Lower Thames Crossing

6.1 Environmental Statement Chapter 11 – Material Assets and Waste (Tracked changes version)

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Lower Thames Crossing

6.1 Environmental Statement
Chapter 11 – Material Assets and Waste
(Tracked changes version)

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11.1 Introduction

11.1.1 This chapter presents the assessment of the likely significant effects of the A122 Lower Thames Crossing (the Project) on material assets and waste during construction and operation. The assessment considers the consumption of material resources and products from primary and recycled/secondary sources and the production, treatment and offsite management and disposal of waste.

11.1.2 The assessment follows the methodology set out in Design Manual for Roads and Bridges (DMRB) LA 110: Material assets and waste (Highways England, 2019).

11.1.3 This chapter is supported by Figure 11.1 (Application Document 6.2), and additional information contained in the following appendices (Application Document 6.3):

a. Appendix 11.1 - Excavated Materials Assessment

b. Appendix 11.2 - Mineral Safeguarding Assessment

c. Appendix 11.3 - List of Third-party Offsite Waste Infrastructure Receptors

d. Appendix 11.4 - Material Assets Assessment Supporting Data

e. Appendix 11.5 - Waste Assessment Supporting Data

f. Appendix 11.6 - Material Assets and Waste Legislation and Policy

11.2 Legislative and policy framework

11.2.1 This chapter assessment has been undertaken in accordance with relevant legislation, and having regard to national, regional and local plans and policies.

11.2.2 Appendix 11.6 sets out how the Applicant has considered and addressed those policies in the NPSs which relate to the assessment of effects considered in this chapter of the Environmental Statement. Policies in the NPSs which relate to decision making in relation to matters of relevance to this topic of the ES are addressed in the Planning Statement (Application Document 7.2).

Legislative requirements

11.2.3 Relevant material assets and waste legislation that has been considered during the assessment is presented in Appendix 11.6 - Material Assets and Waste Legislation and Policy (Application Document 6.3).

National policy

11.2.4 Nationally Significant Infrastructure Projects (NSIPs) are determined in accordance with the decision-making framework in the Planning Act 2008 (as amended) and relevant National Policy Statements (NPSs), as well as any other matters that are both important and relevant (which may include the National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, 2021).

11.2.5 The National Policy Statement for National Networks (NPS NN) (Department for Transport, 2014) sets out the Government's policies to deliver NSIPs on the national road and rail networks in England. Modifications to the nationally significant energy infrastructure are required as part of the Project. Four utilities diversions constitute NSIPs in their own right, and therefore the Project will also be assessed against the following energy policy statements:

a. Overarching National Policy Statement for Energy (EN-1) (Department of Energy and Climate Change, 2011a);

b. National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) (Department of Energy and Climate Change, 2011b); and

c. National Policy Statement for Electricity Network Infrastructure (EN-5) (Department of Energy and Climate Change, 2011c).

11.2.6 However, the NPSNN forms the 'case-making' basis for the Project, and the need for nationally significant utilities diversions arises solely from the need for the road element of the Project.

11.2.7 The NPPF, sets out the Government's planning policies. It provides a framework within which locally prepared plans for housing and other development can be produced.

11.2.8 The NPPF does not contain specific policies for NSIPs. However, the NPPF advises that local authorities' planning policies should take into account NSIPs which are located within their local areas. Paragraph 1.17 of the NPSNN states that the NPS and NPPF are consistent, and paragraph 1.18 explains that the NPPF is an important and relevant consideration, 'but only to the extent relevant to [the] project'.

11.2.9 National Highways (the Applicant) has taken these policy requirements into account during the development and design of the Project and the preparation of this chapter of the Environmental Statement (ES).

11.2.10 Appendix 11.6 - Material Assets and Waste Legislation and Policy (Application Document 6.3), lists the planning policies at a national level and the Project response to them.

11.2.11 Further information on the how the application has responded to national planning policies is available in the Planning Statement (Application Document 7.2).

Local policy framework

11.2.12 Consideration has been given to county policies within Kent, Essex, the Updated London Plan, and local policies relating to material assets and waste within the following local authorities within the study area: Maidstone, Tonbridge and Malling, Gravesham, Thurrock, Havering, and Brentwood. These are outlined in Appendix 11.6 - Material Assets and Waste Legislation and Policy (Application Document 6.3) and are considered further within the Planning Statement (Application Document 7.2).

11.3 Assessment methodology

Standards and guidance

11.3.1 The following standards and guidance documents have been used in devising the methodology for data collection and assessment of material assets and waste impacts:

a. DMRB LA 110 Material assets and waste (Highways England, 2019)

b. The Definition of Waste: Development Industry Code of Practice (Contaminated Land: Applications in Real Environments (CL:AIRE), 2011)

c. Code of Practice for the Sustainable Management of Soils on Construction Sites (Department for Environment, Food and Rural Affairs (Defra), 2009)

d. Guidance on the legal definition of waste and its application (Defra, 2012)

e. Circular Economy: Approach and Routemap (Highways England, 2016)

Scope of the assessment

11.3.2 The scope of this chapter is to assess the likely significant effects on the consumption and use of material assets and production and disposal of waste during the construction and operation of the Project as described in Chapter 2 - Project Description.

11.3.3 Material assets include primary 'raw' materials, such as aggregates and minerals, and mineral or industrial by-products (secondary aggregate) and recycled aggregates. Primary materials are often from non-renewable sources (also referred to as virgin materials).

11.3.4 The term 'aggregate' covers bulk raw particulate materials used in infrastructure construction.

11.3.5 Materials required in significant quantities for construction of the Project include metals, aggregate, pavement, concrete and soils, among others. Most of these material resources would originate offsite, purchased as construction products. Others would arise onsite such as excavated soils/minerals (including sand and gravel) or recycled road plannings.

11.3.6 The Project has the potential to generate large volumes of inert and non-hazardous waste and smaller volumes of hazardous waste.

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11.3.7 The Waste Framework Directive (WaFD) defines waste as '*any substance or object which the holder discards or intends or is required to discard*'. Some naturally occurring soils excavated onsite would be reused within the Order Limits as part of the design proposals. This material is not considered to be waste but is discussed in the assessment to demonstrate the application of the waste hierarchy. The assessment of material assets and waste includes the following:

a. The assessment of the use of material resources and products (from primary, secondary or recycled and renewable sources)

b. The use of materials offering sustainability benefits

c. The use of excavated and other potential waste arisings

d. The production, treatment and offsite management of waste during the construction and operational phases of the Project.

11.3.8 The assessment of material assets and waste demonstrates how the design and proposed construction methodology was influenced by the application of the circular economy principles and the waste hierarchy to manage and mitigate likely significant effects taking account of the relevant characteristics of the future baseline environment.

11.3.9 A circular economy is defined by the Waste and Resources Action Programme (WRAP) as an alternative to a traditional linear economy (make, use, dispose) in which resources are kept in use for as long as possible, the maximum value is extracted from them while in use, then products and materials are recovered and regenerated at the end of each service life (WRAP, 2020).

11.3.10 The waste hierarchy ranks waste management options according to the best environmental outcome taking into consideration the lifecycle of the material. The waste hierarchy gives top priority to preventing waste. When waste is created, it gives priority to preparing it for reuse, then recycling, then other recovery, and last of all disposal (i.e. landfill).

11.3.11 Embedding circular economy and waste hierarchy principles is crucial in driving sustainable development as well as meeting the policies outlined in Appendix 11.6 - Material Assets and Waste Legislation and Policy (Application Document 6.3).

11.3.12 The assessment is focused on the evaluation of likely significant effects on the identified receptors:

a. Material assets used for Project construction (including onsite mineral and peat resources)

b. Local and regional waste management capacity

11.3.13 This assessment has interrelationships with Chapter 10 - Geology and Soils, in terms of excavated material reuse and contamination, and Chapter 15 - Climate, in terms of the quantity of materials required for construction and waste management to calculate greenhouse gas (GHG) emissions.

Temporal scope

11.3.14 The environmental assessment uses defined temporal scopes to characterise the duration of potential effects. The temporal scope refers to the time periods over which impacts may be experienced by receptors.

11.3.15 Temporary (short- and medium-term) effects are typically those associated with demolition and construction works, and permanent (long-term) effects are typically those associated with the completed and operational development.

11.3.16 For material assets and waste, all likely significant effects are considered long term. Although effects are generally related to the construction phase, the construction activities would result in a permanent loss of material assets, resources and landfill capacity.

Limits of deviation and Rochdale Envelope

11.3.17 The Project's application of the Rochdale Envelope and Limits of Deviation (LOD) are defined in the Draft DCO (Application Document 3.1) and summarised in the Explanatory Memorandum (Application Document 3.2). The LOD for the Project represent an 'envelope' within which the Project would be constructed and have informed the reasonable worst-case approach to assessment for the purposes of this chapter. For example, a conservative assessment of earthworks quantities has been carried out to establish an illustrative approach to handling excavated materials and a worst case for waste generation. This assessment has been used as a baseline position to support the traffic assessment and the assessment presented in this Chapter.

Use of the River Thames

11.3.18 Vessel movements on the River Thames are not relevant to this assessment. This is because there are no adverse effects anticipated as a result of river use, within the material assets and waste topic assessment. Use of the river is therefore excluded from the scope of this chapter.

11.3.19 Further details on the potential movement of materials by river is detailed in the outline Materials Handling Plan Handling (oMHP) (Annex B to Appendix 2.2 - Code of Construction Practice (CoCP) Application Document 6.3).

Scoping Opinion

11.3.20 A Scoping Report (Highways England, 2017) was submitted to the Planning Inspectorate on 2 November 2017, setting out the proposed approach to this Environmental Impact Assessment (EIA). A Scoping Opinion was received from the Secretary of State on 13 December 2017, which included comments on the scope of assessment from the Planning Inspectorate and statutory bodies. These comments have been taken into account in the preparation of this chapter, and the Project response is set out in Appendix 4.1 - The Inspectorate's Scoping Opinion and the Applicant Response (Application Document 6.3).

11.3.21 In the Scoping Opinion (Planning Inspectorate, 2017), the Planning Inspectorate agreed that the offsite manufacture and extraction of materials was outside the scope of the material asset and waste assessment and has therefore been excluded. No other aspects have been scoped out for the assessment of impacts on material assets and waste as a result of the Project.

11.3.22 In the Scoping Report (Highways England, 2017*),* a methodology was proposed in line with Interim Advice Note 153/11: Guidance on the environmental assessment of material resources (Highways Agency, 2011), which was the overriding guidance at that time. This has since been superseded through the issue of the new standard DMRB LA 110 Material assets and waste (Highways England, 2019). As a result, the assessment methodology, significance criteria, study area and resulting baseline have been revised to follow LA 110.

11.3.23 The DMRB standard addresses the comment in the Scoping Opinion to provide a defined methodology that goes beyond professional judgement.

11.3.24 To support this assessment, an Excavated Materials Assessment (Document 6.3, Appendix 11.1) was developed to validate available offsite capacity at

third-party potential sites and/or facilities and as a means to determine which of these would be capable of receiving excavated materials from the Project.

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Consultation

Project consultation

11.3.25 Statutory Consultation under Section 42 of the Planning Act 2008 was undertaken on the Project from 10 October 2018 to 20 December 2018. This provided an opportunity for consultees to comment on the Preliminary Environmental Information Report (PEIR) (Highways England, 2018). A summary of the responses to the Statutory Consultation can be found in the Consultation Report (Application Document 5.1). Consultees comprised prescribed consultees, local authorities, people with an interest in land affected by the Project and local communities.

11.3.26 The Project design continued to be developed following the Statutory Consultation, which resulted in changes to the Project. These formed the basis of the Supplementary Consultation, undertaken from 29 January 2020 to 2 April 2020. A Design Refinement Consultation was then undertaken from 14 July 2020 to 12 August 2020 on further proposed changes to the Project.

11.3.27 A Community Impacts Consultation was undertaken from 14 July 2021 to 8 September 2021. This sought feedback on the impacts of the Project at a local ward level, as well as the mitigation proposed for those impacts. Changes to the Project since the Design Refinement Consultation were also presented, along with a summary of how feedback to earlier consultation had shaped the development of the Project.

11.3.28 Prior to the submission of this DCO application, the Local Refinement Consultation was held between 12 May 2022 and 20 June 2022. This provided local communities with the opportunity to comment on proposed refinements to the Project.

11.3.29 The consultations all included information about the environmental impacts associated with the changes presented for consultation. A summary of the responses to these consultation stages can also be found in the Consultation Report (Application Document 5.1).

Stakeholder engagement

11.3.30 A summary of the stakeholder engagement specific to material assets and waste is provided in Table 1.1.

11.3.31 Further details on the technical engagement regarding Mineral Safeguarding Areas (MSAs) is described in Section 1.2 of Appendix 11.2 - Mineral Safeguarding Assessment (Application Document 6.3).

Table 1.1 Stakeholder engagement

Stakeholder	Date of meeting / communication	Summary of discussions
Kent County Council	Email response 23 February 2018	Baseline information was requested and provided from Kent County Council on the location and capacity of waste facilities and mineral sites, relevant local policies and objectives, and relevant local assessments via email. This information was incorporated into the baseline described in Section 11.4.
	Meeting 27 July 2018	Meeting with Kent County Council to discuss minerals within its region and the Order Limits. Kent County Council confirmed that policy DM 7 regarding safeguarding mineral resources in the Kent Minerals and Waste Local Plan (Kent County Council, 2016) would need to be satisfied. Kent County Council's main concern was that it would be unlikely to support mineral extraction in or adjacent to the Thames Estuary and Marshes Ramsar site due to the negative impact it would be likely to have on the wetlands.
	Meeting held 25 July 2019	The reuse of excavated material at the South Portal was discussed, to understand any concerns or design amendments required by Kent County Council. No significant changes were required.
	22 April 2020	A meeting was held to outline the updated DMRB methodology to be used in assessment and preliminary findings of the environmental assessments (DMRB LA 110 Material assets and waste (Highways England, 2019)).
	17 July 2020	Both Kent and Essex County Council requested an assessment of the availability of mineral reserves within their county boundaries. An assessment of potential use of mineral landbanks in Essex and Kent was provided to Kent County Council in response to Appendix 4.1 - The Inspectorate's Scoping Opinion and the Applicants Response (Application Document 6.3).
	29 April 2021	Technical engagement to discuss feedback on the scope, purpose and contents of the outline Site Waste Management Plan (oSWMP) (Application Document 6.3, Appendix 2.2, Annex A). Feedback was incorporated prior to its submission as part of the DCO application.
Essex County Council	Email response 15 November 2017	Baseline information was requested and provided by Essex County Council on the location and capacity of waste facilities and mineral sites, relevant local policies and objectives and relevant local assessments, via email. This information was incorporated into the baseline described in Section 11.4.
	Email response 27 September 2018	Email communication with Essex County Council regarding the potential mineral resources within the Essex section of the route. Essex County Council confirmed that no mineral resources are located within their section.

Stakeholder	Date of meeting / communication	Summary of discussions
	Email response 17 February 2020	During email correspondence with Thurrock Council regarding the approach to minerals management within the Order Limits, Essex County Council confirmed that each singular MSA impacted is below the 5ha threshold which triggers the mineral safeguarding policy in their Minerals Local Plan (Essex County Council, 2014).
	21 April 2020	A meeting was held to outline the updated DMRB methodology to be used in assessment and preliminary findings of the environmental assessments (DMRB LA 110 Material assets and waste (Highways England, 2019)).
	17 July 2020	Both Kent and Essex County Council requested an assessment of the availability of mineral reserves within their county boundaries. An assessment of potential use of mineral landbanks in Essex and Kent has been provided to Essex County Council in response to Appendix 4.1 - The Inspectorate's Scoping Opinion and the Applicants Response (Application Document 6.3).
	22 April 2021	Technical engagement to discuss feedback on the scope, purpose and contents of the oSWMP (Application Document 6.3, Appendix 2.2, Annex A). Feedback was incorporated prior to its submission as part of the DCO application.
London Borough of Havering	Meeting 30 August 2018	London Borough of Havering confirmed during discussions that the only minerals it wishes to safeguard are the superficial deposits of sands and gravels that are found within the MSA.
	Email response 25 September 2019	Baseline information was requested on the location and capacity of waste facilities and mineral sites, relevant local policies and objectives, and relevant local assessments, via email. A response to each request was received and this information has been incorporated into the baseline in Section 11.4. London Borough of Havering was copied into correspondence with East London Waste Authority (ELWA).
	21 April 2020	A meeting was held to outline the updated DMRB methodology to be used in assessment and preliminary findings of the environmental assessments (DMRB LA 110 Material assets and waste (Highways England, 2019)).
	20 April 2021	Technical engagement to discuss feedback on the scope, purpose and contents of the oSWMP (Application Document 6.3, Appendix 2.2, Annex A). Feedback was incorporated prior to its submission as part of the DCO application.

Stakeholder	Date of meeting / communication	Summary of discussions
Dartford Borough Council	7 June 2019 Email response 24 November 2019	Baseline information was requested from Dartford Borough Council on the location and capacity of waste facilities and mineral sites, relevant local policies and objectives and relevant local assessments via email. Dartford Borough Council agreed the dataset to be used in the assessment and this information has been incorporated into the baseline in Section 11.4.
	22 April 2020	A meeting was held to outline the updated DMRB methodology to be used in assessment and preliminary findings of the environmental assessments (DMRB LA 110 Material assets and waste (Highways England, 2019)).
Gravesham Borough Council	Email response 31 October 2019	Baseline information was requested from Gravesham Borough Council on the location and capacity of waste facilities and mineral sites, relevant local policies and objectives and relevant local assessments, via email. The council replied, deferring to Kent County Council on the majority of requests but also suggesting a number of third-party sites with the potential to receive excess excavated materials which were incorporated into the Excavated Materials Assessment (Application Document 6.3, Appendix 11.1).
	Meeting held 25 July 2019	The reuse of excavated material at the South Portal was discussed to understand any concerns or design amendments required. Gravesham Borough Council requested the Project ensures that the landscaping does not conflict with future expansion of residential development in subsequent Local Plans. This feedback was taken into account when finalising the designs of the South Portal landscape design.
	22 April 2020	A meeting was held to outline the updated DMRB methodology to be used in assessment and preliminary findings of the environmental assessments (DMRB LA 110 Material assets and waste (Highways England, 2019)).
	29 April 2021	Technical engagement to discuss feedback on the scope, purpose and contents of the oSWMP (Application Document 6.3, Appendix 2.2, Annex A). Feedback was incorporated prior to its submission as part of the DCO application.
Medway Council	Contacted 7 June, 4 July, 24 July and 22 November 2019	Baseline information was requested from Medway Council on the location and capacity of waste facilities and mineral sites, relevant local policies and objectives, and relevant local assessments, via email. A response to the request was not received. Medway Council were contacted to confirm the Local Plan objectives that were assumed to apply for waste and materials. A response was not received, however, the objectives from the Local Plan have been incorporated as the most appropriate available objectives.

Stakeholder	Date of meeting / communication	Summary of discussions
	22 April 2020	A meeting was held to outline the updated DMRB methodology to be used in assessment and preliminary findings of the environmental assessments (DMRB LA 110 Material assets and waste (Highways England, 2019)).
	29 April 2021	Technical engagement to discuss feedback on the scope, purpose and contents of the oSWMP (Application Document 6.3, Appendix 2.2, Annex A). Feedback was incorporated prior to its submission as part of the DCO application.
East London Waste Authority (ELWA)	Contacted 31 October and 22 November 2019	ELWA was contacted, at the request of the London Borough of Havering, to provide a high-level summary of the Project's approach to waste and materials assessment and provide an opportunity for engagement.
	January 2021	ELWA confirmed the continued use of the targets and objectives in the Joint Waste Development Plan for the East London Waste Authority Boroughs (ELWA, 2012) and that this was currently under review. ELWA stated that its principal concern was the management of municipal waste and therefore had no further comment.
Environment Agency	Planning Inspectorate Scoping Opinion	The Environment Agency responded to the Scoping Report with the comment, '*There should be an ambition to beneficially re-use tunnel arisings where possible*'.
	Ongoing engagement	Meetings were held to agree the Project's approach to long-term stockpiling and reuse of excavated materials in line with the waste hierarchy. The assessment criteria used in the Excavated Materials Assessment (Application Document 6.3, Appendix 11.1) were presented and discussed. The Environment Agency supported the Project proposals to maximise reuse of excavated materials within the design and limit impacts on the capacity of the local waste management infrastructure and road network. Discussion was held over the potential approaches with regard to appropriate permitting to achieve the Project design. The Project approach to the management of waste including stockpiling, treatment, reuse and disposal of excavated materials, is detailed in the Statements of Common Ground between (1) National Highways and (2) the Environment Agency (Application Document 5.4.1.1).

Stakeholder	Date of meeting / communication	Summary of discussions
Thurrock Council	Workshop, 30 February 2019	Baseline information was requested from Thurrock Council on the location and capacity of waste facilities and mineral sites, relevant local policies and objectives, and relevant local assessments, via email. Information was provided on historic and current landfills as well as several third-party sites with the potential to receive excess excavated materials. This information was considered as part of the Excavated Materials Assessment (Application Document 6.3, Appendix 11.1). A response was not received, however, the policies and objectives from the current Local Plan have been incorporated as the most appropriate available.
	Design Narrative and Proposed Design Changes, Issued 08 August 2019	Following the release of the proposed design at the North Portal, Thurrock Council requested that the Project explored opportunities for significant landscape enhancements and increased recreational links and open space in the long term, as well as some potential for habitat creation/ restoration as this is a '*key part of the England Coast Access area being promoted by Natural England and part of the locally important Two Forts Way and Thames Estuary Path.*'
	29 January 2020 17 February 2020	Thurrock Council was issued the Mineral Safeguarding Assessment (Application Document 6.3, Appendix 11.2) which outlines the proposed management of minerals within its region. The approach to the Mineral Safeguarding Assessment was accepted by Thurrock Council.
	Email sent 31 January 2020 Email sent 17 February 2020	Following comments raised at Statutory Consultation, two emails were sent to clarify the points of concern and to reiterate the Thurrock Council plans being used.
	Workshop 08 April 2020	The proposed design at the North Portal was subsequently developed and presented at a workshop. The council's response indicated that it was receptive to the improved design.
	21 April 2020	A meeting was held to outline the updated DMRB methodology to be used in assessment and preliminary findings of the environmental assessments (DMRB LA 110 Material assets and waste (Highways England, 2019)).
	6 May 2021	Technical engagement to discuss feedback on the scope, purpose and contents of the oSWMP (Application Document 6.3, Appendix 2.2, Annex A). Feedback was incorporated prior to its submission as part of the DCO application.
Selected landowners	May 2019 to January 2020	Third-party landowners and operators were consulted to obtain and verify information used in Annex C of Appendix 11.1 - Excavated Materials Assessment (Application Document 6.3).

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Study area

11.3.32 The study area for material assets and waste is illustrated in Figure 11.1 (Application Document 6.2).

Construction

11.3.33 The study areas for the material assets and waste assessment have been selected in line with DMRB LA 110 Material assets and waste (Highways England, 2019).

11.3.34 The first study area for the assessment of material assets and waste is the Order Limits (including compounds and land subject to temporary possession). This was selected as it is the area in which materials to construct and operate the Project would be consumed and waste would be generated.

11.3.35 The study area for considering mineral resources sterilisation is defined by the Project's Order Limits, the particular focus is land that is subject to permanent acquisition.

11.3.36 The second study area covers the following:

a. Feasible sources and availability of construction materials required to construct the main elements of the Project. There are no restrictions on the sourcing of material for the purposes of this assessment. However, when sourcing material the proximity principle would be applied (Register of Environmental Actions and Commitments (REAC) Ref. MW002). Further details on material sourcing are provided in the oMHP (Annex B to Appendix 2.2 - Code of Construction Practice Application Document 6.3).

b. The inert and non-hazardous waste infrastructure within Kent, Essex and the ELWA. This study area was selected based on the waste disposal authorities through which the Project passes, and which could experience increased demand as a result of the Project waste arisings.

11.3.37 The hazardous waste infrastructure within England was used to assess likely significant effects of hazardous waste generated by the Project due to the limited hazardous waste landfill capacity within Kent, Essex and ELWA.

11.3.38 In accordance with DMRB LA 110, professional judgement, with consideration for balancing the proximity and value for money principles, has been applied in establishing the second study area.

Operation

11.3.39 The same study areas for material assets and waste infrastructure proposed for the construction phase assessment have been used for the operational phase assessment.

Impact assessment methodology

11.3.40 The assessment follows the general approach described in Chapter 4 - EIA Methodology. This section provides topic-specific information regarding the methodology used for establishing the baseline conditions, and the methods used for the construction and operational phase assessments.

11.3.41 Deviations from the approach described in Chapter 4 - EIA Methodology are noted for defining significance, which follows the specific requirements set out within DMRB LA 110 Material assets and waste (Highways England, 2019).

Method of establishing baseline conditions

Existing baseline

11.3.42 The existing baseline in relation to material assets and waste was established based on data collection from published sources as well as direct engagement with the waste and minerals industry.

Desk-based studies

Material assets

11.3.43 As detailed in the Scoping Report a total market approach will be used to procure material resources required for the Project, thus a specific study area has not been identified. However, when taking into account the proximity principle, information has been collected to determine the aggregate resource within the Order Limits, the current local landbank and supply of available resources, and the anticipated availability in the future within Kent, Essex and ELWA as detailed in the oMHP (Annex B to Appendix 2.2 - Code of Construction Practice Application Document 6.3).

11.3.44 The baseline conditions for material assets have been established through engagement with stakeholders, as set out in Table 1.1, and a desk-based review of the following data sources:

a. National and Regional Guidelines for Aggregates Provision in England 2005-2020 (Department for Communities and Local Government, 2009)

b. Greater Essex Local Aggregate Assessment 2021 (Covering Calendar Year 2020) (Essex County Council, 2020) (note this assessment includes Essex and Thurrock)

c. London Aggregates Working Party Annual Report 2019 (Greater London Authority, 2019)

d. Kent Local Aggregate Assessment 2019 (Kent County Council, 2020)

e. Kent County Council Local Aggregate Assessment (2020) Dashboard (Kent County Council, 2020)

f. Medway Authority Monitoring Report 2020 Volume 1 and 2 (Medway Council 2020)

g. Marine Aggregates – Capability and Portfolio 2021 (The Crown Estate, 2021)

Waste

11.3.45 Baseline conditions were established to support the assessment of waste arisings through desk-based research. This was used to determine the current

capacity of local waste infrastructure and included a review of the following key data sources:

a. UK Statistics on Waste 2022 (Defra, 2022)

b. Remaining Landfill Capacity in 2020 Database (Environment Agency, 2022)

c. Environmental Permitting Regulations (EPR) Database 2019 (Environment Agency, 2021)

d. Essex County Council Authority Monitoring Report 2017/18, Baseline for Construction, Demolition & Excavation Waste Generated in Essex & Southend on Sea Update 2017 (BPP Consulting, 2019)

e. Essex & Southend on Sea Waste Local Plan, Topic Paper 1: Waste Capacity Gap Update (Essex County Council, 2015)

f. Essex and Southend-on-Sea Waste Local Plan (Essex County Council, 2017)

g. 14th Annual Minerals and Waste Monitoring Report 2019-2020 (Kent County Council, 2021)

Future baseline ('Without Scheme' scenario)

11.3.46 The information used for the current baseline also indicated trends in the annual consumption of material assets and generation of waste. Using the sources above, the anticipated future changes to availability of material assets and waste management capacity were forecast for a 'Without Scheme' scenario, i.e., the future situation that would likely occur in the absence of the Project. The year 2025 has been selected as the future baseline for the assessment as it is the first year of construction.

11.3.47 In line with the requirements of DMRB LA 110 Material assets and waste (Highways England, 2019), the future baseline comprises a forecast of the local and regional waste capacity (including landfill and recovery facilities) in the absence of the Project, and a forecast of the availability of material resources and presence of onsite mineral and peat resources. The future baseline is reported in Section 11.4.

Method of assessment – construction

11.3.48 The consumption of material resources and the management of waste can give rise to environmental impacts that need to be managed and mitigated. Due to the scale of the Project, a detailed quantitative assessment, in line with DMRB LA 110 Material assets and waste (Highways England, 2019), was completed to assess the impacts on material assets and waste.

Material assets

11.3.49 The following information was identified to inform the assessment:

a. An evaluation of the types and quantities of key construction materials required for the construction and operation of the Project. These are

defined as construction materials which, by weight, constitute the majority of material required to deliver the Project.

b. Details of the source/origin of materials, including site-won materials to replace virgin materials, materials from secondary/recycled sources or virgin/non-renewable sources.

c. Information on any known sustainability credentials of materials to be used.

d. The handling and use of excavated materials generated through the construction of the Project.

e. Identification of MSAs and potential/existing peat extraction sites within the Order Limits.

11.3.50 Details of on-site storage and stockpiling arrangements are set out in the oMHP (Annex B to Appendix 2.2 - Code of Construction Practice Application Document 6.3).

Waste

11.3.51 The following information was collated to inform the assessment:

a. The types and quantities of waste arising from the Project (demolition, excavation arisings and remediation)

b. The amount of waste (by weight) that would be recovered and diverted from landfill either onsite or offsite

c. Details of onsite storage and segregation arrangement for waste and any supporting logistical arrangements

d. The type and quantity of hazardous waste

e. Documentation as to how the waste hierarchy has been applied by the Project

f. Completion of an Excavated Materials Assessment (Application Document 6.3, Appendix 11.1) to aid evaluation of impacts to offsite waste capacity

11.3.52 All the materials identified for use in construction were designated for use in either permanent or temporary works. All materials designated for use in the temporary works such as concrete, asphalt and aggregates were assumed to be removed from the Order Limits as waste following the completion of construction. However this does not preclude appropriate materials from the temporary works being reused on site.

11.3.53 In addition to the estimated waste quantities, a wastage rate was also applied to all key materials used in construction (in both permanent and temporary works). The wastage factors defined in Net Waste Tool (WRAP, 2008) were applied to account for damage and defects.

11.3.54 For the purposes of the waste assessment, it has been assumed that 70% of non-hazardous construction wastes leaving the Order Limits would be diverted from landfill, as required by the WaFD. The waste arisings likely to be generated during the construction phase are presented in Table 1.1 of Appendix 11.5 - Waste Assessment Supporting Data (Application Document 6.3).

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Method of assessment – operation

11.3.55 To establish operational impacts (including maintenance), a quantitative assessment was undertaken.

11.3.56 DMRB LA 110 Material assets and waste (Highways England, 2019) specifies that the environmental assessment should report on the opening year which is defined in DMRB LA 110 as the first year of operation.

11.3.57 The approach affords a reasoned conclusion on the likely significant effects of the Project on the environment, considering current knowledge and methods of assessment as required by the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (EIA Regulations).

Material assets

11.3.58 Maintenance works completed during the operation of the Project are based on minor and major intervention cycles which have different frequencies, depending on the material. For this reason, the material demand and waste generation would typically come in cycles over the decades.

11.3.59 Benchmarked data enabled prediction of renewal frequencies of the key elements of the highways and tunnels. Estimates for the material quantities required for operational phase maintenance were calculated for the design life of the scheme and averaged to generate the first-year operational requirements. For example, replacement of drainage gullies, footways and manholes every 40 years, lighting columns and vehicle restraint system every 30 years and pavement every 10 years.

11.3.60 The assessment of the forecast operational materials demand and waste quantities/management route for the first year of operation uses the significance criteria, as presented in Table 1.2.

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Waste

11.3.61 In the absence of a published method, seven years of operational waste data from the M25 (2012-2018), was used to predict operational effects. Although the M25 has four lanes in both directions for some stretches of its alignment it is taken as a reasonable equivalent due to its location in proximity to the Project and its similarity to the Project, including large junctions and two tunnel assets.

11.3.62 Using the highest year of waste recorded during the seven-year period enabled the calculation of a waste tonnage per kilometre length. This could then be extrapolated to the length of the Project to calculate operational waste arisings. One year of operation was used as a representation of the first year of operation of the Project. Using the operational data from the M25 as a comparator to the Project provides a worst-case approach to calculating operational waste anticipated to be generated by the Project.

Determining significance of effects

11.3.63 A conclusion as to the significance of environmental effects for material assets and waste has been reached using the standard provided in DMRB LA 110 Material assets and waste (Highways England, 2019), which differs slightly from the approach described in Chapter 4 - EIA Methodology. The assessment set out within DMRB LA 110 does not use specific 'value' (sensitivity) or 'magnitude' criteria but instead adopts 'significance category' descriptors.

11.3.64 By virtue of the fact that 'magnitude' and 'value' are not used, the assignment of significance also differs to the matrix approach presented in Chapter 4 - EIA Methodology. In its place, DMRB LA 110 Material assets and waste (Highways England, 2019) has its own significance criteria that are based on the approach in DMRB LA 104 Environmental assessment and monitoring (Highways England, 2019) where changes that are moderate and above should be reported as significant.

11.3.65 Table 1.2, adopted from DMRB LA 110 Material assets and waste (Highways England, 2019), was used to determine the significance of effects related to material assets and waste.

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Table 1.2 Significance of effect categories for material assets and waste

Significance category	Significance criteria	Material assets	Waste
Neutral	Not significant	1.) Project achieves >99% overall material recovery/recycling (by weight) of non-hazardous Construction Demolition Waste (CDW) to substitute use of primary materials[1]; and 2.) Aggregates required to be imported to site comprise >99% reused /recycled content.	No reduction or alteration in the capacity of waste infrastructure within the region.
Slight	Not significant	1.) Project achieves 70–99% overall material recovery/ recycling (by weight) of non-hazardous CDW to substitute use of primary materials; and 2.) Aggregates required to be imported to site comprise re-used / recycled content in line with relevant regional percentage target[2] .	1.) >1% reduction or alteration in the regional capacity of landfill; and 2.) Waste infrastructure has sufficient capacity to accommodate waste from a project, without compromising integrity of the receiving infrastructure (design life or capacity) within the region.
Moderate	Significant	1.) Project achieves less than 70% overall material recovery / recycling (by weight) of non-hazardous CDW to substitute use of primary materials; and 2.) Aggregates required to be imported to site comprise re-used / recycled content below relevant regional percentage target[2].	1.) >1% reduction or alteration in the regional capacity of landfill as a result of accommodating waste from a project; and 2.) 1–50% of project waste for disposal outside the region.
Large	Significant	1.) Project achieves <70% overall material recovery / recycling (by weight) of non-hazardous Construction Demolition Waste (CDW) to substitute use of primary materials; and 2.) Aggregates required to be imported to site comprise <1% re-used / recycled content; and/or	1.) >1% reduction in the regional capacity of landfill as a result of accommodating waste from a project; and 2.) >50% of project waste for disposal outside the region.

Significance category	Significance criteria	Material assets	Waste
		3.) Project sterilises[3] one mineral safeguarding site and/or peat resource[4].	
Very large	Significant	1.) No criteria; use the criteria for large categories.	1.) >1% reduction or alteration in national capacity of landfill, as a result of accommodating waste from a project; or 2.) Construction of new (permanent) waste infrastructure is required to accommodate waste from a project.

Notes:

[1] 'Primary materials': Materials that are from a non-renewable source (also referred to as 'virgin' materials).

[2] 'The relevant regional percentage target of reused/recycled content for East England is 31%, as presented in Table E/1.2 in DMRB LA 110 Material assets and waste (Highways England, 2019).

[3] Sterilise: substantially constrain / prevent existing and potential future use and extraction of materials.

[4] Peat resource: existing or potential peat extraction sites.

11.3.66 As detailed in paragraph 3.13.1 of LA 110, where primary materials are mandated within DMRB, for example, to meet safety standards for critical infrastructure such as tunnel components, they are excluded from the material recycling, recovery and reuse calculations.

Assumptions and limitations

11.3.67 General assumptions used throughout the ES, and limitations affecting the assessments are set out in Chapter 4 - EIA Methodology. Relevant assumptions and any other limitations encountered during the material assets and waste assessment are as described below.

11.3.68 The quantifications of materials required, and waste arisings predicted to be generated from the Project are based on the preliminary design.

11.3.69 An assessment of earthworks quantities has been carried out to establish an illustrative approach to handling excavated material. This assessment has been used as a baseline position to support the traffic assessment and the assessment presented in this Chapter. Further details are provided in the oMHP (Annex B to Appendix 2.2 - Code of Construction Practice Application Document 6.3).

11.3.70 The following assumptions have been made:

a. During detailed design, consideration would continue to be given to the principles of circular economy and the waste hierarchy (i.e. elimination of waste in design). This is reflected in Section 11.5 Project design and

mitigation, e.g. mitigation measures (REAC Ref. MW003 (use of standardised components) and MW004 (design for off-site construction)).

b. The usability of excavated and tunnelled ground materials. This was factored to specific geologies and based on a review of the Project ground investigation data.

11.3.71 The Project would prioritise the prior extraction and reuse, recycling and recovery of materials excavated as part of the construction works within the Project design which would reduce the level of safeguarded mineral sterilisation likely to occur within these areas. It is assumed that any minerals not excavated as part of the proposals would remain in situ. The full extraction of all safeguarded minerals prior to the Project construction would not be practical or environmentally feasible due to the number of likely adverse effects as set out in the Mineral Safeguarding Assessment (Application Document 6.3, Appendix 11.2).

11.3.72 Baseline data has been collected at national, regional and sub-regional levels, including the following:

a. Availability of construction aggregates

b. Presence of MSAs and/or peat resources

c. Construction, demolition and excavation waste arisings

d. Information on regional waste transfer, treatment, recycling, and disposal facilities capacity.

11.3.73 Environment Agency (2020) data was used to calculate impacts to landfill, recycling and recovery capacity.

11.3.74 The construction of the Project would result in the release of construction process wastewater and effluent. This falls outside the scope of the material assets and waste assessment and is assessed in Chapter 14 - Road Drainage and the Water Environment.

11.3.75 Transportation would be required to import materials and remove waste from the Order Limits. This aspect falls outside the scope of the material assets and waste assessment. However, an assessment of the likely significant environmental effects associated with transportation is included within other ES chapters, where relevant, including:

a. Chapter 5 - Air Quality

b. Chapter 12 - Noise and Vibration

c. Chapter 15 - Climate

11.3.76 In addition, the Transport Assessment (Application Document 7.9) and Health and Equalities Impact Assessment (Application Document 7.10) have both considered the potential traffic-related impacts associated with the material and waste movements.

11.3.77 Where peat exists within the Order Limits it does not constitute an existing or potential extraction site. Ground investigation has indicated that within the Order Limits, to the north of the tunnel crossing, there are localised and discrete bands of peat of varying depth associated with the Alluvium. The discrete peat bands are located beneath material previously disposed of within historic landfill. No specific measures are proposed beyond management in line with the waste hierarchy.

11.3.78 To support the assessment, an Excavated Materials Assessment was completed (Application Document 6.3, Appendix 11.1). This document focuses on bulk excavated materials only, including stone, chalk and tunnel-related arisings. It does not include other construction-related wastes, or address impacts from the operational phase of the Project.

11.3.79 The DCO application has been developed on the basis of a late 2030 opening year. This assumes consent is in 2024. Following the DCO Grant there would be preparatory works, referred to in the draft DCO as preliminary works taking place in 2024. The main construction period for the Lower Thames Crossing would start in early 2025, with the road being open for traffic in late 2030. Construction may take approximately six years, but as with all large projects there is a level of uncertainty over the construction programme, which will be refined once Contractors are appointed and as the detailed design is developed. The 2030 opening year has been selected as the basis for the assessments and is representative of the reasonable worst-case scenario. This has been used consistently across the environmental assessments, transport assessments and the economic appraisal of the Project.

Nitrogen deposition compensation sites

11.3.80 The DCO application documents identify the locations of habitat creation sites proposed as compensation for the effects of nitrogen deposition. Consideration of these sites is not relevant to this chapter because the sites do not impact on material use or waste generation. Assessment of these sites has therefore been excluded from the scope of this Chapter.

11.4 Baseline conditions

Existing baseline

Regional recycled aggregate target

11.4.1 The regional recycled aggregate target for alternative aggregates (which comprises both secondary aggregates, which are by-products from industrial and mining operations, and recycled aggregates, which are produced from construction waste) is set out in the National and Regional Guidelines for Aggregates Provision in England 2005-2020 (Department for Communities and Local Government, 2009).

11.4.2 The Project spans Kent, Medway, Essex and Greater London, with the majority of the Project sitting within the South East and East regions respectively. The recycled aggregate target for the South East region is 26% and the target for the East region is 31% as set out in DMRB LA 110. In line with DMRB LA 110, the higher target of 31% has been selected for the Project (REAC Ref. MW001).

Current regional aggregate reserves

11.4.3 Current aggregate reserves in the regional area are summarised in Table 1.3. The current sum of regional production capacity for secondary/recycled aggregate is 7,313,930t/year (see baseline in Table 1.3), when the lowest capacity estimate of each region is used.

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Table 1.3 Current aggregate reserves available in Greater London Authority (including London Borough (LB) of Havering), Kent, Medway and Greater Essex

Material type	Baseline	Greater London Authority (including LB Havering)	Kent	Medway	Greater Essex (including Essex and Thurrock)
Sharp sand and gravel	Permitted reserves (t)	3,503,000	2,780,000	574,000	33,590,000
	Landbank (years)	3.2	10.26	4.3	7.55
	10-year sales average (t/year)	401,000	337,034	43,000	3,260,000
	Three-year sales average (t)	305,000	111,733	134,000	3,230,000
Soft sand	Permitted reserves (t)	n/a	9,340,000	n/a	n/a
	Landbank (years)	n/a	21	n/a	n/a
	10-year sales average (t/year)	n/a	471,313	n/a	n/a
	Three-year sales average (t)	n/a	434,352	n/a	n/a
Crushed rock (data from 2016)	Permitted reserves (t)	-	15,400,000 – 18,500,000	n/a	n/a
	Landbank (years)	-	22	n/a	n/a
	10-year sales average (t/year)	-	829,935	n/a	n/a
	Three-year sales average (t)	-	-	n/a	n/a
Secondary/ recycled aggregate	Sales/productive capacity (t/year)	2,053,000	909,000	135,000	590,000

Material type	Baseline	Greater London Authority (including LB Havering)	Kent	Medway	Greater Essex (including Essex and Thurrock)
Marine aggregate	Landbank	The total marine aggregate primary reserves available in the East Coast, Thames Estuary and East English Channel is 994 million tonnes. The annual permitted offtake in the East Coast, Thames Estuary and East English Channel is 31.25 million tonnes. There is therefore a long term viable and sustainable supply of marine dredged aggregate both for construction uses and for direct beach nourishment by vessel delivery			
	10-year sales average (t/year)	4,386,000	1,812,000	-	
	3-year sales average (t)	4,713,000	1,048,000	-	-

Notes.
n/a – area does not contain the geology for type of reserve
(-) denotes no data

Minerals safeguarding areas within Order Limits

11.4.4 With reference to the geological sequence described in Chapter 10 - Geology and Soils, potentially extractable minerals are present within the Order Limits. Information is presented below with regard to the MSAs located within the Order Limits. A proportion of the minerals indicated could potentially be used within the Project for construction materials.

11.4.5 A Mineral Safeguarding Assessment (Application Document 6.3, Appendix 11.2) has been prepared for the Project route. This assessment was required to determine if the Project would lead to adverse effects and potential sterilisation of strategically allocated mineral extraction sites, mineral infrastructure and mineral units which have been designated as safeguarded from non-mineral development by the Minerals Planning Authority. This uses a three-stage approach:

a. Stage 1 – Scope definition and engagement

b. Stage 2 – Mineral study baseline

c. Stage 3 – Mineral safeguarding impact assessment

11.4.6 A review of the mineral planning policy and technical engagement with the relevant mineral planning authority was undertaken to determine the mineral study baseline. The Mineral Safeguarding Assessment provides a full description of allocated mineral extraction sites, safeguarded mineral infrastructure (such as wharves) and likely safeguarded mineral resources located within the Order Limits.

11.4.7 There were no allocated mineral extraction sites and safeguarded mineral infrastructure located within or adjacent to the Order Limits. The safeguarded

mineral units identified relevant to each of the mineral planning authorities are summarised below in Table 1.4, and presented within Section 4 of Appendix 11.2 - Mineral Safeguarding Assessment (Application Document 6.3).

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Table 1.4 Summary of safeguarded minerals within the Order Limits

Local authority	Safeguarded minerals within Order Limits	Location of safeguarded minerals
Kent County Council	Sub-Alluvial River Terrace Deposits River Terrace Deposits	Located within Gravesham Borough Council. The River Terrace Deposits within the Order Limits are within or directly adjacent to the Thames Estuary and Marshes Special Protection Area and Ramsar site.
Thurrock Council	Taplow Gravel Member	Mapping indicates the Taplow Gravel Member being present within the Order Limits to the west of East Tilbury and Linford and extending from 450m south of the Tilbury Loop line to Muckingford Road.
	Boyn Hill Gravel Member	Mapping indicates that the Boyn Hill group is found around Orsett Heath and the existing A13 junction with the A1089. Within the Order Limits it extends from Hoford Road north to Stifford Clays Road. There are small areas of Boyn Hill located at South Ockendon (North Road). An existing quarry (Mill House Farm Quarry) and ceased mineral working to the west of Hoford Road indicates that the minerals are potentially viable in localised areas.
	Lynch Hill Gravel Member of the Maidenhead Formation	There are two small outcrop areas of Lynch Hill Gravel Member present within the Order Limits. These are located to the west of the Project route at East Tilbury and along the existing alignment of the M25, to the south of the London Tilbury and Southend railway line.
Essex County Council	No safeguarded minerals identified within the Order Limits	
London Borough of Havering	Boyn Hill Gravel Member	Boyn Hill Gravel Member is located to the north of the London, Tilbury and Southend railway line.
	Lynch Hill Gravel Member	Lynch Hill Gravel Member is generally found to the south of the London, Tilbury and Southend railway line.

Peat reserves within Order Limits

11.4.8 Ground investigation has indicated that, to the north of the tunnel crossing, the Alluvium is likely to contain peat in the form of thin striations/bands beneath material previously disposed of within historic landfill.

11.4.9 The peat deposits are not considered to constitute an existing or potential extraction site and the volume is considered negligible in comparison to other excavated materials. The peat is also anticipated to be contaminated as it lies under areas of historic landfill in layers too difficult to excavate practically and economically.

11.4.10 Further descriptions of the peat deposits are provided in Chapter 10 - Geology and Soils.

Current construction, demolition and excavation (CDE) waste reuse, recycling and/or recovery

11.4.11 DMRB LA 110 Material assets and waste (Highways England, 2019) requires highways schemes to divert material from disposal. DMRB LA 110 states that '*at least 70% (by weight) of CDW shall be subjected to material recovery in accordance with the Waste Directive*'.

11.4.12 Through a combination of one or more of reuse, recycling and/or recovery the Contractors shall achieve a minimum of 90% (by weight) of non-hazardous excavated wastes and a minimum of 90% (by weight) of non-hazardous construction and demolition waste that are destined for off-site waste management outside the Order Limits, and therefore would be diverted from final disposal in landfill (REAC Ref. MW013).

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11.4.13 The latest data from 2020 indicated that UK construction projects achieved a recovery rate of 93.2% (Defra, 2022).

Waste

11.4.14 The Project would result in the production of waste arising from several sources, including damaged materials and goods, offcuts, demolition, excavation of ground, tunnelling, temporary works materials and used packaging.

11.4.15 In line with the requirements of DMRB LA 110 Material assets and waste (Highways England, 2019), a baseline of national and regional capacity has been identified. The assessment has focused on keeping inert and non-hazardous waste within the regional area however a national baseline has also been presented to provide overall context.

11.4.16 Figure 11.1 (Application Document 6.2) shows the location of waste facilities within the second study area of the Project likely to accept construction wastes. This is tabulated in a non-exhaustive list in Appendix 11.3 (Application Document 6.3).

Waste infrastructure capacity in England

11.4.17 To calculate the impact on national capacity in the assessment, the remaining landfill capacity in England in 2020, documented in Environment Agency records (Environment Agency, 2022), was reviewed as shown in Table 1.5.

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11.4.18 The amount of CDE and hazardous waste capacity in the study area will fluctuate year on year, based on the number, type and size of construction projects underway. This in turn is heavily influenced by factors such as the economic situation, investment levels and legislative and policy variations.

Table 1.5 Remaining landfill capacity in 2020 – England

Landfill type	Remaining landfill capacity (m^3)
Inert	140,191,731
Non-hazardous	164,824,065
Stable non-reactive hazardous waste	66,969,897
Hazardous merchant	15,571,171
Hazardous Restricted	809,640
TOTAL	**388,366,504**

Waste infrastructure capacity in second study area

11.4.19 To calculate the impact on the study area capacity, data on the remaining landfill capacity from the Environment Agency records (Environment Agency, 2022) were obtained, as shown in Table 1.6.

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11.4.20 Landfill facilities within the study area are predominantly focused on accepting inert and non-hazardous waste streams. In the study area there is some capacity to manage hazardous waste in Kent only (Table 1.6).

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Table 1.6 Remaining study area landfill capacity in 2020

Landfill type	Remaining landfill capacity 2020 (m^3)			
	Kent	Essex	ELWA	Study area total
Inert	5,350,898	6,496,111	540,559	12,387,568
Non-hazardous	0	10,750,211	4,105,867	14,856,078
Stable non-reactive hazardous	1,792,505	-	-	1,792,505
Hazardous restricted	117,042	-	-	117,042
Hazardous merchant	146,325	-	-	146,325
TOTAL	7,406,770	17,246,322	4,646,426	29,299,518

Note:
Hazardous restricted landfills do not typically accept construction waste whereas hazardous merchant landfills will take European Waste Code Chapter 171.

11.4.21 As the Project will look for opportunities to divert waste from landfill, it is appropriate to establish the baseline capacity of alternative waste facilities.

11.4.22 The EPR Database (Environment Agency, 2022) was used to establish the tonnage permitted annually at facilities likely to accept construction waste for recycling and recovery in the regions assessed. This is shown in Table 1.7. As

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[1] https://dsposal.uk/ewc-codes/17/

can be seen in Table 1.7, there is over 65 million tonnes of permitted annual capacity within the study area for recycling, treatment and recovery.

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Table 1.7 Permitted annual tonnage for regional and local facilities in 2022

Facility type		Permitted annual tonnage (t) for study area
Recycling facilities	Metal recycling	5,453,057
On/in land	Deposit to land	12,876,389
Transfer	Transfer (hazardous)	4,009,677
	Transfer (soils and CDE waste)	1,992,478
	Transfer (other)	17,846,220
Treatment	Other recycling/recovery/ treatment	23,285,069
TOTAL (t)		65,462,890

Future baseline ('Without Scheme' scenario)

11.4.23 The future baseline identifies anticipated changes to the existing baseline over time in the absence of the Project and is used as a basis against which to predict the potential impacts of the Project. A description of how the future baseline has been considered within the assessment is provided in Chapter 4 - EIA methodology.

11.4.24 The latest information on material assets and waste infrastructure capacity has been used to inform the future baseline. Where available information on likely trends has been used to define the potential future baseline.

Material resources

11.4.25 In line with the proximity principle, the Project would prioritise sourcing primary, secondary and recycled aggregates from Kent, Essex and Greater London where available (see REAC ref. MW002).

11.4.26 Based on Table 1.3, the landbanks[2] in Kent and Medway are in excess of nine years. The landbanks of Greater London are not only less than nine years but also below the NPPF requirement for local authorities to maintain a minimum landbank of seven years. The landbank for Greater Essex meets the required minimum period of seven years.

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11.4.27 Marine aggregate sources are not considered to be restricted by physical availability or extent of permitted reserves but rather by rate of extraction and offloading. The baseline in Table 1.3 shows there are large permitted reserves of marine aggregates (994 million tonnes), meaning a considerable volume of the permitted reserves are likely to remain unused by late 2030. Current estimates suggest there are 12 years of primary marine aggregate production permitted in the East Coast, 24 years in the Thames Estuary, and 14 years in the East English Channel region.

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[2] A 'landbank' is a current stock of mineral reserves with planning permission for extraction.

Waste

11.4.28 The Kent Minerals and Waste Local Plan 2013-2030 encompasses the entire construction phase and the opening year and is supported by regular capacity assessments. The latest at the time of writing, the 13th Annual Minerals and Waste Monitoring Report (Kent County Council, 2021), determined that there is a surplus of inert CDE waste recycling capacity within Kent to the end of the plan period (2030). However, additional inert landfill capacity within Kent may be required, particularly if provision is to be made for waste from London. It is acknowledged by Kent County Council that there is regional disparity due to the uneven distribution of facilities.

11.4.29 The Essex and Southend Waste Local Plan, adopted 2017 (Essex County Council, 2017) runs until 2032 and again encompasses the future baseline year of late 2030. It too is supported by regular capacity assessments. Essex and Southend-on-Sea Waste Local Plan, Topic Paper 1: Waste Capacity Gap Update (Essex County Council, 2015) indicates a shortfall in capacity for treatment and inert landfill, which may arise over time as time-limited planning consents expire, requiring the closure of facilities.

11.4.30 The Joint Waste Development Plan for the East London Waste Authority Boroughs (ELWA, 2012) does not encompass the future baseline year of late 2030 as it only ran until 2020. The Plan makes provision for future inert landfill sites but does not consider that additional permanent new CDE recycling facilities are required as '*a large portion of recycling and reuse of construction, excavation and demolition waste currently occurs on site rather than in designated licensed facilities or is transferred out of London through inert transfer stations.*'

Future landfill capacity

11.4.31 It is expected that during the construction and operation of the Project landfill capacity void space across the study area would continue to be taken up. The focus of the relevant local plans is to prioritise waste treatment and recovery to preserve landfill void. Government policy is also likely to continue to introduce measures to divert waste from landfill.

11.4.32 Permitted capacity data published by the Environment Agency for 2015 to 2020 (Environment Agency, 2020) has been used to estimate the projected landfill capacity for the study area (Kent, Essex and ELWA) and England for the future baseline to 2030.

11.4.33 Predicted landfill capacity has been calculated based on the average percentage change in permitted landfill capacity for the years 2015 to 2020 using the data published by the Environment Agency for inert, non-hazardous and hazardous landfill types. This average percentage change has then been applied to the 2020 permitted landfill capacity and projected forward to 2030. The same average percentage change has been applied year on year for each different landfill type.

11.4.34 Based on engagement with local waste operators during the completion of the Excavated Materials Assessment (Application Document 6.3, Appendix 11.1), several new landfill phases and restoration sites are known to be in the process

of permit acquisition or proposed to come online in the period prior to the future baseline year of 2025.

11.4.35 Further, when the existing landfills in the region are filled, there would be a market demand for large volumes of inert and non-hazardous restoration soils to cover the previously deposited waste. It is anticipated that this would be beneficial to the Project as it could provide material to fill this demand. However, it is not possible to quantify the landfill restoration requirements, therefore this has not been taken into account in this assessment.

11.4.36 Permits for treatment and transfer stations stipulate a maximum annual throughput as their capacity. Broadly, these do not change unless the permit is varied or surrendered. Providing the associated planning consent does not expire, the treatment and transfer capacity available in late 2030 for waste management facilities (excluding landfill disposal) is likely to remain in line with the existing baseline for 2022 presented in Table 1.7 for the study area (65,462,890 tonnes/year).

11.4.37 Permits for treatment and transfer stations stipulate a maximum annual throughput as their capacity. Broadly, these do not change unless the permit is varied or surrendered. Providing the associated planning consent does not expire, the treatment and transfer capacity available in late 2030 for waste management facilities (excluding landfill disposal) is likely to remain in line with the existing baseline for 2022 presented in Table 1.7 for the study area (65,462,890 tonnes/year).

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11.4.39 Further, when the existing landfills in the region are filled, there would be a market demand for large volumes of inert and non-hazardous restoration soils to cover the previously deposited waste. It is anticipated that this would be beneficial to the Project as it could provide material to fill this demand. However, it is not possible to quantify the landfill restoration requirements, therefore this has not been taken into account in this assessment.

11.4.40 Permits for treatment and transfer stations stipulate a maximum annual throughput as their capacity. Broadly, these do not change unless the permit is varied or surrendered. Providing the associated planning consent does not expire, the treatment and transfer capacity available in late 2030 for waste management facilities (excluding landfill disposal) is likely to remain in line with the existing baseline for 2022 presented in Table 1.7 for the study area (65,462,890 tonnes/year).

11.4.41 Table 1.8 presents the future landfill capacity for the study area and Table 1.9 presents the future landfill capacity for England.

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Table 1.8 Future landfill capacity for the study area

Year	Inert Landfill Estimated Capacity (m^3)	Non-hazardous Landfill Estimated Capacity (m^3)	Hazardous Landfill Estimated Capacity (m^3)
2020	12,837,568	16,648,583	263,367
2021	14,387,002	16,235,334	219,334
2022	16,123,444	15,832,343	182,662
2023	18,069,468	15,439,354	152,122
2024	20,250,367	15,056,121	126,688
2025	22,694,490	14,682,400	105,507
2026	25,433,607	14,317,955	87,867
2027	28,503,323	13,962,556	73,176
2028	31,943,539	13,615,980	60,941
2029	35,798,973	13,278,006	50,752
2030	40,119,739	12,948,421	42,267

Table 1.9 Future landfill capacity for England

Estimated capacity m^3	Inert Landfill Estimated Capacity (m^3)	Non-hazardous Landfill Estimated Capacity (m^3)	Hazardous Landfill Estimated Capacity (m^3)
2020	140,191,731	231,793,962	16,380,811
2021	142,579,706	217,558,194	16,051,421
2022	145,008,357	204,196,725	15,728,655
2023	147,478,377	191,655,859	15,412,379
2024	149,990,470	179,885,198	15,102,463
2025	152,545,354	168,837,438	14,798,779
2026	155,143,756	158,468,184	14,501,201
2027	157,786,418	148,735,764	14,209,607
2028	160,474,095	139,601,066	13,923,877
2029	163,207,553	131,027,382	13,643,892
2030	165,987,571	122,980,255	13,369,537

11.4.42 The trends in Table 1.8 show that overall landfill capacity would increase within the study area over the construction phase, with the highest capacity forecast in 2030.

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11.4.43 For the basis of a reasonable worst case assessment a comparison of the Project construction waste has been made against the 2025 landfill capacity data which is forecast to be at its lowest capacity during the construction phase within the study area.

11.4.44 Based on engagement with local waste operators during the completion of the Excavated Materials Assessment (Application Document 6.3, Appendix 11.1), several new landfill phases and restoration sites are known to be in the process of permit acquisition or proposed to come online in the period prior to the future baseline year of 2025.

11.4.45 Further, when the existing landfills in the region are filled, there would be a market demand for large volumes of inert and non-hazardous restoration soils to cover the previously deposited waste. It is anticipated that this would be beneficial to the Project as it could provide material to fill this demand. However, it is not possible to quantify the landfill restoration requirements, therefore this has not been taken into account in this assessment.

11.4.46 Permits for treatment and transfer stations stipulate a maximum annual throughput as their capacity. Broadly, these do not change unless the permit is varied or surrendered. Providing the associated planning consent does not expire, the treatment and transfer capacity available in late 2030 for waste management facilities (excluding landfill disposal) is likely to remain in line with the existing baseline for 2022 presented in Table 1.7, for the study area (65,462,890 tonnes/year).

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Mineral and peat deposits

11.4.47 There are no land-based mineral extraction sites (preferred or reserved) allocated by any of the mineral planning authorities through their minerals policy within the Order Limits. Based on current planning applications it is unlikely that mineral and peat deposits identified in Section 11.4 would have been removed within the Project Order Limits.

11.5 Project design and mitigation

11.5.1 Environmental considerations have influenced the Project throughout the design development process, from early route options assessment through to refinement of the Project design. An iterative process has facilitated design updates and improvements, informed by environmental assessment and input from the Project engineering teams, stakeholders and public consultation.

11.5.2 The Project includes a range of environmental commitments. Commitments of relevance to material assets and waste are set out in this section under the following categories:

a. Embedded mitigation: measures that form part of the engineering design, developed through the iterative design process summarised above.

b. Good practice: standard approaches and actions commonly used on infrastructure development projects to avoid or reduce environmental impacts, and typically applicable across the whole Project.

c. Essential mitigation: any additional Project-specific measures needed to avoid, reduce or offset potential impacts that could otherwise result in effects considered to be significant in the context of the EIA Regulations. Essential mitigation has been identified by environmental topic specialists, taking into account the embedded and good practice mitigation.

11.5.3 Embedded mitigation is included within the Design Principles (Application Document 7.5) or as features presented on Figure 2.4 - Environmental Masterplan (Application Document 6.2). Design Principles relevant to mitigation of effects on material assets and waste are described below, each with an alpha-numerical reference code (e.g. MW. XX). Good practice and essential mitigation are included in the Register of Environmental Actions and Commitments (REAC). The REAC forms part of Appendix 2.2 - Code of Construction Practice (Application Document 6.3). Relevant extracts to safeguard the material assets and waste are provided below.

11.5.4 The Design Principles, Environmental Masterplan, CoCP and REAC, all form part of the Project control plan. The control plan is the framework for mitigating, monitoring and controlling the effects of the Project. It is made up of a series of 'control documents' which present the mitigation measures identified in the application that must be implemented during design, construction and operation to reduce the adverse effects of the Project. Further explanation of the control plan and the documents which it comprises is provided in the Introduction to the Application (Application Document 1.3). The oMHP (Application Document 6.3, Appendix 2.2, Annex B) also forms part of the Project control plan and sets out the approach and high-level principles for handling construction materials and waste.

11.5.5 Enhancement measures have been directly incorporated into the Project as part of the application of 'good design' principles. Enhancements are measures that are considered to be over and above any measures to avoid, reduce or remediate adverse impacts of the Project. Relevant beneficial effects arising as a consequence of this good design process are provided below in Section 11.5.21.

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11.5.1 The Carbon and Energy Management Plan (Application Document 7.19) also sets out the mechanisms and management arrangements including enhancement measures to lead the construction industry in the adoption of low carbon innovation for the Project to support transition to Net Zero.

Design measures

Material assets

11.5.2 The opportunities with the greatest potential for improving resource efficiency and contributing to the circular economy in construction projects occur during the feasibility and early design stage, as outlined in Circular Economy: Approach and Routemap (Highways England, 2016). The implementation of these opportunities is presented below.

11.5.3 The principle of 'Designing out materials' was applied throughout the design process. Design options were reviewed, and the advantages and disadvantages evaluated, including changes to material demand. Removing the bridge at Hornsby Lane, reducing the number of lanes on the Project road south of the M25, widening the existing Rectory Road rather than constructing a new highway, and reducing the span of the Tilbury Viaduct from 1.2km to 600m resulted in the net reduction in demand for aggregate, asphalt, concrete and steel.

11.5.4 The principle of 'identifying, securing and using materials on-site' was applied through a review of published geology, supported by ground investigation. This identified likely suitable *in situ* aggregate and mineral deposits as well as other ground materials likely to be suitable for use as engineered fill and landscaping. This resulted in a large reduction of the need to import fill materials, particularly to the north of the River Thames. Similarly, topsoil stripped during the Project would be retained within the Order Limits throughout the construction programme and reused for landscaping and restoration following construction completion. All excavated materials and soils proposed for reuse under a Materials Management Plan would be required to meet risk-based acceptability criteria applicable to their intended use (REAC ref. GS006)

11.5.5 Estimates of the materials generated within the Order Limits and used during construction are presented in Table 1.1 of Appendix 11.4 - Material Assets Assessment Supporting Data (Application Document 6.3).

11.5.6 As well as design options being reviewed, material use in the design was also reviewed, looking at opportunities to use alternatives to steel in reinforced concrete, such as graphene which requires less material than traditional concrete. It is also stronger, more durable and more water-resistant and reduces carbon emissions. There are also options for incorporating waste materials into asphalt including using repurposed plastic waste or incorporating recycled rubber from old tyres. This not only reduces potential waste being sent to landfill but also reduces the carbon emissions from the manufacture of asphalt.

11.5.7 The principle of 'Designing for long life' was applied through the selection of materials appropriate for the design to ensure durability and increase the asset design life. Application of this principle would help to reduce the maintenance demand for materials during the operational phase. For example, incorporating graphene into asphalt can lengthen the life of road surfaces reducing the maintenance and replacement requirements.

11.5.8 The principle 'Design for the future' was implemented by considering the flexibility of future deconstruction by ensuring that materials used in construction could be easily recovered and recycled at the end of first life. As detailed in Chapter 15 - Climate and Appendix 15.3 (Application Document 6.3) the Contractors would design the permanent works in accordance with the DMRB standards and use construction materials that would be resilient to the effects of projected future climate change in line with UKCP18 (REAC Ref. CC006).

Waste

11.5.9 At design, the top-tier principle of 'elimination' was implemented in line with the waste hierarchy.

11.5.10 As a result of design changes, material wastage and excess excavated material generated have, where possible, been reduced or eliminated. Table 1.10 provides some examples of design changes that have been implemented.

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Table 1.10 Waste elimination in design

Design change
Removal of southbound auxiliary lanes north of junction 29 on the M25.
Reduction of the Project road from three lanes to two between the M25 and A13 (southbound).
Moving the South Portal approximately 350m south from the location presented at Statutory Consultation, resulting in a reduced excavation for the road cutting.
Retention and reuse within the Order Limits of excavated materials and treated tunnel boring machine slurry to fulfil the Project's requirements for fill and landscaping material.
Re-routed road alignment between Hornsby Lane and Muckingford Road to reduce the number of existing pylons to be diverted, and at North Ockendon to avoid the construction of a new gas compound and associated high pressure gas networks.
Refinement of compound locations and layouts to reduce the requirements for vegetation clearance and vegetation waste generation.

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Embedded mitigation

Construction phase – material assets and waste

11.5.11 The design measures (including circular economy principles) that are described above have been applied throughout the development of the Project. These measures are therefore considered fundamental to the Project as described in the DCO application.

Operational phase – material assets and waste

11.5.12 The design measures (including circular economy principles) that are described above have been applied throughout the development of the Project and are considered to minimise the materials required for maintenance and waste generated during the first year of operation.

Good practice

Construction phase – material assets

11.5.13 Construction phase good practice of relevance to material assets is as follows:

a. **Minimising use of primary materials (REAC Ref. MW001)** – during detailed design, materials that are renewable, reclaimed or have a recycled content would be specified:

   i. Where design specification permits, key construction materials used would include a measurable recycled or secondary content.

   ii. In line with the target set out in DMRB LA 110 Material assets and waste (Highways England, 2019), 31% of aggregates used in construction would be recycled or secondary, for those applications where it is technically and economically feasible to substitute these alternative materials for primary aggregates. To facilitate compliance with this target, the Contractors would calculate the total aggregate required to achieve the detailed design, and the total where design

specification dictates only primary aggregate is used. During construction, the Contractors would record the amount of primary and secondary/recycled aggregate by weight and calculate compliance with the target (offsetting the amount excluded by design specification).

iii. Also in line with the target set out in DMRB LA 110, 70% of suitable, uncontaminated concrete from demolition activities would be recycled and reused within the Order Limits to substitute for primary material.

iv. Suitable uncontaminated concrete from demolition and construction activities would be processed to achieve non-waste status e.g. in accordance with the Aggregates from Inert Waste Quality Protocol (WRAP, 2013).

b. **Responsible sourcing (REAC Ref. MW002):**

i. Priority would be given to sourcing primary, secondary and recycled aggregates from facilities in Kent, Essex and Greater London whenever the design specification permits, and supply is available, to comply with the proximity principle.

ii. The Contractors would use BRE Framework Standard for Responsible Sourcing (BES 6001) (BRE Global, 2016) to verify imported materials are sustainably sourced and managed, to reduce the impacts throughout the supply chain.

c. **Design for materials optimisation (REAC Ref. MW003)** – the Contractors would be required to review the design and investigate opportunities to standardise (where practicable) construction aspects for example beam and abutment dimensions and components such as piers to increase efficiency of materials use in production and reduce waste. This initiative would be progressed through detailed design and documented in a material efficiency design report submitted to the Applicant prior to construction.

d. **Design for offsite construction (REAC Ref. MW004)** – While the ES (Application Document 6.1, 6.2 and 6.3) has evaluated the impacts from a segment plant within the Order Limits associated with the tunnelling, the procurement process would not prevent Contractors from offsite manufacture. The Contractors would be required to review the design to investigate the use of pre-fabricated structures and components and encourage a process of assembly rather than construction on site where economically and technically feasible.

e. **Demolition audits (REAC Ref. MW005)** –Contractors would undertake pre-demolition surveys of any structures and buildings. Demolition materials would be identified and quantified including potential opportunities for the reuse (with or without treatment) of aggregate within the Project, as well as

hazardous materials such as asbestos requiring additional waste management controls.

f. **Characterisation of excavated fill (REAC Ref. MW008)** – The Contractors would use the information and data available to identify what site-won excavated materials can be used as Class I-IV material or aggregate. Supplementary data and information would be obtained in order to assess the potential availability and suitability of excavated materials to meet the relevant material specifications.

Construction phase – waste

11.5.14 Construction phase good practice of relevance to waste is as follows:

a. Excavated material (and all wastes) will be managed in line with the waste hierarchy. Preference is given to appropriate reuse and/or recycling before disposal where feasible and permitted by the design (REAC Ref. MW007).

b. Clean, naturally occurring soils will be reused, recycled and/or recovered within the Order Limits in line with the relevant regulatory controls (REAC Ref. MW007).

c. Contractors would implement the necessary environmental permits, exemptions and complete Materials Management Plan (as per the Definition of Waste: Development Industry Code of Practice (CL:AIRE, 2011)) for the reuse, recycling and/or recovery of excavated materials and soils (REAC Ref. MW007).

d. Material that is not suitable for reuse, recycling and/or recovery, or is excess to requirements, is likely to be considered waste. Opportunities would be sought within schemes or facilities outside the Order Limits (REAC Ref. MW007).

e. During both the detailed design and construction, Contractors would appoint a Materials and Waste Manager to ensure that the waste hierarchy is implemented and opportunities to reduce waste generation or improve reuse, recycling and/or recovery rates are identified. The Materials and Waste Manager would be responsible for ensuring compliance with waste mitigation requirements set out in the REAC, and ensuring the Site Waste Management Plan is written and updated (REAC Ref. MW006).

11.5.15 Contractors would implement the following measures during construction in order to enhance recovery and recycling rates and minimise the quantities of waste (REAC Ref. MW010):

a. All waste arisings would be characterised. All waste arisings would be monitored via the SWMP (or equivalent in substance) during construction.

b. Classify all wastes through sampling to determine the mirror entry code, in line with the prevailing technical guidance (currently Waste Classification: Guidance on the classification and assessment of waste, WM3 (Scottish Environment Protection Agency, Natural Resources Wales and Environment Agency, 2021).

c. Offsite waste management would be implemented under the relevant UK waste regulation such as: Environmental Permitting Regulations 2016; Duty of Care (Section 34 of the Environmental Protection Act 1990); The Classification, Labelling and Packaging of Chemicals (Amendments to Secondary Legislation) Regulations 2015; and Hazardous Waste (England and Wales) Regulations 2005.

d. Satisfy the need under the Waste (England and Wales) Regulations 2011 (as amended) for pre-treatment of waste and confirm this in a written declaration on the associated waste documentation.

e. Demonstrate and document how sufficient space has been allowed within the construction working areas for stockpiles for topsoil, contaminated material, materials to be reused, excess clean material and imported materials for construction. This would enable the segregation of waste types, prevent the mixing of hazardous and non-hazardous wastes, and enhance recovery rates by minimising degradation, damage and loss. The oMHP (Application Document 6.3, Appendix 2.2, Annex B) provides details on what needs to be considered with regard to onsite stockpiling and segregation arrangements for waste and any supporting logistical arrangements.

f. Segregate hazardous and non-hazardous waste, separating waste at source by type where practicable; providing separate skips for general waste, metal, dry recycling and timber as a minimum at each compound. Suitable provision would also be made for common hazardous wastes, e.g. used absorbents, aerosol cans, oily rags and waste electronics.

g. Provide impermeable surfaces with sealed drainage for remediation, quarantine and hazardous waste storage areas to prevent cross-contamination of other waste streams and surrounding ground.

h. Label stockpiles and skips with contents to prevent the mixing of hazardous and non-hazardous wastes.

i. Comply with any legislative specific waste storage and handling requirements, e.g. for asbestos or waste electronics.

j. Vegetation waste should be reused within the Order Limits wherever possible, e.g. for ecological mitigation (unless contaminated by invasive species).

k. Where possible agree with material suppliers to reduce the amount of packaging on materials or to participate in a packaging take-back scheme.

l. Implement a material delivery system to avoid materials being stockpiled, which increases the risk of their damage and disposal as waste.

m. Monitor material quantity requirements to avoid over-ordering to reduce opportunity for oversupply and damage whilst stored, which would generate waste materials.

n. Prioritise off-ground storage, e.g. on pallets, retention of materials in original packaging, protection from rain and collision by plant or vehicles.

o. Ensure that the storage of lightweight or liquid/sludge waste materials will prevent dispersion by wind and precipitation.

p. Prohibit the burning of waste and unwanted materials within the Order Limits.

q. In line with the requirements of DMRB LA 110 Material assets and waste (Highways England, 2019) or as amended, enhancement opportunities would be identified, reported and implemented during detailed design and construction to reduce the Project's material demand and amount of waste sent for final disposal in landfill.

Operational phase

11.5.16 In line with REAC item MW010, the following good practice material assets and waste management procedures would be implemented as part of maintenance, repair and replacement activities during the operational phase:

a. Contractors would implement the following, where practicable, in order to reduce the quantities of waste requiring offsite management, enhance recycling and recovery rates and minimise the generation of hazardous waste (REAC Ref. MW016):

   i. All waste arisings would be characterised. All waste arisings would be monitored using a SWMP (or equivalent in substance) during construction projects undertaken during the operational phase.

   ii. All wastes would be classified, with relevant European Waste Catalogue (EWC) codes and in the case of mirror entry codes, the wastes would be sampled to determine classification, in line with the prevailing technical guidance (currently Waste Classification: Guidance on the classification and assessment of waste, WM3 (Scottish Environment Protection Agency, Natural Resources Wales and Environment Agency, 2021).

iii. Waste management off-site would be completed under relevant UK waste regulation. All waste would be transported using licensed carriers and taken only to appropriately permitted facilities. All waste movements would be accompanied by waste documentation such as Waste Transfer or Consignment Notes (dependent of waste class) which would be retained for the required period.

iv. Satisfy the need under the Waste (England and Wales) Regulations 2011 (as amended) for pre-treatment of waste and confirm this in a written declaration on the associated waste documentation.

v. Demonstrate and document that sufficient space has been allowed within the construction working areas for stockpiles for topsoil, material not suitable for reuse on site, materials to be reused, excess clean material and imported materials for construction. This would enable the segregation of waste types, prevent the mixing of hazardous and non-hazardous wastes and enhance recovery rates by minimising degradation, damage and loss.

vi. Segregate hazardous and non-hazardous waste, separating waste at source by type, where practicable, providing separate skips for general waste, metal, dry recycling and timber as a minimum at each compound. Suitable provision would also be made for common hazardous wastes, e.g. used absorbents, aerosol cans, oily rags and waste electronics.

vii. Provide impermeable surfaces with sealed drainage for remediation, quarantine and hazardous waste storage areas to minimise cross contamination of other waste streams and surrounding ground.

viii. Label stockpiles and skips with contents, to prevent the mixing of hazardous and non-hazardous wastes.

ix. Comply with any specific waste storage and handling requirements required by the prevailing legislation, e.g. for asbestos or waste electronics.

x. Vegetation waste should be reused within the Order Limits wherever possible, e.g. for ecological mitigation (unless contaminated by invasive species).

xi. Where possible agree with material suppliers to reduce the amount of packaging on materials or to participate in a packaging take-back scheme.

xii. Implement a material delivery system to avoid materials being stockpiled, which increases the risk of their damage and disposal as waste.

xiii. Monitor material quantity requirements to avoid over-ordering to reduce opportunity for oversupply and damage on site which would generate waste materials.

xiv. Prioritise off-ground storage, e.g. on pallets, retention of materials in original packaging, protection from rain and collision by plant or vehicles

xv. Ensure that the storage of lightweight or liquid/sludge waste materials will prevent dispersion by wind and precipitation.

xvi. Prohibit the burning of waste and unwanted materials within the Order Limits.

xvii. In line with the requirements of DMRB LA 110 Material assets and waste (Highways England, 2019) or as amended, enhancement opportunities would be identified, reported and implemented during detailed design and construction to minimise the demand for material and the amount of waste sent for final disposal in landfill.

Essential mitigation

Potential significant effects

11.5.17 An iterative appraisal of the Project design taking into account the design principles and good practice was undertaken to identify any potentially significant effects that would require essential mitigation. Effects on material assets and waste which could be significant, and which therefore required further consideration for essential mitigation, were identified as the temporary reduction of capacity at waste management facilities or permanent reduction of landfill capacity.

Construction phase – material assets

11.5.18 No specific essential mitigation measures are presented for material assets.

Construction phase – waste

11.5.19 Construction phase essential mitigation of relevance to waste is as follows:

a. Offsite excavated material management:

i. Through a combination of one or more of reuse, recycling and/or recovery the Contractors would achieve a minimum of 95% (by weight) of inert excavation wastes and a minimum of 95% (by weight) of inert construction and demolition waste destined for offsite waste management outside the Order Limits would be diverted from final disposal in landfill. (REAC Ref. MW011).

ii. The Contractors would use the methodology in the Excavated Materials Assessment (Application Document 6.3, Appendix 11.1) to identify offsite facilities and/or schemes that score positively against the sustainability scoring system presented in that document. Sites would be considered acceptable where they perform no worse than those sites on the detailed assessment list (at the time of submission of the DCO application) (REAC Ref. MW012).

iii. Where reuse is not practical recycling and recovery of materials would be the next preferred option. Through a combination of one or more of reuse, recycling and/or recovery the Contractors shall achieve a minimum of 90% (by weight) of non-hazardous excavated wastes and a minimum of 90% (by weight) of non-hazardous construction and demolition waste that are destined for off-site waste management outside the Order Limits, and therefore would be diverted from final disposal in landfill (REAC Ref. MW013).

iv. The Contractors would achieve a target of 70% (by weight) of hazardous construction, demolition and excavation waste to be diverted from landfill. It is anticipated that this would be achieved by undertaking remediation or treatment within the Order Limits or offsite at third-party facilities. It is acknowledged that the nature of some hazardous construction waste may preclude this. Where a hazardous construction waste cannot be diverted from landfill, the justification and evidence will be provided to the Applicant and logged by the Contractors in the SWMP (or equivalent) (REAC Ref. MW015).

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Operational phase

11.5.20 No specific essential mitigation measures are proposed in relation to the assessment of material assets or waste.

Enhancement measures

11.5.21 Beneficial effects arising from enhancements to the Project of relevance to material assets and waste are as follows:

a. The building of noise bunds and visual screening bunds where necessary along the route.

b. The potential opportunities to reuse temporary works and/or demolition materials and wastes onsite which if required would be subject to appropriate treatment to enable reuse.

c. The creation of public open space through the reuse of suitable surplus excavated materials.

11.5.22 Further opportunities for environmental enhancement which could be explored by the Contractors including the use of surplus recycled or recovered materials

in community projects. For example, utilising recycled mulch from tree felling on any adjacent community facilities.

11.5.23 In line with the requirements of DMRB LA 110 Material assets and waste (Highways England, 2019) or as amended, enhancement opportunities would be identified, reported and implemented during detailed design and construction to minimise the demand for material and the amount of waste sent for final disposal in landfill (MW016).

11.5.24 Further enhancement measures relating to material assets and waste will be considered and implemented where applicable during subsequent stages of the Project.

11.6 Assessment of likely significant effects

11.6.1 This section presents the assessment of likely significant effects on material assets and waste receptors resulting from the construction and operational phases of the Project. This is based on the design of the Project and takes into account the mitigation as presented in Section 11.5 of this chapter.

11.6.2 The significance of effects has been determined in accordance with the matrix provided in DMRB LA 110 Material assets and waste (Highways England, 2019). As presented within Section 11.3, this methodology is bespoke to the assessment of material assets and waste and does not use the approach described in Chapter 4 - EIA Methodology as there are no separate criteria for the value/sensitivity of a receptor and magnitude of change.

11.6.3 The assessment of direct impacts is presented in this chapter. The indirect effects relating to material assets and waste are assessed in Chapter 15 - Climate.

Construction phase

Material assets

11.6.4 The key materials anticipated to be required in construction of the Project are presented in Table 1.1 of Appendix 11.4 - Material Assets Assessment Supporting Data (Application Document 6.3). Where these are supplemented by sources within the Order Limits, this is noted within the table. The calculations include the initial works (including utility diversions), demolition and main construction works (including temporary works, highway and tunnelling).

11.6.5 Table 1.1 of Appendix 11.4 - Material Assets Assessment Supporting Data (Application Document 6.3) shows that the greatest material demand would include fill materials, steel, concrete, cement, bentonite, aggregate and asphalt.

Receptor effect: permanent reduction/depletion of material assets – material recycling / recovery

11.6.6 To reduce the import of fill materials, naturally occurring excavated materials will be reused within the Order Limits (REAC Ref. MW007), resulting in the reuse of an estimated 11,176,500 million cubic metres of excavated materials. This material is not waste and would avoid the use of primary materials. In line with the WaFD methodology, this is not included in waste calculations. Where excavated materials and soils are to be reused, recycled and/or recovered within the Order Limits this would be subject to the relevant regulatory controls.

11.6.7 In addition, a target of 70% reuse within the Order Limits of suitable, uncontaminated concrete from demolition is estimated to result in the reuse of approximately 2,500m^3 of recycled aggregate for recovery (REAC Ref. MW001).

11.6.8 By reusing vegetation in ecological mitigation (e.g. through mulching or hibernacula construction, etc), an additional 73,000m^3 of vegetation would also be reused. (REAC Ref. MW010). Where tree removal is required within ancient woodland, then timber will be retained and placed in log piles and left to decompose naturally (REAC Ref. LV031)

11.6.9 Through a combination of one or more of reuse, recycling and/or recovery the Contractors shall achieve a minimum of 90% (by weight) of non-hazardous excavated wastes and a minimum of 90% (by weight) of non-hazardous construction and demolition waste that are destined for off-site waste management outside the Order Limits, and therefore would be diverted from final disposal in landfill (REAC Ref. MW013). This would make the Project wastes available as substitutes for primary materials for use within the construction industry. Contractors would need to evidence that they have sought to comply with the target to achieve 90% (by weight).

11.6.10 It is anticipated that an overall recovery rate of above 90% can be achieved where it is technically and economically feasible. This exceeds the Government's 70% recovery target for recovery of construction.

11.6.11 Assessment against the significance criteria in Table 1.2 demonstrated that by achieving 70% non-hazardous construction and demolition waste recovery, and therefore making wastes available as substitutes for primary materials, the effects on permanent depletion of material assets for material recovery are judged to be slight and **not significant**.

Receptor effect: permanent reduction/depletion of material assets – recycled and secondary aggregate

11.6.12 In line with the requirements set out in DMRB LA 110 Material assets and waste (Highways England, 2019), a commitment is in place to ensure that 31% of imported aggregate is from recycled or secondary sources (where design specification permits). This is in line with the relevant regional percentage target (REAC Ref. MW001).

11.6.13 As shown in Table 1.3 the recycling and secondary aggregate annual sales/production in the study area is approximately 3.68 million tonnes. It has been estimated that the Project would require approximately 224,000 tonnes of recycled and secondary aggregate per annum to meet the 31% target which is approximately 6% of the annual recycled and secondary aggregate sales/production within the study area.

11.6.14 Assessment against the significance criteria in Table 1.2 indicates the relevant regional percentage target will be met and is legally secured. The effects on the depletion of material assets for recycled and secondary aggregate are judged to be slight and **not significant**.

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Receptor effect: permanent loss or sterilisation of MSAs and/or peat resources within the Order Limits

11.6.15 As outlined in Appendix 11.2 - Mineral Safeguarding Assessment (Application Document 6.3), the Project would not impact existing (active and inactive) mineral workings, strategically allocated mineral extraction sites and safeguarded mineral infrastructure identified by the relevant mineral planning authorities.

11.6.16 There are several geologies that are identified within Order Limits as potential MSAs due to their potential extractive and economic value. While some of these MSAs and non-designated mineral reserve areas are extensive in area within the Order Limits, much of the mineral resources fall within areas of land subject to temporary possession or proximity to existing land use that renders future exploitation unlikely (e.g. proximity to the M25). The alignment is also unlikely to substantially constrain or prevent existing and potential future use and extraction of these materials in the wider area.

11.6.17 Table 1.11 provides details on the likely impact on safeguarded minerals within the area of land subject to compulsory acquisition.

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Table 1.11 Summary of the impact on safeguarded minerals within the Order Limits

Local authority	Allocated mineral extraction sites and infrastructure	Safeguarded minerals within Order Limits	Potential sterilisation within the land subject to permanent acquisition
Kent County Council	None identified	Sub-Alluvial River Terrace Deposits River Terrace Deposits Safeguarded minerals are located beneath and adjacent to the Thames Estuary and Marshes Ramsar site in Gravesham.	Permanent acquisition of land would potentially sterilise 14,500m^2 (1.4ha) of safeguarded minerals. In line with Policies DM2, DM7 and DM9, prior extraction is unlikely to be supported or viable due to the potential adverse effects on the internationally designated Ramsar site, which is located north of Lower Higham Road. Viability of surface extraction is further compromised due to the thickness of head and alluvial deposits that overlay the mineral resources. In light of the above, prior extraction is not therefore considered feasible and the Project would not result in the full sterilisation of any safeguarded mineral resources in Kent.

Local authority	Allocated mineral extraction sites and infrastructure	Safeguarded minerals within Order Limits	Potential sterilisation within the land subject to permanent acquisition
Thurrock Council	None identified	Thanet Formation (sand) River Terrace Deposits comprising Boyn Hill Gravel Member, Taplow Gravel Member, Lynch Hill Gravel Member Project ground investigation as presented on the Ground Model (Appendix 10.5, Application Document 6.3) indicate that mineral resources between the Muckingford Road and Stifford Clays Road are typically found close to the surface.	The Project would potentially result in 1.5 million m^2 (150ha) of safeguarded minerals being sterilised. When put into context of the overall availability of safeguarded minerals within Essex and Thurrock, this would comprise 0.12% sterilisation. The Project proposals include a number of secured commitments to prioritise the use of prior extracted materials generated within the Order Limits, including MW007 and MW008 (Section 5.3). Mineral resources that are excavated within the MSA would be prioritised to be used within the Project. The areas of mineral sterilisation are likely to be discrete pockets in nature. The existing road network and access arrangements are likely to constrain the viability of mineral extraction, whilst the dispersed nature of the sterilised minerals would also reduce viability. Further adverse environmental effects would likely arise due to: Reduction in road safety Effects on local residential areas from noise, dust and air quality issues due to traffic movements and mineral workings Loss of BMV land Potential for cumulative effects from multiple site workings The Project would not result in the full sterilisation

Local authority	Allocated mineral extraction sites and infrastructure	Safeguarded minerals within Order Limits	Potential sterilisation within the land subject to permanent acquisition
			of the Thanet Sands and River Terrace Deposits safeguarded mineral units for the following reasons: only a small amount of the relevant safeguarded minerals would be subject to potential sterilisation; even then, the Project has secured commitments to reuse excavated materials and the nature of the geology means that some of these minerals will be reused in the Project; full prior extraction is not a viable option for the reasons mentioned
Essex County Council	None identified	None identified within the Project Order Limits	No sterilisation of safeguarded minerals by the Project
London Borough of Havering	None identified	River Terrace Deposits comprising Boyn Hill Gravel Member and Lynch Hill Gravel Member	Minimal sterilisation of safeguarded minerals by the Project would occur due to existing constraints limiting viability of mineral extraction, for example, the existing M25 and Thames Chase Forest Centre. Permanent Acquisition of Land would potentially result in 62,700m^2 (6.2ha) of safeguarded minerals to be sterilised. Within a large part of the areas sterilised by the Project to the west of the M25, the Project route is in cutting where it goes beneath the M25 and Ockenden Road. This would likely result in prior extraction of some of the minerals as part of the works and would reduce the effect reported. The Project proposals include a number of secured commitments to

Local authority	Allocated mineral extraction sites and infrastructure	Safeguarded minerals within Order Limits	Potential sterilisation within the land subject to permanent acquisition
			make preferential use of excavated materials generated within the Order Limits, including MW007 and MW008. The Project would not result in the full sterilisation of the Boyn Hill Member safeguarded mineral units.

11.6.18 The Project design has been optimised to minimise the land required to construct and operate the Project and maximise the land reinstated and returned to owners. Where land is returned, the Project would not result in the permanent sterilisation of underlying mineral resource.

11.6.19 Where avoidance of safeguarded mineral units has not been possible and in line with Paragraph 5.182 of the NPSNN, the Project has identified mitigation measures to reduce the magnitude of effects on mineral resources.

11.6.20 Minerals excavated prior to and during the construction phase would be prioritised for reuse, recycling and recovery within the Order Limits by the Contractor as secured through MW007, MW008 and GS006.

11.6.21 As discussed in the baseline in Section 11.4, it is considered that peat within the footprint of the Project does not constitute an existing or potential extraction site due to its very localised nature and its location beneath historic and active landfill sites which render exploitation unlikely.

11.6.22 As outlined above, the full sterilisation of MSAs or peat deposits is not anticipated due to the Project. Assessment against the significance criteria in Table 1.2 indicates the threshold for a large (significant) effect is not met as the Project does not sterilise any full mineral safeguarded sites, any operational sites or sites identified within the strategic planning documents for the extraction of minerals. The effects are therefore judged as **not significant.**

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Waste

11.6.23 The waste arisings likely to be generated during the construction phase of the Project have been forecast in Table 1.1 of Appendix 11.5 - Waste Assessment Supporting Data (Application Document 6.3). The calculations include the enabling works (including utility diversions), demolition and main construction works (including temporary works, highway and tunnelling) for each key construction area (Kent Roads, Tunnels and Roads North).

11.6.24 Table 1.1 of Appendix 11.5 - Waste Assessment Supporting Data (Application Document 6.3) shows that the largest contributor to waste arisings is associated with the earthworks, particularly excess excavated inert and non-hazardous materials.

11.6.25 Hazardous waste is anticipated from excavation in areas of potential contamination in historic landfills, Made Ground deposits, demolition materials, asbestos-containing materials and *in situ* coal-tar-bearing road surfacing. A

conservative estimate of hazardous waste quantities has been used for the purposes of establishing a worst-case scenario and the conclusions are therefore robust. The significance of effects from waste are detailed below in Section 11.6.44.

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Receptor effect: generation of waste leading to permanent reduction of landfill capacity and use of temporary capacity at waste management facilities

11.6.26 The Project is predicted to generate a total of 2,265,503m^3 of inert and non-hazardous construction, demolition and excavated waste, of which 968,857m^3 would be disposed of to landfill and 1,296,645m^3 is expected to be subject to reuse, recycling and/or recovery at waste management facilities (see Table 1.1 of Appendix 11.5 - Waste Assessment Supporting Data (Application Document 6.3) (excluding hazardous wastes and uncontaminated soils retained and reused within the Order Limits).

11.6.27 As outlined in Appendix 11.4 - Material Assets Assessment Supporting Data (Application Document 6.3) and the Outline Materials Handling Plan (Application Document 6.3, Appendix 2.2, Annex 3) it has been calculated that 12,500,000m^3 of excavated materials sourced onsite within the Order Limits would be generated and would comprises of the following:

a. 11,176,500 m^3 of inert excavated material reused within the Order Limits;

b. 660,000m^3 of non-hazardous excavated material to be disposed of to landfill within the Order Limits;

c. 350,000m^3 of non-hazardous excavated material managed offsite for reuse, recycling and/or recovery outside the Order Limits;

d. 150,000m^3 of non-hazardous excavated material managed offsite and disposed of to landfill outside of the Order Limits; and

e. 163,500m^3 of hazardous excavated material managed offsite outside the Order Limits.

11.6.28 Table 1.12 provides a summary of the waste tonnages anticipated to be generated during construction.

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Table 1.12 Summary of waste tonnage and volumes anticipated during constuction

	Calculated tonnes (t)	Calculated volume (m^3)
Inert waste		
Estimated inert waste reuse, recycling and recovery (diversion from landfill) (95%) (REAC Ref. MW011)	1,249,808	654,075
Estimated inert waste disposal (5%) (REAC Ref. MW011)	65,763	34,425
Total inert waste	**1,315,571**	**688,500**
Non-hazardous waste		
Estimated non-hazardous waste reuse, recycling and recovery (diversion from landfill) (70%)	898,926	642,570
Estimated non-hazardous waste disposal (30%)	1,573,254	934,4322
Total non-hazardous waste	**2,472,180**	**1,577,002**
Non-hazardous and inert waste		
Estimated non-hazardous and inert waste reuse, recycling and recovery (diversion from landfill)[1]	2,148,734	1,296,645
Estimated non-hazardous and inert waste disposal	1,639,017	968,857
Total non-hazardous and inert waste	**3,787,751**	**2,265,503**
Hazardous waste		
Estimated hazardous waste recovery (diversion from landfill) (70%) (REAC Ref. MW015)	206,010	114,450
Estimated hazardous disposal (30%) (REAC Ref. MW015)	88,290	49,050
Total hazardous waste[2]	**294,300**	**163,500**

Notes:

[1] This figure includes 73,000m3 vegetation and 2,500m3 demolition concrete recovered and reused within the Order Limits

[2] In line with WaFD methodology, hazardous waste is excluded from calculations of compliance with legal target

[3] This figure includes 660,000m3 non-hazardous excavated material to be disposed of to landfill within the Order Limits

11.6.29 Based on likely European Waste Catalogue codes, forecast waste streams arising from the Project were classed as inert, non-hazardous or hazardous and compared against the relevant landfill capacity in Table 1.13.

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11.6.30 In order to predict the reasonable worst case, the total waste generated by the Project has been compared against the total future landfill capacity in the study area and England in 2025. The year 2025 has been selected for the assessment as it is the first year of construction.

11.6.31 Table 1.13 summarises the projected waste landfill capacity remaining in 2025 (as presented in the baseline in Table 1.8 and Table 1.9) against the Project waste forecast.

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Table 1.13 Landfill capacity assessment

	Landfill type	Study area total capacity (m^3) in 2025	Project waste forecast (m^3)	Used capacity (%)
England	Inert and non-hazardous	321,382,792	968,857	0.30%
	Hazardous	14,798,779	49,050	0.33%
	All waste (inert, non-hazardous and hazardous)	336,181,571	1,017,907	0.30%
Study area (Kent, Essex and ELWA)	Inert and non-hazardous	37,376,890	968,857	2.59%
	Hazardous[2]	105,507	49,050	46.49%[1]
	All waste (inert, non-hazardous and hazardous)	37,482,396	1,017,907	2.72%

Notes:
[1]There is one hazardous landfill which accepts asbestos waste within the study area. Any hazardous waste requiring landfill disposal would be managed outside the study area.
[2] Hazardous waste landfill capacity excludes 'restricted' capacity.

11.6.32 As Table 1.13 shows, the waste generated during the construction phase (which is assumed to be sent for disposal in landfill), would likely represent the following:

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a. 2.59% of the landfill capacity in 2025 for inert and non-hazardous (968,857m^3) within Kent, Essex and ELWA

b. 0.33% of landfill capacity in 2025 for hazardous waste (49,050m^3) within England

11.6.33 All waste (inert, non-hazardous and hazardous) generated during the construction phase assumed to be sent for disposal to landfill would likely represent 2.72% of the landfill capacity within the study area in 2025.

11.6.34 The non-hazardous and inert waste generated during the construction phase (which is assumed to be sent for disposal in landfill), would likely represent less than 1% of the landfill capacity in England in 2025. England's landfill capacity has been provided in Table 1.13 for context and comparison purposes as required by DMRB LA110 and does not form part of the assessment for inert and non-hazardous waste.

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11.6.35 Given the limited hazardous landfill capacity within the study area it is likely that hazardous waste would need to be disposed of outside the study area. On this basis the hazardous waste generated during the construction phase would likely represent approximately 0.33% of the projected hazardous landfill capacity within England in 2025.

11.6.36 The inert and non-hazardous waste generated during the construction phase assumed to be sent for disposal to landfill would likely represent 2.59% of the projected landfill capacity within the study area in 2025. It should be noted that approximately 68% of the total inert and non-hazardous landfill capacity (within the study area) used by the Project is within the Order Limits (660,000m^3 of non-hazardous excavated material). This was considered to be the best overall environmental outcome as it negates the need to transport the waste offsite. The transportation of waste (excluding any hazardous waste) from the construction and tunnelling operations would not be on the local road network but would be offline, using heavy duty construction vehicles. Haul routes would be constructed to facilitate the movement at the North Portal site.

11.6.37 If the material destined for landfill within the Order Limits was excluded from the assessment, approximately 0.94% of inert and non-hazardous landfill capacity would be used in the study area instead of 2.59% as reported in Table 1.13 and Section 11.6.31.

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11.6.38 The Project's estimated annual average non-hazardous and inert waste arisings that would be subject to reuse, recycling and/or recovery is approximately 358,122 tonnes. When the annual average is compared against the annual waste infrastructure recovery capacity in Table 1.7 (65,462,890 tonnes/year), the Project would use approximately 0.5% of the annual recycling/recovery capacity in the study area.

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11.6.39 The largest single waste stream (by weight) leaving the Order Limits is non-hazardous excavated material. An Excavated Materials Assessment (Application Document 6.3, Appendix 11.1) has been undertaken to validate available offsite capacity at third-party potential receiver sites and to determine which of these would be capable of receiving excavated materials from the Project.

11.6.40 As part of proposed mitigation, the Applicant has commitment to a target that 90% (by weight) of non-hazardous excavated materials destined for waste management outside the Order Limits would be diverted from final disposal to landfill (REAC Ref. MW013). The Applicant has also committed to a target that 95% (by weight) of inert excavated materials destined for waste management outside the Order Limits would be diverted from final disposal in landfill (REAC Ref. MW011).

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11.6.41 It is likely that a proportion of the excavated material would be classified as inert however as a reasonable worst case and for the purposes of the assessment it has therefore been assumed that 70% of non-hazardous materials destined for waste management outside the Order Limits would be reused, recycled and/or recovered.

11.6.42 To mitigate impacts to hazardous waste landfill, a commitment to divert 70% (by weight) of hazardous waste from final disposal in landfill is proposed (REAC Ref. MW015).

11.6.43 As outlined in the baseline assessment, the permitted annual waste recovery and recycling capacity within the study area is approximately 65.4million tonnes. It is considered the market can absorb the Project waste recycling/recovery demands and that waste could remain in the region defined by the second study area.

11.6.44 Assessment against the significance criteria in Table 1.2 indicates the Project would use less than 1% of the inert and non-hazardous landfill capacity in England, which would be below the threshold to trigger a significant effect. The Project would use more than 1% of inert and non-hazardous landfill capacity in the study area. This is above the threshold outlined within DMRB LA 110 Material assets and waste (Highways England, 2019), and in line with Table 1.2, as 1-50% project wastes is expected to be disposed of outside the region, the effects on waste receptors are judged to be moderate adverse and therefore **significant**.

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11.6.45 The assessment of significance noted above uses the criteria set out within DMRB LA 110 (Highways England, 2019), which only reports against landfill capacity, not reuse, recycling or recovery within the study area. With regard to paragraph 5.43 of the NPSNN, which refers to the '*adverse effect on the capacity of existing waste management facilities*', the assessment demonstrates that an adverse effect on the capacity of existing waste management facilities, as a whole, to deal with other waste arisings in the area would not occur. As stated, the Project would use approximately 2.59% of inert and non-hazardous landfill capacity within the study area, which also includes a landfill site located within the Order Limits. If this site was excluded from the assessment, the Project would use approximately 0.94% of inert and non-hazardous landfill capacity within the study area, which would be less than the 1% threshold required to trigger a significant effect. In addition, the Project would use only 0.5% of the annual recycling/treatment and/recovery capacity in the study area.

11.6.46 There is one hazardous landfill which accepts asbestos waste along with other hazardous wastes within the study area. Should the hazardous waste generated by the Project require landfill disposal it would likely be managed outside the study area. The Project would require less than 0.33% of the available national hazardous waste capacity. It is therefore considered unlikely to adversely affect the capacity of existing waste management facilities to deal with other waste arisings.

Operational phase

Material assets

11.6.47 It is anticipated that during the operational phase of the Project, maintenance works would involve significantly lower quantities of materials than during construction and would therefore have a lesser impact on mineral resources and product supply.

11.6.48 DMRB LA 110 Material assets and waste (Highways England, 2019) requires the material assets and waste assessment to evaluate impacts of the first year of operational activities (opening year).

11.6.49 Maintenance works are based on minor and major intervention cycles which have different frequencies depending on the asset type, e.g. the renewal frequency of the road surface of the running lane is 10 years, but the renewal frequency of timber fencing is 30 years. For this reason, the material demand would typically come in cycles over the decades. An annual average calculated from the design life of the Project is therefore taken as a proxy for the first operational year.

11.6.50 The anticipated material demand for operation over the lifetime of the asset is detailed in Table 1.2 of Appendix 11.4 - Material Assets Assessment Supporting Data (Application Document 6.3).

11.6.51 Based on the annual average calculated for materials, the material most in demand during the representative year would be asphalt (32,221 tonnes).

11.6.52 The Applicant's maintenance contracts would implement the requirements in DMRB LA 110 Material assets and waste (Highways England, 2019) for aggregates imported into the Order Limits to comprise reused/recycled content in line with the relevant regional percentage target. Assessment against the significance criteria in Table 1.2, indicates the effects on the depletion of material assets for recycled and secondary aggregate are therefore predicted to be slight and not significant.

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11.6.53 Based on the data collected for maintenance activities completed on the nearby M25, which has been taken as a worst-case approach due to its location in proximity to the Project and its similarity to the Project, including large junctions and two tunnel assets. It has been assumed that the operation of the Project would be expected to result in similar rates of recycling and recovery as the M25. The M25 data shows that a total of 96% of the waste generated was recycled and/or recovered and this has also been assumed for the Project. Any Project waste subject to recycling and/or recovery would be available as substitute for primary materials within the construction industry. Assessment against the significance criteria in Table 1.2, indicates the effects on permanent depletion of material assets are therefore predicted to be slight and not significant.

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11.6.54 Once construction is complete, the Project would not impact existing (active and inactive) mineral workings, strategically allocated mineral extraction sites and safeguarded mineral infrastructure identified by the relevant mineral planning authorities or peat deposits. Assessment against the significance criteria in Table 1.2, indicates the threshold for a large or moderate effect would not be met. The effects are therefore predicted as **not significant.**

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Waste

11.6.55 During the representative year of operation, minor quantities of operational waste would be produced from site staff in offices associated with the portal structures and from maintenance repairs over the operational lifetime of the asset.

11.6.56 Wastes would typically comprise street cleansing waste, mixed municipal waste, mixed construction waste and sewage.

11.6.57 Table 1.2 of Appendix 11.5 - Waste Assessment Supporting Data (Application Document 6.3) summarises the quantities of waste estimated to be generated. These quantities have been calculated using data collected for maintenance and operational activities completed for the nearby M25. Maintenance and operational waste data was collected for M25 from 2012 to 2018. For this assessment, the year of highest maintenance waste generation of the seven-year period of the M25 data has been used to represent the anticipated operational and maintenance waste quantities likely to be generated during the representative year of operation for the Project.

11.6.58 Based on the Applicant's current waste management practices, approximately 459 tonnes of waste are anticipated in the representative year of operation. This equates to less than <0.1% of landfill capacity in England and in the study area assessed.

11.6.59 Assessment against the significance criteria in Table 1.2 indicates the effects on permanent depletion of landfill capacity are therefore predicted to be slight and **not significant**.

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11.6.60 Approximately 441 tonnes of waste are expected to be managed through recycling and recovery which would use <1% of local and regional recycling/recovery capacity, assuming a recycling/recovery rate of 95% as achieved on the M25.

11.6.61 It is considered that waste infrastructure therefore has sufficient capacity to accommodate waste from operation, without compromising the integrity of the receiving infrastructure (design life or capacity) within the region.

11.6.62 Assessment against the significance criteria in Table 1.2 indicates the effects of the reliance on disposal outside the region are therefore predicted to be slight and **not significant**.

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11.7 Cumulative effects

Intra-project effects

11.7.1 Cumulative effects of the Project can occur as a result of interrelationships between different environmental topics, which are referred to as 'intra-project effects'. For material assets and waste, interrelationships are identified within Chapter 10 - Geology and Soils, and Chapter 15 - Climate. The value of topsoil and excavated materials as resources for reuse in the Project have been outlined in Chapter 10 - Geology and Soils. The indirect effects relating to material assets and waste are assessed in Chapter 15 - Climate.

Inter-project effects

11.7.2 In addition to intra-project effects, cumulative impacts can also occur due to the Project in combination with other existing and/or approved developments. These are known as 'inter-project' effects and are considered separately in Chapter 16 - Cumulative Effects Assessment.

11.8 Monitoring

Construction

11.8.1 Monitoring of waste generation during the construction phase would be undertaken via the SWMP, which is to be included within the Environmental Management Plan (EMP) (second iteration), by the Principal Contractor.

11.8.2 The SWMP is secured by Requirement 4(3) which provides that the SWMP must be substantially in accordance with the oSWMP (Application Document 6.3, Appendix 2.2, Annex A).

11.8.3 The focus of the SWMP will be monitoring the quantities and types of waste generated, as well as the duty of care information for the contractors transferring the waste and the sites the waste is taken to for management.

11.8.4 The origin, quantity and suitability of excavated materials must be monitored during construction. The re-use of significant quantities of site-won materials means a tracking system should be in place (as part of the Materials Management Plan) to ensure that materials and wastes are effectively segregated and that only chemically and geotechnically suitable materials are used in construction.

11.8.5 The monitoring that would be undertaken under the construction SWMP during the construction phase is secured by REAC Ref MW0010 (Application Document 6.3, Appendix 2.2, Annex A).

Operation

11.8.6 The road operator would provide a summary of materials used and waste generated during the first year of operation in line with requirements of DMRB LA 110 Material Assets and Waste (Highways England, 2019). This information would be reviewed against the forecast presented in this chapter and used to update the Environmental Management Plan for future operational years (REAC Ref. MW014).

11.8.7 This monitoring commitment is also captured in the REAC, within the CoCP (Application Document 6.3, Appendix 2.2).

11.9 Summary

11.9.1 The assessment of effects on material assets and waste considered the construction and operational effects on material resources and waste infrastructure capacity. Assessments were undertaken in accordance with DMRB LA 110 Material assets and waste (Highways England, 2019) and based on professional judgement.

11.9.2 Receptors considered as part of the material assets and waste assessment include local, regional and national material resources and local waste infrastructure capacity.

11.9.3 The potential significant effects considered were depletion of finite primary material resources and the generation of waste leading to temporary capacity utilisation at waste management facilities or permanent reduction of landfill capacity.

11.9.4 Mitigation, including designing-out material use, sustainable material sourcing, application of the waste hierarchy, contract commitments and targets, has been proposed.

11.9.5 Table 1.14 summarises effects on material assets and waste. This table takes into consideration the mitigation measures outlined above in Section 11.5.

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Table 1.14 Material assets and waste impact summary table

Impact description	Effect	Significance
Construction		
Materials assets 1) Project achieves 70–99% overall material recovery / recycling (by weight) of non-hazardous CDW to substitute use of primary materials; and 2) Aggregates required to be imported to site comprise reused / recycled content in line with relevant regional percentage target.	Slight	Not significant
Waste 1) >1% reduction or alteration in the regional capacity of landfill as a result of accommodating waste from the Project; and 2) 1–50% of Project waste for disposal outside the region.	**Moderate**	**Significant**
Operation		
Materials assets 1) Project achieves 70–99% overall material recovery / recycling (by weight) of non-hazardous CDW to substitute use of primary materials; and 2) Aggregates required to be imported to site comprise reused/recycled content in line with relevant regional percentage target.	Slight	Not significant
Waste 1) >1% reduction or alteration in the regional capacity of landfill; and 2) Waste infrastructure has sufficient capacity to accommodate waste from a project, without compromising integrity of the receiving infrastructure (design life or capacity) within the region.	Slight	Not significant

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