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Rail construction and operational effects on biodiversity and geological interests

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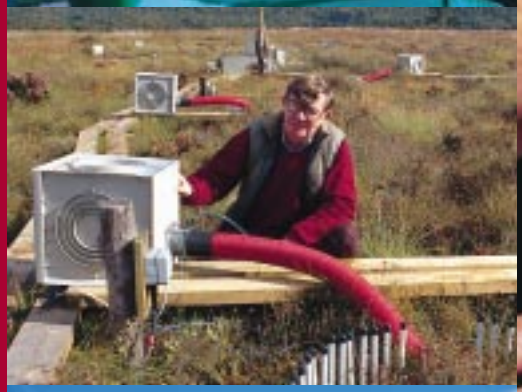

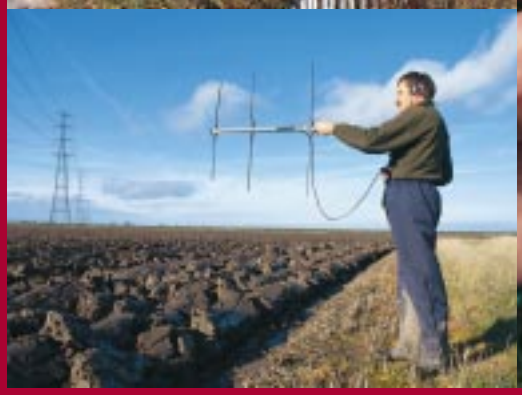

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Rail construction and operational effects on biodiversity and geological interests

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Executive summary

This document aims to develop a better understanding of the effects of rail projects on biodiversity and geological interests. It also makes recommendations to English Nature on how to integrate in its policy advocacy activities and project case-work for this transport sector.

The study is based on the relatively limited literature that addresses the effects of rail projects on biodiversity and geological interests. A review of eight Environmental Statements prepared for rail projects was also undertaken, although this largely failed to reveal impacts or mitigation measures that were specific to rail projects.

The discussion in Section 4 gives an overview of opportunities for further research and for improving environmental assessment practice. It also examines the following key effects associated with rail projects:

a. Bird collision due to overhead electrical lines;
b. Management of habitat along rail corridors;
c. Wildlife casualties along rail corridors;
d. Knowledge of procedural issues associated with rail projects.

In the last section, recommendations to assist English Nature's understanding and ability to comment effectively on rail proposals are presented. These recommendations are summarised below:

a. Discuss with DTLR the implications of rail restructuring upon the agreements between Railtrack Plc and English Nature, concerning in particular the management of SSSIs;
b. Promote the adoption of appropriate appraisal methods for strategic rail studies and projects;
c. Develop and promote a leaflet as reference guidance for rail maintenance contractors on the management of lineside habitat for nature conservation;
d. Investigate the extent to which rail corridors act as barriers to the movement of protected and priority species and the significance of mortality due to collisions with trains for such species;
e. Consider producing a leaflet/intranet page detailing the key issues, alongside a summary of the experiences of English Nature staff, to raise awareness for English Nature staff;
f. Liaise with the British Trust for Ornithology and Wildlife Trusts on the implications of electrification of East Coast Main Line on bird kills.

Contents

1. Introduction

This scoping paper provides a brief review of the potential consequences of rail construction and operation on biodiversity and geological interests. The paper identifies some specific effects associated with rail projects along with a discussion on the current state of knowledge.

The following three tasks have contributed to this paper:

a. Liaison with English Nature staff to help identify suitable case studies and associated experiences. Telephone discussions were held with Rob Cameron (Wye Office), Anton Irving (Banbury Office) and Graham Walker (Shrewsbury Office).
b. A limited literature, internet search and review of eight Environmental Statements (ESs) prepared for rail schemes to identify and obtain relevant published work on the topic. The literature and internet searches were limited to European based information from 1990 to date.
c. The literature was selectively reviewed and based primarily on their written abstracts/summaries and/or introduction and conclusions. *At the time of writing, six papers have been reviewed and another three are still outstanding (they are listed in Annex A)*.
d. The findings from the literature search and the review of the ESs have been collated into this scoping paper.

Section 2 provides a summary on the main effects related to rail schemes that are considered in the literature, while Section 3 presents the effects identified in the ESs that were reviewed. A wider discussion of the issues is provided in Section 4. This is then followed by recommendations for English Nature in Section 5.

2. Literature review

It has been found that few studies have addressed the impacts of railways on biodiversity or geological interests. This situation contrasts with the substantial literature and associated guidance on nature conservation issues arising from highway proposals (e.g. Byron, 2000; ERM, 1996).

As rail and highway schemes are both linear projects involving land take, they have fundamentally the same type of impact on ecology and geology. Their direct and secondary effects are presented in Table 1.

Table 1: Direct and secondary impacts of linear projects

Direct Impacts	Secondary Impacts
Habitat loss	Air pollution
Habitat fragmentation	Noise
Corridor restriction	Artificial lighting
Loss of geological resources	Wildlife casualties
	Litter
	Contamination

(Source: Byron, 2000; English Nature, 1996; OECD, 1994)

According to the papers reviewed, existing rail schemes do however raise three potential issues which are specifically related to wildlife habitats along rail corridors:

a. Line-side habitat;
b. Protected areas traversed by railways;
c. Mammal mortality due to collision.

2.1 Line-side habitat

Railways provide corridors for a wide range of flora and fauna (Van der Grift, 1999; London Wildlife Trust, 2001) providing habitat as well as enhancing connectivity between other sites. The range of habitats reflects the relative lack of human disturbance which provides a diversity of flora and fauna that in some cases can be relatively rich (London Wildlife Trust, 2001).

In urban areas such as London it has been found that significant areas of semi-natural habitat remain along the rail estate as a legacy of the former countryside (Railtrack, 2001). As a result, a total of 838 ha of line-side habitat has been identified as Sites of Importance for Nature Conservation in London alone (London Wildlife Trust, 2001).

Van Der Grift, (1999) considers rail embankments alongside other rights of way as potential ecological corridors for mammals which can be used for providing connectivity between their habitats. The value of green corridors has also been recognised in PPG9 (PPG9, 1994), in that they "*help to form a network necessary to ensure the maintenance of the current range and diversity of our flora [and] fauna*."

As a result, the line-side estate requires sensitive management to meet operational standards while sustaining or enhancing biodiversity and providing connection between wildlife habitats. As an example, Railtrack has committed to manage its estate for natural conservation. In partnership with London Wildlife Trust, Railtrack has been implementing specific measures such as tree thinning and grass cutting to ensure a diversity of wildflowers (Railtrack, 2001).

2.2 Protected areas traversed by railways

Following the privatisation of the railways, Railtrack inherited a large number of protected sites (such as Sites of Special Scientific Interest, SSSIs) previously owned by British Rail. These protected sites are in general unmanaged (London Wildlife Trust, 2001) and often sold as redundant land for development (DTZ Pieda Consulting, 1999). Railtrack has recognised the need to protect these habitats and has agreed with English Nature to review all protected sites on its land and produce Site Management Statements for its SSSIs (Railtrack, 1998). The status of this agreement must now be questioned within the current re-structuring of the railway industry.

2.3 Mammal mortality due to collision

Studies in Europe and North America (Van Der Grift, 1999) indicate that a wide variety of mammal species are killed by trains, in particular in protected areas such as National Parks (i.e. where mammals tend to be concentrated).

According to Van Der Grift, mammal species that can be found as victims of collisions range from small insectivores (e.g. hedgehog) to ungulates (e.g. red deer and moose) and large carnivores (e.g. grizzly bear). Surveys were undertaken in Canada and in European countries, such as The Netherlands, Spain, Norway, Czech Republic. No reference has been found about similar such surveys in the UK.

Based on these surveys, Van Der Grift argues that railways fatalities can have *"a severe impact on mammal populations*" especially for already endangered mammals. Van Der Grift's work raises two questions:

a. Is there a higher proportion of mammal casualties due to collisions with trains than those due to collisions on roads?
b. Is this issue relevant to UK?

As no specific surveys have been carried out to compare the number of mammals killed on railways and on roads, and no data has been found on mammal collisions with trains in UK, it is not possible to answer these questions. However, the following provisional comments can be made.

In his paper, Van Der Grift argues that the attraction of animals to railways can be an important cause of collisions. As discussed previously, mammals often use railways as a corridor to move between different parts of their "home range". Managed vegetation along railways also provides them with an attractive food resource and is often used for den sites For example, foxes use line-sides as den sites and railways as pathways for dispersal in urban areas (Van Der Grift, 1999). Further surveys show the presence of badgers in railways embankments in The Netherlands, bats in railways tunnels in Spain and stone martens in the vicinity of tunnels in Spain (Van Der Grift, 1999).

The specific attraction of railways for mammals might increase their chance of being killed by trains although further studies would be needed to investigate this in a UK context.

3. Review of case studies

The review of case studies was based on eight Environmental Statements (ESs) prepared for rail schemes listed in Table 2. A summary of the main ecological and/or geological impacts considered in the ES as well as the mitigation measures proposed are presented in Table 3.

In general, the assessment of the ecological/geological impact of the rail projects was similar to what could be expected from the assessment of a road scheme or any other development. The main impacts identified were related to:

a. land take (loss of natural habitat and habitat fragmentation);
b. disturbance during construction work (spoil disposal, lighting, noise).

However, two issues specific to rail schemes were identified:

a. the presence of overhead electrical cables;
b. the management of line-side vegetation.

In two ESs (Updating of the Old Dalby Test Track and Crossrail ES), the overhead electrical cables were identified as potential issues for the vegetation situated close to the cables and for birds flight paths (species not specified). The vegetation close to the cables needed to be cleared for safety and operational reasons however, mitigation measures were agreed to minimise vegetation clearance to branches in the proximity of the cables. This was to prevent birds from collisions with the cables, through retention of many existing trees to act as a barrier to bird flight paths.

Three ESs (Updating of the Old Dalby Test Track, Crossrail ES, King's Cross Railway Bill ES) proposed management plans for ensuring that vegetation clearance for safety and operation reasons would not threaten line-side biodiversity. They all concerned existing rail corridors where important wildlife habitats existed.

In the Channel Tunnel Rail Link ES, mitigation measures were proposed to provide wildlife habitats, including tree and shrub planting, pathways for animals and relocation measures of protected species such as badgers, grey mouse-ears and great crested newts. Substantial on-site mitigation measures on SSSIs such as the Inner Thames Marshes were also proposed.

Table 2: General information on ES case studies

ES Title	Year	Author	Client	Local Authority involved	Works involved
Channel Tunnel Rail Link	1994	ERM	Union Railways	Provision of the 'Channel Tunnel Rail Link Act 1996'	Construction of a railway between St. Pancras, in London, and the Channel Tunnel portal at Castle Hill, Folkestone, in Kent.
British Railways No4 Bill	1991	Northern Environmental Consultants Ltd	British Railways	Doncaster MBC	Construction of: - Connecting railway line - Access bridge
Channel Expressway	1985	Travers Morgan Planning	British Ferries Ltd	Kent	Construction of: - Twin bore tunnels under English Channel - Terminals - Access road connections
Upgrading the Old Dalby Test Track	2000	ERM	Alston Transport	Melton Borough Council	- Works to electrify existing test track - Refurbishment of existing buildings - Installation of rail safety and signalling systems with communication masts
Trinity of Terminal Port of Felixstowe	2000	Posford Duvivier Environment	Felixstowe Dock and Railway Company	Suffolk Coastal District Council	Reclamation of 14 hectares of and construction of container park and new rail terminal
Agecroft Rail Freight Centre	1995	Parkman Ltd	Powell Duffryn Storage Ltd	Salford County Council	Development of up to 13 hectares for construction of warehousing and associated rail freight centre
Crossrail Environment Statement (ES)	1991	Drivers Jones	London Underground Ltd, British Railways Board	Corporation of London	Construction of twin rail tunnels under central London with construction and upgrading of stations and installation of overhead electric cables along rail
King's Cross Railway Bill ES	1991	Montagu Evans	London Underground Ltd, British Railways Board	Corporation of London	Construction of new railway connections and diversion of Thameslink Route at King's Cross

Table 3: Summary of main impacts on ecology and geology and mitigation measures

ES Title	Main Ecological and geological Impacts Assessed	Mitigation Measures	Comments
Channel Tunnel Rail Link	- Loss and fragmentation of woodland habitats - Disturbance to wetland habitats during construction - Loss of habitat along disused railtrack - Loss of some geological resources by the nature of the project	- Construction of wide vegetated bridges for providing pathways for animals - Relocation measures for some protected animals - Fencing during construction work	
British Railways No4 Bill	- Loss of agricultural land - Probable damage of ancient lanes and hedgerows	- New planting and good working practice to protect hedgerows - Construction of 4 triangles of land to create ecological habitat	Because of quality of hedgerows and agricultural land, no significant habitat fragmentation
Channel Expressway	- Loss of woodland - Damage of cuttings on adjacent SSSIs	- Woodland creation - Buffer zone between escarpment and cutting - Management agreements to improve quality of grassland areas	Neighbouring SSSI currently unmanaged
Upgrading the Old Dalby Test Track	- Disturbance of bats roosts while maintaining tunnels - Habitat loss and disturbance of badgers by installation of supports for overhead lines - Collision birds / overhead cables	- Good working practice - Vegetation management plan (reduction of vegetation clearance during breeding season) - Planting on trackside to reduce impact of electrical cables	- Some existing cuttings have an ecological interest - Mitigation measures for badgers to be agreed with English Nature
Trinity of Terminal Port of Felixstowe	- Disturbance of construction work (noise, lighting) to neighbouring protected sites (AONB, Ramsar Site, SSSIs) - Drainage to water on protected sites	Good working practice	Mitigation measures to protect from drainage of site and leakage of water
ES Title	Main Ecological and geological Impacts Assessed	Mitigation Measures	Comments
Agecroft Rail Freight Centre	- Land take and associated impact on wildlife corridor	Enhancement and creation of habitats along the railway by good management techniques	
Crossrail Environment Statement (ES)	- Loss of trees situated in Hanover Square during construction - Trimming and lopping of wayside vegetation due to the presence of overhead lines	- Overall layout of site to avoid trees - Wildlife habitat management alongside corridors - Code of Construction Practice to include protection of habitat and restock of disrupted wildlife habitat on completion of work	Urban project
King's Cross Railway Bill ES	- Loss of an existing urban wildlife park (Camley Street Natural Park) - Loss of goods yards and embankments - Disturbance of existing Canal Wildlife Corridor	- Replacement of the wildlife park by smaller site - Improvement of canal wildlife corridor - Good working practice to minimise pollution spills	Urban project

4. Discussion

The effects of rail schemes on biodiversity are in general very similar to those of road schemes in terms of land take and habitat fragmentation. Motorways have a bigger footprint than railways[1] but railways require the construction of new stations with associated car parks, auto-transformers stations[2], signalling and traffic control systems plants[3] and maintenance depots. According to a study funded by WWF (TEST, 1991), highways require thirteen times the space to carry the same number of passengers than a suburban train system.

Given vertical and horizontal alignment restrictions, rail may however have less ability to avoid sensitive sites which may give rise to a difference in the frequency of occurrence of exposure of geological features. Other geological impacts (e.g. the loss of geological resources due to construction works) are otherwise again very similar to the impact from road construction.

The literature and case studies review identified three main issues that are specific to railways: overhead lines, habitat provided by the rail estate and mortality due to collision with trains.

There is little information concerning birds fatalities caused by overhead lines. Collisions can result from the presence of high cables located along migratory flight paths or close to areas frequented by species "*with laborious take off and landing*" (ERM, 2000).

The impact of overhead lines on birds is not generally addressed in ES and scope for improvement exists. Mitigation measures could consist of landscaping management plans to ensure the presence of tall trees that act as barriers to flight paths crossing overhead lines. Some further research on the subject might be needed to determine which species might be threatened and to identify the environmental characteristics of sensitive areas.

The rail environment can offer valued wildlife habitats and ecological corridors (London Wildlife Trust, 2001; Van Der Grift, 1999). In urban areas, they support animals and plants that have adapted to an urban environment (London Wildlife Trust, 2001; Railtrack, 2001). In the countryside and in particular in and around protected areas, they support important wildlife habitats (Van Der Grift, 1999) and they are often used by animals as movement corridors (Van Der Grift, 1999). It is also important to note that the biodiversity potential of disused rail corridors is significantly greater still, an important issue in the context of current initiatives to re-develop disused lines.

No information has been found concerning animal casualties caused by collision with trains in the UK. More research might be needed to assess the significance of animal mortality due to collisions with trains in UK and identify sites with high collision rates and potential mitigation measures, should they be warranted.

In addition to the issues identified above which relate to the actual effects of rail schemes, discussions with English Nature staff have identified wider “procedural issues” that make rail

[1] the total land surface required for a three lane motorway is 47m whereas a double railway line requires only 12m in total (Railtrack, 1998)
[2] land take of 200m^2 every 5km for the CTRL (ERM, 1994)
[3] land take of 450m^2 every 14km for the CTRL (ERM, 1994)

proposals different from road schemes. Importantly, the length of rail scheme under consideration within a single project may be considerably longer than most road schemes. An example of this was the Channel Tunnel Rail Link where the "whole route" approach for the Environmental Impact Assessment enabled a full and influential assessment of cumulative effects (i.e. many effects on ancient woodland along the route which cumulatively added up to a significant effect).

Providing effective input to a large rail project on both generic project-wide issues and detailed matters may however be particularly challenging to organise, not least as it would be more likely to require cross boundary working between English Nature local teams. This may be further complicated by the need to develop an understanding of the responsibilities and relationships of the rail industry promoter organisations as well as the legislative project consenting processes.

Table 4 summarises the key effects and procedural issues associated with rail projects that differ from other linear projects involving land-take such as road schemes.

Table 4: Summary of the key specific effects associated with rail projects

Issues for English Nature	Importance for English Nature	Comments on current state of knowledge
Bird collisions due to overhead electrical lines	Depends on species concerned by this issue	Low
Wildlife habitat management along rail corridors	Depends on importance of adjacent sites for natural conservation (e.g. SSSI)	Not all of the rail estate has yet been surveyed
Wildlife casualties along rail corridors	Depends on: Species concerned by this issue Whether the issue is more important than for roads	Low
Knowledge of procedural issues associated with rail projects	Co-ordination of experience and efforts may have a significant bearing on English Nature's ability to influence on route assessment, cumulative effects and mitigation issues.	Inevitably patchy (relating to the location of recent schemes)

5. Recommendations

The following recommendations are made to assist English Nature's understanding and ability to comment effectively on rail proposals. These are classified in priority order in accordance with English Nature's preliminary views.

High priority:

a. Discuss with DTLR the implications of rail restructuring upon the agreements between Railtrack Plc and English Nature, concerning in particular the management of relevant SSSIs.

b. Promote the adoption of integrated and robust appraisal methods for rail projects at the local and strategic level. The Office of Passenger Rail Franchising (OPRAF – now within the Strategic Rail Authority) issued "Planning Criteria - A Guide to the Appraisal of Support for Passenger Rail Services" in 1999 but this guidance may now require

updating in light of experience of its application and experiences in the use of GOMMMS (DETR, 2000).

c. Develop a leaflet as reference guidance for management of lineside habitat for nature conservation. This guidance could possibly be developed in collaboration with the Wildlife Trusts, and/or as part of English Nature's initiative on the Practical Application of Conservation Techniques ("Enpact").

Medium priority:

a. Investigate the extent to which rail corridors act as barriers to the movement of protected and priority species and the significance of mortality due to collisions with trains for protected and priority species. This could be achieved through assessing which species are using railways (and rail tunnels) as movement corridors or den sites, and identifying and mapping areas with high rate of mortality due to collisions. Such data would help to locate sections of railway corridors where mitigation measures may be appropriate.
b. Consider producing the issues identified in Table 4, alongside a summary of the experiences of English Nature staff, as a leaflet/intranet page to raise awareness for English Nature staff. A further step could involve the development of a simple checklist for staff dealing with consultations regarding new rail infrastructure or maintenance/ improvement schemes.

Low priority:

a. Liaise with the British Trust for Ornithology (BTO) and Wildlife Trusts on potential implications of electrification of East Coast Main Line on bird kills.

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Front cover photographs:
Top left: Using a home-made moth trap.
Peter Wakely/English Nature 17,396
Middle left: Co_2 experiment at Roudsea Wood and Mosses NNR, Lancashire.
Peter Wakely/English Nature 21,792
Bottom left: Radio tracking a hare on Pawlett Hams, Somerset.
Paul Glendell/English Nature 23,020
Main: Identifying moths caught in a moth trap at Ham Wall NNR, Somerset.
Paul Glendell/English Nature 24,888