13 Materials

Executive summary

This chapter assesses the likely significant effects associated with the use of material resources and the generation of waste.

The scheme is a major infrastructure project and as such, construction would require the use of large amounts of materials and would generate waste which would need to be reused, recycled or disposed of. Large quantities of earth would be moved during construction.

Excavated material from cuttings and flood compensation areas would be used as fill material in embankments. Imported materials would primarily comprise blacktop, sub base, concrete and steel.

Six borrow pits would be used to supplement the fill requirement. These are located close to the point of use along the route of the scheme to reduce usage of heavy vehicles. Imported materials would be sourced with consideration for recycled content, appropriately graded secondary aggregates and transportation requirements. Haul routes would be agreed with the local authorities and would avoid unsuitable roads.

Green waste from vegetation clearance would be chipped and composted on-site for reuse in landscaping works where practicable. Top soils would be managed for reuse. Demolition wastes, such as from the removal of the A14 viaduct over the East Coast mainline railway in Huntingdon would be recovered for recycling and re-use off-site.

The contractors would be required to implement site specific waste management plans and to maximise diversion from landfill by re-use, recycling and recovery. The contractors would record and monitor their environmental performance and compliance with regulatory controls.

During site preparation large volumes of soils would be removed. Suitable top soils would be reused on-site for landscaping. Other soils would be used for engineering purposes or taken off-site for reuse and/or recycling. Overall a slight adverse effect is identified for this aspect of the assessment.

During construction the need for imported aggregates would be reduced by re-use of excavated materials from works cuttings and from flood compensation areas. Overall a slight adverse effect is identified for this aspect of the assessment. The earthworks quantities requirements for the scheme is large and would be met by using material from borrow pits within or close to the area of the scheme. Overall a moderate adverse effect is identified for this aspect of the assessment. There is also a requirement for a large amount of imported material which would need to be sourced off-site. These would be sourced with consideration for recycled content and transportation requirements. Overall a moderate adverse effect is identified for this aspect of the assessment.

13.1 Introduction

13.1.1 This chapter assesses the likely significant effects associated with the use of materials and generation of waste associated with the scheme. It considers and follows the guidance within *Design Manual for Roads and Bridges Volume 11, Section 2, Part 5, HD205/08* (*DMRB HD205/08)* (Highways Agency et al., 2008) and *Interim Advice Note (IAN) 153/11* (Highways Agency et al., 2011).

13.1.2 Constructing a strategic trunk road uses large amounts of raw materials and generates a variety of types and quantities of waste. The consumption of material resources and generation of wastes give rise to environmental impacts that would need to be managed and mitigated.

13.1.3 For the purposes of this assessment, 'materials' include consideration of the:

- provision and use of materials resources; and
- generation and management of wastes[1].

13.1.4 This chapter assesses the impacts of the construction and operation/maintenance of the scheme in terms of materials used, as well as wastes generated. It concentrates on the assessment of impacts that may occur through the use of primary, secondary, recycled raw materials and manufactured construction products, including the embodied carbon/energy associated with the manufacture of materials and the management of waste. The full carbon assessment is presented in *Appendix 13.2*.

13.1.5 This assessment does not consider impacts associated with the off-site extraction of raw materials used for the off-site manufacture of products. These stages of the products' or materials' life-cycles are outside the boundaries of this assessment due to the range of unknown variables associated with the extraction and manufacturing processes and given that it is likely that environmental effects associated with materials extraction and wastes management have been dealt with for the facilities' established consents.

13.1.6 The environmental effects associated with the use of materials and generation of wastes are considered within other chapters of the ES. Therefore impacts and effects from dust are discussed in *Chapter 8*, noise impacts and effects associated with handling and transporting of materials and waste is discussed in *Chapter 14*. Impacts and effects associated with water aspects are discussed in *Chapter 17*. Potential impacts upon geology, soils and contamination aspects of reusability of soils and aggregates are discussed within *Chapter 12.* Traffic movements related to construction materials used for the scheme are shown in *Appendix 3.2.* The use of the borrow pits and their impacts and effects are assessed throughout the ES as part of the overall scheme. This assessment deals with the impacts associated with resource depletion and the availability of appropriate waste management facilities.

[1] As defined in IAN 153/11 (Highways Agency et al., 2011), waste is considered to include surplus materials which become waste during the construction of the scheme as well as other substances discarded as waste.

13.1.7 Cumulative impacts and effects that may arise as a result of these aspects are discussed in *Chapter 18.*

13.2 Legislative and policy background

13.2.1 The legislation, plans and policies which are relevant to this chapter include:

- *Council Directive (2008/98/EC) of the European Parliament and of the Council on Waste;*
- *Government Review of Waste Policy in England 2011* (Department for Environment Food and Rural Affairs, 2011*);*
- *Waste (England and Wales) Regulations 2011;*
- *Waste Strategy for England 2007* (Department for Environment Food and Rural Affairs, 2007)*;*
- *National Planning Policy Framework 2012* (Department for Communities and Local Government, March 2012);
- *National Planning Policy for Waste 2014* (Department for Communities and Local Government, October 2014);
- *Draft National Policy Statement for National Networks 2013* (Department of Transport, December 2013);
- *The Cambridge Local Plan 2014: Proposed Submission* (Cambridge City Council, July 2013);
- *The South Cambridgeshire Local Plan 2011-2031: Proposed Submission* (South Cambridgeshire District Council, 2011);
- *Highways Agency Strategic Plan 2010-2015* (Highways Agency, 2010);
- *Highways Agency Environment Strategy 2010-2015* (Highways Agency, 2010);
- *Highways Agency Sustainable Development Plan 2012-2015* (Highways Agency, 2012);
- *Highways Agency Procurement Strategy 2009* (Highways Agency, 2009)*;*
- *Cambridgeshire and Peterborough Minerals and Waste Core Strategy 2011* (Cambridgeshire County Council and Peterborough City Council, July 2011); and
- *Cambridgeshire and Peterborough Minerals and Waste Site Specific Proposals Plan* (Cambridgeshire County Council and Peterborough City Council, February 2012).

13.2.2 The scheme does not extend into Cambridge City Council's boundary. In addition, the study area to the north of Cambridge is tightly enclosed by development to the south of the existing A14. As such, it is unlikely that landscape policies in the *Development Plan for Cambridge* (Cambridge City Council) apply to the scheme.

13.2.3 A review of legislation and policy has identified the key and most relevant statutory and policy requirements applicable to materials resource use and waste management for the scheme. These are presented in *Table 13.1*.

Table 13.1: Applicable statutory and policy requirements

Requirements	Reference
'*Take reasonable steps when transferring waste to apply the following waste management hierarchy;* *(a) prevention;* *(b) preparing for reuse;* *(c) recycling;* *(d) other recovery; and* *(e) disposal*.'	*Waste (England and Wales) Regulations 2011*
'*Helping to secure the re-use, recovery or disposal of waste without endangering human health and without harming the environment'* *'The handling of waste arising from the construction and operation of development maximises reuse/recovery opportunities, and minimises off-site disposal.'*	*National Planning Policy for Waste 2014* (Department for Communities and Local Government, October 2014)
By 2020 the recovery of non-hazardous construction and demolition waste shall be increased to a minimum of 70% by weight.	*Council Directive (2008/98/EC) of the European Parliament and of the Council on Waste* (European Union, 2008). *Government Review of Waste Policy in England 2011* (Department for Environment Food and Rural Affairs, 2011). *Highways Agency Procurement Strategy 2009* (Highways Agency, 2009).
25% (minimum) of products used in construction projects to be from schemes recognised for responsible (sustainable) sourcing by 2012.	*Highways Agency Procurement Strategy 2009* (Highways Agency, 2009).
50% reduction of waste to landfill from construction and demolition activities by 2012.	*Highways Agency Procurement Strategy 2009* (Highways Agency, 2009). *Highways Agency Environment Strategy 2010-2015* (Highways Agency, 2010).

Requirements	Reference
Advocates the 'waste hierarchy' principle. Applicants are required to minimise the amount of waste produced and the volume of waste sent for disposal unless it can be demonstrated that this is the best overall environmental outcome. Waste must be managed properly both on and off-site, and must be dealt with appropriately by the waste infrastructure available.	*Draft National Policy Statement for National Networks* (Department of Transport, December 2013).

13.2.4 The Government removed the statutory requirement for site waste management plans (SWMP) in October 2013. SWMPs were previously required for construction and demolition wastes in England. However, as their use is considered good practice to ensure that demolition and construction wastes are dealt with in an appropriate manner and in accordance with the waste hierarchy, the requirement to develop and implement a SWMP is secured through the CoCP and is included in the *Register of Environmental Actions and Commitments.* This approach is consistent with the guidance in the *Draft National Policy Statement for National Networks* (Department for Transport, 2013) to implement sustainable waste management through the application of the waste hierarchy.

13.3 Method of assessment

Approach

13.3.1 Large construction projects, such as this scheme, require a detailed assessment as required in *IAN 153/11* (Highways Agency et al., 2011) to quantify the effects associated with material use and waste.

13.3.2 To assess the effects associated with material use and waste production/management, the assessment has identified and quantified the following, using professional judgement, where appropriate:

- the types and quantities of materials required for the project;
- details of the sources of materials;
- the types and quantities of forecast waste arisings from the project;
- waste that requires on-site storage prior to re-use, recycling or disposal;
- waste to be pre-treated on-site for re-use within the project;
- waste requiring treatment and/or disposal off-site; and
- the impacts that may arise in relation to the availability of materials resources and waste management capacity.

13.3.3 For the purposes of this assessment the quantification of materials has been based on a likely worst case scenario. These assumptions are based upon the information provided within *Appendix 3.2* and has included within them a 10% contingency of material volumes to cover unknown items. The guidance that covers this assessment does not consider the temporal aspects of the scheme's construction. Therefore, the envisaged construction programme in *Appendix 3.2* does not affect the likely worst case scenario as assessed.

13.3.4 The study area for the assessment is the scheme footprint within the DCO boundary including associated borrow pits, soil storage areas and compound sites, as illustrated on *Figure 1.1*. In addition the study area also includes the all materials and waste facilities within 10km of the scheme footprint.

13.3.5 Details on the consultation exercise carried out for the scheme and statutory and key stakeholder responses can be found in *Chapter 5*.

13.4 Assessment criteria

Materials and waste

13.4.1 There is no guidance available in the *IAN 153* (Highways Agency et al., 2011) that provides definitions for receptor sensitivity, magnitude or likely significant of effects in relation to this topic. In this context, impacts have been identified and their significance assessed based upon the professional judgement of suitably qualified and experienced specialists, as listed in *Appendix 6.1*. The assessment identifies whether impacts occur during demolition, construction or operation and maintenance and are described as positive or negative, permanent or temporary and direct or indirect as required by the *IAN 153* (Highways Agency et al., 2011).

13.4.2 The sensitivity of materials use is based on the availability of the resource in question and whether its use could result in its depletion. For example, high sensitivity might pertain to a rare resource that is not available locally or available locally in very limited amounts, such that the resource could be significantly depleted by its proposed use. Conversely, a low sensitivity resource may be considered as one that is very common locally or that primarily comprises recovered/recycled materials such that its use would contribute to waste reduction targets and the avoidance of the use of primary materials. Moderate sensitivity would apply to materials somewhere between these two extremes.

13.4.3 The sensitivity of waste management facilities is based on available local waste management capacity. For example, a high sensitivity waste management operation (or even the whole waste management infrastructure in the area) could be considered to have very limited capacity for the waste type requiring treatment/disposal. This may be particularly true of hazardous or difficult wastes where local capacity may be limited. A low sensitivity operation/local infrastructure could be considered to be large or numerous waste management sites with plenty of capacity to deal with the waste arisings.

13.4.4 For this assessment the estimated types and quantities of materials utilised and wastes generated from the scheme have been used to identify the likely magnitude of impacts against the available resource. The waste hierarchy has also been taken into account. Professional judgement has been applied to determine the likely significance of effects on a graduated scale as per the *DMRB HA 205/08* (Highways Agency et al., 2008). This has been done by comparing the sensitivity/capacity of the resource and the magnitude of impact (i.e. the requirement for materials/waste management capacity created by the scheme).

13.4.5 The matrix set out in *Table 13.2* has been used to determine the significance of effect (based on *DMRB HA 205/08*. For example if the sensitivity is considered high as the resource is only available locally in limited amounts and the magnitude is considered as major as a large quantity of material is required the likely significance would be considered as large or very large. Whereas if the sensitivity is considered low as the resource primarily comprises recovered/recycled materials and only limited volumes are required then significance would be neutral.

Table 13.2: Arriving at the significance of effects

Value/ sensitivity	Magnitude of impact			
	Negligible	Minor	Moderate	Major
Very High	Slight	Moderate/large	Very large/large	Very large
High	Slight	Slight or moderate	Moderate/large	Large/very large
Medium	Neutral/slight	Slight	Moderate	Moderate/large
Low	Neutral	Neutral/slight	Slight	Slight/moderate

13.4.6 The most significant potential effects are shown red, followed by those shown orange. These effects are therefore considered as significant for the purposes of the Environmental Impact Assessment, with those categories of neutral/slight (shown yellow) not being significant effects.

13.4.7 The receptors for this assessment are defined as:

- Highways Agency, local/regional and national policy on the sourcing of materials; and
- the waste management infrastructure in the local area and policy as set out above.

Embodied carbon content of materials

13.4.8 As an additional part of the assessment the quantification of the carbon impacts of different materials has also been carried out. This provides another means to assess the magnitude of change associated with the schemes materials requirements. Although the scale of magnitude is not strictly a measure of the significance, in the absence of a true measure of significance, it provides further indication of the severity or otherwise of the identified impacts.

13.4.9 The magnitude of the environmental impact has been assigned through an assessment of the embodied carbon emissions as a proxy for all other environmental effects associated with the materials used on the scheme.

13.4.10 The scale of magnitude in *Table 13.3* has been used to assess the magnitude of change associated with the scheme's materials requirements, The scale in *Table 13.3* is based on benchmark data from previous road projects where the magnitude of change as a result of materials use has been quantified.

Table 13.3: Scale of magnitude for assessing CO2e of materials

Scale of impact magnitude	Total CO_2e of materials (tonnes)
No change	< 1,000
Negligible	1,000 – 5,000
Minor	5,000 – 20,000
Moderate	20,000 – 40,000
Major	> 40,000

Limitations

13.4.11 During the preliminary design stage of the scheme the full information required for a detailed assessment (*IAN 153/11*), such as the exact sources/origins and quantities of materials, is not available. Therefore this detailed assessment has been undertaken using professional judgement.

13.4.12 For the purposes of this assessment the quantification of materials has been based on the likely worst case scenario drawn from information currently available. This has included a 10% contingency to cover unknown items. The likely worst case scenario for the purposes of this assessment is in line with the construction information provided within *Appendix 3.2*.

13.4.13 Information on the permitted capacity of waste facilities is provided in *Table 13.4* and *Appendix 13.1* however it is noted that changes to this permitted capacity during the construction of the scheme cannot be identified at this stage.

13.5 Baseline conditions

Materials

Primary aggregates

13.5.1 'Primary aggregate' "*is the term used for aggregate produced from naturally occurring mineral deposits and used for the first time*" (British Geological Society, 2014).

13.5.2 The *East of England aggregates working party: annual monitoring report* (Department for Communities and Local Government, 2012) identifies primary aggregate and mineral sources in the East of England which includes Cambridgeshire and Peterborough. The report identifies that sand and gravel sales in Cambridgeshire and Peterborough in 2012 amounted to 1.78 million tonnes.

13.5.3 Cambridgeshire and Peterborough have been identified as strategic areas for housing and employment growth over the period to 2026. The *Cambridgeshire and Peterborough Minerals and Waste Development Plan, Core Strategy Development Plan Document (Cambridgeshire and Peterborough Core Strategy)* (Cambridgeshire County Council and Peterborough City Council, July 2011) has allocated sufficient extraction sites to ensure the supply of primary aggregates including three million tonnes of sand and gravel per annum in Cambridge and Peterborough to accommodate this growth in housing and employment.

13.5.4 The *Cambridgeshire and Peterborough Minerals and Waste Core Strategy* (Cambridgeshire County Council and Peterborough City Council, July 2011) acknowledges that the A14 scheme would require large quantities of sands and gravels and that the use of borrow pits would be required to provide the source of sands and gravels for the scheme.

Alternatives to primary aggregates

13.5.5 Construction, demolition and excavation wastes can be used as an alternative to primary aggregates. The *East of England aggregates working party: annual monitoring report* (Department for Communities and Local Government, 2012) provides details on the locations of recycling facilities for construction, demolition and excavation waste within 10 kilometres of the scheme as detailed in *Table 13.4*. These recycling facilities process and/or provide alternative aggregates that can be used in construction projects.

Table 13.4: Aggregate recycling sites

Company name and site	Capacity of the site (tonnes)	Approximate distance from the scheme (km)
Mick George Ltd, Meadow Lane, St Ives	199,999	2.4km
Dawson Plant Hire, Middle Watch, Swavesey	74,999	3.1km
Cottenham Skips, Histon Road, Cottenham	24,999	5.3km
Eaton Tractors, Little Paxton	25,000	9.3km
AmeyCespa Ltd, Waste Management Park, Waterbeach	100,000	9.8km

13.5.6 Other potential sources of alternative aggregates would be investigated at the detailed design stage, including opportunities to reuse materials from major development sites in the area such as the new settlements of Northstowe, Waterbeach, Bourn Airfield and Network Rail's Whitemoor distribution centre.

Waste

13.5.7 The scheme is likely to produce a range of waste types including inert, non-hazardous and hazardous wastes. The majority of wastes assumed to be produced are construction and demolition wastes. There would also be a small amount of non-construction and demolition waste associated with construction workers including packaging and food waste. Additional, small quantities of wastes would be produced during the operational phase including concrete, steel and green waste.

13.5.8 An assessment of the available regional waste management infrastructure is provided in *Appendix 13.1* including the type, locations and capacities of these facilities.

13.5.9 The *Cambridgeshire and Peterborough Core Strategy* (Cambridgeshire County Council and Peterborough City Council, July 2011) sets out the total waste arising in the area as shown in *Table 13.5*. In 2011 the annual inert waste arisings from construction, demolition and excavation activities were 2.7 million tonnes (i.e. inert waste in *Table 13.5*) and this was projected to increase to 2.9 million tonnes by 2026. *Table 13.5* also includes details on non-hazardous and hazardous waste arisings and illustrates that there may be a shortfall in available recycling facility capacity (based on 2009 data). This suggests that alternative solutions may need to be sought for managing all waste types.

Table 13.5: Estimated total waste arisings in Cambridge and Peterborough

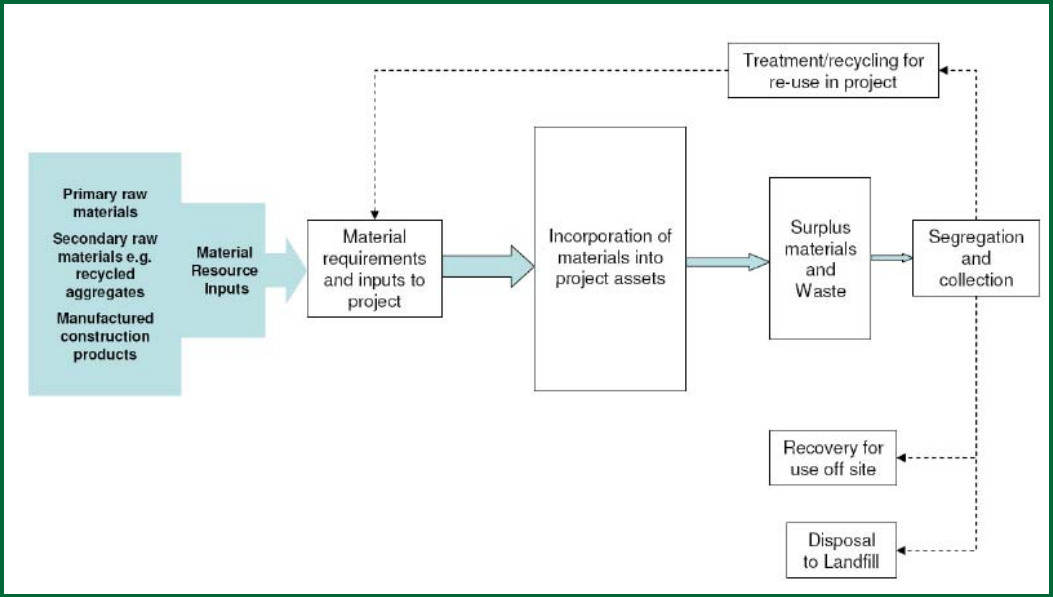
Waste type	Estimated waste arisings in 2011 (tonnes)	Estimated recycling operating capacity in 2009 (tonnes per annum)	Remaining Void (m^3) in 2009
Inert waste	2,719,000	1,129,000	2,232,000
Non-hazardous waste	2,082,000	616,800	15,736,000
Hazardous waste	45,000	34,000	600,000
Total	**4,846,000**	**1,779,800**	**18,568,000**

13.6 Potential impacts

13.6.1 Potential impacts include those associated with the extraction and use of primary raw materials and the use of products for construction, operation and maintenance. Many material resources would originate on-site, and would be reused on-site. Other materials and products for example street lamps and fencing would be purchased and used for construction, operation and maintenance.

13.6.2 Potential impacts also include those associated with the production of waste. Waste would arise as a result of construction and operation/maintenance of the scheme. Waste would primarily arise either from the demolition of existing structures and from materials brought to site and not used for their original purpose i.e. damaged items, off cuts and surplus materials. The impacts would result from the production, movement, transport, processing and disposal of these wastes. *Box A* illustrates how material resources are typically used and how wastes are typically produced and managed during the construction process.

Box A: Project material flow diagram



Source: *IAN 153/11* (Highways Agency et al 2011)

Demolition, construction and operational impacts

Types, quantities and sources of material resources

13.6.3 At this stage in the design process, there is a degree of uncertainty about material volumes and their sources. In order to ensure the assessment of likely significant effects during construction, the likely worst case comprises of imported major material types being blacktop, sub base, concrete and steel. Aggregates would be sourced from within the scheme boundary and from borrow pits and cuttings in the vicinity of fill requirement. All material volumes quoted include a contingency of 10%. Uncertainty in the location of the source of materials is addressed through assuming up to 14% of the total of materials required for the scheme may be imported (including blacktop, sub base, concrete, steel and plastic), which incorporates the contingency of 10% in respect of construction vehicle movements accessing the scheme from offsite. The remaining 86% of total materials required for the scheme including earthworks cut, material from flood compensation areas and fill material from borrow pits would be sourced within the scheme boundary.

13.6.4 The estimated main types and quantities of materials used during the construction phase are shown in *Table 13.6*.

13.6.5 The estimated quantities of earthworks materials are provided in *Table 13.7*.

13.6.6 The estimated quantities detailed in *Table 13.6* and *13.7* are based on the likely worst case scenario which includes 10% contingency.

13.6.7 The scheme would require fencing along the length of the road, but at this stage of the preliminary design quantities of timber to be used on the scheme have not yet been determined.

Table 13.6: Summary of construction materials resource use (based on Table A within IAN 153/11)

Construction material required	Estimated quantities of materials (m^3)	Additional information on materials resource
Blacktop	516,700	Contains primary aggregate. Material used to pave the road and bridges surfaces.
Sub base	273,040	Primary aggregate. Layer of aggregate material.
Capping	383,700	Primary/secondary aggregate. Layer of usually relatively low quality aggregate.
Concrete	606,370	Concrete in bridges, structures, roads, headwalls, culverts, chambers.
Steel	12,360	Steel used in bridges, structures, roads.
Plastics	2,765	Plastics used for ducting and carrier drains.

13.6.8 *Table 13.7* confirms that the earthworks cut required would produce 1.7 million m^3, cut from the flood compensation areas would be 854,000m^3. The earthworks fill required is 6.8 million m^3. As such, approximately 5.8 million m^3 of fill material would need to be obtained from the borrow pits for embankments and capping, with a further requirement for 1.6 million m^3 of additional fill available for landscaping and restoration.

Table 13.7: Estimated cut and required fill volumes

Source, requirements and availability	Estimated quantities (m^3)
Flood compensation areas	854,000
Excavation from cuttings	1,737,000
Excavation from borrow pits	5,766,000
Required fill – Embankments and capping	6,779,000
Additional fill available for restoration	1,577,000

Types, quantities and sources of waste

13.6.9 The anticipated main types and quantities of waste generated during the site preparation and remediation, demolition, construction and operational and maintenance phases are shown in *Table 13.8*.

13.6.10 At this stage of the preliminary design quantities of green waste, inert waste and contaminated soils generated through site preparation and remediation activities have not yet been identified. However, it is not anticipated that there would be large volumes of green waste generated through site preparation and remediation works as the scheme would involve the clearance of largely arable land with the removal of some hedgerows and trees. Where practicable a large proportion of the inert waste generated would be reused and/or recycled on-site and used for engineering purposes.

13.6.11 Contaminated soils are also unlikely to arise in significant volumes given the scheme is primarily located within greenfield land or land which is identified as having only limited contaminative potential. Potential impacts associated with remediation of areas on the scheme are discussed within *Chapter 12*.

13.6.12 Demolition waste estimates for the scheme are based on preliminary designs submitted as part of the DCO.

13.6.13 Waste and Resources Action Programme's (WRAP) civil engineering wastage rates set out in *The Designing Out Waste Tool for Civil Engineering Projects* (WRAP, August 2010) have been applied to the construction materials to estimate the waste arisings generated during the construction stage. At this stage of the preliminary design quantities of timber wastes generated through construction activities have not yet been identified however it is anticipated that any timber waste produced would be taken off-site for recycling.

13.6.14 Operational and maintenance waste arisings are estimated using maintenance and construction waste data for 2013/14 for Area 8, the network area that covers the A14. An estimate of the operational waste has been calculated using a ratio of the scheme carriageway length against the total road network of Area 8.

13.6.15 Operational and maintenance waste arisings detailed in *Table 13.8* are based on historical data derived from previous comparable road schemes. It is anticipated that for the first five operational years of the scheme the maintenance and operational waste for the scheme would be less than that detailed in *Table 13.8*.

Table 13.8: Summary of waste arisings (based on Table B within IAN 153/11)

Project activity	Waste arising from the scheme	Estimated quantities of waste arisings	Additional information on waste arisings
Site remediation and preparation	Green waste	Not quantified	Potential to be composted off-site
	Topsoil/subsoil	2,376,000m^3	Potential to be re-used for engineering and restoration purposes
	Unsuitable for engineering fill	1.6 million m^3	Potential to be reused for landscaping
	Inert waste	Not quantified	Potential to be reused and/or recycled.
	Contaminated soils and wastes from remediation activities	Not quantified	Potential impacts and effects upon geology, soils and remediation aspects of reusability of soils and aggregates are discussed within *Chapter 12.* May require treatment/disposal off-site
Demolition	Concrete	20,000 tonnes	Based on good practice 95%[2] of the estimated demolition waste quantities produced should be able to be recovered. This will be taken off-site for reuse and/or recycling.
	Reinforcement	1,600 tonnes	
Construction	Blacktop	12,920m^3	Potential to be reused on-site.
	Sub base	13,650m^3	Potential to be reused on-site.
	Capping	19,185m^3	Potential to be reused on-site.
	Concrete	15,160m^3	Potential to be reused on-site.
	Steel	620m^3	Potential to be recycled off-site.
	Plastics	55m^3	Potential to be recycled off-site.
Operation and maintenance	Oil waste	0.9 tonnes per annum	Potential to be recycled and/or recovered.
	Tyres	0.9 tonnes per annum	Potential to be recycled and/or recovered.
	Concrete	196 tonnes per annum	Potential to be reused and/or recycled.
	Planings	3,764 tonnes per annum	Potential to be reused and/or recycled.
	Ferrous	34 tonnes per annum	Potential to be recycled.
	Non ferrous	0.5 tonnes per annum	Potential to be recycled.
	Safety fencing	359 tonnes per annum	Potential to be reused and/or recycled.
	Filter drain material	208 tonnes per annum	It is likely that filter drain waste would be landfilled.

[2] ICE Demolition Protocol (2008)

Project activity	Waste arising from the scheme	Estimated quantities of waste arisings	Additional information on waste arisings
	Unbound materials and aggregate	2,441 tonnes per annum	Potential to be reused and/or recycled.
	Lantern units	2 tonnes per annum	Potential to be recycled.
	Batteries	0.5 tonnes per annum	It is likely that a proportion of the batteries generated would be landfilled.
	Wood	0.9 tonnes per annum	Potential to be reused and/or recycled.
	Plastics	1.5 tonnes per annum	Potential to be reused and/or recycled.
	Green arisings	41 tonnes per annum	Potential to be composted.
	Gully arisings	4.8 tonnes per annum	It is likely that the gully arisings generated would be landfilled.
	Inert	9.4 tonnes per annum	It is likely that a proportion of the inert waste generated would be landfilled.

Embodied carbon content of materials

13.6.16 For the forecast materials detailed in *Table 13.7* and the excavation activities the total embodied carbon has been calculated using the *Highways Agency Carbon Calculation for Major Projects* (*CCMP*) (Highways Agency, 2013). This provided a figure of approximately 673,105 tonnes of CO_2e.

13.6.17 *Table 13.9* provides details of the embodied carbon contained within those main materials that would be used for the scheme. Accordingly, using the assessment methodology set out in *Table 13.3* above, the magnitude of the impact was assessed to be major.

13.6.18 The full carbon assessment is presented in *Appendix 13.2*.

Table 13.9: Embodied carbon content of materials to be used on the scheme3

Construction material	Total estimated tonnage of embodied carbon (CO_2e)
Blacktop	57.974
Sub base and capping (includes all the excavation activities detailed in *Table 13.7*)	343,793
Concrete	184,822
Steel	144,342
Plastics	8,783

13.6.19 *Table 13.10* provides the outputs of the detailed assessment relating to the potential impacts associated with the site remediation and preparation, demolition, construction and operational activities. The table provides details on the nature and magnitude of the impact, the sensitivity and the determined significance pre-mitigation.

[3] Figures have been calculated using the Highways Agency Carbon Calculator

Table 13.10: Detailed assessment reporting matrix for materials and waste impacts (based on Table C within IAN 153/11)

Project activity	Activities with potential impacts on material resource/waste	Sensitivity of resource	Description and magnitude of the impacts	Significance
Site remediation and preparation	Site clearance resulting in green waste arisings from vegetation.	Low (there are several composting facilities in the area – see *Appendix 13.1* and *Table 13.4* above).	Minor, permanent and direct. The impact would involve low volumes of green waste materials being generated given that the areas to be cleared on the scheme largely comprise arable land. Any impact is unlikely to be more than minor given that green waste would be composted/chipped on-site to act as soil improver for landscaping purposes or would be composted/chipped off-site. Low volumes exported unlikely to involve significant transport effects.	Neutral/slight adverse
	Production of soils (suitable and unsuitable for use) from site clearance.	Medium	Moderate, permanent and direct. The impact would involve moderate volumes of soils being generated. Suitable soils would be stored and reused on the scheme for engineering fill. Other soils would be reused elsewhere on the scheme for landscaping or taken off-site for reuse or recycling. Unlikely that significant volumes would be exported so unlikely to involve significant transport effects.	Moderate adverse

Project activity	Activities with potential impacts on material resource/waste	Sensitivity of resource	Description and magnitude of the impacts	Significance
	Production of inert waste from site clearance activities.	Low	Minor, permanent and direct. The impact would involve low to moderate volumes of inert materials unsuitable for on-site use being generated. Inert waste generated through site clearance would either be reused on-site or taken off-site for recycling. Low volumes exported unlikely to involve significant transport effects.	Slight adverse
	Contaminated soils and wastes from remediation activities.	Medium	Minor, permanent and direct. The impact would involve low volumes of contaminated soils requiring remediation. Any contaminated soils would be treated on-site or taken off-site to a soil treatment centre Potential impacts and effects upon geology, soils and remediation aspects of reusability of soils and aggregates are discussed within Chapter 12.	Slight adverse
Demolition	Reuse of waste materials on-site (at point of use) resulting in lowering the requirements for: • the use of primary materials; • sourcing new materials; and • landfilling.	Low (available secondary resource)	Minor, permanent and direct. The impact would involve relatively low volumes of demolition waste materials being reused on-site thereby reducing the need for primary materials and waste disposal.	Neutral/slight adverse

Project activity	Activities with potential impacts on material resource/waste	Sensitivity of resource	Description and magnitude of the impacts	Significance
	Storage of waste on-site for on-site reuse or off-site treatment resulting in lowering the requirement for landfilling.	Low (available secondary resource)	Minor, temporary and direct. The impact would involve relatively low volumes of waste and materials being stored on-site potentially resulting in issues such as contamination, silty run-off and dust (refer to *Chapters, 8, 12, 14, 17 and Appendix 3.2)* and double handling.	Neutral/slight adverse
	Reuse and recycling of demolition waste materials off-site resulting in lowering the requirement for landfilling.	Low (available secondary resource)	Moderate, permanent and indirect. The impact would involve the reuse of moderate volumes of demolition waste materials off-site. Potential volumes exported could potentially contribute to impacts associated with traffic. The effects associated with traffic are assessed in *Chapters 8, 12, 14, 17 and Appendix 3.2*.	Slight adverse
	Use of non-landfill waste management facilities resulting in: • lowering the requirement of landfilling waste; and • utilising the available waste management capacity of the non-landfill waste management facilities.	Low - (there are several recycling facilities in the area – see *Appendix 13.1* and *Table 13.4* above).	Minor, temporary and direct. The impact would involve the use of waste management facility capacity but is unlikely to result in over use given both on and off-site reuse and relatively low volumes associated with demolition. Low volumes exported unlikely to involve significant transport effects.	Neutral/slight adverse

Project activity	Activities with potential impacts on material resource/waste	Sensitivity of resource	Description and magnitude of the impacts	Significance
	Landfilling the waste results in: • a reduction in the remaining available landfill capacity; • not reusing or recycling the waste; • lowest waste management option as set out in the waste hierarchy.	Low - (there are several landfills in the area – see *Appendix 13.1* including one that can take hazardous wastes).	Minor, temporary (degradable)/permanent (non-degradable) and indirect. Any impact is unlikely to be more than minor given relatively low volumes of material and that as much waste as practicable would be reused on or off-site. Low volumes exported unlikely to involve significant transport effects.	Neutral/slight adverse
Construction	Use of imported aggregates from new quarries resulting in the depletion of finite resources (note: quarry materials would only be used as back up if site won materials are not suitable).	High (local resource (quarry) capacity is less than the materials required).	Moderate, permanent and direct. The impact could involve the use of low to moderate volumes of primary aggregate resources won off-site depending on what can be won and/or recovered on-site. Potential volumes imported could potentially contribute to impacts associated with traffic. The effects associated with traffic are assessed in *Chapters 8, 12, 14, 17 and Appendix 3.2*.	Moderate/large adverse

Project activity	Activities with potential impacts on material resource/waste	Sensitivity of resource	Description and magnitude of the impacts	Significance
	Use of new materials (e.g. borrow pits) resulting in environmental impacts associated with on-site excavation activities.	Medium (exploiting new but readily available resource)	Major, permanent and direct. The impact could involve the use of high volumes of primary aggregate resources won on-site. Volumes unlikely to contribute to impacts associated with traffic as all transport would be on-site. Potential impacts associated with land-use, ecology, water resources and dust associated with on-site excavation and storage of borrow pit materials are dealt with in *Chapters 8, 12, 14, 17 and Appendix 3.2*.	Moderate/large adverse
	Use of imported materials (e.g. blacktop, sub base, steel, concrete).	Medium (exploiting new but readily available resource)	Major, permanent and direct. The impact would involve the use of high volumes of materials that would need to be sourced off-site. The use of imported primary materials would contribute to the depletion of finite natural resources. Potential impacts associated with transporting imported materials.	Moderate/large adverse
	Reuse of potential waste materials on-site (at point of use) resulting in lowering the requirements for: • the use of primary materials. • sourcing new materials; and • landfilling waste.	Low (available secondary resource)	Moderate, permanent and direct. The impact would involve relatively high volumes of construction waste materials being reused on-site thereby reducing the need for primary materials and waste disposal.	Slight adverse

Project activity	Activities with potential impacts on material resource/waste	Sensitivity of resource	Description and magnitude of the impacts	Significance
	Storage of potential waste on-site for on-site reuse or off-site treatment resulting in lowering the requirement for landfilling.	Low (available secondary resource)	Moderate, temporary and direct. The impact would involve relatively high volumes of waste and materials being stored on-site potentially resulting in issues such as contamination, silty run-off and dust (refer to *Chapters 8, 12, 14, 17 and Appendix 3.2*) and double handling.	Slight adverse
	Reuse and recycling of potential waste materials off-site (at point of use) resulting in lowering the requirement for landfilling.	Low (available secondary resource)	Moderate, permanent and indirect. The impact would involve the reuse of relatively high volumes of waste materials thereby reducing the need for primary materials and waste disposal. Potential volumes exported could potentially contribute to impacts associated with traffic. The effects associated with traffic are assessed in *Chapters 8, 12, 14, 17 and Appendix 3.2*.	Slight adverse

Project activity	Activities with potential impacts on material resource/waste	Sensitivity of resource	Description and magnitude of the impacts	Significance
	Use of non-landfill waste management facilities resulting in: • lowering the requirement for landfilling; and • utilising the available waste management capacity of the non-landfill waste management facilities.	Low - (there are several recycling facilities in the area – see *Appendix 13.1* and *Table 13.4* above).	Moderate, temporary and direct. The impact would involve the use of waste management facility capacity. The volumes potentially involved could temporarily affect capacity but are unlikely to result in over use given both direct on and off-site re-use limiting volumes needed to be treated. Volumes potentially exported could contribute to transport effects. The effects associated with traffic are assessed in *Chapters 8, 12, 14, 17 and Appendix 3.2*.	Slight adverse
	Landfilling the waste results in: • a reduction in the remaining available landfill capacity; • not reusing or recycling the waste; and • Poorest waste management option as set out in the waste hierarchy.	Low - (there are several landfills in the area – see *Appendix 13.1* including one that can take special wastes).	Moderate, temporary (degradable)/permanent (non-degradable) and indirect. Any impact is unlikely to be more than moderate given that as much waste as practicable would be re-used on or off-site. Potential volumes exported could contribute to impacts associated with traffic. The effects associated with traffic are assessed in *Chapters 8, 12, 14, 17 and Appendix 3.2*.	Slight adverse

Project activity	Activities with potential impacts on material resource/waste	Sensitivity of resource	Description and magnitude of the impacts	Significance
Operation/maintenance	Use of materials (primary and secondary resources) for scheme maintenance resulting in depletion of available materials.	Medium (exploiting primary and secondary resources)	Neutral or slight, permanent and direct. The impact may involve the loss of relatively small volumes of material resources. However, this is unlikely to be significantly different to that required if the current A14 route was retained in the study area.	Neutral or slight adverse
	Reuse of potential waste materials on-site (at point of use) resulting in lowering the requirements for: • the use of primary materials. • sourcing new materials; and • landfilling waste.	Low (available secondary resource)	Neutral, permanent and direct. The impact would involve relatively small volumes of waste materials being reused on-site. However, this is unlikely to be significantly different to that required if the current A14 route was retained in the study area.	Neutral adverse
	Reuse and recycling of potential waste materials off-site (at point of use) resulting in lowering the requirement of landfilling waste.	Low (available secondary resource)	Neutral, permanent and direct. The impact would involve relatively small volumes of waste materials being transported and reused off- site. However, this is unlikely to be significantly different to that required if the current A14 route was retained in the study area and volumes would be low.	Neutral adverse

Project activity	Activities with potential impacts on material resource/waste	Sensitivity of resource	Description and magnitude of the impacts	Significance
	Use of non-landfill waste management facilities resulting in: • lowering the requirement for landfilling; and • utilising the available waste management capacity of the non-landfill waste management facilities.	Low - (there are several recycling facilities in the area – see *Appendix 13.1* and *Table 13.4* above).	Neutral, permanent and direct. The impact would involve relatively small volumes of waste materials being transported. However, this is unlikely to be significantly different to that required if the current A14 route was retained in the study area and volumes would be low.	Neutral adverse
	Landfilling the waste results in: • a reduction in the remaining available landfill capacity; • not reusing or recycling the waste; • lowest waste management option as set out in the waste hierarchy.	Low - (there are several landfills in the area – see *Appendix 13.1* including one that can take special wastes).	Neutral, permanent and direct. The impact would involve relatively small volumes of waste materials being transported. However, this is unlikely to be significantly different to that required if the current A14 route was retained in the study area and volumes would be low.	Neutral adverse

13.7 Mitigation

13.7.1 Measures would be implemented to reduce the impacts of material usage and waste generated by the scheme.

13.7.2 A CEEQUAL assessment is being undertaken for the client and design aspects of the scheme. The CEEQUAL assessment includes a section for materials and waste, which looks for opportunities throughout the design and construction period to conserve the use of materials through the reduction, reuse and recycling of wastes. CEEQUAL also seeks to influence the supply and use of materials through design, specification, selection, storage and use.

13.7.3 Mitigation measures for materials used on-site would be managed by the *Code of Construction Practice (CoCP)* (*Appendix 20.2*) and the *Soil management strategy* (*Appendix 12.2).*

13.7.4 To avoid the need to import earthworks materials for the scheme the use of borrow pits within the scheme footprint is proposed. *Table 13.7* confirms that the earthworks cuttings required would provide 1.7 million m^3, cut from the flood compensation areas would be 854,000m^3 and the earthworks fill required would be 6.8 million m^3. 5.8 million m^3 of fill material would be obtained from the borrow pits, which would result in 1.6 millionm^3 of additional fill available for landscaping and restoration. This additional fill can be used to mitigate potential availability risks if, for example, later ground investigations identify that borrow pits would not provide as much material as initially estimated.

13.7.5 The materials excavated from the borrow pits would be a significant and valuable resource for the scheme. Materials from the borrow pits would be used wherever practicable to construct the engineering earthworks and mitigate environmental impacts of the scheme such as transporting materials which would arise if materials were to be sourced from outside the scheme.

13.7.6 Material would also be obtained from the proposed flood compensation areas and it is anticipated that this material would also be used within the scheme. Further details on the volumes and storage of the material from the proposed flood compensation areas can be found in the *Soil management strategy* provided in *Appendix 12.2*.

13.7.7 The hierarchy of the proposed use of the excavated materials, subject to their properties meeting the engineering requirements, includes:

- high-grade construction material e.g. capping, drainage aggregate, selected backfill to structures or reinforced earth in lieu of imported aggregates;
- fill for highway embankments;
- fill for mitigation earthworks;
- fill for re-instating borrow pits and other landscaping; and
- the lowest priority would be to use material beneficially at other local sites not connected with the scheme.

13.7.8 A number of other options were considered with regards to providing material for the scheme, including disused airfields near the route that have been earmarked for redevelopment in the near future. The pavement and sub-layers of the runways may provide a sustainable source of recycled earthworks fill and capping as outlined in *Chapter 4*.

13.7.9 Any material used for the scheme (or for re-instating borrow pits) would be proven 'suitable for use' by adoption of acceptance criteria and would be deposited under either the *Environmental Permitting (England and Wales) Regulations 2010 (as amended)* or *The Definition of Waste: Development Industry Code of Practice* (Contaminated Land; Applications in Real Environments (CL:AIRE), March 2011).

13.7.10 Proposed soil storage areas and compound sites are shown on *Figure 3.1*. Further details on the mitigation and management practices with regards to soil management can be found in *Appendix 12.2* and construction compounds are described in *Appendix 3.2*.

13.7.11 Where imported material is required the choice of whether to use sustainably sourced materials and recycled or appropriately graded secondary aggregates would be made after considering a combination of factors such as source, specification, production and transport of available materials. Both reinforced concrete and steel structures include a measurable recycled content in their manufacture. Consideration would also be given to sourcing materials locally. The means of importing materials would be explored with the contractor which would include exploring the use of railheads. Transport routes for road haulage shall be identified and discussed with the highways authority.

13.7.12 Further details on carbon reducing interventions and how the impacts of embodied carbon anticipated to be generated from material use can be reduced are provided in *Appendix 13.2*.

13.7.13 It is not anticipated that there would be large volumes of green waste generated through site preparation works. The scheme would involve the clearance of largely arable land with the removal of some hedgerows and trees. Mitigation would involve the composting/chipping on-site of the green waste to act as soil improver for landscaping purposes or involve its transport off-site for composting. It is likely that during site clearance works some hard surfaces would need to be removed; this material would be reused and/or recycled wherever practicable.

13.7.14 Any topsoil or subsoil would be stripped, appropriately stored on-site and used on the scheme. Other soil material generated through site preparation activities would be used for landscaping on the scheme. Further details on the mitigation and management practices with regards to soil management can be found in the *Soil management strategy* provided in *Appendix 12.2.*

13.7.15 Any contamination identified may require soils to be treated on-site or taken off-site for treatment and/or disposal. Any asphalt waste containing coal tar waste identified when removing old road and hard standing sections would be taken off-site for disposal at a suitably. It has been identified that there is one hazardous waste management site within 10km of the scheme. Potential impacts upon geology, soils and remediation aspects of reusability of soils and aggregates are discussed within *Chapter 12*.

13.7.16 Mitigation of on-site demolition and construction waste impacts would be managed through the development and implementation of a *CoCP* and a SWMP.

13.7.17 A *CoCP* has been developed for the scheme and is provided in *Appendix 20.2*. The *CoCP* sets out a series of proposed measures and standards of work that would be applied by the Highways Agency and its main contractors throughout the construction period.

13.7.18 All material used and waste generated from the scheme would be managed in accordance with the *CoCP*. The *CoCP* requires contractors to:

- maximise opportunities for the potential reusing and recycling of all material and waste;
- sort and segregate waste in different waste types;
- manage material use to maximise the environmental and development benefits from the use of surplus material; and
- prepare and implement a SWMP.

13.7.19 Some structures have been identified for demolition before the construction of the scheme, where practicable demolition material generated would be used within the scheme footprint. Some structures would be demolished after the scheme has been completed; it is likely that the demolition material generated would not be able to be reused on-site. Opportunities for reusing this material off-site would be investigated and secured to ensure that reuse opportunities are maximised.

13.7.20 A SWMP would be prepared and implemented by the contractor prior to the start of construction to ensure that all generated wastes are evaluated against the waste management hierarchy of prevention, reuse, recycling, recovery and disposal. This evaluation would be used to derive management options that would achieve the highest practicable performance levels within the hierarchy.

13.7.21 Where waste needs to be taken off-site for reuse, recycling, recovery or disposal the SWMP would detail information on the waste carriers and the waste management facilities that would be used.

13.7.22 The SWMP would identify waste to landfill targets to work towards the aim of recovering at least 70 per cent by weight of non-hazardous construction and demolition waste in order to reflect the Highways Agency's aspirations and current government policy in addition to the other strategic targets identified in *Table 13.1*.

13.7.23 Waste prevention and reuse activities are consistent with the waste and sustainable resource use policies identified in *Table 13.1*. The *Draft National Policy Statement for National Networks* (Department for Transport, December, 2013) requires the scheme to minimise the volume of waste produced and to implement sustainable waste management through the application of the waste hierarchy. The scheme would apply the waste hierarchy in order to move waste management practices as far up the hierarchy as practicable minimising disposal and maximising re-use and recycling. Minimising the production of waste has been considered throughout the design process of the scheme.

13.7.24 Potential impacts associated with operational and maintenance materials use and waste generation would be managed through the implementation of a handover environmental management plan (HEMP), which would be prepared by the contractor before the end of construction and passed to the Highways Agency's managing agent. Further details on the content of the HEMP are provided in *Chapter 20*.

13.7.25 *Table 13.11* sets out the main impacts assumed to arise from materials and waste activities during the demolition and construction phases and the mitigation measures that can be applied to minimise their effects.

Table 13.11: Mitigation measures reporting matrix (based on Table D within IAN 153/11)

Project activity	Potential impacts associated with material resource/waste	Description of mitigation measures/ enhancement	How the measures would be implemented, measured and monitored
Site remediation and preparation	Site clearance resulting in green waste arisings.	Maximise the opportunities for composting/chipping on or off-site.	Implementation: • Provision of separate appropriately contained/bunded waste storage locations/bins for recyclable materials away from wastes for disposal. • Provision of a SWMP and *CoCP* incorporating targets for recycling and waste minimisation. Measured/Monitored: • SWMP used to measure and monitor the waste off-site. Appropriate waste and recycling facilities identified. • Materials and waste inventories/materials balance. • Materials and waste audits.
	Production of soils (suitable and unsuitable for use) from site clearance.	Maximise the opportunities for reuse and recycling via dedicated storage areas for specific waste.	
	Production of inert waste from site clearance activities.	Maximise the opportunities for reuse and recycling via dedicated storage areas for specific waste.	
	Contaminated soils and wastes from remediation activities.	Appropriate construction practices to reduce mobilisation of contamination. Off-site removal or treatment of locally impacted soil if encountered.	Implementation: • Ground investigations • Appropriate construction practices to reduce mobilisation of contamination. Measured/Monitored: • Appropriate treatment and/or disposal facilities would be identified; and • Duty of Care standard requirements.

Project activity	Potential impacts associated with material resource/waste	Description of mitigation measures/ enhancement	How the measures would be implemented, measured and monitored
Demolition	Reuse of waste materials on-site (at point of use) resulting in lowering the requirements for : • the use of primary materials; • sourcing new materials; and • landfilling waste.	Maximise the opportunities for reuse and recycling via dedicated and controlled storage areas for specific wastes and associated suitability testing.	Implementation: • Provision of separate contained waste storage locations /bins for reusable materials away from wastes for disposal. • Provision of a SWMP and *CoCP* incorporating targets for reuse, recycling and waste minimisation. Measured/Monitored: • SWMP. • Materials and waste inventories/materials balance. • Materials and waste audits.
	Storage of waste on-site for on-site reuse or off-site treatment resulting in lowering the requirement for landfilling waste.	Appropriate segregation and storage on-site.	Implementation: • Provision of separate appropriately contained/bunded waste storage locations/bins for recyclable materials away from wastes for disposal. • Provision of a SWMP and *CoCP* incorporating targets for recycling and waste minimisation. • Construction staff training re: waste minimisation and recycling. Measured/Monitored: • SWMP. • Waste consignment notes/weighbridge records. • Waste inventory.

Project activity	Potential impacts associated with material resource/waste	Description of mitigation measures/ enhancement	How the measures would be implemented, measured and monitored
	Reuse and recycling of waste materials off-site resulting in lowering the requirement for landfilling.	Maximise the opportunities for reuse and recycling via dedicated storage areas for specific waste.	Implementation: • Appropriate segregation and storage on-site and implemented through the SWMP and *CoCP.* • Construction staff training re: waste minimisation and recycling. Measured/Monitored: • SWMP used to measure and monitor the waste off-site. • Appropriate waste and recycling facilities or reuse opportunities identified.
	Use of non-landfill waste management facilities resulting in: • lowering the requirement of landfilling waste; and • utilising the available waste management capacity of the non-landfill waste management facilities.	Methods to minimise waste would be incorporated into the SWMP including the provision of facilities to separate out recyclable wastes such as metals, plastics, oils, green wastes and surplus/rejected aggregates etc. for export to the appropriate local recycling/treatment facilities.	Implementation: • Provision of separate contained waste storage locations/bins for recyclable materials away from wastes for disposal. • Provision of a SWMP and *CoCP* incorporating targets for recycling and waste minimisation. • Construction staff training re: waste minimisation and recycling. Measured/Monitored: • SWMP used to measure and monitor the waste off-site. • Appropriate waste and recycling facilities would be identified; and • Duty of Care standard requirements.

Project activity	Potential impacts associated with material resource/waste	Description of mitigation measures/ enhancement	How the measures would be implemented, measured and monitored
	Landfilling waste results in: • a reduction in the remaining available landfill capacity; • not reusing or recycling the waste; • Poorest waste management option as set out in the waste hierarchy.	If landfill is required then the landfills used would be prioritised on the basis of suitability to take the specific waste and distance to minimise transport.	Implementation: • In accordance with the waste hierarchy, waste to landfill would be minimised and implemented through the SWMP and *CoCP.* • Opportunities to use off-site soil treatment centres as alternatives to landfill for unsuitable soil would be considered where appropriate. • Construction staff training re: waste minimisation and recycling. Measured/Monitored: • SWMP used to measure and monitor the waste off-site; and • Target setting to reduce the waste sent to landfill.

Project activity	Potential impacts associated with material resource/waste	Description of mitigation measures/ enhancement	How the measures would be implemented, measured and monitored
Construction	Use of imported aggregates from new quarries results in the depletion of finite resources (note: quarry materials would only be used as back up if site won materials are not suitable).	Off-site quarry materials would only be used as back up if site won materials are not suitable. Therefore effective use of site excavated materials is essential. The proposed use of the borrow pits would significantly reduce the amount of, or negate the need, to import material. Additional methods to reduce the use of and impacts of external primary materials would be considered throughout the development of the scheme. This would include reuse of on-site materials and use of secondary/recycled materials locally and responsibly sourced.	Implementation: • Design specifications. • Procurement of secondary/recycled materials • *Soils Management Strategy* and *CoCP* subject to ongoing development and updating to allow for improved estimates for reuse of materials on-site. • Use of *CL:AIRE Code of Practice* to allow re-use of site-won materials which are suitable for the intended use. Measured/Monitored: • SWMP used to measure and monitor. • *CoCP.*

Project activity	Potential impacts associated with material resource/waste	Description of mitigation measures/ enhancement	How the measures would be implemented, measured and monitored
	Use of new materials (e.g. borrow pits) resulting in environmental impacts associated with on-site excavation activities.	On-site materials would be reused wherever practicable subject to appropriate testing for suitability for the proposed end use. Maximise the use of recycled content in new materials to at least 25%.	Implementation: • Design specifications. • Use of 'just in time delivery' where materials would be ordered when they are required; thus reducing the need to stockpile materials and also reducing wastage. • Where materials do need to be stockpiled this would be in accordance with best practice and managed appropriately to reduce wastage e.g. covering, appropriate stockpile dimensions. • Supply and procurement documentation including specifications. Measured/Monitored: • *CoCP* and SWMP; and

Project activity	Potential impacts associated with material resource/waste	Description of mitigation measures/ enhancement	How the measures would be implemented, measured and monitored
	Use of imported materials (e.g. blacktop sub base, steel, concrete).	Methods to reduce the use of and impacts of external primary materials would be considered throughout the development of the scheme. This would include reuse of on-site materials and use of secondary/recycled materials locally and responsibly sourced. Where importation of materials is required, the methods of this would be explored with the contractor which would include exploring the use of railheads. Transport routes for road haulage shall be identified and discussed with the highways authority.	Implementation: • Design specifications. • Procurement of secondary/recycled materials • Supply and procurement documentation including specifications. Measured/Monitored: • *CoCP*
	Reuse of waste materials on-site (at point of use) resulting in lowering the requirements for : • the use of primary materials; • sourcing new materials; and • landfilling.	Maximise the opportunities for reuse and recycling site via dedicated storage areas for specific waste.	Implementation: • Provision of separate contained waste storage locations/bins for reusable materials away from wastes for disposal. • Provision of a SWMP and *CoCP* incorporating targets for reuse, recycling and waste minimisation. Measured/Monitored: • SWMP. • Materials and waste inventories/materials balance. • Materials and waste audits.

Project activity	Potential impacts associated with material resource/waste	Description of mitigation measures/ enhancement	How the measures would be implemented, measured and monitored
	Storage of waste on-site for on-site reuse or off-site treatment resulting in lowering the requirement of landfilling waste.	Appropriate segregation and storage on-site site via dedicated storage areas for specific waste.	Implementation: • Provision of separate appropriately contained/bunded waste storage locations/bins for recyclable materials away from wastes for disposal. • Provision of a SWMP and *CoCP* incorporating targets for recycling and waste minimisation. • Construction staff training re: waste minimisation and recycling. Measured/Monitored: • SWMP. • Waste consignment notes/weighbridge records. • Waste inventory.
	Reuse and recycling of waste materials off-site (at point of use) resulting in lowering the requirement of landfilling.	Maximise the opportunities for reuse and recycling site via dedicated storage areas for specific waste and associated suitability testing.	Implementation: • Appropriate segregation and storage on-site and implemented through the SWMP and *CoCP.* • Construction staff training re: waste minimisation and recycling. Measured/Monitored: • SWMP used to measure and monitor the waste off-site. Appropriate waste and recycling facilities identified.

Project activity	Potential impacts associated with material resource/waste	Description of mitigation measures/ enhancement	How the measures would be implemented, measured and monitored
	Use of non-landfill waste management facilities resulting in: • lowering the requirement for landfilling; and • utilising the available waste management capacity of the non-landfill waste management facilities.	Methods to segregate waste would be incorporated into the SWMP including the provision of facilities to separate out recyclable wastes such as metals, plastics, oils, green wastes and surplus/rejected aggregates etc. for export to the appropriate local recycling/treatment facilities.	Implementation: • Provision of separate contained waste storage locations/bins for recyclable materials away from wastes for disposal. • Provision of a SWMP and *CoCP* incorporating targets for recycling and waste minimisation. • Construction staff training re: waste minimisation and recycling. Measured/Monitored: • SWMP used to measure and monitor the waste off-site; • Appropriate waste and recycling facilities would be identified; and • Duty of Care standard requirements.
	Landfilling the waste results in: • a reduction in the remaining available landfill capacity; • not reusing or recycling the waste; and • lowest waste management option as set out in the waste hierarchy.	If landfill is required then the landfills used would be located within close proximity of the scheme to reduce transport distance of wastes.	Implementation: • In accordance with the waste hierarchy, waste to landfill would be minimised and implemented through the SWMP and *CoCP.* • Opportunities to use off-site soil treatment centres as alternatives to landfill for unsuitable soil would be considered where appropriate. • Construction staff training re: waste minimisation and recycling. Measured/Monitored: • SWMP used to measure and monitor the waste off-site; and • Target setting to reduce the waste sent to landfill.

Project activity	Potential impacts associated with material resource/waste	Description of mitigation measures/ enhancement	How the measures would be implemented, measured and monitored
	Increased number of vehicles on the local road network resulting in disruption to existing users, decreases in air quality and increases in noise levels.	Refer to *Chapters, 8, 12, 14, 17 and Appendix 3.2*.	
Operation and maintenance	Use of materials (primary and secondary resources) for scheme maintenance resulting in depletion of available materials.	On-site materials would be reused where practicable. Maximise the use of recycled content in new materials.	Implementation/measured/monitored: • A handover environmental management plan would be developed to consider and reduce the long-term environmental effects associated with maintenance and management of the scheme.
	Reuse of waste materials on-site (at point of use) resulting in lowering the requirements for : • the use of primary materials. • sourcing new materials; and • landfilling.	Maximise the opportunities for reuse and recycling site via dedicated storage areas for specific waste.	
	Reuse and recycling of waste materials off-site (at point of use) resulting in lowering the requirement of landfilling waste.	Maximise the opportunities for reuse and recycling site via dedicated storage areas for specific waste.	

Project activity	Potential impacts associated with material resource/waste	Description of mitigation measures/ enhancement	How the measures would be implemented, measured and monitored
	Use of non-landfill waste management facilities resulting in: • lowering the requirement of landfilling waste; and • utilising the available waste management capacity of the non-landfill waste management facilities.	Methods to further minimise waste from the scheme would be considered in the *handover environmental management plan.*	
	Landfilling the waste results in: • a reduction in the remaining available landfill capacity; • not reusing or recycling the waste; • lowest waste management option as set out in the waste hierarchy.	If landfill is required then the landfills would be located within close proximity of the scheme to reduce the transport distance of wastes.	
	Transport of materials/waste.	Refer to *Chapters, 8, 12, 14, 17 and Appendix 3.2*.	

13.8 Assessment of residual effects

13.8.1 In accordance with the methodology set out in sections 13.3 and 13.44 each potential impact has been described including their nature, magnitude and significance (see *Table 13.10*) in the absence of specific mitigation. The table describes whether impacts are considered to be positive or adverse, permanent or temporary and direct or indirect, their magnitude and significance.

13.8.2 Following the implementation of the mitigation measures as described in *Table 13.11* the likely significant effects have been subsequently determined on the three impacts that were identified as having a likely significant effect (i.e. moderate significance or above). This is set out in *Table 13.12* below.

Table 13.12: Summary of residual effects

Project activity	Activities with potential impacts on material resource/waste	Description of the impacts	Significance if un mitigated / un-enhanced	Summary of mitigation/enhancement	Residual effect significance
Site remediation and preparation	Production of soils (suitable and unsuitable for engineering use) from site clearance.	The impact would involve moderate volumes of soils being generated. Unlikely those volumes would be exported - therefore unlikely to involve transport effects.	Moderate adverse	Suitable soils would be stored and reused on the scheme for engineering fill. Other soils would be reused elsewhere on the scheme for landscaping or taken off-site for reuse or recycling.	Slight adverse
Construction	Use of imported aggregates from new quarries (note: quarry materials would only be used as back up if site won materials are not suitable) this results in the depletion of finite resources.	The impact could involve the use of low to moderate volumes of primary aggregate resources won off-site depending on what can be won and/or recovered on-site. Volumes imported may contribute to impacts associated with traffic.	Moderate/large adverse	Refer to *Chapters, 8, 12, 14, 17 and Appendix 3.2*.	Slight adverse
	Use of new materials (e.g. borrow pits) resulting in environmental impacts associated with on-site excavation activities.	The impact could involve the use of high volumes of primary aggregate resources won on-site.	Moderate/large adverse	On-site materials would be reused wherever practicable subject to appropriate testing for suitability for the proposed end use. Maximise the use of recycled content in new materials to at least 25%. Refer to *Chapters, 8, 12, 14, 17 and Appendix 3.2*.	Moderate adverse

Project activity	Activities with potential impacts on material resource/waste	Description of the impacts	Significance if un mitigated / un-enhanced	Summary of mitigation/enhancement	Residual effect significance
	Use of imported materials (e.g. blacktop, sub base, steel, concrete).	The impact would involve the use of high volumes of materials that would need to be sourced off-site.	Moderate/large adverse	Methods to reduce the use of and impacts of external primary materials would be considered throughout the development of the scheme. This would include reuse of on-site materials and use of secondary/recycled materials locally and responsibly sourced. Where importation of materials is required, the methods of this would be explored with the contractor which would include exploring the use of railheads. Transport routes for road haulage shall be identified and discussed with the highways authority.	Moderate adverse

13.9 Summary and conclusion

13.9.1 This chapter assesses the likely significant effects associated with the use of material resources and the generation of waste.

13.9.2 The scheme is a major infrastructure project and as such, construction would require the use of large amounts of materials and would generate waste which would need to be reused, recycled or disposed of. Large quantities of earth would be moved during construction.

13.9.3 Excavated material from cuttings and flood compensation areas would be used as fill material in embankments. Imported materials would primarily comprise blacktop, sub base, concrete and steel.

13.9.4 Six borrow pits would be used to supplement the fill requirement. These are located close to the point of use along the route of the scheme to reduce usage of heavy vehicles. Imported materials would be sourced with consideration for recycled content, appropriately graded secondary aggregates and transportation requirements. Haul routes would be agreed with the local authorities and will avoid unsuitable roads.

13.9.5 Green waste from vegetation clearance would be chipped and composted on-site for reuse in landscaping works where practicable. Top soils would be managed for reuse. Demolition wastes, such as from the removal of the A14 viaduct over the East Coast mainline railway in Huntingdon would be recovered for recycling and re-use off-site.

13.9.6 The contractors would be required to implement site specific waste management plans and to maximise diversion from landfill by re-use, recycling and recovery. The contractors would record and monitor their environmental performance and compliance with regulatory controls.

13.9.7 During site preparation large volumes of soils would be removed. Suitable top soils would be reused on-site for landscaping. Other soils would be used for engineering purposes or taken off-site for reuse and/or recycling. Overall a slight adverse effect is identified for this aspect of the assessment.

13.9.8 During construction the need for imported aggregates would be reduced by re-use of excavated materials from works cuttings and from flood compensation areas. Overall a slight adverse effect is identified for this aspect of the assessment. The earthworks quantities requirements for the scheme is large and would be met by using material from borrow pits within or close to the area of the scheme. Overall a moderate adverse effect is identified for this aspect of the assessment. There is also a requirement for a large amount of imported material (such as blacktop, sub base, concrete, and steel) which would need to be sourced off-site these would be sourced with consideration for recycled content and transportation requirements. Overall a moderate adverse effect is identified for this aspect of the assessment.

13.9.9 As an additional part of the assessment the magnitude of the impact of the embodied carbon contained within the main materials to be used on the scheme was assessed as major. However, with the amount of material and waste that will be reused on the scheme the overall demand for materials off-site sources is reduced.

13.9.10 The operation of the scheme is expected to give rise to neutral effects.

Table 13.13: Summary of effects

Description of effect	Project activity (site remediation and preparation, demolition, construction or operation)	Mitigation	Significance of effect
Use of raw materials			
Depletion of primary materials.	Site remediation and preparation	Wherever practicable materials generated on-site through site preparation, including top soil and sub-soils would be reused on-site in accordance with the waste hierarchy.	Slight – waste reuse would be maximised on-site.
	Construction	The earthworks requirements for the scheme would be met by using materials from the borrow pits within the scheme footprint. If practicable, this would either negate or significantly reduce the need to import aggregates.	Moderate – the use of site won and secondary materials would be maximised.
		The impact would involve the use of high volumes of materials that would need to be sourced off-site. The methods of importing the materials would be explored with the contractor which would include exploring the use of railheads. Transport routes for road haulage shall be identified and discussed with the relevant highways authority.	Moderate – the use of sustainable transport methods would be explored.

Description of effect	Project activity (site remediation and preparation, demolition, construction or operation)	Mitigation	Significance of effect
	Construction	Wherever practicable materials for all products used on the scheme would be procured on the basis of having some recycled content and thus would assist with achieving the Highways Agency's Procurement Strategy target of "*25% of products (minimum) used in construction projects from schemes recognised for responsible (sustainable) sourcing"* (Highways Agency, 2009). Wherever practicable waste materials generated on-site, including top soil, sub soils and demolition wastes would be reused on-site in accordance with the waste hierarchy to replace primary resources.	Slight/neutral – the reuse of site derived wastes and secondary materials would be maximised on-site.
	Operation	A handover environmental management plan would be developed to consider and reduce the long-term environmental effects associated with maintenance and management of the scheme.	Neutral – unlikely to be significantly greater than that associated with the current A14.
Waste generation			
Use of local construction and demolition waste management and composting facilities.	Site remediation and preparation	Green waste generated through site clearance activities would be taken off-site and transferred to local composting waste management facilities.	Neutral/slight - Waste taken off-site unlikely to have a major impact on local waste management facility capacity.

Description of effect	Project activity (site remediation and preparation, demolition, construction or operation)	Mitigation	Significance of effect
	Demolition and construction	Wherever practicable waste materials generated on-site, including top soil, sub soils and demolition wastes would be reused on-site in accordance with the waste hierarchy. It is not proposed for this waste to be transferred to local construction and demolition reuse and recycling waste management facilities, if avoidable.	Slight/neutral – waste reuse would be maximised on-site.
		Some of the construction/demolition waste generated would not be suitable for reuse on the scheme such as materials of inappropriate composition and any identified contaminated material. However, as the majority would be inert wastes which would be either recycled or reused, it is assumed that the effect on local waste treatment and landfill capacity would be minimal given that.	Slight/neutral
	Operation	Some of the operational waste generated through the maintenance of the scheme would not be suitable for reuse such as materials of inappropriate composition. Where practicable opportunities for recycling would be maximised.	Neutral – unlikely to be significantly greater than that associated with the current A14.

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