.06 Local Plans	2.00	1.67	1.67	1.67	3.00	1.67	1.33	2.00	2.67	3.00	2.67	2.67	4.67	2.67	2.38
2.07 Legal Rights	2.33	4.00	3.67	3.33	3.00	2.00	4.00	4.33	2.67	5.33	2.67	3.67	5.33	4.00	3.60
BASELINE CONDITIONS															
3.01 Search of existing data	2.67	2.00	2.00	2.33	1.33	1.67	1.67	2.33	2.67	2.67	2.33	2.00	1.67	3.00	2.17
3.02 Recreation survey	3.00	4.67	2.67	3.67	3.00	2.00	2.67	3.00	2.33	5.00	3.33	4.00	1.67	3.33	3.17
3.03 Aquatic spp	2.33	2.00	1.67	2.33	1.33	2.33	3.00	2.33	2.67	5.33	2.00	1.67	3.00	3.33	2.52
3.04 River Corridor	1.67	1.67	1.67	3.33	1.33	2.00	4.33	2.33	3.67	4.67	2.67	1.00	1.00	1.33	2.33
3.05 Terrestrial	2.00	2.67	2.33	2.33	1.33	3.67	1.67	4.33	2.67	5.33	2.33	2.00	1.67	2.67	2.64
3.06 Tree	2.67	2.67	2.33	2.00	3.00	3.00	3.00	2.67	3.00	2.00	3.67	2.67	2.33	3.00	2.71
3.07 Cons site designations	2.00	2.33	2.00	2.00	2.00	1.67	1.33	2.33	2.00	2.33	2.33	3.67	1.67	2.33	2.14
3.08 Ecological	1.67	2.33	2.00	2.00	2.33	1.67	2.33	3.00	2.67	4.00	2.00	2.33	1.67	3.33	2.38
3.09 Ornithological	2.67	2.00	2.33	2.67	1.33	4.00	1.67	2.67	3.33	4.33	1.67	2.00	1.33	2.00	2.43
3.10 Fisheries	2.00	1.67	1.67	3.67	1.67	2.33	3.33	2.33	2.67	4.00	1.67	3.67	2.00	3.00	2.55
3.11 Invertebrates	3.33	3.33	2.33	5.00	3.33	3.67	2.67	3.33	3.00	4.33	2.00	4.00	3.00	2.67	3.29
3.12 Spp list	3.00	3.00	2.67	5.33	1.67	2.33	3.33	2.67	2.67	4.33	5.33	2.00	2.00	3.33	3.12
3.13 Rare spp	2.67	3.67	2.67	5.33	1.67	2.67	1.33	4.33	2.33	4.33	1.67	3.67	2.00	3.67	3.00
3.14 Water Quality	2.67	2.33	2.67	3.67	1.67	1.67	2.00	2.00	2.67	4.67	2.33	2.00	2.00	2.67	2.50
3.15 Water flows	2.33	4.33	2.67	3.67	2.00	2.00	3.33	3.00	2.67	2.67	2.00	3.00	1.67	2.67	2.71
3.16 Flood flows	2.33	4.33	2.67	3.33	2.33	2.00	3.33	3.00	3.00	2.67	2.67	3.00	1.67	3.33	2.83
3.17 Biological	2.33	2.67	2.33	3.67	2.00	1.67	2.00	2.00	2.67	5.00	2.00	2.00	2.00	3.33	2.55
3.18 Geomorphology	2.67	4.67	3.67	4.33	2.67	3.00	3.33	2.33	3.67	4.33	2.00	4.00	1.33	2.67	3.19
3.19 Geology and soils	2.33	4.00	2.67	1.67	2.67	2.33	3.00	2.00	4.00	4.33	1.67	3.00	1.67	3.33	2.76
3.20 Ag Landuse	1.67	1.33	1.67	2.00	2.33	1.33	2.00	2.00	2.67	2.33	2.33	2.67	2.33	3.67	2.17
3.21 Landscape Assessment	2.00	2.67	2.00	2.00	3.67	2.67	2.00	2.00	2.67	2.33	2.33	2.67	2.67	4.67	2.60
3.22 Archaeological	3.00	2.33	3.00	2.00	2.67	2.33	3.00	2.00	2.67	2.33	2.33	2.33	2.33	4.00	2.60
3.23 Legal Rights	2.67	4.33	4.00	3.33	3.00	2.33	4.33	2.00	3.00	2.33	2.33	3.00	4.00	4.33	3.21

Appendix Table 2 Spreadsheet Data from Review of 14 ESs

CRITERIA	PROJECTS I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	Mean
3.24 H & S	4.00	4.33	2.67	3.67	4.33	2.67	2.00	3.33	2.67	3.33	3.67	2.67	3.67	6.00	3.50
3.25 Other survey	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
3.26 Other survey	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
3.27 Uncertainty of data	2.67	4.33	4.00	3.00	3.00	2.67	4.33	2.67	2.67	4.00	3.00	4.33	1.67	3.33	3.26
3.28 Additional data	2.67	4.67	4.00	3.33	2.67	2.00	4.67	3.33	4.00	3.67	3.00	4.67	2.00	3.67	3.45
CONSULTATION															
4.01 EN/CCW	2.67	1.67	2.33	2.00	1.67	2.33	1.67	2.00	3.00	2.67	3.67	2.67	1.33	2.33	2.29
4.02 Countryside Commission	2.67	1.67	2.33	2.00	2.00	2.67	6.00	2.00	4.33	2.67	3.33	3.33	2.00	2.67	2.83
4.03 English Heritage/Cadw	2.67	4.33	1.67	2.00	2.67	4.33	4.33	2.67	4.33	2.67	4.33	2.67	2.67	4.33	3.26
4.04 County Ecologist	2.00	4.33	4.33	4.33	4.33	3.33	3.33	2.00	4.33	3.33	3.00	6.00	4.33	6.00	3.93
4.05 County Archaeologist	3.33	3.33	2.00	3.33	4.67	2.33	1.67	2.00	4.33	2.00	2.00	3.00	2.67	2.00	2.76
4.06 Royal Comm. of Historic Mon.	2.67	4.33	3.33	4.33	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.95
4.07 Local Auth. County Council	3.00	2.67	2.33	2.00	4.67	1.67	2.33	3.33	4.33	2.00	3.00	2.67	4.33	3.67	3.00
4.08 Local Auth. District Council	1.67	1.67	2.00	1.67	4.33	2.33	2.33	2.00	2.67	2.00	4.33	2.67	2.00	2.67	2.45
4.09 Local Auth. Parish Council	1.67	4.33	2.00	2.67	2.67	2.67	1.67	2.67	2.67	2.67	3.00	2.67	4.33	2.00	2.69
4.10 Local Auth. TPOs	2.33	2.00	1.67	1.67	2.67	2.33	1.33	2.00	2.33	1.67	1.67	1.67	4.33	5.00	2.33
4.11 Local Auth. Listed Buildings	1.67	1.33	1.67	1.33	2.67	2.33	1.67	2.00	2.00	2.00	3.00	3.33	3.00	1.67	2.12
4.12 Local Auth. Local Plans	1.67	1.33	2.33	1.33	4.33	2.33	1.33	2.00	2.00	2.00	2.00	2.67	4.33	2.33	2.29
4.13 Local Auth. Highways	3.00	3.67	2.33	3.00	4.33	3.33	2.33	1.67	3.00	2.67	2.33	2.33	3.67	2.00	2.83
4.14 Local Auth. Env. Health	2.67	3.67	2.00	3.67	4.33	3.33	2.33	2.00	4.33	2.67	3.67	4.33	3.67	3.67	3.31
4.15 Local Auth. Other	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.67	1.00	1.00	1.00	1.05
4.16 County Wildlife Trust	2.00	4.33	2.33	2.00	2.00	2.00	1.67	2.00	2.00	2.00	3.00	4.33	2.00	3.67	2.52
4.17 RSPB	4.33	2.67	3.33	2.00	1.67	2.33	1.67	4.33	3.67	2.67	4.67	4.00	1.33	2.67	2.95
4.18 BTO	4.00	2.67	1.67	2.67	1.33	2.67	1.67	4.33	4.33	2.67	4.67	2.67	4.33	4.33	3.14
4.19 Local Wildlife Groups	1.67	3.33	2.00	1.67	1.67	2.33	2.00	1.00	4.33	1.00	4.33	1.67	2.67	5.00	2.48
4.20 Env Groups	1.00	1.00	3.00	2.00	1.00	1.67	1.00	1.67	3.33	1.00	4.33	1.67	1.00	1.00	1.76
4.21 CPRE/CPRW	4.33	2.67	1.67	2.00	2.67	1.00	2.67	2.67	4.33	2.67	4.33	2.67	2.67	4.33	2.90
4.22 Angling Clubs	4.00	1.00	3.33	2.67	6.00	6.00	2.00	2.00	2.00	2.67	6.00	2.67	2.67	1.00	3.14
4.23 Local User Groups	4.00	1.00	1.67	1.67	4.33	4.33	2.67	1.67	2.00	1.00	4.33	3.33	3.33	1.67	2.64
4.24 Ramblers Assn	5.67	3.33	2.00	1.00	6.00	2.67	4.33	1.00	2.00	1.00	6.00	4.33	2.67	4.33	3.31
4.25 National Trust	1.00	1.00	1.00	1.00	2.67	1.00	1.00	1.00	1.00	1.00	2.67	1.00	1.00	1.00	1.24
4.26 Navigation Authority	3.67	1.00	1.33	2.00	1.00	1.00	2.33	2.00	2.00	1.00	2.67	1.00	1.00	1.00	1.64
4.27 Land Owners	3.33	4.33	1.33	1.67	3.67	3.67	4.33	4.00	4.00	2.00	3.33	3.33	4.33	2.33	3.26
4.28 Local Residents	4.67	6.00	3.33	2.00	4.00	6.00	4.33	4.33	6.00	3.00	3.33	4.33	3.33	3.00	4.12
4.29 Owners of Legal Rights	3.67	4.33	1.33	1.67	2.33	5.00	3.33	3.67	2.67	3.33	2.33	4.33	4.33	3.67	3.29
4.30 Other	1.00	1.00	1.33	1.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.07
4.31 NRA Area FD Ops	3.33	6.00	1.67	6.00	4.67	2.33	4.33	2.00	4.33	4.33	4.33	3.33	4.33	5.67	4.05
4.32 NRA Area FD Tech Liaison	3.33	4.33	1.67	6.00	4.67	2.33	4.33	2.33	4.33	4.33	4.33	4.33	4.33	5.67	4.02
4.33 NRA Area EQ	1.67	3.00	2.00	5.00	6.00	2.00	5.00	2.33	2.33	2.67	3.00	3.33	4.33	4.33	3.36
4.34 NRA Area Biologist	4.33	1.33	4.67	6.00	6.00	2.00	5.00	2.00	6.00	6.00	1.33	5.00	4.33	4.33	4.17
4.35 NRA Area Catchment Mgt	3.00	4.33	1.67	6.00	6.00	2.33	6.00	1.33	5.00	4.33	1.67	4.33	4.33	4.33	3.90
4.36 NRA Area Planning Liaison	2.67	3.00	4.67	6.00	4.33	4.33	6.00	2.67	5.00	4.33	4.33	4.33	4.33	5.33	4.38
4.37 NRA Area Fisheries	1.67	1.33	2.00	5.00	4.67	3.00	5.00	2.00	5.00	2.00	3.33	2.33	3.00	5.33	3.26
4.38 NRA Area Conservation	1.67	1.33	2.00	5.00	4.67	3.00	5.00	2.00	3.33	2.67	2.00	2.33	3.00	2.33	2.88

Appendix Table 3 Spreadsheet Data from Review of 14 ESs

CRITERIA	PROJECTS I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	Mean
4.39 *NRA Area Rec and Nav*	2.00	3.00	1.67	5.00	5.00	6.00	5.00	2.00	3.33	3.33	2.00	3.33	4.33	4.67	3.62
4.40 NRA Estates	1.67	4.33	1.67	6.00	5.00	2.67	4.33	2.00	4.33	4.33	3.00	4.33	4.33	4.33	3.74
4.41 NRA Legal	2.67	4.33	3.00	6.00	4.33	4.33	4.33	1.67	4.33	4.33	4.33	4.33	4.33	4.33	4.05
4.42 NRA Estates Terrier	2.67	2.67	4.33	6.00	4.33	2.67	4.33	2.67	2.67	2.67	2.67	4.33	2.67	2.67	3.38
4.43 NRA Other	1.00	1.00	2.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.33	1.00	1.00	1.14
4.44 NRA Other	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
4.45 NRA Other	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
4.46 Comments in ES	5.00	3.67	2.00	2.33	6.00	3.00	5.00	2.00	4.33	4.00	3.00	3.67	2.00	3.33	3.52
4.47 *Public Consultation*	6.00	6.00	5.33	1.67	6.00	6.00	6.00	2.67	6.00	5.67	6.00	4.33	2.67	4.67	4.93
4.48 Specific meetings held	4.33	4.33	4.33	1.33	6.00	6.00	6.00	2.67	4.33	4.33	4.33	6.00	2.67	6.00	4.48
4.49 Public Awareness of EA	6.00	6.00	3.67	1.67	6.00	6.00	6.00	6.00	6.00	4.33	6.00	4.33	2.67	5.33	5.00
4.50 Press Releases	4.33	6.00	3.67	4.67	6.00	6.00	6.00	6.00	6.00	4.33	6.00	5.00	6.00	6.00	5.43
IMPACTS															
5.01 Key issues identified	1.67	1.67	2.33	1.67	1.67	1.33	2.33	2.00	1.67	2.00	2.00	2.33	2.00	2.33	1.93
5.02 Effects of site investigation	3.33	4.00	3.00	3.33	2.33	2.33	3.67	3.67	2.33	3.67	2.67	3.67	3.67	4.00	3.26
5.03 Effects of design, size, scale	2.33	2.33	2.67	1.67	2.00	1.67	2.00	2.00	2.00	2.00	2.33	3.00	2.33	2.33	2.19
5.04 Effects of construction	2.00	2.33	3.00	2.33	1.67	1.67	2.00	2.00	1.67	1.67	2.00	2.67	2.33	2.33	2.12
5.05 Effects of operation	2.00	2.33	3.00	1.67	1.67	1.67	1.67	1.67	1.67	2.33	2.00	2.67	2.33	2.00	2.05
5.06 Effects of maintenance	2.67	5.33	2.67	3.00	1.67	2.67	3.00	2.33	3.00	3.33	2.33	3.67	3.33	2.33	2.95
5.07 Temporary effects	2.33	2.00	2.67	1.67	1.67	1.33	2.00	2.00	2.00	2.00	2.00	2.67	1.67	2.00	2.00
5.08 Permanent effects	2.33	2.00	3.00	1.67	1.67	1.33	1.67	2.00	2.00	2.33	2.00	2.67	1.67	2.00	2.02
5.09 Direct effects	2.00	2.33	2.67	1.67	1.67	1.33	2.00	2.00	2.00	2.00	2.00	2.67	1.67	2.00	2.00
5.10 In-direct effects	2.33	2.33	2.67	2.00	1.67	1.33	2.33	2.33	2.00	2.33	2.00	2.67	1.67	3.00	2.19
5.11 Cumulative effects	2.00	3.00	3.33	2.00	2.67	2.00	3.00	2.33	2.33	3.00	2.00	2.67	2.67	3.33	2.60
5.12 Short term effects	2.00	2.33	2.67	1.67	1.67	1.33	2.33	2.33	2.00	2.00	2.00	2.33	1.67	2.00	2.02
5.13 Long term effects	1.67	1.67	2.33	1.67	1.67	1.67	2.33	2.33	2.00	3.00	2.00	2.33	1.67	2.00	2.02
5.14 Uncertainty of prediction	2.33	3.33	3.00	3.00	3.00	2.00	3.33	3.00	3.33	3.33	3.00	3.00	2.33	3.00	2.93
5.15 Explanation of methodologies	3.33	3.67	2.33	3.33	3.33	2.67	3.00	2.33	2.67	4.00	2.67	2.67	3.00	3.33	3.02
5.16 Checklists used	3.33	3.33	3.00	4.00	4.00	3.33	2.67	2.00	3.67	4.33	2.67	3.33	6.00	2.67	3.45
5.17 Use of matrices	3.67	2.33	3.00	2.33	3.00	2.33	3.33	2.33	4.00	4.33	2.33	2.33	1.67	4.33	2.95
5.18 *Conflicting impacts*	3.33	2.33	3.00	2.33	2.67	3.00	3.67	3.00	3.33	4.33	2.67	3.67	2.67	3.67	3.12
5.19 Beneficial effects	2.00	2.00	2.00	1.67	1.67	1.67	1.33	2.33	2.00	2.33	2.00	2.33	2.00	1.67	1.93
5.20 Adverse effects	1.67	1.67	3.00	1.33	2.00	1.67	1.67	2.00	2.00	2.00	2.00	2.33	2.67	2.00	2.00
5.21 Safety Implications	4.33	5.33	2.33	3.33	3.67	2.67	3.67	2.33	2.67	2.67	2.33	2.67	2.67	4.67	3.24
5.22 Energy Resources	5.00	5.33	4.00	4.00	4.00	3.67	5.00	2.67	3.67	4.33	3.67	3.67	4.00	5.33	4.17
5.23 Material Resources	3.67	3.67	3.67	3.67	2.33	2.67	4.67	2.33	3.33	3.00	2.33	2.33	2.00	2.33	3.00
5.24 Reversibility	5.00	3.67	4.00	3.67	4.00	4.00	2.67	3.00	6.00	3.33	4.33	3.67	5.00	4.33	4.05
IMPACT PREDICTION, MAGNITUDE & SIGNIFICANCE															
6.01 Magnitudes	2.33	2.67	2.33	2.00	2.33	2.33	2.67	2.33	2.67	3.00	2.33	3.00	2.33	2.33	2.48
6.02 Significance	2.67	2.00	2.67	2.00	2.33	2.33	2.67	2.33	3.00	3.00	2.00	2.67	2.67	2.67	2.50
6.03 Reference to quality standards	3.00	3.33	3.00	3.33	4.00	3.00	4.00	2.33	3.33	6.00	2.67	3.33	3.67	4.33	3.52

Appendix Table 4 Spreadsheet Data from Review of 14 ESs

CRITERIA	PROJECTS I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	Mean
6.04 Ranges of uncertainty stated	3.00	3.33	3.33	3.33	3.67	3.00	3.00	3.00	3.33	3.67	3.00	3.67	2.67	4.33	3.31
6.05 Subjective statements minimised	2.00	2.00	2.67	2.33	3.00	2.00	2.67	2.00	2.33	3.00	2.00	2.67	2.33	2.67	2.40
ALTERNATIVES															
7.01 All alternatives identified	2.67	2.67	2.67	3.00	1.33	1.67	3.00	2.67	2.33	3.67	1.67	3.33	2.00	1.33	2.43
7.02 Do Nothing considered	2.67	2.33	2.33	3.00	1.33	1.67	2.00	2.00	2.33	5.33	2.33	3.67	2.33	1.33	2.48
7.03 Alternative locations considered	3.00	2.67	2.67	3.00	1.33	1.33	2.67	2.00	3.67	3.00	2.33	3.00	4.33	1.67	2.62
7.04 Alternative designs considered	3.00	2.67	2.67	3.00	1.33	1.33	4.00	2.67	3.33	2.33	2.33	2.33	2.67	1.67	2.52
7.05 Valid rejection reasons	2.67	2.67	2.67	3.00	1.67	2.33	4.00	2.33	3.33	2.33	2.33	2.67	3.00	2.33	2.67
MITIGATION MEASURES															
8.01 Mitigation measures relevant	2.33	1.67	2.00	1.67	2.00	2.67	2.33	2.33	2.33	3.67	2.00	3.00	2.67	2.67	2.38
8.02 Effectiveness of mitigation	2.33	2.00	2.33	2.00	2.00	3.00	2.67	2.33	2.33	4.33	2.33	3.00	3.00	2.67	2.60
8.03 Details of implementation	2.67	3.00	2.00	2.33	3.00	2.33	2.67	2.67	2.67	4.33	2.33	2.67	3.00	3.00	2.76
8.04 Commitment to implementation	2.33	3.33	2.33	1.67	3.00	2.00	2.33	2.33	2.33	4.00	2.33	2.67	3.33	2.67	2.62
8.05 Impact of mitigation assessed	3.00	3.33	2.33	4.00	3.67	3.00	3.00	2.33	3.67	5.33	2.67	3.33	3.33	4.00	3.36
ENHANCEMENT															
9.01 Enhancement measures relevant	2.67	2.00	2.67	2.33	2.33	2.00	2.67	2.33	2.33	3.00	2.33	2.67	3.00	3.00	2.52
9.02 Effectiveness of enhancements	2.67	2.00	2.67	2.33	2.67	2.67	2.67	2.33	2.33	3.67	2.33	2.33	3.00	3.33	2.64
9.03 Details of implementation	3.00	3.33	2.67	2.67	3.00	2.00	2.67	2.33	2.67	3.00	2.67	2.67	3.67	3.33	2.83
9.04 Commitment to implementation	2.67	3.00	3.33	2.67	3.00	2.00	2.67	2.33	2.67	3.67	2.33	3.00	3.67	3.33	2.88
9.05 Impact of enhancement assessed	3.33	3.67	3.33	4.00	3.33	2.67	3.33	2.33	4.00	4.67	2.67	3.67	3.67	4.33	3.50
MONITORING PROGRAMME															
10.01 Pre-start survey	3.67	4.67	3.33	1.67	3.67	2.33	2.00	2.00	3.33	4.00	1.67	1.67	2.33	2.33	2.76
10.02 Comprehensive programme	3.67	4.67	3.67	1.67	2.67	2.33	2.67	2.33	2.67	4.33	2.33	2.33	3.33	3.33	3.00
10.03 Brief for EA monitoring officer	4.00	4.67	4.00	2.33	2.00	2.33	5.33	2.00	3.33	5.00	2.67	2.33	3.33	4.33	3.40
10.04 Commitment to implementation	3.67	4.67	3.67	2.33	2.33	2.33	2.33	2.00	2.67	4.67	2.00	2.00	3.33	3.00	2.93
10.05 Planned liaison with third parties	4.00	4.33	4.00	1.67	1.67	3.00	1.67	2.33	2.67	4.67	2.00	2.33	3.00	3.33	2.90
10.06 Post-project appraisal planned	4.33	5.33	4.00	1.33	4.00	3.00	2.33	2.00	4.00	5.33	2.00	3.00	2.67	3.33	3.33
10.07 EA QA system	3.67	5.33	4.00	3.33	3.67	4.00	3.67	2.00	3.67	5.00	2.67	2.67	3.67	4.33	3.69
10.08 EA on progress meeting agenda	4.33	5.00	3.67	3.00	4.00	4.00	6.00	2.00	5.00	5.00	3.33	2.67	4.00	3.67	3.98
10.09 EAP provided	6.00	6.00	5.33	4.00	5.00	3.33	6.00	2.00	5.67	5.00	5.00	3.00	5.33	5.33	4.79
10.10 Construction work monitoring	3.33	4.33	2.67	1.67	2.00	2.67	2.33	2.33	2.33	3.33	2.00	2.33	3.00	2.33	2.62
10.11 Liaison programme	5.00	4.33	3.67	3.00	1.67	3.33	4.00	2.33	3.00	4.67	2.33	2.67	4.00	2.67	3.33
EA/ES LAYOUT AND PRESENTATION															
11.01 List of contents	2.33	2.33	1.67	2.00	3.00	1.33	1.33	2.00	3.00	2.33	3.33	1.67	2.33	1.67	2.17

Appendix Table 5 Spreadsheet Data from Review of 14 ESs

CRITERIA	PROJECTS I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	Mean
11.02 Clear introduction	2.00	2.33	1.67	1.67	2.67	2.33	1.67	2.00	1.33	3.00	2.33	2.00	2.00	2.00	2.07
11.03 Non-technical summary	2.33	3.33	2.00	1.67	3.00	2.33	1.33	6.00	1.67	6.00	4.00	2.33	2.33	1.67	2.86
11.04 Technical terms and initials	2.33	2.67	2.67	3.00	3.33	2.00	1.67	2.00	1.67	3.00	2.67	2.33	2.67	2.33	2.45
11.05 References quoted	2.67	3.00	1.67	3.00	1.67	3.33	2.67	2.33	3.33	4.00	2.67	2.67	2.00	2.67	2.69
11.06 Index	4.33	4.67	3.67	4.33	4.33	3.67	4.33	3.67	4.33	4.33	4.33	3.67	3.67	4.33	4.12
11.07 Integrated document	2.33	3.00	2.33	2.33	2.33	2.00	2.00	2.00	2.33	3.67	2.33	2.67	2.33	2.67	2.45
11.08 Logical layout	2.33	4.00	2.33	2.00	2.33	2.00	2.33	2.00	2.00	3.67	2.00	2.67	3.33	2.00	2.50
11.09 Paragraph numbering	2.00	1.00	3.00	1.33	2.00	2.00	3.67	2.00	1.67	2.33	1.67	1.33	1.33	1.67	1.93
11.10 Ease of cross reference	2.67	4.00	3.33	2.33	2.67	2.33	2.33	2.00	2.00	3.33	2.67	2.33	2.00	1.67	2.55
11.11 Impacts separated logically	2.33	2.00	2.67	2.00	2.00	2.00	2.00	2.33	2.00	3.00	2.00	2.00	2.00	1.67	2.14
11.12 Impacts and mitigation linked	2.00	2.00	3.33	1.67	2.33	2.00	2.00	2.33	2.00	2.33	2.33	2.00	2.67	2.00	2.21
11.13 Maps and diagrams clear	2.00	3.33	1.67	1.33	3.00	1.67	2.67	2.00	2.00	2.00	2.67	2.33	2.33	2.67	2.26
11.14 Photographs	2.00	6.00	1.33	6.00	2.67	1.67	2.67	2.00	3.33	2.67	3.33	4.00	3.00	6.00	3.33
11.15 Appendices used	1.67	2.67	2.00	1.33	2.67	1.67	2.00	2.33	2.67	2.00	3.00	2.00	2.00	2.33	2.17
EMPHASIS															
12.01 Presentation of adverse impacts	1.67	2.33	2.67	1.33	1.33	1.67	1.67	2.00	2.33	2.67	2.00	2.33	2.67	2.33	2.07
12.02 Prediction of uncertainty	2.67	3.00	2.67	3.00	2.67	2.67	4.33	2.33	3.33	3.33	3.33	2.67	2.00	3.33	2.95
12.03 Unknowns' stated	3.33	3.00	2.33	2.67	2.33	2.33	4.33	2.33	3.00	3.67	3.00	3.00	2.33	3.00	2.90
12.04 Lack of bias	2.00	1.67	2.00	1.67	1.67	2.00	1.67	2.00	2.00	2.67	2.00	2.00	2.33	2.33	2.00
KEY ISSUES															
13.01 Key Issue 1	2.00	2.00	1.67	1.67	1.67	1.33	1.67	2.33	1.67	2.67	2.00	2.00	1.67	2.67	1.93
13.02 Key Issue 2	2.00	2.33	2.33	1.67	2.00	1.67	1.67	2.67	1.67	2.67	2.00	2.00	2.33	2.67	2.12
13.03 Key Issue 3	2.00	2.00	2.33	1.67	2.33	1.67	2.33	2.33	2.00	2.00	1.67	2.33	2.33	2.33	2.10
13.04 Key Issue 4	2.33	2.00	2.33	2.33	1.67	2.00	1.67	1.67	2.00	2.67	2.33	2.67	2.00	3.00	2.19
13.05 Key Issue 5	2.33	2.00	1.67	2.00	1.67	2.33	1.67	1.67	2.33	1.67	2.00	2.67	2.67	2.33	2.07
OVERALL IMPRESSION OF ES															
14.02 Readiblity	2.33	3.00	3.00	2.33	3.00	2.00	2.00	3.00	3.00	2.00	2.67	2.67	2.00	2.33	2.40
14.01 Overall impression of ES	3.00	3.00	3.00	2.33	3.00	2.33	2.67	2.00	2.67	3.00	2.00	2.67	2.67	3.33	2.69
MEAN 'WEAKNESS INDEX'	2.72	3.06	2.57	2.66	2.80	2.44	2.85	2.39	2.91	3.14	2.70	2.86	2.71	3.02	2.77
TIME TO READ ES	58.67	96.00	143.33	86.67	56.67	91.67	41.67	63.00	71.00	60.67	77.33	67.33	71.00	90.00	76.79
TIME TO DO QUESTIONNAIRE	35.00	49.00	40.00	40.33	31.67	34.00	23.33	25.00	36.67	52.67	37.67	30.00	40.00	48.33	37.40
TOTAL TIME TO REVIEW ES	93.67	145.00	183.33	127.00	88.33	125.67	65.00	88.00	107.67	113.33	115.00	97.33	111.00	138.33	114.19

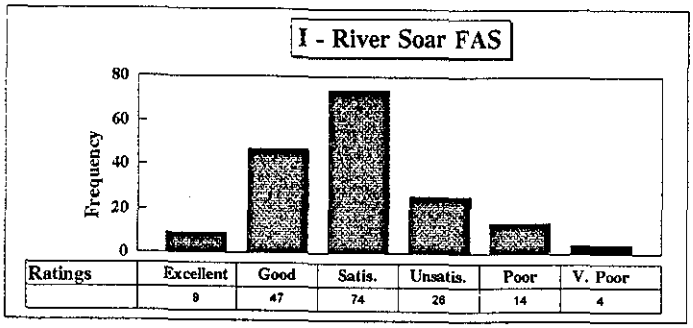
Appendix Table 6 Spreadsheet Data from Review of 14 ESs

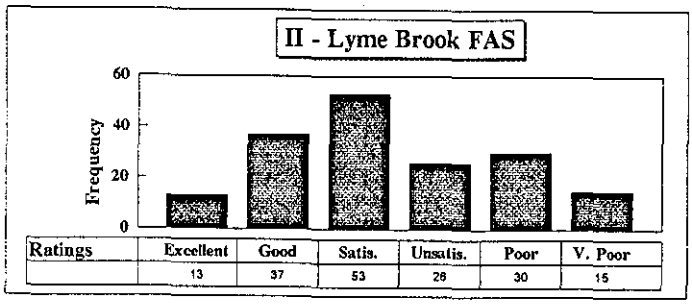
CRITERIA	PROJECTS I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	Mean

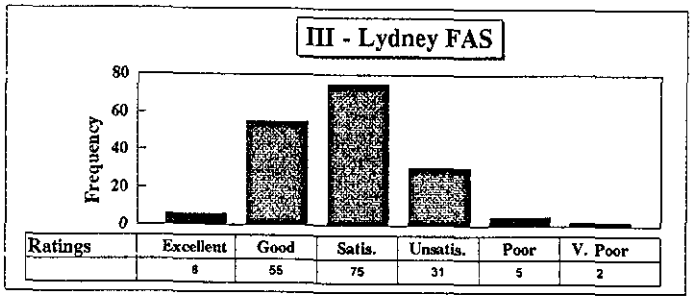
Weakness Index: 1 = No Weakness, 6 = Very Weak.

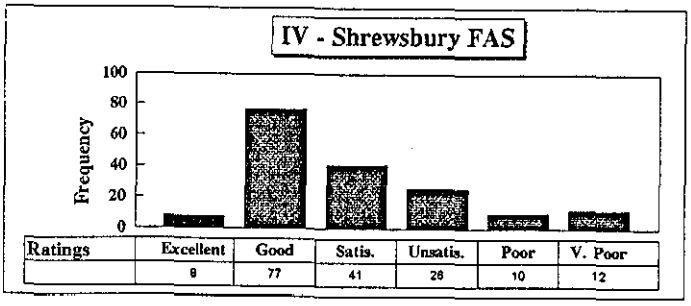
	Project	Date Pub.	Consultant
I	River Soar FAS	July '92	Gould Consultants
II	Lyme Brook FAS	Nov '91	Cobham Resource Consultants
III	Lydney FAS	July '93	Singleton Landscapes
IV	Shrewsbury FAS	Nov '93	Gould Consultants
V	Ouse Washes	Jan '90	Christine Cowley
VI	River Irwell FAS	Feb '94	Chris Blanford Associates
VII	Abbey Mill Weir	Feb '93	Nicholas Pearson Associates
VIII	Chadbury Weir	July '94	Landcare Associates
IX	Eckington Sluice	May '90	Nicholas Pearson Associates
X	Whatstandwell Gauging Station	Feb '91	Peter Conlon
XI	Binn Wall - Severn Beach	May '93	Mark Ross
XII	Mitchell's Salt Rhine	April '94	Land Use Consultants
XIII	Winder Moor Sea Defences	Sept '91	Environmental Management Consultants
XiV	Millbeach to Goldhanger Tidal Defences	Nov '94	Posford Duvier Environment

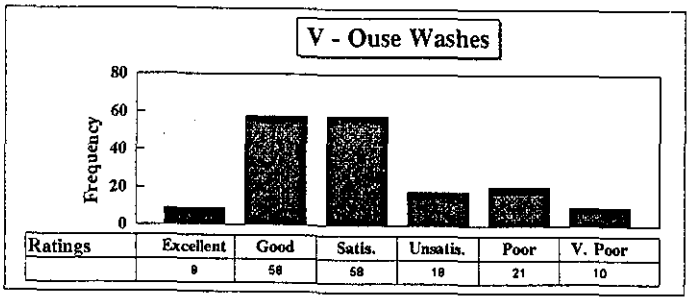
Appendix Table 7 Distribution of Ratings for 14 ESs



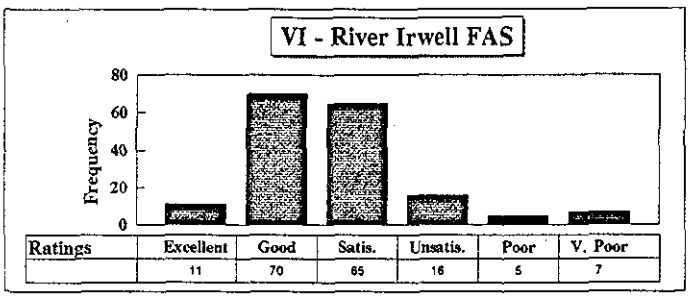


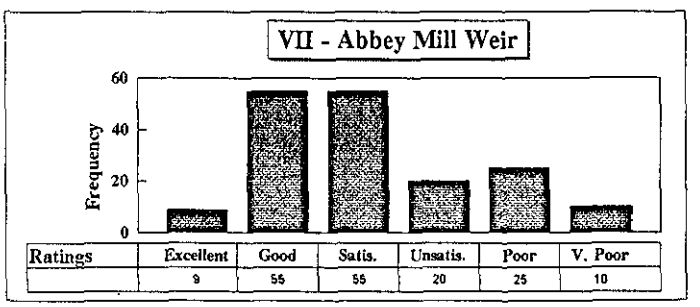


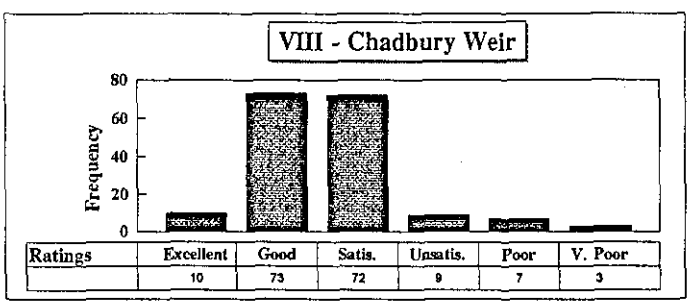


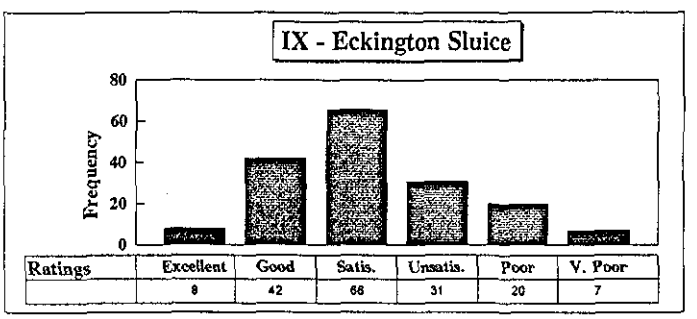


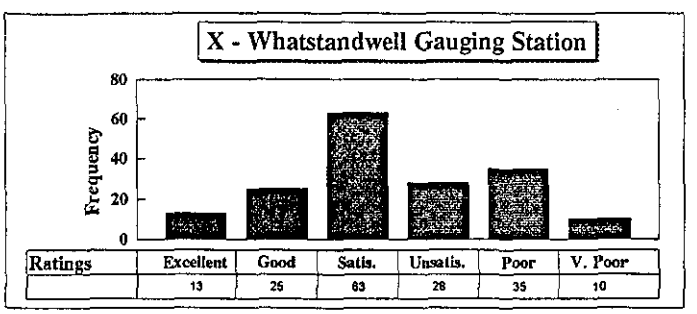
Appendix Table 8 Distribution of Ratings for 14 ESs



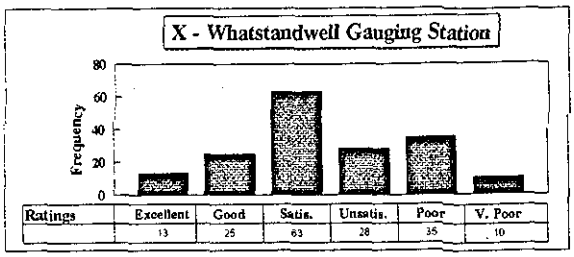


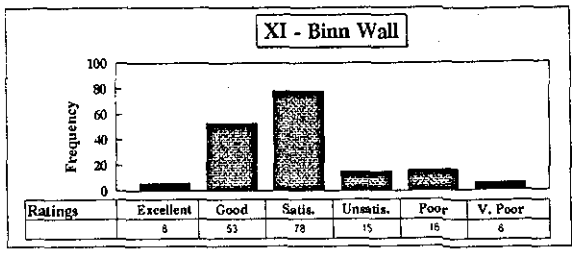


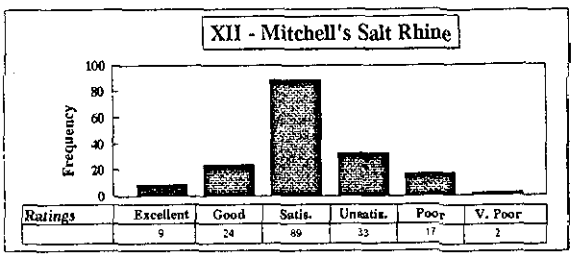


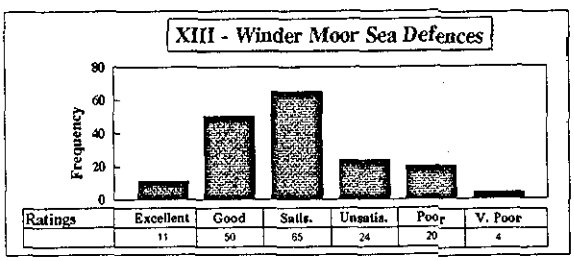


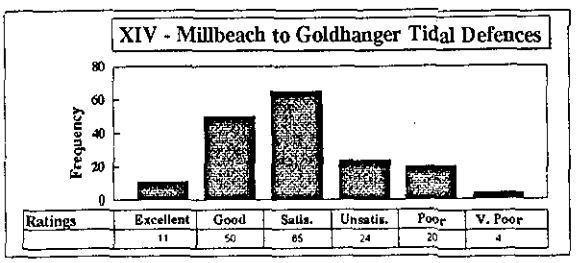
Appendix Table 9 Distribution of Ratings for 14 ESs











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The Development of Environmental Action Plans: Turning Statements into Actions

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ABSTRACT *The Midlands Region of the Environment Agency has developed a management system, in the form of an Environmental Action Plan (EAP) to ensure that the constraints and mitigation measures identified in the Environmental Statement document are delivered on the ground. The reasons are considered for developing such procedures and examples are provided of the environmental objectives and targets which lie at the heart of the new procedures. The EAP is designed to provide a summary of the environmental constraints, adverse effects and their associated mitigation measures, and monitoring requirements, in an easily accessible document for both technical and non-technical readers.*

Introduction

The importance of strengthening the follow-up management and monitoring of the environmental assessment (EA) process was one of key recommendations of the recently completed International Study of the Effectiveness of Environmental Assessment (Sadler, 1996). The Environmental Action Plan (EAP) has been developed to provide a mechanism for strengthening the EA process, from the published Environmental Statement (ES) through to the completion of the project. It details how the protection, conservation, mitigation and enhancement measures for the project will be delivered by the Environment Agency and its contractors. The EAP also contributes to the overall environmental quality control mechanism for the EA process, by the introduction of more formalised checklists and stages to be signed-off (Leu, *et al.*, 1996). Evidence of similar approaches can be found in the EA of World Bank projects (World Bank, 1995) and the work of the Hong Kong Environmental Protection Department (Sanvicens and Baldwin, 1996).

The concept of the EAP has been the culmination of three years work developing and refining environmental assessment project systems to ensure effective management and delivery of water management projects in the Midlands Region of the Environment Agency (Hickie and Wade, in prep.). It is an environmental project management system which operates within the wider framework of the integrated environmental management

system for all the operational, regulatory and business support activities of the Environment Agency. EA is seen as a management process, not only for providing information for the decision-making process, but also for the management of the implementation of that decision and any required changes due to unforeseen circumstances, ultimately through to project decommissioning. This has significantly broadened the traditional view of EA as a process solely for assessing the environmental consequences of proposed developments, as can be seen in the remit for EA as defined in the legislation of the UK (UK Government, 1988b) and many other countries.

The EAP forms the last section of the published ES which as part of the Statutory Instrument (SI) No. 1217: The Land Drainage Improvement Works (Assessment of Environmental Effects) Regulations 1988 is a legally binding document (UK Government, 1988a). Normally under the UK planning EA regulations, SI No. 1199 (UK Government, 1988b), the ESs are not legally binding documents, but are deemed to be supporting environmental information for a planning application. In the case of a SI No. 1217 (Land Drainage) ES, the works will have permitted development rights, i.e., no planning application is required because there are existing flood defences on the site (UK Government, 1995). The ES is a legally binding document, as carrying out works not covered by the ES can lead to enforcement action through the courts (UK Government, 1988a). The Environment Agency as a corporate body is accountable for the implementation of the ES, and hence also the EAP. Within the Midlands Region of the Environment Agency the EA of operational works is managed by an entirely separate department from either the client departments (which are normally the Flood Defence or Water Resource Management departments), or the Regional Engineering Services department (responsible for managing the feasibility studies, design and implementation of the project). The EA staff act in an independent capacity ensuring the compliance with environmental standards and legislation. The co-ordination of regional consistency and standards, through the management of environmental assessment policy, guidelines, audit, research and environmental training is provided by the Regional Environmental Assessment Co-ordinator.

The concept of the EAP has now been nationally recognised by the Environment Agency as a key component of good EA practice.

Development of the Environmental Action Plan Concept

The development of EAPs in the Midlands Region of the Environment Agency has arisen as a result of a combination of problems encountered with the traditional EA process. In 1994, an in-house research project to review and develop the Regional EA procedures for the National Rivers Authority (which became part of the Environment Agency on 1st April 1996) found a number of problems associated with the existing EA process. These were identified through interviews with both in-house EA staff managing the environmental process and external environmental consultants. These problems included the need to improve the identification, specification and control of the environmental impacts arising from the project, both to external bodies and the design engineers; to be able to effectively evaluate the impact predictions; and to be seen to be able to manage and deliver the project in a more open and accountable manner.

Controlling Environmental Impact

In the 1990s, the Severn-Trent Region of the National Rivers Authority (now the Midlands Region of the Environment Agency) began assessing a large programme of flood and coastal defence works along the Severn Estuary. This included undertaking environmental assessments in accordance with UK legislation for land drainage works (SI No. 1217 (UK Government, 1988a)). Much of the programme required construction work in or near the Severn Estuary Site of Special Scientific Interest (SSSI). An SSSI is a nationally important nature conservation site and, in accordance with section 28 of the Wildlife and Countryside Act 1981 (UK Government, 1981) permission is required from English Nature (the UK governmental agency responsible for nature conservation) for any works in an SSSI. The Severn Estuary is also a Ramsar Site (designated under the Convention on Wetlands of International Importance); a Special Protection Area designated through the European Community Directive 79/409/EEC on the Conservation of Birds (Commission of the European Community, 1979); and a Special Area of Conservation designated through the European Community Habitats Directive 92/43/EEC (Commission of the European Community, 1992). Most permitted development rights are rescinded if the work is in a Special Area of Conservation, however, land drainage projects are exempt from this restriction if the work is assessed under SI No. 1217 EA regulations (UK Government, 1995)). Therefore, in parallel with the section 28 consent, approval is also required from English Nature for the ES for the proposed works. In such a sensitive situation English Nature requested that a construction method statement be supplied before a decision could be made on work in or near the SSSI. The problem then arose that until the contractor had been selected and the contract let, the contractor's work method could not be known. This created the classic 'catch 22' situation. As a consequence of this lack of knowledge as to which construction method would be used, all the reasonable options had to be assessed by the EA team, an inefficient process in itself, but still the contractor could propose a construction method that had not been thought of, leading to further delay.

The problem has arisen because of the change in engineering contract specification philosophy. Prior to 1994, many of the projects were designed and specified with a particular construction method in mind, which was defined in the specification to the contractor. However, the recent trend of good practice in contract specification has been towards the specification of performance outputs, e.g., a flood bank constructed to certain size and levels, rather than method specification. In the UK, most designers who are specifying contracts, are now using specifications which define the end results required, known as performance specification. This allows the contractors to choose the most appropriate and cost effective method to implement the contract. It also requires the contractor to accept liability for meeting the required performance specifications, rather than the designer specifying a method which may not meet the required specification. With no control of the final method chosen by the engineering contractor, this provided a potential problem for both the environmental decision makers and interested parties commenting on the ES.

In trying to resolve on the one hand the lack of ability to specify a particular construction method, and on the other the need to be able to identify and control the environmental impacts caused by a project, it was noted that it was not essential to

know which work method was to be used, as long as it was possible to define the environmental parameters required to protect or conserve any given environmental feature(s). For any environmental feature, whether a scheduled ancient monument, landscape feature, saltmarsh or mudflat, there are a number of impact parameters which are significant. For example, overwintering birds on the saltmarsh require certain conditions. Significant constraint parameters could include season; time of day; noise and visual disturbance; and water levels; but would not include parameters such as the colour of a brick floodwall (which could be important for other receptors such as the local community and passing public in cars or along a footpath). For each potential impact receptor, a list of significant impact parameters can be defined as part of the normal impact analysis process. Acceptable limits of the impact magnitude can then identified to provide the basis for inclusion in the engineering design brief.

Impact Parameters
The impact parameters act as a constraint on the design, construction and operation of a project and can be described in terms of three elements. These can be summarised as:

i) Magnitude of specific impacts in terms of quality/quantity such as:
noise (e.g., limit of 10 dBA above ambient background noise levels)
visual impact (e.g., all built structures associated with a new flood defence to be constructed in the vernacular architectural style)

ii) Time:
seasonal (e.g., winter/spring; bird nesting or fish migration seasons)
weekly (e.g., weekdays/weekends)
daily (e.g., working day, peak traffic periods)
others (e.g., tidal or flood periods)

iii) Spatial:
distance (e.g. no construction plant within 10 m of a specified archaeological structure)
zoning (e.g. no access to specific conservation zones or construction traffic to use certain routes only)

Publication of Environmental Statements Earlier in Environmental Assessment Process
During 1994, the Ministry of Agriculture, Food and Fisheries (MAFF), the UK government department acting as the regulator for flood and coastal defence works, and providing grant aid for such projects requested that an 'agreement in principle' should be confirmed by English Nature at the early consultation stages of a project. MAFF also requested that 'good practice' would require ESs to be published before the commencement of the detailed design stage. Previously ESs were published after final detailed design had been completed and this necessitated a major shift in the Midlands Region's approach to EA. The change was supported in principle by both EA and engineering managers, though there was some reluctance on the part of some EA staff, who were worried that not enough detail of the project would be known at this early stage for an acceptable ES to be published. They were concerned that either it would have to be re-published at a later stage if additional significant impacts came

to light, or that such changes would not be subject to sufficient scrutiny after the project had been given approval.

In the previous year, an ES had been published for the Shrewsbury Flood Alleviation Scheme, which used the planning EA regulations, because the flood defence works were completely new and so required planning permission (Gould Consultants, 1993). This demonstrated that an ES could be published at the end of the feasibility stage with enough detail to enable all the environmental issues to be incorporated in the statement. A detailed ES can be prepared for a water management project, as long as the project is designed in enough detail to define key information such as where it is located, what it would look like, how it will operate; to enable the EA team to assess the impacts of the project and define the environmental constraint requirements. In the post-ES publication phase, the detailed engineering design and any changes made after the ES has been published, will be required to be assessed for significance. If the assessment reveals any changes in the environmental effects that now reach previously defined significance levels, this will necessitate the publication of a revised ES, together with confirmation from English Nature and other parties of their agreement to such changes. A summary of the ES and the need to re-assess any changes is, therefore, required for inclusion in the brief for the consultant's final engineering design work. The flowchart in Figure 1 outlines the current main steps in the EA process during the planning, design and construction stages of a flood defence project under the SI No. 1217 (land drainage EA regulations). The EA process may require the re-assessment of environmental effects if there are any significant changes in the approved operational, maintenance and de-commissioning stages of a project.

Open and Accountable Commitment to Deliver Environmental Statement

The relative poor quality of environmental statements produced prior to 1994 (Wood and Jones, 1991; Coles, *et al.*, 1992), did not provide critics, especially non-governmental organisations, with much confidence that developers would deliver projects as promised. Following publication of the ES for the River Soar flood alleviation scheme near Loughborough, a number of objections had been received from nature conservation bodies (Shankland Cox, 1992). During 1993, a compromise 'Conservation Action Plan' was negotiated that took account of the needs of both the conservation bodies and the engineering requirements of the scheme. This provided a document which defined in practical terms how the environmental commitments were to be implemented, with details of the associated environmental monitoring and liaison programme. Such a framework for open and accountable delivery of the agreed environmental constraints is deemed to be desirable for all projects and now forms the basis of the EAP (Canter, 1996; Kreske, 1996).

Need for Objectives and Targets

In reviewing previous EAs and ESs, it was identified that the lack of any clear objectives and targets for environmental issues was severely hampering the ability to effectively review the management processes and projects on the ground (Hickie and Wade, in prep.). There is a need to clearly state protection and mitigation objectives

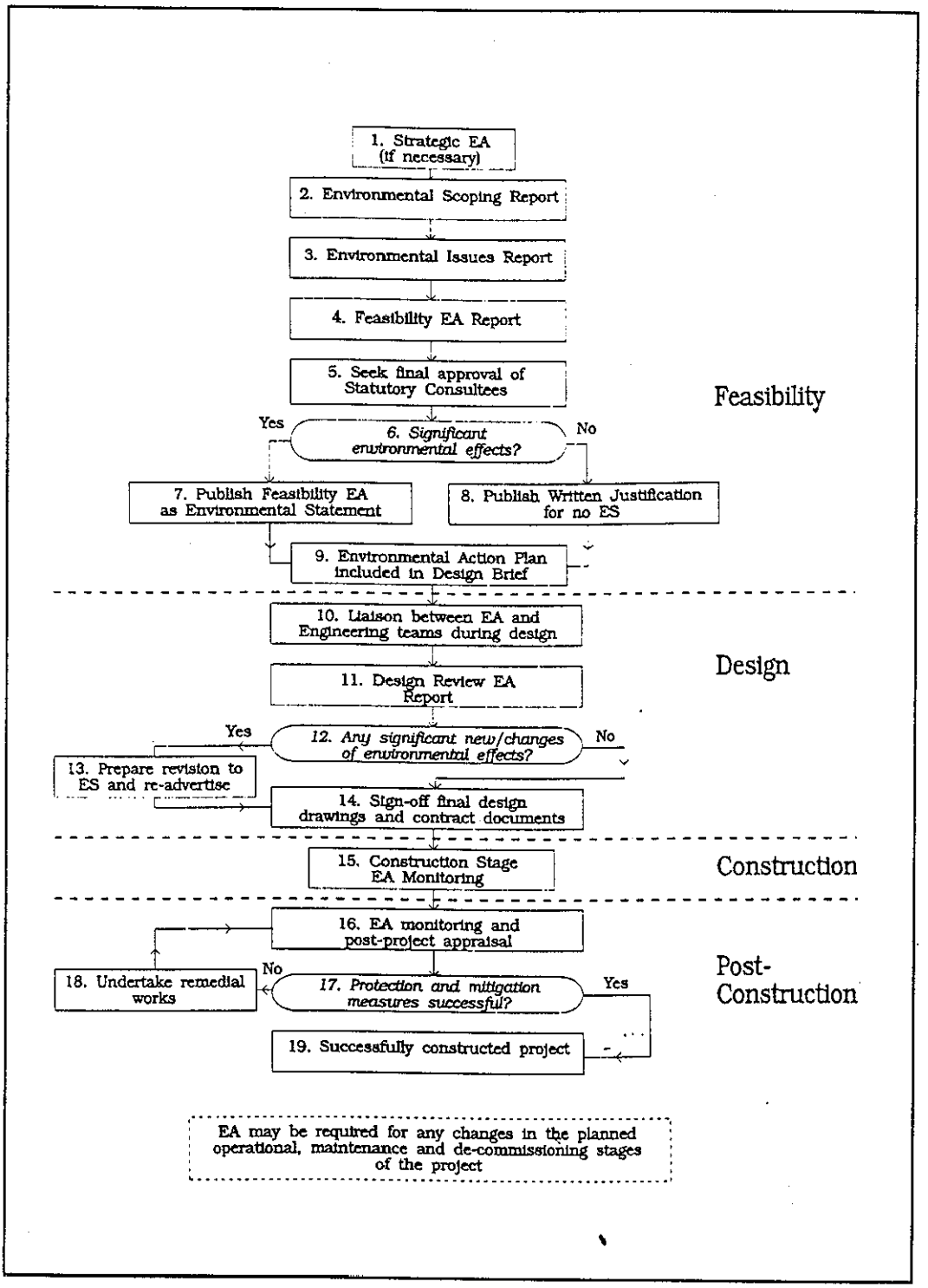

Figure 1. EA steps during Planning, Design and Construction Stages of a Flood Defence Project in the UK

and targets, to ensure that they are understood and implemented as part of the EA process. A prime example of this in the past was the consistent failure of EA reports to identify the acceptable noise levels for construction works near residential areas. The reports often referred to construction noise as being of 'low to moderate significance', with no further mention in the reports. In practice the local residents often did complain about excessive construction site noise.

However, if acceptable levels of noise are defined and agreed as an early part of the EA process, these can form a constituent part of the brief for the design and supervision team; ensuring that acceptable levels of noise are specified in the contract documentation and can be monitored on site. Other objectives could be the protection of water quality, important areas of vegetation or historic structures. The monitoring of the success or failure of a project according to such targets can lead to appropriate remedial action and the increased knowledge of the application of such measures. The review of the successes and problems associated with such objectives and targets can help future EA projects, developing a confidence in EA management techniques. A simple example of such feedback is the recognition of the need for a more sturdy protective fencing specification to keep contractors plant out of protected zones. In the past some contracts only stipulated a simple orange tape fence to keep contractors out of specific areas. This has been found to be insufficient to protect such important areas, especially from suppliers vehicles wishing to turn around in restricted working areas.

Summary of Need for Environmental Action Plan
The EAP was devised as a means of dealing with a number of issues:

(a) the provision of details of environmental parameters and constraints for work in SSSIs acceptable to English Nature;
(b) the summary of environmental issues and constraints for the design team and external readers;
(c) the explanation of how the environmental constraints and mitigation measures were to be implemented and policed by in-house staff;
(d) the explanation of how any post-ES changes would be assessed and approved; and,
(e) the need for objectives and targets for successful post-project appraisal.

The EAP provided an integrated mechanism which facilitated these needs. The full support of the senior engineering managers was ensured by involving the Regional Engineering Services Manager in the development of the format of the EAP. This assisted in their implementation as a standard component of all Midlands Region's flood defence and water resource projects. The EAP also facilitated the improvement of the management system for external engineering consultants through the inclusion of detailed environmental, as well as technical and economic constraints in the briefs for such contracts.

Format of the Environmental Action Plan

The resultant EAP format has four elements. Firstly, it incorporates the explanation of the management system required for the EA process, picking up from the publication of the ES through to the successful completion of the project (i.e. once the project is operational and all remedial works have been implemented). This allows the reader to understand the management processes and who is responsible for what. Secondly, it includes the environmental objectives and targets for each of the environmental constraints and mitigation measures identified in the ES. These are summarised in a table for easy reference and are used as the checklist for the EA quality assurance system by the EA staff. Thirdly, a summary list of environmental specifications is

provided for inclusion in the engineering contract to enable the environmental constraints to become contractual requirements. Fourthly, to aid the accessibility of the information in the EAP, a drawing is provided showing the environmental constraints and implementation notes related to the EA study area. Table 1 summarises the content of an EAP.

The EAP clarifies the responsibilities for the environmental input and approval systems required for the project. The in-house project Environmental Assessment Officer (EAO) is responsible for managing the technical environmental input to the project. The engineering consultants are responsible for providing a landscape architect whose role is four-fold. Firstly, to aid the engineering design to ensure that it blends in with surrounding landscape (in the detailed design of the colour, texture and form of materials). Secondly, to check the engineering contract specifications and drawings, to ensure that all the environmental requirements in the EAP have been taken account of and are covered by appropriate and enforceable specification clauses (the formal signing-off of the environmental issues in the contract documents is a key milestone in the EA quality assurance system and is done by the EAO, but it is the landscape architect who is responsible for checking all the details). Thirdly, to manage the employment of specialist environmental contractors during the design and construction period, taking the contractual preparation and management burden off the in-house EAO. And finally, to design and manage the implementation of any separate landscape contracts required for the project. The landscape architect, although formally employed by the engineering consultant, reports directly to the EAO on all environmental matters. The project EAO will normally be assisted by the same

Table 1. Elements of an Environmental Action Plan

A - Management and monitoring for final design and delivery of the project in accordance with the ES:

(1) Summary of Environmental Assessment Process and the environmental constraints to be taken into account in terms of protection, conservation, mitigation and enhancement measures.
(2) Management of change in project design and implementation in relation to environmental impact.
(3) Communication programme to network in-house staff; engineering consultants and contractors; residents; landowners; public; user groups; and conservation bodies.
(4) Commitment to staff resourcing and procedures, normally a project Environmental Assessment Officer (as an independent member of the project team) and an Environmental Clerk of Works (as part of the supervising Resident Engineering team); Environmental Protection Schedules (EPS) to be checked by the Environmental Clerk of Works on a weekly basis; and Environmental Incident Forms and an associated reporting and follow-up system.
(5) Environmental assessment quality assurance system.

B - Objectives and Targets for each environmental constraint:

(1) Objective.
(2) Implementation statement.
(3) Targets for objective (to be reviewed at post-project appraisal stage and remedial works instigated if necessary).

C - Summary of Environmental Specifications Required in Engineering Contract:

(1) Contractors workmanship including procedures and limitations.
(2) Materials specifications.

D - Drawing showing all constraints and comments

consultant who has prepared the ES. The EA consultant will normally assist in providing technical expertise and the continued management of specialist sub-consultants (such as ecologists and protected species experts) which also ensures continuity of environmental project management through to the completion of a project.

At the construction stage, an Environmental Clerk of Works (ECW) assists the engineering consultant's Resident Engineer, supervising the contract. The ECW is provided by the engineering consultant and is responsible for the supervision of all works from an environmental perspective and for ensuring that the contractor is complying with all the environmental requirements of the contract.

The ECW is encouraged to take a proactive role in such duties, ensuring that all parties are aware of what should happen and the decisions that need to be taken to ensure a sensitive implementation of the works, rather than checking on conditions after mistakes have been made. An Environmental Protection Schedule (EPS) is used as a checklist on site, listing all key environmental measures to be undertaken by the contractor. This is checked by the ECW on a weekly basis and in the event of a problem occurring on site, for example, one of the environmental parameters being exceeded, an environmental incident reporting system ensures appropriate assessment and remedial measures are undertaken. This also provides an environmental audit trail for use in the post-project appraisal stage. The EAP specifies the professional qualifications and experience required by the landscape architect and ECW, to ensure that appropriate staff are employed to undertake these important tasks.

Example of Environmental Constraint Objective
Two examples of the many environmental constraint objectives in an EAP are given below:

(1) *Objective:* *To provide permanent works in keeping with the local landscape character.*

Implementation Statement: Any permanent visible materials, such as concrete finishes, brick, stone or fencing, must be chosen not only to be suitable on engineering grounds but also to be sympathetic to the character of the area. The Consultant shall agree the latter with the Environmental Assessment Officer (EAO).

Target: All permanently visible materials to be as approved by EAO.
(Ross, 1996, p.40); and,

(2) *Objective:* *To prevent all forms of pollution from the construction works.*

Implementation Statement:

a) All requirements of the Environment Agency Pollution Control Guidance notes will be specified in the contract and all sub-contracts and strictly enforced.
b) No vehicle will be refuelled outside the designated areas in the contractor's site compound.
c) All fuel will be stored in a bunded section of the compound. Any fuel spillage will be immediately removed by using sand to soak up the fuel and then excavated and removed to a licensed tip.
d) No debris will be dumped in the river or on land outside the contractor's site compound.

e) Vehicles transporting excavated material will not be over loaded, in order to avoid spillage of material on access roads.
f) No debris or litter will be left on the site at the end of the construction works. All materials will be cleared off site to the satisfaction of the EAO.
g) All appropriate materials will be damped down on site, as necessary, to prevent a nuisance from dust.

Target:
(a) No pollution incident
(b) No dust nuisance
(c) A clean and tidy site at the end of the contract period.
(Branch Landscape Associates, 1997, p.33)

Review of Environmental Action Plans in Practice

The concept of EAPs has been incorporated in the Environment Agency's Midlands Regional EA Guidelines and Procedures (Hickie, 1996). All new ESs now include a EAP, forming the last section of each ES. The EAP is designed to be used also as a 'stand alone' document for inclusion as a prime reference in the engineering consultants briefs; for communication of an environmental issues summary to all contractors and other staff; as a baseline document for environmental post-project appraisal; and for overall management of the EA process through to completion of the project.

The development of the EAP process during the River Soar Flood Alleviation Scheme provided useful practical experience of such procedures. The River Soar ES was published with no EAP, but a conservation action plan was developed to manage the implementation for this last phase of a 20 kilometre flood defence scheme. The conservation action plan was in the form of a series of A1 sized drawings showing all the constraints and mitigation measures required. The initial ECW supervision programme allowed for one site visit per week. Given the rapid progress of dredging works along five kilometres of very sensitive river corridor, this was immediately increased to two site visits per week, plus additional daily inspections at times of intense activity on the project. At stages where activity decreased, supervision was reduced to weekly visits. A close working relationship between the ECW and the Resident Engineer proved very important and good communications were achieved using visits, fax and mobile telephones. The attendance of environmental staff at all monthly contract progress meetings increased discussion and awareness of engineering issues which could affect the environment. This ensured that decisions were made in full knowledge of all the environmental consequences and that appropriate mitigation measures were undertaken.

The recent use of the EAP as a component of the engineering design brief for the detailed design stage has ensured that no project has had to be re-published due to significant changes in the design. The EAP not only provides the design engineer with the environmental parameters within which he or she has to ensure the design remains, but also provides the mechanism for ensuring that the EA staff continually liaise with the engineering designer during this period and requires the final design drawings and contract specifications to be assessed and signed-off by the EA staff. Any variations in design which have been necessary have to be assessed. The use of

the EAP at contractual and post-completion stages has been most successful. This much more pro-active approach to EA project management provided by the EAP has led to improved lines of communication and defined areas of responsibility, ensuring that many potential problems are addressed before they escalate into a environmental incidents, which can result in works on site having to stop until the problem has been resolved. The results of the monitoring of the outcomes of the EAP targets have provided a new simple checklist methodology, which at the end of the construction period, ensures that all outstanding environmental issues can easily be identified and followed up. As in other organisations reviewing EA processes (Ortolano and Shepherd, 1995), the development of the EAP in the Midlands Region of the Environment Agency has given the impetus for the review and improvement of associated project management systems, such as the newly introduced communications planning system for all new projects within the Midlands Region which is now a component of the EAP (see Table 1).

Cost of the EAP

The cost of preparing an EAP in addition to the normal ES has been found to be minimal. The EAP follows on logically from the analysis of effects and the required mitigation measures, and if a standardised EAP format is used, this can be completed fairly quickly. The additional time taken at this stage to specify objectives, implementation statements and targets saves time later on in the EA and design process.

The costs associated with the implementation of the EAP can be divided into two stages. In the detailed design stages, there a savings to be made with the use of clearer definition of environmental constraints form the beginning of the design process. In the past, some environmental issues were often overlooked during the technical design process, resulting in the need for costly additional design works. The use of the EAP constraints assists in the checking of environmental compliance against key objectives, again saving in consultancy time.

The major new additional cost has been the use of the ECW assisting the supervision of the project on site. This additional expenditure has resulted in contractual and consultancy savings due to better management of the environmental issues on site, thus reducing potential delays and needless environmental damage. Such savings by there very nature are not easy to quantify, but they are now seen by the Environment Agency to be part of the requirements of good environmental management practice.

Use of EAPs by Private Developers

It is suggested that the EAP may be of similar benefit to private developers. They enable the environmental issues to be effectively and efficiently managed as part of the wider project management process. In the long run, good environmental project management practices save money. They reduce the risk of adverse environmental effects and the associated bad publicity.

Use of EAPs in SEAs

Following the successful use of EAPs for project EAs, The Midlands Region of the Environment Agency has used the concept in Strategic Environmental Assessments

(SEAs). The Severn-Vyrnwy Area Flood Defence SEA has used the concept of the EAP to define strategic environmental policy objectives in a similar format as used in project EAs (Nicol *et al.*, 1997). The use of EAPs in SEAs is still at an early trial stage, but it is expected that they will provide a useful communication tool summarising the strategic environmental constraints and associated objectives.

Conclusions

EA has been described as a project management tool, and as such, must effectively help to manage the implementation of a project from an initial EA scoping stage through to the decision-making point, and on to the successful completion of the project (Wathern, 1988). In any complex engineering project with a large project team it is often very difficult to keep track of all the environmental issues throughout such a project. Environmental Action Plans help the Environment Agency to strengthen the EA process by effectively and efficiently achieving this task, and ensuring commitments in the ES are turned into actions on the ground. The use of Environmental Action Plans is recommended for improving the effectiveness of all Environmental Assessments.

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