14. Material Assets and Waste

Summary

This chapter considers the potential environmental effects of the A9 Dualling Pass of Birnam to Tay Crossing (hereafter referred to as the 'proposed scheme') on material assets and waste within the proposed scheme's boundary (first study area), and Tayside, Central and Fife Local Authority Region (second study area) during the construction of the proposed scheme. Operational effects on material assets and waste have been scoped out of this assessment for the reasons described in paragraphs 14.2.39 and 14.2.40.

The construction of the proposed scheme will unavoidably require the consumption and use of material assets including primary materials and manufactured construction products, and therefore may result in potential effects on the environment through the depletion of non-renewable natural resources. The construction of the proposed scheme will also result in the production and disposal of surplus materials and waste, leading to potential effects on the available waste management infrastructure (i.e. available landfill capacity).

There is likely to be a good supply of both primary and recycled aggregates within the study area to construct the proposed scheme; and there are no minerals safeguarding sites or peat resources within or in close proximity to the first study area. Although the second study area is expected to have sufficient inert landfill capacity to handle most of the surplus materials and wastes generated during the anticipated construction programme (2028 to 2032), there is likely to be limited landfill capacity for both non-hazardous and hazardous wastes.

Throughout the design process, a number of embedded mitigation features have been included in the proposed scheme design with the potential to reduce the consumption and use of material assets and the production and disposal of waste. Where potential residual effects have been identified, these will be reduced, where practicable, during detailed design and construction stage efficiencies and via compliance with relevant legislation, policies and plans relating to the consumption and use of material assets and the management of waste.

With good practice application of responsible sourcing methods, the waste hierarchy, implementation of Site Waste Management Plans and inclusion of targets that support the delivery of the Zero Waste Plan (Scottish Government, 2010) targets, the potential for environmental effects relating to the consumption and use of material assets and production and disposal of waste have been assessed as Slight Adverse (not-significant) and Moderate Adverse (Significant) respectively after the application of essential mitigation measures.

Significant environmental effects are anticipated due to the proposed scheme's potential use of the available non-hazardous landfill capacity within the second study area, as well as the use of non-hazardous landfill capacity outwith the second study area. Waste transportation beyond the second study area will likely be necessary due to a forecasted lack of non-hazardous landfill capacity by the start of construction of the proposed scheme in 2028. After 2028, non-hazardous landfill options are likely to be limited to sites in Airdrie, Aberdeenshire and Fort William (i.e. unless additional capacity or landfills are commissioned).

14.1 Introduction

14.1.1 This chapter presents the results of the material assets and waste assessment undertaken as part of the Design Manual for Roads and Bridges (DMRB) Stage 3 Environmental Impact Assessment Report (EIAR) for the A9 Dualling: Pass of Birnam to Tay Crossing project (hereafter referred to as the 'proposed scheme'), which is described in Chapter 6 (The Proposed Scheme).

14.1.2 This includes the assessment of potential environmental effects related to the consumption and use of material assets and the production and disposal of waste that can reasonably be anticipated with the construction of the proposed scheme. It identifies measures for mitigating these effects, where practicable, and describes the significance of the residual effects that remain after both embedded and essential mitigation. Operational effects on material assets and waste have been scoped out of this assessment for the reasons described in paragraphs 14.2.39 and 14.2.40.

14.1.3 The assessment is supported by the following appendices and figures presented in Volume 2 and Volume 3 respectively of this EIAR:

- Appendix 14.1 (Assessment of Regulatory and Policy Compliance);
- Appendix 14.2 (Waste Sites and Capacities within the Study Area); and
- Figure 14.1 (Locations of Operational Waste Management Sites Within the Study Area).

14.1.4 The assessment of effects on material assets and waste is aligned with and supported by relevant information and findings communicated by other environmental factors, most notably Chapter 13 (Geology, Soils, Groundwater and Land Contamination) for information on superficial mineral resources, coal workings, peat deposits, sources of contaminated land and hazardous (or special) waste; and Chapter 20 (Climate) for a unified schedule of material asset types and quantities associated with the construction of the proposed scheme. The interaction of material assets and waste with other factors has been considered in Chapter 21 (Assessment of Cumulative Effects).

Legislative and Policy Background

14.1.5 The assessment of material assets and waste reported in this chapter has been undertaken to satisfy the Roads (Scotland) Act 1984 (Environmental Impact Assessment) Regulations 2017 (as amended) (Scottish Government, 2017).

14.1.6 These regulations mandate a thorough description and assessment of both the direct and indirect significant impacts of the proposed scheme on environmental factors, including 'material assets' (as per Regulation 5, Section 20B (3), and Schedule 1A). Additionally, where information is available, it should include a description of any likely significant environmental effects of the proposed scheme resulting from, among other things:

- use of natural resources, considering the sustainable availability of these resources; and
- expected residues and emissions and the production, recovery and disposal of waste.

14.1.7 Additionally, these regulations require that the EIA should include a description of the proposed scheme, including in particular: the nature and quantity of the materials and natural resources to be used; and an estimate, by type and quantity, of waste produced during the construction and operation phases, where relevant.

14.1.8 The use and consumption and use of material assets and the production and disposal of waste are also subject to a complex framework of legislative and policy instruments at the national, local and applicant level. The key legislative, policy, plans and statutory guidance influencing the design, construction and assessment of the proposed scheme are identified below. This includes any emerging legislation, policies and plans, where applicable and appropriate.

National Level: Legislation

- Landfill Tax (Scotland) Act 2014 (as amended) (Scottish Government, 2014a);
- The Environmental Protection (Duty of Care) (Scotland) Regulations 2014 (as amended) (Scottish Government, 2014b);
- Waste Electrical and Electronic Equipment (WEEE) Regulations 2013 (as amended) (Scottish Government, 2013);
- The Waste (Scotland) Regulations 2012 (as amended) (Scottish Government, 2012a);
- Pollution Prevention and Control (Scotland) Regulations 2012 (as amended) (Scottish Government, 2012b);
- The Waste (Scotland) Regulations 2011 (as amended) (Scottish Government, 2011a);
- The Waste Management Licensing (Scotland) Regulations 2011 (as amended) (Scottish Government, 2011b);
- The Waste Batteries and Accumulators Regulations 2009 (as amended) (Scottish Government, 2009);
- The Landfill (Scotland) Regulations 2003 (as amended) (Scottish Government, 2003);
- The Special Waste Regulations 1996 (as amended) (Scottish Government, 1996);
- The Controlled Waste (Registration of Carriers and Seizure of Vehicles) Regulations 1991 (as amended) (Scottish Government (1991);
- The Environmental Protection Act 1990 (as amended) (Scottish Government, 1990); and
- The Control of Pollution (Amendment) Act 1989 (as amended) (Scottish Government, 1989).

Policy

- Scotland's Circular Economy and Waste Route Map to 2030 (Scottish Government, 2024);
- Scottish Government, National Planning Framework 4 (NPF4) (Scottish Government, 2023);
- Scottish Government, Making Things Last A Circular Economy Strategy for Scotland, (Scottish Government, 2016);

- Office for Product Safety and Standards, Guidance Regulations: timber and FLEGT licences, (Office for Product Safety and Standards, 2014);
- Scottish Government, Safeguarding Scotland's Resources - Blueprint for a More Resource Efficient and Circular Economy, (Scottish Government, 2013); and
- Scottish Government, Scotland's Zero Waste Plan (Scottish Government, 2010).

Local Level:

- Perth & Kinross Council Local Development Plan 2 (LDP2), (PKC, 2019); and
- Perth & Kinross Council Supplementary Planning Guidance – Delivering Zero Waste, (PKC, 2020).

Applicant Level:

- Transport Scotland, Corporate Procurement Strategy 2024-25 (TS, 2024);
- Transport Scotland, National Transport Strategy 2 (TS, 2020);
- Transport Scotland, Road Asset Management Plan for Scottish Trunk Roads (TS, 2016a);
- Transport Scotland, A9 Dualling Programme Sustainability Strategy (TS, 2016b);
- Transport Scotland, The Strategic Environmental Design Principles (TS, 2014);
- Highways England et al, DMRB, GG 103 Introduction and general requirements for sustainable development and design (Highways England et al., 2019a); and
- Highways England et al, DMRB, LA 110 Material assets and waste (Highways England et al., 2019b); and
- Highways England et al, DMRB, LA 104 Environmental assessment and monitoring (Revision 1) (Highways England et al., 2020).

Guidance:

- Scottish Government, Duty of Care Code of Practice (Scottish Government, 2012);
- Scottish Environmental Protection Agency (SEPA), Guidance, IS IT WASTE Understanding the definition of waste (SEPA, 2006);
- SEPA Guidance, Reuse Activities and Waste Regulation (SEPA, 2017);
- SEPA *et al*., Technical Guidance WM3: Waste Classification (SEPA, 2021);
- SEPA Guidance, Classification of WEEE – Hazardous Substances and Persistent Organic Pollutants (POPs) (SEPA, 2022);
- SEPA Guidance, Classification of Waste Wood (SEPA, 2021);
- SEPA, Guidance, Recycled Aggregates from Inert Waste (SEPA, 2013);
- SEPA *et al*., Guidance on the Production of Fully Recovered Asphalt Road Planings (SEPA, 2008);
- SEPA Position Statement, Use of Incinerator Bottom Ash Aggregate in Construction, (SEPA, 2022);

- SEPA, Land Remediation and Waste Management Guidelines, (SEPA, 2009);
- SEPA, Regulatory Guidance, Promoting the Sustainable Reuse of Greenfield Soils in Construction (SEPA, 2010);
- SEPA Guidance, Recovery and Disposal of Waste in Quarries (SEPA, 2020);
- SEPA, Guidance, Management of Forestry Waste (SEPA, 2017);
- SEPA, Guidance, Developments on Peat and Off-Site Uses of Waste Peat (SEPA, 2017);
- SEPA, Use of Trees Cleared to Facilitate Development on Afforested Land (SEPA, 2014);
- SEPA, Guidance on Disposal of trees and plants infected with specific plant diseases (SEPA, 2013);
- SEPA, Technical Guidance Note, On-site management of Japanese Knotweed and associated contaminated soils (SEPA, 2008);
- SEPA, Guidance, Asbestos in Demolition Waste (SEPA,2015);
- SEPA, Technical Guidance on Activities Exempt from Waste Management Licensing, n.d;
- SEPA *et al*., GPP 6: Working at Construction and Demolition Sites (SEPA, 2023);
- SEPA Position Statement, Portable/Chemical Toilet Wastes (SEPA, 2019);
- SEPA, Position Statement, Crushing or Piercing of Waste Aerosol Cans for the Purposes of Recovery (SEPA, 2018);
- SEPA Guidance, Consigning Special Waste Guidance (SEPA, 2022); and
- SEPA Guidance, Prior Treatment of Waste for Landfill (SEPA, 2006).

14.1.9 A summary of the legislative and policy framework, and an assessment of the alignment of the proposed scheme proposals with the regulatory and policy context is provided in Appendix A14.1 (Assessment of Regulatory and Policy Compliance).

14.2 Approach and Methods

Scope and Guidance

14.2.1 This assessment addresses material assets and waste in accordance with DMRB LA 101 'Introduction to environmental assessment' (National Highways et al., 2019) which identifies materials assets and waste as an EIA factor to be assessed.

14.2.2 Specifically, this assessment has been prepared in accordance with DMRB LA 110 'Material assets and waste' (National Highways et al., 2019) which is the published standard for assessing and reporting the effects on material assets and waste from the delivery of motorway and all-purpose trunk road projects, and which replaced the draft unpublished HD 212/11 guidance in Scotland.

14.2.3 The material assets and waste assessment considers the following elements:

- the consumption of material assets. This includes materials and products from primary, secondary, recycled and renewable sources, the use of materials offering sustainability benefits, and the use of excavated and other arisings that fall within the scope of waste exemption criteria; and
- the production and disposal of waste. This includes surplus materials which can become waste during the construction of the proposed scheme, as well as other substances which the holder discards or intends or is required to discard.

Study Area

14.2.4 In accordance with DMRB LA 110, the assessment of material assets and waste has utilised two geographically different study areas to examine the consumption and use of primary, secondary and recycled construction materials; and the production and disposal of waste:

- The first study area is based on the construction footprint/boundary (including compounds and temporary land take) of the proposed scheme. Within these areas as shown on Figure 1.2 (Pass of Birnam to Tay Crossing Overview), construction materials will be consumed and used, and waste will be produced.
- The second study areas are based on the likely provenance of construction materials required to construct the main elements of the proposed scheme, and waste infrastructure that is likely to be suitable (permitted for waste quantity and type) to accept arisings and/or waste generated by the proposed scheme. These include:
  - Angus Council, Dundee City Council, Perth & Kinross Council, Clackmannanshire Council, Falkirk Council and Stirling Council Mineral Planning Areas which are likely to be the primary source of material assets (primary, secondary and recycled aggregates) used to construct the proposed scheme. This study area has been delineated through the adoption of the Tay Area and Forth Valley Minerals Market Regions.
  - Angus Council, Clackmannanshire Council, Dundee City Council, Falkirk Council, Fife Council, Perth and Kinross Council and Stirling Council Waste Planning Areas where the waste management infrastructure, likely to be used in managing the majority of waste generated by the proposed scheme, is located. This study area has been delineated through the adoption of Tayside, Central and Fife Local Authority Region.

14.2.5 Professional judgement (a balance of the proximity principle and value for money principle) has been applied in deriving the second study areas. This was achieved through reference to the Mineral Market Areas provided in the Collation of the Results of the 2019 Aggregate Minerals Survey for Scotland (Scottish Government, 2023) and the Tayside, Central and Fife Local Authority Region identified on Local Authority Regions Map of Scotland (Public Scotland, n.d.). The boundaries of the second study areas can be viewed through the provided hyperlinks.

14.2.6 It would be the appointed Contractor's responsibility to source materials and manage waste during the construction of the proposed scheme. Typically, they would look to use local material sources and waste infrastructure, wherever practicable, to reduce the environmental impact and cost of transport and support the economic well-being of local communities. This would be managed through the measures specified in Section 14.5 (Mitigation), including but not limited to the preparation of the Contractor's Site Waste Management Plan (SWMP).

14.2.7 Procurement rules mean that it is not possible for the EIA process to identify/prescribe specific material suppliers and waste management facilities to be used during construction of the proposed scheme with any certainty, and these prevent setting a precedent that would potentially tie the appointed Contractor to exclusive arrangements with specific material suppliers and waste management facilities.

Baseline Conditions

14.2.8 In reporting the DMRB Stage 3 Assessment, the following baseline data has been gathered from desk-based reviews of existing information, and through the analysis and review of available stakeholder information (where available):

- a description of the first study area, including information about the types and quantity of material use and waste generation associated with operation of the existing road/site;
- an assessment of the key legislative and policy instruments influencing the consideration of the consumption and use of material assets and production and disposal of waste;
- an assessment of the regional availability of construction aggregates, facilitated by a review of the Collation of the Results of the 2019 Aggregate Minerals Survey for Scotland (Scottish Government, 2023);
- a review of the locations of any mineral safeguarding sites (operational sites or sites identified within strategic planning documents for minerals extraction) and peat resources (existing or potential peat extraction sites) in relation to the proposed scheme; and
- an assessment of the current and likely future state (in the absence of the proposed scheme) of regional transfer, treatment, recycling, recovery and disposal facilities to be utilised by the proposed scheme, through a review of the Scottish Waste Sites and Capacity Data Tool (SEPA, 2024).

14.2.9 Although an Environmental Steering Group, comprising the members specified in Chapter 7 (Consultation and Scoping), has met regularly throughout DMRB Stages 2 and 3, there has been no specific or direct consultation at DMRB Stage 3 regarding the material assets and waste baseline with SEPA, Angus Council, Clackmannanshire Council, Dundee City Council, Falkirk Council, Fife Council, Perth and Kinross Council, or Stirling Council. This is because the necessary baseline information for the DMRB Stage 3 Assessment is readily available from the sources mentioned above.

Consultation

14.2.10 Information gathered via consultation has been considered in this assessment. Consultations undertaken relevant to this chapter are summarised as shown in Table 14.1 while Appendix A7.1 (Summary of Consultation Responses) provides a summary of correspondence undertaken. Further information on the consultation process is provided in Chapter 7 (Consultation and Scoping).

Table 14.1: Summary of Consultations

Consultee	Consultation Purpose	Summary of Consultee Response
SEPA	To inform the early stages of the proposed scheme design and the EIA.	SEPA advised that consideration will need to be given to any waste arisings predicted from the project and it should be demonstrated how the waste hierarchy will be applied to any produced during construction and operation to limit any waste materials.
SEPA	Statutory consultee comments on the EIA Scoping Report	SEPA reported that it had no concerns with the proposed scope of the assessment on material assets and waste at the scoping stage. It welcomed the commitment to producing a site waste management plan (SMC-M1) and to apply the principles of the 'Waste Hierarchy' to minimise waste generation (SMC-M3), and recommended that this assessment also consider the management of any diseased trees. The Scoping Report indicated that peat is proposed to be scoped out as it is not present along the proposed scheme. Whilst SEPA had no concerns with this approach, it recommended the information supporting that conclusion be provided either before or with the EIAR.
SEPA	Statutory Consultee comments on the Draft DMRB Stage 3 EIAR	From a waste management perspective, it's encouraging to note the references to the waste hierarchy, Site Waste Management Plans etc throughout.
SEPA	Statutory Consultee comments on the Draft DMRB Stage 3 EIAR	To include reference to EASR and SEPA's Developments on Peat and Off-Site Uses of Waste Peat guidance.
SEPA	Statutory Consultee comments on the Draft DMRB Stage 3 EIAR	SEPA notes the residual impact of the disposal of waste produced by the project is judged to have a moderately significant impact on landfill capacity in the 'second study area' which is the Tayside, Central and Fife Local Authority Region. SEPA would encourage reuse of as much suitable material as possible within the scope of the project

Consultee	Consultation Purpose	Summary of Consultee Response
		(providing they are legitimate/justified) to avoid the need to haul offsite. It would also encourage investigation of recovery options for surplus materials removed from site as opposed to disposal.

14.2.11 While Section 14.4 (Potential Impacts and Effects) addresses the predicted waste arisings during the construction of the proposed scheme, the appointed Contractor's SWMP will detail how the waste hierarchy has been applied to reduce the production and disposal of these wastes (as set out in Mitigation Items SMC-M1 to SMC-M4 as shown in Table 14.13). Operational waste has been excluded from this chapter for the reasons described in paragraphs 14.2.39 and 14.2.40.

Impact Assessment

14.2.12 This assessment focuses primarily on determining the likely significant effects of constructing the proposed scheme on the environment resulting from the consumption and use of material assets; and the production and disposal of waste.

14.2.13 The assessment utilises and builds on the information and data gathered as part of the DMRB Stage 2 Scheme Assessment Report (Transport Scotland, 2023) and collates additional information to quantify as accurately as possible the material assets to be consumed and used, and the wastes likely to be produced, in constructing the proposed scheme.

14.2.14 The material assets and waste assessment is largely a desk-based quantitative study that aims to identify the following information for the construction phase (assumed to be 2028 to 2032 for assessment purposes) and the first year of operational activities (proposed year of opening) (assumed to be 2033 for the assessment purposes).

14.2.15 For material assets, the assessment identifies the following:

- legislative and policy requirements;
- types and quantities of materials required to construct the project;
- information on materials that contain secondary/recycled content;
- information on any known sustainability credentials of materials to be consumed;
- the type and volume of materials that will be recovered from on or off-site sources for use on the project;
- the cut and fill balance;
- degree of minerals sterilisation; and
- details of on-site storage and stockpiling arrangements, and any supporting logistical details.

14.2.16 For waste, the assessment identifies the following:

- legislative and policy requirements;
- the amount of waste (by weight) that will be recovered and diverted from landfill either on site or off site (i.e. for use on other projects);
- types and quantities of waste arising from the project (site clearance, excavation and construction) requiring disposal to landfill;
- details of on-site storage and segregation arrangement for waste and any supporting logistical arrangements; and
- potential for generation of hazardous waste (type and quantity).

Significance Criteria

14.2.17 DMRB LA 110 sets out how effects associated with material assets and waste should be assessed through the use of a simplified assessment framework.

14.2.18 The descriptors of effect as shown in Table 14.2 have been used to assess the likely environmental effects of constructing the proposed scheme on material assets and waste.

14.2.19 Professional judgement has been used to determine which significant effect categories the proposed scheme is likely to fall within with regards to the material assets and waste elements of this factor.

Table 14.2: Significance category descriptions for material assets and waste (DMRB LA 110)

Significance category	Description (1)
Very large	Material assets 1) no criteria: use criteria for large categories. Waste 1) >1% reduction or alteration in national capacity of landfill, as a result of accommodating waste from a project; or 2) construction of new (permanent) waste infrastructure is required to accommodate waste from a project.
Large	Material assets 1) project achieves <70% overall material recovery/recycling (by weight) of non-hazardous Construction and Demolition Waste (CDW) to substitute use of primary materials (2); and 2) aggregates required to be imported to site comprise <1% re-used/recycled content (3); and/or (4) 3) project sterilises >1 mineral safeguarding site and/or peat resource (5). Waste 1) >1% reduction in the regional capacity of landfill as a result of accommodating waste from a project; and 2) >50% of project waste for disposal outside of the region.

Significance category	Description (1)
Moderate	Material assets: 1) project achieves less than 70% overall material recovery/recycling (by weight) of non-hazardous CDW to substitute use of primary materials (2); and 2) aggregates required to be imported to site comprise re-used/recycled content below the relevant regional percentage target (3). Waste: 1) >1% reduction or alteration in the regional capacity of landfill as a result of accommodating waste from a project; and 2) 1-50% of project waste for disposal outside of the region.
Slight	Material assets: 1) project achieves 70-99% overall material recovery/recycling (by weight) of non-hazardous CDW to substitute use of primary materials (2); and 2) aggregates required to be imported to site comprise re-used/recycled content in line with the relevant regional percentage target (3). Waste: 1) < 1% reduction or alteration in the regional capacity of landfill; and 2) waste infrastructure has sufficient capacity to accommodate waste from a project, without compromising integrity of the receiving infrastructure (design life or capacity) within the region.
Neural	Material assets: 1) project achieves >99% overall material recovery/recycling (by weight) of non-hazardous Construction Demolition Waste (CDW) to substitute use of primary materials (2); and 2) aggregates required to be imported to site comprise >99% re-used/recycled content (3). Waste: 1) no reduction or alteration in the capacity of waste infrastructure within the region.
(1) This table, reproduced from DMRB LA 110, uses very precise and deliberate language, specifically "OR", "AND" and "AND/OR" after each descriptor of effect to denote which significance category should be applied. The descriptors for the material assets matter are generally summative (Large, Moderate, Slight and Neutral effects), and all descriptors need to be met in full in order to assign a relevant significance category (i.e. with the notable exception of a large effect which can be assigned when a project sterilises ⩾1 mineral safeguarding site and/or peat resource). The descriptors of effect for the waste matter are either standalone (very large and neutral effects) or summative (Large, Moderate and Slight effects).	
(2) In the absence of further guidance in the DMRB LA 110 standard, this descriptor has been interpreted to mean 'project achieves XX% overall material reuse/recycling/recovery (by weight) to substitute use of primary materials on or off-site' (i.e. within the first or second study area). Limiting this to solely 'C&D waste'	

Significance category	Description (1)
in the context of the 'material assets' descriptors (where there are already separate descriptors for 'waste') would be impractical and inappropriate given that 'waste' is a legally defined term, and that the project would not look to use 'waste' to substitute primary materials given the potential costs, delays and risks associated with securing licenses.	
(3) In the absence of a Scottish specific target in the Scotland National Application Annex to DMRB LA 110, the England Average target of 25% (provided in England National Application Annex) has been adopted for the purposes of this assessment.	
(4) The published version of DMRB LA 110 includes "AND" instead of "AND/OR". This has been changed to correct an editorial error in the original guidance that was confirmed in an email from Wilson. S (2020) at Highways England.	
(5) Sterilisation is defined by DMRB LA 110 to mean 'substantially constrain/prevent existing and potential future use and extraction of materials'. In the absence of further guidance, this has been interpreted to mean that a project would need to intersect with (sterilises) the whole of a mineral safeguarding site and/or or existing or potential peat extraction site or intersects with a significant part of a safeguarded minerals site/existing or potential peat extraction site (>50% by area). A peat resources is defined in DMRB LA 110 as 'Existing or potential peat extraction sites'.	

14.2.20 The potential for likely significant effects on material assets and the receiving waste management infrastructure has been determined in accordance with the criteria as shown in Table 14.3 which are aligned to the category descriptions as shown in Table 14.2.

14.2.21 Consequently, this framework precludes the application of a methodology to derive a measure of the significance of effect based on the receptor value and the magnitude of impact. This is consistent with DMRB LA 104 'Environmental assessment and monitoring' (National Highways et al., 2020) which states that '*where relevant, individual environmental factors can set out variations in value, magnitude and significance description requirements*'.

Table 14.3: Significance Criteria for Material Assets and Waste (DMRB LA 110)

Significance category	Description
Significant (one or more criteria met)	Material assets: 1) category description met for Moderate or Large effect. Waste: 1) category description met for Moderate, Large or Very Large effect.
Not significant	Material assets: 1) category description met for Neutral or Slight effect. Waste: 1) category description met for Neutral or Slight effect.

Assessment Methodology

14.2.22 DMRB LA 104 requires that the significance of an effect shall be reported including embedded mitigation measures.

14.2.23 A number of embedded mitigation measures have been included as part of the proposed scheme design to reduce certain environmental effects. These include:

- careful designing of the proposed scheme to reduce the consumption and use of material assets, the production and disposal of waste, and avoid key receptors where practicable; and
- compliance with those regulatory and legislative regimes as required by law that apply irrespective of the EIA process, including the consents and licenses identified in Section 14.1 (Introduction).

14.2.24 DMRB LA 104 specifies that residual effects shall be reported after the assessment of the effectiveness of essential mitigation measures identified in Section 14.4 (Potential Impacts and Effects) which are required to avoid, reduce and, if possible, offset likely significant adverse environmental effects.

14.2.25 Assigning significance of an effect, taking account of embedded mitigation, and again after an assessment of the effectiveness of essential mitigation demonstrates the positive contribution of all committed mitigation.

Cumulative Effects

14.2.26 Potentially significant cumulative effects of the proposed scheme, and those of the proposed scheme in combination with other reasonably foreseeable developments, are assessed in Chapter 21 (Assessment of Cumulative Effects).

Limitations of the Assessment

14.2.27 The assessment on material assets and waste receptors presented in this chapter currently has limitations, as it is predominantly based on a review of the baseline information and DMRB Stage 3 preliminary design information available at the DMRB Stage 3 Design Fix (April 2025).

14.2.28 Whilst the baseline data sources used in this assessment represent the most recently available stakeholder information, there is a general lag (in years) of materials, waste processing and landfill capacity data in the UK/Scotland and conditions may have changed since publication of this data (e.g. as mineral planning permissions are granted and as existing reserves are worked; and as waste management licenses/permits are granted, modified and surrendered, and available capacity is utilised).

14.2.29 Although checks are made by stakeholders for anomalies or errors in their data prior to publication, it cannot be guaranteed that these data sets are error free, or whether any commercial decisions have been taken by site operators that may have affected these data. It is recognised that some mineral and landfill operators do not release information for reasons of commercial confidentiality. The resulting data gaps may reduce the value of the data that is made publicly available.

14.2.30 The availability of material assets and waste management capacity may also be impacted by other buildings and infrastructure projects taking place at the time of construction of the proposed scheme as detailed in Chapter 21 (Assessment of Cumulative Effects). Furthermore, changes to the permitted minerals and waste management capacity of waste facilities during the construction of the proposed scheme cannot be predicted with any precision.

Notwithstanding, policy, strategic and legislative drivers are likely to facilitate that sufficient capacity continues to be provided.

14.2.31 Whilst the DMRB Stage 3 preliminary design information provides an initial estimate of the key materials likely to be required during the construction of the proposed scheme, it does not quantify all material and product types that would be required. Therefore, the estimated quantities presented in this assessment can only be taken as approximate and indicative. The assessment parameters, which form the basis of the material assets and waste forecasting, will inevitably be subject to some changes as the proposed scheme evolves through the detailed design and construction stages.

14.2.32 Given that the estimated material assets required, and waste generated, may change between this assessment and eventual construction, a 15% uplift has been applied to all material and waste quantities. This figure is derived from the default contingency factor for early design as outlined in the RICS Professional Standard - Whole Life Carbon Assessment for the Built Environment (Royal Institution of Chartered Surveyors, 2024). This uplift is intended to account for additional materials not included in the current estimate and potential changes between the specimen design and construction.

14.2.33 Furthermore, there is also limited precise information currently available as described in the subsequent paragraphs.

14.2.34 For material assets:

- the types and quantities of materials used during the operation of the existing road/site;
- precise provenance of imported materials and products;
- information on materials that contain secondary/recycled content;
- information on any known sustainability credentials of materials to be consumed;
- the type and volume of materials that will be recovered from on or off-site sources for use on the project; and
- details of on-site storage and stockpiling arrangements, and any supporting logistical details.

14.2.35 For waste management:

- the types and quantities of waste produced associated with operation of the existing road/site;
- the amount of waste (by weight) that will be recovered and diverted from landfill either on site or off site (i.e. for use on other projects);
- types and quantities of waste arising from the project (demolition, excavation arisings and remediation) requiring disposal to landfill;
- details of on-site storage and segregation arrangement for waste and any supporting logistical arrangements; and
- the chosen waste management methods (recycling, recovery, disposal) and precise

geographical locations for managing each waste stream that cannot be re-used on-site.

14.2.36 The above limitations are not untypical of this stage in the design lifecycle, and the information presented in this chapter is considered of an appropriate level of detail to undertake a proportionate assessment in line with DMRB LA 110. Therefore, the assessment has been supported by the following additional information, which has been used to populate these data gaps and allow the assessment of the material assets and waste factor to be undertaken on a precautionary basis:

- Waste and Resources Action Programme (WRAP) guidance – for indicative recycled content of standard construction materials and products;
- Royal Institution of Chartered Surveyors (RICS) guidance – for wastage rates and typical end-of-life pathway percentages for common construction materials and products; and
- Professional judgment.

14.2.37 Material assets and waste can affect the full range of environmental media and assessment factors. It is acknowledged that, depending on how material assets and waste are managed, indirect adverse effects may arise (from greenhouse gas emissions; water consumption; visual effects, dust, noise, vibration, vehicle emissions, traffic and other potential causes of nuisance; and water pollution amongst others).

14.2.38 Such effects do not form part of the material assets and waste assessment and are considered as part of the other technical chapters in this EIAR where relevant. This chapter should therefore be read in conjunction with Chapters 16, 17 and 18 (Population and Human Health); Chapter 13 (Geology, Soils, Groundwater and Land Contamination); Chapter 19 (Road Drainage and the Water Environment); Chapter 8 (Air Quality); Chapter 15 (Noise and Vibration); and Chapter 20 (Climate).

14.2.39 The impacts from the consumption of material assets and the production and disposal of waste are largely dispersed, rather than affecting specific receptor locations. It is, therefore, not possible to assess, either qualitatively or quantitatively, the indirect environmental effects from either upstream materials extraction and production facilities, or downstream waste management and disposal facilities within the expansive study area. The exception to this is the indirect carbon emissions that fall within the scope of Chapter 20 (Climate).

14.2.40 As reported in the DMRB Stage 3 Scoping Report (Transport Scotland, 2024), operational effects associated with material assets and waste have not been assessed, as they were considered to be not significant (by quantity) in the context of the proposed scheme. Furthermore, DMRB LA 110 specifies that the environmental assessment shall only report on the first year of operational activities (i.e. proposed year of opening).

14.2.41 It has been assumed that no significant maintenance activities would occur during the proposed year of opening, and therefore no significant materials consumption or waste generation is likely to be realised. Whilst it is appreciated that the first year of operational activities is a time period not necessarily confined to operational effects, any construction phase effects overlapping within this period are captured within the construction phase assessment.

14.2.42 Notwithstanding this, the design process would inherently seek to reduce the consumption and use of material assets; and the production and disposal of waste throughout the lifecycle of the proposed scheme. Design choices and the choice of materials will make a significant contribution to reducing the environmental effects, associated with material assets and waste during operation, by influencing the required method and frequency of maintenance, and facilitating opportunities to recover and regenerate materials and products at the end of first life to support a circular economy.

14.2.43 It is also assumed that the assessment of any environmental effects associated with material assets and waste during any large scale future maintenance, renewal, or improvement works beyond the proposed year of opening, would be undertaken by the Road Operating Company in accordance with the requirements of the Overseeing Organisation.

14.3 Baseline Conditions

14.3.1 A desk-based assessment has been undertaken in order to establish, for the first and second study areas, the existing and likely future conditions (in the absence of the proposed scheme) for material assets and waste.

14.3.2 Baseline data has been collected at national, regional and sub-regional levels, including:

- availability of construction aggregates;
- presence of mineral safeguarding sites and/or peat resources;
- construction, demolition and excavation waste arisings; and
- information on regional waste transfer, treatment, recycling, and disposal facilities capacity.

Material Assets

14.3.3 For the purpose of this assessment, material assets are considered to be the physical resources in the environment, which may be of human or natural origin.

14.3.4 Primary aggregates have been chosen to act as a proxy indicator of material assets given that large quantities of aggregates are typically required for motorway and all-purpose trunk road projects, e.g. for direct use in unbound bulk fill, capping, sub-base, filter drains, and for indirect use in bound applications such as concrete and asphalt.

14.3.5 This was also considered appropriate due to the prominence given to aggregates in DMRB LA 110, and the fact that aggregates are likely to constitute the key construction material (by weight) to be consumed and used in the construction of the proposed scheme.

Existing Aggregates Consumption

14.3.6 The operational maintenance of the existing A9 consumes both unbound aggregates (used as sub-base and drainage applications) and bound aggregates (used in ready mixed concrete, asphalt and pre-cast concrete products).

14.3.7 There are no precise figures available regarding the baseline quantities of operational/ maintenance aggregates consumption across the first study area. Based on recent experience on other road schemes, this information is unlikely to be available at sufficient granularity to be useful in reporting the baseline conditions associated with the first study area.

14.3.8 Notwithstanding this, operational effects have been scoped out of the assessment for the reasons described in paragraphs 14.2.39 and 14.2.40.

Primary Aggregate Reserves

14.3.9 The principal materials used in road construction are primary aggregates, including sand, gravel and crushed rock. Primary aggregates are produced from naturally occurring mineral deposits and used for the first time, as defined by the in its Mineral Planning Factsheet: Construction Aggregates (British Geological Survey (BGS), 2019)).

14.3.10 Aggregates are normally defined as being hard, granular materials which are suitable for use on their own or with the addition of cement, lime or bituminous binders. However, a proportion of aggregates sales are for construction fill or other uses where soft and non-granular material may be acceptable or specified.

14.3.11 Crushed rock typically has a much wider range of uses than sand and gravel, including as a source of both coarse and fine concrete aggregate, other screened and graded aggregates and for other construction uses, including fill. However, its main use is in road construction, both unbound, primarily for the foundations of roads, and bound with either bitumen or cement in the upper layers.

14.3.12 Scotland's National Planning Framework 4 (NPF4) continues the UK landbank approach to planning for the supply of construction aggregates. Adopted in February 2023, NPF4 details the long-term planning strategy for Scotland to 2045. In terms of minerals, NPF4 sets out planning policies which ensure that a steady supply of construction aggregates is maintained to meet the needs of society and the economy in an acceptable and sustainable manner.

14.3.13 NPF4 requires those preparing local development plans to adopt a landbank approach to planning for the supply of construction aggregates. This approach is intended to ensure that a stock of reserves, with planning permission, is maintained to ensure adequate supplies of aggregates. Those preparing local development plans are required through NPF4 to maintain a landbank of permitted reserves equivalent to a minimum of 10 years supply at all times. The ten-year period recognises the likely time that it takes to bring a new site into full production.

14.3.14 The Collation of the results of the 2019 Aggregate Minerals Survey for Scotland (Scottish Government, 2023) confirms that the second study area (Tay Area and Forth Valley) had a

total landbank for crushed rock and sand and gravel of 30 years and 9 years respectively at the end of 2019 (the most recent year available):

- Crushed rock: 30 years for crushed rock from maximum supply at 2019 sales levels. In 2019, total sales of crushed rock equated to 434,000 tonnes.
- Sand and gravel: 9 years for crushed rock from maximum supply at 2019 sales levels. In 2019, total sales of sand and gravel equated to 441,000 tonnes.

14.3.15 Review of the British Geological Survey Directory of Mines and Quarries (BGS, 2020) suggests that the mines and quarries in the study area are able to supply a wide range of materials, including but not limited to primary aggregate, concrete and asphalt products. It can reasonably be inferred that there is likely to be an adequate supply of construction aggregates available within the study area to construct the proposed scheme; and policy, strategic and legislative drivers are likely to facilitate that sufficient capacity is provided.

14.3.16 The appointed Contractor would source materials for the construction of the proposed scheme, and typically they would look to use local suppliers and to re-use materials on-site to reduce the environmental impact and cost of waste transport and to support the economic well-being of the local communities in line with the proximity principle. Procurement rules mean that it is not possible to prescribe specific materials sources to specific quarries, manufacturers or suppliers.

14.3.17 Both secondary and recycled aggregates can be used, subject to the Specification for Highway Works (Department for Transport (DfT), 2022), as alternatives to primary aggregate and have a number of benefits, including the reuse of secondary and waste materials and reducing the impact of primary extraction:

- Secondary aggregates are typically by-products of industrial processes. These can be sub-divided into manufactured and natural aggregates, depending on their source and can include materials such as pulverised fuel ash, ground granulated blast furnace slag, incinerator bottom ash and recycled glass.
- Recycled aggregates are typically derived from reprocessing materials previously used in construction, e.g. road planings or crushed concrete from construction and demolition (C&D) activities.

14.3.18 Zero Waste Scotland has previously produced an Aggregate Quality Protocol Suppliers Directory (Zero Waste Scotland, 2024) of suppliers of recycled aggregates who have successfully demonstrated their compliance with the Quality protocol: aggregates from inert waste - End of waste criteria for the production of aggregates from inert waste (WRAP, 2013). The details on the locations of suppliers, identified from the directory, that are within the second study area and could be utilised for the proposed scheme, are as shown in Table 14.4.

14.3.19 These suppliers could be utilised to provide recycled aggregates or potentially to process waste from the proposed scheme. Other potential sources of alternative aggregates would be investigated as the detailed design is progressed, including opportunities to re-use site-won materials and materials from major development sites in the area. The second study area, for

material assets, has been expanded to include the Fife Council area given that these sites can be viewed as both material suppliers and waste recovery facilities.

Table 14.4: Recycled Aggregates Suppliers in the Second Study Area (Zero Waste Scotland, 2024)

Sub-region	Address of Recycled Aggregate Supplier	Products
Angus	Walkkmill – Geddes Group, Waulkmill Quarry, DD11 4UT	Sub-base (Type 1) and capping (6F5).
Dundee	Ardownie – Geddes Group, Ardownie Quarry, DD5 4HW	Sub-base (Type 1) and capping (6F5).
Perth & Kinross	Collace Quarry – Tayside Contracts, PH2 6JB	General fill; sub-base (Type 1); sub-base (Type 4); and drainage and filter bedding.
Fife	Clatchard Quarry – Breedon Aggregates Scotland Ltd, KY14 6JJ	General fill
Fife	Langside Quarry – Purvis Group, KY8 5SG	General fill and Sub-base (Type 1)
Fife	Bowhill Recycling Centre – Purvis Group, KY5 0ND	General fill; sub-base (Type 1); and capping (6F5)
Fife	Birchwood Sidings – Belliston Quarry Co Ltd, KY9 1JS	General fill; sub-base (Type 1); and capping (6F5)
Fife	Achilty Quarry – Leiths Scotland Ltd, KY2 5XD	Sub-base (Type 1); capping (6F3); and asphalt planings
Fife	Grant House – Grant Construction Services Ltd, KY11 9YX	Capping (6F5)
Falkirk	Eagle Recycling – Purvis Group	Sub-base (Type 1); capping (6F5); and recycled sand (0/6mm)

Minerals Safeguarding Sites

14.3.20 Scotland's National Planning Framework 4 requires that: '*Local development plans should safeguard important workable mineral resources, which are of economic or conservation value, and take steps to ensure these are not sterilised by other types of development*'.

14.3.21 A review of the Perth & Kinross Local Development Plan 2 (Perth & Kinross Council, 2019) has not identified any mineral safeguarding sites (i.e. operational extraction sites or mineral sites specifically identified/allocated in strategic planning documents as those that will be mined or extracted) within or in close proximity to the first study area. Superficial deposits, where present, are recorded as alluvium, river terrace deposits, glaciofluvial deposits and Devensian glacial till.

14.3.22 The majority of the existing A9 is underlain by glaciofluvial deposits comprising sand and gravel with local lenses of silt, clay and organic matter. Where the existing A9 is located close

to the River Tay, for example at Inver, the River Tay Crossing and west of Little Dunkeld, the underlying superficial material comprises river alluvium, a silty clay which can contain layers of silt, sand, gravel and peat.

14.3.23 River terrace deposits are recorded in the west of the study area, further up slope on the edge of the floodplain, and are generally described as being comprised of sand and gravel with local lenses of silt, clay or peat. Glacial till is generally recorded on the higher ground of the valley sides and is typically composed of a wide range of poorly sorted clays, sands and gravels.

Peat Resources

14.3.24 No peat resources (i.e. existing or potential peat extraction sites) have been identified within the first study area. For the purposes of this assessment, this equates to sites with an extant planning permission for commercial peat extraction.

14.3.25 No peat deposits are recorded on Minerals Information Online (BGS, 2025) within 250m of the first study area. In addition, the entire study area is classified as Class 0 (mineral soils where peatland habitats are not typically found) by the Carbon and Peatland map 2016 (Nature Scotland, 2016) with a small area at Birnam, Little Dunkeld and Dunkeld classified as Class -2 (non-soil; i.e. loch, built up area, rock and scree).

14.3.26 Notwithstanding this, a review of ground investigation data indicated that peat/peaty soils have been encountered locally in a relatively small number of exploratory hole locations. Additional details on peat as a soil resource, rather than a mineral resource, can be found in Chapter 13 (Geology, Soils, Groundwater and Land Contamination).

Waste Production and Disposal

Existing Waste Production

14.3.27 Waste produced during the operational maintenance of the existing A9 is likely to include asphalt planings, soft estate vegetative arisings, road sweepings, gully arisings, oil separator waste, animal by-products (roadkill) and litter.

14.3.28 There are no precise figures available regarding the baseline quantities of operational/ maintenance waste generation across the first study area. Based on recent experience on other road schemes, this information is unlikely to be available at sufficient granularity to be useful in reporting the baseline conditions associated with the first study area.

14.3.29 Notwithstanding this, operational effects have been scoped out of the assessment for the reasons described in paragraphs 14.2.39 and 14.2.40.

Construction and Demolition Waste Generation

14.3.30 The construction of the proposed scheme will produce a range of waste types including inert, non-hazardous and hazardous (or special) wastes. The majority of wastes are assumed to be inert and non-hazardous C&D wastes.

14.3.31 However, there will also be Municipal Solid Waste (MSW) generated by construction workers (e.g. canteen, office and staff welfare waste), and smaller quantities of hazardous waste (e.g. contaminated soils, paints and solvents, admixtures, spill absorbent materials, waste lubricants, waste electrical and electronic equipment, and batteries).

14.3.32 Scotland's Environment Waste Discover Data Tool (SEPA, 2024) provides a break-down of all waste types for 2011 to 2022, and the trend for Scottish waste landfilled since 2005. This tool records that Scotland generated approximately 4,616,588 tonnes of C&D waste in 2022 (the latest year available), the composition of which is as shown in Table 14.5. No further regional breakdown is provided.

14.3.33 The Waste Discover Data Tool also confirmed that 90.4% of inert and non-hazardous C&D waste was recorded as having been recycled in 2022 (88.8% average between 2011 and 2022), against the EU Waste Framework Directive 2008/98/EC target of 70% by 2020. C&D recycling rates are from data provided to Europe for reporting under the Waste Framework Directive. C&D recycling excludes hazardous waste and naturally occurring soil and stones coded under 17 05 04 of the European Catalogue List of Wastes.

Table 14.5: Generated C&D Waste from All Sources in 2022 (SEPA, 2024)

Waste type	Generated in 2022 (t)	Composition in 2022 (%)
Dredging spoils	5,129	0.11%
Glass wastes	20,277	0.44%
Household and similar wastes	2,610	0.06%
Metallic wastes, ferrous	85,316	1.85%
Metallic wastes, mixed ferrous and non-ferrous	20,415	0.44%
Metallic wastes, non-ferrous	10,329	0.22%
Mineral waste from construction and demolition (1)	1,359,714	29.45%
Other mineral wastes	2,215	0.05%
Plastic wastes	7,825	0.17%
Soils	2,981,523	64.58%
Vegetal wastes	792	0.02%
Wood wastes	120,443	2.61%
Total	**4,616,588**	**100%**

(1) Includes concrete, bricks and gypsum waste; bituminous and tar bound road-surfacing waste; and certain mixed C&D streams.

14.3.34 The summary document and commentary text to the Waste Discover Data Tool confirms that annual C&D waste generation varies considerably depending on construction activities and major projects in Scotland, with year-on-year changes in C&D waste ranging from -27% to

+26%. The generation of C&D waste is therefore sensitive to large regional projects, which accounts for the large annual variation in C&D waste generated.

Current Waste Treatment, Recycling and Recovery Baseline

14.3.35 The available waste treatment, recycling, recovery and disposal infrastructure within the second study area accepting inert, non-hazardous and hazardous commercial and industrial waste (including C&D waste) is summarised as shown in Table 14.6. This is provided for the 2023 calendar year (the most recent year available), and is based on a review of Scotland's Waste Sites and Capacities Data Tool (SEPA, 2024).

14.3.36 A number of the waste facilities, as shown in Table 14.6, operate more than one waste management activity on-site and includes both merchant and restricted facilities. The reported tonnages therefore represent the total wastes inputted to each facility type and not tonnages per activity. Similarly, the reported capacities are for the facility type as a whole, not per activity as these data are not currently published by SEPA.

Table 14.6: Permitted and Remaining Capacity in Operational Waste Sites in the Second Study Area, 2023 (SEPA, 2024)

Waste Management Facility Type	Annual Waste Capacity (t)	Waste Inputs (2023) (t)	Utilised Capacity (2023) (t)
Civic amenity	181,854	69232	38%
Civic amenity/Composting	91,000	14,894	16%
Civic amenity/Transfer station	253,053	101,489	40%
Civic amenity/Transfer station/ Landfill (not operational)	7,000	5,234	75%
Co-incineration	685,000	410,988	60%
Composting/Anaerobic digestion	97,620	46,937	48%
Composting/Landfill (not operational)	37,000	17,448	47%
Incineration	424,000	210,942	50%
Landfill	849,398	58,237	7%
Landfill/Civic amenity/ Composting/Anaerobic digestion/Other treatment	436,500	189,405	43%
Landfill/Civic amenity/ Composting/Other treatment	302,500	144,738	48%
Landfill/Composting	165,000	29,256	18%
Landfill/Other treatment	898,500	320,540	36%
Metal recycler	537,255	239,029	44%

Waste Management Facility Type	Annual Waste Capacity (t)	Waste Inputs (2023) (t)	Utilised Capacity (2023) (t)
Metal recycler/Transfer station	179,749	72,813	41%
Other treatment	130280	330088	253%
Transfer station	2,794,269	808,567	29%
Transfer station/Anaerobic digestion	90,000	18,836	21%
Transfer station/Composting	304,999	134,490	44%
Transfer station/Landfill (not operational)	2,499	248	10%
Transfer station/Other treatment	645,850	208676	32%
Total capacity/inputs, and average utilised capacity (2023)	**9,113,326**	**3,432,087**	**48%**

14.3.37 Reference to the Waste Sites and Capacities Data Tool identifies that there was a total of 148 operational waste sites in the second study area (21 in Angus Council area, 16 in Dundee City Council area, 27 in the Perth & Kinross Council area, 6 in Stirling Council area, 27 in Falkirk Council area, 5 in Clackmannanshire Council area and 46 in Fife Council area) at the end of 2023.

14.3.38 It can therefore be assumed on the basis of the above facility types, throughputs and capacities, that there will be significant opportunity for appropriate wastes arising during the construction of the proposed scheme to be reused, recycled or otherwise recovered via appropriate means, subject to the waste hierarchy of prevent, prepare for reuse, recycle, recover and dispose as shown in Diagram 14.1.

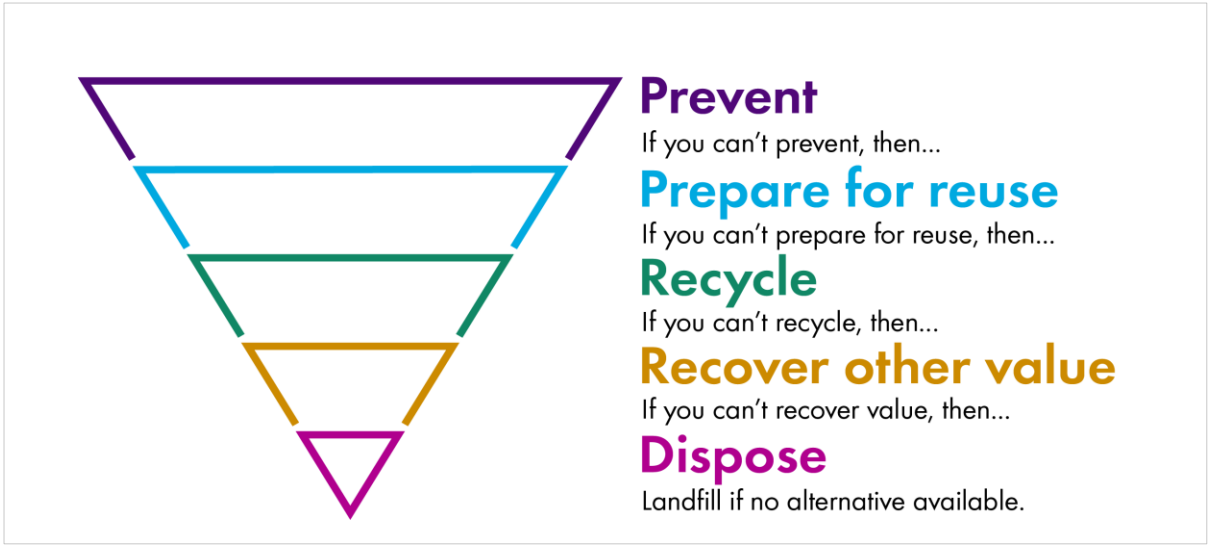

Diagram 14.1: The Waste Hierarchy (reproduced from Scottish Parliament, 2024)

14.3.39 A more detailed summary of the available waste management infrastructure in the second study area is provided in Appendix A14.2 (Waste Sites and Capacities within the Study Area), including the type, locations and capacities of each facility. The locations of the operational waste management infrastructure within the second study area are mapped as shown on Figure 14.1, which includes both merchant and restricted waste management facilities.

Current Landfill Capacity Baseline

14.3.40 For wastes which cannot be reused, recycled or otherwise recovered, disposal to landfill would be required. Scotland's Waste Sites and Capacities Data Tool details total remaining inert and non-hazardous landfill capacity in the second study area at the end of 2023, and this is as shown in Table 14.7.

14.3.41 The baseline review suggests that there is currently available inert landfill capacity within the second study area for the majority of wastes likely to arise from the construction of the proposed scheme, but there is limited non-hazardous and hazardous landfill capacity.

Table 14.7: Permitted and Remaining Capacity of Operational Landfills (Inert and Non-Hazardous) in the Second Study Area, 2023 (SEPA, 2024)

Site Name	Council Area	Approx Distance	Capacity on Permit 2023 (t)		Remaining Capacity at the End of 2023 (t)	
			Annual	Total	Remaining Capacity	Landfilling End Date
Inert landfill sites						
Border Quarry Landfill	Angus	~70km	24,999	-	341,013	01/12/2050
Ardownie Landfill	Angus	~60 m	75,000	-	263,320	01/12/2035
Prettycur Landfill	Angus	~50km	24,999	53,067	5,218	01/12/2024
Hatton Mill Landfill	Angus	~70km	75,000	1,875,270	1,818,385	01/12/2034
Non-hazardous landfill sites (1)						
West Carron Landfill	Falkirk	~90km	77,400	5,000,000	218,332	01/12/2027
Avondale Landfill	Falkirk	~100km	720,000	8,350,000	376,000	01/11/2025
Lochhead Landfill	Fife	~70km	382,500	7,946,400	96,217	01/12/2025
Lower Melville Woods Landfill	Fife	~60km	282,500	2,701,000	61,830	01/12/2025
Hazardous landfill sites (2)						
Avondale Quarry	Falkirk	~100km	200,000	800,000	31,000	01/12/2025
Total (Mt)	**N/A**	**N/A**	**1.86**	**26.73**	**3.21**	**N/A**

Site Name	Council Area	Approx Distance	Capacity on Permit 2023 (t)		Remaining Capacity at the End of 2023 (t)	
			Annual	Total	Remaining Capacity	Landfilling End Date
(1) These non-hazardous landfills also accept stable non-reactive hazardous waste in separate dedicated landfill cells (e.g. asbestos). All existing operational non-hazardous landfills in the second study area are currently scheduled to have ceased infilling by the start of construction in 2028. The closest operational non-hazardous landfills with sufficient likely remaining capacity beyond 2028 are: Greengairs Landfill, Meikle, Drumgray Road, Airdrie, ML6 7TD with 3,579,070 t of remaining capacity at the end of 2023 and an estimated date for ceasing landfill of 01/03/2038 (~100km); Easter Hatton Farm, Balmedie, Aberdeenshire, AB23 8YY with 1,593,000 t of remaining capacity at the end of 2023 and an estimated date for ceasing landfill of 01/12/2056 (~150km).						
(2) Reference to SEPA's Consultation Hub (SEPA, 2022) confirms that SEPA received an application from Avondale Environmental Limited in 2021 for a new Pollution Prevention and Control Permit (PPC) (PPC/A/SEPA2021-7010) to undertake landfill activities in a new hazardous landfill cell at their waste management complex. This new application looks to increase the hazardous waste landfill operations within the wider Avondale Environmental waste management complex by utilising previously undeveloped land to construct a new cell area. The design will provide an extra 220,000 m3 (or 352,000 t) of void space for the landfill of hazardous waste. Whilst SEPA has assessed the application and has drafted new permit conditions along with a draft decision document, which recommended that a permit variation be issued, its Consultation Hub would suggest that the application was withdrawn by the applicant on the 15/08/2024. Currently, there is no specific timeline for future applications by Avondale Environmental Limited for additional capacity at Avondale Quarry Landfill.						

Future Waste Treatment, Recycling and Recovery Baseline

14.3.42 Waste treatment, recycling and recovery facilities are typically characterised by large annual throughput capacities; consequently, large step changes in capacity (as single facilities are commissioned) have an exaggerated impact on the historical trend. Waste treatment, recycling and recovery capacity cannot therefore be realistically projected forward to the construction phase.

14.3.43 The waste treatment and recovery infrastructure capacity will therefore be based on the most recent available Waste Sites and Capacities Data Tool capacity/input data that suggests that there is likely to be adequate opportunity for appropriate wastes arising during the construction of the proposed scheme to be recycled or subject to other recovery, subject to the waste hierarchy.

14.3.44 Waste transfer, treatment, recycling and recovery infrastructure facilities are considered to be a beneficiary of incoming materials by driving the management of arisings up the waste hierarchy, and by facilitating a circular approach to the management of materials. Whilst such facilities are a factor in the reduction in the significance of effect associated with waste disposal, they are not considered to be a sensitive receptor for the purposes of assessment in the same way as landfills, which are a finite resource.

14.3.45 Professional experience has shown that waste markets are flexible and adapt to changing markets within a region. It is expected that whilst the actual waste facilities available may change over the course of construction, the overall capacity is likely to remain similar as the market responds.

Future Forecast Landfill Capacity

14.3.46 Projected future landfill capacity values have been estimated and are illustrated as shown in Table 14.8 and Diagram 14.2 respectively, based on the average annual percentage change in remaining inert and non-hazardous landfill capacity for the years for which consistent data are available in Waste Sites and Capacities Data Tool (i.e. 2015 to 2023):

- inert landfill (-4.14%);
- non-hazardous landfill (-22.50%); and
- hazardous landfill (-13.37%).

14.3.47 The predicted changes in landfill capacity are derived from the historic time-based data provided in the Waste Sites and Capacities Data Tool (i.e. remaining landfill capacity at the end of each calendar year). These data have been projected forward to 2032, using the calculated average annual capacity change in landfill capacity from 2015 to 2023, in order to provide an estimate of the remaining landfill capacity that may be available during the construction of the proposed scheme (assumed to be between 2028 and 2032 for assessment purposes).

14.3.48 The estimates, as shown in Table 14.8 and Diagram 14.2, assume continuation of a similar trend, in the subtraction and addition of landfill capacity, as that reported by Waste Sites and Capacities Data Tool between 2015 and 2023.

Table 14.8: Forecast Future Landfill Capacity in the Second Study Area (2028 to 2032)

Timeline	Inert capacity (t)		Non-hazardous (t)		Hazardous capacity (t)	
	Historic baseline	Future baseline	Historic baseline	Future baseline	Historic baseline	Future baseline
2015	3,483,145	N/A	6,124,181	N/A	164,264	N/A
2016	3,450,026	N/A	5,761,346	N/A	133,601	N/A
2017	3,415,908	N/A	4,652,778	N/A	100,000	N/A
2018	3,405,720	N/A	3,198,700	N/A	80,000	N/A
2019	3,368,112	N/A	2,477,702	N/A	59,180	N/A
2020	3,281,932	N/A	1,836,508	N/A	43,557	N/A
2021	3,239,328	N/A	1,434,590	N/A	34,732	N/A
2022	3,114,578	N/A	885,694	N/A	17,225	N/A
2023	2,427,936	N/A	752,379	N/A	31,000	N/A
2024	N/A	2,327,491	N/A	583,061	N/A	26,856
2025	N/A	2,231,202	N/A	451,846	N/A	23,266
2026	N/A	2,138,897	N/A	350,161	N/A	20,156
2027	N/A	2,050,410	N/A	271,359	N/A	17,462
2028	**N/A**	**1,965,584**	**N/A**	**210,291**	**N/A**	**15,128**

Timeline	Inert capacity (t)		Non-hazardous (t)		Hazardous capacity (t)	
	Historic baseline	Future baseline	Historic baseline	Future baseline	Historic baseline	Future baseline
2029	N/A	1,884,267	N/A	162,967	N/A	13,106
2030	N/A	1,806,314	N/A	126,292	N/A	11,354
2031	N/A	1,731,586	N/A	97,871	N/A	9,836
2032	N/A	1,659,950	N/A	75,845	N/A	8,521
Average annual capacity 2028-32 (tpa)	N/A	1,809,540	N/A	134,653	N/A	11,589

14.3.49 Although there is generally a reducing trend for landfill disposal in Scotland, the forecast future baseline landfill capacity suggests that there is likely to be adequate inert landfill capacity (~1,809,540 tpa); limited non-hazardous landfill capacity (134,653 tpa) and very limited hazardous landfill capacity (11,589 tpa) available in the second study area between 2028 and 2032 to support the construction of the proposed scheme.

14.3.50 Notwithstanding this, it is envisaged that the vast majority of the inert and non-hazardous waste arising from constructing the proposed scheme will be re-used, recycled or otherwise recovered within the first or second study area in accordance with the legislative and policy regime. This assumption is validated by the available Scottish statistics with 90.4% of inert and non-hazardous C&D waste having been recycled and diverted from landfill in 2022 (the most recent year available).

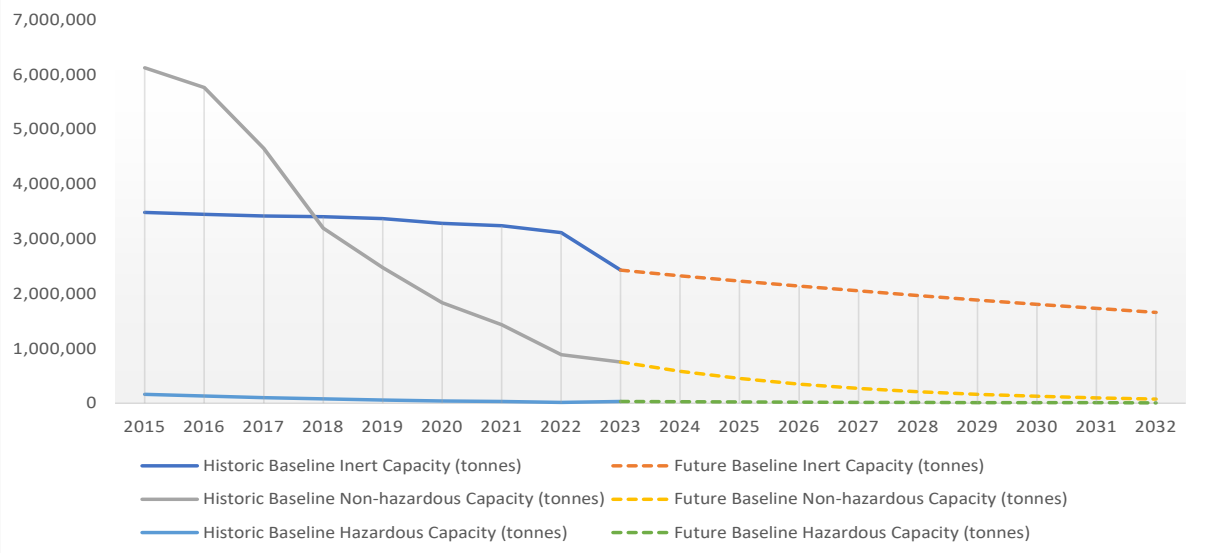

Diagram 14.2: Forecast Future Landfill Capacity in the Second Study Area (2028-32)

14.3.51 This will be required in order to demonstrate the proposed scheme's contribution to achieving Scotland's Zero Waste Plan target of recycling 70% of all waste, and landfilling a maximum of

5% by 2025; and to comply with the provisions of The Waste (Scotland) Regulations 2011 (e.g. taking all such reasonable measures available to apply the waste hierarchy) and The Waste (Scotland) Regulations 2012 (e.g. banning the landfilling of segregated waste).

14.3.52 Any landfills that have ceased infilling at the time of construction, and are no longer accepting waste, may also still require inert and non-hazardous materials for capping and restoration purposes, and therefore may be amenable to accepting any suitable surplus materials arising from construction subject to waste regulatory controls (e.g. waste management licensing, pollution prevention and control permitting or exemptions).

Sensitivity of the Identified Resources and Receptors

14.3.53 The baseline environment is comprised of receptors which have been defined geographically based on the likely environmental effects, associated with the use and consumption of material assets and the production and disposal of waste, as set out in DMRB LA 110. Whilst these receptors and an indication of their sensitivity have been summarised as shown in Table 14.9, it should be noted that the DMRB LA 110 simplified significance framework precludes the need to assign a sensitivity rating to the identified receptors for the purposes of assessment.

Table 14.9: Sensitivity of Receptors that are Relevant to the Materials Assets and Waste Factor

Receptor	Sensitivity of the Receptor
Primary, secondary and recycled aggregate resources	There is likely to be a good supply of both primary and recycled aggregates within the study area to construct the proposed scheme. Although, there is currently limited information on the availability of secondary aggregates.
Mineral safeguarding sites and peat resources	There are no mineral safeguarding sites or peat resources within or in close proximity to the first study area. Given the absence of any mineral safeguarding sites and peat resources within the first study area, these receptors have been scoped out of any further assessment of potential impact and effects in this chapter.
Waste management infrastructure	There is likely to be sufficient inert landfill capacity (~1,809,540 tpa) within the second study area to support the construction of the proposed scheme. However, there is anticipated to be limited non-hazardous landfill capacity (134,653 tpa) and very limited hazardous landfill capacity (11,589 tpa). However, it should also be noted that all non-hazardous and hazardous landfills in the second study area are currently scheduled to have ceased infilling by the start of construction in 2028 (as shown in Table 14.7).

14.3.54 In addition to the generalised receptors as shown in Table 14.9 for material assets and waste, additional receptors and designated areas are identified in Chapters 16, 17 and 18 (Population and Human Health); Chapter 13 (Geology, Soils, Groundwater and Land Contamination); Chapter 19 (Road Drainage and the Water Environment); Chapter 8 (Air Quality); Chapter 15

(Noise and Vibration); and Chapter 20 (Climate). Designated sites located within 500m of the proposed scheme extents are as shown on Figure 1.2 (Key Environmental Constraints).

14.3.55 The proposed scheme design was developed to be cognisant of the identified constraints including, but not limited to topography; the existing ground and water features; potential drainage outfalls; existing roads and infrastructure; properties, land/farm boundaries; and the environmental constraints identified during the DMRB Stage 2 Scheme Assessment Report.

14.4 Potential Impacts and Effects

Introduction

14.4.1 The construction of the proposed scheme will require the use of material assets which impacts upon their immediate and, in the case of primary aggregates, long-term availability, resulting in temporary or permanent adverse effects on the environment through the depletion of natural resources. Material assets include both primary materials, such as mineral aggregates, and manufactured construction products such as asphalt and concrete. Some of these materials would originate offsite, purchased as primary construction products, but some would arise onsite, particularly from the use of excavated soils, crushed concrete or recycled asphalt planings, or recycled materials brought in from offsite, possibly from other projects or industries.

14.4.2 The construction of the proposed scheme will also generate surplus materials and waste, leading to potential impacts on the available waste management infrastructure through permanently occupying landfill capacity. Landfill is a finite resource, and the successive disposal of waste generally results in a continued need to expand existing, and develop new, landfill facilities. This loss of resources to landfill generally requires the extraction or production of new material assets which, in turn, accelerates the depletion of natural resources, resulting in temporary or permanent adverse effects on the natural environment.

Embedded Mitigation

14.4.3 Throughout the DMRB Stage 3 iterative design process, a number of engineering, buildability and environmental workshops have considered each aspect of the developing design and made recommendations for certain features to be included in the next design iteration.

14.4.4 These aspects have been defined as ‘embedded mitigation’ and where they are incorporated into the proposed scheme, they are considered within the context of the impact assessment as providing mitigation to avoid or reduce potential environmental effects. These measures are detailed in Chapter 5 (Iterative Design Development) and Chapter 6 (The Proposed Scheme).

14.4.5 With respect to the material assets and waste elements under consideration in this chapter, it is important to note that the design iterations have been informed by ongoing consideration of earthworks materials balance across the proposed scheme. The main focus at DMRB Stage 3 has been to consider the various means of incorporating embedded mitigation through refining the proposed scheme alignment and levels to optimise the cut and fill balance.

14.4.6 Other specific opportunities identified at the time of assessment, with the potential to reduce materials consumption and waste generation, and which have been incorporated into the proposed scheme as embedded mitigation include, but are not limited to the following design development measures which are further detailed in the DMRB Stage 3 Assessment Report Volume 1 Part 2 Chapter 4 Engineering Assessment:

- General design development.
- Removal of a Roundabout at Dalguise Grade Separated Junction.
- Dalguise Vertical Alignment Redesign.
- Inver Parallel Access Track Removal.
- Murthly Estate Access Track Relocation.
- Design Development – Birnam Glen Bridge.
- Birnam Junction Bridge Structure Form.

Consumption and Use of Material Assets

14.4.7 The types of material assets likely to be required for construction are common to all road schemes. Indicative estimated quantities of the major materials required for the proposed scheme, including a 15% contingency to cover any unknown items, are as shown in Table 14.10.

14.4.8 Material assets consumption has been estimated through a review of the DMRB Stage 3 preliminary design information. Indicative levels of recycled content have been sourced thorough reference to material specific recycled content levels, at good practice levels, provided in the Net Waste Tool Dataset (WRAP, 2008).

14.4.9 Given the age of this data, good practice benchmarks, as opposed to standard or best practice benchmarks, have been selected in order to provide a reasonable and realistic worst case assessment scenario in line with WRAP following benchmark definitions:

- 'Standard practice' benchmarks reflect the baseline performance of the construction industry, at the time of publication, based on achieving minimum standards and legal requirements.
- 'Good practice' benchmarks reflect going beyond standard practice to realise 'quick win' - benefits that are easy to achieve on a majority of projects without a fundamental change in working practice and were at least cost neutral at the time of publication.
- 'Best practice' benchmarks reflect the leading approach undertaken in the industry at the time of publication, but may bear a cost premium or require a significant change in working practice on some projects.

14.4.10 The use of good practice benchmarks aligns with the implementation of those essential mitigation measures/targets identified in Section 14.5 (Mitigation) of this chapter. These measures would be implemented to reduce the use of new/virgin materials and increase the use of reused, recycled, recovered and responsibly sourced materials in the proposed scheme.

Table 14.10: Summary of Estimated Material Assets Consumption (2028 to 2032) (Including 15% Contingency)

Material assets	Approximate Quantity Range (t)	Indicative Recycled Content Levels (%)	Estimated Recycled Content Range (t)	Estimated Virgin Content Range (t)
Site-won general fill	1,547,462	100	1,547,461.5	0.0
Site-won topsoil	86,881	100	86,880.6	0.0
Imported general stone (1)	2,321	31	719.5	1,601.5
Imported fill, aggregate, sand (1)	334,985	31	103,845.4	231,139.7
Imported asphalt (1)	203,478	30	61,043.4	142,434.6
Imported concrete (1)	111,632	20	22,326.4	89,305.7
Imported steel	14,705	60	8,823.1	5,882.1
Imported plastics	387	10	38.7	348.0
Imported timber	609	20	121.7	486.9
Total (t) and Average (%)	**2,302,459**	**45**	**1,831,260**	**471,198**

(1) Denotes aggregate materials or aggregate containing materials for the purposes of assessment.

14.4.11 The quantities information provided in Tables 14.10 and 14.11 have been used to calculate what percentage of overall material reuse, recycling or recovery is likely to be achieved by the proposed scheme to substitute use of primary materials within the first or second study area.

14.4.12 As shown in Table 14.2, this has been determined by calculating the total quantities of: site-won materials; imported materials with recycled content; and materials reused, recycled or recovered off-site as proportion of the overall mass balance for the proposed scheme.

14.4.13 By implementing good practice during construction, the proposed scheme could achieve an approximate overall material reuse, recycling or recovery rate of up to 87% to substitute use of primary materials within the first or second study area (equating to approximately 3,262,254 t of material).

14.4.14 The choice of whether to use primary or secondary or recycled aggregates, or a combination of both, will ultimately be made by the appointed Contractor after considering a combination of factors, such as sources, specification, production and transport of available materials.

14.4.15 By implementing good practice during construction, the proposed scheme could consume imported aggregates with an approximate overall reused/recycled content of up to 28% (equating to approximately 187,935 t of material).

Construction and Demolition Waste Production and Disposal

14.4.16 The estimated quantities of key C&D waste likely to be generated during the construction of the proposed scheme are as shown in Table 14.11, which includes a 15% contingency to account for any unknown items.

14.4.17 Waste arisings have been calculated using various methods. These include referencing actual quantities from the DMRB Stage 3 preliminary design data and applying material-specific wastage rates based on traditional UK construction practices, as outlined in the RICS Professional Standard - Whole Life Carbon Assessment for the Built Environment. These rates were applied to the material quantities for the proposed scheme, as detailed in Table 14.10.

14.4.18 Indicative waste recovery rates for each major waste type have been sourced from the RICS Professional Standard - Whole Life Carbon Assessment for the Built Environment. This standard outlines typical end-of-life pathway percentages for common construction materials, categorised by reuse, recycling, incineration and disposal, based on current business as usual UK construction practices and technologies. Recovery rates have been calculated by summing the end-of-life pathway percentages for reuse, recycling, and incineration so as to provide a measure of typical waste recovery (or diversion from landfill) during the construction of the proposed scheme.

14.4.19 The application of these default end-of-life scenarios is consistent with the essential mitigation measures and targets outlined in Section 14.5 (Mitigation) of this chapter. These measures aim to reduce the disposal of surplus materials and waste, promoting their management higher up the waste hierarchy and supporting the shift towards a circular economy. These typical percentages have also been chosen to enable a reasonable and realistic assessment scenario for the proposed scheme.

Table 14.11: Estimated C&D Waste Generation, Recovery and Disposal (2028 to 2032) (Including 15% Contingency)

Waste Stream (1)	Indicative Waste Class	Approximate Quantity (t)	Good Practice Wastage Rate (%)	Estimated Waste Generation (t)	Indicative Waste Recovery Rate (%)	Estimated Disposal to Landfill Range (t)
Site clearance						
Woodland clearance	Non-hazardous	13,234	N/A	13,234	99	132.3
Asphalt planings	Non-hazardous	216,828	N/A	216,828	98	5,420.7
Concrete	Inert	2,923	N/A	2,923	98	73.1
Masonry	Inert	302	N/A	302	98	7.5
Aggregates	Inert	84	N/A	84	98	2.1
Mixed metal	Non-hazardous	496	N/A	496	98	9.9

Waste Stream (1)	Indicative Waste Class	Approximate Quantity (t)	Good Practice Wastage Rate (%)	Estimated Waste Generation (t)	Indicative Waste Recovery Rate (%)	Estimated Disposal to Landfill Range (t)
Timber	Non-hazardous	64	N/A	64	99	0.6
Glass	Inert	9	N/A	9	61	3.4
Plasterboard	Non-hazardous	61	N/A	61	17	50.8
Excavation						
Acceptable cut and rock	Inert	653,920	N/A	653,920	98	16,348.0
Acceptable topsoil	Non-hazardous	226,081	N/A	226,081	98	5,652.0
Unacceptable cut and rock	Non-hazardous	266,723	N/A	266,723	98	6,668.1
Unacceptable topsoil	Non-hazardous	34,774	N/A	34,774	98	869.3
Construction						
Imported general stone	Inert	2,321	10	232	98	5.8
Imported fill, aggregate and sand	Inert	334,985	10	33,499	98	837.5
Imported asphalt	Inert	203,478	6	12,209	98	305.2
Imported concrete	Inert	111,632	5	5,582	98	139.5
Imported steel	Non-hazardous	14,705	3	441	98	8.8
Imported plastics	Non-hazardous	387	2	8	100	0.0
Imported timber	Non-hazardous	609	10	61	99	0.6
Total (t) and Average (%)		**2,083,615**	**7**	**1,467,529**	**92**	**36,535**

(1) Table 14.11 does not encompass all the potential waste streams that could be generated during the construction of the proposed scheme. For example, estimates for municipal solid waste from construction workers, packaging waste, unidentified contaminated land, miscellaneous hazardous wastes, trees and plants infected with specific plant diseases; invasive non-native species, have not been included given the relatively limited expected quantities and challenges in forecasting them. This table also only covers wastes in solid form and does not consider any discharges in liquid form. The waste assessment is predicated on impacts to landfill capacity. Liquid wastes are prohibited from landfill and have therefore been excluded from the assessment.

Summary of Significant Effects Prior to Essential Mitigation

14.4.20 The significance of potential environmental effects is assessed, with embedded mitigation measures and prior to the application of essential mitigation measures, as shown in Table 14.12. This follows the methodology described in Section 14.2 (Approach and Methods).

Table 14.12: Summary of Significant Effects Prior to Essential Mitigation

Element	Description of Potential Effects	Assessment vs. Significance Criteria in Table 14.2
Material Assets		
Overall material recovery/ recycling	The proposed scheme has the potential to achieve an overall material reuse, recycling or recovery rate of 86.5% to substitute the use of primary materials within the first or second study area (equating to approximately 3,262,254 t). Materials would be recovered within the first or second study area to offset the use of primary construction materials and support the transition to a circular economy. This would be achieved through a combination of using site-won materials; importing materials with reused or recycled content and recovering surplus materials and waste off-site. These data support the assumption that the proposed scheme is unlikely to achieve an overall recovery/recycling rate (by weight) of less than 70%. This assumption is further supported by the Waste Discover Data Tool which confirm that 90.4% of inert and non-hazardous C&D waste was recycled in 2022 (88.8% average between 2011 and 2022).	Project achieves 70-99% overall material recovery/ recycling (by weight) of non-hazardous C&D waste to substitute use of primary materials; and Aggregates imported to site comprise re-used recycled/content in line with the relevant regional percentage target of 25%. Significance: **Slight**

Element	Description of Potential Effects	Assessment vs. Significance Criteria in Table 14.2
Incorporation of reused/ recycled aggregate content	The proposed scheme has the potential to incorporate up to an estimated 187,935 t of reused/recycled aggregate within the build which equates to approximately 28.0% by weight. These data support the assumption that reused/recycled aggregate content use on the proposed scheme is unlikely to be less than the surrogate target of 25%. This assumption is further supported by Construction Procurement Guidance (WRAP, 2009) which suggests that the recycled content as a percentage of the total material cost for an infrastructure project was typically 25 - 49% when applying cost-neutral good practice. Reference to the Profile of the UK Mineral Products Industry 2023 Edition (Mineral Products Association, 2023) also confirms that 31% of total supply of construction aggregates in 2022 was from recycled and secondary sources.	
Waste		
Occupation of landfill capacity within the second study area	The proposed scheme has the potential to dispose of 17,722 t and 18,813 t respectively of inert and non-hazardous waste to landfill within the second study area between 2028 and 2032. This would be equivalent to a 1.0% and 14.0% drawdown/reduction in forecast inert and non-hazardous landfill capacity respectively between 2028 and 2032. This is based on the amount of average annual inert (1,809,540 tpa) and non-hazardous and hazardous (134,653 tpa) landfill capacity projected to be available in the second study area.	Project leads to a greater than 1% reduction or alteration in regional non-hazardous landfill capacity; and Project disposes of 1-50% of non-hazardous project waste outside of the region. Significance: **Moderate**
Occupation of landfill capacity outwith the second study area	Given the likely absence of non-hazardous landfill within the second study area by 2028 (assuming a worst case scenario), the proposed scheme has the potential to dispose of 18,813 t of non-hazardous waste at landfills located outwith the second study area between 2028 and 2032. This	

Element	Description of Potential Effects	Assessment vs. Significance Criteria in Table 14.2
	would be equivalent to 1.3% of total project waste for disposal outside of the second study area.	

14.4.21 In summary, the construction of the proposed scheme has the potential to cause Slight and Moderate adverse effects on material assets and waste, respectively, after applying the embedded mitigation measures detailed in Chapter 5 (Iterative Design Development) and Chapter 6 (The Proposed Scheme), and described in paragraphs 14.4.5 and 14.4.6. These effects are considered Not-significant and Significant, respectively, for the purposes of EIA.

14.4.22 Where effects have been identified, these will be addressed through adherence to national regulatory standards and local policy requirements as reported in Section 14.1 (Introduction) and Appendix A14.1 (Assessment of Regulatory and Policy Compliance)), and the essential mitigation measures reported in Section 14.5 (Mitigation) and as shown in Table 14.13.

14.5 Mitigation

14.5.1 The embedded mitigation measures, adopted as part of the evolution of the proposed scheme design, are recorded in Section 14.5 (Potential Impacts and Effects), Chapter 5 (Iterative Design Development) and Chapter 6 (The Proposed Scheme).

14.5.2 This section identifies the additional 'essential mitigation' measures required to further prevent, reduce and offset the environmental effects for material assets and waste identified in Section 14.4 (Potential Impacts and Effects). This is consistent with DMRB LA 110 which requires that, where adverse effects have been identified, mitigation measures should consider avoidance, reduction and remediation.

14.5.3 Essential mitigation measures for the proposed scheme have been identified through a review of current legislation, policy and guidance, and have been considered in the subsequent identification of likely residual effects in Section 14.6 (Residual Effects). Such measures focus on influencing the project design and construction in order to realise the mitigation purpose/ objectives as shown in Table 14.13.

14.5.4 This chapter refers to overarching standard mitigation measures applicable across the A9 Dualling Programme (Mitigation Items SMC-M1 to SMC-M7). No project-specific mitigation measures ('P02' mitigation item references) have been identified for the proposed scheme. These measures are also set out in Chapter 22 (Schedule of Environmental Commitments).

14.5.5 The appointed Contractor will be required to develop a management system to structure the implementation of the mitigation measures outlined in this and other chapters of the EIAR. This will include a Construction Environmental Management Plan (CEMP) (Mitigation Item SMC-S1), requirements for which will be established via the Contract Documents.

Table 14.13: Schedule of Environmental Commitments - Material Assets and Waste

Mitigation Item	Approximate Chainage/ Location	Timing of Measure	Responsible Party for Implementation	Description	Mitigation Purpose/ Objective	Specific Consultation or Approval Required	Monitoring Measures
SMC-M1	Throughout proposed scheme	Pre-construction; Construction	Main Contractor	Prior to construction a SWMP will be developed as part of the CEMP (see Mitigation Item SMC-S1) to set out how all construction phase materials will be managed and it will be updated regularly during the construction of the proposed scheme. The SWMP will identify, prior to the start of construction works, the types and likely quantities of wastes that may be generated and it will set out, in an auditable manner, how waste will be reduced, re-used, managed and disposed of in accordance with relevant Zero Waste Scotland Guidance. The SWMP will include specific materials management and soil management plans developed under voluntary and industry regulated Codes of Practice including:	To set out how all construction phase materials will be managed.	Consultation with SEPA.	SWMP

Mitigation Item	Approximate Chainage/ Location	Timing of Measure	Responsible Party for Implementation	Description	Mitigation Purpose/ Objective	Specific Consultation or Approval Required	Monitoring Measures
				▪ Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (DEFRA, 2009); ▪ Land Remediation and Waste Management Guidelines (SEPA, 2009); and ▪ Promoting the Sustainable Re-use of Greenfield Soils in Construction (SEPA, 2010). Appropriate waste minimisation and associated KPI targets will also be included.			
SMC-M2	Throughout proposed scheme	Pre-construction; Construction	Main Contactor	The Contractor will comply with all relevant waste legislation in relation to waste handling, storage, transport and disposal (e.g. The Waste Framework Directive) and consultation with SEPA for advice on waste practice, licences and exemptions where appropriate.	To ensure waste handling, storage, transport and disposal is compliant with all relevant waste legislation.	Consultation with SEPA	SWMP

Mitigation Item	Approximate Chainage/ Location	Timing of Measure	Responsible Party for Implementation	Description	Mitigation Purpose/ Objective	Specific Consultation or Approval Required	Monitoring Measures
SMC-M3	Throughout proposed scheme	Pre-construction; Construction	Main Contractor	The Contractor will apply the principles of the Waste Hierarchy (Prevention, Preparing for Re-use, Recycling, Other Recovery, Disposal) to minimise waste generation, maximise re-use of site-won materials on-site and minimise the need for disposal of waste. Where re-use is not possible within the proposed scheme, alternative re-use and recycling options will be sought off-site with disposal the final option, with clear justification of options provided.	To reduce waste generation, maximise re-use of site-won materials on-site and reduce the need for disposal of waste.	None required	SWMP
SMC-M4	Throughout proposed scheme	Pre-construction; Construction	Main Contractor	The Contractor will implement Zero Waste Scotland's Design for Resource Efficient Construction Principles.	To make the best use of materials, over the lifecycle of the proposed scheme's built assets, to reduce embodied carbon emissions.	None required	SWMP

Mitigation Item	Approximate Chainage/ Location	Timing of Measure	Responsible Party for Implementation	Description	Mitigation Purpose/ Objective	Specific Consultation or Approval Required	Monitoring Measures
SMC-M5	Throughout proposed scheme	Pre-construction; Construction	Main Contractor	The key material elements (i.e. aggregates, asphalt, cement, precast concrete products, ready-mixed concrete and steel) used within the proposed scheme shall be specified to be responsibly sourced.	To reduce impacts associated with the extraction and manufacture of materials.	None required	Material procurement records
SMC-M6	Throughout proposed scheme	Pre-construction; Construction	Main Contractor	All timber and timber products shall be sourced from independently verifiable legal and sustainable sources.	To reduce impacts associated with the extraction and manufacture of materials.	None required	Material procurement records
SMC-M7	Throughout proposed scheme	Pre-construction; Construction	Main Contractor	Alternatives to primary aggregates shall be investigated, including opportunities to use recycled or secondary aggregates in the construction of the proposed scheme; either sourced from construction, demolition and excavation waste obtained on-site or off-site; or secondary aggregates obtained from a non-construction or post-consumer or industrial by-product source.	To reduce impacts associated with the extraction, manufacture and transport of materials and to reduce waste generation, maximise re-use of site-won materials on-site and reduce the need for disposal of waste.	None required	Material procurement records

14.5.6 In addition to the essential mitigation measures identified with respect to material assets and waste, there are embedded and essential mitigation items from Chapters 16, 17 and 18 (Population and Human Health); Chapter 13 (Geology, Soils, Groundwater and Land Contamination); Chapter 19 (Road Drainage and the Water Environment); Chapter 8 (Air Quality); Chapter 15 (Noise and Vibration); and Chapter 20 (Climate) that will further mitigate the effects on material assets and waste. These are identified in the Chapter 22 (Schedule of Environmental Commitments).

14.5.7 No specific environmental enhancement measures have been identified at this stage with regards to this aspect over and above what is required to mitigate the adverse effects of the proposed scheme. Enhancement measures will be explored throughout the design and construction of the proposed scheme, and as an intrinsic part of developing the SWMP (SMC-M1). Example beneficial enhancements opportunities from the proposed scheme that of relevance to material assets and waste could include, but not be limited to, the following:

- Recycling suitable material for construction of enhancement measures, identified by other aspects, where the need for enhancement has been identified. For example: using felled vegetation and dead wood to create habitat piles and hibernacula within retained habitat and designated landscaping and mitigation areas.
- Using surplus recycled or recovered materials in community projects, for example the creation of public open space through the reuse of suitable surplus excavated materials, utilising recycled mulch from tree felling on adjacent community facilities, or using asphalt planings and rubble to maintain tracks, paths or bridleways.
- Exploring opportunities to use any surplus excavated materials for beneficial uses such as: engineering/landscaping fill on other A9 Dualling Projects; or outwith the programme in habitat creation, environmental rehabilitation, agricultural improvement, quarry restoration, contaminated land remediation or as a platform for future land development.

14.6 Residual Effects

14.6.1 The assessment has indicated that the construction of the proposed scheme is likely to consume material assets and hence will result in potential effects on the environment, through the depletion of natural resources. Conversely, this assessment has determined that constructing the proposed scheme is also likely to generate C&D waste, leading to potential effects on the available waste management infrastructure (i.e. through the permanent use of landfill void space and/or the short-term use of waste treatment capacity).

14.6.2 Throughout the design process, ‘embedded mitigation’ features have been included in the proposed scheme design with the potential to reduce materials consumption and waste generation. Where potential significant effects have been identified these will be avoided, reduced or offset where practicable through ensuring that the construction of the proposed scheme responds to the national regulatory standards and local policy requirements as reported in Section 14.1 (Introduction) and Appendix A14.1 (Assessment of Regulatory and Policy Compliance), and ‘essential mitigation’ measures reported in Section 14.5 (Mitigation).

14.6.3 Residual effects that remain once the essential mitigation measures have been implemented have been identified and are as shown in Table 14.14, following the methodology described

in Section 14.2 (Approach and Methods). Given the nature of the DMRB LA 110 simplified assessment framework criteria, all residual environmental effects are likely to remain unchanged from their pre-essential mitigation levels as shown in Table 14.12.

Table 14.14: Summary of Significant Effects After Essential Mitigation

Element	Description of Potential Effects	Mitigation Measures	Assessment vs. Significance Criteria in Table 14.2
Material Assets			
Overall material recovery/ recycling	The proposed scheme has the potential to achieve an overall material reuse, recycling or recovery rate of 86.5% to substitute the use of primary materials within the first or second study area (equating to approximately 3,262,254 t). Materials would be recovered within the first or second study area to offset the use of primary construction materials and support the transition to a circular economy. This would be achieved through a combination of using site-won materials; importing materials with reused or recycled content and recovering surplus materials and waste off-site. These data support the assumption that the proposed scheme is unlikely to achieve an overall recovery/recycling rate (by weight) of less than 70%. This assumption is further supported by the Waste Discover Data Tool which confirm that 90.4% of inert and non-hazardous C&D waste was recycled in 2022 (88.8% average between 2011 and 2022).	SMC-M1 SMC-M2 SMC-M3 SMC-M4 SMC-M5 SMC-M6 SMC-M7	Project achieves 70-99% overall material recovery/ recycling (by weight) of non-hazardous C&D waste to substitute use of primary materials; and Aggregates imported to site comprise re-used recycled/content in line with the relevant regional percentage target of 25%. Significance: **Slight**
Incorporation of reused/ recycled aggregate content	The proposed scheme has the potential to incorporate up to an estimated 187,935 t of reused/recycled aggregate within the build which equates to approximately 28.0% by weight. These data support the assumption that reused/recycled aggregate content use on the proposed scheme is unlikely to be less than the surrogate target of 25%. This assumption is further supported by Construction Procurement Guidance (WRAP, 2009) which suggests that the recycled	SMC-M1 SMC-M2 SMC-M3 SMC-M4 SMC-M5 SMC-M7	

Element	Description of Potential Effects	Mitigation Measures	Assessment vs. Significance Criteria in Table 14.2
	content as a percentage of the total material cost for an infrastructure project was typically 25 - 49% when applying cost-neutral good practice. Reference to the Profile of the UK Mineral Products Industry 2023 Edition (Mineral Products Association, 2023) also confirms that 31% of total supply of construction aggregates in 2022 was from recycled and secondary sources.		
Waste			
Occupation of landfill capacity within the second study area	The proposed scheme has the potential to dispose of 17,722 t and 18,813 t respectively of inert and non-hazardous waste to landfill within the second study area between 2028 and 2032. This would be equivalent to a 1.0% and 14.0% drawdown/reduction in forecast inert and non-hazardous landfill capacity respectively between 2028 and 2032. This is based on the amount of average annual inert (1,809,540 tpa) and non-hazardous and hazardous (134,653 tpa) landfill capacity projected to be available in the second study area.	SMC-M1 SMC-M2 SMC-M3 SMC-M4 SMC-M7	Project leads to a greater than 1% reduction or alteration in regional non-hazardous landfill capacity; and Project disposes of 1-50% of non-hazardous project waste outside of the region. Significance: **Moderate**
Occupation of landfill capacity outwith the second study area	Given the likely absence of non-hazardous landfill within the second study area by 2028 (assuming a worst case scenario), the proposed scheme has the potential to dispose of 18,813 t of non-hazardous waste at landfills located outwith the second study area between 2028 and 2032. This would be equivalent to 1.3% of total project waste for disposal outside of the second study area.	SMC-M1 SMC-M2 SMC-M3 SMC-M4 SMC-M7	

Summary

14.6.4 A summary of any likely adverse or beneficial significant residual effects, with the inclusion of mitigation, are as shown in Table 14.15 and Table 14.16 respectively.

Table 14.15: Summary of Significant Adverse Residual Effects – Material Assets and Waste.

Factor/Element	Summary of Significant Adverse Residual Effects	Significance
Material Assets	No significant effects have been recorded.	**Not significant**
Waste	Significant effects have been recorded in relation to the occupation of non-hazardous landfill capacity within the second study area; and occupation of non-hazardous landfill capacity outwith the second study area.	**Significant**

Table 14.16: Summary of Significant Beneficial Residual Effects – Material Assets and Waste

Factor/Element	Summary of Significant Adverse Residual Effects	Significance
Material Assets	No significant effects have been recorded.	**Not significant**
Waste	No significant effects have been recorded.	**Not significant**

14.7 Compliance against Plans and Policy

14.7.1 DMRB LA 104 'Environmental Assessment and Monitoring', states that environmental assessment, reporting and monitoring shall meet the requirements of the national planning policy for each relevant Overseeing Organisation. Appendix A14.1 (Assessment of Regulatory and Policy Compliance) provides a review of national and local policy documents which are of relevance to the assessment undertaken and reported in this chapter in accordance with DMRB guidance.

14.7.2 National policy objectives of relevance to this assessment are provided in the National Planning Framework 4 (2023) and Scotland's Zero Waste Plan (Scottish Government 2010). The Perth and Kinross Local Development Plan 2 (Perth and Kinross Council 2019) is relevant to this chapter, as is the Perth & Kinross Council Supplementary Planning Guidance - Delivering Zero Waste, 2020.

Summary of Policy Compliance

14.7.3 Overall, the design and assessment of the proposed scheme has had regard to, and is compliant with, policy objectives to reduce effects on material assets and waste.

14.7.4 Subject to appropriate mitigation measures that promote resource efficiency during the design and construction of the proposed scheme, it is assessed that the proposed scheme adheres to the requirements of policies relevant to material assets and waste as reported in Section 14.1 (Introduction).

14.7.5 A full policy compliance assessment can be found in Appendix A3.1 (Assessment of Policy Compliance).

14.8 Statement of Significance

14.8.1 The assessment has concluded that the environmental effects on material assets and waste as a result of constructing the proposed scheme are likely to remain at a Slight and Moderate

adverse effect level respectively after the application of essential mitigation measures as shown in Table 14.13. Based on the DMRB LA 110 significance criteria, this would result in Not-significant and Significant effects respectively.

14.8.2 Whilst the application of essential mitigation measures has the potential to reduce the environmental effects from the consumption and use of material assets and the production and disposal of waste to a certain but unspecified degree, it remains uncertain whether the proposed scheme's construction could achieve the levels of resource efficiency needed to meet the criteria for a Slight adverse effect on waste.

14.8.3 The ultimate significance of the proposed scheme's effect on available landfill capacity will be determined by its success in waste diversion and the actual landfill availability within the second study area. It is important to acknowledge, however, that landfill availability is outside the scope of the proposed scheme's influence.

14.8.4 To assess the actual environmental consequences of the proposed scheme and its implications for established policy directives, a review will be conducted by Transport Scotland (or its appointed agents or consultants) using the Scottish Trunk Road Infrastructure Project Evaluation (STRIPE) framework. This post-implementation evaluation would compare the environmental performance of the as-built scheme against the findings outlined in this EIAR.

14.9 References

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