



Preliminary Environmental Information Report

Volume 2

Chapter 16: Soils and Land

16 Soils and Land

16.1 Introduction

16.1.1.1 This chapter of our Preliminary Environmental Information Report (PEIR) considers the effects from construction and operation of the River Thames Scheme (RTS) ('the project') in relation to soils and land. Within this chapter we have included topic specific sections on:

- Legislation, policy and guidance (noting any changes since Environmental Impact Assessment (EIA) scoping);
- Engagement with consultees, including responses to comments received on the RTS EIA Scoping Report;
- The assessment methodology for this topic (again noting any changes or updates since EIA scoping);
- Key environmental considerations and opportunities,
- Primary and tertiary mitigation;
- Our preliminary assessment of effects;
- Secondary mitigation; and
- Future work for this topic of our EIA.

16.1.1.2 For a summary of the key baseline elements associated with soils and land see Section 5.12.

16.1.1.3 For the purposes of soils and land the study area encompasses the full extent of the area within the project boundary for EIA PEIR. For the purposes of land potentially affected by contamination, the study area encompasses the extent of the area within the project boundary for EIA PEIR and extends an additional 250 metres from the soils and land study area outlined above.

16.1.1.4 This is the same definition of the study area that was used for the soils and land chapter of the RTS EIA Scoping Report (Environment Agency and Surrey County Council, October 2022) ('the EIA Scoping Report'), see Section 16.2.3 of the Scoping Report. However, the study area will be slightly different to that presented in the EIA Scoping Report due to minor changes in the project boundary for EIA PEIR (see Chapter 3 and Figure 5.28, for further information).

- 16.1.1.5 This chapter describes the proposed scope of the assessment on soils and land. It outlines the likely effects of the project and the avoidance or mitigation measures proposed to alleviate these.
- 16.1.1.6 The assessment of soils and land effects overlaps with the following other topics and utilises similar baseline information: Chapter 10: Flood Risk, Chapter 11: Health, Chapter 13: Materials and Waste, and Chapter 18: Water Environment. The scope of agricultural soils in this chapter is limited to the quality of farmland (in the context of Agricultural Land Classification (ALC)). Any socio-economic aspects of agriculture and commercial businesses are covered in Chapter 15: Socio Economics. The potential effects associated with contamination and changes in soil structure to ecological receptors is included in Chapter 7: Biodiversity. The carbon aspects of soils are included in Chapter 8: Climatic Factors. Potential effects associated with waterborne contamination are discussed in Chapter 18: Water Environment.

16.2 Legislation, Policy and Guidance

- 16.2.1.1 A summary of the key legislation, policy and guidance relevant to soils and land is provided in Appendix M of the EIA Scoping Report. Since publication of the EIA Scoping Report in October 2022, the National Policy Statement for Water Resources Infrastructure (NPS) has been updated and finalised (Defra, 2023a). No notable changes to the NPS from the draft NPS (published in 2018) have been identified as relevant to this chapter. There has been no other new relevant legislation, policy or guidance published since the submission of the EIA Scoping Report. In August 2023 CIRIA published guidance on Sustainable management of surplus soil and aggregates from construction (CIRIA, 2023). This has not been considered in the PEIR but will be considered in the Environmental Statement (ES).

16.3 Engagement

16.3.1 Responses to EIA Scoping

- 16.3.1.1 Table 16-1 below summarises the comments and responses received on our EIA Scoping Report following formal submission to the Planning Inspectorate (PINS) including the PINS EIA Scoping Opinion (date 15 November 2022) ('the PINS Scoping Opinion') and any key comments

received from statutory consultees. Full consultee comments on our EIA Scoping Report and our responses to these comments are provided in Appendix 4.1.

Table 16-1: Responses to comments received on the EIA Scoping Report

Consultee or Organisation	Summary of Comment	Project Response
Planning Inspectorate (PINS)	PINS considered that not enough standard practice information was presented at scoping to scope out effects associated with general construction activities causing damage to soils and compactions.	General construction activities have been scoped in to our PEIR.
PINS	Mitigation such as bank protection works and profiling of channels to safe measurements and support from sheet piling is proposed to reduce the potential for operational failures occurring. An emergency plan for operational failures should also be submitted with the Environmental Statement (ES). On the basis these measures are described in the ES and secured through the DCO, the Inspectorate is content to scope this matter out.	An emergency plan for operational failure will be produced and included within the ES and secured through the DCO.
PINS	Although the sediment regimes are anticipated to return to normal once the weir structures are in place, there is potential for a time lag for this to take effect. The ES should confirm if this is the case and assess the potential for significant effects to occur due to an altered regime.	Sediment regimes, including in relation to weir structures, are being considered in Chapter 18: Water Environment and will be included in the ES
PINS	Section 16.7.2 of the Scoping Report does not include agricultural land as a receptor (including best and most versatile) although the grading is reported in paragraph 16.3.1.22. The ES should assess the potential for significant effects due to agricultural land take.	Temporary and permanent effects on agricultural land are scoped in under Section 15.4.1.1 bullet 5 and Section 16.4.2.1 bullet 2 of the EIA Scoping Report and have been considered in the PEIR.
PINS	Considering the reprofiling of land has potential to cause land instability, the ES	Land instability from earthworks, creation

Consultee or Organisation	Summary of Comment	Project Response
	<p>should assess significant effects where they are likely to occur.</p>	<p>of site compounds, temporary material processing sites and temporary storage of excavated material etc. have been scoped in and included within the PEIR.</p>
<p>PINS and Local Planning Authority (LPA) Project Group</p>	<p>The Scoping Report does not set out the methodology by which any assessment of soils and agricultural land will be undertaken, and we advise that this must be completed in accordance with standard practice and measures to protect soil resources should be in accordance with the 'Construction Code of Practice for the Sustainable Use of Soils on Construction Sites' (Defra 2009). This should include an assessment that takes account of the ecosystem services they provide as a resource.</p>	<p>Soils as a resource are assessed in the PEIR and will be assessed in the ES. Adherence to the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites' is considered tertiary mitigation and will also be used to inform the assessment in the ES. A project specific Natural Capital Assessment is being undertaken that considers the ecosystem services that soil provides and will be reported on alongside the ES.</p>
<p>LPA Project Group</p>	<p>The Geology and Soils chapter of the EIA Scoping Report does not make any reference to land stability and/or geological hazards. It is advised that a preliminary land stability risk assessment should be undertaken, with the findings used to inform the EIA.</p>	<p>The effects of the project on structure and stability of soils are assessed in our PEIR and will also be assessed in the ES. A Preliminary Land Stability Risk Assessment will inform the ES.</p>

16.3.2 Other Engagement

16.3.2.1 Briefings have been held with the LPA Project Group in 2023 to provide updates on our approach to materials and waste management, including a summary of our ground investigations (GI). We have also met with the Environment Agency National Infrastructure team to discuss consenting requirements in relation to materials management, waste and permitting requirements, and this will continue as the project progresses.

16.4 Methodology

16.4.1 Introduction

16.4.1.1 This section should be read in conjunction with Chapter 4 'Approach to the Environmental Assessment' which sets out relevant information on the design parameters and information that have informed the PEIR assessment, and how we have approached various aspects of the assessment including:

- The scope of the assessment;
- The methodology (including the approach to defining the baseline environment, topic study areas, and assessment methodology and criteria);
- The approach to mitigation; and
- The approach to cumulative effects.

16.4.1.2 The assessment methodology used for the soils and land assessment in this PEIR and to be used in the Environmental Statement (ES) is presented in Section 16.7 of the EIA Scoping Report, including defining categories for the sensitivity of receptors and the magnitude of effects. No changes to the methodology were required in response to the Planning Inspectorate (PINS) EIA Scoping Opinion. Following additional feedback from engagement with the LPA Project Group, at the ES stage further analysis of natural capital consideration will be undertaken in the soil assessment in accordance with A New Perspective on Land and Soil in Environmental Impact Assessment (IEMA, 2022d).

16.4.2 Assessment Method for the PEIR

16.4.2.1 The baseline presented in Section 5.12 of the PEIR and Section 16.3 of the EIA Scoping Report was informed by previous GI data. No further GI

data or interpretive reporting has been considered for the PEIR assessment. Additional GI data is currently being processed, this data will supplement the older data and be used to create a detailed conceptual ground model, the detail of which will be discussed with the relevant stakeholders as part of on-going engagement. The conceptual ground model will only be available at the ES stage. Therefore, for the PEIR we have completed our assessment based on professional judgement utilising the available baseline information and applying a precautionary approach to provide a robust assessment.

16.4.2.2 Our evaluation of significance and analysis of consequences is based on established EIA assessment approaches and expert professional judgement. We have relied on industry approved standards, guidelines, and current legislation to support the assessment (see Appendix M of the EIA Scoping Report). There is potential for various likely significant effects on soil and land to arise from the construction and operation of the project, and we have assessed these effects according to relevant guidance.

16.4.2.3 We have assessed the significance of possible contamination in the study area by considering the probability and severity of the following factors combined:

- A source of contamination is present;
- There is a pathway or route that the contaminant can travel along;
and
- Along the pathway is a receptor – a specific part of the natural or human environment that is negatively affected by the contaminant.

16.4.2.4 We have assessed the effects that could arise due to placement of materials on land. This could result in compression of historical landfill waste under the new green open spaces and priority areas for habitat creation, enhancement or mitigation, leading to the release of contamination. We have also evaluated the potential for contamination to infiltrate into groundwater should a pathway exist or if there is a possibility of one or more being created. Based on this assessment, we have established the likelihood of any significant effects upon groundwater (and any other identified receptors) in the future and identify the necessary control measures.

16.4.3 Assessment Method for the ES

- 16.4.3.1 The assessment methodology will be as described for the PEIR above with the following additions:
- 16.4.3.2 The assessment of effects undertaken as part of the EIA and to be reported within the ES will be based on the latest information available at that time and will include details from GI interpretive reports, ground modelling and associated risk assessments.
- 16.4.3.3 A ground model is being developed for the project and will inform the ES by identifying sources, pathways, and receptors of potential effects.
- 16.4.3.4 The project design is currently being developed and will include strategies and measures to prevent negative effects on receptors by avoiding (or minimising the effects of) the creation of new sources, removing the source contaminants, or breaking the source-pathway-receptor linkage by severing the pathway.
- 16.4.3.5 In areas where excavation of materials is required, we will assess their physical and chemical properties for suitability for placement elsewhere within the study area. This information will be reported in the ES. The chemical properties will be assessed to ensure suitability for the proposed public open green spaces or parkland as well as adjacent controlled waters (see Chapter 18: Water Environment). Physical properties such as the soil's ability to be compacted and used as general fill without significant future settlement or instability will also be evaluated to ensure suitability for placement in public open spaces.

16.5 Key Environmental Considerations and Opportunities

- 16.5.1.1 The key considerations with respect to soils and land are:
- The small areas of moderate and high-quality agricultural land within the study area are sensitive to land use changes such that agricultural land is lost;
 - There are numerous historical and authorised landfill sites and other areas of potentially contaminated land within the study area. These are a risk to identified receptors from the creation of new pollutant pathways;

- Soil structure, quality and quantity is sensitive to compaction, degradation and pollution from land use changes such as the construction of major infrastructure projects.

16.5.1.2 The key opportunities with respect to soils and land are:

- A reduction in flood risk for land use assets (e.g. agricultural land within the soils and land study area); and
- There are likely to be opportunities for use of excavated wastes and materials within the project, incorporated into the landscape and green infrastructure design (subject to approval).

16.6 Primary and Tertiary Mitigation

16.6.1 Primary Mitigation

16.6.1.1 The following primary mitigation is proposed in relation to soils and land effects. For further detail of these measures see Chapter 2 Project Description:

- The Sequential Approach to flood risk ensures that the areas of site of lowest flood risk are appropriately allocated for activities that are particularly sensitive to uncontrolled flooding. This will mitigate effects associated with, for example, for the potential damage or loss of topsoil and subsoil stockpiles, and uncontrolled release of contaminants into flood waters at materials processing sites; and
- Silt monitoring and channel maintenance will be required at the entrances to the intake structures and at interconnecting waterbodies to prevent the build-up of sediment reducing the effectiveness of the flood channel and therefore avoiding negative effects associated with flooding of contaminated land.

16.6.2 Tertiary Mitigation

16.6.2.1 The following tertiary mitigation is proposed in relation to the soils and land effects assessed within this PEIR. Many of these measures will also serve as mitigation in respect of other EIA topics:

- Apply standard construction practices in relation to handling of soils to mitigate against effects associated with the damage to soils

(geochemically and geotechnically), to minimise reduction of quality, for example:

- Topsoil stripping, storage, and replacement to preserve and protect the soil resource from further deterioration during construction.
- Limiting construction traffic to delineated routes and away from riverbanks to prevent damage to soils.
- Placement of granular layers of hardcore with geotextile at construction compounds and material processing sites to minimise ground compaction.
- Soil handling measures will be undertaken to mitigate effects on soils in accordance with the following good practice guidance documents (this is not an exhaustive list):
 - Good Practice Guide for Handling Soils in Mineral Workings (The Institute of Quarrying (IQ), 2021).
 - BS4428:1989 British Standard code of practice for general landscape operations.
 - BS3882:2007 British Standard specification for topsoil and requirements for use.
 - Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (Defra, 2009).
 - Site Specific Soil Resource Plan.
- Develop a Construction Surface Water Management Plan to mitigate effects from damage to soils and land and spread of potential contamination by leaching due to interaction with surface water. This could include measures such as (this is not an exhaustive list):
 - Design of stockpiles sized and orientated to not obstruct storm surface water flowpaths, to prevent deterioration of soils from washout, and the management of stockpile water runoff.
 - Design of the sequencing and timing of works to optimise storm water storage and prevent saturation of stockpiled soils.
 - A suitable plan for the treatment and discharge of collected water from construction activities such as dewatering and road sweeping.
- Develop a Materials Management Strategy. We are developing the strategy in parallel to the Development Consent Order (DCO) process and it will include measures to protect soils through:
 - Efficient management proposals for processing and recovery of waste and placement of materials generated by the project, using

- specific criteria based on risk assessments to ensure geochemical and geotechnical suitability for minimal acceptable effect on environmental receptors. This reduces the need to import materials from off-site, and minimises the volume of unsuitable materials requiring off-site disposal including soils.
- Being implemented in line with relevant permitting requirements and protocols such as CL:AIRE Definition of Waste: Code of Practice (DoWCoP) and various other end of waste protocols such as the Waste and Resources Action Programme (WRAP).
 - Develop a Site Waste Management Plan (SWMP) to control the movement, storage and recovery of waste to mitigate against the effects from mixing and pollution of other soils and wastes. The SWMP sets out the amount and type of waste and how it will be recovered, recycled or disposed of in accordance with legislation. The Contractor(s) will adopt the outline SWMP and develop further as required.
 - Apply the waste hierarchy. For example, minimise generation of waste, reuse of arisings, treatment of waste to make it suitable for deposit etc. This will aid further with mitigation of the possible effect from pollution of other soils and wastes.
 - Undertake GI. We are currently completing geotechnical and geoenvironmental investigations, involving intrusive sampling and testing of the underlying soils, bedrock, groundwater, and ground gas to determine characteristic physical and chemical properties of materials underlying the site. The GI is being completed in accordance with the Water Resources Act 1991 (as amended) and Part 2A of the Environmental Protection Act 1990 supplemented by the Contaminated Land Regulations 2012. Results and interpretation of the GI findings is allowing us to produce a ground model containing relevant geochemical and geotechnical data that will refine our primary, tertiary, and secondary mitigation in relation to management of soil.
 - Undertake a Hydrogeological Risk Assessment to a scope to be agreed with host authorities and the Environment Agency to evaluate the environmental risk of pollution of groundwater from contaminated soils, in accordance with the Water Resources Act 1991 (as modified to 2020) and develop control measures to minimise this risk during excavation, treatment, or deposition and therefore reduce effects of

pollution migration to sensitive receptors. The Hydrogeological Risk Assessment will be submitted with the DCO.

- Apply standard construction practices in relation to waste and materials management to mitigate the spread of contaminated soils and waste to receptors. This would include mitigation measures and associated monitoring (such as for groundwater) in accordance with the following good practice guidance documents and legislation (this is not an exhaustive list):
 - Technical Guidance WM3: Waste Classification - Guidance on the classification and assessment of waste (Environment Agency, 2021a).
 - Land Contamination Risk Management (LCRM).
 - Model Procedures for the Management of Contaminated Land (CLR 11).
 - Part IIA of the Environmental Protection Act 1990.
 - Water Framework Directive.
 - Groundwater Regulations 1998 (as amended).
 - Water Resources Act 1991 (as amended).
 - Environmental consents and permitting (Environmental Permitting (England and Wales) Regulations, 2016) – see below.
 - Environment Agency Landfill Gas Guidance (Environment Agency, 2004).
- Obtain and comply with environmental permits for waste in relation to potential spread of contaminants in soil as a result of compression from project components, e.g. new landforms, as well as changes in land use of historical landfills due to the project. Any works within or affecting landfills or involving waste will be subject to the requirement of an environmental permit under the Environmental Permitting (England and Wales) Regulations 2016. For the purposes of this PEIR assessment, environmental permits for waste have been included as mitigation, with the assumption that these are in place. As part of the permitting process, we will be required to:
 - Undertake a range of risk assessments / modelling of landfill leachate and gas migration (based on the outcomes of GI and ground modelling), which will be subject to scrutiny by the Environment Agency's National Permitting Service to ensure that they are robust;
 - Propose and put in place suitable measures to mitigate effects on the environment to an acceptable level, which the Environment

Agency National Permitting Service will review and scrutinise in terms of their adequacy and appropriateness for mitigating the risks and effects identified. An environmental permit will only be granted if the Environment Agency National Permitting Service is satisfied that effects on human health and the environment are acceptable.

- Comply with conditions to limit effects on human health and the environment and ensure that the activities are subject to suitable controls.

16.7 Preliminary Assessment of Likely Significant Effects

16.7.1 Introduction

- 16.7.1.1 Our PEIR adopts a precautionary approach. Assessments reported within this chapter are a preliminary assessment of potential likely significant environmental effects based on the design parameters set out in Chapter 2. This precautionary approach has been taken for the PEIR as there is some information on the project that is currently incomplete and the parameters within Chapter 2 are high level and account for a range of uses and allowance for design development within a boundary that could possibly be refined once this work has been completed. For example, some designs, construction or mitigation details (and therefore also land requirements) or baseline information is still required from further surveys, assessments and/or consultation feedback.
- 16.7.1.2 In making a determination of likely significant effects, we have considered the sensitivity of receptors (a receptor being a feature of the environment that responds to change) and the potential magnitude (i.e. size) of change caused by the RTS. The methodology for defining sensitivity and magnitude varies by topic and are defined in the topic sections of our Scoping Report.
- 16.7.1.3 We are committed to including mitigation measures as necessary to address likely significant negative environmental effects as far as reasonably practicable. Both primary and tertiary mitigation are considered to form part of the RTS; those applicable to this topic are set out in Section 16.6.1 and 16.6.2. Several of these mitigation measures are still being developed, and therefore as a precaution, the preliminary assessment of effects for our PEIR does not assume full achievement of

these in considering if a project effect is likely to be significant (Appendix 4.2 identifies the implementation status of primary and tertiary mitigation for the PEIR assessment). An exception to this is that for the purposes of the soils and land within the PEIR, we have completed our assessment of likely significant effects of the project with the assumption that environmental waste permits are in place as set out in Sections 16.6.2.14 to 16.6.2.16. Furthermore, the potential likely significant effects reported within our PEIR have been assessed prior to the implementation of secondary mitigation measures, those applicable to this topic are set out in Section 16.7.5. These secondary mitigation measures are the subject of further development; and given they are still being developed, are not able to be applied to develop a 'residual' effects assessment.

16.7.1.4 Our PEIR is based on the latest design and construction parameters and baseline information. As such the findings of the preliminary environmental appraisal presented within our PEIR may be subject to change as the design progresses, as mitigation is further developed or information from further studies becomes available, such as on-going Ground Investigation works, risk assessment / modelling of landfill leachate migration and ground gas. The final assessment of effects undertaken as part of the EIA and reported within the ES will be based on the latest information available at that time.

16.7.2 Potential Likely Significant Effects

16.7.2.1 Our preliminary assessment of likely significant environmental effects has identified the potential for the following significant effects from construction in relation to soils and land:

- Permanent negative effect from loss of arable and pasture farm land as a result of creation of the channels (material excavation), new green open spaces and priority areas for habitat creation, enhancement or mitigation.

16.7.2.2 Our preliminary assessment of likely significant environmental effects has identified the potential for the following significant effects from operation in relation to soils and land:

- Positive permanent effect from reduced flood risk of contaminated land causing reduced mobilisation of contaminants into the

Shepperton Gravel Member and the associated principal aquifer, and groundwater abstraction Source Protection Zones.

16.7.2.3 Further details of the potential likely significant effects from construction and operation with respect to receptors, project components and project activities, in relation to soils and land can be found in Table 1 and 2 in Appendix 16.1.

16.7.3 Potential Likely Non-Significant Effects

16.7.3.1 Further details of the non-significant effects from construction and operation with respect to receptors, project components and project activities, in relation to soils and land can be found in Table 3 and 4 in Appendix 16.1.

16.7.3.2 Some examples of soils and land non-significant effects include (this is not an exhaustive list):

- Non-significant positive effects from reduced flood risk of contaminated land, reduced mobilisation of contaminants into geological formation and groundwater.
- Non-significant positive effects to arable and pasture land from reduction in flood risk and control of groundwater levels and the associated reduction in nutrient loss such as nitrates and phosphates by leaching, and erosion of the top layers of soil.

16.7.4 In-Combination Climate Impact

16.7.4.1 Consideration of 'In-Combination Climate Impact' (ICCI) has been undertaken. The preliminary environmental assessment has considered a future climate scenario and has identified certain potential likely significant environmental effects for this topic which will be exacerbated further by predicted climate change. Further consideration of ICCI will be included in the ES.

16.7.5 Secondary Mitigation

16.7.5.1 No secondary mitigation has been identified at this PEIR stage. The need for mitigation will be considered further as design and assessment work continues to progress as part of the EIA, and any secondary mitigation developed will be reported in the ES.

16.7.5.2 As noted under 16.6.2, existing ground investigation data is currently being processed to create a detailed ground model and inform risk assessments. Ground investigations are ongoing to aid with development of secondary mitigation measures (such as gas monitoring during construction) in order to refine the magnitude of change and reduce significance on receptors.

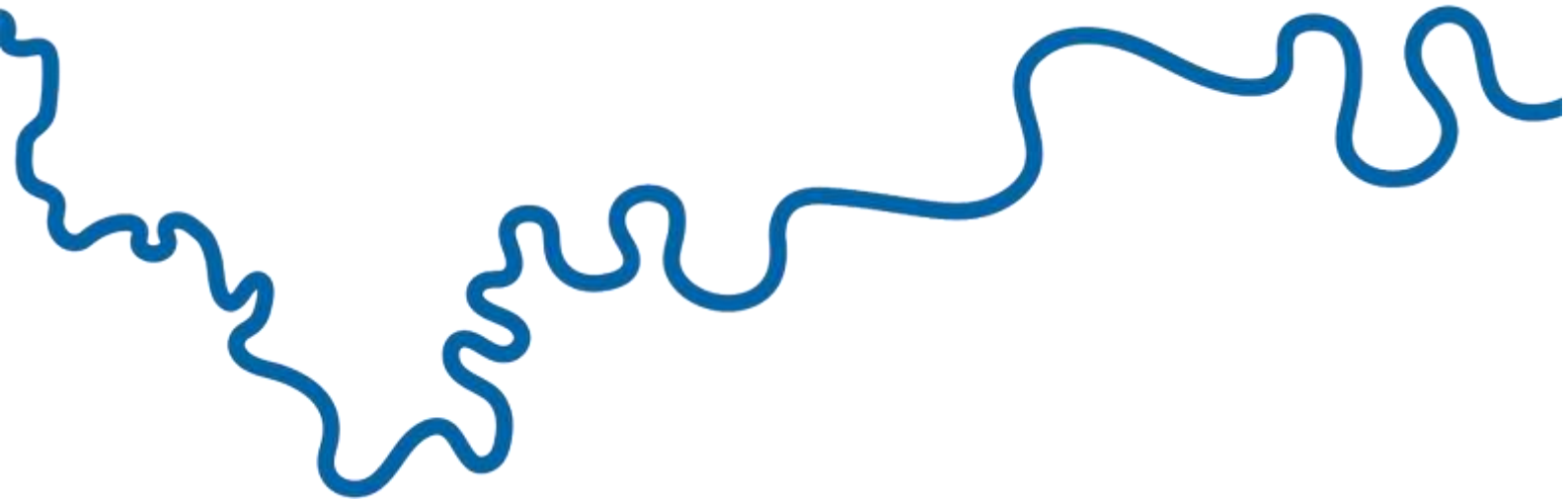
16.8 Further Work for the EIA

16.8.1.1 The detailed assessment of effects upon soils and land to inform the ES will be undertaken following the methodology set out in Section 16.7 of the EIA Scoping Report, having been informed by the PINS Scoping Opinion and other consultation feedback on baseline, methodology, mitigation and effects scoped into the assessment.

16.8.1.2 Further to the preliminary environmental assessment presented in this PEIR, the following will be undertaken as part of the detailed assessment of effects upon soils and land for the ES:

- An update will be made to the baseline as set out in the EIA Scoping Report where there is more updated information available, including additional data emerging from the ongoing GI works and review of associated factual reports.
- Data from our GI is being processed to create a detailed ground model. This ground model will feed into risk assessments / modelling of landfill leachate and gas migration that will, in discussion with the Environment Agency National Permitting Service, inform suitable measures to mitigate effects on the environment to an acceptable level (including further iteration of the design where applicable). This will be reported on in the ES.
- We will use the project specific Natural Capital Assessment to inform our assessment of soil as a resource in the ES.

16.8.1.3 We consider that the further development of the project design and mitigation measures which will be reflected in the ES and DCO application, will enable a reduction in the scale of identified negative likely significant effects set out in this chapter..



The River Thames Scheme represents a new landscape-based approach to creating healthier, more resilient and more sustainable communities by reducing the risk of flooding and creating high quality natural environments.