18 Materials

18.1 Introduction

18.1.1 This chapter presents the results of the Design Manual for Roads and Bridges (DMRB) Stage 2 assessment of the route options for the A9/A96 Inshes to Smithton scheme (hereafter referred to as the proposed Scheme) in relation to the likely use of material resources and the generation and management of waste.

18.1.2 There are many ways that material use and the generation of waste can impact upon the environment, such as impacts associated with the extraction of raw materials, release of carbon during extraction and processing, the use of water in refinement, fuel use in transportation, leaching of contaminants during construction and use, and other issues associated with disposal and storage.

18.1.3 Road schemes require significant quantities of 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, have the potential to have an adverse impact on the environment.

18.1.4 This assessment does not attempt to extensively quantify the impacts of material use and the generation of waste for the different route options, but rather, uses estimates of quantities and costs of known materials and an indication on likely types of waste to highlight the potential for impact, and allow differentiation and comparison between the route options.

18.1.5 The chapter is supported by the following figure which is cross referenced where relevant:

- Figure 18.1 (Operational Waste Management Sites).

18.2 Approach and Methods

Scope and Guidance

18.2.1 For the purposes of this assessment, 'materials' are defined according to guidance in DMRB Volume 11, Section 3, Part 6, HD212/11 Materials (Highways Agency, Scottish Executive Development Department, The National Assembly for Wales and The Department of Regional Development Northern Ireland, 2012), (hereafter referred to as HD212/11) as comprising the:

- '*use and consumption of material resources for the construction, improvement and maintenance of roads; and*
- *production and management of wastes resulting from the construction, improvement and maintenance of roads.'*

Material Resources

18.2.2 HD212/11 sets out that:

> '*material resources encompass the materials and construction products required for the construction, improvement and maintenance of the road network. Material resources include raw materials, such as aggregates and minerals from primary, secondary or recycled sources, and manufactured construction products*' (Highways Agency, Scottish Executive Development Department, The National Assembly for Wales and The Department of Regional Development Northern Ireland 2012, p. 6 paragraph 2.3).

18.2.3 The guidance explains that manufactured construction products can include the construction of road surfacing, bridges, gantries, signage, barriers, lighting and fencing. It also recognises that

some material resources for construction of a scheme would originate off-site and some would arise on-site, such as excavated soils or recycled road planings and other recovered material from demolished buildings and carriageways. The production, sourcing, transport, handling, storage and use of these materials, as well as the disposal of any surplus, have the potential to adversely affect the environment.

Generation, Management and Definition of Waste

18.2.4 In considering material resource use and waste management, it is important to define when, under current legislation, a material is considered to be waste. HD212/11 does not provide an independent definition, however, waste is defined by Directive 2008/98 of 19 November 2008 of the European Parliament and of the Council on waste [2008] (Waste Framework Directive (WFD)) as *'any substance or object which the holder discards or intends or is required to discard*' (Article 3 (1)).

18.2.5 HD212/11 acknowledges that most roads projects are likely to result in the production of surplus materials and waste. The waste primarily comes from two sources:

1) existing site materials, such as excavation of materials from earthworks and concrete from the demolition of existing structures or road planings; and

2) materials brought onto site but not used for the original purpose, including damaged materials, off cuts and materials surplus to demand.

18.2.6 Some types of waste are harmful to human health, or to the environment, either immediately or over an extended period of time. These are called hazardous wastes. Hazardous waste is defined in the WFD as: '*waste which displays one or more of the 15 hazardous properties listed in Annex III of the revised Waste Directive*' (Article 3 (2)).

18.2.7 Once 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 of the WFD. The WFD sets out that a waste may cease to be a waste where:

- *'The substance or object is commonly used for specific purposes;*
- *There is an existing market or demand for the substance or object;*
- *The use is lawful (substance or object fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products); and*
- *The use will not lead to overall adverse environmental or human health impacts'* (Article 6 (1) and (2)).

Methodology

18.2.8 The assessment follows the HD212/11 guidance for a 'Simple Assessment'. This assessment focuses on the potential construction impacts arising from the use of material resources during construction and the production, processing, and disposal of wastes for the route options. The operational impacts on material use and waste generation have not been considered in this assessment as they are likely to be minor and therefore not a key factor for route option differentiation.

18.2.9 The purpose of a 'Simple Assessment' is to assemble data and information that is readily available to understand the likely environmental impacts of each of the route options in relation to materials used and waste generated. The Simple Assessment is used where it is not possible to quantify material requirements and forecast waste generation in detail. 'Detailed Assessment', as defined in HD212/11, would be carried out at DMRB Stage 3 for the preferred option.

18.2.10 The assessment identifies the magnitude of potential impacts for each of the route options, based on the following information for each route option:

- total estimated quantities of materials required for construction;
- estimates of the number of structures to be demolished;
- estimates of the number and / or cost of new structures; and
- estimated types of waste and the identification of potentially contaminated sites.

18.2.11 HD212/11 guidance for a 'Simple Assessment' also states *that 'where the project is at the planning or options selection stage and quantifiable information on material resources and waste is not available it should be possible to undertake a qualitative assessment based on the information available. This should be based on a comparison of the options presented to provide an indication of the relative magnitude of materials use and forecast waste generation from each option'* (Highways Agency, Scottish Executive Development Department, The National Assembly for Wales and The Department of Regional Development Northern Ireland 2012, p 28, paragraph 4.37).

18.2.12 This assessment includes material estimates for each of the route options, and where material volumes could not be estimated (e.g. for structures), the anticipated number or cost of structures has been taken as a proxy for the volume of material required. As such, the values underpinning this assessment are indicative only; and based on the DMRB Stage 2 level of design, limited ground/site information, and professional judgement. Therefore, this 'Simple Assessment' largely focuses on comparison of the route options and whether the impacts of one are likely to be more significant than the others. Significance criteria will be adopted in the DMRB Stage 3 assessment for the preferred option.

18.2.13 It is outside the scope of this assessment to consider the environmental impacts associated with the extraction of raw materials and the manufacture of products. It is expected that the impacts associated with the extraction of materials and manufacture of products have been the subject of separate consent procedures (such as applications for planning permission), which may have included environmental assessments.

18.2.14 Further considerations related to the Materials Assessment are addressed separately within other chapters. Section 2.30 of HD212/11 advises that there should be "*appropriate liaison between specialists working on the respective topic areas*". The most significant inter-relationship with the materials topic is with soils and geology, given the understanding required regarding the nature of the materials. The interrelationships also include dust, noise and traffic movement associated with demolition activities, the collection and removal of waste, and the supply of materials.

18.2.15 While the use of materials and the production of waste can affect the full range of environmental media and assessment topics, their effect on the wider environment has been assessed within each of the other technical chapters in this Report, as follows:

- Soils and contaminated lands. The link between this topic and the materials chapter includes the classification of contaminated soils, remediation of contaminated soils, on site treatment of contaminated soils and re-use of excavated sub strata and soils. Please see Chapter 13 (Geology and, Soils).
- Humans, particularly local residents, and commercial businesses, please see Chapter 10 (Noise and Vibration), Chapter 9 (Air Quality) and Chapter 17 (People and Communities: Community and Private Assets).
- Wildlife and its habitats; information on habitats and protected species is provided in Chapter 12 (Ecology and Nature Conservation) and associated appendices and figures.

Material Resources

18.2.16 Estimates of material requirements and potential waste generation were made as per paragraph 18.3.11. These estimates take account of aspects such as the alignment of the route options and the consequent road cuttings and embankments that may be required, typical requirements for the length and area of roads infrastructure, and the requirement for the demolition, re-use or new provision of structures such as bridges.

18.2.17 Quantities (m^3) of imported materials required for each route option were assessed using estimates for the following:

- bulk earthworks (soil and rock);
- road infrastructure, referred to as 'pavement' in engineering terms (bituminous); and
- pavement foundation (sub-base).

18.2.18 The approximate cost of the structures (e.g. bridges and culverts) required for each of the proposed route options was also included in this assessment, on the basis that the number of structures and / or the cost is directly related to the quantity of materials required for its construction.

Generation and Management of Waste

18.2.19 At this stage in the design process (DMRB Stage 2), there is limited information available regarding the quantities of waste likely to be generated by each route option. Where large quantities of material need to be imported or disposed of off-site however, this represents an adverse impact. The aim at the detailed design stage for any route option would be to reduce the amount of materials to be imported or disposed of off-site.

18.2.20 Without further testing of the limited volume of materials to be excavated, it is difficult to quantify what amount would be suitable for re-use. We have assumed however that the embankments will require the specification of Class 1 fill, and in order to present a robust worst case scenario, this assessment has assumed that approximately 50% of the cut material would be unacceptable for re-use. Some recovered materials which may not be suitable for use in the construction of the road directly could potentially be used in other aspects of construction, such as the creation of landscaping bunds. 95% of topsoil excavated should be suitable for re-use. It should also be noted that the amount of cut materials is not considered to be significant in relation to the quantities of fill materials required.

18.2.21 Information is available on potentially contaminated land sites. The number of sites which have the potential for direct interaction with contaminated land has been considered for each of the proposed route options. Interaction with contaminated land could potentially result in the generation of hazardous waste that would require treatment at hazardous waste facilities. The number of structures that would need to be demolished for each route option can also be estimated, although it should be noted that these measures do not provide a quantification of the waste to be generated from these activities, but only provide an indication of potential sources of waste. Further details are provided in Chapter 13 (Geology and Soils) and Chapter 17 (People and Communities: Community and Private Assets).

18.2.22 This assessment also considers whether each of the route options would require the clearance of areas of woodland, which could result in the generation of organic waste requiring disposal. Where possible, any surplus organic materials would be re-used or recycled through on-site landscaping or ecological improvement works, however composting at an external waste management facility may also be an option.

18.2.23 The assessment has assessed the waste management infrastructure that is likely to be available to treat and dispose of waste generated by the project. The most up to date information available on

landfill capacity was obtained from Scottish Environmental Protection Agency's (SEPA's) Landfill Sites and Capacity Report for Scotland 2014 (SEPA 2014a).

Study Area

18.2.24 The study areas for this chapter have two types of boundary. The first boundary encompasses The Highland Council area for the locations of source materials and waste management infrastructure. Moray and Aberdeenshire Council areas, have been included for regional context.

18.2.25 The second is limited to the individual footprints of the route options within which materials would be used and wastes generated and stored prior to off-site management. Land that may be used temporarily during construction has not been included as this information is not yet known, however, it is assumed that these areas would be broadly comparable / consistent between the route options. Such temporary land may include construction compounds, temporary storage areas for soils and other materials, land for temporary construction site drainage, and haul roads. Chapter 7 (Overview of Environmental Assessment) contains a detailed overview of the study area.

Baseline Conditions

18.2.26 All of the route options have the potential to impact upon local waste infrastructure and raw material resource availability; the conditions specific to each route option have been presented in Section 18.4 (Baseline Conditions). However, in contrast to other environmental DMRB Stage 2 topic assessments, this chapter does not consider impacts in terms of changes to these baseline conditions. It focuses primarily on material import/export and wastes rather than changes to an existing situation, and provides background on materials and waste as relevant to this project.

18.2.27 The baseline conditions have been considered, where possible, according to conditions likely to be present at the commencement of construction which, for the purposes of this assessment, is assumed to be in 2019.

Impact Assessment

18.2.28 Impacts from the use of material resources and the generation and management of waste, such as resource depletion and carbon release, are largely dispersed or generalised, rather than affecting specific geographically-bounded receptors. Therefore, potential impacts are determined from a consideration of the anticipated quantities of material required and waste likely to be generated. More detailed information on assessment methods is given separately for material resources and waste in the following paragraphs.

18.2.29 Information is available on the following activities, which are expected to generate waste:

- felling of woodlands during the construction period is expected to result in the generation of wood waste, for which a suitable end-use (e.g. re-use, recycling or treatment) would be required;
- direct interaction with contaminated land sites is expected to result in the generation of hazardous waste, which would require treatment at appropriately licensed facilities suitable for treating this type of waste; and
- demolition of buildings is expected to result in the generation of demolition waste, for which a suitable end market (re-use, recycling or disposal) would be required.

18.2.30 The assessment of potential impacts has been undertaken with consideration of:

<u>Materials</u>

- regulatory and policy requirements;
- information about construction methods and techniques in relation to materials;

- materials management, recycling / re-use within the proposed Scheme; and
- types and quantities of construction materials and products required for each phase of the proposed Scheme.

Waste

- regulatory and policy requirements;
- the waste hierarchy (prevention, re-use, recycling and recovery);
- types, locations and capacities of identified waste management facilities (including disposal sites); and
- types, quantities and classification of waste forecast to be produced at each phase of the project, including disposal routes.

18.2.31 Receptor and resource baseline types likely to be at risk of impacts include the following:

- Resource depletion through the requirement for the use primary aggregates from quarries, other sources of minerals and other finite raw material resources; specific sources of raw materials to be used for the proposed Scheme have not yet been identified.
- Ground conditions of the site and contaminated land sites as set out in Chapter 13 (Geology and Soils).
- Registered landfill sites; there are 12 in the study area (including Aberdeenshire and Moray Council).
- National and local policy targets relevant to materials and wastes as set out in Section 18.3 (Legislative and Policy Background) of this chapter.
- Surface Water Features (SWFs) and Groundwater resources. Further baseline information is provided in Chapter 12 (Ecology and Nature Conservation) and Chapter 13 (Geology and Soils) of this report.
- Human beings, particularly local residents and commercial business. See Chapter 10 (Noise and Vibration), Chapter 9 (Air Quality) and Chapter 16 (People and Communities: Community and Private Assets).
- Habitats and protected species and in particular woodlands as addressed in Chapter 12 (Ecology and Nature Conservation) of this report.

  The global climate and resultant greenhouse gas emissions is discussed in Chapter 9 (Air Quality) of this report.

Mitigation

18.2.32 Potential mitigation measures have been considered during this assessment and take into account best practice, legislation, guidance and professional experience.

18.2.33 As described in Part 1: Chapter 1 (Scheme Background) and Part 3 (Chapter Overview of Environmental Assessment) the mitigation commitments and monitoring frameworks identified in the Strategic Environmental Assessments (SEAs) for the Strategic Transport Projects Review (STPR) (Jacobs, 2008) have also been taken into consideration in relation to the mitigation proposals.

18.2.34 The mitigation commitment relevant to the Materials Assessment detailed within the STPR SEA is detailed below:

- "*Fully consider the use of secondary or recycled aggregates in the construction of interventions. There are no construction and demolition recycling targets detailed in the*

Scottish National Waste Strategy, however in England the Government (Defra 2007) is considering a target to halve the amount of construction, demolition and excavation waste going to landfill by 2012, as a result of waste reduction, reuse and recycling. Scotland could also introduce a similar target."

18.2.35 The specific mitigation measures in relation to the route options are discussed further in Section 18.6 (Mitigation).

Limitations to Assessment

18.2.36 Baseline information, potential impacts and mitigation are described based on available information. Estimated quantities are approximate, based on the available information following the development of the route options.

18.2.37 The level of detail provided at this time is limited by the available design information which is required to estimate material use and waste management. Estimates will be refined at later stages when additional design information is available (i.e. design development during DMRB Stage 3, pre-construction preparation or during the construction period).

18.2.38 The type and quantity of materials required during the operational and maintenance phase are not included in the assessment. It is anticipated that the variation in operational impacts between the route options would be small and is not considered to be a key factor for route option differentiation. Therefore, operational impacts fall outside the scope of this assessment. Information regarding haulage distances for delivery of materials and the removal of waste is not available and is therefore not included in the assessment. The source of materials and the location of where any waste would be treated would be generally determined by the contractor(s) appointed to construct the proposed scheme. Although exact disposal / treatment sites are not fully known at this stage of the assessment (DMRB Stage 2), local waste site capacity has been presented in Section 18.4 (Baseline Conditions).

18.2.39 The extent and quantum of contaminated land cannot be determined at this stage (DMRB Stage 2), and as such, it is not possible to confirm the amount and type of contaminated land likely to be removed from site. However, the number of direct interactions with potentially contaminated land sites can be estimated. Ground investigations during the DMRB Stage 3 assessment would assist in identifying contaminated land and quantifying the amount to be directly impacted by the preferred option.

18.2.40 The assessment for this project has been undertaken assuming that approximately 50% of excavated cut material would be unacceptable for re-use. This assumption is based on current knowledge of materials/ground conditions, but the actual amount of materials suitable for re-use would be determined by on-site observations and chemical analysis, and therefore could represent a larger or smaller percentage.

18.2.41 The above limitations are typical of a DMRB Stage 2 assessment, and the assessment reported in this chapter is considered of an appropriate level to provide an assessment of the route options. Further information on the source and quantity of materials and waste would be considered as part of the DMRB Stage 3 assessment following the selection of a preferred option.

18.3 Legislative and Policy Background

18.3.1 Appendix A8.1 (Planning Policy Context for Environmental Assessment) describes the planning policies and guidance from national to local level which are relevant to this chapter. An assessment of the compliance of the route options against all development plan policies relevant to this environmental topic is reported in Appendix A8.2 (Assessment of Development Plan Policy Compliance) and a summary overview is provided in Chapter 8 (Policies and Plans).

18.3.2 As set out in HD212/11 the following are the key strategies in regard to materials:

- Securing the Future - The UK Government Sustainable Development Strategy 2005; and
- EU Sustainable Development Strategy – Renewed Strategy 2006.

18.3.3 Securing the Future – the UK Government Sustainable Development Strategy 2005 (H.M. Government 2005) presents the vision of a '*one planet economy*' and encourages businesses to consider the implications that sustainable consumption and production will have on their business models and product / service ranges. It further asserts that consumers today demand higher environmental and ethical standards from businesses and that those, '*that anticipate this trend and develop 'material light' goods and services will be best placed to benefit from these opportunities and to enhance their competitiveness*' (H.M. Government 2005, p.46).

18.3.4 The EU Sustainable Development Strategy sets out a single, coherent strategy on how the EU will more effectively live up to its long-standing commitment to meet the challenges of sustainable development. It recognises the need to gradually change our current unsustainable consumption and production patterns and move towards a better integrated approach to policy-making.

18.3.5 The above strategies identify the following priorities: sustainable consumption and production; climate change; and natural resource protection. The principle of achieving 'more with less' has been investigated as part of this assessment and has directly shaped the proposed mitigation.

18.3.6 In Appendix 4 of 'Understanding the Definition of Waste' (SEPA 2006), SEPA set out a procedure for evaluating the full recovery of waste, and guidelines to determine when waste may cease to be waste. In 2013, approximately 6.2 million tonnes of waste was generated by construction and demolition compared to 2.4 million tonnes of waste generated by households. Scotland's 'Zero Waste Plan 2010' (Scottish Government 2010) sets out the Scottish Government's vision for a zero waste society. This describes a Scotland where all waste is viewed as a resource; waste is minimised; valuable resources are not disposed of to landfill; and a majority of waste is sorted, leaving a minimal volume of waste requiring treatment. To achieve this, the Plan sets out measures, including:

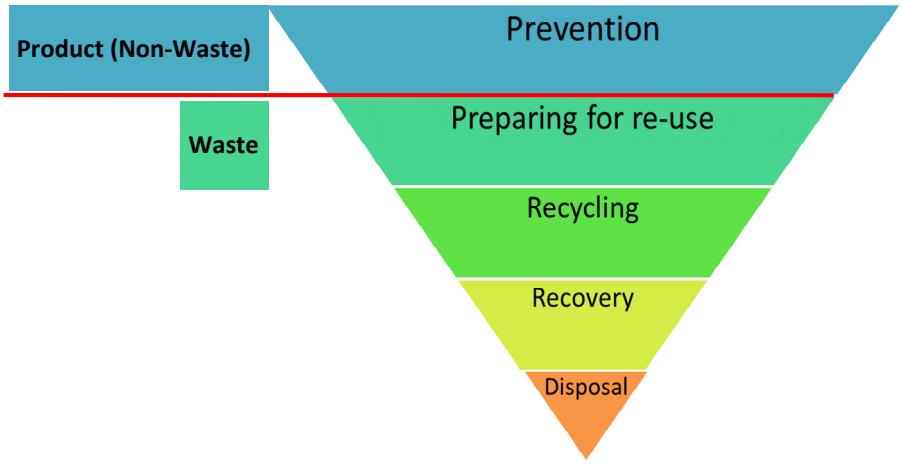
- development of a Waste Prevention Programme for all wastes, ensuring the prevention and re-use of waste is central to all of the Scottish Government's actions and policies; and,
- two new targets applying to all waste by 2025: 1) 70% recycled; and 2) a maximum of 5% sent to landfill.

18.3.7 The Waste Prevention Programme was published in October 2013 and is called 'Safeguarding Scotland's Resources – Blueprint for a More Resource Efficient and Circular Economy' (Natural Scotland 2013b). The Plan aims to cut 7% of all waste in Scotland by 2017 and 15% by 2025.

18.3.8 'Low Carbon Scotland: Meeting our Emissions Reduction Targets 2013 – 2027' (The Scottish Government 2013a) reiterates the targets provided in the Waste Prevention Programme, however it also states the aim of recycling all waste with no landfill by 2050.

18.3.9 Waste management is structured around a 'waste hierarchy' which defines the order of preference of the various waste management options. Diagram 18.1 illustrates the waste hierarchy as per the WFD.

Diagram 18.1: The Waste Hierarchy



18.3.10 The waste hierarchy ranks waste management options according to what is best for the environment. It gives top priority to preventing waste in the first place. When waste is created, it gives priority to preparing it for re-use, then recycling, then recovery, and last of all disposal (e.g. landfill).

18.3.11 Generally, all relevant waste and resources management legislation and policy drivers aim to increase the efficiency of resource use, minimise waste, maximise the re-use/recycling/recovery of waste and reduce carbon emissions.

18.3.12 The following sections expand on the content of local devolved Scottish policy relevant to materials assessment and waste management.

Transport Scotland Corporate Plan (2012 – 2015)

18.3.13 Published in 2012, Transport Scotland's Corporate Plan sets out guidance for delivering increased sustainable economic growth (Transport Scotland 2012). The Corporate Plan's notional end date was 2015 and the Transport Scotland Annual Business Plan (2015-2016) sets out that the Corporate Plan has been: *'extended for one additional year'* (Transport Scotland 2015, p.3). Ensuring the protection and enhancement of Scotland's environment is a key consideration during the construction and maintenance of transport infrastructure. As such, the following key commitments are relevant to Materials and Waste:

- '*Fully integrate our Carbon Management System (CMS) to influence and support low-carbon decision-making across the design and delivery of transport infrastructure projects and network maintenance;*
- *Utilise our CMS, in tandem with our Carbon Management Plan, to facilitate annual sustainability reporting;*
- *Embed resource efficiency into our practices and adopt the next generation of Waste and Resources Action Programme (WRAP) Construction Commitments; and*
- *Support sustainable design, construction, maintenance and operations through the adoption of infrastructure assessment schemes*' (Transport Scotland 2012, p.15).

Climate Change (Scotland) Act (2009) ('the Act')

18.3.14 The Act sets out Scotland's strategy for the reduction of greenhouse gas (GHG) (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride) and a transition to a low carbon economy. Part 1 of the Act creates the statutory framework for

greenhouse gas emissions reductions in Scotland by setting an interim 42% reduction target by 2020 relative to 1990 emissions levels, with the power for this to be varied based on expert advice, and an 80% reduction target for 2050 (also relative to 1990 emissions).

18.3.15 Part 4 of the Act places duties on public bodies (including Transport Scotland) in relation to climate change. These duties require that a public body must, in exercising its functions, act in a way that is best calculated to contribute to the delivery of emissions reductions targets (termed climate change 'mitigation'), assists in the delivery of statutory climate change adaptation programmes and is considered to be the most sustainable. In the case of Transport Scotland, this includes delivering infrastructure projects sustainably in line with the Scottish Government's aim to achieve *'Almost complete decarbonisation of road transport by 2050 with significant progress by 2030 through wholesale adoption of electric cars and vans, and significant decarbonisation of rail by 2050' as* stated on p.29 of the Climate Change Delivery Plan 2009.

Scotland's Zero Waste Plan (2010)

18.3.16 Scotland's Zero Waste Plan (Scottish Government 2010) outlines a strategy for a zero waste society which in turn will help to achieve the targets set out in the Climate Change (Scotland) Act (2009) of reducing Scotland's (GHG) greenhouse gas emissions by 42% by 2020 and 80% by 2050.

18.3.17 The Plan's objectives include:

- Eliminating the unnecessary use of raw materials, leading to further reductions in GHG emissions in areas such as mining of raw materials, manufacturing, and transport. Financial savings are also made through recycling and recovering value from materials.
- Producing energy savings from the manufacture of products from recycled materials in preference to raw materials.
- Construction and Demolition waste are highlighted as an area in which future policy can be developed to support higher targets and recovery levels in this area. This is proposed to be achieved through the collection of more robust data on these waste types, their composition and their waste management methods.

18.3.18 Furthermore, in relation to the use of materials, the Plan's vision is to: 'Reduce Scotland's impact on the environment, both locally and globally, by minimising the unnecessary use of primary materials, reusing resources where possible, and recycling and recovering value from materials when they reach the end of their life' (Scottish Government 2010, p.3).

The Highland Council Waste Management Strategy

18.3.19 The Highland Council and Moray Council (note that none of the route options fall within the jurisdiction of Moray Council) work closely in the area of waste management and the two councils produced a joint Waste Strategy Report in 2009 (The Highland Council and Moray Council 2009) to identify services and treatment facilities that would be required to achieve their respective waste targets. The chosen option comprised the development of three efficient recovery of energy from waste (EfW) plants in Highland, one in Moray and in-vessel composting (IVC). After the adoption of Scotland's Zero Waste Plan in 2010 and the introduction of The Waste (Scotland) Regulations 2012, both Councils reviewed their strategies to ensure that their services and treatment facilities were in line with the revised legislation.

18.3.20 The Highland Council issued an 'Update on Waste Strategy' in 2014 (The Highland Council 2014) which presented a business case in support of the approval previously given in 2009 for three appropriately sized and sited EfW facilities in Skye, Caithness and Inverness. It is recommended that development of these three EfW plants best supports the goal of '*locally based solutions which can be delivered on an incremental basis'.*

The Strategic Transport Projects Review

18.3.21 The Strategic Transport Projects Review (STPR) Strategic Environmental Assessment (SEA) (Jacobs 2008) has developed a series of strategic environmental assessment objectives for the STPR which includes the following relevant to this Materials Assessment:

- "*Make prudent use of natural resources such as minerals and aggregates in the improvement of transport infrastructure*"; and
- "*Minimise waste by re-using and recycling materials where possible in the construction of transport infrastructure*";

18.3.22 The STPR SEA also presents the findings of a bespoke sustainability appraisal on the STPR Key Strategic Outcomes (KSOs) to illustrate how these conform to overall Scottish sustainability aspirations**:**

- KSO1: Improved Journey Times & Connections.
- KSO2: Reduced Emissions.
- KSO3: Improve Quality, Accessibility and Affordability.

18.3.23 KSO2: Reduced Emissions sets out to tackle the issues of climate change, air quality and health improvement. Recognising the challenges of reducing emissions, the overall objective for the transport network is to adopt a stepped approach to reducing transport emissions towards 2050:

- reduce CO_2 emissions per person km;
- stabilise total CO_2 emissions; and
- reduce CO_2 emissions in line with expectations from the emerging Climate Change Bill (60% reduction by 2020 / 80% reduction overall by 2050).

18.4 Baseline Conditions

Materials

18.4.1 There is capacity to supply minerals and aggregates from within the Highland and The Moray Council areas. The adopted Highland-Wide Local Development Plan states that:

'*the Council will seek to ensure that a landbank of approved reserves in each market area is sufficient at all times to meet the needs that are expected to arise in the following ten-year period*' (The Highland Council, 2012, p.104).

18.4.2 The adopted Moray Local Development Plan states under Policy ER4 that minerals will: *'ensure that there is a minimum 10 year landbank of permitted reserves for construction aggregates'* (The Moray Council, 2015, p.64).

18.4.3 A number of quarries in the area are being considered for the sourcing of aggregates, and it would be the intention that as much of the material as possible would be sourced locally. It is up to the contractor appointed to construct the proposed Scheme to source materials for the project and typically they would look to use local suppliers and to re-use materials on site to reduce costs. The use of such material would be controlled in accordance with specifications within the Manual of Contract Documents for Highway Works (MCHW). Table 18.1 lists a number of quarries that could potentially be used in the vicinity of the route options. These include Caledonian Quarry Products east of Blackcastle, Breedon Aggregates at Daviot (Breeden Asphalt Plant), and Leiths Quarry, Forres. Due to European Union competition regulations, it is not possible to prescribe materials sources, however, it can reasonably be inferred that there is likely to be an adequate supply of such aggregate from local sources.

Table 18.1: Active Quarries in the Area of the Route options

Quarry	Distance from Gollanfield	Resource Available	Quantity Available
Achilty Quarry (Leiths)	29 miles	Aggregate and Recycled Aggregate	Not Known
Mid Lairg Quarry (Daviot A Ross & Sons)	16 miles	Sand, Gravel, Road Base, and Recycled Aggregate	6,000 tonnes per day
Balblair Quarry (Breedon Aggregates)	22 miles	Aggregate and Recycled Aggregate	Not Known
Blackcastle Quarry – Tarmac (Caledonian Quarry Products)	3 miles	Sand and Gravel	160,000 tonnes Subject to planning permission for quarry extension
Daviot Quarry (Breedon Aggregates)	11 miles	Asphalt	Not Known
Netherglen Quarry (Breedon Aggregates)	32 miles	Crushed Rock and Asphalt	Not Known
Lochinver Quarry – Tarmac	27 miles	Sand and Gravel	Existing reserve = 39,000 tonnes + 3 million tonnes Based on approved planning application to Moray Council (11/01792/EIA)
Gransh Quarry (David Ritchie & Sons)	39 miles	Sand, Gravel, and Recycled Aggregate	Not Known
Limehillock Quarry (Keith)	40 miles	Aggregate	Not Known
Limehilllock Quarry (Buckie)	40 miles	Aggregate	Not Known
New Forres Quarry (Leiths)	18 miles	Crushed Rock	Not Known
Dalmagarry Quarry (Pat Munro)	24 miles	Sand and Gravel	1,000,000 tonnes Based on planning application committee report dated December 2014
Classach Quarry (Duffus)	26 miles	Sandstone	Not Known
Cays Briggs Quarry - Tarmac	32 miles	Sand and Gravel	Not Known

18.4.4 The Scottish Aggregates Survey 2012 published in 2015 by The Scottish Government confirms that 35% of the total production of hard rock, sand and gravel takes place in the Highland and Moray areas (approximately 43% of hard rock and 12% of sand and gravel).

18.4.5 Around 85 to 90% of crushed rock quarried is retained within the area where it was produced; however, the exception to this rule is the coastal quarry at Glensanda in the Highlands which primarily supplies markets outside Scotland and the United Kingdom. Only 6% of the hard rock produced in the Highlands and Moray stays in the region, although 96% of the sand and gravel produced is generally used locally. The report estimates that there is an average 29 year supply for hardrock in Scotland from active sites, and a further 14 years for sand and gravel.

18.4.6 Based on the quantities of material reserves available both from local quarries and throughout Scotland, it can be reasonably inferred that, although the material demand is relatively large, the materials required for the route options would predominantly be available locally.

Waste Management

Waste Site Capacity

18.4.7 It should be noted that most of the waste generated from the Scheme, regardless of route option,

would be construction and demolition waste (C&D). The SEPA Waste Site and Capacity Report for Scotland 2015 (SEPA 2015a) identifies a total of 66 operational waste sites in The Highland Council area, 73 operational waste sites in Aberdeenshire, and 11 in the Moray Council area. Table 18.2 details the annual capacity of these sites in 2015 (excluding sites that offer only civic amenity facilities and pet crematoria), the waste that was accepted in that year and the remaining capacity at the end of 2015. The location of these sites is shown in Figure 18.1, as informed by SEPA's Scottish Waste Site and Capacity Interactive Tool (SEPA 2015b).

Table 18.2: Operational Waste Sites Permitted and Remaining Capacity in Highland, Moray and Aberdeenshire Council Areas

Waste Site Type	Operational Site Permitted Capacity (Tonnes / annum) 2015				Waste Accepted (2015)	Remaining Capacity (2015)
	Highland Council	Moray Council	Aberdeen-shire Council	Total	Total	Total
Civic amenity / Other treatment*	5,000	n/a	n/a	5,000	2,950	2,050
Civic amenity / Transfer station*	41,500	113,875	n/a	155,375	67,815	87,560
Civic amenity / Transfer station / Other treatment*	1,000	n/a	n/a	1,000	100	900
Composting	n/a	n/a	72,500	72,500	23,865	48,635
Composting / Other treatment	n/a	n/a	97,650	97,650	0	97,650
Incineration	105	n/a	n/a	105	15	90
Landfill	359,000	n/a	655,000	1,014,000	393,175	620,825
Landfill / Civic amenity*	n/a	122,000	n/a	122,000	44,050	77,950
Landfill / Civic amenity / Composting*	85,000	n/a	n/a	85,000	43,600	41,400
Landfill / Civic amenity / Other treatment*	26,000	n/a	n/a	26,000	14,415	11,585
Landfill / Other treatment	n/a	n/a	100,000	100,000	82,800	17,200
Landfill / Transfer Station / Other Treatment	n/a	n/a	75,000	75,000	60,650	14,350
Landfill / Transfer station / Composting / Other treatment	45,000	n/a	n/a	45,000	16,175	28,825
Metal recycler	6,225	27,250	29,700	63,175	13,275	49,900
Metal recycler / Transfer station	54,575	75,000	25,000	154,575	55,600	98,975
Metal recycler / Transfer station / Other treatment	87,000	n/a	n/a	87,000	3,100	83,900
Other treatment	30,600	n/a	209,500	240,100	129,700	110,400
Transfer station	429,200	n/a	667,750	1,096,950	440,000	656,950
Anaerobic Digestion	n/a	n/a	50,000	50,000	51,450	-
Transfer station / Anaerobic digestion	4,000	n/a	n/a	4,000	4,210	-
Transfer station / Composting	50,000	20,800	n/a	70,800	59,900	10,900
Transfer station / Other treatment	79,000	n/a	537,000	616,000	181,750	434,250
*sites without Civic amenity will be used in preference.						

Scotland

18.4.8 According to the SEPA Waste Site and Capacity Tool (SEPA 2015b), the total quantity of controlled waste disposed to landfill in Scotland in 2015 was 4,064,985 tonnes. Of this, 65,083 tonnes were disposed to landfill in Highland, 398,167 to landfill in Aberdeenshire, and 42,086 tonnes were disposed of to landfill in Moray. In 2015, there were 56 operational landfills in Scotland (18 inert, 37 non-hazardous and one hazardous).

18.4.9 The 18 operational inert waste landfills had a remaining capacity of 8,030,310 tonnes at the end of 2015.

18.4.10 The remaining capacity of the 37 operational non-hazardous landfills at the end of 2015 was 50,304,519 tonnes.

18.4.11 The only active hazardous landfill site in Scotland in 2015 was Avondale in Falkirk. 33,115 tonnes were landfilled at this site in 2015, leaving a remaining capacity of 164,264 tonnes at the end of the year.

Highland, Moray and Aberdeenshire Council Areas

18.4.12 The study area for the route options includes both Moray and Aberdeenshire Council areas for regional context. In 2015, two operational inert landfills and three operational non-hazardous landfills were recorded in The Highland Council area. There were three operational inert landfills and three operational non-hazardous landfills recorded in Aberdeenshire, and one non-hazardous landfill was recorded in the Moray Council area.

18.4.13 The figures for the total amount of inert waste disposed of to landfill in 2015, and the remaining capacity, for each council area are outlined in Table 18.3.

Table 18.3: Total Used and Remaining Capacity of Operational Landfills (Inert and Non-Hazardous) in Highland, Moray and Aberdeenshire Council Areas) 2015

2015 Capacity (tonnes)	The Highland Council	The Moray Council	Aberdeenshire Council	Total
Inert landfills				
Used	2,525	n/a	26,725	26,725
Remaining	71,425	n/a	2,236,025	2,307,450
Non-hazardous landfills				
Used	62,560	42,085	371,450	470,095
Remaining	802,000	145,000	2,743,400	3,690,400

18.4.14 Table 18.4 provides more details of these sites, and their location is given in Figure 18.1 (information from SEPA's Waste Site and Capacity Tool (SEPA 2015b).

Table 18.4: Permitted and Remaining Capacity of Operational Landfills (Inert and Non-Hazardous) in Highland and Moray Council Areas (Including Aberdeenshire)

Operational landfills, 2015	Annual Capacity on Permit (tonnes)	Remaining Capacity on 31 December 2015 (tonnes)	Distance and Orientation
Inert landfills			
John Gunn & Sons Limited, Skitten Quarry, Wick	25,000	71,425	Circa 120 – 150km to the north.
DW3100 LLWF Landfill, Dounreay, Highland	334,000	not known	Circa 190 – 220km to the north.
Loch Hills Quarry, Parkhill, Dyce, Aberdeenshire	100,000	1,401,025	Circa 120 – 150km to the south-east.
Park Quarry, South Deeside Road, Aberdeen, Aberdeenshire	75,000	835,000	Circa 140 – 170km to the south-east
A&M Smith, Bankhead, Portlethen, Aberdeenshire	25,000	-	Circa 140 – 170km to the south-east
Non-hazardous landfills			
Granish Landfill Site Cell 3, by Aviemore	25,000	70,000	Circa 45 – 55km to the south

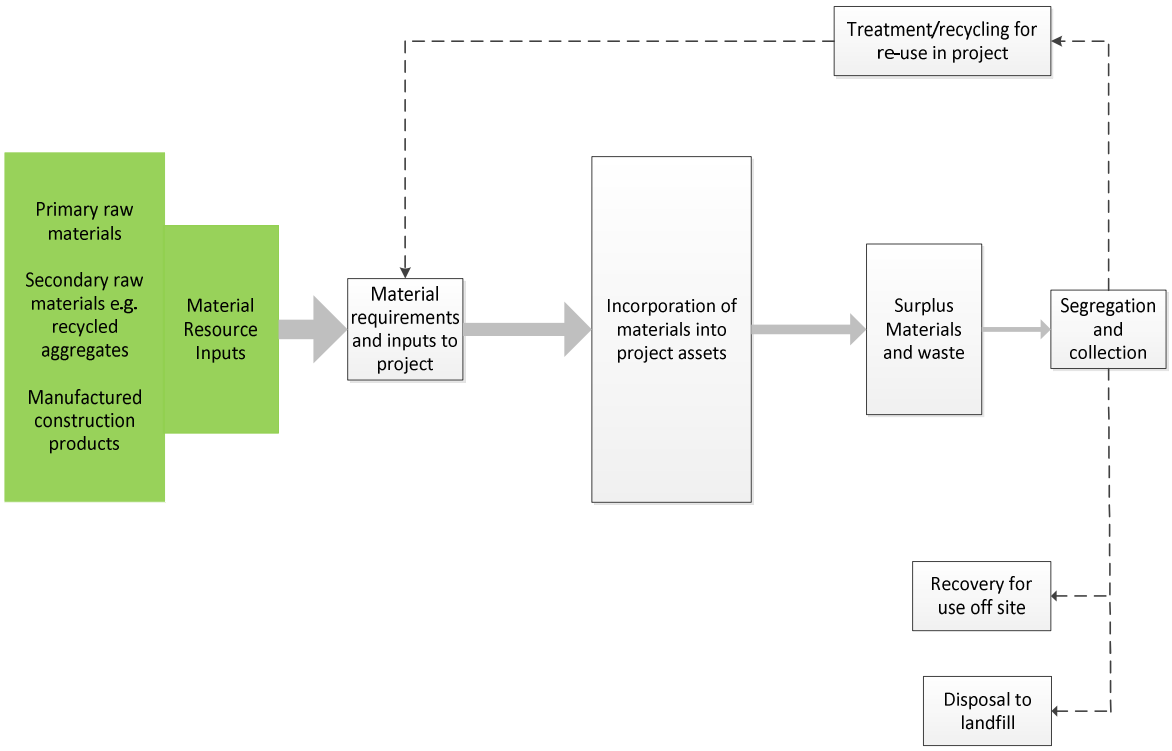
Operational landfills, 2015	Annual Capacity on Permit (tonnes)	Remaining Capacity on 31 December 2015 (tonnes)	Distance and Orientation
Seater Landfill Site, Bower, by Wick	65,000	250,000	Circa 130 – 160km to the north
Duisky Landfill Site, Kinlocheil, Fort William	24,000	482,000	Circa 180 – 210km to the south-west
Savoch Landfill, Newton of Savoch, Aberdeenshire	25,000	67,000	Circa 140 – 170km to the east
Stoneyhill Landfill Site, Aberdeenshire	355,000	2,636,400	Circa 140 – 170km to the east
Easter Hatton Farm, Balmedie, Aberdeenshire	200,000	40,000	Circa 130 – 160km to the east
Nether Dallachy Landfill Site	120,000	145,000	Circa 50 – 80km to the east
Total Capacity	1,373,000	5,867,350	

18.5 Impact Assessment

18.5.1 A detailed description of the route options is provided in Chapter 7 (Overview of Environmental Assessment), and the following section provides a summary of the environmental impacts for each in relation to material use and waste generation. The use of material assets and the generation of waste can affect the environment in various ways, including: release of carbon when extracting or processing materials; use of fuel in transportation off site; import of materials; leaching of contaminants from materials or waste; and issues associated with the disposal and storage of resources and waste materials.

18.5.2 Environmental impacts associated with material resources and the generation of waste occur at each stage of the projects material flow cycle. HD212/11 does not include a specific materials resource flow diagram; however, Highways Agency, Transport Scotland, The National Assembly for Wales and The Department of Regional Development Northern Ireland (2011) IAN153/11 (now superseded by HD212/11) provides a useful diagram recreated below in Diagram 18.2. This presents a simplified representation of materials resource flows and is still relevant for the purposes of this assessment.

Diagram 18.2: A Project's Material Flow Cycle (recreated from IAN153/11)



Material Resources

18.5.3 The types of materials likely to be required for construction are common to all road schemes. The estimated quantities of the major materials required to be imported for each route option are provided in Table 18.5. This is not an exhaustive list, but represents the key materials required.

Table 18.5: Estimated Quantity (m^3) of Materials to be Imported*

Option	Bulk Earthworks** (m^3)	Pavement: Sub Base (m^3)	Pavement: Bituminous (m^3) Material	Total (m3)
1A	293,000	10,000	10,000	313,000
1B	356,000	11,000	11,000	378,000
2A	359,000	12,000	12,000	383,000
2B	425,000	12,000	12,000	449,000
3A	134,000	9,000	9,000	152,000
3B	201,000	9,000	9,000	219,000

*All volumes are provided to the nearest 1,000m^3
**Includes topsoil and subsoils
Please note: some small differences exist in the figures for Variants A and B of each route option as a result of rounding figures up or down.

18.5.4 Materials are also required for the construction of structures, such as bridges and culverts associated with each of the route options. At this stage in the design (DMRB Stage 2), the quantities of these materials have not been estimated. However, the estimated costs of the structures for each route option are available and these are considered to reflect the quantities of material required (e.g. those route options with a higher cost are considered to require a larger

quantity of material for the construction of the associated structures). The estimated structure costs for each route option are provided in Table 18.6. These costs are provided as indicative figures for comparative assessment purposes only.

Table 18.6: Estimated Cost of Structures (£ million at Quarter 1 2015 Prices and Excluding VAT)

Option	Est. Cost Structure (£ million)
1A	3.9
1B	4.2
2A	5.8
2B	6.1
3A	2.1
3B	2.4

18.5.5 A proportion of both building materials and composite components used during the construction process will inevitably end up as waste. The Waste and Resources Action Programme (WRAP) has published a Net Waste Tool which projects typical wastage rates in order to assist contractors with construction waste management and minimisation. The Net Waste Tool is not able to forecast waste with complete accuracy, but is designed to help project teams identify their major sources of waste, and the most significant opportunities to take action.

18.5.6 Wastage rates in the Net Waste Tool exist in two forms, baseline and good practice, the latter being associated with Modern Methods of Construction (MMC). The rise of MMC has resulted in a reduction in construction waste generated on-site of up to 90% for specific building components. As MMC will be used in the construction of the proposed Scheme the good practice wastage rates for estimated materials volumes are expected to be between 0% and 5% (earthworks are dealt with separately). Given this, it can be inferred that there is likely to be adequate waste management capacity to deal with the waste arising from the Scheme, regardless of which route option is chosen, if sites in Aberdeenshire are considered in conjunction with those in Highland and Moray.

Aggregates

18.5.7 The depletion of finite natural resources could occur through extraction of primary aggregates (e.g. sands and gravels) from local or other quarries. Structures, drainage and signage products are to be procured with consideration of the environmental impacts associated with their manufacture, as well as other considerations such as structural design, carbon footprint, energy consumption, long life performance, visual impacts, durability and cost. Both reinforced concrete and steel structures include a measurable recycled content in their manufacture.

18.5.8 Existing on-site soils, infrastructure and demolition materials are considered to be potential material resources, including the following which would be generated during construction:

- Excavated natural soils and/or rocks (and made ground) produced during topsoil stripping and the construction of cuttings and embankments (collectively referred to as ‘earthworks’). These could be re-used on-site for landscaping or, potentially, for construction projects off-site.
- Road planings, which could be incorporated into new pavements on or off-site.
- Structures demolition material.

18.5.9 Imported aggregates are also likely to be required for structures, drainage and road pavement construction. These can be either primary aggregates, such as sand, natural gravels and rocks, or secondary aggregates, such as recycled concrete, recycled road planings, Incinerator Bottom Ash Aggregate (IBAA) and reclaimed railway ballast. Within The Highland and Moray Council areas there is capacity to supply minerals and quarry material.

18.5.10 The choice of whether to use primary or secondary aggregates (or a combination of both) would be made after considering a combination of factors, such as source, specification, production and transport of available materials. Secondary (recycled) aggregates may not always have the lowest impact on the environment, and materials would be selected based on a consideration of all relevant impacts.

18.5.11 Structures, drainage and signage products would also be procured with consideration of the environmental impacts associated with their manufacture, as well as other considerations such as structural design, carbon footprint, energy consumption, long-life performance, visual impacts, durability and cost. Both reinforced concrete and steel structures include a measurable recycled content in their manufacture.

Earthworks

18.5.12 The DMRB Stage 3 design would seek to achieve the optimum cut and fill balance possible for the scheme. Due to the assumption that the embankments for each of the route options would require Class 1 fill, this assessment has assumed that approximately 50% of the cut material would be unacceptable for re-use, as described in Section 18.2 (Approach and Methods). Without further testing of the materials it is difficult to quantify exactly what amount of the excavated materials would be suitable for re-use, but it is not considered likely that a cut and fill balance would be achieved.

18.5.13 All route options would require a significant amount of material to be imported, and the cut and fill estimates for each are shown below in Table 18.7. The table also shows that the quantities of cut material are not considered significant in relation to the quantities of fill material required.

Table 18.7: Cut and Fill Estimates per Option

Option	Fill (m^3)	Cut (m^3)
1A	313,000	6,900
1B	378,000	12,000
2A	383,000	7,500
2B	449,000	12,600
3A	152,000	7,600
3B	219,000	12,600

Please note: some small differences exist in the figures for Variants A and B of each route option as a result of rounding figures up or down.

18.5.14 Some additional earthworks and construction materials would likely be imported to site for specialist purposes, for example the incorporation of geotextiles (i.e. textiles that are permeable to water that can be used to reinforce structural earthworks) in earthworks can considerably reduce the quantity of fill material required by improving the strength of the material used. Similarly, this can also reduce the quantity of steel or concrete required to build structures.

18.5.15 The estimated earthworks volumes for each of the route options are shown in Table 18.8. The pavement areas have been deducted from the overall fill volumes shown in Table 18.7 in order calculate the estimated earthworks import volumes required for each route option. The estimated disposal figures represent half of the cut quantities shown in Table 18.7 as this assessment has assumed that approximately 50% of the cut material would be unacceptable for re-use and would require disposal.

Table 18.8: Earthworks Volume Estimates per Option (Excluding On-site Acceptable Material which does not require Import or Disposal)

Option	Estimated Import (m^3)	Estimated Disposal (m^3)	Balance (m^3)
1A	290,000	3,450	295,350
1B	350,000	6,000	338,550
2A	355,000	3,750	347,000
2B	419,000	6,300	405,500
3A	130,000	3,800	121,500
3B	195,000	6,300	170,500

Please note: some small differences exist in the figures for Variants A and B of each route option as a result of rounding figures up or down.

Other Impacts

18.5.16 Environmental impacts can also arise as a result of vehicle movements for the transportation of materials, and poor planning of materials re-use could lead to excessive use of plant and vehicles to move and handle bulk materials, resulting in inefficient use of energy and increased risk of spillages (e.g. of fuel and lubricants) potentially causing localised contamination of soils or surface water features. At this stage of the assessment (DMRB Stage 2) the source of materials is unknown; however, where feasible, materials would be sourced locally in order to reduce potential environmental impacts (e.g. from transport emissions) and to support local businesses.

18.5.17 Other potential impacts associated with the use of material resources in the construction phase include:

- Nuisance to local communities and damage to farmland, wildlife, habitats and surface water features as a result of wind-blown dust arising from the excavation, movement, temporary storage and permanent placement of large quantities of topsoil and subsoil.
- Pollution of surface water features by the creation of water-borne sediments, which can damage farmland, wildlife and habitats. Such impacts could occur by locating unmanaged stockpiles of materials close to surface water features or drainage. Silting of surface water features and drainage can occur if water containing silts (e.g. from dewatering of excavations) is not managed appropriately.
- Flooding or disruption of the existing drainage network could be caused by poor stockpile management and the creation of additional impermeable areas.

Generation and Management of Waste

18.5.18 Most of the waste generated from each of the route options would be Construction and Demolition (C&D) waste. WRAP identifies C&D wastes as waste materials arising from UK commercial C&D sites. It includes, but is not limited to, off-cuts and waste timber, plastics (e.g. uPVC & HDPE), glass (e.g. windows), packaging (e.g. card, wood and plastic film) and inert materials such as soils and rubble. It also includes aggregate materials (e.g. masonry, brick and block, paving, tiles and ceramics) and plasterboard in mixed waste.

18.5.19 For wastes and surplus or defective materials, impacts are primarily associated with the production, movement, transport and processing (including recycling/recovery) of the wastes on and off-site and, if required, their disposal at licenced off-site facilities. In this case, there is likely to be adequate local waste management capacity to deal with the waste arising from each of the route options. Waste management would become a concern of high importance if there was a risk of filling local facilities up to capacity, thereby forcing locally-produced wastes to be transported greater distances for disposal elsewhere.

18.5.20 The following wastes are likely to require removal from site, though the potential quantities are currently unknown:

- earthworks materials;
- road planings, especially those containing coal tars;
- bituminous macadam ('tarmac');
- recycled concrete;
- metals and plastics;
- wood from tree removal and vegetation wastes; and
- general waste and office waste.

18.5.21 It is assumed the majority of these wastes would be returned to the manufacturer, re-used or recycled; however, a proportion of the general and office wastes may require disposal to landfill.

18.5.22 It is also likely that a proportion of the materials imported would be secondary (recovered/recycled materials) and that materials exported off-site could potentially be used on other construction sites. Mixing imported and existing in-situ materials with recycled content may divert other third party wastes away from landfills, thereby minimising the overall volume of waste disposed to landfill.

Earthworks Balance

18.5.23 There is likely to be some surplus fill material from all route options which would require export from the site. This will be further reviewed at Stage 3 assessment. Section 7 of the Land Remediation and Waste Management Guidelines (SEPA 2009) explains that existing soils and infrastructure removed during the construction works would be considered as a waste if there is no possibility of recovering the material through recycling (on-site or off-site) or other processing that would enable re-use of the materials in the construction or elsewhere. Where re-use of any material is not possible, the material would need to be discarded and would thus become classified as waste. As illustrated in Section 18.4 (Baseline Conditions) there is currently sufficient landfill capacity in the Highland, Moray and Aberdeenshire Council areas.

Woodland Clearance

18.5.24 This assessment considers whether the route options would require the clearance of trees and areas of woodland resulting in the generation of waste material for disposal. The biggest concentration of trees (scrubby and sparse) are to the south of Smithton Roundabout and C1032 Barn Church Road, associated with Cairnlaw Burn (Surface Water Feature (SWF) 08) and its tributary (SWF 10). Other areas of note that have been carefully considered during design refinement are:

- Isolated trees along field boundaries across Ashton Farm.
- A few trees along the line of Scretan Burn (SWF 04).
- Mature trees in the vicinity of U1058 Caulfield Road North, Mature trees along the access to Castlehill House and its southern boundary with the B9006 Culloden Road.
- Mature trees parallel to the minor access road to the Dell of Inshes.

18.5.25 Table 18.9 shows the estimated area of woodland expected to be lost in relation to each of the route options.

Table 18.9: Estimated Area of Woodland Lost (ha)

Option	Est. Area of Woodland Lost (ha)
1A	0.30
1B	0.50
2A	0.30
2B	0.50
3A	0.30
3B	0.42

Please note: some small differences exist in the figures for Variants A and B of each route option as a result of rounding figures up or down.

18.5.26 Surplus organic materials may also include vegetation from clearance of gardens and verges, and deposits removed from within redundant drainage channels. Where suitable, such waste would be re-used or recycled, such as through on-site landscaping or ecological improvement works. Composting at an external waste management facility may also be an option.

Demolition Wastes

18.5.27 Some of the route options may require the demolition of buildings (Table 18.10) which would contribute to the quantity of the overall demolition waste generated by construction.

18.5.28 Up to five residential properties have been identified as being at risk of demolition:

- Direct impact on two properties on B9006 Culloden Road (Options 1A, 1B, 2A, 2B);
- Direct impact on two properties at Dell of Inshes (Options 1A, 1B, 2A, 2B); and
- Direct impact on one property at Inshes Junction (Options 2A, 2B).

18.5.29 In addition, the following commercial properties may be affected:

- Direct impact on storage buildings and a polytunnel at Simpsons Garden Centre (Options 2A, 2B); and
- Direct impact on existing A9 Inshes Overbridge (PS01A) (Option 2A and 2B).

Table 18.10: Number of Structures with Potential to be Demolished

Route Option	No. of Structures potentially demolished
Option 1A	Four residential properties.
Option 1B	Four residential properties.
Option 2A	Five residential properties, storage buildings/polytunnel at Garden Centre, Existing A9 Inshes Overbridge (PS01A).
Option 2B	Five residential properties, storage buildings/polytunnel at Garden Centre. Existing A9 Inshes Overbridge (PS01A).
Option 3A	None
Option 3B	None

18.5.30 Additionally, a small amount of demolition waste would also be generated from removal of structures such as redundant safety barriers and lighting columns. At this stage (DMRB Stage 2) it is not possible to accurately quantify these volumes. This would be carried out as part of the DMRB Stage 3 Detailed Assessment.

Other Wastes

18.5.31 Other wastes may include:

- hazardous wastes, including asbestos (likely to be of minimal volume);
- municipal solid waste (MSW) from construction workers (likely to be of minimal volume); and
- surplus materials (likely to be of minimal volume).

18.5.32 With regards to the items listed above, quantities for specific items cannot be estimated at this time. This information would become available at the detailed design stage; once further assessment of the proposed Scheme is undertaken in advance of construction. However, they are discussed briefly below.

Hazardous Wastes

18.5.33 Hazardous wastes may comprise any contaminated soils or demolition waste that cannot be treated to make them suitable for use, such as any material contaminated with asbestos or Volatile Organic Compounds (VOC), oils and metals. Disturbance or storage of contaminated soils or demolition waste during construction can also lead to the release of chemical pollutants into the air, ground or water (remobilisation of contaminants). The potential for waste materials or land uses to generate contaminated soils or groundwater cannot be defined at this stage. This would be addressed as part of DMRB Stage 3 through site specific ground investigation surveys along the route options, as discussed in Chapter 13 (Geology and Soils).

Municipal Solid Wastes

18.5.34 Accommodation units for construction workers would generate general municipal wastes in small volumes. Again, there is sufficient capacity in the Highland, Moray and Aberdeenshire Council areas for the disposal and recycling of such wastes (Section 18.4: Baseline Conditions). However, on-site segregation facilities would be provided to ensure that recovery and recycling of such wastes is maximised.

Surplus Materials

18.5.35 Surplus materials would be avoided wherever possible by efficient quantity surveying and procurement. If any do arise, they would be segregated and returned to the manufacturer or recycled or treated as appropriate.

18.5.36 A number of the route options have the potential to directly interact with areas of woodland which would need to be removed, and with buildings which may need to be demolished. Although, at this stage (DMRB Stage 2) it is not possible to provide details of the quantities of waste to be generated, the route options have been compared to provide an indication of likely sources of waste to be generated by each variant.

18.6 Potential Mitigation

18.6.1 The objectives of the mitigation measures outlined in this section are to prevent, reduce or offset the potential impacts described in Section 18.5 (Impact Assessment). At this stage (DMRB Stage 2) the design has not been sufficiently developed to allow mitigation measures to be defined in detail. The objective of this section is to identify potential mitigation taking into account best practice, legislation and guidance.

18.6.2 Measures could be implemented to mitigate the potential impacts of both the use of material resources and the generation of waste for each route option. There is significant synergy between materials re-use and the avoidance of the generation of waste. Therefore, there is a substantial overlap between the mitigation measures.

18.6.3 The importance of careful management of materials to promote re-use and reduce waste has been widely recognised by the construction industry. Both legislation and voluntary best practice mechanisms have been developed and implemented. These provide measurable and accountable processes that form the basis for mitigating potential environmental impacts associated with materials and waste. The rise of Modern Methods of Construction (MMC), which would be used on the proposed Scheme, has resulted in a reduction in construction waste generated on-site of up to 90% for specific building components.

18.6.4 Throughout detailed design and construction, the principles of the waste hierarchy (Diagram 18.1) should be applied to minimise waste generation and maximise re-use of waste arising on-site. Where feasible, materials should be sourced locally in order to reduce potential environmental impacts, such as transport emissions, and to support local businesses.

18.6.5 For all potential waste arisings, the contractor should consult with SEPA and comply, where appropriate, with The Waste Management Licensing (Scotland) Regulations 2011, the UK Forestry Standard (Forestry Commission 2011) and associated environmental guidelines. Consideration should also be given to SEPA guidance on sustainable waste management, such as that provided in Promoting the Sustainable Re-use of Greenfield Soils in Construction (SEPA 2010) and Guidance on the Production of Fully Recovered Asphalt Road Planings (SEPA 2008). If wastes cannot be legitimately re-used on site, these should be removed to a licensed recycling or disposal facility in line with legislative requirements.

18.6.6 A Construction Environmental Management Plan (CEMP) should be developed by the appointed contractor during the detailed design phase (i.e. before the start of construction) and implemented during the construction phase. The CEMP should include the following:

- details of the approach to environmental management throughout the construction phase, with the primary aim of mitigating any adverse impacts from construction activity on the identified sensitive receptors;
- methods for the prevention and control of any potential short-term construction-phase impacts (e.g. construction dust and the risk of accidental spillages of contaminating materials) and also permanent impacts (e.g. disturbance to vegetation, archaeology and heritage);
- good materials management methods, such as co-location of temporary haul routes on permanent capping and recovery and re-use of temporary works materials from haul routes, plant and piling mattresses; and
- risk/impact-specific method statements and strategic details of how relevant environmental impacts would be addressed, embodying the requirements of the relevant SEPA Pollution Prevention Guidelines.

18.6.7 Though not mandatory in Scotland, a Site Waste Management Plan (SWMP) could be developed and updated regularly during construction. The SWMP should identify, prior to the start of construction, the types and likely quantities of wastes that may be generated. It should set out, in an auditable document, how these wastes would be reduced, re-used, managed and disposed of. The SWMP should be developed by the contractor before commencement of the construction phase and, where possible, incorporated within the CEMP as the documents are naturally interlinked.

18.6.8 The SWMP may contain a Materials Management Plan (MMP) which would set out the approach to the management of all construction phase materials. The MMP should include specific soils management plans developed under the following voluntary and industry regulated Codes of Practice:

- Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (Defra 2009) which provides best practice guidance for the excavation, handling, storage and final placement of soils.

- The Definition of Waste: Development Industry Code of Practice Version 2 (CL:AIRE 2011) which provides a process whereby contaminated soils can be re-used on the site of origin (i.e. they do not become a waste), if they are proven through appropriate risk assessment to be suitable for use. It also provides for soils with naturally elevated contamination to be used directly on another site provided that they are suitable for use at that site.

18.6.9 If contaminated soils are encountered during the construction works, further investigation, testing and risk assessment should be undertaken to determine whether the soils could stay on-site, require treatment to make them suitable to remain on-site or would need to be disposed of off-site. Further details on mitigation measures for contaminated land sites are provided within Chapter 13 (Geology and Soils).

18.6.10 Implementation of the SWMP and the accompanying MMP would aim to minimise waste at source, during detailed design and construction, by facilitating measures to maximise re-use of materials on-site and reduce the need for new construction materials.

18.6.11 Where materials cannot be used for the route options, opportunities should be sought to re-use materials on other projects as part of the strategic commitment to manage waste in accordance with the waste hierarchy, for example it may be possible to recycle all or most of the road surface (planings) for incorporation in other Transport Scotland schemes or other local construction projects. It is acknowledged that any soils or peat stored for greater than three years would require a permit under The Landfill (Scotland) Regulations 2003.

18.7 Summary of Route Options

18.7.1 This section provides a summary of the route options in relation to use of material resources and generation of waste during the construction of the route options. Potential mitigation measures are also discussed in relation to how they can reduce the impacts from use of material resources and management of waste.

Material Resources

18.7.2 Use of material resources can have a significant impact on the environment through the depletion of finite natural resources, the energy and waste used and produced in their extraction, manufacture and transportation, and the energy consumption and durability during their use. Therefore, the route options with the greatest use of material resources are expected to have the greatest impact on the environment and its receptors.

18.7.3 This assessment has assumed that 50% of cut material would be unacceptable for re-use, and it is expected that some materials would be required to be imported to site.

18.7.4 Table 18.11 shows the estimated volumes of materials expected to be imported and the estimated cost of the structures for each of the route options. The information for volume of materials is based on estimated quantities of known materials including earthworks (soil/rock), pavement (bituminous) and pavement (sub-base) and does not represent all materials that would be required. The estimated cost for the structures is considered to reflect the quantity of materials required, so those route options with higher costs are expected to require a larger volume of materials to construct the structures.

Table 18.11: Estimated Volumes (m^3) of Materials Imported and Cost of Structures

Option	Materials Imported (m^3) (nearest 1,000 m_3)	Cost of Structures (£ million at Q1 2015 prices and excluding VAT)
1A	290,000	3.9
1B	350,000	4.2
2A	355,000	5.8
2B	419,000	6.1
3A	130,000	2.1
3B	195,000	2.4

Please note: some small differences exist in the figures for Variants A and B of each route option as a result of rounding figures up or down.

18.7.5 Although all route options being considered would require significant volumes of materials to be imported, Option 2B has been estimated to require the import of the greatest volume of materials, followed by Option 2A. Option 2B also has the highest estimated cost of structures, followed by Option 2A. Option 3A has been estimated to require both the import of the least volume of materials, and the lowest cost of structures, followed by Option 3B which ranks the second lowest for both indicators.

18.7.6 Mitigation as described in Section 18.6 (Potential Mitigation) is expected to reduce the impacts for materials described for all of the route options.

Generation and Management of Waste

18.7.7 The generation and management of waste can have a significant impact on the environment through its potential to contaminate sensitive receptors such as watercourses and soils and through its transport and processing. Therefore, the route options with the greatest levels of waste are expected to have the greatest impact on the environment and its receptors.

18.7.8 The amount of waste required to be removed from site would be kept to a minimum for all the route options in line with the principles of the waste hierarchy and MMC. The contractor would look to re-use materials on-site, where possible (e.g. surplus material could be used in landscaping bunds). Where materials are not able to be re-used on-site, alternative sources off-site should be sought. If re-use is not possible, then appropriate treatment methods (e.g. recycling) would be sought. As part of the DMRB Stage 3 Detailed Assessment the WRAP Net Waste Tool would be used to estimate the typical wastage rates that are likely to occur during the construction of the proposed Scheme.

18.7.9 Table 18.12 shows the potential for waste generation for each route option in respect of demolished buildings, loss of woodland and potential interaction with contaminated land. The latter provides an indication of likely removal of hazardous waste from the site. This information does not represent all waste that would be generated by the route options. Other wastes could include earthworks materials, road planings, metals and plastics, general waste, office waste and bituminous macadam.

Table 18.12: Potential Sources of Waste

Option	Est. No of Buildings Demolished	Est. Area Woodland Lost (ha)	Est. No of Contaminated Land Sites (direct interaction)
1A	Five residential properties.	0.30	0
1B	Five residential properties.	0.50	0

Option	Est. No of Buildings Demolished	Est. Area Woodland Lost (ha)	Est. No of Contaminated Land Sites (direct interaction)
2A	Six residential properties, storage buildings/polytunnel at Garden Centre, Existing A9 Inshes Overbridge (PS01A).	0.30	1
2B	Six residential properties, storage buildings/polytunnel at Garden Centre Existing A9 Inshes Overbridge (PS01A).	0.50	1
3A	None.	0.30	0
3B	None.	0.42	0

Please note: some small differences exist in the figures for Variants A and B of each route option as a result of rounding figures up or down.

18.7.10 Options 2A and 2B are expected to result in the potential demolition of six residential properties, as well as storage buildings and a polytunnel at Simpsons Garden Centre. Option 2A and 2B would also require the demolition of the existing A9 Inshes Overbridge (PS01A). Options 1A and 1B would potentially affect five residential properties, whilst Options 3A and 3B would not result in the demolition of any buildings.

18.7.11 Option 1B and 2B would require the largest areas of woodland to be cleared, with approximately 0.5 ha being lost. Options 1A, 2A and 3A all require only 0.3 ha of woodland clearance. Options 2A and 2B are also the only two variants that would potentially be affected by a contaminated land site, passing near the Pet Cemetery located to the rear of Inshes Veterinary Centre on B9006 Culloden Road.

Conclusion

18.7.12 Taking into account use of material resources and the potential to generate waste, Option 2B is expected to have the greatest impact on the environment, followed by Options 2A, 1B and 1A. Option 3 (Variants A and B) is expected to have the least impact. Potentially significant effects are foreseen and a detailed assessment would be completed as part of the DMRB Stage 3 EIA, wherein significance criteria would be assessed for the preferred option.

18.8 Scope of DMRB Stage 3 Assessment

18.8.1 At DMRB Stage 3 a 'Detailed Assessment' of the preferred option would be undertaken in line with HD212/11. This assessment would consider the materials and waste aspects of the preferred option and aim to identify and quantify the following:

- The types and quantities of materials required for the project;
- Details of the source/origin of materials, including site-won materials to replace virgin materials;
- The cut and fill balance;
- The types and quantities of forecast waste arisings, including any hazardous waste;
- Surplus materials and waste falling under regulatory controls;
- Waste that requires storage on-site prior to re-use, recycling or disposal;
- Waste to be pre-treated and/or disposed of off-site;
- The impacts that would arise in relation to materials and waste;
- A discussion of the sensitivity of receptors, and the magnitude, nature and significance of the impacts;
- Identification of measures to mitigate adverse impacts; and

- A detailed assessment of the potential carbon dioxide equivalent (CO_{2e}) impacts of the proposed Scheme.

18.8.2 The DMRB Stage 3 Assessment for materials aims to develop an in-depth appreciation of the environmental consequences (both adverse and beneficial) of material use and the production and management of waste for the preferred option.

18.9 References

CL:AIRE (2011). The Definition of Waste: Development Industry Code of Practice Version 2.

The Council of the European Union (2006). EU Sustainable Development Strategy, Renewed Strategy 2006.

Department for Environment Food & Rural Affairs (DEFRA) (2007) E-Digest Statistics – Waste and Recycling.

Department for Environment Food & Rural Affairs (DEFRA) (2009). Construction Code of Practice for the Sustainable Use of Soils on Construction Sites.

Forestry Commission (2011). UK Forestry Standard.

Jacobs, Faber Maunsell, Grant Thornton and Tribal Consulting *(on behalf of Transport Scotland)* (2008). Strategic Transport Projects Review: Final Report.

H.M. Government (2005). Securing the Future – the UK Government Sustainable Development Strategy 2005.

The Highland Council (2012). Highland-wide Local Development Plan (HwLDP), 2012.

The Highland Council (2014). Update on Waste Strategy Report by Director of Community Services, Community Services Committee, Agenda Item 10, Report No COM 36/14. 6th November 2014.

The Highland Council and Moray Council (2009). Joint Waste Strategy Report, 2009.

Highways Agency, Transport Scotland, The National Assembly for Wales and The Department of Regional Development Northern Ireland (2011). Design Manual for Roads and Bridges, Interim Advice Note 153/11, Guidance on the Environmental Assessment of Material Resources. October 2011.

Highways Agency, Transport Scotland, The National Assembly for Wales and The Department of Regional Development Northern Ireland (2012). DMRB Volume 11, Section 3, Part 6 HD 212/11 [Unpublished]. Draft, amended as per conventions.

Moray Council (2015). Moray Local Development Plan 2015.

SEPA (2006). Guidance for SEPA Staff, Is it Waste: Understanding the definition of Waste (WML-G-DEF-01).

SEPA (2008). Guidance on the Production of Fully Recovered Asphalt Road Planings.

SEPA (2009). Land Remediation and Waste Management Guidelines.

SEPA (2010). Promoting the Sustainable Re-use of Greenfield Soils in Construction.

SEPA (2015a). The SEPA Waste Site and Capacity Report for Scotland 2015 [online]: Accessed from http://www.sepa.org.uk/environment/waste/waste-data/waste-data-reporting/waste-site-information/waste-sites-and-capacity-excel/ [Accessed September 2017].

SEPA (2015b). Waste Site and Capacity Tool [online]: Available from https://www.sepa.org.uk/data-visualisation/waste-sites-and-capacity-tool/ [Accessed September 2017].

Scottish Government (2009). Climate Change Delivery Plan 2009.

Scottish Government (2010). Scotland's Zero Waste Plan 2010.

Scottish Government (2013a). Low Carbon Scotland: Meeting our Emissions Reduction Targets 2013 – 2027.

Scottish Government (2013b). Safeguarding Scotland's Resources – Blueprint for a More Resource Efficient and Circular Economy.

Transport Scotland (2012). Transport Scotland Corporate Plan (2012 – 2015).

Transport Scotland (2015). Transport Scotland Annual Business Plan (2015-2016).

The Waste and Resources Action Programme (WRAP) (2008) Net Waste Tool Guide to Reference Data, Version 1.0, May 2008.

EU Directives and National Legislation

Climate Change (Scotland) Act (2009).

European Union (2008). Directive 2008/98 on waste (2008).

Paris Agreement (United Nations Framework on Climate Change), COP21 (21st Conference of Parties), 7th to 8th December 2015, Stade de France, Paris (adopted 4th November 2016).

Scottish Government (2003). Landfill (Scotland) Regulations 2003 (as amended 2013).

Scottish Government (2011). Waste Management Licensing (Scotland) Regulations 2011.