

A417 Missing Link  
TR010056

6.2 Environmental Statement  
Chapter 10 Material Assets and Waste

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APFP Regulation 5(2)(a)  
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(Applications: Prescribed Forms  
and Procedure) Regulations 2009**

**A417 Missing Link**

Development Consent Order 202[x]

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**6.2 Environmental Statement  
Chapter 10 Material Assets and Waste**

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## 10 Material assets and waste

### 10.1 Introduction

- 10.1.1 This chapter provides an assessment of the likely significance of the environmental effects from the use of material assets and the generation and disposal and recovery of waste resulting from the A417 Missing Link (the scheme).
- 10.1.2 This chapter details the methodology followed for the assessment, summarises the regulatory and policy framework related to material assets and waste, and describes the existing environment in the area surrounding the scheme. Following this, the design, mitigation and residual effects of the scheme are discussed, along with the limitations of the assessment.
- 10.1.3 The assessment has been conducted in accordance with the Design Manual for Road and Bridges (DMRB) *LA 110 Material assets and waste*<sup>1</sup>.
- 10.1.4 Material assets and waste are defined as comprising:
- The consumption of materials and products (from primary, recycled or secondary, and renewable sources), the use of materials offering sustainability benefits, and the use of excavated and other arisings that fall within the scope of waste exemption criteria.
  - The production and disposal of waste.
- 10.1.5 In line with DMRB *LA 110 Materials assets and waste* methodology, the assessment presented in this chapter reports on the construction phase and first year of operational activities.
- 10.1.6 The effects of the scheme in terms of geology and soils, and the potential for land contamination, have been addressed in ES Chapter 9 Geology and soils (Document Reference 6.2) and the effects on climate have been addressed in ES Chapter 14 Climate (Document Reference 6.2).
- 10.1.7 The effects associated with the transportation of material assets and waste are assessed separately in ES Chapter 5 Air quality, ES Chapter 11 Noise and vibration and ES Chapter 14 Climate (Document Reference 6.2).

### 10.2 Competent expert evidence

- 10.2.1 The materials lead is a Chartered Geologist who holds a BSc (Hons) degree in Geology from The University of Liverpool (2000) and an MSc in Applied Environmental Geology from Cardiff University (2002). They are a Fellow of the Geological Society of London. Full details are provided in ES Appendix 1.2 Competent expert evidence (Document Reference 6.4).

### 10.3 Legislative and policy framework

#### Legislation

#### The Waste and Environmental Permitting etc (Legislative Functions and Amendment etc) (EU Exit) Regulations 2020

- 10.3.1 The Waste and Environmental Permitting etc (Legislative Functions and Amendment etc) (EU Exit) Regulations 2020 ensure waste and environmental

permitting regimes continue to operate effectively at the end of the EU transition period.

#### The Waste (England and Wales) Regulations 2011

10.3.2 The Waste (England and Wales) Regulations 2011 (S.I. 2011 No. 988) involve measures taken before a substance, material or product has become a waste that reduce:

- The quantity of waste, including through re-use of products or the extension of the life span of products.
- The adverse impacts of generated waste on the environment and human health.
- The content of harmful substances in materials and products.

10.3.3 The regulations mandate the Waste Hierarchy which requires that where waste is unavoidable, products and materials should, subject to regulatory controls, be used again, for the same or a different purpose (re-use). Otherwise, assets should be recovered from waste through recycling. Value can also be recovered by generating energy from waste but only if none of the above offer an appropriate alternative solution. The waste hierarchy is summarised in Table 10-1.

**Table 10-1 The waste hierarchy**

Stages	Includes
Prevention	Using less material in design and manufacture. Keeping products for longer; re use. Using less hazardous material.
Preparing for re-use	Checking, cleaning, repairing, refurbishing, whole items or spare parts.
Recycling	Turning waste into a new substance or product. Includes composting if it meets quality protocols.
Other recovery	Includes anaerobic digestion, incineration with energy recovery, gasification and pyrolysis which produce energy (fuels, heat and power) and materials from waste; some backfilling operations.
Disposal	Landfill and incineration without energy recovery.

10.3.4 This reduces the amount of material that requires off-site disposal and hence reduces the potential impacts relating to the movement of materials both on to and off-site.

#### Environmental Protection Act (EPA) 1990 (Duty of Care)

10.3.5 Section 34 of the EPA 1990 sets out the extent of the 'Duty of Care' owed by any person who imports, produces, carries, keeps, treats or disposes of controlled waste.

#### Further legislation

10.3.6 The following legislation relating to material assets and waste should also be taken into account which enact a wide range of legislation that govern the storage, collection, treatment and disposal of waste, these include:

- The Controlled Waste (England and Wales) Regulations 2012
- The Hazardous Waste (England and Wales) Regulations 2005
- Waste (Circular Economy) Regulations 2020

- The Environmental Permitting (England and Wales) Regulations 2016
- Environmental Protection Act 1990
- Environment Act 1995
- Finance Act 1996
- Waste Minimisation Act 1998
- Waste and Emissions Trading Act 2003
- Clean Neighbourhoods and Environment Act 2005

### Aggregates levy

- 10.3.7 An aggregates levy encourages a shift in demand from virgin aggregates towards alternative materials such as recycled aggregate. This is a tax on sand, gravel and rock that has either been dug from the ground, dredged from the sea in UK waters or imported. HM Revenue and Customs should be notified every quarter on how much aggregate has been produced or sold. A tax of £2 per tonne is charged per sand, gravel or rock<sup>2</sup>.

### **National policy**

#### National Policy Statement for National Networks (2014)

- 10.3.8 As discussed in ES Chapter 1 Introduction (Document Reference 6.2), the primary basis for whether to grant a Development Consent Order (DCO) is the National Policy Statement for National Networks<sup>3</sup> (NPSNN), which, sets out policies to guide how DCO applications are decided and how the effects of national networks infrastructure should be considered. Table 10-2 identifies the NPSNN policies relevant to the material assets and waste and then specifies where in the chapter information is provided to address the policy.

**Table 10-2 Relevant NPSNN policies for the material assets and waste assessment**

<b>Relevant NPSNN paragraph reference</b>	<b>Requirement of the NPSNN</b>	<b>Where in the chapter is information provided to address this policy</b>
5.42 and 5.43 (waste management)	The applicant should set out the arrangements that are proposed for managing any waste produced. The arrangements described should include information on the proposed waste recovery and disposal system for all waste generated by the development. The applicant should seek to reduce the volume of waste produced and the volume of waste sent for disposal unless it can be demonstrated that the alternative is the best overall environmental outcome.	Estimates of waste generated is outlined in Table 10-16. Section 10.10.20 outlines how the scheme should re-use as much material as possible on-site should it be assessed as being suitable for re-use. Section Design, mitigation and enhancement measures 10.9 details the design, mitigation and enhancement measures that would be implemented during the design and construction phases.

- 10.3.9 The NPSNN requires that evidence of appropriate mitigation measures (incorporating engineering plans on configuration and layout and use of materials) during both design and construction need to be presented together with the arrangements for managing any wastes that are produced.
- 10.3.10 The NPSNN identifies that government policy on waste is intended to protect the environment and human health by producing less and using it as a resource wherever possible. Where this is not possible, the NPSNN identifies that waste management regulation ensures waste is disposed of in a way that is least

damaging to the environment and to human health and that the waste hierarchy is utilised. This includes consideration of the ability for the waste from the development to be dealt with appropriately by waste infrastructure, without having an adverse effect on the capacity of existing waste management facilities to deal with other waste arisings in the area.

#### Waste Management Plan for England (2021)

- 10.3.11 The Department for Environment, Food and Rural Affairs (Defra) published the *Waste Management Plan for England* in January 2021<sup>4</sup>. The plan provides an overview of waste management in England. The plan does not introduce new policies or change how waste is managed in England. Its aim is to bring current waste management policies together under one national plan. It fulfils the requirements of the Waste (England and Wales) Regulations 2011 for the waste management plan to be reviewed every six years.
- 10.3.12 The plan also includes changes to waste management plan requirements which have been made by the Waste (Circular Economy) (Amendment) Regulations 2020 where these could be incorporated in the Plan.

#### Our waste, our resources: A strategy for England (2018)

- 10.3.13 In 2018, Defra published '*Our Waste, Our Resources: A Strategy for England*'<sup>5</sup> a major policy publication on waste setting out how England will preserve material resources by minimising waste, promoting resource efficiency and moving towards a circular economy in England.

#### National Planning Policy for Waste (2014)

- 10.3.14 The *National Planning Policy for Waste*<sup>6</sup> sets out the national planning policy on waste and provides the planning framework to enable local authorities to put forward, through waste local plans, strategies that identify sites and areas suitable for new or enhanced facilities to meet the waste management needs of their areas. This plan details waste planning policies for England and has been considered in conjunction with the *National Planning Policy Framework* (NPPF), the *Waste Management Plan for England*<sup>7</sup> and National Policy Statements for Waste Water<sup>8</sup> and Hazardous Waste<sup>9</sup>.

#### National Planning Policy Framework (NPPF) (2019)

- 10.3.15 The NPPF sets out the Government's planning policies for England. It does not contain specific materials or waste management policies; however, the framework includes reference to waste management by advocating that waste minimisation forms part of the environmental objective role of achieving sustainable development.

### **Local policy**

#### Minerals Local Plan for Gloucestershire (2018-2032) (adopted March 2020)

- 10.3.16 This plan replaced the Gloucestershire Minerals Local Plan (1997-2006) Saved Policies (adopted 2007) and has been developed to focus on achieving sustainable development. The management of mineral resources is essential to support:

- Local and national economic well-being.

- The safeguarding of Gloucestershire’s local communities and those nearby who may be affected by mineral developments.
- The protection and enhancement of the natural environment including the integrity of the country’s multi-functional green infrastructure network of landscape elements and features and valued built assets.

Gloucestershire Waste Core Strategy (2012 – 2027)

10.3.17 The *Gloucestershire Waste Core Strategy* was adopted in November 2012 and forms part of the local development plan for Gloucestershire, replacing the Gloucestershire Waste Local Plan (2002 – 2012). The Strategy explains how the County Council and its partners will address the issue of planning for waste management in Gloucestershire.

10.3.18 Relevant extracts of policies of relevance to the scheme are outlined below.

- “WCS2 – Waste Reduction:

*All development will be expected to incorporate the principles of waste minimisation and re-use. Planning applications for ‘major’ development must be supported by a statement setting out how any waste arising during the demolition, construction, and subsequent occupation for the development will be minimised and managed.”*

- “WCS4 – Inert Waste Recycling and Recovery:

*To help reduce the impact of landfill and achieve the requirements of the Waste Framework Directive (2008) the Council will aim to divert around 85,000 tonnes per year of inert waste from landfill through recycling and recovery operations.”*

- “WCS9 – Hazardous Waste:

*In the interest of moving the management of hazardous waste up the waste hierarchy, proposals for the recycling and recovery of hazardous waste will be supported in principle, where it can be demonstrated that the proposal is ‘environmentally acceptable’ and complies with other relevant development plan policies.”*

Cotswolds Area of Outstanding Natural Beauty (AONB) Management Plan 2018-2023

10.3.19 The *Cotswolds AONB Management Plan 2018-2023* is a non-statutory plan, which sets out the vision, outcomes and policies for the management of the Cotswolds AONB for the period 2018-2023.

10.3.20 The *Cotswolds AONB Management Plan* recognises that the movement of waste in and around the AONB has the potential to impact on the local road network, local communities and roadside verges and promotes the reduction of waste in accordance with the waste hierarchy (*Policy CE13 Waste management*).

Cotswold District Local Plan 2011-2031

10.3.21 The *Cotswold District Local Plan 2011-2031* was formally adopted on 3 August 2018 and sets out the policies and proposals to meet the challenges facing the area over the period 2011-2031. An objective of this plan under the climate change and flood risk subheading involves maximising water and energy efficiency, promoting the use of renewable energy sources and sustainable construction methods, and reducing pollution and waste.



## Standards and guidance

10.3.22 The assessment of the environmental effects associated with the use of material assets and the disposal or recovery of waste has been conducted in accordance with DMRB *LA 110 Material assets and waste*<sup>10</sup> and also considers the following:

The Definition of waste: Development Industry Code of Practice, Version 2 (Contaminated Land: Applications in Real Environments (CL:AIRE))<sup>11</sup>.

10.3.23 This Code of Practice (CoP) serves the following purposes:

- It sets out good practice for the development industry to use when:
  - i. Assessing on a site specific basis whether excavated materials are classified as waste or not.
  - ii. Determining on a site specific basis when treated excavated waste can cease to be waste for a particular use.
- It describes an auditable system to demonstrate that this CoP has been adhered to.

Highways England Sustainable Development Strategy (2017)

10.3.24 The Highways England *Sustainable Development Strategy*<sup>12</sup> sets out Highways England's approach and priorities for sustainable development to their key stakeholders. The strategy outlines several ambitions relating to Financial Capital (climate change adaptation), Human Capital (sustainability leadership), Natural Capital (carbon management), Social Capital (responsible sourcing) and Manufactured Capital (circular economy). Of these ambitions, the following are of relevance to this assessment:

- *“We will more actively manage our carbon emissions: we will examine and focus on business areas where efficiencies can be achieved through reducing fuel, energy and raw material consumption, and all waste generation.”*
- *“We will increase our knowledge of where our goods and materials are sourced from...Ensuring we responsibly source resources is essential, as their production and handling can have local, national and global impacts – on human and social health and also on the environment and climate change.”*
- *“We will push towards a circular approach to our management of resources: minimising our demand for primary resources extracted from the ground and maximise the reuse of the resources already in use on the network. Reutilising them in as high a value function as possible.”*

## 10.4 Assessment methodology

10.4.1 This section sets out the methodologies that have been employed to undertake the material assets and waste assessment, with reference to published standards, guidelines and best practice.

10.4.2 The assessment of the environmental effects associated with the use of material assets and the disposal or recovery of waste resulting from construction of the scheme has been undertaken following the methodology outlined in DMRB *LA 110 Material assets and waste*<sup>1</sup>. Professional judgement and emerging best practice have also been applied throughout the assessment.

### Identification of baseline

- 10.4.3 The existing baseline conditions have been identified as the receptors which have the potential to be impacted by the scheme. This includes the source of materials required for construction of the scheme, and waste management facilities which may be used for the treatment or disposal of waste. The baseline conditions have been informed by desk-based studies and information from ground investigations, including (but not limited to) data from:
- The Environment Agency.
  - Gloucestershire County Council.
  - Local development policies and topic papers.
- 10.4.4 To identify the baseline conditions, data has also been collected from Highways England, including ground investigation data, and members of the design team on the material assets that are likely to be used during each stage of the scheme, and the waste that is likely to arise.

### Assessment of construction impacts

- 10.4.5 For the purposes of assessing the material assets, an assessment has been undertaken based on buildability advice at the time of undertaking the assessment. Following the methodology outlined in *DMRB LA 110 Material assets and waste*<sup>1</sup>, the assessment of environmental effects associated with the consumption of material assets resulting from construction has considered the scheme design relating to the following:
- The types and quantities of materials required for the scheme.
  - Information on materials that contain secondary or recycled content.
  - Information on any known sustainability credentials of materials to be consumed.
  - The type and volume of materials that would be recovered from off-site sources for use of the scheme.
  - The cut and fill balance.
  - Details of on-site storage and stockpiling arrangements, and any support logistical details.
- 10.4.6 Following the methodology outlined in *DMRB LA 110 Material assets and waste*<sup>1</sup>, the assessment of environmental effects associated with the production and disposal of waste resulting from construction of the scheme is a quantitative exercise which identifies the following:
- The amount of waste (by weight) that would be recovered and diverted from landfill either on-site or off-site (i.e. for use on other projects).
  - The types and quantities of waste arising from the scheme (demolition, excavation arisings and remediation) requiring disposal to landfill.
  - Details of on-site storage and segregation arrangements for waste and any supporting logistical arrangements; and potential for generation of hazardous waste (type and quantity).
- 10.4.7 As defined in the CL:AIRE *Definition of Waste: Development Industry Code of Practice*, materials are only considered waste if they are discarded, intended to be discarded or required to be discarded by the holder. Once discarded, this remains the case even when the holder of the waste changes and the subsequent holder has a use for it.

### Assessment criteria

10.4.8 DMRB *LA 110 Material assets and waste*<sup>1</sup> defines a specific methodology for assessing the environmental significance of a material resource or for determining the magnitude of the impact on such resource. The significance of the material assets or waste within the study area is determined on the basis of the descriptions described in Table 3.13 of DMRB *LA 110 Material assets and waste*<sup>1</sup>, as reproduced in Table 10-3.

**Table 10-3 Significance category descriptions**

Significance	Description
Very large	<p>Material assets</p> <ul style="list-style-type: none"> <li>no criteria: use criteria for large categories.</li> </ul> <p>Waste</p> <ul style="list-style-type: none"> <li>&gt;1% reduction or alteration in national capacity of landfill, as a result of accommodating waste from a project; or</li> <li>construction of new (permanent) waste infrastructure is required to accommodate waste from a project.</li> </ul>
Large	<p>Material assets</p> <ul style="list-style-type: none"> <li>project achieves &lt;70% overall material recovery/recycling (by weight) of non-hazardous construction and demolition waste (CDW) to substitute use of primary materials; and</li> <li>aggregates required to be imported to site comprise &lt;1% re-used/recycled content; and</li> <li>project sterilises ≥1 mineral safeguarding site and/or peat resource.</li> </ul> <p>Waste</p> <ul style="list-style-type: none"> <li>&gt;1% reduction in the regional capacity of landfill as a result of accommodating waste from a project; and</li> <li>&gt;50% of project waste for disposal outside of the region.</li> </ul>
Moderate	<p>Material assets</p> <ul style="list-style-type: none"> <li>project achieves less than 70% overall material recovery/recycling (by weight) of non-hazardous CDW to substitute use of primary materials; and</li> <li>aggregates required to be imported to site comprise re-used/recycled content below the relevant regional percentage target.</li> </ul> <p>Waste</p> <ul style="list-style-type: none"> <li>&gt;1% reduction or alteration in the regional capacity of landfill as a result of accommodating waste from a project; and</li> <li>1-50% of project waste for disposal outside of the region.</li> </ul>
Slight	<p>Material assets</p> <ul style="list-style-type: none"> <li>project achieves 70-99% overall material recovery/recycling (by weight) of non-hazardous CDW to substitute use of primary materials; and</li> <li>aggregates required to be imported to site comprise re-used/recycled content in line with the relevant regional percentage target.</li> </ul> <p>Waste</p> <ul style="list-style-type: none"> <li>≤1% reduction or alteration in the regional capacity of landfill; and</li> <li>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.</li> </ul>
Neutral	<p>Material assets</p> <ul style="list-style-type: none"> <li>project achieves &gt;99% overall material recovery/recycling (by weight) of non-hazardous CDW to substitute use of primary materials; and</li> </ul>

Significance	Description
	<ul style="list-style-type: none"> <li>aggregates required to be imported to site comprise &gt;99% re-used/recycled content.</li> </ul> Waste <ul style="list-style-type: none"> <li>no reduction or alteration in the capacity of waste infrastructure within the region.</li> </ul>

10.4.9 Table 10-4 outlines the methodology for determining significance in line with the methodology set out in DMRB *LA 110 Materials assets and waste*<sup>1</sup>, incorporating professional judgement by the competent expert.

**Table 10-4 Significance criteria for material assets and waste**

Significance category	Description
Significant (one or more criteria met)	Material assets: <ul style="list-style-type: none"> <li>category description met for moderate or large effect.</li> </ul> Waste: <ul style="list-style-type: none"> <li>category description met for moderate, large or very large effect.</li> </ul>
Not significant	Material assets: <ul style="list-style-type: none"> <li>category description met for neutral or slight effect.</li> </ul> Waste: <ul style="list-style-type: none"> <li>category description met for neutral or slight effect.</li> </ul>

## 10.5 Assessment assumptions and limitations

10.5.1 Construction of the scheme would be carried out in accordance with industry standard good working practice, as outlined in ES Appendix 2.1 Environmental Management Plan (EMP) (Document Reference 6.4). This would include the environmental measures that would be adopted during the construction phase.

10.5.2 The assessment is based on the scheme design and as such, the assessment is limited to identifying activities that are likely to require significant quantities of materials or are likely to produce significant quantities of waste.

10.5.3 The quantities of materials to be used for construction of the scheme, sources of materials and their mode of transport would be finalised at detailed design. Values have been estimated based on the scheme design.

10.5.4 Maintenance would be carried out in accordance with the Maintenance and Repair Strategy Statement and will be consistent with other dualled sections of the A417 in Gloucestershire.

### Limits of Deviation

10.5.5 An assessment has been conducted within the Limits of Deviation (LoD) outlined in ES Chapter 2 The project (Document Reference 6.2).

10.5.6 Variations within the LoD could result in minor changes to the quantities of material assets required and estimated waste arisings to construct the scheme. It is considered unlikely that the localised alignment changes permitted by the LoD would have a significant effect on material volumes. Therefore, the LoD would not give rise to any materially new or materially worse adverse environmental effects from those reported in this chapter.

## 10.6 Study area

- 10.6.1 The first study area is based on the construction footprint and DCO Boundary of the scheme (including compounds and temporary land take). This constitutes the area within which construction materials would be consumed (used, re-used and recycled) and waste would be generated.
- 10.6.2 The second study area covers an area sufficient to identify feasible sources and availability of construction materials typically required for road schemes, and suitable waste infrastructure that could accept arisings of waste generated by the scheme. The second study area encompasses the county of Gloucestershire and includes the waste infrastructure that is suitable (licensed for waste volume and type) to accept arisings and/or waste generated by the scheme. Opportunities to seek secondary aggregates outside the county boundary are scoped out of this assessment. Travelling further than the Gloucestershire boundary would not align with the proximity principle which highlights a need to treat and/or dispose of wastes in reasonable proximity to their point of generation to reduce the environmental impacts and cost of waste transport.
- 10.6.3 Following the methodology outlined in DMRB *LA 110 Material assets and waste*<sup>1</sup>, it is outside the scope of the assessment to assess the indirect environmental effects associated with the extraction of raw materials from their original source and the manufacture of products which occur off-site. This stage of a material's lifecycle is likely to have already been subject to an environmental assessment. These effects are therefore not addressed in this chapter.

## 10.7 Baseline conditions

### Current baseline

- 10.7.1 In order to provide an assessment of the significance of any new development proposal (in terms of material assets and waste), it is necessary to identify and understand the baseline conditions in and around the study area. This provides a reference level against which any potential changes in material assets and waste can be assessed. The following section outlines information on the existing use of material assets and generation of waste, availability of construction materials, mining and material resources, superficial deposits, waste generation, potentially hazardous waste arisings and waste management facilities.

### Material assets

- 10.7.2 In accordance with schedule 2 of The Waste (England and Wales) Regulations 2011, measures would be taken to ensure at least 70% by weight of CDW is subject to material recovery. The baseline targets for alternative aggregates (which comprise both secondary aggregates, which are by-products from industrial and mining operations, and recycled aggregates which are produced from construction waste) are set out in Table 10-5 (reproduced from the Table E/1.2 of DMRB *LA 110 Material Assets and waste*<sup>1</sup>). The relevant target for the scheme in the South West region is 22%.

**Table 10-5 Recycled aggregate targets for England 2005-2020 (national and regional guidelines for aggregate provision, published 2009) <sup>13</sup>**

Region	Recycled content target (alternative materials)	Total Aggregate provision (million tonnes)
South West	22%	656
England Average	25%	3,908

10.7.3 In addition to the recycled aggregates targets for England, the aggregates levy and circular economy package has been considered in relation to the scheme by re-using onsite materials and recovery of surplus materials.

Availability of manufactured construction materials

10.7.4 The scheme would require both primary raw materials, such as stone and soil, and manufactured construction materials such as concrete, asphalt and steel.

10.7.5 The manufactured construction materials would be sourced from established suppliers who regularly provide materials for similar sized projects. The suppliers have not yet been determined but the contractor would ensure that they are suppliers with adequate resources to meet the quantitative needs of the scheme, without having a negative influence on their resources. Where appropriate resources are available, materials would be provided from local sources, although the contractor would work to ensure a balance with the value for money principle.

10.7.6 In addition, information for the UK has also been provided as a national comparison (where information is not available for the UK due to the differing governing authorities for England, Wales and Scotland, England has been used to provide the national comparison). This information has been determined through a desk study using readily available resources, including from the Minerals Products Association, International Steel Statistics Bureau, and Gloucestershire County Council.

10.7.7 The scope of the baseline, in terms of mining and mineral safeguarding, is listed below:

- Highways Agency Geotechnical Data Management System (HA GDMS).
- The *Review of Mining Instability in Great Britain – South West Regional Report*, prepared for the Department of the Environment.
- British Geological Survey (BGS) 1:100,000 *Mineral Resource map for Gloucestershire*.
- Historical OS plans contained within the *Groundsure report* (to identify the presence of historical quarries).

10.7.8 Table 10-6 outlines the UK demand, in terms of sales of minerals and mineral products in 2016, and 2018 for steel.

**Table 10-6 Materials demand in the UK**

Mineral	UK demand per annum (million tonnes)
Aggregates of which:	247 (2016) <sup>14</sup> :
Crushed rock	113.9
Sand and gravel – land won	48.6
Sand and gravel – marine won	14.1
Recycled and secondary	70.4

<b>Mineral</b>	<b>UK demand per annum (million tonnes)</b>
Cementitious (including imports) of which: Cement (including imports) Other cementitious materials (fly ash, ground clay bricks)	15 (2016): 12 3
Ready-mixed concrete	56.1 (2016)
Concrete products	25.8 (2016)
Asphalt	25.2 (2016)
Dimension stone	1 (2016)
Steel	10.72 (2018) <sup>15</sup>

10.7.9 At a regional level, Table 10-6 outlines the most recent publicly available information on the aggregate sales and reserves in the UK (for 2016) and provides an indication of theoretical capacity.

10.7.10 Aggregates produced across Gloucestershire include crushed rock from Carboniferous and Jurassic limestone, sand and gravel mostly made up of sharp sand with small amounts of soft sand, and recycled aggregates from construction, demolition and excavation wastes.

10.7.11 Table 10-7 outlines the countywide sand and gravel landbank was 6.561mt on 1 January 2019. This is based on 10-year rolling average sales of 0.742mtpa. applying a 3-year rolling average annual sales would increase the remaining length of the landbank to 8.71 years.

10.7.12 Table 10-7 outlines the landbank for crushed rock within Gloucestershire, from 11 January 2018 to 31 December 2018, was 20.83 million tonnes according to analysis undertaken by Gloucestershire County Council. The remaining length of this landbank stands at 14.58 years based upon the application of a 10-year rolling average annual sales which amounts to 1.428 million tonnes per annum.

**Table 10-7 Gloucestershire summary of sales and reserves 11/01/2018 - 31/12/2018<sup>16</sup>**

<b>Aggregate</b>	<b>2018 sales (million tonnes)</b>	<b>10-year sales average (million tonnes per annum)</b>	<b>3-year sales average (million tonnes per annum)</b>	<b>Local Area Agreement rate per year (million tonnes)</b>	<b>Reserves (million tonnes)</b>	<b>Landbank (remaining years)</b>	<b>Theoretical capacity (million tonnes per annum)</b>
All land-won sand and gravel	0.683	0.742	0.753	0.742	6.561	8.84	Up to 1.14
Crushed rock	1.66	1.428	1.7	1.428	20.83	14.58	Up to 2.77
Recycled or secondary aggregates	0.194	Insufficient data available	0.16	0.16 (based on 3 years of data)	-	-	-

10.7.13 Gloucestershire's aggregates landbanks as of the end of 2018 indicate that additional provision is likely to be required over the coming years for both crushed rock and sand and gravel. As highlighted in The Eighth Local Aggregates Assessment for Gloucestershire<sup>16</sup>, in the case of crushed rock, countywide reserves are theoretically sufficient to meet projected annual demand until the

end of 2023. In terms of sand and gravel, countywide reserves are anticipated to expire by the end of 2023.

#### Mineral resources and mining

- 10.7.14 There are two types of limestone deposits present in Gloucestershire, including Carboniferous limestones found within the Forest of Dean and Jurassic limestones which make up the Cotswold Hills<sup>17</sup>. Limestone is an important resource for aggregates, building stone, a soil improver (agricultural lime) and is used to support other specialist industrial processes. The overall distribution of Gloucestershire's limestone is not confined to the county's administrative boundaries, in particular, Jurassic limestones extend over a very wide area including parts of South Gloucestershire and Wiltshire to the south, Oxfordshire to the east and Warwickshire and Worcestershire to the north-east.
- 10.7.15 Quarrying of the Inferior Oolite limestone was a major local activity from the late 16<sup>th</sup> century to around the mid-1920s, particularly at Crickley Hill and Leckhampton Hill. Limekilns and quarries were developed to the south-east of the Existing A417 around the late 19<sup>th</sup> century, the latter on either side of Birdlip bypass. The most recently worked quarry on Crickley Hill closed in 1963.
- 10.7.16 Leckhampton Hill was a major source of 'Cotswold Stone'. The best of this stone was used for carving for interior use, while the bulk of the lower quality stone was used for roads and lime production. The Cleeve Cloud Member of the Birdlip Limestone Formation consists of a thick succession of massive uniform Oolite, strongly bedded with very little fossil content. This was by far the most important unit used as building stone in the Cotswolds, being the most widely used and versatile of the Cotswold Limestones.
- 10.7.17 There are three coalfields present within Gloucestershire; these include the Forest of Dean, Newent and Oxfordshire-Berkshire, which lies on the eastern fringes of Gloucestershire County<sup>17</sup>. The site falls outside the Coal Authority reporting area, however the *Review of Mining Instability in Great Britain – South West Regional Report*, indicates that there is a potential for mining instability in Birdlip, associated with rock commodity (limestone). This area is also shown to have a 'Likely' hazard from underground mining by the BGS non-coal mining areas of Great Britain database, related to a 'Limestone – Bath Stone' commodity. Further details of underground mining in the Birdlip area are unavailable, though a cave on the escarpment by the Royal George Hotel in Birdlip is known to have had its entrance 'modified by miners', and a passage enlarged by stone extraction.

#### Superficial deposits

- 10.7.18 Superficial deposits are the youngest geological deposits formed during the most recent period of geological time. The majority of these superficial deposits consist of unconsolidated sediments such as gravel, sand, silt and clay<sup>17</sup>.
- 10.7.19 The Cheltenham Sand and Gravel are mapped on the western part of the scheme. Further detail is included in section 9.7 Baseline conditions of ES Chapter 9 Geology and soils (Document Reference 6.2).



*Mineral resource areas, mineral safeguarding area and mineral consultation areas*

- 10.7.20 Two of Gloucestershire's Mineral Resource Areas (MRA) are located within the footprint (the first study area) of the scheme<sup>18</sup>, displayed in ES Figure 10.2 Mineral safeguarding areas (Document Reference 6.3). One is for sandstone and limestone and the other is for sand and gravel<sup>19</sup>. The designation of the MRA aims to ensure that non-mineral development doesn't needlessly prevent the future extraction of mineral resources which are of local and national importance. They form part of the local network of Mineral Safeguarding Areas (MSA). The scheme also falls within a Mineral Consultation Area (MCA), defined as: "*an area in which development is likely to affect or be affected by the winning and working of minerals other than coal*"<sup>18</sup>.
- 10.7.21 The delineation of the MRA ensures that the Mineral Planning Authority (i.e. Gloucestershire County Council) is consulted before any planning applications are determined. For more information on how Gloucestershire County Council has been consulted during the development of the scheme, including through non-statutory and statutory consultation, please refer to the Consultation Report (Document Reference 5.1). Further details on consultation relating to material assets and waste is provided in the Statement of Common Ground with the Joint Councils, included in the Statement of Commonality (Document Reference 7.3).
- 10.7.22 The first 500 metres of the scheme up to Ch 0+500 would overlap with the MRA for sand and gravel. As the scheme closely follows the existing road alignment and is widened in this location, the impact on the MRA would be very similar to the current baseline. There is a single drainage basin to the south of the road, which would also be within the MRA.
- 10.7.23 The offline section of the scheme, between the Ullenwood junction and Cowley junction, would intermittently cross the sand and gravel MRA.
- 10.7.24 0.05% of Gloucestershire's sand and gravel safeguarded area is within the DCO Boundary and 1.3% of Gloucestershire's sandstone and limestone safeguarded area is within the DCO Boundary. These are small proportions of the wider resource as shown in ES Figure 10.2 Mineral safeguarding areas (Document Reference 6.3) and therefore the scheme would not sterilise the use of the wider resource.
- 10.7.25 Several old quarries and gravel pits are situated within the vicinity of the scheme, but not within the footprint. It is understood that historical quarrying of the Inferior Oolite took place across Crickley Hill and Leckhampton Hill. Birdlip Quarry (owned by Hanson Quarry Products Europe Limited) is located to the north of Cowley roundabout. The quarry is an extant dormant quarry under the Environmental Act 1995. Through correspondence with Gloucestershire County Council, it is understood that there have been no active workings in the past 25 years, and as outlined in The Eighth Local Aggregates Assessment for Gloucestershire<sup>16</sup>, there are no current planning applications associated with this site.
- 10.7.26 There are no Mineral Infrastructure Safeguarded Sites near the scheme and therefore no potential impacts on these locally designated sites. The most recently worked quarry on Crickley Hill closed in 1963.

## Waste

10.7.27 The most recent information available relating to current waste generation and operational waste facilities in Gloucestershire has been gathered to provide the baseline for this assessment. Information on the current waste arisings, and the waste management facilities have been determined through a desk-top study using a number of readily available resources, in particular data from the Environment Agency and Gloucestershire County Council.

### Waste generation

10.7.28 The latest data from the Environment Agency<sup>20</sup> indicates that Gloucestershire received 653,493 tonnes of waste in 2019. Table 10-8 demonstrates the types of waste produced.

**Table 10-8 Waste received in 2019 by waste category in Gloucestershire and England**

Waste category	Gloucestershire (tonnes)	South West (tonnes)	England (tonnes)
Hazardous	12,872	516,057	6,998,933
Household / industrial / commercial	203,750	12,321,848	132,536,823
Inert / construction and demolition	436,871	83,244,075	88,817,931
<b>Total</b>	<b>653,493</b>	<b>96,081,980</b>	<b>228,353,687</b>

10.7.29 With respect to CDW Table 10-9 outlines the latest information for Gloucestershire and England, from Environment Agency data. These figures indicate that a total of 352,337 tonnes of waste was received (as per the site types below) in 2019.

**Table 10-9 CDW received in Gloucestershire in 2019<sup>20</sup>**

Sites located in	Tonnes
Cheltenham	9,238
Cotswold	149,862
Forest of Dean	7,211
Gloucester	141,454
Stroud	16,024
Tewkesbury	28,548
<b>County Total</b>	<b>352,337</b>

### Potential hazardous waste arisings

10.7.30 Sources of contamination have been considered within the DCO Boundary. There are no authorised or historic landfills within the study area. However, as indicated in ES Chapter 9 Geology and soils (Document Reference 6.2), there may be potential contamination risks from general highways use and agricultural land use. For more information on the potential contamination risks see ES Chapter 9 Geology and soils (Document Reference 6.2).

10.7.31 From Environment Agency data, 1,733 tonnes of construction and demolition hazardous waste was handled in Gloucestershire in 2019, all of which was disposed in landfill.

## Waste management infrastructure (off-site)

### *Landfill*

10.7.32 The Environment Agency Waste Data Interrogator<sup>20</sup> uses data on the quantities and types of waste that operators of regulated waste management facilities deal with. Table 10-10 outlines the breakdown of landfill waste in 2019 in Gloucestershire.

**Table 10-10 Landfill inputs in Gloucestershire and the South West in 2019<sup>20</sup>**

Material type	Quantity (tonnes)	
	Gloucestershire	South West
Hazardous Merchant	13,000	51,000
Hazardous Restricted	-	-
Non-Hazardous with Stable Non-Reactive Hazardous Wastes (SNRHW) cell	52,000	396,000
Non-Hazardous	551,000	1,541,000
Non-Hazardous Restricted	-	-
Inert	38,000	1,223,000
<b>Total</b>	<b>654,000</b>	<b>3,211,000</b>

Table notes:

Data since 2005 has been reclassified into categories used under the Pollution Prevention and Control (PPC) permitting of landfills and because of the ban on the co-disposal of waste in landfills in July 2004.

From 16 July 2004, hazardous landfills have only been able to accept wastes classified as hazardous under the Hazardous Waste (England and Wales) Regulations 2005.

Some non-hazardous sites can accept some Stable Non-Reactive Hazardous Wastes (SNRHW) into a dedicated cell, but this is usually a small part of the overall capacity of the site.

The above data do not include waste received by closed landfills for restoration purposes.

10.7.33 In addition to permitted construction and demolition waste management sites, inert material is also managed on sites that have an Environment Agency environmental permit exemption. These exempt sites generally comprise land restoration activities such as restoring mineral voids, engineering or landscaping schemes and for beneficial improvements to land. They are an important part of the provision of the capacity for managing inert materials. Although small tonnages of waste from other waste streams (e.g. biodegradable waste) may be managed at locations with an exemption, the largest tonnage of exempt activities is likely to involve construction and demolition material.

10.7.34 Data produced by the Environment Agency<sup>21</sup> states that the remaining landfill capacity at the end of 2019 in the South West amounted to 3,514,032m<sup>3</sup> from four sites, including Grundon Waste Management Ltd., S Grundon Waste Ltd., Cory Environmental (Gloucestershire Ltd.) and Cory Environmental (Gloucestershire) Ltd. as shown in Table 10-11.

**Table 10-11 Remaining landfill capacity in Gloucestershire at the end of 2019<sup>22</sup>**

Operator name	Facility name	Local authority	Site type	Remaining capacity (m <sup>3</sup> )
Grundon Waste Management Ltd.	Wingmoor Quarry Landfill	Tewkesbury	L02 - Non Hazardous Landfill with SNRHW cell	1,481, 532
S Grundon (Waste) Ltd.	Wingmoor Farm	Tewkesbury	L01 - Hazardous Merchant Landfill	1,051,993
Cory Environmental (Gloucestershire) Ltd.	Wingmoor Farm Landfill Site	Tewkesbury	L04 - Non Hazardous	980,507
Cory Environmental (Gloucestershire) Ltd.	Hempsted Landfill Site	Gloucester	L04 - Non Hazardous	0
Terra Firma (Gloucestershire) LLP	Former Sand Quarry	Forest of Dean	L05 - Inert Landfill	0
Multi - Agg Limited	Kempsford Quarry	Cotswold	L05 - Inert Landfill	0
Cemex UK Materials Limited	Frampton Landfill Site	Stroud	L04 - Non Hazardous	0
<b>Total</b>				<b>3,514,032</b>

10.7.35 Table 10-12 displays the requirements of Municipal Solid Waste (MSW) and Construction and Industrial (C&I) Capacity Requirements of Gloucestershire to 2027<sup>23</sup>.

**Table 10-12 Gloucestershire MSW and C&I capacity requirements to 2027<sup>23</sup>**

Waste facilities for	Tonnage per annum range	Hectares (ha) required	Single site	Multi-site
MSW Residual Waste	108,000 – 145,000	5-6 ha	1 large strategic site of about 5ha	2-3 smaller strategic sites of minimum 2ha each
C&I <sup>24</sup> Waste Management Facilities	-	6-8 ha	1 large strategic site of a minimum of about 5ha and up to about 8ha	2 large strategic sites of 4 – 5 hectares each OR 3 – 4 smaller strategic sites of minimum 2ha each
Recycling or composting	91,000 – 111,000			
Recovery	43,000 – 73,000			

10.7.36 Table 10-13 provides insight into the transfer and treatments of waste (subdivided by type of waste) for 2016-2018 in Gloucestershire.

**Table 10-13 Transfer and treatment of waste in Gloucestershire (2016-2018)<sup>23</sup>**

Type of waste		Quantity (tonnes)	
		Gloucestershire	South West
<b>2016 total</b>		<b>1,167,000</b>	<b>12,442,000</b>
<b>2017 total</b>		<b>1,170,000</b>	<b>13,127,000</b>
<b>2018</b>			
Transfer	Transfer	361,000	2,639,000
	Civic amenity	82,000	864,000
<b>Transfer total</b>		<b>443,000</b>	<b>3,503,000</b>
Treatment	Material recovery	11,000	551,000
	Physical	233,000	2,919,000
	Physico-chemical	2,000	729,000
	Chemical	-	37,000
	Composting	36,000	564,000
	Biological	269,000	3,259,000
<b>Treatment total</b>		<b>551,000</b>	<b>8,058,000</b>
Metal Recycling Site (MRS)	Vehicle depopulation	20,000	456,000
	Metal recycling	77,000	1,107,000
<b>MRS total</b>		<b>97,000</b>	<b>1,562,000</b>
<b>2018 total</b>		<b>1,091,000</b>	<b>13,123,000</b>

### Future baseline

10.7.37 ES Chapter 4 Environmental assessment methodology (Document Reference 6.2) sets out the 'Do-Minimum' and 'Do-Something' scenarios. The 'Do-Minimum' scenario represents the future baseline with minimal interventions and without new infrastructure. Potential changes to future material asset and waste receptors would not be noticeable to those identified in the baseline text above. Therefore, the future baseline would remain the same as set out above.

## 10.8 Potential impacts

10.8.1 There is potential for the following impacts relating to material resources and waste arising to occur during construction of the scheme:

- Impacts on-site generated materials (e.g. soils) and waste arisings have on the existing capacity of landfill.
- Impacts on the use of primary (i.e. non-recycled) material resources used for construction.

10.8.2 Mitigation measures are being incorporated in the design and construction of the scheme which are set out in Section 10.9 Design, mitigation and enhancement measures. The potential impacts on material assets and waste are outlined below in relation to construction and operation.

## Construction impacts

### Construction compounds

- 10.8.3 The location of the construction compounds has been determined to prevent pollution, reduce waste and to encourage ease of use, and taken into account environmental considerations including the potential for leakage and contamination. Storage of any suspected contaminated material prior to treatment or disposal off-site would be in a designated, bunded area on an impermeable surface, in line with the requirements set out in ES Appendix 2.1 EMP (Document Reference 6.4).
- 10.8.4 There would be three construction compounds including two main compounds and a third compound for material processing (crusher) and stockpiling. The main compounds would be located at:
- Chainage (Ch) 0+000, located in the adjacent fields to the westbound carriageway.
  - Ch 5+500 located in the adjacent fields to Cowley junction on the eastbound carriageway.
- 10.8.5 To reduce the distance between the major excavation area and the location where the material would be processed, the material processing (crusher) and material stockpile compound would be located:
- in the fields on the south side of the new alignment of the A417 between Ch 2+300 and Ch 2+600. To facilitate movement of material to and from this compound, a temporary bailey bridge crossing over the Existing A417 would be required at Ch 2+100.
- 10.8.6 Satellite compounds for the junction and side road overbridges and underbridge construction are located at the following locations:
- Grove Farm underpass
  - Gloucestershire Way crossing
  - Shab Hill junction
  - Stockwell overbridge
  - Cowley overbridge

### Material asset impacts

#### *Material assets required*

- 10.8.7 Material assets include both primary raw materials, such as aggregates and minerals, and secondary manufactured products. Many material assets would originate off-site and some, such as excavated soils and rock, would arise on-site.
- 10.8.8 Road schemes require both primary raw materials and secondary manufactured products. The production, sourcing, transport, handling, storage and use of these materials, as well as the disposal of any surplus (where necessary), have the potential to adversely affect the environment.
- 10.8.9 The consumption of materials has the potential to result in direct and indirect impacts on the environment. For material asset use, the potential environmental effects are associated with the sourcing of primary raw materials, the sourcing of secondary products and their subsequent use during construction. There are also

potential environmental effects associated with the site won material, such as the requirement to store and possibly process any materials during construction.

### *Earthworks*

10.8.10 The construction of the scheme would generate earthworks material:

- Cut: excavation of material removed from an area
- Fill: placement of material into an area to make, for example, embankments

10.8.11 The scheme has the potential for impact outside of the scheme, depending on the balance of the cut and fill. The earthworks strategy would seek to re-use material from cuts in nearby embankments to reduce impacts within the construction footprint of the scheme.

### *Mineral resources and mining*

10.8.12 The scheme has the potential to impact on an MRA for sandstone and limestone and an MRA for sand and gravel due to overlap of the footprint of the scheme.

10.8.13 The scheme also has the potential to impact on the dormant Birdlip Quarry. It should be noted that this is an extant dormant quarry and through correspondence with Gloucestershire County Council, Highways England understand that there has been no active working in the past 25 years.

### Waste impacts

10.8.14 In considering material asset use and waste management, it is important to define when, under current legislation and understanding, a material is considered to be a waste. The definition of waste is important because the classification of substances as waste is the basis for the formulation of waste management and the application of controls to protect the environment and human health in respect of waste.

10.8.15 In respect of this assessment, the material excavated and re-used within the scheme area is not classified as waste, subject to it being suitable for its intended use as earthwork embankments and landscaping.

### *Waste arisings*

10.8.16 For waste materials, the potential environmental effects are associated with the production, storage, processing and ultimate disposal of arisings from site to alternative sites or landfill during construction.

10.8.17 The types and quantities of waste generated during construction would vary in their impact depending on the management route opportunities (re-use, off site recycling, off site composting or off-site recovery) and the potential recovery rate.

### *Waste management infrastructure (off-site)*

10.8.18 The scheme has the potential to generate large amounts of construction, demolition and excavation waste which may affect the capacity of Gloucestershire and the wider region's waste management infrastructure. This is due to the need to occupy landfill space, limiting the short-term use of available waste storage and the potential to impact the scheme's ability to comply with relevant waste policies and plans.

## Operational impacts

- 10.8.19 Roads are subject to a periodic maintenance regime, and DMRB *CD 226 Design for new pavement construction*<sup>25</sup> highlights that all new roads are built to a 40-year design life.
- 10.8.20 Significant effects are considered unlikely during the operation of the scheme, from both the use of material assets and the disposal or recovery of waste. As such, operational impacts have been scoped out of the assessment, in accordance with the Planning Inspectorate's *Scoping Opinion*<sup>26</sup> (ES Appendix 4.1 The Planning Inspectorate Scoping Opinion (Document Reference 6.4)).

## 10.9 Design, mitigation and enhancement measures

### Embedded mitigation

- 10.9.1 Embedded mitigation involves project design principles adopted to avoid or prevent adverse environmental effects. Embedded mitigation relating to material assets and waste is outlined in section 2.8 of ES Chapter 2 The project (Document Reference 6.2).

### Essential mitigation

- 10.9.2 The following mitigation measures would be implemented during detailed design and construction phases:
- Design for re-use, recovery and materials optimisation.
  - Confirmation of types and quantities of materials, alongside information on materials that contain secondary and recycled content would be developed following detailed design.
  - Opportunities to re-use material resources would be sought.
  - Opportunities to support the circular economy would be considered.

### Materials

- 10.9.3 A Materials Management Plan (MMP) has been developed during the design process and development of the EIA, and forms Annex E of ES Appendix 2.1 EMP (Document Reference 6.4). The MMP outlines how material resources would be managed, in accordance with best practice requirements and the controls for material management and storage. This approach for managing materials is consistent with the waste hierarchy defined in England by the Waste (England and Wales) Regulations 2011 (S.I. 2011 No. 988)<sup>27</sup>.

### Waste

- 10.9.4 A Site Waste Management Plan (SWMP) has been developed during the design process and development of the EIA, and forms Annex H of ES Appendix 2.1 EMP (Document Reference 6.4). The SWMP outlines the proposals for the identification, segregation, handling and storage of wastes identified as arising from the scheme.
- 10.9.5 ES Appendix 2.1 EMP (Document Reference 6.4) contains measures to ensure that contaminated material is addressed during construction and unacceptable risks are mitigated. Further details are provided in ES Chapter 9 Geology and soils (Document Reference 6.2).



- 10.9.6 The Waste and Resources Action Programme (WRAP) and Environment Agency *Quality Protocol: Aggregates from inert waste*<sup>28</sup> would be followed with respect to the production and use of aggregates from inert waste.
- 10.9.7 It may be necessary to remove some unsuitable and excess materials from site which could result in impacts on waste management infrastructure and the local road network. When applying the waste hierarchy, measures would be implemented to ensure the options that deliver compliance with The Waste (England and Wales) Regulations 2011 to ensure the best environmental outcome.
- 10.9.8 The following waste management measures are documented in ES Appendix 2.1 EMP (Document Reference 6.2) to minimise the likelihood of any localised impacts of waste on the surrounding environment:
- Damping down of surfaces during spells of dry weather and brushing or water spraying of heavily used site entrances or tracks.
  - Off-site prefabrication where possible.
  - Burning of waste or unwanted material would not be possible on-site.
  - All hazardous material including fuels, chemicals, cleaning agents or solvent products to be kept in sealed containers and stored appropriately.
  - All contaminated materials encountered on site to be dealt with through further ground investigations and specific risk assessments (as per ES Chapter 9 Geology and soils (Document Reference 6.2)).
  - Materials requiring removal from the site would be transported using licensed carriers and records would be kept detailing the types of waste moved.
- 10.9.9 The handling of waste material should be in accordance with the CL:AIRE *Definition of Waste: Development Industry Code of Practice*. Where practicable, the following approaches (documented in ES Appendix 2.1 EMP (Document Reference 6.2)), would be implemented to minimise the quantities of waste requiring disposal:
- Agreements with material suppliers to reduce the amount of packaging or to participate in a packaging take-back scheme.
  - Implementation of just-in-time material delivery system to avoid materials being stockpiled, which increases the risk of their damage and disposal as waste.
  - Attention to material quantity requirements to avoid over-ordering and generation of waste materials due to surplus.
  - During site clearance and construction re-use of materials wherever feasible e.g. re-use of excavated soil for earthwork embankments and landscaping.
  - The materials would be sorted or processed and where necessary, treated. Where materials excavated on-site are initially unable to meet the re-use criteria, they would either be treated to make them suitable for use or, as a last resort, disposed off-site as waste.
  - Segregation of waste at source where practical.
  - The scheme would be designed to maximise the earthworks balance.
  - Re-use of materials within construction for example. Re-use of pavement planning in subbase in footpaths.
  - Re-use and recycling off-site where re-use on-site is not practical.

## Earthworks

10.9.10 An earthworks surplus of 65,945m<sup>3</sup> has been identified as outlined in Table 10-15. This material is comprised of three types of material including clay, mudstone and limestone. Measures would be taken to reduce this excess material to the point that no surplus material will remain after the required cut and fill construction operations. These measures include:

- Highway alignment changes to reduce cut volumes.
- Changes to landscape earthworks cross section and slope design to increase placed fill volumes.
- Changes to cut slope design and cross sections at locations in deep cutting to reduce cut volumes.
- Utilisation of excavated limestone materials in pavement construction.

10.9.11 The above measures are documented in the Register of Environmental Actions and Commitments in ES Appendix 2.1 EMP (Document Reference 6.4) and Annex E MMP of ES Appendix 2.1 EMP (Document Reference 6.4).

## **Enhancement**

10.9.12 No enhancement measures have been included in the scheme for materials and waste.

## **10.10 Assessment of likely significant effects**

10.10.1 This section assesses the potential effects of the material assets used and waste generated during construction of the scheme. In accordance with the applied methodology, the assessment of effects has been undertaken based on a reasonably worst-case scenario, but it is reasonable to assume could occur, rather than an extreme scenario that is on balance unlikely.

### **Construction effects**

#### Material assets

##### *Material assets required*

10.10.2 Aggregates would be required to be imported for construction of the scheme, including pavement, concrete and manufactured products. The regional recycled aggregate target, outlined in Table 10-5, states that the recycled content target for alternative materials in the South West is 22%.

10.10.3 The types of materials required for the construction phase of the scheme are listed in Table 10-14, these would be refined during detailed design.

**Table 10-14 Material assets required**

<b>Scheme activity</b>	<b>Detail of likely material assets required for the scheme</b>	<b>Quantities of material assets required or dimension and length</b>	<b>Additional information on material assets</b>
Fill	General fill, including earth embankments (mainline and side roads) and earth bunds	Total fill – 1,520,137m <sup>3</sup> Surplus earthworks – 65,945m <sup>3</sup>	Sourced from material won on-site

Scheme activity	Detail of likely material assets required for the scheme	Quantities of material assets required or dimension and length		Additional information on material assets
Installation of pavement	Mainline and side roads (including sub-base, base, binder course and surface course)	Sub-base – 85,612m <sup>3</sup> Base – 38,567m <sup>3</sup> Binder – 17,074m <sup>3</sup> Surface (including re-surfacing) – 14,871m <sup>3</sup> (including re-surfacing existing)		Potential to re-use site won materials. If not suitable or due to programme requirements, material would be sourced from local suppliers
	Central reserve (including sub-base, binder course and sub course)	Sub-base – 2,104m <sup>3</sup> Binder – 833m <sup>3</sup> Surface – 550m <sup>3</sup>		
	Asphalt and bituminous material	111,430m <sup>3</sup>		
	Other concrete pavement, footpaths or maintenance access	41,391m <sup>2</sup>		
Installation of manufactured products	Steel restraint systems	17,844m		Sourced from local/national suppliers, dependent upon material required
	Drainage	Concrete (ready mixed) – 159,783m <sup>3</sup> Concrete channels – 10,825m length, New concrete kerb – 14,012m length, Vertical concrete barrier – 5.5km length, Concrete drainage pipes – 45,131m length, Concrete chambers – 714 units Concrete gully – 588 units, Concrete headwalls – 70 units, Concrete culvert – 1km length		
	Traffic signs (varying in size from 0.5m <sup>2</sup> to 25m <sup>2</sup> )	290 units		
	Road markings – laying – continuous lines, raised rib lines and ancillary lines	39,907m length		
	Road markings – laying – intermittent lines	21,610m length		
	Environmental barrier fencing	900m length		
	Timber post and rail fencing	11.504m length		
	Rubble masonry/Cotswold stone walling (to site perimeter)	11,061m length		
		Dimension	Length	
Structures	Crickley Hill bat underpass	3m x 3m	55m	Local batching plants. Majority of precast factories in the
	Grove Farm underpass	4m (h) x 8m (w)	-	
	Cotswold Way crossing	65m span	-	

Scheme activity	Detail of likely material assets required for the scheme	Quantities of material assets required or dimension and length		Additional information on material assets
	Gloucestershire Way crossing	37m	70m	UK are situated in the Midlands. Steel composite likely to be sourced from a national supplier, closest availability would be Somerset or South Wales
	B4070 mammal culvert	0.6m +	37m	
	Shab Hill junction underbridge	To be confirmed during detailed design	To be confirmed during detailed design	
	Shab Hill Junction mammal culvert	0.75m +	112m	
	Cowley overbridge	11m wide	48m	
	Stockwell overbridge	11m wide	48m	
	Mammal culvert south of Stockwell overbridge	0.6m +	58m	
	Soil nailing works	2,160m <sup>2</sup>		
	Rock fall netting	4,480m <sup>2</sup>		
	Rock catch walls	2 sections with total of 1.628km length of concrete wall (1.5m height)		

- 10.10.4 The scheme has been designed to reduce the quantity of imported construction materials, alongside reducing the quantities of waste taken off-site by re-using or recycling the available existing materials within the scheme.
- 10.10.5 Following the material re-use assessment, material to be produced on the scheme includes Class 1B and 1C (general fill), Class 2A, 2B, 2C and 2D (cohesive general fill) and Class 4 (landscape fill). The cut and fill and landscaping material assets are likely to be re-used from site won material. Re-using Class 1 and 2 fill for embankments and Class 4 material for landscape bunds would reduce the amount of material required to be sourced from off-site.
- 10.10.6 The contractor would seek to re-use as much material as possible, this would be detailed within the MMP in Annex E of the ES Appendix 2.1 EMP (Document Reference 6.4).
- 10.10.7 The scheme would cut into existing topography. Based on preliminary design figures, the excavated material would be used as general fill for earthwork embankments and landscaping. On this basis, it is expected that the scheme would achieve an earthworks balance of cut and fill materials.
- 10.10.8 From preliminary design figures, 800m<sup>3</sup> of earthworks material is classified as contaminated unacceptable U2 material requiring off-site disposal. Therefore, as a percentage of the total cut, the scheme is estimated to have a 99.9% material earthworks recovery recycling rate.
- 10.10.9 The materials required for the installation of the pavement are likely to be imported to site, with the potential to re-use some site won material. Other imported materials related to the installation of manufactured products are likely to be sourced from local, established suppliers who regularly provide materials for similar sized projects.
- 10.10.10 The contractor would ensure that the suppliers have adequate capacity to meet demand, without having a negative impact on their resources. When identifying the suppliers, the contractor would consider the distance from the scheme to

ensure the distance the materials travel is as short as possible, with a preference for sourcing locally to support the local and regional economy.

- 10.10.11 Overall, in terms of earthwork material assets, the scheme involves a 99.9% material recovery recycling rate. Therefore, in line with Table 10-4, the assessment of effects on material assets is slight and therefore not significant.

#### *Earthworks*

- 10.10.12 The preliminary scheme cut, fill and surplus quantities which arise from the earthwork figures are outlined in Table 10-15.

**Table 10-15 Preliminary scheme design earthworks estimates**

Zone	Cut (m <sup>3</sup> )	Fill (m <sup>3</sup> )	Surplus (m <sup>3</sup> )
Zone A	38,358	12,597	25,761
Zone B	77,516	374,428	-296,912
Zone C	184,101	13,021	171,080
Zone D	910,797	854,856	55,941
Zone E	304,079	179,061	125,018
Zone F	71,232	86,175	-14,943
<b>Totals</b>	<b>1,586,082</b>	<b>1,520,137</b>	<b>65,945</b>

- 10.10.13 As outlined in paragraph 10.9.10, measures will be taken to reduce this excess volume of fill to the point that no surplus material will remain following the cut and fill construction operations.

#### *Mineral resources and mining*

- 10.10.14 As outlined in paragraphs 10.7.20 – 10.7.23, a MSA for sandstone and limestone and a MSA for sand and gravel overlap the footprint of the scheme. It would not diminish access to the MSAs and would not sterilise the use of the wider resource. The scheme would affect a small proportion of the resource and would not diminish access to or sterilise the use of the wider resource. Regarding Birdlip Quarry, a worst-case scenario has been undertaken whereby the scheme would sterilise this quarry and prevent future extractions. It should be noted that this is an extant dormant quarry, and through correspondence with Gloucestershire County Council, Highways England understand that there has been no active working in the past 25 years. Therefore, the assessment of effects on mining and material resources is considered slight and not significant.

#### *Impact of imported materials*

- 10.10.15 The scheme involves a 99.9% earthworks material recovery rate and material won on-site from excavations is likely to be re-used on-site as general fill for embankments and topsoil. Table 10-14 identifies the material assets that would not be able to be sourced on-site and would need to be imported.
- 10.10.16 The imported manufactured material assets would be sourced from established suppliers who regularly provide materials for similar sized projects. The contractor would determine the suppliers involved in the scheme, ensuring they have adequate resources to meet the quantitative needs of the scheme without having negative influence on their resources.

- 10.10.17 Within the Eighth Local Aggregates Assessment for Gloucestershire<sup>16</sup>, the countywide landbank for crushed rock in December 2018 was 20.83 million tonnes, equivalent to crushed rock aggregate reserves being able to meet projected demand for 14.58 years. The landbank for all land-won sand and gravel was estimated at 6.561 million tonnes in December 2018, and the remaining landbank was estimated at 8.84 years.
- 10.10.18 Material would be imported to site in line with the recycled content target for the South West of 22% by the contractor, as defined in ES Appendix 2.1 EMP (Document Reference 6.4). Therefore, the assessment of effects on material assets is considered *slight* and *not significant*.

### Waste

#### *Waste arisings*

- 10.10.19 The estimated main types and quantities of waste generated during construction of the scheme and the potential recovery rates are shown in Table 10-16.

**Table 10-16 Estimated waste arisings**

Scheme activity	Likely waste from the scheme	Quantity (tonnes)	Quantity (m <sup>3</sup> )	Potential management routes	Recovery rate (%) <sup>29</sup>
Site remediation, preparation or earthworks	Contaminated soil	1,680	800m <sup>3</sup>	Contaminated unacceptable U2 material to tip or treatment hub	0%
	Vegetation arising from site clearance	1,500	2,500	All assumed to keep and re-use on-site, or undertake off-site composting	100%
	Soil (topsoil and subsoil)	Not expected – balanced earthworks		-	-
Demolition	Asphalt from removal of existing road, some of which may contain coal tars	16,100	7,000	Off-site recycling or disposal depending on coal tar content	95%
	Materials from demolition of buildings	600	300	Segregated during demolition to allow for off-site recycling or disposal	75%
Construction	Concrete (ready mixed)	190	75	Off-site recycling or disposal	95%
	Concrete (products) e.g. Precast concrete kerb (includes existing kerbs removed but not re-used)	500	200	Off-site recycling or disposal	95%
	Steel	40	5	Off-site recycling or disposal	100%

Scheme activity	Likely waste from the scheme	Quantity (tonnes)	Quantity (m <sup>3</sup> )	Potential management routes	Recovery rate (%) <sup>29</sup>
	Asphalt and bituminous material	150	65	Off-site recycling or disposal	95%
	Aggregates	200	100	Off-site recycling or disposal	95%
	Soil (topsoil and subsoil)	Not expected – balanced earthworks		-	-
	Timber/plywood e.g. form work and shutting to cast concrete	9	15	Off-site recycling or energy recovery	90%
Waste from the compounds	General office waste/construction worker waste	Domestic waste is considered to be minimal		Off-site recycling or disposal	85%
	Packaging from materials delivered to site	Packaging is considered to be minimal		Taken back by suppliers for re-use or recycling, sorted and taken off-site for recycling or disposal	85%
Operation	Typically, highway schemes have a material life span of 20-40years before maintenance or upgrading is required, dependent on material properties, maintenance and usage. Maintenance would be carried out in accordance with the Design for Roads and Bridges when the deterioration is judged to affect the standards of the service provided to the road user and the integrity of the pavement structure <sup>30</sup>	Minimal due to the re-use of planned material		This would be managed by Highways England and is likely to consist of a combination of local recycling facilities, disposal at an inert or non-landfill site	-
<b>Total</b>		<b>20,969</b>	<b>11,060</b>		

10.10.20 Measures would be implemented to ensure material is handled in accordance with the Waste (England and Wales) Regulations 2011 to ensure the best environmental outcome. The scheme would re-use as much material as possible on-site, if suitable for re-use. Testing would be undertaken during construction to confirm the materials meet the specification requirements, which would be developed in line with the CL:AIRE *Definition of Waste: Development Industry Code of Practice*. This would ensure excavated material can be used directly within the development, subject to being suitable for use or following site

treatment. Any material that does not meet this specification would be disposed of appropriately.

- 10.10.21 Should hazardous waste be encountered during construction, this would be handled at storage compounds, prior to transfer to external waste management sites. Non-hazardous materials would be segregated and appropriately re-distributed to alternative projects or re-distributed to waste management facilities.
- 10.10.22 Construction of the scheme is expected to generate 11,060m<sup>3</sup> (20,969 tonnes) of waste arisings.
- 10.10.23 The remaining landfill capacity in the South West of England for all non-hazardous and hazardous waste as determined by the Environment Agency<sup>21</sup> is 3,514,032m<sup>3</sup>. Based on a worst-case scenario, whereby all estimated waste arisings generated by the scheme would be disposed of at landfill, this would utilise approximately 0.3% of the South West's landfill capacity. In practice, a large proportion of waste produced by the scheme would likely be reprocessed or recycled rather than being disposed of in landfill, therefore, further reducing the quantities of waste produced.
- 10.10.24 The scheme accounts for a less than 1% reduction or alteration in the regional capacity of waste management infrastructure, and there is adequate disposal capacity in the South West (although in practice, a large amount of this waste would be reprocessed or recycled). Therefore, the assessment of effects on waste arisings would be *slight* and therefore *not significant*.

*Waste management infrastructure (off-site)*

- 10.10.25 All materials arising from construction would be managed in accordance with the waste hierarchy defined within The Waste (England and Wales) Regulations 2011.
- 10.10.26 Some site won materials would not be required for re-use on-site and, where this is the case, efforts would be made to reduce the need to export this to local waste management facilities.
- 10.10.27 Should any asbestos be found on-site during construction, demolition and excavation works, the contractor would treat this as hazardous waste and assess the risk of those materials to ensure that a management system is in place that responds correctly and appropriately to the materials present.
- 10.10.28 The location of waste management facilities for construction and demolition waste within the second study area are shown in ES Figure 10.1 Waste management infrastructure (Document Reference 6.3). This figure includes seven types of waste infrastructure facility with data gathered from Gloucestershire County Council. The waste management sites include composting, hazardous and clinical waste transfer station, hazardous waste treatment facility, landfill/non-hazardous, landfill or inert, metal recycling facility and waste transfer station. There are 22 waste transfer stations located in Gloucestershire, dealing with MSW, C&I waste and CDW<sup>31</sup>.
- 10.10.29 Overall, there would be a limited amount of waste that would be removed from site and therefore it is unlikely that waste would be disposed of outside the region. Therefore, the assessment of effects on waste management infrastructure is *slight* and *not significant*.



## Operation effects

10.10.30 The scheme has limited potential to generate significant effects during the first year of operational activities as there are no requirements to import or export materials or to generate waste on a day to day basis. Therefore, the assessment of effects on material assets is neutral. Routine maintenance would include gully emptying, litter collection and periodic maintenance activities including resurfacing. Waste arisings from these maintenance activities would be expected to be equivalent to the existing road and the waste would be managed using the established procedures and facilities that are used across the strategic highways network. During the first year of operational activities there is not expected to be a requirement for the use and disposal of any significant volume of material, therefore the assessment of effects on waste is neutral, and not significant overall.

## 10.11 Monitoring

10.11.1 In line with the methodology in DMRB *LA 110 Material assets and waste*<sup>1</sup>, the assessment provides a framework for assessing and managing the effects associated with the use of material assets and the disposal or recovery of waste by promoting:

- Reduction in overall impacts and improvements in the efficiency of resource use.
- Prevention and/or reduction of adverse effects associated with the generation and management of waste.

10.11.2 Procedures would be adopted by the contractor during construction to control the use of materials and further reduce the impact. This would be controlled and monitored through updates to the EMP (construction) and the MMP. The contractor would ensure environmental permitting requirements are met and solutions are developed to reduce conflict and delays.

10.11.3 Materials would be responsibly sourced (i.e. must have a certified provenance, traceability and sustainability) in order to reduce the impact on the highways network and material assets. Responsible sourcing is defined in BS8902<sup>32</sup> *Responsible sourcing sector certification schemes for construction projects – Specification as:*

*“the management of sustainable development in the provision or procurement of a product.”*

10.11.4 Sustainable development is further defined as:

*“an enduring, balanced approach to economic activity, environmental responsibility and social progress.”*

10.11.5 In order to comply with responsible sourcing principles, the contractor would, for example:

- Refer to standard BES 6001 - Responsible Sourcing of Construction Products.
- Ensure suppliers are certified by the Forest Stewardship Council (FSC) or Programme for the Endorsement of Forest Certification (PEFC).

10.11.6 The EMP (construction) would set out monitoring to be undertaken during the construction stage to ensure that the mitigation measures embedded in the scheme design are secured and implemented.

## 10.12 Summary

10.12.1 This chapter has considered the potential environmental effects associated with the use of material assets and waste, following the methodology in DMRB *LA 110 Material assets and waste*<sup>1</sup>.

### **Construction assessment**

10.12.2 There are no significant effects anticipated during construction of the scheme.

### **Operational assessment**

10.12.3 There are no significant effects anticipated during operation of the scheme.

## References

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- <sup>8</sup> Department for Environment Food & Rural Affairs, *National Policy Statement for Waste Water: A framework document for planning decisions on nationally significant waste water infrastructure*. 2012.
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- <sup>24</sup> This is an approximate requirement based on the latest available waste data produced by the Waste Disposal Authority and is dependent upon a number of variables e.g. recycling rates and overall waste growth.

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- <sup>25</sup> Design Manual for Roads and Bridges. CD 226 Design for new pavement construction.
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