



The High Speed Rail (London – West Midlands) (Greatmoor Railway Sidings Etc.) Order

Environmental Statement – technical appendices **Volume 4.9:** Land quality impact assessment



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(Greatmoor Railway Sidings Etc.) Order

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Volume 4.9:
Land quality impact assessment



Department for Transport

High Speed Two (HS2) Limited has been tasked by the Department for Transport (DfT) with managing the delivery of a new national high speed rail network. It is a non-departmental public body wholly owned by the DfT.

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1 Introduction

1.1.1 The land quality appendix for the Proposed Scheme comprises:

- detailed risk assessment (Section 2);
- inspection notes and other site data (Section 3);
- geological Sites of Special Scientific Interest (SSSI) and local geological sites (Section 4); and
- mining and minerals data (Section 5).

1.1.2 Maps referred to throughout the land quality appendix are contained in Map ES-17: Land Quality, in Volume 3 of this ES.

2 Detailed risk assessment

1.2 Introduction

2.1.1 This appendix presents assessments for areas potentially posing a contaminative risk for the Proposed Scheme within the study area. For each site the following data is presented:

- baseline risk assessment;
- construction risk assessment;
- post-construction risk assessment; and
- assessment of temporary (construction) and permanent (post-construction) effects.

2.1.2 This risk assessment incorporates the following assumptions:

- construction workers are not included as part of this assessment;
- sites that have been assessed as potentially posing a contaminative risk to the Proposed Scheme have been grouped and considered together where appropriate. It should be noted that some parcels of land may have had several land uses from different epochs;
- during construction, standard mitigation procedures will be in place in accordance with the draft Code of Construction Practice (CoCP) (see Volume 4.14: Environmental Statement Technical Appendix: Draft CoCP); and
- during the post-construction condition it is assumed that all required remediation has been undertaken and carried out.

2.1.3 The sites assessed in this study area are shown in Map ES-17: Land Quality, in Volume 4 of this ES and set out in Table 1.

Table 1: Sites included in the detailed risk assessment within the Proposed Scheme

Site reference	Name	Table No's.
GRS -1	Existing Aylesbury Link railway line	2, 5, 8, 11
GRS -2	Calvert landfill Pit 6	3, 6, 9, 12
GRS -3	Greatmoor EfW facility	4, 7, 10, 13

2.1.4 Contaminant types included within the risk assessments are based on the Priority Contaminants Report CLR 8. Although withdrawn, this document is still commonly used and is considered as good practice.

2.1.5 The remainder of this appendix presents the risk assessment for the sites set out in Table 2 to Table 13. The following acronyms are used in these tables:

- CSM - Conceptual Site Model;
- SINC - site of importance for nature conservation;
- SSSI - Site of Special Scientific Interest; and
- VOC - volatile organic compounds.

2.2 Baseline risk assessment

Table 2: Detailed risk assessment: Baseline CSM and Qualitative Risk Assessment – Existing Aylesbury Link railway line (Area ref GRS-1)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
The existing Aylesbury Link railway line Residual contamination in made ground (e.g. ballast) including heavy metals, fuels, oils and asbestos.	Sensitive land use On-site employees (railway maintenance workers etc.)	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Unlikely	Medium	Low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Medium	Low
	Sensitive land use Off-site workers (farm employees on adjacent land and employees at Greatmoor EfW facility and Calvert landfill within 250m)	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Unlikely	Medium	Low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Medium	Low
	Controlled waters Secondary A Alluvium aquifer	Vertical and lateral migration of contaminated groundwater/leachate	Unlikely	Medium	Low
		Surface run off	Unlikely	Medium	Low

Controlled waters On-site ponds, Muxwell Brook and off-site surface water culverts	Lateral migration of contaminated groundwater	Unlikely	Medium	Low
	Surface run off	Unlikely	Medium	Low
Ecological Finemere Wood and Sheephouse Wood SSSI	Contact with windblown dusts	Unlikely	Minor	Very low
	Lateral migration of contaminants in groundwater.	Unlikely	Minor	Very low
Property Buildings within 50m	Direct contact of below ground building structures and services with contaminated groundwater	Unlikely	Minor	Very low

Table 3: Detailed risk assessment: Baseline CSM and Qualitative Risk Assessment – Calvert landfill Pit 6 (Area ref GRS-2)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
Calvert landfill Pit 6 Currently accepting spoil and incinerator bottom ash (IBA).	Sensitive land use	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Unlikely	Medium	Low
	On-site employees				
	Controlled waters Secondary A Alluvium aquifer	Vertical and lateral migration of contaminated groundwater/leachate	Unlikely	Medium	Low
		Surface run off	Unlikely	Medium	Low
	Controlled waters On-site ponds, Muxwell Brook and off-site surface water culverts	Lateral migration of contaminated groundwater	Unlikely	Medium	Low
		Surface run off	Unlikely	Medium	Low
	Ecological Finemere Wood and Sheephouse Wood SSSI	Contact with windblown dusts	Unlikely	Minor	Very low
		Lateral migration of contaminants in groundwater.	Unlikely	Minor	Very low

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
	Property Buildings within 50m	Gas migration to structures Direct contact of below ground building structures and services with contaminated groundwater	Unlikely Unlikely	Severe Minor	Low/moderate risk Very low

Table 4: Detailed risk assessment: Baseline CSM and Qualitative Risk Assessment – Greatmoor EfW facility (Area ref GRS-3)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
<p>Greatmoor EfW facility</p> <p>Contaminants that could be present during operation potentially arise from imported waste, any chemicals (including fuels) stored on site and IBA. These could include, but are not limited to: heavy metals, organic compounds e.g. oils and inorganic compounds.</p>	<p>Sensitive land use</p> <p>On-site employees</p>	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Unlikely	Medium	Low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Medium	Low
	<p>Sensitive land use</p> <p>Off-site workers (farm employees on adjacent land and railway workers on the existing Aylesbury Link railway line within 250m)</p>	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Unlikely	Medium	Low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Medium	Low
	<p>Controlled waters</p> <p>Secondary A Alluvium aquifer</p>	Vertical and lateral migration of contaminated groundwater/leachate	Unlikely	Medium	Low
		Surface run off	Unlikely	Medium	Low
	<p>Controlled waters</p> <p>Muxwell Brook and off-site surface water culverts</p>	Lateral migration of contaminated groundwater	Unlikely	Medium	Low

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
		Surface run off	Unlikely	Medium	Low
	Ecological Finemere Wood and Sheephouse Wood SSSI	Contact with windblown dusts	Unlikely	Minor	Very low
		Lateral migration of contaminants in groundwater.	Unlikely	Minor	Very low
	Property Buildings within 50m	Direct contact of below ground building structures and services with contaminated groundwater	Unlikely	Minor	Very low

2.3 Construction Risk Assessment

Table 5: Construction CSM and Qualitative Risk Assessment – Existing Aylesbury Link railway line (Area ref GRS-1)

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
The existing Aylesbury Link railway line Residual contamination in made ground (e.g. ballast) including heavy metals, fuels, oils and asbestos.	Sensitive land use On-site employees (railway maintenance workers etc.)	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Low likelihood	Medium	Low/moderate risk
		Inhalation of vapours derived from contaminated groundwater/soil	Low likelihood	Medium	Low/moderate risk
	Sensitive land use Off-site workers (farm employees on adjacent land and employees at Greatmoor EfW facility and Calvert landfill within 250m)	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Unlikely	Medium	Low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Medium	Low
	Controlled waters Secondary A Alluvium aquifer	Vertical and lateral migration of contaminated groundwater/leachate	Unlikely	Medium	Low
		Surface run off	Low likelihood	Medium	Low/moderate risk
	Controlled waters On-site ponds, Muxwell Brook and off-site surface water culverts	Lateral migration of contaminated groundwater	Unlikely	Medium	Low

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
		Surface run off	Low likelihood	Medium	Low/moderate risk
	Ecological Finemere Wood and Sheephouse Wood SSSI	Contact with windblown dusts	Unlikely	Minor	Very low
		Lateral migration of contaminants in groundwater.	Unlikely	Minor	Very low
	Property Buildings within 50m	Direct contact of below ground building structures and services with contaminated groundwater	Unlikely	Minor	Very low

Table 6: Construction CSM and Qualitative Risk Assessment – Calvert landfill Pit 6 (Area ref GRS-2)

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
Calvert landfill Pit 6 Currently accepting spoil and IBA	Sensitive land use On-site employees	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Unlikely	Medium	Low
	Controlled waters Secondary A Alluvium aquifer	Vertical and lateral migration of contaminated groundwater/leachate	Unlikely	Medium	Low
		Surface run off	Unlikely	Medium	Low
	Controlled waters On-site ponds, Muxwell Brook and off-site surface water culverts	Lateral migration of contaminated groundwater	Unlikely	Medium	Low
		Surface run off	Unlikely	Medium	Low
	Ecological Finemere Wood and Sheephouse Wood SSSI	Contact with windblown dusts	Unlikely	Minor	Very low
		Lateral migration of contaminants in groundwater.	Unlikely	Minor	Very low

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
	Property Buildings within 50m	Gas migration to structures Direct contact of below ground building structures and services with contaminated groundwater	Unlikely Unlikely	Severe Minor	Low/moderate risk Very low

Table 7: Construction CSM and Qualitative Risk Assessment – Greatmoor EfW facility (Area ref GRS-3)

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
<p>Greatmoor EfW facility</p> <p>Contaminants that could be present during operation potentially arise from imported waste, any chemicals (including fuels) stored on site and IBA. These could include, but are not limited to: heavy metals, organic compounds e.g. oils and inorganic compounds.</p>	<p>Sensitive land use</p> <p>On-site employees</p>	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Unlikely	Medium	Low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Medium	Low
	<p>Sensitive land use</p> <p>Off-site workers (farm employees on adjacent land and railway workers on the existing Aylesbury Link railway line within 250m)</p>	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Unlikely	Medium	Low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Medium	Low
	<p>Controlled waters</p> <p>Secondary A Alluvium aquifer</p>	Vertical and lateral migration of contaminated groundwater/leachate	Unlikely	Medium	Low
		Surface run off	Unlikely	Medium	Low
	<p>Controlled waters</p> <p>Muxwell Brook and off-site surface</p>	Lateral migration of contaminated groundwater	Unlikely	Medium	Low

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
	water culverts	Surface run off	Unlikely	Medium	Low
	Ecological Finemere Wood and Sheephouse Wood SSSI	Contact with windblown dusts	Unlikely	Minor	Very low
		Lateral migration of contaminants in groundwater.	Unlikely	Minor	Very low
	Property Buildings within 50m	Direct contact of below ground building structures and services with contaminated groundwater	Unlikely	Minor	Very low

2.4 Post-construction Risk Assessment

Table 8: Post-Construction CSM and Qualitative Risk Assessment – Existing Aylesbury Link railway line (Area ref GRS-1)

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
The existing Aylesbury Link railway line Residual contamination in made ground (e.g. ballast) including heavy metals, fuels, oils and asbestos.	Sensitive land use On-site employees (railway maintenance workers etc.)	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Unlikely	Medium	Low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Medium	Low
	Sensitive land use Off-site workers (farm employees on adjacent land and employees at Greatmoor EfW facility and Calvert landfill within 250m)	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Unlikely	Medium	Low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Medium	Low
	Controlled waters Secondary A Alluvium aquifer	Vertical and lateral migration of contaminated groundwater/leachate	Unlikely	Medium	Low
		Surface run off	Unlikely	Medium	Low

Controlled waters On-site ponds, Muxwell Brook and off-site surface water culverts	Lateral migration of contaminated groundwater	Unlikely	Medium	Low
	Surface run off	Unlikely	Medium	Low
Ecological Finemere Wood and Sheephouse Wood SSSI	Contact with windblown dusts	Unlikely	Minor	Very low
	Lateral migration of contaminants in groundwater.	Unlikely	Minor	Very low
Property Buildings within 50m	Direct contact of below ground building structures and services with contaminated groundwater	Unlikely	Minor	Very low

Table 9: Post-Construction CSM and Qualitative Risk Assessment – Calvert landfill Pit 6 (Area ref GRS-2)

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
Calvert landfill Pit 6 Currently accepting spoil and IBA.	Sensitive land use On-site employees	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Unlikely	Medium	Low
	Controlled waters Secondary A Alluvium aquifer	Vertical and lateral migration of contaminated groundwater/leachate	Unlikely	Medium	Low
		Surface run off	Unlikely	Medium	Low
	Controlled waters On-site ponds, Muxwell Brook and off-site surface water culverts	Lateral migration of contaminated groundwater	Unlikely	Medium	Low
		Surface run off	Unlikely	Medium	Low
	Ecological Finemere Wood and Sheephouse Wood SSSI	Contact with windblown dusts	Unlikely	Minor	Very low
		Lateral migration of contaminants in groundwater.	Unlikely	Minor	Very low

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
	Property Buildings within 50m	Gas migration to structures Direct contact of below ground building structures and services with contaminated groundwater	Unlikely Unlikely	Severe Minor	Low/moderate risk Very low

Table 10: Post-Construction CSM and Qualitative Risk Assessment – Greatmoor EfW facility (Area ref GRS-3)

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
<p>Greatmoor EfW facility</p> <p>Contaminants that could be present during operation potentially arise from imported waste, any chemicals (including fuels) stored on site and IBA. These could include, but are not limited to: heavy metals, organic compounds e.g. oils and inorganic compounds.</p>	<p>Sensitive land use</p> <p>On-site employees</p>	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Unlikely	Medium	Low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Medium	Low
	<p>Sensitive land use</p> <p>Off-site workers (farm employees on adjacent land and railway workers on the existing Aylesbury Link railway line within 250m)</p>	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Unlikely	Medium	Low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Medium	Low
	<p>Controlled waters</p> <p>Secondary A Alluvium aquifer</p>	Vertical and lateral migration of contaminated groundwater/leachate	Unlikely	Medium	Low
		Surface run off	Unlikely	Medium	Low
	<p>Controlled waters</p> <p>Muxwell Brook and off-site surface water culverts</p>	Lateral migration of contaminated groundwater	Unlikely	Medium	Low

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
		Surface run off	Unlikely	Medium	Low
	Ecological Finemere Wood and Sheephouse Wood SSSI	Contact with windblown dusts	Unlikely	Minor	Very low
		Lateral migration of contaminants in groundwater.	Unlikely	Minor	Very low
	Property Buildings within 50m	Direct contact of below ground building structures and services with contaminated groundwater	Unlikely	Minor	Very low

2.5 Assessment of temporary (construction) and permanent (post-construction) effects

Table 11: Significance of Impact during Construction and Post Construction – Existing Aylesbury Link railway line (Area ref GRS-1)

Contaminant linkage	Baseline Risk	Construction Risk	Post-construction Risk	Construction effects	Post-construction effects
Exposure of on-site human receptors (workers) to contamination by direct contact, ingestion and inhalation of contaminants in windblown soil/dust.	Low	Low/moderate	Low	Minor adverse effect	Neutral effect
Exposure of on-site human receptors (workers) to inhalation of vapours derived from contaminated soil/groundwater.	Low	Low/moderate	Low	Minor adverse effect	Neutral effect
Exposure of off-site human receptors (residential and workers) to contamination by direct contact, ingestion and inhalation of contaminants in windblown soil/dust.	Low	Low	Low	Neutral effect	Neutral effect
Exposure of off-site human receptors (residential and workers) to inhalation of vapours derived from contaminated soil/groundwater.	Low	Low	Low	Neutral effect	Neutral effect
Exposure of Secondary A Alluvium aquifer to vertical and lateral migration of contaminated groundwater/leachate.	Low	Low	Low	Neutral effect	Neutral effect
Surface run off to the Secondary A Alluvium aquifer	Low	Low/moderate	Low	Minor adverse effect	Neutral effect
Exposure of surface water features to vertical and lateral migration of contaminated groundwater/leachate.	Low	Low	Low	Neutral effect	Neutral effect
Surface run off to surface water features.	Low	Low/moderate	Low	Minor adverse effect	Neutral effect
Exposure of off-site ecological receptors (Finemere Wood and Sheephouse Wood SSSI) to contact with	Very low	Very low	Very low	Neutral effect	Neutral effect

contaminants in windblown dusts.					
Exposure of off-site ecological receptors (Finemere Wood and Sheephouse Wood SSSI) to lateral migration of contaminants in groundwater.	Very low	Very low	Very low	Neutral effect	Neutral effect
Exposure of off-site properties (e.g. below ground building structures and services) to direct contact with contaminants in soil and surface water / groundwater.	Very low	Very low	Very low	Neutral effect	Neutral effect

Table 12: Significance of Impact during Construction and Post Construction – Calvert landfill Pit 6 (Area ref GRS-2)

Contaminant linkage	Baseline Risk	Construction Risk	Post-construction Risk	Construction effects	Post-construction effects
Exposure of on-site human receptors (workers) to contamination by direct contact, ingestion and inhalation of contaminants in windblown soil/dust.	Low	Low	Low	Neutral effect	Neutral effect
Exposure of Secondary A Alluvium aquifer to vertical and lateral migration of contaminated groundwater/leachate.	Low	Low	Low	Neutral effect	Neutral effect
Surface run off to the Secondary A Alluvium aquifer	Low	Low	Low	Neutral effect	Neutral effect
Exposure of surface water features to vertical and lateral migration of contaminated groundwater/leachate.	Low	Low	Low	Neutral effect	Neutral effect
Surface run off to surface water features.	Low	Low	Low	Neutral effect	Neutral effect
Exposure of off-site ecological receptors (Finemere Wood and Sheephouse Wood SSSI) to contact with contaminants in windblown dusts.	Very low	Very low	Very low	Neutral effect	Neutral effect
Exposure of off-site ecological receptors (Finemere Wood and Sheephouse Wood SSSI) to lateral migration of	Very low	Very low	Very low	Neutral effect	Neutral effect

Contaminant linkage	Baseline Risk	Construction Risk	Post-construction Risk	Construction effects	Post-construction effects
contaminants in groundwater.					
Exposure of off-site properties (e.g. below ground building structures and services) to direct contact with contaminants in soil and surface water / groundwater.	Very low	Very low	Very low	Neutral effect	Neutral effect

Table 13: Significance of Impact during Construction and Post Construction – Greatmoor EfW facility (Area ref GRS-3)

Contaminant linkage	Baseline Risk	Construction Risk	Post-construction Risk	Construction effects	Post-construction effects
Exposure of on-site human receptors (workers) to contamination by direct contact, ingestion and inhalation of contaminants in windblown soil/dust.	Low	Low	Low	Neutral effect	Neutral effect
Exposure of on-site human receptors (workers) to inhalation of vapours derived from contaminated soil/groundwater.	Low	Low	Low	Neutral effect	Neutral effect
Exposure of off-site human receptors (residential and workers) to contamination by direct contact, ingestion and inhalation of contaminants in windblown soil/dust.	Low	Low	Low	Neutral effect	Neutral effect
Exposure of off-site human receptors (residential and workers) to inhalation of vapours derived from contaminated soil/groundwater.	Low	Low	Low	Neutral effect	Neutral effect
Exposure of Secondary A Alluvium aquifer to vertical and lateral migration of contaminated groundwater/leachate.	Low	Low	Low	Neutral effect	Neutral effect
Surface run off to the Secondary A Alluvium aquifer	Low	Low	Low	Neutral effect	Neutral effect

Contaminant linkage	Baseline Risk	Construction Risk	Post-construction Risk	Construction effects	Post-construction effects
Exposure of surface water features to vertical and lateral migration of contaminated groundwater/leachate.	Low	Low	Low	Neutral effect	Neutral effect
Surface run off to surface water features.	Low	Low	Low	Neutral effect	Neutral effect
Exposure of off-site ecological receptors (Finemere Wood and Sheephouse Wood SSSI) to contact with contaminants in windblown dusts.	Very low	Very low	Very low	Neutral effect	Neutral effect
Exposure of off-site ecological receptors (Finemere Wood and Sheephouse Wood SSSI) to lateral migration of contaminants in groundwater.	Very low	Very low	Very low	Neutral effect	Neutral effect
Exposure of off-site properties (e.g. below ground building structures and services) to direct contact with contaminants in soil and surface water / groundwater.	Very low	Very low	Very low	Neutral effect	Neutral effect

3 Inspections notes and other site data

- 3.1.1 Information from site walkovers has been taken into account in the Land Quality assessment.

4 Geological SSSI and local geological sites

4.1.1 There are no geo-conservation resources identified within the study area.

5 Mining and minerals data

- 5.1.1 The Buckinghamshire County Council Minerals and Waste Core Strategy Development Plan Document (November 2012) confirms that the study area is not located within a Minerals Consultation/Safeguarding Area or a Preferred Area.
- 5.1.2 Reserves of clay deposits are present at the Calvert landfill site to the southwest of the Proposed Scheme. Historically, this material was an important resource used for the production of bricks at the site. Brickwork production ceased at the site in 1991. Consent exists for an extended area of excavation within Calvert landfill Pit 6.

6 References

- Buckinghamshire County Council, (2011), Minerals and Waste Core Strategy, Adopted November 2012.
- Defra and Environment Agency, (2002), Potential contaminants for the assessment of land - R&D Publication, Bristol, Environment Agency.

