A417 Missing Link

Preliminary Environmental Information Report

Chapter 10 Materials Assets and Waste

28 September 2020

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10 Material assets and waste

10.1 Introduction

10.1.1 This chapter provides a preliminary 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 proposed scheme.

10.1.2 This chapter details the methodology followed for the preliminary assessment, summarises the regulatory and policy framework related to material assets and waste, and describes the existing environment in the area surrounding the proposed scheme. Following this, the design, mitigation and residual effects of the proposed 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 Bridge (DMRB) LA 110 *Material assets and waste*[1].

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; and
- the production and disposal of waste.

10.1.5 The preliminary assessment presented in this chapter reports on the construction phase and first year of operational activities.

10.1.6 The effects of the proposed scheme in terms of geology and soils, and the potential for land contamination, have been addressed in Chapter 9 Geology and soils of this Preliminary Environmental Information (PEI) report, and the effects on climate have been addressed in Chapter 14 Climate.

10.1.7 The effects associated with the transportation of materials are scoped in, however these are assessed separately in Chapter 5 Air quality, Chapter 11 Noise and vibration and Chapter 14 Climate.

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 Appendix 2.1 Competent expert evidence.

10.3 Legislative and policy framework

10.3.1 As discussed in Chapter 1 Introduction, the primary basis for deciding whether to grant a Development Consent Order (DCO) is the National Policy Statement for National Networks[2] (NPSNN), which, sets out policies to guide how DCO applications are decided and how the effects of national networks infrastructure should be considered. Table 10-1 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 10-1 Relevant NPSNN policies for the material assets and waste assessment

Relevant NPSNN paragraph reference	Requirement of the NPSNN	Where in the chapter is information provided to address this policy
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 minimise 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 10-20. Section 10.10.18 outlines how the proposed scheme should re-use as much material as possible on-site should it be assessed as being suitable for re-use. Section 10.9.1 involves the essential mitigation that would be implemented during the design and construction phases.

Legislation

EU Waste Framework Directive 2008/98/EC

10.3.2 The EU Waste Framework Directive 2008/98/EC provides the overarching legislative framework for the collection, transport, recovery and disposal of waste, and includes a common definition of waste, which is 'any substance or object which the holder discards or intends or is required to discard', with the term 'discard' including the disposal, recovery or recycling of a substance.

10.3.3 Waste for disposal is classed as hazardous, non-hazardous or inert, depending on the level of harm to human health and/or the environment. Once a material has become waste, it remains waste until it has been fully recovered and no longer poses a potential threat to the environment or to human health, at which point it is no longer subject to the controls and measures required by the Directive.

10.3.4 It sets out measures to protect the environment and human health by preventing or reducing the adverse effects of the generation and management of waste, and by improving the efficiency of resource use, and reducing the overall impact.

10.3.5 The Directive also mandates 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[3] is summarised in Table 10-2.

Table 10-2 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.

Stages	Includes
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.

The Waste (England and Wales) (Amendment) Regulations 2014

10.3.6 Directive 2008/98/EC has been transposed in England by the *Waste (England and Wales) Regulations 2011* (S.I. 2011 No. 988) (as amended)[4]. In addition to the above, the following legislation relating to material assets and waste would also be taken into account:

- The Controlled Waste (England and Wales) Regulations 2012; and
- The Hazardous Waste (England and Wales) Regulations 2005.

EU Landfill Directive 1999/31/EC

10.3.7 The EU *Landfill Directive* 1999/31/EC5 sets stringent requirements for the landfilling of wastes. The Directive aims to prevent or reduce negative effects on the environment from the landfilling of waste, as far as possible, and introduces stringent technical requirements for waste and landfills as a disposal option through:

- setting minimum standards for the location, design, construction and operation of landfills;
- setting targets for the diversion of Biodegradable Municipal Waste from landfill;
- controlling the nature of waste accepted for landfill; and
- defining the different categories of waste (hazardous waste, non-hazardous waste and inert waste) and applies to all landfills, defined as waste disposal sites for the deposit of waste onto or into land.

10.3.8 The requirements of the Directive were transposed into national legislation through *The Landfill (England and Wales) Regulations 2002* (as amended) and subsequently re-transposed as part of *The Environmental Permitting (England and Wales) Regulations 2016* (as amended).

10.3.9 There are also a number of primary legislative instruments in the UK on waste that enact a wide range of secondary legislation that governs the storage, collection, treatment and disposal of waste. These include:

- 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; and
- Clean Neighbourhoods and Environment Act 2005.

The Environmental Permitting (England and Wales) Regulations 2016

10.3.10 *The Environmental Permitting (England and Wales) Regulations 2016's* objective is to supplement the requirements of the Waste Directive (2006/12/EC) and prevent or reduce as far as possible the negative effects of landfilling on the environment and any resultant risks to human health. It seeks to achieve this

through specifying uniform standards at Community level and sets out requirements for the location, management, engineering, closure and monitoring for landfills.

Aggregates levy

10.3.11 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 (HMRC) 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[5].

EU Circular Economy Action Plan

10.3.12 The European Commission presented *A new Circular Economy Action Plan*[6] for a cleaner and more competitive Europe in March 2020. The new action plan announces initiatives along the entire lifecycle of the products, targeting for example their design, promoting circular economy processes, fostering sustainable consumption and aiming to ensure that the resources used are kept in the EU economy for as long as possible. The European Commission aims to accelerate the transition towards a regenerative growth model that gives back to the planet more than it takes, advance towards keeping its resource consumption within planetary boundaries and therefore strive to reduce its consumption footprint and double its circular material use rate in the coming decade.

National policy

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

10.3.13 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. It specifically states at paragraph 5.42 that:

'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 minimise 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.'

10.3.14 The NPSNN identifies that government policy on waste is intended to protect the environment and human heath 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.

National Planning Policy for Waste (2014)

10.3.15 The *National Planning Policy for Waste*[7] sets out the detailed waste planning policies for England and has been considered in conjunction with the *National Planning Policy Framework* (NPPF), the National Waste Management Plan for England[8] and National Policy Statements for Waste Water[9] and Hazardous Waste[10].

National Planning Policy Framework (2019)

10.3.16 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.

Waste Prevention Programme for England (2013)

10.3.17 The *Waste Prevention Programme for England*[11] is a requirement of the revised *Waste Framework Directive* (2008/98/EC). The programme sets out the roles and actions for government and others to reduce the amount of waste produced in England.

The Waste Management Plan for England (2013)

10.3.18 The Department for Environment, Food and Rural Affairs (Defra) published the *Waste Management Plan for England* in July 2013[12]. The plan outlines the waste hierarchy as a guide to sustainable waste management.

10.3.19 The plan sets out the Government's ambition to work towards a more sustainable and efficient approach to resource use and management. Positive planning plays a pivotal role in delivering England's waste ambitions through ensuring the re-use, recovery or disposal of waste is undertaken without endangering human health or harming the environment and delivering sustainable development and resource efficiency through all schemes.

10.3.20 The plan evaluates how it would support implementation of the objectives and provisions of the revised *Waste Framework Directive*. It identifies the UK's commitment and success in not only meeting but exceeding its target under the *Waste Framework Directive* of recovering at least 70% by weight of construction and demolition waste (CDW) by 2020.

Local policy

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

10.3.21 This plan replaced the Gloucestershire Mineral Local Plan (1997-2006) 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; and
- 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)

10.3.22 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.

10.3.23 Policies of relevance to the proposed 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."

Gloucestershire Waste Minimisation in Development Project Supplementary Planning Document (WM-SPD) (adopted 2006)

10.3.24 The *Gloucestershire Waste Minimisation in Development Project Supplementary Planning Document* was adopted in 2006 and supplements Policy 36 in the Gloucestershire Waste Local Plan (October 2004). It is a material consideration when planning authorities in Gloucestershire determine planning applications. The planning document sets out a two-level approach for those applying for planning permission:

- Those applying for planning permission for "major" developments are required to prepare and submit a Waste Minimisation Statement to accompany their planning application; and
- Planning applications for all other developments need to abide by the principles of waste minimisation.

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

10.3.25 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.

10.3.26 The 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

10.3.27 The *Cotswold District Local Plan 2011-2031* was formally adopted on 3rd 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

10.3.28 The assessment of the environmental effects associated with the use of material assets and the disposal or recovery of waste related to the construction of the proposed scheme has been undertaken in accordance with DMRB, LA 110 *Material assets and waste*.

10.3.29 Reference has also been made to the following standards relating to material assets and wastes:

- LA 101 Introduction to Environmental Assessment[13];
- LA 104 Environmental assessment and monitoring[14] and
- The Definition of waste: Development Industry Code of Practice, Version 2 (Contaminated Land: Applications in Real Environments (CL:AIRE))[15].

Highways England Sustainable Development Strategy (2017)

10.3.30 The Highways England *Sustainable Development Strategy*[16] 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 the construction of the proposed scheme has been undertaken in accordance with LA 110 Material assets and waste. This standard, alongside the use of professional judgement and emerging best practice has been used 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 proposed scheme. This includes the source of materials required for the construction of the proposed 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; and
- Local development policies and topic papers.

10.4.4 To identify the baseline conditions, data has also been collected from Highways England and members of the design team on the materials that are likely to be used during each stage of the proposed scheme, and the waste that is likely to arise.

Assessment of construction impacts

10.4.5 For the purposes of assessing the material assets, a preliminary assessment has been undertaken based on current buildability advice. In accordance with LA 110 Material assets and waste, the assessment of environmental effects associated with the consumption of material assets resulting from construction has considered the proposed scheme design relating to the following:

- the types and quantities of materials required for the project;
- 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 project;
- the cut and fill balance; and
- details of on-site storage and stockpiling arrangements, and any support logistical details.

10.4.6 In accordance with LA 110 Material assets and waste, the assessment of environmental effects associated with the production and disposal of waste resulting from the construction of the proposed scheme is a quantitative exercise which identifies the following:

- the amount of waste (by weight) that will 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 project (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).

CL:AIRE Definition of Waste: Development Industry Code of Practice

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.

10.4.8 In line with this, it is important to take account of the aims and objectives of the *Waste Framework Directive* and the need to ensure that they are not undermined.

Assessment criteria

10.4.9 LA 110 *Material assets and waste* 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 LA 110 Material assets and waste, as reproduced in Table 10-3.

Table 10-3 Significance category descriptions

Significance	Description
Very large	Material assets • no criteria: use criteria for large categories. Waste • >1% reduction or alteration in national capacity of landfill, as a result of accommodating waste from a project; or • construction of new (permanent) waste infrastructure is required to accommodate waste from a project.
Large	Material assets • project achieves <70% overall material recovery/recycling (by weight) of non-hazardous CDW to substitute use of primary materials; and • aggregates required to be imported to site comprise <1% re-used /recycled content; and • project sterilises ≥1 mineral safeguarding site and/or peat resource. Waste • >1% reduction in the regional capacity of landfill as a result of accommodating waste from a project; and • >50% of project waste for disposal outside of the region.
Moderate	Material assets • project achieves less than 70% overall material recovery/recycling (by weight) of non-hazardous CDW to substitute use of primary materials; and • aggregates required to be imported to site comprise re-used/recycled content below the relevant regional percentage target. Waste • >1% reduction or alteration in the regional capacity of landfill as a result of accommodating waste from a project; and • 1-50% of project waste for disposal outside of the region.
Slight	Material assets • project achieves 70-99% overall material recovery/recycling (by weight) of non-hazardous CDW to substitute use of primary materials; and

Significance	Description
	• aggregates required to be imported to site comprise re-used/recycled content in line with the relevant regional percentage target. Waste • ≤1% reduction or alteration in the regional capacity of landfill; and • 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.
Neutral	Material assets • project achieves >99% overall material recovery/recycling (by weight) of non-hazardous CDW to substitute use of primary materials; and • aggregates required to be imported to site comprise >99% re-used/recycled content. Waste • no reduction or alteration in the capacity of waste infrastructure within the region.

10.4.10 Table 10-4 outlines the approach for determining significance, 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: • category description met for moderate or large effect. Waste: • category description met for moderate, large or very large effect.
Not significant	Material assets: • category description met for neutral or slight effect. Waste: • category description met for neutral or slight effect.

10.5 Assessment assumptions and limitations

10.5.1 The construction of the proposed scheme would be carried out in accordance with industry standard good working practice, which will be outlined in the Environmental Management Plan (EMP) to submitted as part of the DCO application. This will include the environmental measures that would be adopted during the construction phase.

10.5.2 The assessment is based on the proposed 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 the construction of the proposed scheme design, sources of materials and their mode of transport are yet to be finalised. Values have been estimated based on the proposed scheme design.

10.5.4 The maintenance works would involve the export of surface course planings[17] and damaged kerbs etc. The location for the disposal of these materials is not currently known, however, it is likely that the road planings are recycled and other materials processed off-site. Import of materials would be required to replace the

surface course and damaged kerbs and the current source of these materials is not known, however, it is likely to be sourced from local suppliers.

10.6 Study area

10.6.1 The first study area is based on the construction footprint and project boundary of the proposed 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 proposed 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 project. 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 minimise the environmental impacts and cost of waste transport.

10.6.3 Based on DMRB LA 110 *Material assets and waste*, 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.

Existing use of materials and generation of waste on-site

10.7.2 Roads are subject to a periodic maintenance regime, and DMRB CD 227 Design for pavement maintenance[18] highlights that all new roads are built to a 40-year design life, which can only be achieved if the highway is maintained. Maintenance is required using a 10-year cycle of interventions which are likely to include:

- year 10, minor intervention. Remove and replace surface course;
- year 20, major intervention. Remove and replace surface course, replace kerbs, upgrade drainage system, replace road signs, patch the binder and road base selectively;
- year 30, minor intervention as year 10; and
- year 40, major intervention as year 20.

Material assets

10.7.3 In accordance with the EU *Waste Directive*[19], at least 70% (by weight) of CDW should be subjected to material recovery. Uncontaminated excavated soil and stones (*European Waste Code 17 05 04*) are specifically excluded from this target.

10.7.4 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*). The relevant target for the proposed scheme in the South West region is 22%.

Table 10-5 DMRB recycled aggregate targets for England 2005-2020 (national and regional guidelines for aggregate provision published 2009)

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

10.7.5 In addition to the recycled aggregates targets for England, the aggregates levy and circular economy package should be considered in relation to the proposed scheme.

Availability of construction materials

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

10.7.7 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 proposed scheme, without having a negative influence on their resources. Where possible, materials would be provided from local sources in accordance with the proximity principle, although the contractor would work to ensure a balance with the value for money principle.

10.7.8 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.

10.7.9 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*; and
- Historical OS plans contained within the *Groundsure report* (to identify the presence of historical quarries).

10.7.10 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: Crushed rock Sand and gravel – land won Sand and gravel – marine won Recycled and secondary	247 (2016)[20]: 113.9 48.6 14.1 70.4
Cementitious (including imports) of which: Cement (including imports) Other cementitious materials (fly ash, ground clay bricks (GCBs))	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)[21]

10.7.11 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.

10.7.12 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. Table 10-7 shows the ten-year rolling average for crushed rock and sand and gravel for Gloucestershire from 2007 to 2016.

Table 10-7 Ten year rolling average of annual sales for primary land-won aggregates from Gloucestershire (2007-2016 inclusive)[22]

Mineral	10 year rolling average of annual sales for primary land-won aggregates from within Gloucestershire (2007-2016 inclusive) (million tonnes)
Crushed rock	1.452
Sand and gravel	0.742

10.7.13 The landbank for crushed rock across Gloucestershire, in 2016, was 24.32 million tonnes, which indicates that reserves may be available to meet projected demand for just under 17 years according to analysis undertaken by Gloucestershire County Council. For sand and gravel the landbank in 2016, was 4.41 million tonnes, with the remaining length of this landbank being close to six years[23].

10.7.14 Therefore, with regard to the trend in the amount of remaining permitted reserves, in Gloucestershire, these continue to be in decline and now equate to an overall fall of 15% from 2012.

10.7.15 The supply of local-sourced aggregates in Gloucestershire has been well in excess of 100,000 tonnes per annum for a number of years[23]. It largely arises from regeneration and re-development projects from across the county and includes construction and demolition material which has been transported to a fixed plant. There is currently no production of secondary aggregates in Gloucestershire.

Table 10-8 Materials demand in Gloucestershire for 2016[24]

Aggregate	Sales (million tonnes)	Average 10-year sales (million tonnes per annum)	Average 3-year sales (million tonnes per annum)	LAA rate per year (million tonnes)	Reserve (million tonnes)	Landbank (remaining years)	Theoretical capacity (million tonnes per annum)
All land-won sand and gravel	0.701	0.742	0.573	0.742	4.41	5.94	Up to 1.22
Crushed rock	1.652	1.452	1.540	1.452	24.32	16.75	Up to 2.33
Recycled or secondary aggregates	0.139	-	-	0.13	-	-	-

Mining and material resources

10.7.16 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[23]. 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 in the south, Oxfordshire in the east and Warwickshire and Worcestershire in the north-east.

10.7.17 Quarrying of the Inferior Oolite limestone was a major local activity from the late 16th 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 19th century, the latter on either side of Birdlip bypass. The most recently worked quarry on Crickley Hill closed in 1963.

10.7.18 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.

10.7.19 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[23]. 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.

Material assets (on-site)

Superficial deposits

10.7.20 The Cheltenham Sand and Gravel are mapped on the western part of the proposed scheme. Further detail is included in Section 9.7 of Chapter 9 Geology and soils.

Mineral resource areas, mineral safeguarding area and mineral consultation areas

10.7.21 Two of Gloucestershire's Mineral Resource Areas (MRA) are located within the footprint (the first study area) of the proposed scheme[25]. They form part of the local network of Mineral Safeguarding Areas (MSA). One is for sandstone and limestone and the other is for sand and gravel[26]. 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. The proposed 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*"[27]. The delineation of the MRA ensures that the Mineral Planning Authority (i.e. Gloucestershire County Council) is consulted before any planning applications are determined.

10.7.22 The first 500m of the proposed scheme overlaps with the MRA for sand and gravel. As the proposed scheme closely follows the existing road alignment and is widened in this location, the impact on the MRA is very similar to the current baseline. There is a single drainage basin to the south of the road, which is also in the MRA.

10.7.23 The online section of the proposed scheme, between Air Balloon and Cowley roundabout, intermittently crosses the MRA for sand and gravel.

10.7.24 The scheme footprint only occupies a small area of the MRAs and will not sterilise the use of the wider resource.

10.7.25 Several old quarries and gravel pits are situated to the north of the A417: west of Air Balloon roundabout; and to the east of the A417, south and east of the roundabout. It is understood that historical quarrying of the Inferior Oolite took place across Crickley Hill and Leckhampton Hill.

10.7.26 There are no Mineral Infrastructure Safeguarded Sites near the proposed 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, Defra and Gloucestershire County Council.

Waste generation

10.7.28 The latest data from the Environment Agency[27] indicates that Gloucestershire produced over 2.5 million tonnes of waste in 2017, Table 10-9 demonstrates the type of waste produced.

Table 10-9 Waste management by type in 2017

Site type	Gloucestershire (tonnes)	England (tonnes)
Landfill	619,000	45,419,000
Transfer	417,000	46,129,000
Treatment (excluding metal recycling sector)	716,000	78,147,000
Metal recovery	176,000	15,697,000
Incinerated	0	12,992,000
Use of waste	20,000	168,000
Land disposal	561,000	13,555,000
Total	**2,509,000**	**212,107,000**

10.7.29 With respect to CDW, Table 10-10 and Table 10-11 set out the latest information for Gloucestershire and England, from the latest Environment Agency data. These figures indicate that a total of 1,236,000 tonnes of CDW was managed (as per the site types below) or disposed of under permits during 2017 and 1,446,000 tonnes was managed as C&D Waste in Gloucestershire up to 2010.

Table 10-10 Waste management by type in Gloucestershire in 2017[27]

Site type	Gloucestershire (tonnes)	England (tonnes)
Landfill	291,000	29,680,000
Transfer	159,000	15,270,000
Treatment (excluding metal recycling sector)	179,000	25,820,000
Metal recovery	26,000	2,216,000
Use of waste	20,000	82,000
On or In Land (Recovery)	561,000	11,951,000
Total	**1,236,000**	**85,019,000**

Table 10-11 C&D Waste Disposal Capacity of Gloucestershire (based on the sites in the Waste Interrogator and the up-to-date 2010 position)[33]

Sites located in	Tonnes
Cheltenham	0
Cotswold	893,060

Sites located in	Tonnes
Forest of Dean	360,000
Gloucester	77,280
Stroud	0
Tewkesbury	115,340
County total	**1,446,000**

Potential hazardous waste arisings

10.7.30 Sources of contamination have been considered within the proposed scheme boundary. There are no authorised or historic landfills within the study area. However, as indicated in Chapter 9 Geology and Soils, there may be potential contamination risks from general highways use and agricultural land use. For more information on the potential contamination risks see Chapter 9 Geology and Soils.

10.7.31 Regarding construction and demolition hazardous waste, Table 10-12 outlines the quantities managed and deposited in Gloucestershire in 2017, as taken from the latest Environment Agency data[27]

Table 10-12 Hazardous waste managed and deposited in 2017

Hazardous waste	Gloucestershire (tonnes)	England (tonnes)
Managed	240	604,200
Deposited in Landfill	4,820	392,900
Total	**5,060**	**997,100**

Waste management facilities

Landfill

10.7.32 The Environment Agency Waste Data Interrogator[28] involves data on the quantities and types of waste that operators of regulated waste management facilities deal with. Table 10-13 outlines the breakdown of landfill waste in 2018 in Gloucestershire.

Table 10-13 Landfill inputs in Gloucestershire and the south-west in 2018[28]

Material type	Quantity (tonnes)	
	Gloucestershire	South West
Hazardous Merchant	19,000	63,000
Hazardous Restricted	-	-
Non-Hazardous with Stable Non-Reactive Hazardous Wastes (SNRHW) cell	57,000	496,000
Non-Hazardous	591,000	1,794,000
Non-Hazardous Restricted	-	-
Inert	-	824,000
Total	**702,000**	**3,176,000**

Table notes:
Data since 2005 has been reclassified into categories used under the PPC permitting of landfills and because of the ban on the co-disposal of waste in landfills in July 2004.

Material type	Quantity (tonnes)	
	Gloucestershire	South West
From 16 July 2004, hazardous landfills have only been able to accept wastes classified as hazardous under the Hazardous Waste Directive. 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[29] states that the remaining landfill capacity at the end of 2018 in the South West amounted to 4,114,753m^3 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 10-14.

Table 10-14 Remaining landfill capacity in the South West at the end of 2018[30]

Operator name	Facility name	Local authority	Site type	Remaining capacity (m^3)
Grundon Waste Management Ltd.	Wingmoor Quarry Landfill	Tewkesbury	L02 - Non Hazardous Landfill With SNRHW cell	1,576,631
S Grundon (Waste) Ltd.	Wingmoor Farm	Tewkesbury	L01 - Hazardous Merchant Landfill	1,353,122
Cory Environmental (Gloucestershire) Ltd.	Wingmoor Farm Landfill Site	Tewkesbury	L04 - Non Hazardous	1,112,000
Cory Environmental (Gloucestershire) Ltd.	Hempsted Landfill Site	Gloucester	L04 - Non Hazardous	73,000
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 U K Materials Limited	Frampton Landfill Site	Stroud	L04 - Non Hazardous	0

10.7.35 Table 10-15 displays the requirements of Municipal Solid Waste (MSW) and Construction & Industrial (C&I) Capacity Requirements of Gloucestershire to 2027[31].

Table 10-15 Gloucestershire MSW and C&I capacity requirements to 2027[31]

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 5 ha	2-3 smaller strategic sites of minimum 2 ha each
C&I[32] Waste Management Facilities	-	**6-8 ha**	1 large strategic site of a minimum of about 5 ha and up to about 8 ha	2 large strategic sites of 4 – 5 hectares each OR 3 – 4 smaller strategic sites of minimum 2 ha each
Recycling or composting	91,000 – 111,000			
Recovery	43,000 – 73,000			

Recovery and recycling

10.7.36 Table 10-16 provides insight into the transfer and treatments of waste (subdivided by type of waste) for 2016-2018 in Gloucestershire.

Table 10-16 Transfer and treatment of waste in Gloucestershire (2016-2018)[28]

Type of waste		Quantity (tonnes)	
		Gloucestershire	South West
2016 total		1,167,000	12,442,000
2017 total		1,170,000	13,127,000
2018			
Transfer	Transfer	361,000	2,639,000
	Civic amenity	82,000	864,000
Transfer total		**443,000**	**3,503,000**
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
Treatment total		**551,000**	**8,058,000**
Metal Recycling Site (MRS)	Vehicle depopulation	20,000	456,000
	Metal recycling	77,000	1,107,000
MRS total		**97,000**	**1,562,000**
2018 total		**1,091,000**	**13,123,000**

Future baseline

10.7.37 Chapter 4 Environmental assessment methodology 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 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.

10.8.2 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.

Construction impacts

Construction compounds

10.8.3 There would be three construction compounds including two main compounds and a third compound for material processing (crusher) and stockpiling. The main compounds are to be located at:

- chainage 0+000, located in the adjacent fields to the westbound carriageway; and
- chainage 5+500, located in the adjacent fields to the proposed Cowley junction on the eastbound carriageway.

10.8.4 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 will be required at Ch 2+100.

10.8.5 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; and
- Cowley overbridge.

10.8.6 The location of the construction compounds has been determined to prevent pollution, reduce waste and to encourage ease of use, and has 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 EMP to accompany the ES.

Consumption of material assets

10.8.7 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.

10.8.8 In respect of this assessment, the material excavated and reused within the proposed scheme area is not classified as waste, subject to it being suitable for its intended use.

Production and disposal of waste

10.8.9 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.

10.8.10 For waste materials, the potential environmental effects are associated with the production, storage, processing and disposal of arisings from site to alternative sites or landfill during construction. The proposed 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 proposed scheme's ability to comply with relevant waste policies and plans.

Operation impacts

10.8.11 Significant effects are considered unlikely during the operation of the proposed 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*[33].

10.9 Design, mitigation and enhancement measures

Essential mitigation

10.9.1 The following mitigation measures would be implemented during design and construction phases:

- waste arisings would be prevented and designed out where practicable;
- 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; and
- opportunities to support the circular economy would be considered.

10.9.2 An EMP will be prepared in parallel with the development of the proposed scheme design and construction methodology and will include a Materials Management Plan (MMP). The MMP will set out how material resources would be managed, in accordance with best practice requirements. It will set out the controls for material management and storage. This approach for managing materials is consistent with the waste hierarchy defined in the *Waste Framework Directive* (Directive 2008/98/EC). Adopting the waste hierarchy would significantly reduce the amount of material requiring off-site disposal and hence reduce potential impacts relating to movement of materials both on to and off-site.

Construction mitigation

10.9.3 Initial earthworks estimations show a net amount of 86,099m^3 of excess material would arise from construction of the proposed scheme. The earthworks strategy, including management of excess material, is to be developed further as part of the Environmental Impact Assessment. This would examine further options for re-using the material on-site to achieve an earthworks cut/fill balance and ensure waste would not be disposed outside of the region.

10.9.4 The WRAP and Environment Agency *Quality Protocol: Aggregates from inert waste*[34] would be followed with respect to the production and use of aggregates from inert waste.

10.9.5 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 encourage the options that they deliver compliance with the *Waste Framework Directive* and the best environmental outcome.

10.9.6 The EMP would include a MMP which would set out how to manage material resources and the second iteration of the EMP will include a Site Waste Management Plan (SWMP). Waste would be governed by the SWMP, this would manage waste in line with best practice requirements and would be developed by the Main Works Contractor as part of the EMP with best practice requirements.

10.9.7 The handling of waste material should be in accordance with the CL:AIRE *Definition of Waste: Development Industry Code of Practice*.

10.9.8 In order to limit the quantity of material that could be required to be disposed in landfill, 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. Effective treatment could include a combination of treatments including moisture reduction. This would be in the form of drying out of materials which would offset the need for imported material assets and reduce the requirements for disposal.

10.9.9 This would reduce impacts on local waste management infrastructure and ensure the materials are disposed of or re-used as appropriate for the particular waste stream.

10.9.10 By minimising the quantity of materials to be disposed of off-site, the associated heavy goods vehicle movements would also be reduced, thereby reducing impacts on the local road network.

10.9.11 Table 10-17 sets out the mitigation measures associated with each project activity.

Table 10-17 Mitigation measures

Project activity	Potential impacts associated with material resource use or waste management	Description of mitigation measures	How the measures would be implemented, measured and monitored
Site clearance	Waste disposal	Reuse on-site where possible. Recycle or recovery opportunities.	The EMP would include a MMP which will set out how to manage material resources with best practice requirements. Material would be re-used on-site where possible. Any excess materials would be handled in accordance with the CL:AIRE *Definition of Waste: Development Industry Code of Practice*, be sorted and where practical disposed at local waste management facilities. The second iteration EMP would include a Site Waste Management Plan (SWMP) to manage waste in line with best practice requirements.
Earthworks	Use of primary assets Waste disposal	Re-use of site won materials in earthworks. Re-use of site won materials off-site on other local projects. Limit disposal and movements.	Design to maximise the earthworks balance. The EMP will include a MMP to implement, measure and monitor waste.
Pavement planning	Waste disposal	Re-use as subbase in footpaths, in pavement construction and elsewhere.	Design to maximise the earthworks balance. The second iteration of the EMP will include a SWMP to manage waste in line with best practice requirements.

Enhancement

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

10.10 Assessment of effects

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

Construction effects

Material asset requirements

10.10.2 Aggregates would be required to be imported for construction of the proposed 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 proposed scheme are listed in Table 10-18, these would be refined during future design fixes.

Table 10-18 Material assets required

Project activity	Detail of likely material assets required for the proposed scheme	Quantities of material assets required	Additional information on material assets
Cut and fill	General fill, including earth embankments (mainline and side roads)	Total fill – 1,348,751m^3	Sourced from material won on-site
Landscaping	Topsoil fill required for new verges and earthworks	To be confirmed during future design fixes	Likely to be re-use of site won material
Installation of pavement (proposed scheme design)	Mainline (including sub-base, base, binder course and surface course) Side roads (including sub-base, base, binder course and surface course) Central reserve (including sub-base, binder course and sub course) Non-central reserve	536,100m^2 273,088m^2 98,430m^2 8,700m^2	Potential to re-use site won materials. If not suitable, material would be sourced from local quarries due to programme requirements
Installation of manufactured products	Drainage (replacement culvert at tributary of Norman Brook, dry valley under A417, dry valley under Shab Hill slip road and dry valley under A417). Varying diameters Tributary of Normans Brook culvert headwall and backfill Dry valley under A417 culvert headwall and backfill Dry valley under Shab Hill slip road culvert headwall and backfill Chambers culvert Traffic signs and road markings – laying – continuous lines Traffic signs and road markings – laying – intermittent lines Environmental barrier fencing Fencing	To be confirmed during future design fixes	Sourced from local suppliers
Structures	To be confirmed during future design fixes	To be confirmed during future design fixes	Local batching plants. Majority of precast

Project activity	Detail of likely material assets required for the proposed scheme	Quantities of material assets required	Additional information on material assets
			factories in the UK are situated in the Midlands. Steel composite likely to be sourced from a national supplier, closest availability would be Somerset or South Wales

10.10.4 The proposed 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 along the proposed scheme.

10.10.5 The proposed scheme will cut into existing topography. Table 10-19 demonstrates the cut would amount to 1,434,850m^3 and earthwork fill estimate amounts to 1,348,751m^3 which would be won from the proposed scheme. The net cut/fill balance is 86,099m^3.

Table 10-19 Proposed scheme design earthworks estimates

Segment	Cut (m^3)	Fill (m^3)	Net (m^3)
(CH 0 + 500)	22,621	782	21,839
(CH 500 + 1800)	55,396	331,781	-276,385
(CH 1800 + 2200)	153,841	8,932	144,909
(CH 2200 + 4000)	848,052	790,363	57,689
(CH 4000 + 5150)	307,458	165,208	142,250
(CG 5150 + 5759)	47,482	51,685	-4,203
Total	**1,434,850**	**1,348,751**	**86,099**

10.10.6 Following the preliminary material re-use assessment, the majority of the material includes Class 1B and 1C (general fill) and Class 2A, 2B, 2C and 2D (general fill). Class 4 (landscape fill) is likely to be produced between CH 0 + 500 and CH 1 + 800.

10.10.7 The cut and fill and landscaping material assets are likely to be re-used from site won material, as demonstrated in Table 10-19. 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.

10.10.8 The contractor would ensure that the suppliers have adequate resources to meet demand, without having a negative impact on their resources. When identifying the suppliers, the contractor would consider the distance from the proposed scheme to ensure the distance the materials travel is as low as possible, with a preference for sourcing locally to support the local and regional economy.

10.10.9 Overall, in terms of material assets, this scheme involves a 94% material recovery recycling rate. Therefore, the assessment of effects, in line with Table 10-4, on material assets is *slight* and therefore *not significant*.

Mineral resources

10.10.10 Following the preliminary material re-use assessment, the majority of the material generated throughout the proposed scheme includes Class 1 (granular general fill) and Class 2 (cohesive general fill) which is assumed as suitable for re-use. 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 off-site. This assessment is preliminary and would need to be readdressed on completion of the next phase of ground investigation works.

10.10.11 The contractor would seek to re-use as much material as possible, this would be detailed within the MMP as part of the EMP.

10.10.12 As outlined in Section 10.7.21-24, an MRA for sandstone and limestone and one for sand and gravel overlaps with the footprint of the proposed scheme. The scheme will impact on a small area of MRA land. It would not diminish access to the MSA and will not sterilise the use of the wider resource, therefore the assessment of effects on material assets is determined as neutral and not significant.

Impact of imported materials

10.10.13 Over 90% of the material won on-site from excavations are likely to be re-used on-site as general fill for embankments and topsoil, as demonstrated in Table 10-19. Selected granular fill for capping, subbase and ground materials are unlikely to be sourced on-site and would need to be imported. Manufactured goods including drainage infrastructure, kerbs and traffic signs would also require importing.

10.10.14 The imported manufactured material assets would be sourced from established suppliers who regularly provide materials for similar sized projects. The suppliers are to be determined by the contractor who would ensure that they have adequate resources to meet the quantitative needs of the proposed scheme, without having negative influence on their resources. These will be imported in line with the 22% South West recycled aggregate target for England outlined in Table 10-5.

10.10.15 Within The Sixth Local Aggregates Assessment for Gloucestershire[35], the countywide landbank for crushed rock in 2016 was 24.32 million tonnes, equivalent to crushed rock aggregate reserves being able to meet projected demand for just under 17 years. The landbank for sand and gravel was estimated at 4.41 million tonnes in 2016, and the remaining length of this landbank, in 2017, was estimated at ten years. As stated in the baseline, this represents a decline in the remaining permitted reserves of 15% since 2012.

10.10.16 Material will be imported to site in line with the recycled content target for the South West of 22% by the contractor, as defined in the EMP. Therefore, the assessment of effects on material assets is considered *slight* and *not significant*.

Estimated waste arisings

10.10.17 The types of waste arisings associated with the construction phase of the proposed scheme design are listed in Table 10-20.

Table 10-20 Estimated waste arisings

Project activity	Detail of likely waste arisings from the proposed scheme	Quantities of waste arisings	Additional information on waste arisings
Site remediation, preparation or earthworks	Vegetation surface strip and trees, lighting columns and foundations, safety barriers and kerbs Signs, walls and fencing Drainage (displaced material only) Propping slab Structures foundations (open cut) Site remediation	86,099m^3 net earthworks materials are currently expected to be produced from the proposed scheme, however, this is likely to be designed out. To be confirmed during scheme design development.	Testing would be undertaken during construction to confirm that the materials meet the specification requirements which would be developed in line with CL:AIRE *Definition of Waste: Development Industry Code of Practice.* Material is likely to be a combination of reuse on-site, local recycling facilities and disposal at an inert or non-hazardous landfill site. This would ensure excavated materials could be used directly within the proposed scheme, subject to being suitable for use or following site treatment. Any material that does not meet this specification would be disposed of appropriately
Demolition	It is expected that the proposed scheme would involve the demolition of certain buildings A417 and other existing roads removal	Considered minimal based on the number of properties that would be demolished. To be confirmed during future design fixes	Some material would be suitable for reuse on-site. The remaining would be managed through a combination of local recycling facilities, disposal at an inert or non-hazardous landfill site
Site construction	Surface planings	To be confirmed during future design fixes	Likely to be a combination of reuse on-site, local recycling facilities, disposal at a non-hazardous (hazardous if contain coal tar) landfill site
	Site won material (hazardous)	Based on the preliminary material re-use assessment, the proposed scheme is considered unlikely to produce a significant volume of hazardous material	Any hazardous material would be taken to a licensed waste management facility
Waste from the compounds	Domestic waste produced from the site compounds Temporary works allowance	Domestic waste is considered to be minimal To be confirmed during future design fixes	Provisions would be made with local waste collection services to dispose of this waste appropriately
Operation	Over the course of a 40-year design life,	Minimal due to the re-use of planed material	This would be managed by the Overseeing Organisation and is

Project activity	Detail of likely waste arisings from the proposed scheme	Quantities of waste arisings	Additional information on waste arisings
	this would involve: the removal of the surface course on a 10-year cycle and removal of kerbs, drainage system and road signs on a 20-year cycle		likely to consist of a combination of local recycling facilities, disposal at an inert or non-landfill site

10.10.18 Measures should be implemented to ensure material is handled in accordance with the *Waste Framework Directive* to ensure the best environmental outcome. The proposed scheme should 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.

10.10.19 Should non-hazardous waste be encountered during construction, this would be handled at storage compounds, prior to transfer to external waste management sites. The materials would be segregated and appropriately re-distributed to alternative projects or re-distributed to waste management facilities.

10.10.20 Site clearance works would include the clearance of existing trees, safety barriers, concrete kerbs, lighting columns and traffic signs. Materials that may be won during the demolition works, and which may potentially be re-used, are set out below:

- bituminous pavement material;
- aggregate sub-base;
- fill and landscaping material;
- reinforced concrete and concrete;
- masonry and brickwork; and
- reinforcement and structural steelwork.

10.10.21 The current capacity for Construction and Demolition (C&D) disposal in Gloucestershire is estimated around 1,466,000 tonnes as shown in Table 10-11. The proposed scheme design earthwork net estimates accounts for greater than 1% of Gloucestershire's C&D Waste Disposal Capacity. However, following mitigation to achieve an earthworks cut/fill balance, detailed in Section 10.9, the assessment of effects on waste would be *slight* and therefore *not significant*. Mitigation involves refining the scheme to reduce the excess material and exploring opportunities to use materials in legacy projects.

<u>Construction waste management infrastructure (off-site)</u>

10.10.22 All materials arising from construction would be managed in accordance with the waste hierarchy defined within the Waste Framework Directive.

10.10.23 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.

10.10.24 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.

10.10.25 The location of waste management facilities for construction and demolition waste within the second study area are shown in Figure 10.1. 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 and C&D waste[36].

10.10.26 Overall, there would be a limited amount of waste that would be removed from site and therefore it is unlikely that waste will be disposed of outside the region. Therefore, the assessment of effects on waste is *slight* and *not significant*.

Operation Effects

10.10.27 The proposed 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 is expected to be the same as 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 DMRB LA 110 *Material assets and waste*, the assessment provides a framework for assessing and manging 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; and
- 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 documented in a MMP. Once a contractor has been appointed, engagement would be undertaken to ensure Environmental Permitting requirements are undertaken and solutions are developed to minimise 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[37] *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 Where 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; and
- ensure suppliers are certified by the Forest Stewardship Council (FSC) or Programme for the Endorsement of Forest Certification (PEFC).

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

10.12 Summary of effects

10.12.1 This chapter has considered the potential environmental effects associated with the use of material assets and disposal and recovery of waste for the proposed scheme, following DMRB LA 110 *Material assets and waste*.

Preliminary construction assessment

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

Preliminary operational assessment

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

Further Work

10.12.4 The information presented is preliminary and is based on the proposed scheme, as described in Chapter 2 The project. The earthworks strategy is to be developed further. It has the potential to change following any scheme design changes resulting from consultation feedback.

10.12.5 Further EIA work will be undertaken to confirm the scale of environmental impacts and significance of environmental effects arising from the proposed scheme. The final EIA will be reported within the ES, which will accompany the DCO application.

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